FINAL

MANAGEMENT PLAN ADDENDUM FOR FY 2000 NAPL FIELD EXPLORATION

McCormick and Baxter Superfund Site
Stockton, California

July 6, 2000

Prepared for

EPA
REGION 9

U.S. Environmental Protection Agency
Region 9
75 Hawthorne Street
San Francisco, California 94105-3901

Prepared by

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McCormick and Baxter FY 2000 NAPL Field Exploration
July 6, 2000

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EXECUTIVE SUMMARY

This Management Plan Addendum describes the activities associated with the nonaqueous-phase liquid (NAPL) field exploration and groundwater monitoring program to be conducted for the McCormick and Baxter Superfund Site, Stockton, California, beginning in June 2000. This Management Plan Addendum defines the objectives of the investigation and provides details of the work to be performed during the Fiscal Year 2000 (FY00) field effort to meet the project objectives. The Management Plan Addendum incorporates by reference sections of the June 16, 1999, *McCormick and Baxter Superfund Site Management Plan for NAPL Exploration* (USACE 1999) that contain requirements and specifications directly applicable to the FY00 investigation. During the field investigation, both documents will be on site and used by project personnel.

Soil and groundwater at the site are contaminated with creosote, pentachlorophenol, and metals that were used to preserve wood at this former wood-treating facility. The primary objectives of this field exploration are to determine if NAPL has migrated beyond the current McCormick and Baxter property line, and, if so, the lateral and vertical extent of that migration, refine our understanding of the NAPL migrating from the McCormick and Baxter site, and complete the conceptual design for the in situ thermal treatment technology evaluation. A secondary objective for this investigation is to collect groundwater data to enhance the conceptual site model (CSM) and determine whether natural attenuation may be limiting the mobility of contamination.

The components of the exploration include a geophysical survey; use of the U.S. Army Corps of Engineers (USACE) Site Characterization and Analysis Penetrometer System (SCAPS) for mobile data collection; installation of soil borings, monitoring wells, and microwells; collection of soil, NAPL, and groundwater samples for analysis; characterizing potential subsurface obstructions near SE-3, SE-52, and SE-95; and conducting a laboratory-scale thermal treatability study.

The primary purpose for additional data collection at the site is to further evaluate the feasibility of using in situ thermal treatment methods to enhance removal of NAPL from the site and develop an effective groundwater cleanup strategy.

The Management Plan presented here consists of a Work Plan, a Sampling and Analysis Plan (which includes a Field Sampling Plan and a Quality Assurance Project Plan), an Investigation-Derived Waste Plan, and a Site Safety and Health Plan.

Work Plan Addendum for FY 2000 NAPL Field Exploration
McCormick and Baxter Superfund Site
Stockton, California

APPROVAL PAGE

Army Corps of Engineers Project Manager: Cheryl Buckel	Date
Army Corps of Engineers Project Technical Leader: Kira Lynch	Date

FINAL

WORK PLAN ADDENDUM FOR FY 2000 NAPL FIELD EXPLORATION

McCormick and Baxter Superfund Site
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ABBREVIATIONS AND ACRONYMS

ASTM	American Society for Testing and Materials
bgs	below ground surface
CEC	cation exchange capacity
CIH	Certified Industrial Hygienist
CLP	Contract Laboratory Program
cPAHs	carcinogenic polycyclic aromatic hydrocarbons
CPT	cone penetrometer testing
CSM	conceptual site model
CSV	comma-delimited format
DCQCR	daily chemical quality control report
DNAPL	dense nonaqueous-phase liquid
DQO	data quality objective
EDD	Electron diskette deliverable
EPA	U.S. Environmental Protection Agency
FASP	Field Analytical Support Program
FSP	field sampling plan
FY00	Fiscal Year 2000
FY99	Fiscal Year 1999
GC/FID	gas chromatography/flame ionization detector
GC/MS	gas chromatography/mass spectroscopy
GMS	Groundwater Modeling System
GSA	General Services Administration
LIF	laser-induced fluorescence
LNAPL	light nonaqueous-phase liquid
LPG	liquid petroleum gas
MCL	maximum contaminant level
MIBK	methyl isobutyl ketone
MQO	method quality objective
m/min	meters per minute
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
mg C/kg	milligrams of carbon per kilogram
mg/kg	milligrams per kilogram
NA	natural attenuation
NAPL	nonaqueous-phase liquid
NGDV	National Geodetic Vertical Datum
PAH	polycyclic aromatic hydrocarbon
PCP	pentachlorophenol
PM	project manager

ABBREVIATIONS AND ACRONYMS (Continued)

POL	petroleum, oil, and lubricants
ppm	parts per million
PRG	preliminary remediation goal
QA/QC	quality assurance/quality control
RD	remedial design
RI	remedial investigation
RPM	Remedial Project Manager
SAP	sampling and analysis plan
SCAPS	Site Characterization and Analysis Penetrometer System
SVOC	semivolatile organic compound
TAL	target analyte list
TCL	target compound list
TIC	tentatively identified compounds
TOC	total organic carbon
TPH	total petroleum hydrocarbon
TPH-Dx	total petroleum hydrocarbon – diesel extended
UPRR	Union Pacific Railroad
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compound

1.0 INTRODUCTION

The U.S. Army Corps of Engineers (USACE) is assisting the U.S. Environmental Protection Agency (EPA) Region 9 in conducting a pre-remedial design field exploration for the former McCormick and Baxter Creosoting Company, located at 1214 West Washington Street in Stockton, California. This Work Plan Addendum defines the objectives of the investigation and provides details of the work to be performed during the Fiscal Year 2000 (FY00) field effort to meet the project objectives. The Work Plan Addendum incorporates by reference sections of the June 16, 1999, *McCormick and Baxter Superfund Site Management Plan for NAPL Exploration* (USACE 1999) that contain requirements and specifications directly applicable to the FY00 investigation. During the field investigation, both documents will be on site and used by project personnel.

1.1 OBJECTIVES

Soil and groundwater at the McCormick and Baxter Superfund site are contaminated primarily with creosote, pentachlorophenol (PCP), and metals that were used as wood preservatives. Between 160,000 and 1.6 million gallons of creosote nonaqueous-phase liquid (NAPL) is known to exist in the subsurface as well as dissolved contaminants in groundwater and adsorbed contaminants on the solid phase. The primary objectives of this field exploration are to determine if NAPL has migrated beyond the current McCormick and Baxter property line, and, if so, the lateral and vertical extent of that migration, refine our understanding of the NAPL migrating from the McCormick and Baxter site, and complete the conceptual design for the in situ thermal treatment technology evaluation.

A secondary objective for this investigation is to collect groundwater data to enhance the conceptual site model (CSM) and determine whether natural attenuation may be limiting the mobility of contamination.

1.2 SCOPE

A dynamic approach to this field exploration has been developed to take into account the evolution of the CSM as new data are collected. Several initial sampling locations have been selected for each of the exploration methods; however, the majority of the locations will be selected in the field based on the initial results of chemical and physical analyses conducted on site material. The scope of work for this field exploration consists of the following components:

- Installing temporary survey control monuments on adjacent properties

- Conducting Site Characterization and Analysis Penetrometer System (SCAPS) cone penetrometer testing (CPT) and laser-induced fluorescence (LIF) data collection to provide geotechnical and stratigraphic information as well as estimate the extent of petroleum hydrocarbon contamination in support of selecting a final groundwater remedy

- Performing SCAPS soil and groundwater sampling to verify and assist with interpretation of SCAPS LIF data and to delineate contaminant extent and characterize contaminant composition in support of selecting a final groundwater remedy

- Installing SCAPS microwells to be used for light nonaqueous-phase liquid (LNAPL) or A-zone groundwater collection

- Installing soil borings and monitoring wells to collect physical and chemical data

- Evaluating LNAPL, if detected in sufficient volume for collection, to characterize composition, evaluate movement and assist with the final groundwater remediation alternative evaluation

- Collecting groundwater samples from existing monitoring wells to monitor contaminant migration and obtain information on natural attenuation potential and the capacity of the system.

- Characterizing potential subsurface obstructions near SE-3, SE-52, and SE-95.

Details of these work items are provided in the overview of the sampling and analysis program (Section 6.4).

1.3 WORK PLAN CONTENTS

In accordance with USACE guidance EM 200-1-3 (USACE 1994), this Work Plan is intended to serve as the “umbrella” document for the site investigation. It addresses each of the topics presented in EM 200-1-3 and the scope of work for this project. This Work Plan has been organized in the following sections:

1. Introduction
2. Project Organization and Responsibilities
3. Site Background and Setting

4. Previous Investigations and Remedial Efforts
5. CSM
6. Investigation Rationale and Approach
7. Data Review, Presentation, and Interpretation
8. Communications, Data Management, and Reporting
9. Schedule
10. References

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

Key positions and personnel assigned to this project are described in this section.

2.1 EPA REMEDIAL PROJECT MANAGER (RPM): MARIE LACEY (EPA REGION 9)

This text is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

2.2 USACE PROJECT MANAGER (PM): CHERYL BUCKEL (ALBUQUERQUE DISTRICT USACE)

This text is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

2.3 PROJECT TECHNICAL TEAM LEADER/CHEMIST: KIRA LYNCH (SEATTLE DISTRICT USACE)

This text is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

2.4 FIELD INVESTIGATION MANAGERS: MAMIE BROUWER, RICHARD SMITH, RANDY OLSEN, FRED HART

This text is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

2.5 PROJECT SENIOR GEOLOGIST: RICHARD SMITH (SEATTLE DISTRICT USACE)

This text is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

2.6 SEDIMENT CAP TEAM LEADER/QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) OFFICER: JOHN WAKEMAN (SEATTLE DISTRICT USACE)

This text is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

2.7 CERTIFIED INDUSTRIAL HYGIENIST (CIH): DAVID ELSKAMP (SACRAMENTO DISTRICT USACE)

This text is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

2.8 TREATABILITY TESTING LAB MANAGER: EVA DAVIS (EPA KERR LABORATORY)

This text is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

2.9 USACE PERSONNEL FOR FIELD EVENTS

Table 2-1 contains a list of USACE personnel and responsibilities during the field activities. Table 2-2 lists the Tulsa District SCAPS team supporting this exploration.

2.10 CONTRACTOR SERVICES

Table 2-3 is a list of all supporting groups and subcontractors and the services they will be providing for this project**.** These subcontractors are not on the General Services Administration (GSA) List of Parties Excluded from Federal Procurement or Non-Procurement Programs.

2.11 INTERIM PROJECT TECHNICAL TEAM LEADER/CHEMIST: MAMIE BROUWER (SEATTLE DISTRICT USACE)

During the temporary absence of Kira Lynch, Mamie Brouwer will be the interim Project Technical Team Leader/Chemist assuming all responsibilities described in Section 2.3.

Table 2-1
McCormick and Baxter Superfund Site
USACE Personnel for Field Events

Name[a]	Role/Responsibility	USACE District
Kira Lynch Technical Leader Environmental Scientist 206-764-6918 (ph) 206-764-3706 (fax)	Groundwater Team Leader and Chemist Primary point of contact for Seattle District Responsible for decisions regarding sampling locations and evolution of dynamic work plan in the field Present throughout field activities drilling activities (SCAPS and rotosonic drilling), groundwater sampling, NAPL sampling, and slough soil sampling	Seattle District
Richard Smith Geologist 206-764-3309 (ph) 206-764-3706 (fax)	Senior Geologist for the Seattle District Geology point of contact during field events Lead responsible for data management and Groundwater Modeling System Present during part of the drilling activities (SCAPS and rotosonic drilling)	Seattle District
Mamie Brouwer Interim Technical Leader Environmental Scientist 206-764-3577 (ph) 206-764-3706 (fax)	Interim point of contact for Seattle District FY00 Field Investigation Leader and Chemist Responsible for decisions regarding sampling locations and evolution of dynamic work plan in the field. Present throughout field activities, drilling activities (SCAPS and rotosonic drilling), groundwater sampling, LNAPL sampling (if present).	Seattle District
Glenn Terui/Joe Marsh (206) 764-3706 (fax) (206) 764-3324 (ph) (206) 764-3320 (ph)	Groundwater Sampling	Seattle District
Fred Hart Geologist 916-557-6975 (ph) 916-557-5307 (fax)	Senior Geologist during rotosonic drilling for Sacramento District	Sacramento District
Randy Olsen Environmental Engineer 916-557-5285 (ph) 916-557-5307 (fax)	Field Investigation Manager Primary point of contact for barge and rotosonic drill contract Lead responsible for logistics support for the field investigation	Sacramento District
Ken Byes/Tim Crummett Engineers/Geologist (916) 557-6942 (ph) (916) 557-7438 (ph) (916) 557-5307 (fax)	Will serve as backup personnel for SCAPS and the rotosonic field crew.	Sacramento District
Kenneth Regalado Survey Team Leader 916-557-7155 (ph) 916-557-6803 (fax)	Survey three initial locations prior to Phase One activities. Survey SCAPS push locations, SCAPS and rotosonic soil sample locations, rotosonic boring locations, and SCAPS microwell locations, if required, at the conclusion of the field activities.	Sacramento District

Table 2-1 (Continued)
McCormick and Baxter Superfund Site
USACE Personnel for Field Events

Name[a]	Role/Responsibility	USACE District
David Elskamp Industrial Hygienist 916-557-7903 (ph) 916-557-5307 (fax)	Prepare the Site Safety Health Plan for all field activities being performed between June and October 2000 for both Sacramento and Seattle District personnel.	Sacramento District

[a] Other McCormick and Baxter team members may visit the site periodically; however, they do not have a primary role in field sampling activities.

Table 2-2
McCormick and Baxter Superfund Site Field Exploration
Tulsa District SCAPS Team

Name	Role/Responsibility	Location	Phone No.
Rex Ostrander CESWT-EC-EI	Environmental Restoration Section Chief: Manages SCAPS field personnel and equipment, and addresses field work issues as needed.	Office	Office: 918-669-4916 Fax: 918-669-7508
Steve Brewer CESWT-EC-EI	Tulsa District SCAPS Coordinator: Provides supervision and technical oversight for the project, and provides technical support as needed SCAPS Manager: Prepares and tests field equipment prior to mobilization, Site and Safety Health Officer and lead person during field work.	Office and Field	Office: 918-832-4122 Cell: 918-605-9342 Fax: 918-832-4121
Karl Konechny CESWT-EE-R	SCAPS Operator	Field	Office: (601) 634-3972 Fax:
Ken Byes CESPK-ED-M	SCAPS Assistant Operator	Field	Office: 916-557-7438 Fax: (916) 557-5807
Greg Snider CESWT-EC-EI	Health and Safety Officer and substitute for Assistant Operator.	Office and Field	Office: 918-832-4122 Cell: 918-629-1927 Fax: 918-832-4121
Jeff Powell CEWES	SCAPS Technical Support – Electrical Engineer: Provides technical support for the SCAPS prior to mobilization and addresses equipment emergency situations during field work.	Office and Field	Office: 601-634-3407
Jed Constanza NFESC	Groundwater Modeling System (GMS)/Data Management Support: Provides support and training of GMS prior to fieldwork, provides on-site technical support, and reviews data and provides input for the final reports.	Office and Field	Home: 615-699-5033 e-mail: jed64@hotmail.com
Cliff Murray CESWT-EC-ER	SCAPS Manager/GMS point of contact: Reviews work plans, prepares GMS software and equipment prior to field work, downloads data to GMS during the field work, provides GMS data to the web site, substitutes for the SCAPS manager during field work, and develops final reports.	Office and Field	Office: 918-669-7573 Cell: 918-605-5789 Fax: 918-669-7508
Eddie Mattioda CESWT-EC-ER	Chemist: Prepares chemistry supplies, reviews work plans, collects field samples, supports SCAPS field crew, develops final reports.	Office and Field	Office: 918-669-7445 Fax: 918-669-7508
Frank Roepke CESWT-EC-ER	Chemist: Substitutes for Eddie Mattioda	Office and Field	Office: 918-669-7444 Fax: 918-669-7508
Chris Kennedy CESWT-EC-EA	Chemist: Substitutes for Eddie Mattioda	Office and Field	Office: 918-669-7072 Fax: 918-669-7508
Lori Kruse CESWT-EC-ER	Technician: Provides technical support for Cliff Murray concerning the input of data to the GMS software and supports data management needs.	Office	Office: 918-669-7151 Fax: 918-669-7508
SCAPS Truck			Cell: 918-688-5243

Table 2-3
McCormick and Baxter Superfund Site Field Exploration Supporting Groups and Subcontractors

Contractor	Service	Address and Contact
USACE – Tulsa District, Site Characterization and Analysis Penetrometer System (SCAPS)	Cone penetrometer and LIF measurements	1645 South 101 East Ave. Tulsa, OK 74128 Contact: Steve Brewer Telephone: 918-832-4122 Cellular Telephone: (918) 605-9342
EPA Region 9 FASP	Soil and groundwater analyses for TPH-Dx, PCP, and VOCs	1337 S. 46th St. Building 201 Richmond, CA 94804-4698 Office Contact: Liza Finley Telephone: 510-412-2334 Field Contact: Jeff Mays, Contractor Telephone: 510-412-2367
EPA Region 9 Laboratory	Soil and groundwater analyses for TPH-Dx, SVOCs, and VOCs	1337 S. 46th Street, Building 201 Richmond, CA 94804-4698 Contact: Mary O'Donnell Telephone: 415-744-1533 Backup Contact: Rich Bauer Telephone: 510-412-2312 Facsimile: 510-412-2300
Columbia Analytical Services	EPA SW-846 Methods 8151 (PCP), 8260C, and 8270	317 S. 13th Ave., P.O. Box 479 Kelso, WA 98626 Contact: Richard Craven Telephone: (360) 577-7222 Facsimile: (360) 636-1068
Pacific Analytical Laboratory	Dioxins/furans	6349 Paseo del Lago Carlsbad, CA 92009 Contact: Steve Parsons Telephone: (760) 931-1766 Facsimile: (760) 931-9479
EPA Robert S. Kerr Environmental Research Laboratory (Kerr Lab)	Soil analyses fortreatability testing	919 Kerr Research Drive Ada, OK 74820 Contact: Eva Davis Telephone: 580-436-8548 Facsimile: 580-436-8703
Drilling and Barge Contractors	To be determined	
Environmental Resources	Performance evaluation samples	5540 Marshall Street Arvada, CO 80002 Contact: Joe Holtz Telephone: 303-431-8454 Facsimile: 303-431-0159
PTS Laboratories, Inc.	Soil analyses for grain size, cation exchange capacity, density, NAPL saturation, porosity, permeability and TOC NAPL analysis for boiling point distribution	8100 Secura Way Santa Fe Springs, CA 90670 Contact: Richard Young Telephone: 562-907-3607 Facsimile: 562-907-3610
Investigation-Derived Waste Disposal Contractor	To be determined. (Will be in compliance with Comprehensive Environmental Response, Compensation and Liability Act Off-Site Rule)	

3.0 SITE BACKGROUND AND SETTING

3.1 SITE LOCATION, DESCRIPTION, AND TOPOGRAPHY

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

3.2 GENERAL SITE HISTORY

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

3.3 REGULATORY HISTORY

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

3.4 GEOLOGY

This section is updated by reference to Section 5.1.1 of the February 16, 2000, *McCormick and Baxter Superfund Site Draft 1999 NAPL Field Investigation Report* (USACE 2000).

3.5 HYDROGEOLOGY

This section is updated by reference to Section 5.1.2 of the February 16, 2000, *McCormick and Baxter Superfund Site Draft 1999 NAPL Field Investigation Report* (USACE 2000).

4.0 PREVIOUS INVESTIGATIONS AND REMEDIATION EFFORTS

This text is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

The primary findings of the 1999 NAPL Investigation are listed below.

- NAPL occurs in the A-zone through D-zone and is strongly suspected to have contaminated the E-zone, based on data collected from two wells southeast of the property boundary. NAPL has migrated laterally and downward from the Main Processing Area towards the south and southeast as far as the Union Pacific Rail Road (UPRR) property and the southern McCormick and Baxter property boundary near the stormwater retention ponds and the main gate. NAPL is present in shallow elevations along Old Mormon Slough and at elevations as deep as −160 feet near the Main Processing Area.

- The volume of NAPL in the subsurface is estimated at between 160,000 and 1,600,000 gallons.

- The volume of NAPL-contaminated soil is estimated at 220,000 cubic yards.

- Naphthalene was detected in the A-zone through E-zone groundwater, and generally not detected or detected at low concentrations outside the main NAPL plume. PCP and dioxin are dissolved in high concentrations in the A-zone groundwater outside, and downgradient of, the boundaries estimated for the main creosote NAPL plume. Crystalline PCP was observed on the ground surface near soil sample SE-08. Diisopropyl ether was detected in the surface soil collected at EP-01 in the Cellon process area.

- An unknown subsurface obstruction was encountered at approximately 16 feet below ground surface (bgs), which prevented SCAPS sample collection in the area near SE-03, SE-52, and SE-95.

5.0 CONCEPTUAL SITE MODEL

The CSM for the McCormick and Baxter site has been updated based upon the Fiscal Year 1999 (FY99) field investigation data. Updates to the CSM primarily include refinements and additions to the investigation site contaminant fate and transport data (e.g., horizontal and vertical extent of NAPL, horizontal and vertical continuity of sand and silt zones, and groundwater flow directions) that was available prior to the FY99 NAPL field investigation. The probable source areas of NAPL contamination (i.e., oily waste ponds, Cellon process area and the main process area) have not changed based on FY99 data. Significant changes and additions to the CSM include:

- Extensive NAPL is present in the subsurface along Old Mormon Slough in the A-zone and B-zone of the aquifer, and to a lesser extent in the C-zone and D-zone, indicating that NAPL may have migrated under Old Mormon Slough to the north.

- NAPL extends to the southeast onto UPRR property.

- Approximately 90 percent of the NAPL in the subsurface is estimated to be above an elevation of −100 feet NGVD88 (approximately 110 feet bgs).

- Dissolved-phase contaminant concentration data (i.e., PCP) from previous investigations indicate that a previously uncharacterized LNAPL may have migrated through portions of the A-zone on top of the water table. The most likely source of a non-diesel based NAPL is the Cellon process area and/or oily waste ponds where Cellon process wastes may have been disposed.

- Naphthalene (and other polycyclic aromatic hydrocarbons, or PAHs) are generally found only at very low levels in wells that are downgradient of NAPL by more than approximately 100 feet. A mechanism such as biodegradation may be degrading PAHs in situ thus reducing the concentration of PAHs in the groundwater.

5.1 SOURCES OF CONTAMINATION

This section is updated by reference to Section 5.2 of the February 16, 2000, *McCormick and Baxter Superfund Site Draft 1999 NAPL Field Investigation Report* (USACE 2000).

5.2 DESCRIPTION OF CONTAMINATED PHYSICAL SYSTEM

This section is updated by reference to Section 5.1.3 of the February 16, 2000, *McCormick and Baxter Superfund Site Draft 1999 NAPL Field Investigation Report* (USACE 2000).

5.2.1 Description of Soil Contamination

This section is updated by reference to Section 5.3 of the February 16, 2000, *McCormick and Baxter Superfund Site Draft 1999 NAPL Field Investigation Report* (USACE 2000).

5.2.2 Description of Groundwater Contamination

This section is updated by reference to Section 5.4 of the February 16, 2000, *McCormick and Baxter Superfund Site Draft 1999 NAPL Field Investigation Report* (USACE 2000).

5.2.3 Description of Sediment Contamination

This section is included by reference to Section 5.2.3 of the June 16, 1999, *McCormick and Baxter Superfund Site Final Work Plan for NAPL Field Exploration* (USACE 1999).

5.3 CONTAMINANT FATE AND TRANSPORT

This section is included by reference to Section 5.3 of the June 16, 1999, *McCormick and Baxter Superfund Site Final Work Plan for NAPL Field Exploration* (USACE 1999).

6.0 INVESTIGATION RATIONALE AND APPROACH

6.1 CHEMICALS OF CONCERN

The FY99 NAPL investigation data suggests, as presented in Table 6-1, that significant NAPL contamination occurs at the north side boundary of the McCormick and Baxter property (i.e., along Old Mormon Slough) in 12 locations, and to 227 feet bgs at selected locations. The SCAPS sample locations from the FY99 NAPL investigation are shown on Figure 6-1 and are identified as SE-01 through SE-90. NAPL contamination also is suggested in limited, deep isolated stringers at locations east of SE-79 (50 to 60 and 80 to 80.5 feet bgs); areas southeast of the perimeter DSW-4 wells (75 to 140 feet bgs); and south of SE-97 (87 to 90, 90 to 95, and 100 to 102 feet bgs). The FY00 NAPL investigation will determine if NAPL has migrated beyond the current McCormick and Baxter property line, and, if so, the lateral and vertical extent of that migration, refine our understanding of the NAPL migrating from the McCormick and Baxter site, and complete the conceptual design for the in situ thermal treatment technology evaluation.

The primary chemicals of concern (COCs) for Phases One and Two are PAHs/PCP and TPH. The objective of these phases is to determine the location of creosote NAPL. The primary components of creosote include PAHs/PCP and TPH. The primary COCs for Phase Three include PCP, diisopropyl ether, methyl isobutyl ketone (MIBK), and TPH. The diisopropyl ether and MIBK were added to the list of COCs for this phase of the investigation, because they are thought to be the solvents used in the Cellon process. Phase Three has a general screening level for PCP in soil of 1 ppm. This screening level was determined by calculating the concentration of PCP, which if found in saturated zone soils could result in PCP groundwater contamination above the levels of concern. The primary COCs for groundwater monitoring are PAHs, PCP, and dioxin. Site decision action levels for the groundwater monitoring are based on maximum contaminant levels (MCLs) and preliminary remediation goals (PRGs). A final groundwater remedy has not been selected for this site; thus no regulation-driven action levels have been determined.

6.2 DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) are quantitative and qualitative statements specified to ensure that data of appropriate quality are collected during field activities. The DQO process ensures that sufficient data are collected to make required decisions within a reasonable certainty and that only the minimum necessary data are collected. Determining the amount of data sufficient to characterize the extent and composition of a material like NAPL in the subsurface will be difficult because of subsurface heterogeneities, variable flow paths, and diverse modes of occurrence at the McCormick and Baxter site. The number and depth intervals of sample collection locations have been estimated, as was conducted during the FY99 NAPL investigation, based on professional judgment using existing data (i.e., the remedial investigation [ICF Kaiser 1998] and the FY99 NAPL investigation [USACE 2000]) and the current CSM. The dynamic nature of this investigation allows for changes in the number of locations/samples as the investigation progresses, and results from the early stages will be utilized in refining the CSM while in the field. The goal of this sampling event is to substantially reduce the uncertainty in the CSM and obtain sufficient information to develop a conceptual design for in situ thermal technology evaluation. Data collection in this sampling event will continue until the project team decides that additional data would not substantially reduce the uncertainty in the CSM or would not be necessary for the development of a conceptual design for the in situ thermal technology evaluation. In this manner, the FY00 NAPL investigation has been designed as an iterative process that incorporates new information as it becomes available for evaluation and integration into the CSM in order to help guide the characterization of areas with NAPL contamination.

The DQO process for each phase is illustrated in Tables 6-2 through 6-5. The DQO process for the groundwater monitoring program is presented in Section 6.7. The first investigation objective is to collect data north of Old Mormon Slough or beneath Old Mormon Slough that may be used to refine the existing CSM of NAPL contamination related to the McCormick and Baxter site. The types of data to be collected include the following:

- Chemical composition of contaminated soil
- Physical characteristics of the contaminated soil
- Geologic/hydrogeologic properties of the subsurface

A variety of intrusive measurements and sample collection methods will be used that range from in situ sensors to soil borings and monitoring wells. In each case, the performance specification for the investigation method is based on the need to locate and characterize NAPL contamination, and to aid in the evaluation of in situ thermal technologies.

The second investigation objective is to define the extent of deep NAPL stringers indicated by the FY99 investigation results from SE-79 (50 to 60 feet and 80 to 80.5 feet bgs); DSW-4 (75 to 140 feet bgs); and SE-97 (87 to 90 feet, 90 to 95 feet, and 100 to 102 feet bgs). The third objective is to characterize the surficial and subsurface PCP contamination in the Cellon process area near SE-08, and to investigate LNAPL and PCP in the A-zone groundwater downgradient from the Cellon process area. The fourth objective is to determine the nature of the subsurface feature that caused SCAPS refusal at 16 feet bgs at SE-3, SB-52, and SE-95 during the FY99 investigation.

The LIF sensor response is based on fluorescence and will be calibrated with the EPA Region 9 Field Analytical Services Program (FASP) total petroleum hydrocarbons (TPH) data to define detected versus nondetected concentrations of petroleum, oil, and lubricant (POL) constituents above a threshold concentration. Continuous fluorescence measurements will be collected for the entire length of the SCAPS boring to provide an indication of relative concentrations of suspected polycyclic aromatic hydrocarbons (PAHs) and POL. Because SCAPS fluorescence intensity is generally proportional to in situ concentration of PAHs and POL, the LIF data can be used to identify zones of probable high concentrations of these contaminants. This proportional feature of the SCAPS LIF data can be used to pinpoint the zones of highest contaminant concentration and estimate the variation in POL and PAH concentration.

During SCAPS LIF probe pushes, continuous geotechnical and stratigraphic data will also be collected to help interpret contaminant distribution and to delineate the continuity of subsurface materials that may influence contaminant movement, such as clay, silt, and gravel zones. The SCAPS LIF and CPT data will also be used to estimate the occurrence and approximate extent of NAPL, differentiate the occurrence of more than one NAPL type requiring treatment, refine the CSM, and determine soil sample collection locations.

SCAPS soil samples will be collected to accomplish the following objectives:

- Verify SCAPS soil types, emission spectra, and emission intensity data selected throughout the site within SCAPS depth limitations
- Verify apparent anomalous LIF sensor responses
- Identify locations for continuous rotosonic soil borings
- Confirm the maximum depth of POL and PAHs/PCP contamination
- Assess the percent saturation of NAPL contamination
- Characterize nature and extent of NAPL north of the slough to complete the conceptual design for in situ thermal technology evaluation
- Characterize subsurface soil for geochemical and physical characteristics
- Conduct a laboratory-scale thermal treatability study, if required

TPH and PAH/PCP soil data will be used for on site validation and calibration of the fluorescence response obtained by the SCAPS LIF sensor. These data will aid in evaluating the relationship between the LIF response and the presence of NAPL. Soil samples will be collected for TPH fingerprinting and analyzed by the Region 9 FASP on-site laboratory. The FASP on-site laboratory will conduct the following analyses:

- TPH fingerprinting using a gas chromatography/flame ionization detector (GC/FID) method (i.e., a modified version of EPA SW-846 Method 8015) to identify C_{12} to C_{24} (diesel-range) and C_{24} to C_{35} (motor-oil-range) concentrations

- PCP using a modified version of EPA SW-846 Method 8081 (i.e., PCP by GC/ECD) to identify PCP at concentrations above 1 mg/kg

The Region 9 Laboratory, located in Richmond, California, will conduct the following analyses on soil:

- PAHs/PCP using a modified, limited target compound list (TCL) EPA SW-846 Method 8270 analysis to allow for quick turnaround results on samples

- VOCs using EPA SW-846 Method 8260C. Diisopropyl ether will be added to the Standard target analyte list (TAL).

Columbia Analytical Services, located in Kelso, Washington, will analyze groundwater samples for PCP using EPA SW-846 Method 8151 to identify PCP at concentrations 1.0 µg/L or less. The Region 9 Laboratory will conduct the following analyses on groundwater:

- Total and dissolved manganese using EPA Method 200.7
- Anions by EPA Method 300
- Total organic carbon (TOC) using EPA Method 415.1

Pacific Analytical Laboratories, located in Carlsbad, California, will analyze groundwater samples for dioxins/furans using EPA Method 1613B. PTS Laboratories, Inc., located in Sante Fe Springs, California, will analyze soil samples for geochemical parameters.

The analytical procedures and method quality objectives (MQOs) will be consistent with those described in the sampling and analysis plans (SAPs) found in the final management plan for NAPL field investigation (USACE 1999) and in this management plan addendum.

Data collected during the FY 99 NAPL investigation did not consistently show a correlation between the TPH and PAH/PCP contamination within specific soil intervals. In addition, soil sampling will take place this year in areas off site that have no historical characterization data available. All soil samples collected will be specifically evaluated by the project technical team to determine the need for both PAH/PCP and TPH data. Information that will be considered in making this decision will include sample location, LIF result (wavelength and response), concentration of TPH detected, and previous data collected in the vicinity of the sample under consideration. It is estimated that less than 50 percent of the total samples collected and analyzed for TPH will be submitted for analysis of PAH/PCP.

6.3 PHASE ONE: EVALUATE NAPL MIGRATION NORTH OF OR IN OLD MORMON SLOUGH

6.3.1 Field Exploration Approach

SCAPS LIF will initially be used to determine whether NAPL contamination has migrated north of Old Mormon Slough. The SCAPS LIF will be used to identify POL and PAHs exceeding site-specific threshold concentrations in the vadose zone, capillary fringe, and below the water table. Site-specific threshold POL and PAH concentrations in soil will be determined based on the lines of evidence developed during the FY99 NAPL investigation, as presented below:

- LIF counts above 500
- Spectral profiles observations (i.e., peak wavelengths at 467 and 476 nanometers) associated with confirmed creosote NAPL contamination
- Collocated SCAPS soil samples results
- Location of each LIF push and its proximity to confirmed NAPL presence

SCAPS LIF penetrations will initially be conducted at 15 locations beginning at the northeast corner of the Dutra property and repeating approximately every 100 feet along the northern edge of Old Mormon Slough. Analysis of the FY99 data indicated that samples spaced in a rough 100-foot grid are sufficient for remedial design purposes. Final decisions regarding density of sample collection will be made in the field by consensus among technical staff including the EPA Region 9 RPM, a thermal technologies expert from the EPA Kerr Laboratory, and Corps technical team members. Final decisions regarding the total number of samples collected will be made by the EPA RPM. All SCAPS LIF penetrations will be pushed to the maximum depth achievable. Actual placement of the SCAPS equipment will be dependent on physical obstructions encountered on the Dutra and Stockton Cold Storage properties along the Old Mormon Slough shoreline. Continuous fluorescence measurements will be collected for the entire length of each SCAPS push to provide an indication of relative concentrations of contaminants. The SCAPS CPT will be used simultaneously to provide continuous geotechnical and stratigraphic information that will aid in interpreting contaminant distribution. The initial 15 SCAPS LIF push locations are presented in Figure 6-1. In addition to the 15 LIF pushes, 8 soil samples will be collected at 2 additional SCAPS locations and analyzed by the EPA Region 9 Laboratory for PAHs/PCP using a modified version of EPA SW-846 Method 8270 and by the Region 9 FASP on-site laboratory for TPH fingerprinting using a modified version of EPA SW-846 Method 8015. Two soil sample pushes (for a maximum of four soil samples per push) into suspected dredged material located on the Dutra property will be completed. These samples will be analyzed by the EPA Region 9 Laboratory for trace metals using the Contract Laboratory Program (CLP) 1LM03.0 Method and for SVOCs using SW Method 8270. The analytical procedures and MQOs will be consistent with those described in the FY99 NAPL investigation SAP.

Two to four rotosonic borings will be drilled to the E-zone gravel at locations selected based on the SCAPS LIF and soil sample results. The borings are expected to be placed in areas with significant NAPL contamination representative of different contaminant signatures and where representative stratigraphic information can be obtained. If the SCAPS LIF and soil sample results indicate that contamination has not migrated north of the slough, one boring location will be sited across from the Cellon process area and another across from SB-099. The other two rotosonic boring locations are contingent on the SCAPS LIF and soil data, and will be completed only if necessary. A maximum of 200 soil samples (i.e., one sample per every 5 feet or 50 samples per borehole) will be collected and analyzed for TPH. If TPH is detected, the samples will be analyzed for PAHs/PCP. If TPH is not detected in all samples, 10 percent of the samples will randomly be selected and analyzed for PAHs/PCP. Once the borings are advanced to the final depth, 4-inch-diameter monitoring wells may be installed to enable groundwater sampling, which will be conducted at a later date. The need for monitoring well installation and screened intervals will be determined in the field. The primary purpose of these wells would be to allow long-term monitoring to determine if site contamination is migrating in the groundwater north of Old Mormon Slough.

If NAPL contamination is detected north of Old Mormon Slough, the SCAPS LIF sensor will be used to characterize the horizontal and vertical extent of POL and PAHs exceeding site-specific threshold concentrations in the vadose zone, capillary fringe, and saturated zone located north of Old Mormon Slough. If NAPL is detected north of the Old Mormon Slough, additional SCAPS LIF pentrations will be conducted approximately 100 feet north of the original locations and spaced approximately 100 feet apart. If NAPL is detected in these penetrations, additional SCAPS LIF “steps outs” will be completed until sufficient data are collected to bound the NAPL. It is estimated that no more than 45 penetrations will be needed to bound the NAPL, if any, north of the Old Mormon Slough. Sampling of NAPL north of the slough that has migrated beyond the Dutra and Stockton Cold Storage properties, if any, will be addressed at a future date. Actual SCAPS penetration and soil push locations will be determined in the field, based on the initial data and conditions encountered on the Dutra and Stockton Cold Storage properties. All SCAPS LIF penetrations will be made to the maximum depth achievable. Continuous fluorescence measurements will be collected for the entire length of each SCAPS push to provide an indication of relative concentrations of contaminants. The SCAPS CPT will simultaneously be used to provide continuous geotechnical and stratigraphic information that will aid in interpreting contaminant distribution. In addition to the 45 LIF pushes, 72 soil samples (i.e., a maximum of 4 samples per push) will be collected at 18 additional SCAPS locations and analyzed by the EPA Region 9 Laboratory for PAHs/PCP using a modified version of EPA SW-846 Method 8270. TPH fingerprinting will be conducted on the soil samples by the Region 9 FASP on-site laboratory using a modified version of EPA SW-846 Method 8015. The analytical procedures and MQOs used will be consistent with the FY99 NAPL investigation SAP. SCAPS soil samples also may be collected for moisture content, bulk density, effective porosity, NAPL saturation, TOC, cation exchange capacity (CEC), permeability to water, and grain size using the methods listed in Table 6-2. PTS Laboratory will perform all physical and geochemical analyses.

Contingency rotosonic soil borings may be conducted at a maximum of five locations where the SCAPS rig met refusal before the desired end depth was achieved or before soil contamination was sufficiently characterized. These soil borings will be completed to 250 feet bgs. Soil samples will be collected approximately every 5 feet (i.e., a maximum of 250) for TPH analyses, as well as the soil physical parameters listed above. Soil samples will be analyzed for PAHs/PCP if TPH is detected. If TPH is not detected in the soil samples, 10 percent of the samples will randomly be selected and analyzed for PAHs/PCP. A subset of these samples may be selected for the soil geophysical and geochemical analyses listed above.

If NAPL contamination is not detected north of Old Mormon Slough during the initial activities, the SCAPS LIF sensor will be used to characterize the horizontal and vertical extent of POL and PAHs exceeding site-specific threshold concentrations in the sediments beneath Old Mormon Slough. SCAPS LIF penetrations will be conducted at 18 locations in Old Mormon Slough repeating approximately every 100 feet, as shown in Figure 6-1. All SCAPS LIF penetrations will be pushed to a depth of 170 linear feet, as measured from the water surface, or the maximum depth achievable, to provide sufficient data to determine the lateral and vertical extent of contamination underneath Old Mormon slough. The depth limitation is based on soil type and the ability of SCAPS to operate over water and from a barge. Using 170-foot penetrations will be consistent with the overall sampling scope conducted during the FY99 NAPL investigation, takes into account a maximum 20-foot slough depth, and is planned to intercept the NAPL contamination migration suggested by the FY99 data shown in Table 6-1. The number of SCAPS pushes is based on the 100-foot centers and sample collection density used during the FY99 NAPL investigation, as well as the FY99 investigation results summarized in Table 6-1. The actual number of SCAPS LIF penetration locations may be more or less than 18, and will be based on the results of the SCAPS data collected during the initial activities. In addition, the actual depth of SCAPS penetration may be more or less than 170 feet bgs. Based on the SCAPS performance in 1999, the actual penetration activities should be within its capabilities. Final decisions regarding the need for collection of soil samples from within the slough will be made in the field by consensus among technical staff including the EPA Region 9 RPM, a thermal technologies expert from the EPA Kerr Laboratory, and Corps technical team members.

In addition to the SCAPS LIF pushes, eight soil samples will be collected from an additional two push locations and analyzed for TPH by the Region 9 FASP on-site laboratory using a modified version of EPA SW-846 Method 8015 and by the Region 9 Laboratory for PAHs/PCP using a modified version of EPA SW-846 Method 8270. Soil samples also may be collected for treatability study analyses to be performed at the EPA Kerr Laboratory. The analytical procedures and MQOs will be consistent with those described in the FY99 NAPL investigation SAP.

In the event SCAPS cannot effectively operate from a barge, a maximum of five contingency rotosonic soil borings will be completed to 170 feet bgs. Soil samples will be collected approximately every 5 feet (i.e., 34 samples per borehole or a maximum of 170 samples) and analyzed for TPH. Soil samples will be analyzed for PAHs/PCP if TPH is detected. If TPH is not detected in any soil samples, 10 percent of the soil samples will be selected randomly to be analyzed for PAHs/PCP. The TPH analyses will be performed by the Region 9 FASP on-site laboratory using a modified version of EPA SW-846 Method 8015 and the PAH/PCP analyses will be performed by the Region 9 Laboratory using a modified version of EPA SW-846 Method 8270. At least one borehole will be placed across from the Cellon process area and another directly across from SB-099.

6.3.2 Overview of Phase One Sampling and Analysis Program

To accomplish the objectives of the field exploration at the site, the sampling and analysis program will include the following tasks:

- Analyze soil samples using the SCAPS LIF and CPT at 33 to 60 push locations north of or within Old Mormon Slough, dependent on the occurrence of NAPL north of the slough.

- Collect and analyze 16 to 80 soil samples from 4 to 20 SCAPS push locations north of or within Old Mormon Slough for TPH fingerprinting and PAHs/PCP analyses.

- Collect and analyze a maximum of eight soil samples from the Dutra property for analyses of trace metals (except mercury) and SVOCs.

- Collect and analyze soil samples from two to four continuous rotosonic soil borings that will be located along the northern shore of Old Mormon Slough. Collect a maximum of 100 soil samples (i.e., 1 sample every five feet or a maximum of 20 samples per borehole) for TPH fingerprinting by the EPA Region 9 FASP on-site laboratory. Soil sample analysis for PAHs/PCP will be conducted by the Region 9 Laboratory only if TPH is detected. In the event TPH is not detected in the soil samples, 10 percent of the samples will randomly be selected and analyzed for PAHs/PCP.

- Collect a maximum of 100 soil samples (i.e., 1 sample every 5 feet or a maximum of 20 samples per borehole) from five contingency rotosonic soil borings located north of the slough on the Dutra and Stockton Cold Storage properties for TPH fingerprinting by the EPA Region 9 FASP on-site laboratory. Soil sample analysis for PAHs/PCP will be conducted by the EPA Region 9 Laboratory only if TPH is detected. In the event TPH is not detected in the soil samples, 10 percent of the samples will randomly be selected and analyzed for PAHs/PCP.

- Collect and analyze 10 to 20 soil samples on the Dutra and Stockton Cold Storage properties for moisture content, bulk density, effective porosity and NAPL saturation, TOC, CEC, permeability to water, and grain size, if warranted by extent of NAPL contamination detected. These data would be required only if extensive NAPL contamination is found north of the slough.

- Install two to four groundwater monitoring wells north of Old Mormon Slough.

- Collect soil samples from within Old Mormon Slough for a laboratory-scale treatability study testing, if warranted.

These components are summarized in Table 6-2. The FY99 NAPL investigation SAP contains specific field and laboratory procedures, analytical performance specifications, and method sensitivity requirements. The procedures conducted during this investigation will be consistent with the requirements contained in that document.

6.4 PHASE TWO: DEFINE EASTERN AND SOUTHEASTERN LIMITS OF NAPL CONTAMINATION

6.4.1 Field Exploration Approach

SCAPS LIF will be used to determine how far NAPL contamination has migrated to the east and southeast. Approximately 20 SCAPS LIF penetrations will be used to characterize the horizontal and vertical extent of NAPL and POL exceeding site-specific threshold concentrations in the vadose zone, capillary fringe, and saturated zone east of SE-79, southeast of the DSW-4 wells, and south of SE-97. The most likely locations for the 12 initial SCAPS LIF penetrations are presented in Figure 6-1. A dynamic approach to selecting sampling locations has been adopted to allow for incorporation of newly acquired data into the field plan, and so the final penetration and sample collection locations are likely to be different than those presented on Figure 6-1. All SCAPS LIF penetrations will be made to 150 feet bgs or the maximum depth achievable. Actual placement of the SCAPS penetrations will be dependent on the physical obstructions encountered on and access to the UPRR property. Locations may be limited due to railroad tracks and overhead obstructions. Continuous fluorescence measurements will be collected for the entire length of each SCAPS push to provide an indication of the relative contaminant concentrations. The SCAPS CPT will simultaneously be used to provide continuous geotechnical and stratigraphic information that will aid in interpreting contaminant distribution. In addition to the 20 LIF penetrations, 5 SCAPS pushes will be conducted to collect soil samples from four depth intervals (i.e., a maximum of 20 soil samples). Soil samples will be analyzed by the EPA FASP on-site laboratory for TPH fingerprinting using a modified version of EPA SW-846 Method 8015. Soil samples will be analyzed for PAHs/PCP by the EPA Region 9 Laboratory using a modified version of EPA SW-846 Method 8270. The analytical procedures and MQOs will be consistent with those described in the FY99 NAPL investigation SAP.

Contingency soil borings will be drilled at up to five locations where the SCAPS rig met refusal before the desired end depth was achieved or before soil contamination was sufficiently characterized. Soil samples will be collected approximately every 5 feet in each borehole (i.e., 50 samples per borehole or a maximum of 250 samples). Soil samples will be collected at changes in soil type or in intervals where contamination is suspected based on odor or visual evidence. Soil samples will be analyzed for total petroleum hydrocarbon-diesel extended (TPH-Dx) by the FASP on-site laboratory. Samples in which TPH is detected will be submitted to the EPA Region 9 Laboratory for PAHs/PCP analysis. If all soil samples collected contain no detectable TPH concentrations, then 10 percent of the samples collected will randomly be selected and analyzed for PAHs/PCP.

6.4.2 Overview of Phase Two Sampling and Analysis Program

To accomplish the objectives of the field exploration east of SE-79, southeast of the DSW-4 wells, and south of SE-97, the sampling and analysis program will include the following tasks:

- Complete approximately 20 SCAPS LIF and CPT pushes east of SE-79, southeast of the SW-4 wells, and east of SE-97.

- Collect and analyze a maximum of 20 soil samples from 5 SCAPS push locations for TPH and PAHs/PCP.

- Complete a maximum of five contingency rotosonic soil borings to 250 feet bgs.
- Collect a maximum of 100 soil samples (i.e., 1 sample every 5 feet or a maximum of 20 samples per borehole) for TPH fingerprinting by the EPA Region 9 FASP on-site laboratory. Soil samples will be analyzed for PAHs/PCP if TPH is detected. In the event TPH is not detected, 10 percent of the soil samples will randomly be selected and analyzed for PAHs/PCP.

These components are summarized in Table 6-3. The FY99 SAP contains specific field and laboratory procedures, analytical performance specifications, and method sensitivity requirements. The procedures conducted during this investigation will be consistent with the requirements contained in that document.

6.5 PHASE THREE: CHARACTERIZE PCP CONTAMINATION IN CELLON PROCESS AREA AND A-ZONE GROUNDWATER

6.5.1 Field Exploration Approach

During the FY99 NAPL investigation, analysis of a surface soil sample confirmed the presence of percent levels of PCP within the Cellon process area near SE-08. In addition, the groundwater data suggests that there potentially is a separate LNAPL plume carrying PCP and dioxin contamination in the shallow A-zone groundwater. Trade industry information indicates that the Cellon process was developed in the 1970s as an alternative to using large quantities of fossil fuels as the PCP carrier. The PCP was dissolved in liquid petroleum gas (LPG), along with selected co-solvents (e.g., diisopropyl ether and MIBK). The LPG carrier was recovered under vacuum after treatment. The Cellon process was discontinued throughout the industry because it was found that once the carrier fluid was removed, the PCP would deteriorate when exposed to sunlight and weather, and the exposed wood surfaces would rot. The treated product was also susceptible to “blooming,” where PCP would crystallize on the exposed wood surface, which would be brushed off the wood surface after treatment. This same process is believed to have been utilized at the McCormick and Baxter site. During the FY99 NAPL investigation, crystalline PCP was found on the soil surface near SE-08, and diisopropyl ether was tentatively identified in the SE-08 surface soil.

The PCP investigation has been developed to more completely characterize the PCP contamination and the suspected LNAPL that could be acting as a long-term source of PCP groundwater contamination in areas outside the creosote-based NAPL contamination. During this investigation, soil and groundwater data will be collected to accomplish the following objectives:

- To determine the extent of PCP in the shallow PCP source area (i.e., the former Cellon process area)
- To determine whether the PCP source near SE-08 is contained within a structure or vault
- To investigate potential PCP and LNAPL constituents at the PCP mixing shed
- To determine the nature and extent of the hypothesized LNAPL contamination in the A-zone.

These data will be incorporated into the CSM for the groundwater pump and treat system and in situ thermal treatment technology evaluation.

The investigation will be conducted in specific events that proceed from areas suspected to be less contaminated (or where contamination is suspected to be confined to the saturated zone) to areas that are known to be highly contaminated. In general, this investigation will focus on the subsurface soils at the top of the current water table to approximately 40 feet bgs to include the suspected LNAPL smear zone created by the rising water table over the past 10 or more years. All soil samples will be collected in 2-foot intervals beginning at the top of the highest recorded water table to approximately 40 feet bgs, or as determined in the field, except at the PCP mixing shed and the PCP disposal area. Soil samples will be collected at the PCP mixing shed from the ground surface to approximately 40 feet bgs (or as determined in the field), and from 6.5 feet to 30 feet bgs in the PCP disposal area. These events will begin near the A-zone wells (i.e., A3, A4, A5, and A6) and the southern property perimeter, if required, move to the PCP mixing shed, and conclude in the PCP disposal area. Due to the progressive nature of this investigation, the following events have been developed for the PCP/LNAPL investigation:

- Event One — Determine the areal extent of LNAPL and PCP contamination outside areas where the A-zone is known to be contaminated with creosote NAPL and along the southern property boundary.
- Event Two — Identify PCP and LNAPL contamination in the subsurface soils around the PCP mixing shed.

- Event Three — Determine the presence of a subsurface confining structure and the extent of surficial PCP contamination in the PCP disposal area.

This dynamic work plan was developed to be flexible and allow decisions to be made in the field. All decisions regarding the placement of SCAPS penetrations and the number of samples to collect at each location will be made in the field by consensus among technical staff including the EPA Region 9 RPM, a thermal technologies expert from the EPA Kerr Laboratory, and Corps technical team members. The following information will be considered when making these decisions: the evolving CSM, data collected prior to this investigation, information related to M&B operations, contaminant fate and transport, and soil stratigraphy.

The three events are summarized below.

Event One

Determine the areal extent of LNAPL and PCP contamination outside areas where the A-zone is known to be contaminated with creosote NAPL and along the southern property boundary, if required, by conducting the following activities:

- Completing a maximum of 11 SCAPS soil sampling pushes to a maximum of 40 feet bgs, or an alternate depth determined in the field, and collecting a maximum of 154 soil samples (i.e., 14 soil samples per push location) in the event that VOC and PCP concentrations detected in A3, A4, A5, and A6 suggest that LNAPL contamination is potentially migrating towards the property boundary. The samples will be analyzed for a modified list of VOCs by the EPA Region 9 Laboratory using a modified version of EPA SW-846 Method 8260. The FASP laboratory will analyze samples for PCP using a modified version of EPA SW-846 Method 808, and TPH fingerprinting using a modified version of EPA SW-846 Method 8015.

- Installing a maximum of four contingency SCAPS stainless steel microwells screened across the water table near A3, A4, A5, and A6, and determining the presence of LNAPL. Up to four LNAPL or groundwater samples will be collected and analyzed for VOCs plus TICs and semivolatile organic compounds (SVOCs)/PCP using EPA SW-846 Methods 8260 and 8270, respectively, and dioxins using EPA Method 1613. If LNAPL is present groundwater samples will not be collected.

- Installing a maximum of five contingency SCAPS stainless steel microwells (at locations along the southern and southeastern property boundary) screened across the water table and collecting and analyzing five LNAPL or groundwater samples for VOCs plus TICs, SVOCs, and PCP using EPA SW-846 Methods 8260, 8270, and 8081, respectively, and dioxins using EPA Method 1613. If LNAPL is present, groundwater samples will not be collected.

Event Two

Identify surficial PCP and LNAPL contamination at the PCP mixing shed by conducting the following activity. Two SCAPS soil sampling pushes will be completed to a maximum of 40 feet bgs, or an alternate depth determined in the field, and a maximum of 42 soil samples (i.e., a maximum of 21 soil samples per push location) will be completed. The soil samples will be analyzed by the EPA Region 9 Laboratory for a modified list of VOCs using a modified version of EPA SW-846 Method 8260. These samples will also be analyzed for TPH fingerprinting using a modified version of EPA SW-846 Method 8015 by the FASP Laboratory. The FASP laboratory will also analyze soil samples for PCP using a modified version of EPA SW-846 Method 8081.

Event Three

Identify confining structure and extent of surficial PCP in the PCP disposal area by completing a maximum of 10 SCAPS soil sampling pushes beginning at approximately 6.5 feet bgs to a maximum of 30 feet bgs, or alternate depth determined in the field, and collecting a maximum of 120 samples (i.e., a maximum of 12 soil samples per push location). The soil samples will be analyzed by the EPA Region 9 FASP laboratory for TPH fingerprinting using a modified version of EPA SW-846 Method 8015, and PCP using a modified version of EPA SW-846 Method 8081. The soil samples will be analyzed by the EPA Region 9 Laboratory for a modified list of VOCs using a modified version of EPA SW-846 Method 8260.

6.5.2 Overview of Phase Three Sampling and Analysis Program

To accomplish the objectives of the field exploration near SE-8 and in the A-zone groundwater downgradient of the PCP source area, the sampling and analysis program will include the following tasks:

- Collect soil samples at a maximum of 12 locations (i.e., 2 locations at the PCP mixing shed and 10 locations in the PCP disposal area) using SCAPS soil sample pushes.

- Collect soil samples at a maximum of 11 locations (i.e., 4 locations near A3, A4, A5, and A6, and 7 locations near the southern property boundary and elsewhere to determine the extent of A-zone LNAPL) using SCAPS soil sample pushes.

- Analyze a maximum of 162 soil samples (i.e., 42 samples near the PCP mixing shed and 120 samples in the PCP disposal area) for a modified list of VOCs and PCP using modified versions of EPA SW-846 Methods 8260 and 8081, respectively. These samples will also be analyzed for TPH fingerprinting using a modified version of EPA SW-846 Method 8015 by the FASP laboratory.

- Collect a maximum of 154 soil samples (i.e., 98 samples at locations near the southern property boundary and 56 samples near A3, A4, A5, and A6) for a modified list of VOCs and PCP using modified versions of EPA SW-846 Methods 8260 and 8081, respectively. These samples will also be analyzed for TPH fingerprinting using a modified version of EPA SW-846 Method 8015 by the FASP laboratory.

- Install a maximum of 11 contingency stainless steel microwells (i.e., four locations near A3, A4, A5, and A6, and seven locations near the southern property boundary and elsewhere) that are screened across the water table.

- Collect and analyze a maximum of 11 LNAPL or groundwater samples from microwells for VOCs (i.e., ethers and ketones) and SVOCs/PCP using EPA SW-846 Methods 8260 and SW 8270, respectively, and dioxins using EPA Method 1613.

These components are summarized in Table 6-4. The FY00 SAP will contain specific field and laboratory procedures, analytical performance specifications, and method sensitivity requirements.

6.6 PHASE FOUR: CHARACTERIZE SUBSURFACE FEATURES NEAR SE-3, SE-52, AND SE-95

6.6.1 Field Exploration Approach

During the FY99 NAPL investigation, the SCAPS encountered refusal at 16 feet bgs at several locations near the southeast corner of the stormwater retention ponds. The type and characteristics of the obstruction are important to know as these features potentially could affect implementation of remedial actions at the site. A backhoe excavator will be used to characterize the unknown subsurface feature located near SE-3, SE-52, and SE-95 by excavating two 25-foot by 10-foot by 20-foot trenches. All characterization will be visually conducted on the soils contained in the excavator bucket. The primary purpose of this excavation is to characterize the subsurface soils and determine if an underground structure exists where SCAPS LIF encountered refusal at 16 feet bgs during the FY99 NAPL investigation. The core technical team will describe the subsurface soils and recommend further investigation, as required, until the unknown feature is sufficiently characterized.

6.6.2 Overview of Phase Four Sampling and Analysis Program

To accomplish the objectives of the field exploration near SE-3, SE-52,and SE-95, the sampling and analysis program will include excavation of two 25-foot by 6-foot by 20-foot trenches and visual characterization of the subsurface soils. Excavated material will be placed back in the hole. These components are summarized in Table 6-5. The FY00 SAP will contain specific field procedures.

6.7 GROUNDWATER MONITORING PROGRAM

An interim groundwater monitoring strategy during remedial design (RD) is needed for the site to monitor the extent and magnitude of groundwater contamination. Groundwater monitoring data will be useful to protect downgradient receptors, observe NAPL movement, enhance the CSM, and determine if natural attenuation (NA) may be limiting the mobility of contamination.

Previous investigations have shown that groundwater beneath the site is contaminated by creosote NAPL and dissolved-phase contamination of creosote constituents (e.g., naphthalene, PCP and dioxin). Data also suggest that a separate LNAPL plume containing PCP and dioxin may be present on site. The proposed RD groundwater monitoring strategy will allow monitoring of contaminant migration in the aquifer prior to implementation of an interim pump and treat remedial action and/or the final groundwater remedy. The RD groundwater monitoring strategy does not account for final remedial actions and would need to be adjusted to accommodate those actions. Therefore, this strategy is applicable for the FY00 field season and will need to be reevaluated based upon the findings of the FY00 NAPL investigation.

Objectives for the RD groundwater monitoring are listed below:

- Determine the extent (i.e., the downgradient boundary) of groundwater contamination originating from the site
- Determine the extent of NAPL in the subsurface and monitor NAPL migration
- Determine if dissolved-phase contaminant biodegradation is occurring
- Monitor groundwater gradients and flow directions

6.7.1 Field Exploration Approach

Based on the objectives listed above, the groundwater monitoring strategy will consist of the following components:

- Annual monitoring of groundwater for dissolved-phase naphthalene, PCP, and PAHs in selected wells
- Annual NAPL thickness measurement in selected wells
- Quarterly sampling for NA parameters in selected monitoring wells
- Quarterly measurement of groundwater elevations in all site monitoring wells
- Installation of additional monitoring wells to support the monitoring objectives

The first round of groundwater monitoring will occur at the end of the FY00 NAPL field investigation and will include all wells scheduled for annual and quarterly sample collection listed in Table 6-6 and shown in Figures 6-1 through 6-5.

Dissolved-Phase Contaminant Monitoring

Naphthalene, carcinogenic PAHs (cPAHs), dioxin, PCP, and arsenic were identified as indicator chemicals for the extent of dissolved-phase groundwater contamination in the remedial investigation (RI) report (ICF Kaiser 1998). Of these five contaminants, naphthalene and PCP have been detected at the highest concentrations and have migrated the farthest distance from source areas. Arsenic has been detected in groundwater throughout the project area and is assumed to be present at natural background levels except for isolated locations near the source areas. Therefore, naphthalene and PCP are the primary indicators of the extent of dissolved-phase contamination. PCP is generally present in groundwater when naphthalene is present. Since PCP concentrations within each well are generally lower than naphthalene concentrations due to the lower effective solubility of PCP, the extent of the naphthalene and PCP plume will be used to identify the wells to be used to monitor the extent of dissolved-phase contamination.

The aquifer beneath the site is a complex series of bedload channel deposits (i.e., sand) and overbank (i.e., silt) deposits. The horizontal and vertical continuity of the sand units varies across the site. The sand units have been divided vertically into five zones (i.e., A, B, C, D, and E) based upon the relative locations of sand units within the larger silt matrix. Naphthalene has been detected in all five aquifer zones. PCP has been detected at concentrations greater than or equal to 1 μg/L in zones A through D. Therefore, monitoring must be conducted in all five aquifer zones in order to determine the extent of groundwater contamination.

Naphthalene is dissolved in groundwater at concentrations above the calculated minimum effective solubility (i.e., greater than 6,000 µg/L) in wells that contain NAPL or in wells that are screened in zones where NAPL is known or suspected to be near the well screen. Naphthalene concentrations in monitoring wells downgradient of NAPL contaminated zones are generally low (i.e., less than 10 µg/L) or not detected. Naphthalene concentrations in monitoring wells downgradient of the NAPL plume are not proportional to the distance of the well from the NAPL plume. Naphthalene concentrations appear to decrease rapidly to less than 10 µg/L within 100 to 500 feet of the NAPL plume and remain around this concentration 800 or more feet from the source areas and the NAPL plume (Figures 6-1 through 6-5). The distribution of PCP contamination is similar to naphthalene but less extensive. A dissolved-phase naphthalene plume with gradually declining concentrations with distance from the source cannot be measured with the existing monitoring well network.

Monitoring dissolved-phase contamination immediately downgradient of and below NAPL sources will provide information on the migration of NAPL and define the maximum extent of the NAPL source. Wells located immediately downgradient of or below NAPL sources will be called NAPL margin monitoring wells (Table 6-5 and Figures 6-1 through 6-5).

The following NAPL margin monitoring wells should be monitored annually for naphthalene, PCP, and a selected set of SVOCs (modified EPA SW-846 Method 8270):

- A-zone wells: A-3, A-4, A-5, A-6, A-7
- B-zone wells: OFS-1B, DSW-5B
- C-zone wells: ONS-2C, DSW-6C, DSW-1C, OFS-4C
- D-zone wells: ONS-2D, ONS-1D, DSW-1D, OFS-4D
- E-zone well: OFS-4E

Historical naphthalene concentrations detected at well OFS-4E suggest that NAPL may have been near this well in the past. Therefore, it is possible that NAPL and/or dissolved-phase contamination may have migrated deeper than the E-zone in the vicinity of OFS-4E. New monitoring wells screened below the E-zone will be required to determine the maximum depth of contamination and the maximum extent of contamination in zones deeper than the E-zone.

Monitoring wells located downgradient of the maximum extent of detected naphthalene (i.e., plume margin monitoring wells) will be useful for monitoring the migration of the outer extent of groundwater contamination. Some wells within the maximum extent of detected contamination will be sampled to confirm the outer margin of contamination. Upgradient wells and wells located within areas of dense NAPL (DNAPL) contamination are not necessary to determine the extent of groundwater contamination.

The following plume margin monitoring wells should be monitored annually for a selected set of SVOCs (modified EPA SW-846 Method 8270) and PCP at a detection limit of 1 µg/L (EPA SW-846 Method 8151):

- A-zone wells: OFS-2A, OFS-3A, DSW-2A, OS-1A, OS-4A
- B-zone wells: OFS-3B, OS-4B, DSW-7B, DSW-2B, OS-1B
- C-zone wells: OFS-2C, OFS-3C, OS-4C, DSW-7C, DSW-2C, OS-1C
- D-zone wells: OFS-2D, OFS-3D, DSW-2D, OS-5D
- E-zone wells: OFS-3E, OS-2E, OS-3E, OS-1E, DSW-2E, MW-2E

A detection limit of 1 µg/L for PCP is required for plume margin wells due to the expected low concentrations of PCP in groundwater and to allow detection at the MCL. The purpose and selection criteria of each monitoring well selected for annual monitoring are provided in Table 6-6.

NAPL Monitoring

The primary source of groundwater contamination at the site is the NAPL plume that historically has migrated horizontally and vertically to the southeast from the surface source areas. The primary NAPL at the site is a DNAPL that is petroleum based with SVOCs such as naphthalene and PCP as lesser constituents. It is not known if this DNAPL is still moving either horizontally or vertically. The maximum horizontal and vertical extent of the DNAPL is also unknown. LNAPL has been detected in site monitoring wells. The petroleum-based LNAPL observed in monitoring wells is chemically similar to the DNAPL and is likely derived from fractionation of the petroleum-based DNAPL. A separate LNAPL plume composed of an unknown carrier fluid transporting PCP and dioxin may be present in the A-zone of the aquifer. This LNAPL has not been directly measured and its extent is unknown.

To determine if NAPL is migrating in the subsurface and monitor the extent of NAPL contamination, monitoring wells that are within NAPL-contaminated zones and in the path of potentially moving NAPL should be inspected for the presence of NAPL on an annual basis with the first measurement event conducted during this field investigation.

To accomplish this goal, the following wells should be monitored for NAPL on an annual basis:

- A-zone wells: A-3, A-4, A-5, A-6, A-8, A-10, MW-1A, and ONS-2A
- B-zone wells: DSW-4B, DSW-5B, DSW-CB, and ONS-1B
- C-zone wells: DSW-1C, DSW-4C, DSW-6C, and ONS-1C
- D-zone wells: DSW-1D, OFS-4D, ONS-1D
- E-zone well: OFS-4E

Natural Attenuation Monitoring

Natural degradation of naphthalene and other PAHs may be occurring at the site. The lack of significant measured concentrations of naphthalene and other PAHs in wells downgradient of DNAPL contaminated aquifer zones suggests that naphthalene and other PAHs may be biodegraded shortly after partitioning into groundwater from the source NAPL. Therefore, monitoring of natural attenuation parameters will help determine if and how the attenuation of naphthalene and other PAHs is occurring. NA monitoring has been recommended quarterly for a minimum of 3 years. The first quarter of NA sampling will occur during the FY00 NAPL field investigation.

The following existing wells should be monitored for natural attenuation parameters:

- A-zone wells: OFS-5A, A-6, OFS-4A1, OS-4A
- B-zone wells: DSW-3B, DSW-5B, DSW-7B, OS-1B
- C-zone wells: DSW-3C, ONS-1C, DSW-1C, DSW-7C, OS-1C
- D-zone wells: OFS-1D, ONS-1D, DSW-1D, DSW-2D
- E-zone wells: OFS-5E, OFS-4E, OS-3E, OS-1E

The following field measurements will be conducted:

- Redox potential (field meter)
- pH (field meter)
- Temperature (field meter)
- Specific conductivity (field meter)
- Dissolved oxygen (field meter and Chemettes® test kit)
- Hardness (HACH® test kit)
- Alkalinity (calculated)
- Turbidity (field meter)
- Carbon dioxide (HACH® test kit)
- Iron (HACH® test kit)

The following laboratory analyses will be conducted:

- PAHs (modified EPA SW-846 Method 8270C)
- PCP (EPA SW-846 Method 8151A)
- Sulfate, chloride, nitrate, nitrite (EPA Method 300)
- Total and dissolved manganese (EPA SW-846 Method 200.7)
- Methane (RSK 175)

The purpose and selection criteria of each monitoring well selected for natural attenuation monitoring are provided in Table 6-6.

Groundwater Elevation Measurements

An analysis of groundwater elevation measurements collected since August 1993 indicates that the direction and gradient of groundwater flow within and between aquifer zones at the site does not change significantly with time or season. Groundwater elevations have been increasing over time since August 1993. The only observed reversal of this rising trend was between the April 1999 and July 1999 measurement events. To support the study of natural attenuation at the site, groundwater elevations will be monitored in all site monitoring wells during the FY00 NAPL field investigation.

6.7.2 Overview of Groundwater Monitoring Program

The interim monitoring strategy is presented below:

- Collect annual groundwater samples at 16 existing NAPL margin monitoring wells for SVOCs by modified EPA SW-846 Method 8270. Of these wells, six quarterly samples will be collected for natural attenuation parameters and SVOCs.

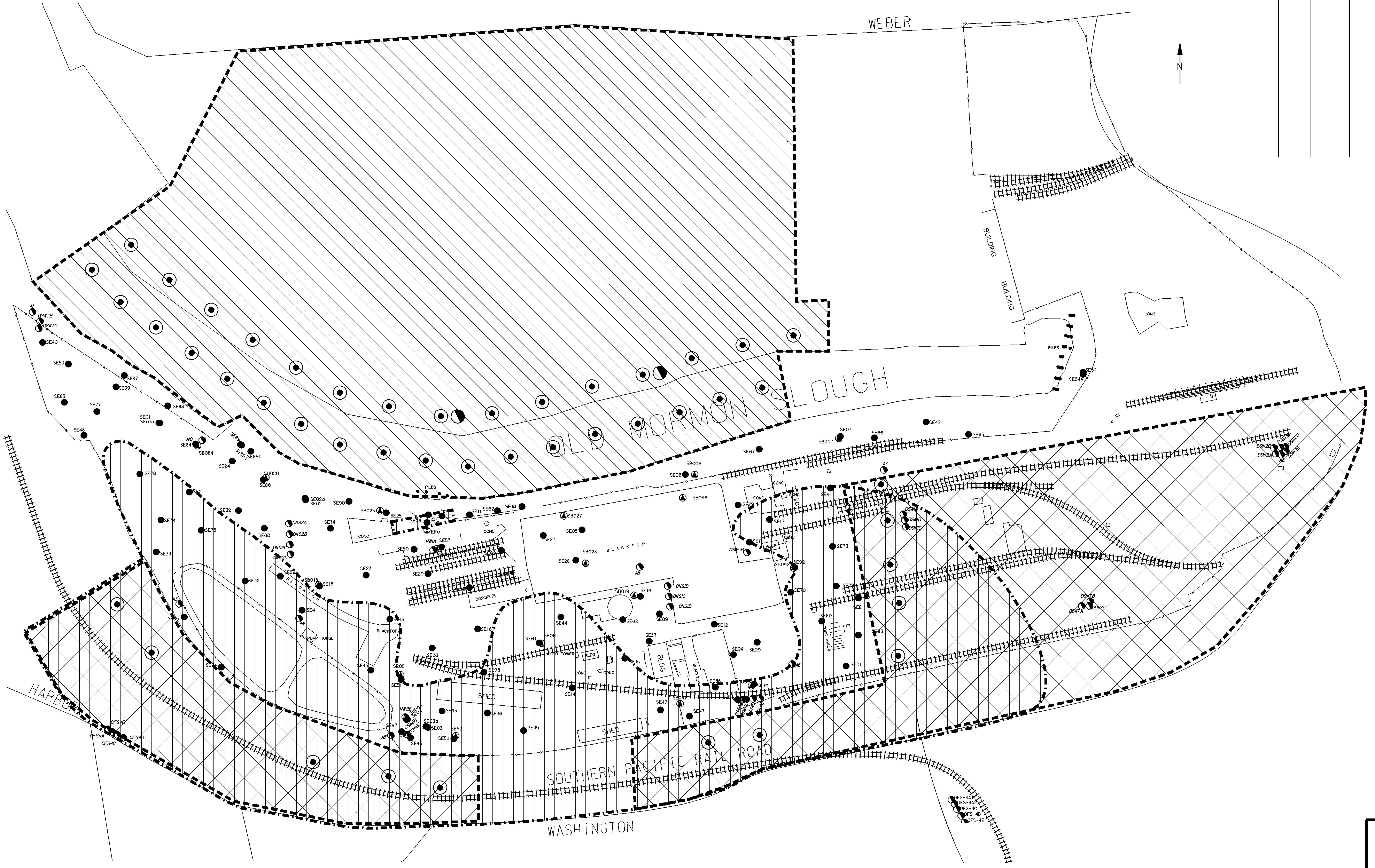
- Collect annual groundwater samples at 26 existing plume margin monitoring wells for SVOCs by modified EPA SW-846 Method 8270 and PCP by EPA SW-846 Method 8151. Of these wells, eight quarterly samples will be collected for natural attenuation parameters and SVOCs.

- Collect quarterly groundwater samples at 22 existing monitoring wells for natural attenuation parameters for a period of 3 years.

- Test for presence of NAPL at 20 existing monitoring wells.

- Measure groundwater elevations at all existing monitoring wells.

REVISIONS				
SYMBOL	ZONE	DESCRIPTION	DATE	BY



LEGEND

PROPOSED AREAS OF INVESTIGATION:

▨ PHASE 1

▨ PHASE 2

▨ PHASE 3

◉ *PRELIMINARY ESTIMATED SCAPS LIF LOCATION

◐ *PRELIMINARY ESTIMATED RS BORING AND GWMW LOCATION

*ALL LOCATIONS ARE PRELIMINARY AND SUBJECT TO MODIFICATION IN THE FIELD BASED ON ACTUAL DATA. LOCATIONS IN OLD MORMON SLOUGH WILL BE USED AS NECESSARY TO FILL DATA GAPS UNDER SLOUGH.

1" = 100'   100' 50' 0 100' 200'

This project was designed by the Seattle District U.S. Army Corps of Engineers. The initials or signatures and registration designations of individuals appear within the specifications or on these project documents within the scope of their employment as required by ER 1110-1-8152, Professional Registration.

DATE AND TIME PLOTTED: 20-JUN-2000 10:49
DESIGN FILE: I:0htrw0McBx0smith0mbnvcs0b.dgn

COMPUTER AIDED DESIGN & DRAFTING

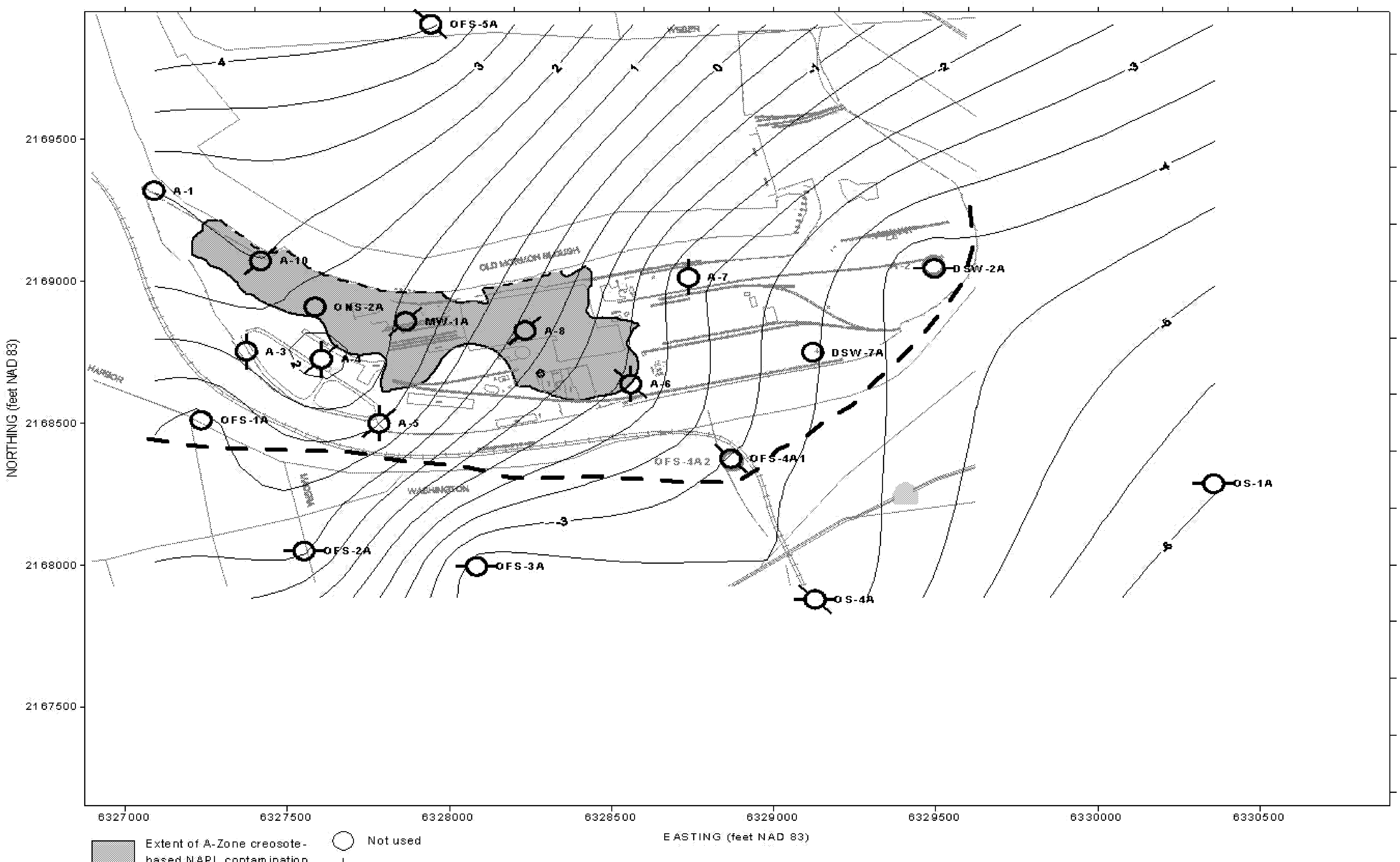
U.S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS
SEATTLE, WASHINGTON

MCCORMICK & BAXTER SUPERFUND SITE

PROPOSED INVESTIGATION LOCATIONS

STOCKTON CALIFORNIA

SIZE	INVITATION NO.	FILE NO.	DATE:	FIGURE
D			99DEC22	6-1
DSGN. SMITH		CHK. LYNCH	SHEET	



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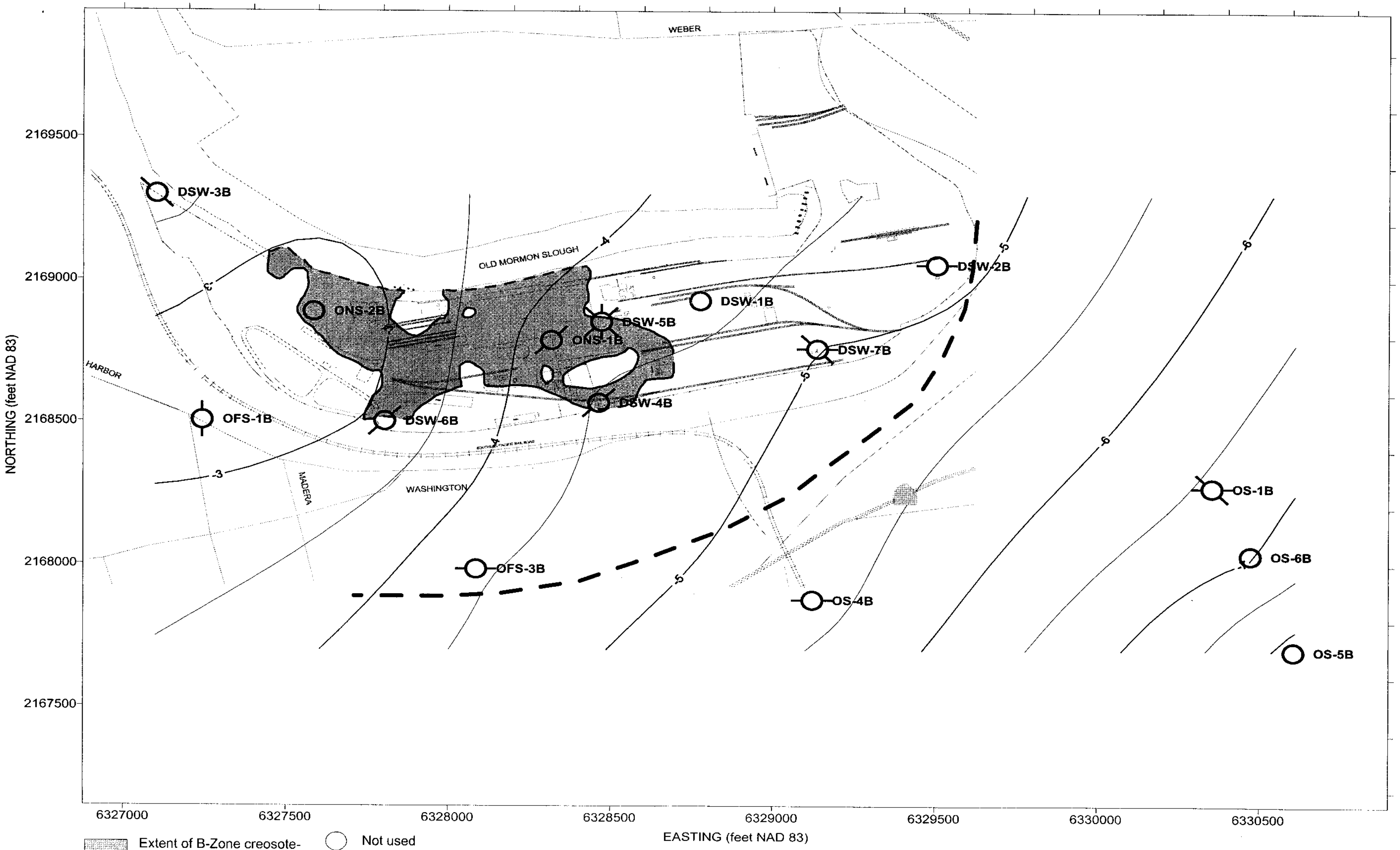
McCormick and Baxter Superfund Site
NAPL Field Investigation

Figure 6-2
A-Zone
Groundwater Monitoring Wells

STOCKTON CALIFORNIA



▨ Extent of B-Zone creosote-based NAPL contamination

April 1999 groundwater elevation contour (feet NVD88)

Approximate maximum extent of detected naphthalene

○ Not used

NAPL Margin Monitoring Well

Plume Margin Monitoring Well

NAPL Monitoring Well

Natural Attenuation Monitoring Well

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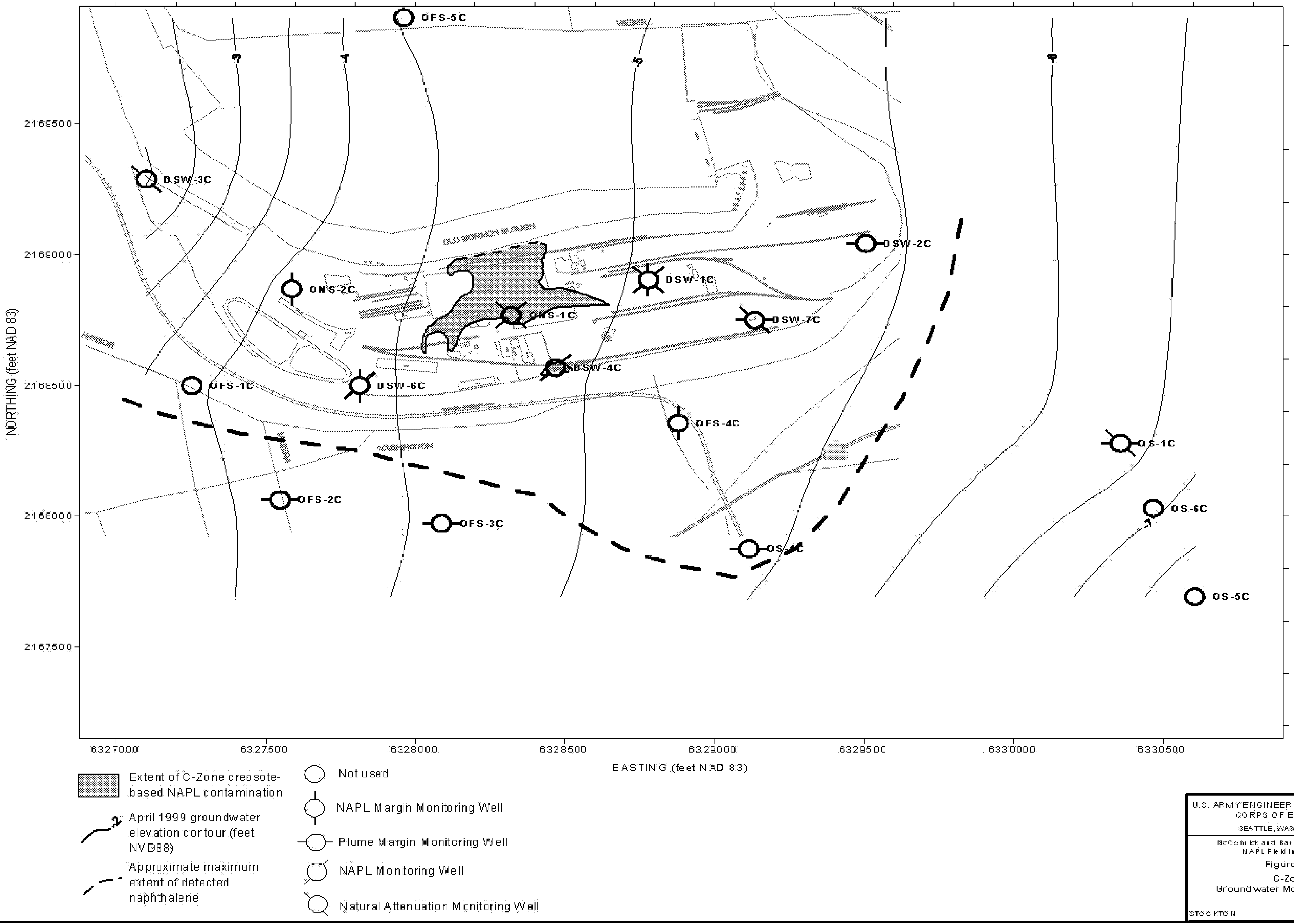
McCormic and Baxter Superfund Site
NAPL Field Investigation

Figure 6-3
B-Zone
Groundwater Monitoring Wells

STOCKTON CALIFORNIA



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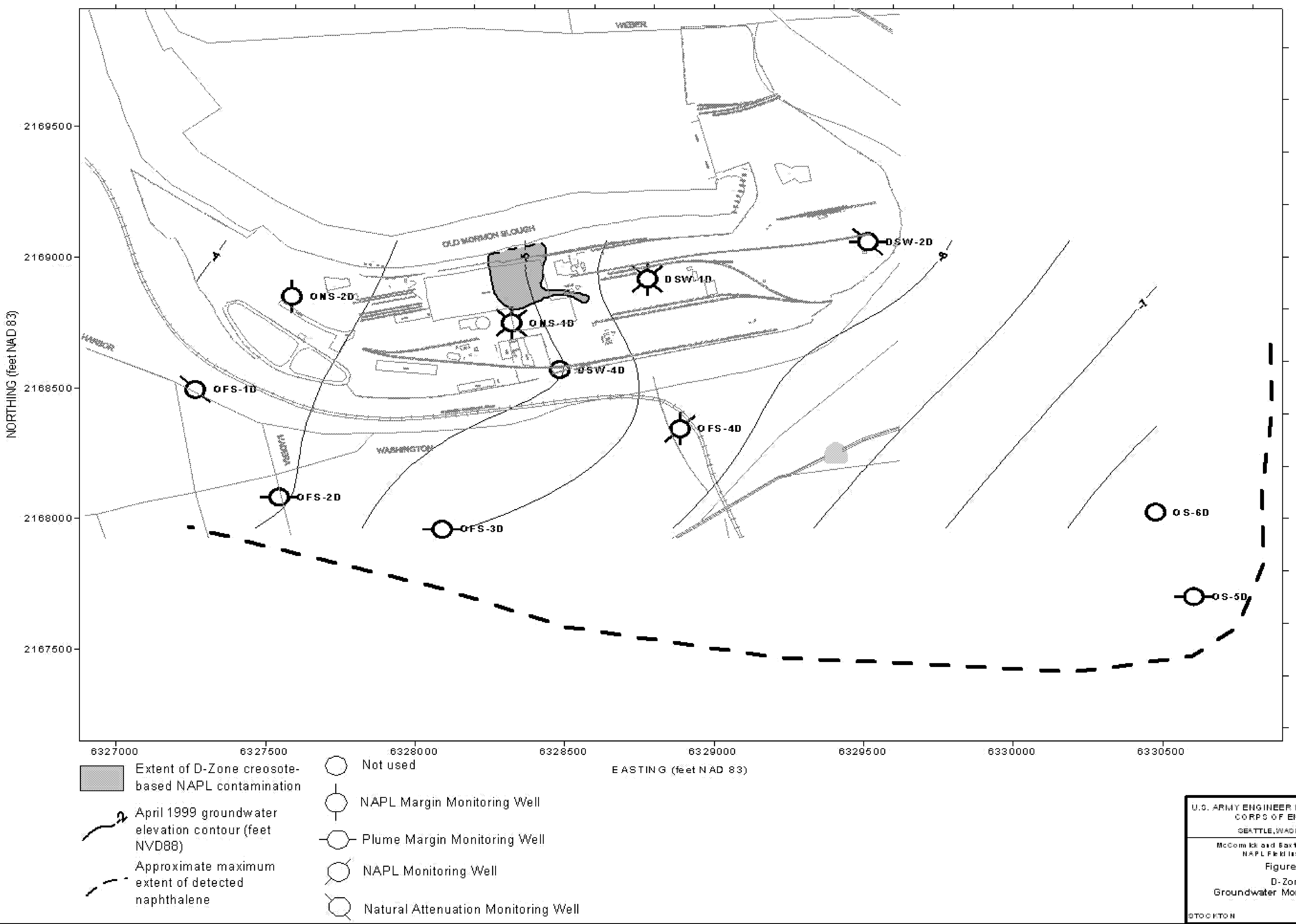
McCormick and Baxter Superfund Site
NAPL Field Investigation

Figure 6-4

C-Zone
Groundwater Monitoring Wells

STOCKTON CALIFORNIA



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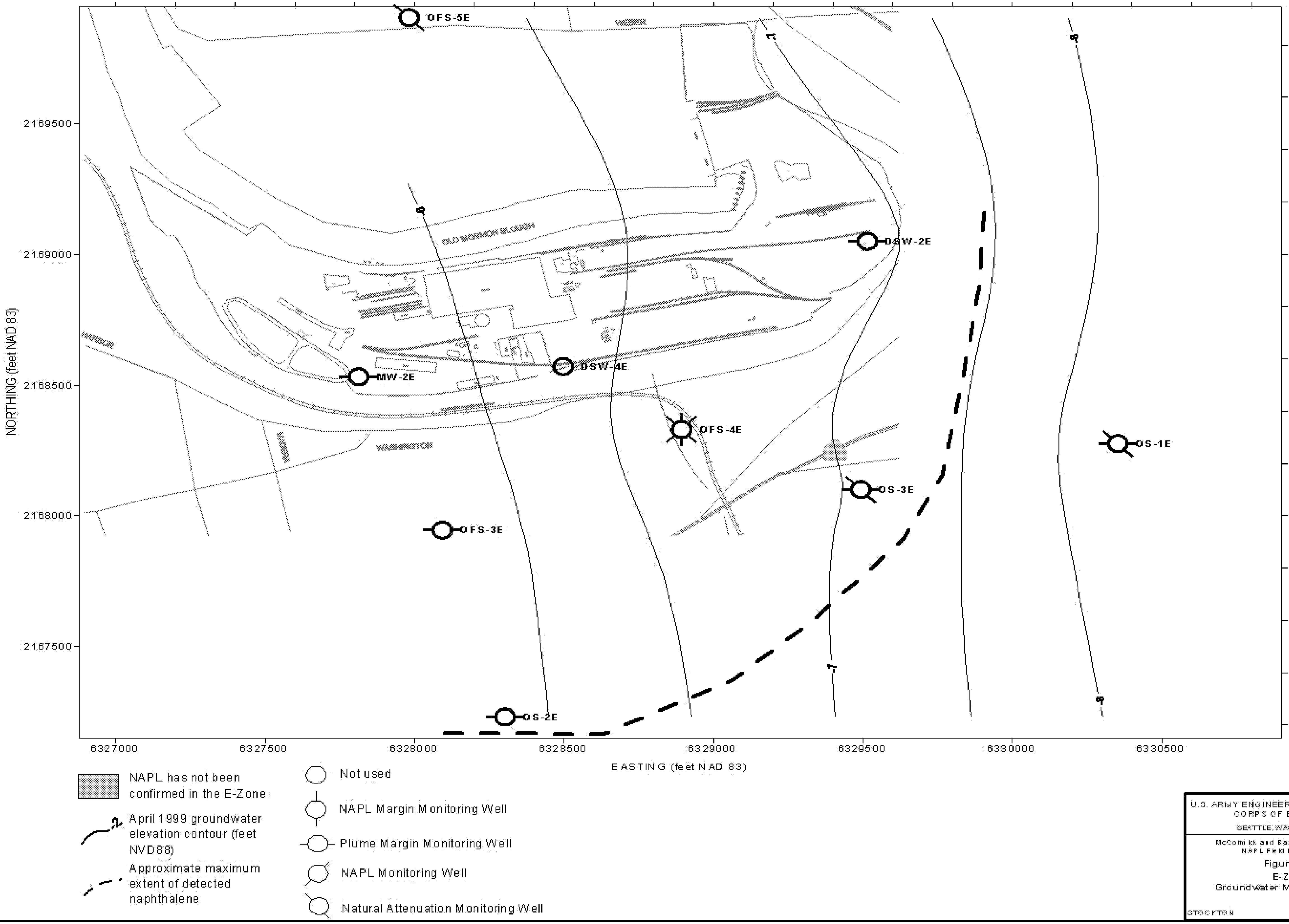
McCormick and Baxter Superfund Site
NAPL Field Investigation

Figure 6-5

D-Zone
Groundwater Monitoring Wells

STOCKTON CALIFORNIA



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McCormick and Baxter Superfund Site
NAPL Field Investigation

Figure 6-6
E-Zone
Groundwater Monitoring Wells

STOCKTON CALIFORNIA

Table 6-1
Summary of Maximum Depth of NAPL Contamination Along Old Mormon Slough

Penetration Location	Maximum Depth (feet bgs)
SE-2	84 to 86
SE-6/SB-006	75 to 80/ 227.2 to 227.5
SE-8	48 to 50
SE-10	61.5 to 63
SE-11	50 to 52
SE-25	77 to 83
SB-027	122.8 to 123.1
SE-39	22 to 22.4
SE-63	40 to 50
SE-64	62 to 63.3
SB-084	51.0 to 51.3
SE-86/SB-086	42 to 49/ 44 to 45
SE-87	20 to 28
SE-88	24 to 25.8
SE-89b	20 to 32
SE-90	50 to 60
SB-099	212.4 to 212.6

Note:
Maximum depth of NAPL determined based on CPT/LIF readings; analytical data; and visual observation of sheen, visible NAPL, or mobile NAPL.

Table 6-2
Phase One McCormick and Baxter Data Quality Objectives Process

Problem Statement

Subsurface NAPL cannot be efficiently removed without thermally enhanced extraction methods. Sufficient data are not available to characterize contaminant extent and select a treatment technology, based on the FY99 field investigation data.

Investigation Objectives	Data Requirements	Investigation Strategy	Field Decision Criteria/ Performance Specifications
SCAPS CPT and LIF			
Determine whether NAPL has migrated north of Old Mormon Slough from the McCormick and Baxter site.	Horizontal and vertical extent of POL and PAHs. Measure concentration of primarily 3 or more ring aromatic compounds (and some 2-ring compounds) using LIF.	LIF detection threshold: 100 to 500 mg/kg TPH. 15 LIF pre-selected penetrations estimated. Initial locations selected consistent with the FY99 investigation results. Spacing of penetrations will be determined in the field and will be evaluated against estimated 100-foot treatment unit size (also used in the FY99 NAPL Investigation). Continuous readings to depth of 150 feet, if possible, final decisions regarding depth of penetration will be made in the field.	Threshold LIF value (reporting limit) determined in field. Approximately 100 to 500 mg/kg TPH. Spatial resolution of 4 cm (0.13 foot) when driven at 1 m/min. LIF penetration locations will be finalized on a daily basis by Mamie Brouwer and Kira Lynch (team leaders/chemists), Richard Smith (hydrogeologist), Marie Lacey (EPA RPM), Eva Davis (EPA Technical Support), Fred Hart (geologist), and Steve Brewer (SCAPS team leader). Initial SCAPS penetration locations were selected to detect NAPL contamination north of Old Mormon Slough, based on the FY99 NAPL investigation results.
Characterize NAPL extent (vertical and horizontal) in the subsurface soils north of Old Mormon Slough.	Horizontal and vertical extent of POL and PAHs. Measure concentration of primarily 3 or more ring aromatic compounds (and some 2-ring compounds) using LIF.	LIF detection threshold: 100 to 500 mg/kg TPH. 45 LIF penetrations estimated. Spacing of penetrations will be determined in the field and will be evaluated against estimated 100-foot treatment unit size (also used in the FY99 NAPL Investigation). Continuous readings to depth of 150 feet, if possible, final decisions regarding depth of penetration will be made in the field.	Threshold TPH value (reporting limit) determined in field. Approximately 100 to 500 mg/kg TPH. Spatial resolution of 4 cm (0.13 foot) when driven at 1 m/min. LIF penetration locations will be determined on a daily basis by Mamie Brouwer and Kira Lynch (team leaders/chemists), Richard Smith (hydrogeologist), Marie Lacey (EPA RPM), Eva Davis (EPA Technical Support), Fred Hart (geologist), and Steve Brewer (SCAPS team leader). SCAPS penetration locations will be selected to maximize understanding of the site CSM and extent of NAPL contamination north of Old Mormon Slough.

Table 6-2 (Continued)
Phase One McCormick and Baxter Data Quality Objectives Process

Investigation Objectives	Data Requirements	Investigation Strategy	Field Decision Criteria/ Performance Specifications
Characterize NAPL extent (vertical and horizontal) beneath Old Mormon Slough.	Horizontal and vertical extent of POL and PAHs. Measure concentration of primarily 3 or more ring aromatic compounds (and some 2-ring compounds) using LIF.	LIF detection threshold: 100 to 500 mg/kg TPH. 18 LIF penetrations estimated. Initial locations will be selected in areas suspected to have been impacted by site contamination. Spacing of penetrations will be determined in the field and will be evaluated against estimated 100-foot treatment unit size (also used in the FY99 NAPL Investigation). Continuous readings to depth of 170 feet, if possible, final decisions regarding location and depth of penetration will be made in the field.	Threshold LIF value (reporting limit) determined in field. Approximately 100 to 500 mg/kg TPH. Spatial resolution of 4 cm (0.13 foot) when driven at 1 m/min. LIF penetration locations will be determined on a daily basis by Mamie Brouwer and Kira Lynch (team leaders/chemists), Richard Smith (hydrogeologist), Marie Lacey (EPA RPM), Eva Davis (EPA Technical Support), Fred Hart (geologist), and Steve Brewer (SCAPS team leader). SCAPS penetration locations will be selected to maximize understanding of the site CSM and extent of NAPL contamination.
Identify if there is more than one unit (as defined by contaminant type) requiring treatment.	Spatial distribution of TPH and PAHs/PCP contamination based on soil fluorescence emission spectra. These intervals will be targeted for collection of soil samples with SCAPS and analysis of soil samples for TPH, PAHs, and PCP. Chemical data will assist with interpretation of LIF wavelength signature.	Nontarget fluorescence will be evaluated by SCAPS soil sampling and analysis. TPH-Dx and PAHs/PCP results will be used in the field to verify apparent anomalous LIF sensor responses and assist with interpretation of wavelength signature.	Identify LIF results representative of different soil types, different emission spectra, and different emission intensity. Identify apparent anomalous LIF responses.
Expand the hydrogeologic CSM to include the area north of Old Mormon Slough. Determine natural subsurface feature impacts to the movement of NAPL.	Geotechnical and stratigraphic data from cone pressure and sleeve friction sensors. Aquitard topography and continuity.	Soil classification using SCAPS sensors according to ASTM Method D3441.	SCAPS soil classification will be compared to existing soil boring logs. Spatial resolution of 4 cm for soil classification at a rate of 1 m/min.
Determine where soil samples will be collected.	Estimated contaminant concentrations in soil from LIF.	Select sampling locations where contamination is high and reflects a range of contaminant compositions as defined by wavelength signature. Soil samples also will be collected to verify suspected anomolous LIF sensor responses, and confirm nondetect LIF responses.	Locations for SCAPS soil samples will be determined in the field by Mamie Brouwer and Kira Lynch (team leaders/chemists), Richard Smith (hydrogeologist), Marie Lacey (EPA RPM), Eva Davis (EPA Technical Support), Fred Hart (geologist), and Steve Brewer (SCAPS team leader). SCAPS soil sample locations will be selected by evaluating existing data and SCAPS LIF data.

Table 6-2 (Continued)
Phase One McCormick and Baxter Data Quality Objectives Process

Investigation Objectives	Data Requirements	Investigation Strategy	Field Decision Criteria/ Performance Specifications
SCAPS Soil Sampling			
Determine accuracy of the SCAPS LIF data. Verify apparent anomolous LIF readings.	Co-located soil samples with SCAPS LIF penetrations.	Visual evaluation of soil cores for NAPL compared with LIF data. Conduct a maximum of 22 SCAPS penetrations. Approximately 4 horizons per penetration will be sampled. Depths decided in field.	Sensitivity for TPH must be at least as good as LIF threshold. LIF and confirmation TPH should be in agreement on detect versus nondetect for 80 percent of the samples; false negative less than 5 percent.
Determine variability of contamination composition. Determine if contaminant extent can be better estimated. Confirm the bottom of POL, PAH, and PCP contamination. Develop the conceptual design of an in situ thermal treatment system.	Soil data for TPH-Dx, PAH, and PCP. Compare soil chemical analysis with LIF results representative of different soil types, emission spectra and emission intensity. Chemical makeup, magnitude, and variability of contamination.	Soil samples analyzed by the following methods: TPH fingerprinting by GC/FID to be conducted by the FASP on-site laboratory, limited semivolatile organic compound (SVOC) TCL by GC/MS to be conducted by the Region 9 Laboratory.	Sensitivity for TPH and SVOC analyses must be at least as good as LIF threshold. Sensitivity for SVOCs and TPH determined based on limitations of analytical instrumentation.
Determine how much NAPL is present. Evaluation of NAPL percent saturation is required to assist with evaluation of areas of mobile NAPL.	Percent saturation of NAPL contamination in soil.	A maximum of 20 samples may be submitted to PTS Laboratory for NAPL saturation analysis using API RP40. A visual evaluation of NAPL saturation will be completed in the field.	NAPL occurrence in all soil samples will be described according to the criteria presented in the FY99 SAP. Heavily contaminated soil samples will be submitted for NAPL saturation analyses.
Identify optimum locations for collecting continuous rotosonic soil cores and installing four groundwater monitoring wells, if warranted.	Soil contaminant concentrations.	Select boring locations in areas of highest contamination based on SCAPS results. In addition borings will be located in areas with different contaminant signatures if possible.	Selection of locations for continuous borings will be made in the field by Mamie Brouwer, Kira Lynch, Richard Smith, and Fred Hart, Marie Lacey, and Eva Davis. Decisions regarding well construction and design will be made in the field by Richard Smith.
Determine if the movement of dissolved organic contaminants, if present, is affected by adsorption onto naturally occurring organic matter.	Soil TOC concentrations in unimpacted areas and representative of soil conditions across the site.	A maximum of 20 soil samples analyzed for TOC using the Walkley-Black method. Samples will be selected to obtain TOC information representative of different aquifer and aquitard zones.	Detection limit of 1,000 mg C/kg to allow for K_d calculation.
Determine downward migration potential for groundwater and NAPL, if present. Provide input for model, and assist with conceptual design of thermal treatment system.	Permeability (hydraulic conductivity) data on aquitard and aquifer materials. Need site-wide data to evaluate variability. Data on permeability of sand zones required to assist with design of thermal treatment system.	A maximum of 20 soil samples to be collected from aquitard and aquifer materials and analyzed for hydraulic conductivity measurements. Locations to be determined in the field.	Permeability measurements using EPA 9100/ASTM 5084 will be made on soil cores that may have to be repacked. The purpose of the permeability data is to estimate average permeability so this method should provide adequate permeability data quality.

Table 6-2 (Continued)
Phase One McCormick and Baxter Data Quality Objectives Process

Investigation Objectives	Data Requirements	Investigation Strategy	Field Decision Criteria/ Performance Specifications
	Geochemistry comparison between zones to provide information to design extraction and treatment system.	A maximum of 20 soil samples will be collected from different aquifer and aquitard zones and analyzed for CEC using EPA 9081 by PTS Laboratories.	Sensitivity based on limitations of analytical instrumentation. Samples selected from most sand-rich and clay-rich soils in clean zones.
	Physical characteristics of soil to determine downward migration potential for groundwater and NAPL. Provide input for model.	Soil classification during drilling. 20 soil samples analyzed for moisture content (ASTM D2216, grain size (ASTM D422), bulk density (ASTM D2937), and effective porosity.	Sensitivity based on limitations of analytical instrumentation. Samples collected for physical testing will be from soil zones that appear to have relatively low levels of contamination, using visual inspection, and be representative of different stratigraphic horizons.
Determine the rate of creosote (PAH) recovery as a function of pore volumes of (condensed) steam injected, and determine the amount of residual creosote remaining after approximately two to four pore volumes of steam have been injected.	For feasibility and determination of design parameters of thermal treatment of Old Mormon Slough sediments.	Samples for steam treatability tests, including steam column tests and leaching tests prior to and following steam treatment, may be collected from within Old Mormon Slough and analyzed by the EPA Kerr Laboratory.	Focus on creosote and PAHs/PCP only. Sediment samples for treatability testing will be selected in the field with input from EPA Kerr Laboratory. They will bracket the concentration range and be representative of varying contaminant signatures and geologic materials.
Rotosonic Soil Borings/Monitoring Wells			
Determine variability of contamination composition. Determine if contaminant extent can be better estimated. Confirm the bottom of POL, PAH, and PCP contamination. Develop the conceptual design of an in situ thermal treatment system.	Soil data for TPH-Dx, PAH, and PCP. Compare soil chemical analysis with LIF results representative of different soil types, emission spectra and emission intensity. Chemical makeup, magnitude, and variability of contamination.	Soil samples analyzed by the following methods: FASP TPH fingerprinting by GC/FID conducted by the FASP on-site laboratory and limited SVOC TCL by GC/MS conducted by Region 9 Laboratory. 1) TPH-Dx by GC/FID by FASP on-site laboratory. All soil samples archived for additional chemical or physical testing 2) SVOC limited TCL by GC/MS by Region 9 Laboratory only if concentration greater than the TPH detection limit or within the 10 percent non-detect confirmation subset, whichever is greater.	Sensitivity for TPH and SVOC analyses must be at least as good as LIF threshold. Sensitivity for SVOCs and TPH determined based on limitations of analytical instrumentation.

Table 6-2 (Continued)
Phase One McCormick and Baxter Data Quality Objectives Process

Investigation Objectives	Data Requirements	Investigation Strategy	Field Decision Criteria/ Performance Specifications
Determine how much NAPL is present. Evaluation of NAPL percent saturation is required to assist with evaluation of areas of mobile NAPL.	Percent saturation of NAPL contamination in soil.	A visual evaluation of NAPL saturation will be conducted in the field.	NAPL occurrence in the soil samples will be described according to the criteria presented in the FY99 Field Sampling Plan (FSP).
Install monitoring points north of the slough to evaluate contaminant migration.	Groundwater monitoring well installation	A maximum of four groundwater monitoring wells may be installed after soil borings completed.	Monitoring well requirements will be determined in the field dependant on the extent of contamination detected. If contamination is not detected north of the slough during the initial SCAPS LIF sampling, a minimum of two monitoring wells will be installed across from the Cellon process area and SB-099 to monitor contaminant transport.
Contingency Rotosonic Soil Borings			
Determine the extent/composition of contamination at depths where SCAPS penetrations are not possible.	Soil characterization where SCAPS met refusal before contamination was fully characterized.	Continuous sampling with a 10-foot core barrel below SCAPS refusal to a depth of 250 feet bgs at a maximum of five locations. A maximum of 100 soil samples (i.e., a maximum of 20 samples per borehole) will be collected. Selection of soil samples in field for analysis by: 1) TPH-Dx by GC/FID by FASP on-site laboratory. All soil samples archived for additional chemical or physical testing. 2) SVOC limited TCL by GC/MS by Region 9 Laboratory only if concentration greater than the TPH detection limit or within the 10 percent non-detect confirmation subset, whichever is greater.	Sensitivity for TPH and SVOC analyses must be at least as good as LIF threshold. Sensitivity for SVOCs and TPH based on limitations of analytical instrumentation. Selection of locations will be made in the field by Mamie Brouwer, Kira Lynch, Richard Smith and Fred Hart, Marie Lacey, and Eva Davis. Contingency boring locations may be approximate to SCAPS locations or in locations selected to maximize understanding of the site CSM and extent of NAPL contamination north of Old Mormon Slough. Soil samples will be collected for chemical analysis at changes in soil type, or in intervals where contamination is suspected, based on odor or visual evidence of contamination.

Table 6-2 (Continued)
Phase One McCormick and Baxter Data Quality Objectives Process

Investigation Objectives	Data Requirements	Investigation Strategy	Field Decision Criteria/ Performance Specifications
Determine if the movement of dissolved organic contaminants, if present, is affected by adsorption onto naturally occurring organic matter.	Soil TOC concentrations in unimpacted areas and representative of soil conditions across the site.	A maximum of 20 soil samples analyzed for TOC using the Walkley-Black method. Samples will be selected to obtain TOC information representative of different aquifer and aquitard zones.	Detection limit of 1,000 mg C/kg to allow for K_d calculation.
Determine downward migration potential for groundwater and NAPL, if present. Provide input for model and assist with conceptual design of thermal treatment system.	Permeability (hydraulic conductivity) data on aquitard and aquifer materials. Need site-wide data to evaluate variability. Data on permeability of sand zones required to assist with design of thermal treatment system.	A maximum of 20 soil samples to be collected from aquitard and aquifer materials and analyzed for hydraulic conductivity measurements. Locations to be determined in the field.	Permeability measurements using EPA 9100/ASTM 5084 will be made on soil cores that may have to be repacked. The purpose of the permeability data is to estimate average permeability so this method should provide adequate permeability data quality. It should be noted that laboratory permeability data systematically underestimates the permeabilities inferred at field scale. The permeability values measured in the laboratory may have a low bias.
	Geochemistry comparison between zones to provide information to design extraction and treatment system.	A maximum of 20 soil samples will be collected from different aquifer and aquitard zones and analyzed for cation exchange capacity using EPA 9081 by PTS Laboratories.	Sensitivity of all methods based on limitations of analytical instrumentation. Samples selected from most sand-rich and clay-rich soils in clean zones.
	Physical characteristics of soil to determine downward migration potential for groundwater and NAPL. Provide input for model.	Soil classification during drilling. 20 soil samples analyzed for moisture content (ASTM D2216, grain size (ASTM D422), bulk density (ASTM D2937), and effective porosity and NAPL saturation (API RP40) by PTS Laboratories.	SCAPS soil classification compared to soil boring logs. Sensitivity based on limitations of analytical instrumentation. Samples collected for physical testing will be from soil zones that appear to have relatively low levels of contamination, using visual inspection, and be representative of different stratigraphic horizons.

Table 6-2 (Continued)
Phase One McCormick and Baxter Data Quality Objectives Process

Investigation Objectives	Data Requirements	Investigation Strategy	Field Decision Criteria/ Performance Specifications
Determine the nature and extent of contamination beneath Old Mormon Slough.	Horizontal and vertical extent of NAPL.	Contingency rotosonic soil borings will only be conducted in Old Mormon Slough if SCAPS is unable to complete the planned investigation. Continuous soil cores will be collected at a maximum of five locations to 170 linear feet. The cores will be visually evaluated to estimate NAPL saturation. Soil samples will be collected for analysis approximately every 5 feet for a maximum of 34 samples per borehole or a total of 170 samples. Soil samples will be analyzed by the following methods: TPH fingerprinting by GC/FID will be conducted by the FASP on-site laboratory. Region 9 Limited TCL SVOC GC/MS analysis to be conducted by the EPA Region 9 Laboratory only if TPH is detected or a maximum of 10 percent of the total nondetect samples, whichever is greater. Collect soil samples for treatability study analyses, if warranted.	Soil samples will be selected from the rotosonic soil borings in the field. Selection criteria will be based on identifying unique geologic intervals and visible contamination. Soil samples will be collected for chemical analyses at changes in soil type or in intervals where contamination is suspected based on odor or visual evidence of contamination.

Table 6-3
Phase Two McCormick and Baxter Data Quality Objectives Process

Problem Statement

Subsurface NAPL cannot be efficiently removed without thermally enhanced extraction methods. Sufficient data are not available to characterize contaminant extent and select a treatment technology, based on the FY99 NAPL investigation data

Investigation Objectives	Data Requirements	Investigation Strategy	Field Decision Criteria/ Performance Specifications
SCAPS CPT and LIF			
Determine where NAPL exists and the approximate extent (vertical and horizontal) east of SE-79, southeast of the DSW-4 wells, and south of SE-97.	Horizontal and vertical extent of POL and PAHs. Measure concentration of primarily 3 or more ring aromatic compounds (and some 2-ring compounds) using LIF.	LIF detection threshold: 100 to 500 mg/kg TPH. 20 LIF penetrations estimated. Initial locations will be selected based the FY99 NAPL investigations data at SE-79, DSW-4, and SE-97. Spacing of penetrations will be determined in the field and will be evaluated against estimated 100-foot treatment unit size (also used in the FY99 NAPL Investigation). Continuous readings to depth of 150 feet, if possible, final decisions regarding depth of penetration will be made in the field.	Threshold LIF value (reporting limit) determined in field. Approximately 100 to 500 mg/kg TPH. Spatial resolution of 4 cm (0.13 foot) when driven at 1 m/min. LIF penetration locations will be determined on a daily basis by Mamie Brouwer and Kira Lynch (team leaders/chemists), Richard Smith (hydrogeologist), Marie Lacey (EPA RPM), Eva Davis (EPA Technical Support), Fred Hart (geologist), and Steve Brewer (SCAPS team leader). SCAPS penetration locations will be selected to maximize understanding of the site CSM and extent of NAPL contamination.
Identify if there is more than one unit (as defined by contaminant type) requiring treatment.	Spatial distribution of TPH and PAHs/PCP contamination based on soil fluorescence emission spectra. These intervals will be targeted for collection of soil samples with SCAPS and analysis of soil samples for TPH, PAH, and PCP. Chemical data will assist with interpretation of LIF wavelength signature.	Nontarget fluorescence will be evaluated by SCAPS soil sampling and analysis for TPH. TPH-Dx and PAHs/PCP results will be used in the field to verify apparent anomalous LIF sensor responses and assist with interpretation of wavelength signature.	Identify LIF results representative of different soil types, different emission spectra, and different emission intensity. Identify apparent anomalous LIF responses.
Determine how the hydrogeologic CSM can be improved. Determine what natural subsurface features impact movement of NAPL.	Geotechnical and stratigraphic data from cone pressure and sleeve friction sensors.	Soil classification using SCAPS sensors according to ASTM Method D3441.	SCAPS soil classification compared to existing soil boring logs. Spatial resolution of 4 cm for soil classification at a rate of 1 m/min.

Table 6-3 (Continued)
Phase Two McCormick and Baxter Data Quality Objectives Process

Investigation Objectives	Data Requirements	Investigation Strategy	Field Decision Criteria/ Performance Specifications
Determine soil sample collection locations.	Estimated contaminant concentrations in soil across site from LIF.	Select sampling locations where contamination is high and reflects a range of contaminant compositions as defined by wavelength signature. Soil samples also will be collected to verify apparent anomalous LIF sensor responses and confirm nondetect LIF responses.	Locations for SCAPS soil samples will be determined in the field by Mamie Brouwer and Kira Lynch (team leaders/chemists), Richard Smith (hydrogeologist), Marie Lacey (EPA RPM), Eva Davis (EPA Technical Support), Fred Hart (geologist), and Steve Brewer (SCAPS team leader). SCAPS soil sample locations will be selected by evaluating existing data and SCAPS LIF data.
SCAPS Soil Sampling			
Determine accuracy of the SCAPS LIF data. Verify apparent anomolous LIF readings.	Co-located soil samples with SCAPS LIF penetrations.	Visual evaluation of soil cores for NAPL compared with LIF data. Collect soil samples at 5 penetration locations for a maximum of 20 soil samples. Approximately 4 locations per penetration. Depths decided in field.	Sensitivity for TPH must be at least as good as LIF threshold. LIF and confirmation TPH should be in agreement on detect versus nondetect for 80 percent of the samples; false negative less than 5 percent. Soil samples will be collected to accomplish the following objectives: 1) Obtain LIF verification samples representative of different soil types, different emission spectra, and different emission intensity selected throughout the site within SCAPS depth limitations 2) Obtain soil samples to verify apparent anomalous LIF sensor responses 3) Identify locations for continuous rotosonic soil borings 4) Confirm the maximum depth of petroleum, oils, and lubricants (POL) and PAHs/PCP contamination

Table 6-3 (Continued)
Phase Two McCormick and Baxter Data Quality Objectives Process

Investigation Objectives	Data Requirements	Investigation Strategy	Field Decision Criteria/ Performance Specifications
			5) Assess the percent saturation of NAPL contamination 6) Collect data on the chemical makeup and magnitude of NAPL to complete the conceptual design of an in situ thermal treatment system.
Determine variability of contamination composition. Determine if contaminant extent can be better estimated. Confirm the bottom of POL, PAH, and PCP contamination. Develop the conceptual design of an in situ thermal treatment system.	Soil data for TPH-Dx, PAH, and PCP. Compare soil chemical analysis with LIF results representative of different soil types, emission spectra and emission intensity. Chemical makeup, magnitude, and variability of contamination.	Soil samples analyzed by the following methods: TPH fingerprinting by GC/FID conducted by the FASP on-site laboratory and limited SVOC TCL by GC/MS to be conducted by Region 9 Laboratory.	Sensitivity for TPH and SVOC analyses must be at least as good as LIF threshold. Sensitivity for SVOCs and TPH determined based on limitations of analytical instrumentation.
Determine how much NAPL is present. Evaluation of NAPL percent saturation is required to assist with evaluation of areas of mobile NAPL.	Percent saturation of NAPL contamination in soil.	A visual evaluation of NAPL saturation will be conducted in the field.	NAPL occurrence in all soil samples will be described according to the criteria presented in the FY99 FSP.
Contingency Soil Borings			
Determine how amenable the site and contamination is to treatment by thermal methods.	Soil samples collected for chemical characterization of areas of suspected NAPL contamination and potentially differing contaminant signatures.	A maximum of five soil borings to 250 feet bgs will be completed east of SE-79, southeast of the DSW-4 wells, and south of SE-97. Continuous soil cores will be obtained. The cores will be visually evaluated to estimate NAPL saturation. Soil samples for analysis collected approximately every 5 feet (50 samples per boring for a maximum of 250 samples).	Samples will be selected from borings in the field. Selection criteria will be based on identifying unique geologic intervals and visible contamination. Soil samples will be collected for chemical analysis at changes in soil type, or intervals where contamination is suspected, based on odor or visual evidence of contamination.
Determine the extent/composition of contamination at depths where SCAPS penetrations are not possible.	Soil characterization where SCAPS met refusal before contamination was fully characterized.	Continuous sampling with a 10-foot core barrel below SCAPS refusal to a depth of 250 feet bgs at a maximum of 5 locations (i.e., 20 samples per borehole and a maximum of	Sensitivity for TPH and SVOC analyses must be at least as good as LIF threshold. Sensitivity for SVOCs and TPH based on limitations of analytical instrumentation.

Table 6-3 (Continued)
Phase Two McCormick and Baxter Data Quality Objectives Process

Investigation Objectives	Data Requirements	Investigation Strategy	Field Decision Criteria/ Performance Specifications
		100 samples). Selection of soil samples in field for analysis by: 1) TPH-Dx by GC/FID by FASP on-site laboratory. All soil samples archived for additional chemical or physical testing. 2) SVOC limited TCL by GC/MS by Region 9 Laboratory, if TPH is detected. 10 percent of all samples with no detectable concentrations of TPH will be analyzed.	

Table 6-4
Phase Three McCormick and Baxter Data Quality Objectives Process

Problem Statement

Surface soil samples collected in the Cellon process area and historical data indicate the potential for a significant PCP source to be located in this area and to have contaminated the A-zone groundwater downgradient from the source area. Sufficient data are not available to determine the extent of the suspected contamination source, whether the source is contained in a subsurface feature, confirm groundwater contamination, or determine the extent of the suspected contamination in the A-zone groundwater.

Investigation Objectives	Data Requirements	Investigation Strategy	Field Decision Criteria/ Performance Specifications
Direct Push or SCAPS Soil Sampling			
Investigate potential presence of a subsurface confining structure in the PCP disposal area (Event Three).	Horizontal and vertical extent of confining structure.	Ten sample collection penetrations. Initial locations will be placed within the Cellon process area, referred to here as the PCP source area. Spacing and final depth of penetrations will be determined in the field. If the SCAPS rods encounter groundwater near 16 feet bgs, which is believed to be the current water table, then this information will be used to evaluate the presence of the confining structure and the remainder of the pushes will be used to determine the extent of PCP/LNAPL contamination.	Soil sample locations will be determined on a daily basis by Mamie Brouwer and Kira Lynch (team leaders/chemists), Richard Smith (hydrogeologist), Marie Lacey (EPA RPM), Eva Davis (EPA Technical Support), Fred Hart (geologist), and Steve Brewer (SCAPS team leader). Soil sample collection locations will be selected to maximize understanding of the site CSM and extent of LNAPL/PCP contamination.
Determine extent of PCP and LNAPL contamination in the PCP disposal area (Event Three).	Soil data for VOCs and PCP.	A maximum of 120 soil samples will be analyzed by the following methods: 1) PCP by modified EPA SW-846 Method 8081 to be conducted by the FASP on-site laboratory 2) VOCs (i.e., a modified list to include diisopropyl ether and MIBK) by GC/MS modified version of EPA SW-846 Method 8260 to be conducted by the EPA Region 9 Laboratory. 3) TPH by GC-FID to be conducted by the FASP on-site laboratory.	Sensitivities for PCP will be equal to 1.0 ppm. Each sample will initially be screened with 100 and 50 ppm test kits. Sensitivities for VOCs (e.g., diisopropyl ether and MIBK) will be determined based on the method limitations. Soil samples will be selected to minimize interference from creosote NAPL.

Table 6-4 (Continued)
Phase Three McCormick and Baxter Data Quality Objectives Process

Investigation Objectives	Data Requirements	Investigation Strategy	Field Decision Criteria/ Performance Specifications
		Samples will be collected every 2 feet from 6.5 feet bgs through the saturated zone to approximately 30 feet bgs.	
Determine extent of PCP and LNAPL contamination around the PCP mixing shed (Event Two).	Soil data for VOCs, plus TICs and PCP.	A maximum of 42 soil samples will be analyzed by the following methods: 1) PCP by GC-ECD to be conducted by the FASP on-site laboratory 2) TPH by GC-FID to be conducted by the FASP on-site laboratory 3) VOCs (i.e., to include diisopropyl ether and MIBK by GC/MS to be conducted by the Region 9 laboratory located in Richmond, California. Samples will be collected every 2 feet from ground surface through the saturated zone to approximately 40 feet bgs.	Sensitivities for PCP will be equal to 1.0 ppm. Each sample will initially be screened with 100 and 50 ppm test kits. Sensitivities for VOCs (e.g., diisopropyl ether and MIBK) will be determined based on the method limitations. Soil samples will be selected to minimize interference from creosote NAPL.
Contingency SCAPS Soil Sampling			
Determine the areal extent of LNAPL/PCP contamination outside areas where the A-zone groundwater is known to be contaminated with creosote NAPL and alongside the southern property boundary (Event One).	Soil data for VOCs plus TICs (with particular emphasis for diisopropyl either and MIBK) and PCP, based on historical evidence.	A maximum of 154 soil samples analyzed by the following methods: 1) PCP using a modified version of EPA SW-846 Method 8081 and TPH using a modified version of EPA SW-846 Method 8015 by the EPA Region 9 FASP on-site laboratory. 2) VOCs (i.e., a modified list to include diisopropyl ether and MIBK) using a modified version of EPA SW-846 Method 8260 by the EPA Region 9 Laboratory located in Richmond, California.	Sensitivities for VOCs (e.g., diisopropyl ether and MIBK) will be determined based on the method limitations. Sensitivities for PCP will be equal to 1.0 ppm. Each sample will initially be screened with 100 and 50 ppm test kits first.

Table 6-4 (Continued)
Phase Three McCormick and Baxter Data Quality Objectives Process

Investigation Objectives	Data Requirements	Investigation Strategy	Field Decision Criteria/ Performance Specifications
		Samples will be collected every 2 feet from the top of the saturated zone to approximately 40 feet bgs.	Soil sampling locations will be determined in the field by Mamie Brouwer and Kira Lynch (team leaders/chemists), Richard Smith (hydrogeologist), Marie Lacey (EPA RPM), Eva Davis (EPA Technical Support), Fred Hart (geologist), and Steve Brewer (SCAPS team leader).
Contingency SCAPS Microwell Installation			
Identify PCP and LNAPL in the A-zone groundwater (Event One).	PCP and VOC plus TICs data with particular emphasis in diisopropyl ether and MIBK.	Install a maximum of four stainless steel microwells screened across the water table the near four A-zone groundwater wells. Measure water level to 0.01 foot.	Microwell installation locations will be determined in the field by Mamie Brouwer and Kira Lynch (team leaders/chemists), Richard Smith (hydrogeologist), Marie Lacey (EPA RPM), Eva Davis (EPA Technical Support), Fred Hart geologist), and Steve Brewer (SCAPS team leader).
Refine direction of groundwater flow in the A-zone (Event One).	Water level data to establish flow conditions downgradient of the PCP source area around the southern property boundary.	Install a maximum of seven stainless steel microwells screened across the water table at the southern property boundary of the site. Measure water level to 0.01 foot.	Microwell installation locations will be determined in the field by Mamie Brouwer and Kira Lynch (team leaders/chemists), Richard Smith (hydrogeologist), Marie Lacey (EPA RPM), Eva Davis (EPA Technical Support), Fred Hart (geologist), and Steve Brewer (SCAPS team leader).
Contingency Groundwater Sample Collection			
Determine the extent of PCP and LNAPL contamination in the A-zone groundwater at and/or near A3, A4, A5, and A6 (Event One).	Determine LNAPL presence or collect groundwater data for VOCs plus TICs, SVOCs, PCP, and dioxins.	Test newly installed microwells for LNAPL presence using indicator paste, interface probe and/or bailer. Collect and analyze LNAPL if present. Alternatively, a maximum of four groundwater samples collected from the newly installed microwells will be analyzed by the following methods: VOCs using a	Method sensitivities for dioxins and SVOCs to be equal to those defined in the FY99 NAPL investigation SAP. Sensitivities for VOCs (e.g., diisopropyl ether and MIBK) will be determined based on the method limitations.

Table 6-4 (Continued)
Phase Three McCormick and Baxter Data Quality Objectives Process

Investigation Objectives	Data Requirements	Investigation Strategy	Field Decision Criteria/ Performance Specifications
		modified version of EPA SW-846 Method 8260 and SVOCs using EPA SW-846 Method 8270 by the EPA Region 9 laboratory. PCP using EPA SW-846 Method 8151 and dioxins using EPA Method 1613 collected in the newly installed microwells only will be conducted by laboratories identified in the Final FY00 SAP.	
Determine the extent of PCP and LNAPL contamination alongside the southern property boundary (Event One).	Determine LNAPL presence and/or collect groundwater data for VOCs plus TICs, SVOCs, PCP, and dioxins.	Test wells for LNAPL presence using indicator paste, interface probe, and/or bailer. Collect and analyze LNAPL if present. Alternatively, a maximum of five groundwater samples analyzed by the following methods: VOCs using a modified version of EPA SW-846 Method 8260 and SVOCs using EPA SW-846 Method 8270 by the EPA Region 9 laboratory. PCP using EPA SW-846 Method 8151 and dioxins using EPA Method 1613 will be conducted by laboratories to be determined using laboratories identified in the FY00 SAP.	PCP detection limit to be equal to the MCL (1.0 µg/L). Method sensitivities for dioxins and SVOCs to be equal to those defined in the FY99 NAPL Investigation SAP. Sensitivities for VOCs plus TICs (e.g., diisopropyl ether and MIBK) will be determined based on the method limitations.

Table 6-5
Phase Four McCormick and Baxter Data Quality Objectives Process

Problem Statement

SCAPS soil sampling pushes near the southeast corner of the stormwater retention ponds met refusal at approximately 16 feet bgs. Sufficient data are not available to determine whether refusal was encountered due to a subsurface structure.

Investigation Objectives	Data Requirements	Investigation Strategy	Field Decision Criteria/ Performance Specifications
Trenching and Potholing			
Determine subsurface features responsible for SCAPS refusal at 16 feet bgs during the FY99 NAPL Investigation.	Identify responsible subsurface feature(s).	Soil samples visually inspected and described from composites taken from excavator bucket and trench sidewalls. Soil classification according to ASTM Method D2488-93.	If no significant subsurface structure or confining layer is encountered within 16 feet bgs, no further exploration will be conducted.

Table 6-6
Monitoring Well Groundwater Sampling and Analysis

Well ID	Sampling Frequency	Rationale	Analyses to Be Performed
A-3	Annual	Monitor dissolved-phase contamination immediately downgradient of main DNAPL and monitor NAPL movement.	EPA SW-846 Method 8270
A-4	Annual	Monitor dissolved-phase contamination immediately downgradient of main DNAPL and within proposed LNAPL plume to determine NAPL movement.	EPA SW-846 Method 8270
A-5	Annual	Monitor dissolved-phase contamination immediately downgradient of main DNAPL and within proposed LNAPL to determine NAPL movement.	EPA SW-846 Method 8270
A-6	Annual and quarterly	Monitor dissolved-phase contamination immediately downgradient of main DNAPL and within proposed LNAPL to determine NAPL movement.	EPA SW-846 Method 8270 and natural attenuation parameters
A-7	Annual	Monitor dissolved-phase contamination immediately downgradient of main DNAPL and monitor NAPL movement.	EPA SW-846 Methods 8270
DSW-2A	Annual	Monitor outer edge of detectable contamination and confirm past detection of PCP.	EPA SW-846 Methods 8270 and 8151
OFS-2A	Annual	Monitor outer edge of detectable contamination.	EPA SW-846 Methods 8270 and 8151
OFS-3A	Annual	Monitor outer edge of detectable contamination.	EPA SW-846 Methods 8270 and 8151
OS-1A	Annual	Monitor outer edge of detectable contamination.	EPA SW-846 Methods 8270 and 8151
OS-4A	Annual and quarterly	Monitor outer edge of detectable contamination.	EPA SW-846 Methods 8270 and 8151 and natural attenuation parameters
DSW-2B	Annual	Monitor outer edge of detectable contamination and confirm past detection of contaminant.	EPA SW-846 Methods 8270 and 8151
DSW-5B	Annual and quarterly	Monitor dissolved-phase contamination immediately downgradient of main DNAPL and monitor NAPL movement.	EPA SW-846 Methods 8270 and 8151 and natural attenuation parameters
DSW-7B	Annual and quarterly	Monitor outer edge of detectable contamination and confirm past detection of contaminant.	EPA SW-846 Methods 8270 and 8151 and natural attenuation parameters
OFS-1B	Annual	Monitor dissolved-phase contamination immediately downgradient of main DNAPL and monitor NAPL movement.	EPA SW-846 Methods 8270 and 8151
OFS-3B	Annual	Monitor outer edge of detectable contamination and confirm past detection of contaminant.	EPA SW-846 Methods 8270 and 8151

Table 6-6 (Continued)
Monitoring Well Groundwater Sampling and Analysis

Well ID	Sampling Frequency	Rationale	Analyses to Be Performed
OS-1B	Annual and quarterly	Monitor outer edge of detectable contamination.	EPA SW-846 Methods 8270 and 8151 and natural attenuation parameters
OS-4B	Annual	Monitor outer edge of detectable contamination.	EPA SW-846 Methods 8270 and 8151
DSW-1C	Annual and quarterly	Monitor dissolved-phase contamination immediately downgradient of main DNAPL and monitor NAPL movement.	EPA SW-846 Methods 8270 and 8151 and natural attenuation parameters
DSW-2C	Annual	Monitor outer edge of detectable contamination and confirm past detection of contaminant.	EPA SW-846 Methods 8270 and 8151
DSW-6C	Annual	Monitor dissolved-phase contamination immediately below confirmed B-zone DNAPL and monitor NAPL movement.	EPA SW-846 Method 8270
DSW-7C	Annual and quarterly	Monitor outer edge of detectable contamination and confirm past detection of contaminant.	EPA SW-846 Methods 8270 and 8151 and natural attenuation parameters
OFS-2C	Annual	Monitor outer edge of detectable contamination.	EPA SW-846 Methods 8270 and 8151
OFS-3C	Annual	Monitor outer edge of detectable contamination.	EPA SW-846 Methods 8270 and 8151
OFS-4C	Annual	Monitor dissolved-phase contamination immediately downgradient of main DNAPL and monitor NAPL movement.	EPA SW-846 Methods 8270 and 8151
ONS-2C	Annual	Monitor dissolved-phase contamination immediately below confirmed B-zone DNAPL and monitor NAPL movement.	EPA SW-846 Method 8270
OS-1C	Annual and quarterly	Monitor outer edge of detectable contamination.	EPA SW-846 Methods 8270 and 8151 and natural attenuation parameters
OS-4C	Annual	Monitor outer edge of detectable contamination and confirm past detection of contaminant.	EPA SW-846 Methods 8270 and 8151
DSW-1D	Annual and quarterly	Monitor dissolved-phase contamination immediately downgradient of main DNAPL and monitor NAPL movement.	EPA SW-846 Methods 8270 and 8151 and natural attenuation parameters
DSW-2D	Annual and quarterly	Monitor outer edge of detectable contamination.	EPA SW-846 Methods 8270 and 8151 and natural attenuation parameters
OFS-2D	Annual	Monitor outer edge of detectable contamination.	EPA SW-846 Methods 8270 and 8151
OFS-3D	Annual	Monitor outer edge of detectable contamination.	EPA SW-846 Methods 8270 and 8151

Table 6-6 (Continued)
Monitoring Well Groundwater Sampling and Analysis

Well ID	Sampling Frequency	Rationale	Analyses to Be Performed
OFS-4D	Annual	Monitor dissolved-phase contamination below and downgradient of confirmed C-zone DNAPL and monitor NAPL movement.	EPA SW-846 Method 8270
ONS-1D	Annual and quarterly	Monitor dissolved-phase contamination cross-gradient of confirmed D-zone DNAPL and monitor NAPL movement.	EPA SW-846 Methods 8270 and 8151 and natural attenuation parameters
ONS-2D	Annual	Monitor dissolved-phase contamination below confirmed B-zone DNAPL and monitor NAPL movement.	EPA SW-846 Methods 8270 and 8151
OS-5D	Annual	Monitor outer edge of detectable contamination.	EPA SW-846 Methods 8270 and 8151
DSW-2E	Annual	Monitor outer edge of detectable contamination.	EPA SW-846 Methods 8270 and 8151
MW-2E	Annual	Monitor potential downward migration of NAPL.	EPA SW-846 Methods 8270 and 8151
OFS-3E	Annual	Monitor outer edge of detectable contamination and confirm past contaminant detection.	EPA SW-846 Methods 8270 and 8151
OFS-4E	Annual and quarterly	Monitor dissolved-phase contamination below and downgradient of confirmed C-zone DNAPL and monitor NAPL movement	EPA SW-846 Methods 8270 and 8151 and natural attenuation parameters
OS-1E	Annual and quarterly	Monitor outer edge of detectable contamination.	EPA SW-846 Methods 8270 and 8151 and natural attenuation parameters
OS-2E	Annual	Monitor outer edge of detectable contamination.	EPA SW-846 Methods 8270 and 8151
OS-3E	Annual and quarterly	Monitor outer edge of detectable contamination.	EPA SW-846 Methods 8270 and 8151 and natural attenuation parameters
OFS-5A	Quarterly	Monitor upgradient background conditions.	EPA SW-846 Methods 8270 and 8151 and natural attenuation parameters
A-8	Quarterly	Monitor NAPL source conditions.	EPA SW-846 Method 8270
OFS-4A1	Quarterly	Monitor conditions at the plume margin.	EPA SW-846 Methods 8270 and 8151 and natural attenuation parameters
DSW-3B	Quarterly	Monitor upgradient background conditions.	EPA SW-846 Methods 8270 and 8151 and natural attenuation parameters
DSW-3C	Quarterly	Monitor upgradient background conditions.	EPA SW-846 Methods 8270 and 8151 and natural attenuation parameters

Table 6-6 (Continued)
Monitoring Well Groundwater Sampling and Analysis

Well ID	Sampling Frequency	Rationale	Analyses to Be Performed
ONS-1C	Quarterly	Monitor source conditions.	EPA SW-846 Methods 8270 and 8151 and natural attenuation parameters
OFS-1D	Quarterly	Monitor upgradient background conditions.	EPA SW-846 Methods 8270 and 8151 and natural attenuation parameters
OFS-5E	Quarterly	Monitor upgradient background conditions.	EPA SW-846 Methods 8270 and 8151 and natural attenuation parameters

7.0 DATA REVIEW, PRESENTATION, AND INTERPRETATION

7.1 QUALITY ASSURANCE REVIEW

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

7.1.1 Field Measurement Quality Assurance

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

7.1.2 SCAPS Laboratory Quality Assurance Review

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

7.1.3 Fixed Laboratory Quality Assurance

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

7.2 DATA PRESENTATION

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

Table 7-1 presents the electronic data deliverable (EDD) format that will be used by the laboratories for submitting analytical data packages. The structure of this file format is shown below. The file(s) will be submitted in an ASCII, comma-delimited (CSV) format, and may be compressed using PKZip, if the file is too large. Required fields are designated with an ‘X’.

7.3 DATA INTERPRETATION

The primary objectives of this field exploration are to better define the northern, eastern, and southeastern extent/composition of NAPL, and to evaluate the geologic constraints to assess appropriate thermal treatment system technologies. Data collected to better define the presence and characteristics of the NAPL include the following:

- SCAPS LIF and CPT data
- Rotosonic boring data
- Analysis of groundwater collected from existing groundwater monitoring wells
- Site geology and stratigraphy
- Analysis of soil and groundwater samples collected from SCAPS penetrations, soil borings, monitoring wells, and microwells

Zones of low permeability in the subsurface provide surfaces upon which NAPL may flow and move from the original source. Geotechnical and stratigraphic data collected by the SCAPS cone penetrometer will be used to identify low permeability zones. Other sources of stratigraphic data include core samples collected from the soil borings. Many of these soil samples will be analyzed for grain size, density, porosity and permeability. The results of the field work and soil testing will be used to refine the existing stratigraphic map of the subsurface that may help explain the distribution of NAPL beyond the McCormick and Baxter property boundaries.

The NAPL distribution data and the subsurface stratigraphy of the site will also be used to evaluate the feasibility of in situ treatment technologies and may be used to aid in the conceptual design of a thermal treatment system.

Soil data and groundwater data from monitoring wells will be used to characterize the suspected LNAPL contamination, as well as surficial and subsurface PCP contamination in the Cellon process area near SE-08 and near the PCP mixing shed.

Table 7-1
Diskette Deliverable Format

Field Name	Attributes	Required	Description
Lab Name	C25	X	
Sample ID	C40	X	
Sample Date	D10	X	MM-DD-YYYY HH24:MM
SDG	C10		
QAQC Type	C50	X	
Matrix	C15	X	
Lab Sample ID	C40	X	
Filtered?	C4		Yes/no for filtered or unfiltered water samples (metals only)
Analysis Method	C25	X	
Extraction Method	C25		
Date Received	D10		MM-DD-YYYY HH24:MM
Date Analyzed	D10	X	MM-DD-YYYY HH24:MM
Date Extracted	D10		MM-DD-YYYY HH24:MM
CAS#	C11		
Compound/Element Name	C75	X	
Result	N	X	
Lab Qualifier	C5	X	
Sample Detection Limit	N	X	
Units	C15	X	
Run Number	C10	X	Default to ‘1’, note dilutions or reanalysis
Dilution Factor	N		
%Solids	N		
%Moisture	N		

Notes:
.txt or .csv or .xls files are acceptable
C - character
C25 - character not more than 25 spaces long
D10 - date not more than 10 spaces long
N - number

8.0 COMMUNICATIONS, DATA MANAGEMENT, AND REPORTING

This section of the Work Plan describes the important project elements of communications between team members and the flow and management of data that has been collected. The method of reporting project results is also described.

8.1 COMMUNICATIONS STRATEGY

Accelerated approaches to sampling and analysis, as required for this project, integrate various characterization tasks and measurements into a single coordinated effort. Accelerated approaches are conducted by a multidisciplinary group of experienced professionals, working as a team in the field to evaluate the data to further refine the CSM and plan the next measurement steps. Project team members and inter-group communication strategies are described below and shown on Figure 8-1.

8.1.1 Project Team

The project team consists of representatives from EPA Region 9; EPA Kerr Laboratory; the Seattle, Albuquerque, and Sacramento Districts USACE; and numerous contractors. The project team provides the overall framework for the sampling and analysis approach by defining project objectives and data quality requirements, and ensuring that both the objectives and data quality requirements are met.

Providing oversight for the project team throughout the process are individuals identified to ensure that project quality assurance/quality control and health and safety issues are addressed. At any time, any individual working on the project may contact the QA/QC Officer or the Health and Safety Officer to discuss project issues or concerns. It is the responsibility of the QA/QC Officer and the Health and Safety Officer to implement corrective actions if project requirements are not being met.

The project team must keep the EPA RPM (Marie Lacey) informed of how the project is proceeding. The approval of EPA is required for any major deviations in the work. Project updates will be given to the EPA RPM and the USACE PM (Cheryl Buckel) by the Project Technical Team Leader (Kira Lynch) and Interim Technical Team Leader (Mamie Brouwer) during regularly scheduled meetings, telephone calls, e-mail messages or facsimiles. The USACE Project Technical Team Leader is a member of the core technical team (below) and will be in daily contact with the Field Investigation Manager. All site activities will be coordinated with Bill Catlett, Site Maintenance Manager.

8.1.2 Core Technical Team

Within the project team is a core technical team made up of individuals who have expertise in geologic, hydrologic, and chemical analytical methods appropriate for the site. They provide a continual, integrated, and multidisciplinary presence throughout the process. The members of the core technical team are involved in all steps of the process and are usually present in the field when data collection related to their areas of expertise is taking place. The optimization of field investigation activities and the quality of the evolving and final CSM depend on the interaction among the members of the core technical team and the EPA, each providing their own special perspective on the site.

The core technical team oversees analysis of the raw data, evaluates the data to further refine the CSM, and recommends to the leader of the core technical team next measurements that best test the crucial features of the CSM. Members of the core technical team should have whole-site-systems understanding of geology, hydrogeology, and contaminant chemistry. They work together to evaluate the data as they are obtained. Their most important role is integrating and understanding inconsistencies between the data and the CSM. The ability to integrate their technical expertise with that of the other members of the core technical team is crucial to the success of the project.

During this project, the core technical team will use field-based site characterization methods that will generate data that will be evaluated and integrated into the CSM in the field. The core technical team will follow a dynamic work plan that allows and requires on-site decisionmaking by the project team. Successive steps are based on the evaluation and integration of field data into the CSM.

Core technical team members include:

- Project Technical Team Leader/Project Chemist—Kira Lynch
- Interim Project Technical Leader/Project Chemist—Mamie Brouwer
- Project Environmental Engineer—Randy Olsen
- Project Senior Geologist/Data Leader—Richard Smith
- Health and Safety Officer (Certified Industrial Hygienist)—David Elskamp

The Project Technical Team Leader and Interim/Technical Team Leader are ultimately responsible for all decisions related to the design and implementation of this project, within the framework provided by the approved dynamic work plan. They are tasked with informing the USACE PM and EPA RPM about all decisions that may impact project schedule or budget. Final decisions that impact budget and schedule will be made by the USACE PM and EPA RPM.

The Project Technical Team Leader and Interim Technical Team Leader, supported by other core technical team members, are also responsible for ensuring data quality and effective data management and also interprets data and integrates the results into the evolving site model and reports. They have the final authority on site technical decision making concerning field operations. If the Project Technical Team Leader or Interim Technical Team Leader are absent during field operations, another member of the core team will be designated as the technical team leader, who, in telephone consultation with the Project Technical Team Leader, makes decisions concerning the next day's activities. This person will most likely be the Field Investigation Manager. Other core technical team members are in the field for data collection involving their primary area(s) of expertise and are available for telephone consultation when they are not present in the field.

Although data management and QA/QC are specific project support functions, the Project Technical Team Leader, supported by the other core technical team members, is responsible for ensuring the following: (1) that data collection is relevant to the objectives of the project (i.e., necessary to satisfy data quality requirements); (2) that QA/QC procedures for data collection and processing for respective areas of expertise are strictly followed; and (3) that field data reduction and processing do not introduce errors into the data and evolving site model.

The core team will be in daily contact to discuss how the project is proceeding and any changes required by the EPA RPM. Additionally, daily meetings to discuss project technical issues will be held in the field with core technical team members present or linked by conference call. Representatives of subcontractors or project support team members (below) may also be asked to attend these meetings. Daily chemical quality control reports (DCQCRs) will be generated and faxed to the Project Data Leader at the USACE Seattle District office. The DCQCR will include all field data generated on a daily basis, including mobile laboratory data, chain of custody forms, and field sampling forms. The reports will be scanned and posted on the project website.

8.1.3 Project Support Team

The project support team includes technical personnel and equipment operators involved in data collection and sampling and personnel who provide other support functions.

Project support team members include:

- EPA FASP Laboratory Team—Liza Finley, EPA FASP Coordinator, and Jeff Mays, ESAT FASP Chemist
- USACE SCAPS Team—Steve Brewer
- USACE Survey Team—Kenneth Regalado

- Off-Site Laboratories
  - EPA Region 9 Environmental Laboratory—Fred Cordini and Mary O'Donnell
  - EPA Kerr Laboratory—Eva Davis
  - Columbia Analytical Services — Richard Craven
  - Pacific Analytical Laboratories — Steve Parsons
  - PTS Laboratories, Inc.—Richard Young

The project support team will be in daily contact with the Field Investigation Manager, or designated technical task manager, when they are working on site. They may be asked to attend technical team meetings to present results or other technical issues, if needed. Off-site laboratories will be contacted by the Field Investigation Manager, or designee, as necessary.

8.2 DATA FLOW

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

8.2.1 Field Data

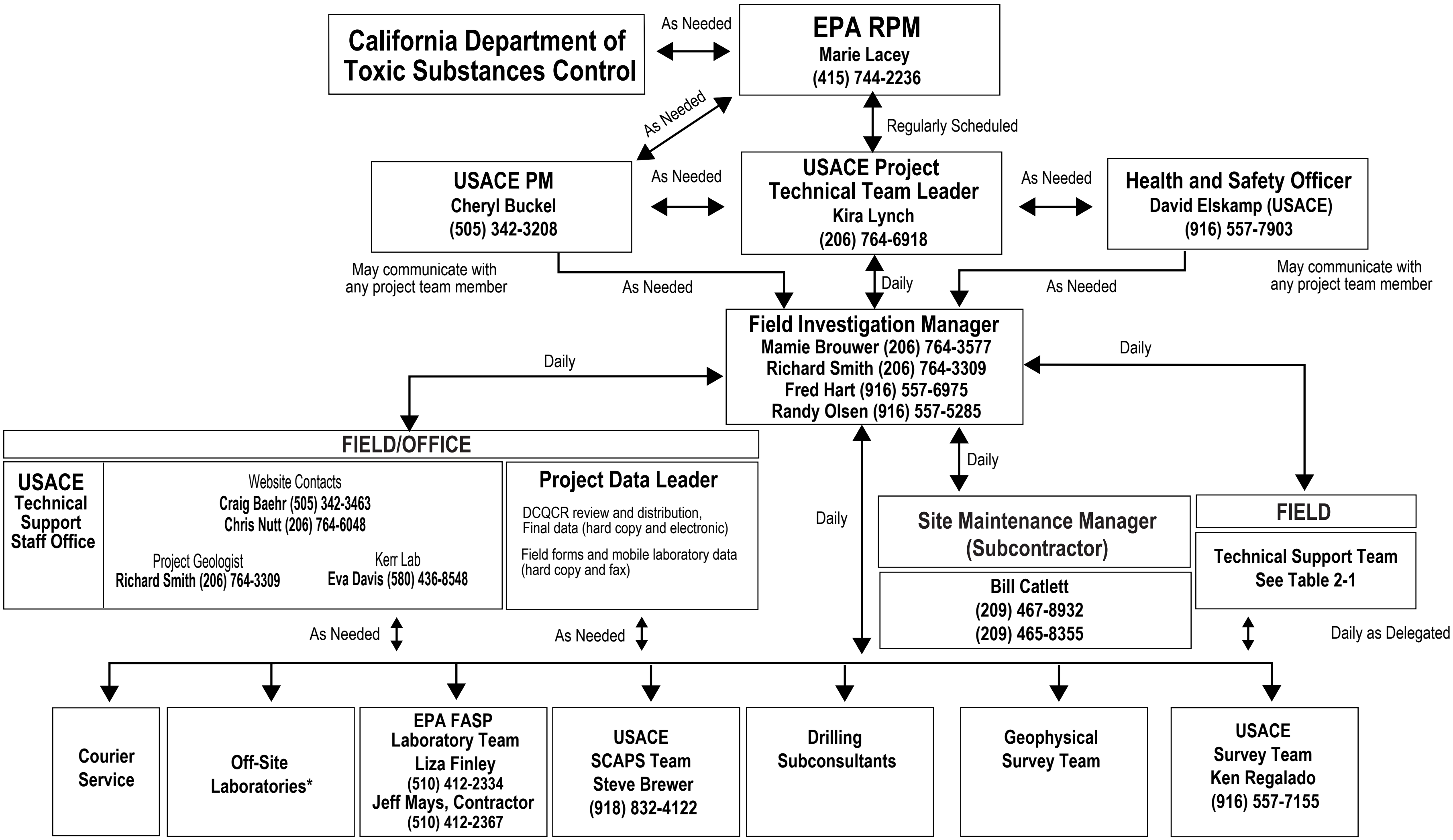
This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

8.2.2 Fixed Laboratory Data

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

8.2.3 Reporting

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).



*EPA Region 9 Environmental Laboratory – Mary O'Donnell (415) 744-1533; Rich Bauer (510) 412-2312
EPA Kerr Laboratory – Eva Davis (580) 436-8548
Columbia Analytical Services – Richard Craven (360) 577-7222
PTS Laboratories, Inc. – Richard Young (562) 907-3607
Pacific Analytical Services – Steven Parsons (760) 931-1766

Figure 8-1
Communication Strategy

MANAGEMENT PLAN
ADDENDUM FOR FY 2000
NAPL FIELD EXPLORATION
McCormick and Baxter Superfund Site
Stockton, California

9.0 SCHEDULE

The schedule for activities for the NAPL field exploration at the McCormick and Baxter Superfund site is shown in Table 9-1. Figure 9-1 shows the SCAPS schedule for June through September 2000.

Table 9-1
Project Schedule

Project Task	Start Date	Finish Date
McCormick and Baxter Field Work		
Site walkthrough and preliminary location surveys	W/E 5/29/00	Same
SCAPS mobilization and field preparation	05/31/00	06/04/00
SCAPS Work Period 1: Conduct pre-selected LIF pushes north of the slough.	06/05/00	06/14/00
SCAPS Work Period 2: Start PCP/LNAPL investigation.	06/19/00	06/29/00
SCAPS Work Period 3: Old Mormon Slough - start rotosonic drilling.	07/07/00	07/24/00
SCAPS Work Period 4: Continue PCP/LNAPL investigation. Begin Phase Two investigation. Continue rotosonic investigation.	07/31/00	08/09/00
SCAPS Work Period 5: Continue Phase Two investigation. Continue rotosonic investigation, if necessary	08/15/00	08/30/00
SCAPS Work Period 6	09/05/00	09/13/00
SCAPS Work Period 7	09/19/00	09/25/00
SCAPS demobilization	09/26/00	09/28/00
Groundwater sample collection	10/02/00	10/15/00
FASP Field Analysis		
FASP lab mobilization	06/05/00	06/07/00
Conduct field analysis	06/12/00	09/25/00
FASP lab demobilization	09/25/00	09/27/00
Reporting		
SCAPS Report	10/03/00	11/08/00
Preliminary Summary of Data	10/15/00	11/15/00
Draft Investigation Report	11/15/00	12/31/00
Final Investigation Report	01/31/01	02/28/01

JUNE 2000

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	29	30	31	1	2	3
		USA Utility Clearance				
			Mobilization - Tulsa to Stockton, CA			Prep
4	5	6	7	8	9	10
Prep	FASP Utility Hookup SCAPS Work Period 1					
11	12	13	14	15	16	17
SCAPS Work Period 1				SCAPS Break 1		
18	19	20	21	22	23	24
	SCAPS Work Period 2					
25	26	27	28	29	30	
SCAPS Work Period 2					SCAPS Break 2	

JULY 2000

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1
2	3	4	5	6	7	8
SCAPS Break 2					SCAPS Work Period 3	
9	10	11	12	13	14	15
SCAPS Work Period 3						
16	17	18	19	20	21	22
SCAPS Work Period 3						
23	24	25	26	27	28	29
		SCAPS Break 3				
30	31					

AUGUST 2000

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	31	1	2	3	4	5
	SCAPS Work Period 4					
6	7	8	9	10	11	12
SCAPS Work Period 4				SCAPS Break 4		
13	14	15	16	17	18	19
SCAPS Break 4		SCAPS Work Period 5				
20	21	22	23	24	25	26
SCAPS Work Period 5						
27	28	29	30	31		
SCAPS Work Period 5						

SEPTEMBER 2000

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1	2
					SCAPS Break 5	
3	4	5	6	7	8	9
SCAPS Break 5		SCAPS Work Period 6				
10	11	12	13	14	15	16
SCAPS Work Period 6				SCAPS Break 6		
17	18	19	20	21	22	23
SCAPS Break 6		SCAPS Work Period 7				
24	25	26	27	28	29	30
SCAPS Work Period 7		SCAPS Demobilization				

Figure 9-1
Tulsa District SCAPS Schedule for McCormick and Baxter Site

MANAGEMENT PLAN ADDENDUM
FOR FY00 NAPL FIELD EXPLORATION
McCormick and Baxter Superfund Site
Stockton, California

10.0 REFERENCES

ICF Kaiser Engineers, Inc. 1998. *Soil and Groundwater Remedial Investigation Report, McCormick and Baxter, Stockton, California.* 2 vols. July 1998.

U.S. Army Corps of Engineers (USACE). 2000. *Draft 1999 NAPL Field Investigation Report, McCormick and Baxter Superfund Site, Stockton, California.* Prepared by USACE Seattle District and URS Greiner Woodward Clyde, Inc. February 16, 2000.

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———. 1994. *Requirements for the Preparation of Sampling and Analysis Plans.* EM 200-1-3.

Sampling and Analysis Plan Addendum for FY 2000 NAPL Field Exploration
McCormick and Baxter Superfund Site
Stockton, California

APPROVAL PAGE

EPA Remedial Project Manager: Marie Lacey — Date

EPA Quality Assurance Management Section: Vance Fong — Date

Army Corps of Engineers Project Manager: Cheryl Buckel — Date

Army Corps of Engineers Project Technical Leader: Kira Lynch — Date

FINAL

SAMPLING AND ANALYSIS PLAN ADDENDUM FOR FY 2000 NAPL FIELD EXPLORATION

McCormick and Baxter Superfund Site
Stockton, California

July 6, 2000

Prepared for

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REGION 9

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PART I – FIELD SAMPLING PLAN ADDENDUM

CONTENTS

CONTENTS (Continued)

APPENDIXES

FIGURES

TABLES

ABBREVIATIONS AND ACRONYMS

ASTM	American Society for Testing and Materials
bgs	below ground surface
bml	below mud line
°C	degrees Celsius
CEC	cation exchange capacity
CLP	Contract Laboratory Program
cm^3	cubic centimeters
CPT	cone penetrometer testing
CSM	conceptual site model
DCQCR	daily chemical quality control report
DNAPL	dense nonaqueous-phase liquid
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
FASP	Field Analytical Support Program
FSP	field sampling plan
FY99	Fiscal Year 1999
FY00	Fiscal Year 2000
GPS	Global Positioning System
IDW	investigation-derived waste
LIF	laser-induced fluorescence
LNAPL	light nonaqueous-phase liquid
LPG	liquid petroleum gas
mg	milligrams
MIBK	methyl isobutyl ketone
mL	milliliters
MS/MSD	matrix spike/matrix spike duplicate
MQO	method quality objective
NAD83	North American datum of 1983
NAPL	nonaqueous-phase liquid
NGVD88	National Geodetic Vertical Datum of 1988
PAH	polycyclic aromatic hydrocarbon
PCP	pentachlorophenol
PE	performance evaluation
PID	photoionization detector
POL	petroleum, oil, and lubricants
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
QAPP	quality assurance project plan

ABBREVIATIONS AND ACRONYMS (Continued)

RD	remedial design
RPD	relative percent difference
RPM	Remedial Project Manager
SAP	sampling and analysis plan
SCAPS	Site Characterization and Analysis Penetrometer System
SDG	sample delivery group
SOW	scope of work
SOP	standard operating procedure
SVOC	semivolatile organic compound
TIC	tentatively identified compound
TOC	total organic carbon
TPH	total petroleum hydrocarbon
TPH-Dx	total petroleum hydrocarbon – diesel extended
UPRR	Union Pacific Railroad
USACE	U.S. Army Corps of Engineers
VOA	volatile organic analysis
VOC	volatile organic compound

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) Addendum is an integral part of the Management Plan Addendum for the McCormick and Baxter Superfund field exploration. The site, located in Stockton, California, is shown on Figure 3-1 of the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

The SAP has two major components: Part I - the Field Sampling Plan (FSP) and Part II - the Quality Assurance Project Plan (QAPP). The FSP presents the detailed scope of work associated with field activities (e.g., sample types and sample locations) and specifies the procedures to be used for sampling and other field operations. The QAPP describes the analytical data quality objectives (DQOs), laboratory analytical procedures, quality assurance/quality control (QA/QC) procedures, and data quality evaluation criteria.

The purpose of the SAP is to assure production of high quality data that meet the project objectives and requirements and accurately characterize measurement parameters. It provides the protocol for collecting samples, measuring and controlling data, and documenting field and laboratory data so that the data are technically and legally defensible.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The team organizational structure for the site investigation was developed based on the requirements of the field and laboratory activities to help ensure attainment of the project objectives. The following key positions and personnel are described in detail in the Work Plan Addendum:

- U.S. Environmental Protection Agency (EPA) Remedial Project Manager (RPM): Marie Lacey (EPA, Region 9)
- U.S. Army Corps of Engineers (USACE) Project Manager: Cheryl Buckel (USACE, Albuquerque District)
- Technical Leader: Kira Lynch (USACE, Seattle District)
- Interim Technical Leader: Mamie Brouwer (USACE, Seattle District)
- Project QA/QC Manager: John Wakeman (USACE, Seattle District)
- Field Investigation Leaders: Mamie Brouwer and Richard Smith (USACE, Seattle District) and Fred Hart and Randy Olsen (USACE, Sacramento District)
- Project Senior Geologist: Richard Smith (USACE, Seattle District)
- Project Environmental Engineer: Randy Olsen (USACE, Sacramento District)
- Sediment Cap Leader: John Wakeman (USACE, Seattle District)
- Certified Industrial Hygienist: David Elskamp (USACE, Sacramento District)
- Technical Support: Eva Davis (EPA Robert S. Kerr Environmental Research Laboratory)
- Drilling Contractor: To be determined
- Geophysical Contractor: To be determined

- Field Laboratories:
  - EPA Field Analytical Support Program (FASP)
  - EPA Region 9 Laboratory

- Fixed Laboratories:
  - EPA Robert S. Kerr Environmental Research Laboratory (Ada, Oklahoma)
  - EPA Region 9 Laboratory
  - Columbia Analytical Services
  - PTS Laboratories, Inc. (proposed)
  - Environmental Resource Associates (proposed)
  - Pacific Analytical Laboratories (proposed)

3.0 FIELD ACTIVITIES

A phased approach has been developed for this site investigation. Due to the possible extent of nonaqueous-phase liquid (NAPL) contamination, the following phases have been assigned to the Fiscal Year 2000 (FY00) NAPL field exploration activities:

- Phase One — Define the extent of the potential NAPL migration in and north of the Old Mormon Slough.
- Phase Two — Define the eastern, southern, and southeastern limits of the NAPL contamination.
- Phase Three — Characterize pentachlorophenol (PCP) and suspected light nonaqueous-phase liquid (LNAPL) contamination in the Cellon process area and A-zone groundwater.
- Phase Four — Characterize subsurface features near Fiscal Year 1999 (FY99) investigation locations SE-003, SB-052, and SE-095.

Flow charts of the four phases of field activities are shown in Figures 3-1 through 3-3.

In addition to the FY00 NAPL field exploration, remedial design groundwater monitoring will be conducted.

The general procedures that will be used to accomplish the specific tasks of the investigation are described in Section 3.1. The specific work elements and the order of execution of work elements are described in sections 3.2 through 3.6. Field standard operating procedures (SOPs) are provided in Appendix A; standard field forms are provided in Appendix B.

3.1 GENERAL PROCEDURES

3.1.1 Base Map

USACE, Seattle District will provide details (e.g., building locations) of the Dutra and Stockton Cold Storage properties located north of the Old Mormon Slough and the Union Pacific Railroad (UPRR) right-of-way between the southern boundary of the site and Washington Avenue to the existing project map. The new details will be created from aerial photographs and show salient site features located in North American Datum of 1983 (NAD83) horizontal state plane coordinates. This map will be used to avoid placing initial sampling locations on significant physical obstructions and to assist with placement of additional sampling locations as the investigation progresses.

3.1.2 Investigation Area Reconnaissance

After completion of the Management Plan, a reconnaissance of the investigation area will be conducted to review site conditions, mark investigation areas, and refine the specific field program as needed. Coordination with the various contractors will be completed during site reconnaissance, including electrical hookup to provide power during field activities. Utility clearance on the McCormick and Baxter site and the Dutra, Stockton Cold Storage, and UPRR properties will be evaluated and performed, if necessary, prior to the commencement of intrusive field activities.

3.1.3 Surveying

Monument Surveying

The USACE, Sacramento District in-house survey crew will be responsible for placing and surveying a minimum of three monuments north of the Old Mormon Slough on the Dutra and Stockton Cold Storage properties. The monuments should be placed along the fence line or by a building since future use of the site for field activities is not known at this time. Horizontal control will use NAD83 state plane coordinates, and vertical control will use the National Geodetic Vertical Datum of 1988 (NGVD88).

Field personnel will use the monuments as reference points. They will measure the locations of sampling points relative to the monuments by means of tape measures, levels and global positioning system (GPS) equipment.

Well and Microwell Surveying

The USACE, Sacramento District survey crew will survey all microwells and monitoring wells installed during the FY00 field investigation. Horizontal control will be in NAD83 state plane coordinates, while vertical control will be provided in NGVD88. The elevation of ground surface, protective casing, and the north side of riser pipe will be provided for each well to a resolution of 0.01 feet. The elevation of the water level sampling port on the dedicated bladder pump assembly will be surveyed to the nearest 0.01 foot for the 49 wells where dedicated bladder pumps are installed.

3.1.4 Documentation

Records of drilling operations and soil description activities will be documented by the overseeing geologist and by the drilling contractor. These records will consist of the soil boring log (Appendix B) and information recorded in the project field notebook. Logs will also be created for exploratory trenches and SCAPS borings pushed for analytical sample collection. Copies of these records will be maintained at the site while drilling is in progress, and will be provided with the final report.

The soil boring log (Appendix B) will include descriptions of soil and NAPL encountered, total depth of the boring, diameter of the hole, formation contacts, occurrence of first water, sampling depths, water level measurements, amount of sealing material used for abandonment, and any other information deemed appropriate by field personnel. Logs of trenches or analytical sample pushes will record general information and soil descriptions. Descriptions of soil will be according to American Society for Testing and Materials (ASTM) D2488-90, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*. The following visual descriptions of creosote NAPL will be documented on the boring logs for each soil boring and SCAPS penetration location:

- No visible evidence – No visible evidence of oil on soil sample
- Sheen – Sheen as described by the sheen testing methodology presented below
- Staining – Visible brown or black staining on soil; can be visible as mottling or in bands; typically associated with fine-grained soils
- Coating – Visible brown or black oil coating soil grains; typically associated with coarse-grained soils
- Oil Wetted – Visible brown or black oil wetting the soil sample. Oil appears as a liquid and is not held by soil grains. Soils oozing petroleum typically contain approximately 2 to 3 percent petroleum.

Sheen screening is a sensitive method that can be effective in detecting petroleum-based products in concentrations lower than regulatory cleanup guidelines. Water sheen testing involves placing soil in water and observing the water surface for signs of a sheen. Sheen is classified as follows:

- No Sheen (NS) – No visible sheen on water surface
- Slight Sheen (SS) – Light colorless film; spotty to globular; spread is irregular, not rapid; areas of no sheen remain; film dissipates rapidly

- Moderate Sheen (MS) – Light to heavy film, may have some color or iridescence; globular to stringy, spread is irregular to flowing; few remaining areas of no sheen on water surface

- Heavy Sheen (HS) – Heavy colorful film with iridescence; stringy, spread is rapid; sheen flows off the sample; most of water surface may be covered with sheen

A hydrophobic dye (e.g., Sudan IV) shake test will be used to test soil cores as part of Phase Three of the investigation on portions of the core that are suspected to have non-creosote LNAPL contamination, but where the NAPL may not be visible. The shake test will consist of transferring approximately 20 cubic centimeters (cm^3) of soil to a sample container. Twenty milliliters (mL) of water and approximately 2 milligrams (mg) of hydrophobic dye (i.e., the amount that rests on the end of a flat toothpick) will be added to the sample in the container. The container will then be capped and shaken for 10 to 30 seconds and allowed to separate for 5 minutes. The sample will be examined visually for the presence of NAPL (i.e., NAPL is stained red fluid and water is clear), and the volume and density of NAPL relative to water will be determined.

Contaminant odor will also be noted on the boring log. Intervals of NAPL and sheen occurrence will be recorded on the appropriate form to the nearest 0.1 foot.

A field drilling report will be prepared and maintained by the drilling contractor on a daily basis. The report will specify the number of hours worked, materials used, unusual problems, and other special comments and observations.

Pertinent details related to each Site Characterization and Analysis Penetrometer System (SCAPS) laser induced fluorescence/cone penetrometer test (LIF/CPT) push and/or soil collection push will be recorded on the SCAPS report form in Appendix B. Pertinent details regarding groundwater sampling and NAPL inspection will be recorded on the groundwater sampling data sheet and the NAPL thickness/sampling form in Appendix B.

3.1.5 Monitoring Well and Microwell Sampling

Phase Three microwell sampling shall consist of inspection for LNAPL and LNAPL and/or groundwater sampling. LNAPL inspection will begin by lowering a clean tape coated with oil/water indicator paste. The thickness of LNAPL will be recorded and a bailer will be used to collect a sample of the LNAPL if it is detected. If LNAPL is not detected using the oil/water indicator paste, a bailer will be lowered to intersect the water surface. The bailer will be retrieved and inspected for LNAPL. If LNAPL is not observed visually in the bailer, water from the upper portion of the bailer will be tested for LNAPL using a hydrophobic dye (e.g., Sudan IV) shake test. The hydrophobic dye shake test shall consist of adding approximately 40 mL of the sample water and 2 mg of the dye to a 50-mL container. The container will be capped, shaken for 10 to 30 seconds and allowed to separate for 5 minutes. The presence and/or volume of NAPL and its density relative to water will be determined.

If LNAPL is not detected by any of the above methods, or there is not enough LNAPL for laboratory analysis, groundwater samples shall be collected. Microwells will be sampled with a bailer or using disposable tubing and a peristaltic pump according to the low-flow sampling protocol in Appendix A.

Groundwater sampling procedures for the remedial design groundwater sampling are described in Section 3.6.

3.1.6 SCAPS Exploration

LIF/CPT Pushes

A SCAPS equipped with a LIF/CPT sensor will be used to characterize the vertical and horizontal extent of the petroleum hydrocarbon plume. Approximately 60 SCAPS borings to a maximum depth of SCAPS capability (assumed to be less than 150 feet bgs) will be placed at the site. The total number of penetrations necessary to meet the project objectives will be determined in the field. The initial 27 locations of the planned SCAPS penetrations are shown on Figure 6-1 of the Work Plan Addendum. The remaining locations will be chosen based on the initial LIF/CPT and soil analytical results.

The location of the SCAPS penetrations will be measured and documented. The penetration locations will be determined using GPS equipment with a minimum of ±3 feet horizontal accuracy. Elevations of SCAPS locations will be determined using a hand level or transit to compare elevations to known survey locations. Salient information regarding the SCAPS penetrations, including location, date, wavelength signature depth, and comments will be recorded on a SCAPS CPT/LIF push-probe penetration log form (Appendix B).

Continuous fluorescence measurements will be collected for the entire length of each of the SCAPS borings to provide an indication of relative concentrations of suspected contaminants. Continuous geotechnical and stratigraphic data will also be collected using the CPT to help interpret contaminant distribution and to delineate the continuity of subsurface materials that may influence contaminant movement, such as clay, silt, and cobble zones. The SCAPS data will also be used to optimize the placement of soil borings and monitoring wells. All SCAPS penetrations will be grouted to ground surface with a cement silica flour mixture. The SCAPS standard operating procedure (SOP) is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

SCAPS Soil Sampling

SCAPS soil samples will be collected to verify the accuracy of SCAPS LIF data, investigate potentially anomalous LIF response, determine the variability of contaminant composition, and to determine the quantity of NAPL present. In addition, samples will be collected for a treatability, total organic carbon (TOC) analysis, permeability, cation exchange capacity and soil physical characteristics (i.e., moisture content, grain size, bulk density, and effective porosity). Table 3-1 provides a summary of sample types and laboratories for SCAPS soil data collection.

The procedure for sampling SCAPS soil cores will vary depending on the phase of the investigation being conducted at the time of sampling. SCAPS soil cores are recovered 2-foot long by 1-inch-diameter split spoons. Sample handlers will wear clean nitrile gloves prior to handling all samples.

Permeability and Physical Characteristics Sampling Procedure. Samples collected for permeability and/or physical characteristics will be collected in a clear plastic sleeve inside the split spoon. Upon recovery, the materials contained within the clear sleeve will be logged. The ends of the sleeves will then be cut to include only the material to be tested for permeability and/or physical characteristics. The ends of the tubes will be capped and sealed with tape for shipment to the laboratory.

VOC and PCP Sampling Procedure. During Phase Three soil sampling, volatile organic compound (VOC) samples will be collected immediately for analysis upon exposing the soil core. The VOC samples will be collected from the portion of the core that has the greatest visible and/or olfactory contamination. VOC samples will be collected with the EnCore^{TM} system according to Sampling Protocol 1 in the VOC sampling SOP included in Appendix A. Each VOC sample location will consist of two collocated samples for potential low-level analysis (EnCore^{TM} sample), one collocated sample for potential high-level analysis (EnCore^{TM} sample), and a collocated sample for moisture content determination (conventional VOC vial). If a duplicate is required, one additional collocated EnCore^{TM} sample will be collected. If a matrix spike/matrix spike duplicate (MS/MSD) is required, two additional collocated EnCore^{TM} samples will be collected. All samples will be preserved with sodium bisulfates or methanol, shipped on ice, and analyzed within 7 days.

After VOC samples have been collected, a hydrophobic dye (e.g., Sudan IV) shake test will be used to test portions of the core that are suspected to have NAPL contamination, but where the NAPL may not be visible. The shake test will consist of transferring approximately 20 cm^3 of soil to a sample container. Twenty mL of water and approximately 2 mg of hydrophobic dye (i.e., the amount that rests on the end of a flat toothpick) will be added to the sample in the container. The container will then be capped and shaken for 10 to 30 seconds and allowed to separate for 5 minutes. The sample will be examined visually for the presence of NAPL (i.e., NAPL is stained red fluid and water is clear), and the volume and density of NAPL relative to water will be determined.

After VOC samples have been collected and prior to PCP sample collection, the soil core will be described according to ASTM D2488-90, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*. Soil descriptions will be recorded on the drilling log form in Appendix B.

PCP analytical sampling will be completed after the soil description. A sufficient volume of material will be transferred from the soil core to a decontaminated, large stainless steel bowl. Large grains of gravel and pieces of debris will be removed from the soil. Any unusual pieces removed will be noted in the logbook and boring log. The sample material will then be thoroughly homogenized by stirring with a decontaminated stainless steel spoon. Sample containers will be filled approximately 75 percent to allow representative sub-sampling by the lab.

Formation materials representing significant stratigraphic changes may be placed into labeled jars for archiving at 4°C at the project laboratory for 2 years. These additional soil samples for possible future analysis shall be collected from each boring at 5-foot intervals.

TPH-Dx and PAH/PCP Sampling. Upon recovery, the soil core will be described according to ASTM D2488-90, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*. Soil descriptions will be recorded on the drilling log form in Appendix B.

TPH-Dx and PAH/PCP analytical sampling will be completed after the soil description. A sufficient volume of material will be transferred from the soil core to a decontaminated, large stainless steel bowl. Large grains of gravel and pieces of debris will be removed from the soil. Any unusual pieces removed will be noted in the logbook and boring log. The sample material will then be thoroughly homogenized by stirring with a decontaminated stainless steel spoon. Sample containers will be filled approximately 75 percent to allow representative sub-sampling by the lab.

Formation materials representing significant stratigraphic changes may be placed into labeled jars for archiving at 4°C at the project laboratory for 2 years. These additional soil samples for possible future analysis shall be collected from each boring at 5-foot intervals. Samples will be analyzed if requested by the USACE.

Microwell Installation

For the purposes of obtaining groundwater and LNAPL samples during Phase Three of the investigation, up to nine 1-inch diameter microwells with stainless steel hydrophobic screens may be installed in SCAPS push locations where LNAPL has been observed or is suspected to be present. If microwells are installed, groundwater or LNAPL samples will be collected by bailer and analyzed for VOCs plus tentatively identified compounds (TICs) and semivolatile organic compounds (SVOCs)/PCP using EPA SW-846 Methods 8260 and 8270, respectively, and dioxins/furans using EPA Method 1613. Alternatively, groundwater may be sampled using disposable tubing and a peristaltic pump according to the low flow sampling protocol incorporated by reference to the June 16, 1999*, McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999); the SOP for microwell installation is also included by reference. The locations of all wells installed during this investigation will be surveyed by the Sacramento District in-house survey crew.

3.1.7 Rotosonic Soil Borings

Contingency rotosonic borings may be drilled during Phases One and Two of field exploration activities. Boreholes will be advanced using 6-inch or 8-inch outside diameter casing. Casing size will depend on whether a monitoring well might be set in the boring. A 3.5-inch-diameter core barrel will be advanced ahead of the casing for sample collection. The core barrel will be advanced in either 5-foot or 10-foot runs as determined by the field geologist. Soil samples will be vibrated out of the core barrel into a plastic sleeve, knotted at one end. The statement of work (SOW) for rotosonic exploration is included in Appendix A.

The plastic sleeves will be slit open to expose the samples, and the soil core will be described according to ASTM D2488-90, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*. Soil descriptions will be recorded on the drilling log form in Appendix B. Soil samples for permeability and physical characteristics shall be transferred directly to sample containers with no homogenization. Stiff silt material will be wrapped in aluminum foil and sealed with tape for delivery to the laboratory. Loose sand and gravel material will be placed directly into sample jars. For additional analytical sampling, a sufficient volume of material will be transferred from the soil core to a decontaminated, large stainless steel bowl. Large grains of gravel and pieces of debris will be removed from the soil. Any unusual pieces removed will be noted in the logbook and boring log. The sample material will then be thoroughly homogenized by stirring with a decontaminated stainless steel spoon. Sample containers will be filled approximately 75 percent to allow representative sub-sampling by the lab.

Formation materials representing significant stratigraphic changes may be placed into labeled jars for archiving at 4°C at the project laboratory for 2 years. These additional soil samples for possible future analysis shall be collected from each boring at 5-foot intervals.

3.1.8 Groundwater Monitoring Well Installation and Development

After completion of the soil borings, 4-inch diameter monitoring wells with prepacked stainless steel screens and mild steel risers may be installed to permit groundwater sampling. Dielectric material will be placed between the screen and riser to minimize galvanic corrosion. The decision to develop these borings into monitoring wells and well construction decisions will be made in the field by the technical team. The rotosonic drilling SOW used to drill soil borings, collect subsurface soil samples, install and develop monitoring wells, and abandon the borings, if necessary, is presented in Appendix A.

Wells installed at these locations will be surveyed by the Sacramento District survey crew at the end of field work. The monitoring wells will be constructed in accordance with the San Joaquin County Public Health Service's *Standards for Well Construction and Destruction in San Joaquin County* (1992), and EM 1110-1-4000, *Monitoring Well Design, Installation, and Documentation at Hazardous, Toxic, and Radioactive Waste Sites* (USACE 1998). Well installation will be performed by a licensed drilling contractor whose employees are qualified to work at hazardous waste sites. All drilling, well installation, development and testing, and sampling operations will be supervised or performed by a geologist or qualified scientist. The drilling contractor will be responsible for obtaining and submitting all well drilling permits and logs, as required by the State of California. The drilling contractor will be contracted by the USACE.

Following installation, the monitoring wells will be developed using the procedure described in the rotosonic drilling SOW in Appendix A. Development will cease if NAPL is encountered because a large volume of highly contaminated water would be produced. Well development will be documented on the well development report in Appendix B.

3.1.9 Decontamination of Drilling and Sampling Equipment

Equipment used during the field investigation and sampling activities will be decontaminated before use at the site and between sampling locations to prevent cross-contamination. The field activities in which decontamination procedures will be followed include SCAPS exploration, SCAPS soil and groundwater sampling, microwell installation, monitoring well installation, and all associated sampling activities. The specific procedures for decontamination are outlined in this section.

Downhole drilling and sampling equipment, including the SCAPS, microwell, and rotosonic drilling equipment, will be decontaminated before entering and leaving the site and between sampling locations. Downhole equipment (e.g., drilling casing, drilling rods, soil samplers) and other equipment in direct contact with the sampled materials, soil cuttings, and fluids will be cleaned between borings and other sampling locations. While performing Phases One and Two activities, a temporary decontamination pad will be established on each of the Stockton Cold Storage and Dutra properties for the rotosonic rig. Decontamination for all other rotosonic drilling will be conducted at the permanent decontamination area on site.

Decontamination of large drilling equipment is required to prevent cross-contamination of sampling locations, especially those in which groundwater monitoring wells will be established, or from which soil samples will be retrieved for chemical analysis. This process also provides for the protection of personnel subsequent to demobilization from restricted areas. During decontamination of drilling equipment and accessories, it is especially critical to clean the inside of casing, drill rods, drill bits, and all couplings and threads. Prior to leaving the facility, the drill rig will be decontaminated. Decontamination water will be contained and disposed in the pole wash area. The management and disposition of decontamination water is discussed in the Investigation-Derived Waste (IDW) Plan Addendum. The drilling tools will be cleaned by a high-pressure hot water wash until all visible soil and other debris have been removed.

Before installation, all sections of well screen and riser will be rinsed with a high-pressure hot water washer using potable water. If the well casings are obtained pre-cleaned by the manufacturer in factory-sealed containers, high-pressure hot water washing is not required.

Sampling equipment includes all non-disposable sampling devices used to collect or contain a sample prior to placement into a laboratory-provided sample container. Such equipment may include core barrels, split spoons, stainless steel spoons and bowls, stainless steel cable, flexible tubing and submersible pumps. Disposable equipment may include bailers. Monitoring well sampling will be conducted using non-dedicated and dedicated pumps and tubing. Before initial use, all sampling equipment that may contribute to the contamination of a sample must be thoroughly decontaminated, unless specific documentation exists to show that the sampling equipment has already been decontaminated. Pre-cleaned equipment in factory-sealed containers does not require decontamination.

Non-dedicated sampling equipment will be decontaminated between sample locations according to the following procedure:

- Scrub equipment thoroughly with phosphate-free detergent and warm potable water and use a brush to remove any particulate matter or surface film.

- Triple rinse and/or flush with clean potable water.

- Rinse and/or flush with clean distilled water.

- Package and seal equipment in plastic bags or other appropriate containers to prevent recontamination

Small non-disposable sampling equipment that comes in contact with NAPL will be decontaminated as described previously, followed by a solvent rinse with methanol. Flexible pump tubing that comes in contact with NAPL will be disposed of. The containment and disposal of decontamination wash water and other waste material is described in the IDW Plan Addendum.

3.1.10 Field Quality Control (QC) Samples

Field QC samples will be employed to evaluate data quality. QC samples are controlled samples introduced into the analysis stream whose results are used to review data quality and to calculate the accuracy and precision of the chemical analysis program. The purpose of each type of field QC sample, collection and analysis frequency, evaluation criteria, and methods of collection are described in this section.

Field QC checks are accomplished through the analysis of controlled samples that are introduced to the laboratory from the field. Rinsate and trip blanks, field duplicates, matrix spike/matrix spike duplicates (MS/MSDs), and performance evaluation (PE) samples will be collected and submitted to the mobile field laboratory and/or the fixed laboratories, where applicable, to provide a means of assessing the quality of data resulting from the field sampling program.

Rinsate and Trip Blanks

Rinsate blanks are collected to determine the potential for cross-contamination of samples during collection. Rinsate blanks will be collected and analyzed at the rate of 5 percent if utilizing non-dedicated sampling equipment. If dedicated or disposable sampling equipment is utilized, field blanks will be collected instead. Rinsate and trip blanks will be submitted to both the mobile field laboratory and the fixed laboratory. Rinsate blanks will consist of store-bought distilled water collected from the final rinse of sampling equipment after the decontamination procedures described in Section 3.1.9. Trip blanks will consist of laboratory-grade, organic-free water transferred directly into 40-mL volatile organic analysis (VOA) vials in the field. Trip blanks will be prepared every day that VOC samples are collected and will be shipped with the soil samples to the Region 9 Laboratory.

The rinsate groundwater blank will be collected by filling the rinsed polyvinyl chloride (PVC) tube (used in decontamination) with 2 gallons of locally purchased distilled water. A 4-foot-long piece of unused Teflon-lined tubing will be attached to the freshly decontaminated pump. The pump will be placed into the PVC tube containing the distilled water. The pump will be started and flow established at approximately 300 mL/minute. Approximately 0.5 gallon of distilled water will be pumped through the pump and tubing before pre-labeled sample containers will be filled from the discharge end of the tubing.

The rinsate soil blank will be collected from the stainless steel bowls that will be used to collect soil samples prior to placing them in sample containers. The rinsate and blank will be collected by rinsing the bowl with approximately 2 gallons of locally purchased distilled water. The bowl will be rinsed with approximately 2 gallons of distilled water, which will be collected and stored in 55-gallon drums as described in the IDW Plan Addendum. Following the distilled water rinse, pre-labeled sample containers will be filled using a dedicated stainless steel funnel.

All rinsate or trip blanks will be submitted blind to the laboratory with sample numbers that are indistinguishable from primary samples. QC criteria and corrective actions are the same as for method blanks (as described in Section 4.2.2 of the QAPP Addendum). Blank samples will be analyzed for the same parameters as the associated field samples.

Field Duplicates

Field duplicate samples will be used to check for sampling reproducibility. Field duplicates will be submitted to the mobile field laboratory and the fixed laboratory at a frequency of 10 percent of the field samples for every analytical method. Field duplicate samples are collected in conjunction with and by the same methods as the primary sample. Field duplicate samples will be submitted from locations having significant concentrations of target analytes as determined by results of field screening. Control limits for field duplicate precision are 30 percent relative percent difference (RPD) for aqueous samples and 50 percent RPD for soil and NAPL samples.

Field duplicates will be submitted blind to the laboratories, with sample numbers that are indistinguishable from primary samples. QC criteria for field duplicates and calculation and reporting of the RPD are described in Section 4 of the QAPP Addendum.

Matrix Spike/Matrix Spike Duplicates

MS/MSDs are used to assess sample matrix interferences and analytical errors, as well as to measure the accuracy and precision of the analysis. The MS/MSDs will be collected and analyzed at a rate of 5 percent of the field samples for each analytical method or at least one for each analytical batch, whichever frequency is greater. Known concentrations of analytes are added to environmental samples; the MS or MSD is then processed through the entire analytical procedure and the recovery of the analytes calculated. Results are expressed as percent recovery of the known spiked amount (and RPD for MS/MSD pairs).

Field duplicate and MS/MSD samples will be collected from different locations. Additionally, MS/MSD samples should not be collected from locations with potentially high concentrations of target analytes that may mask the added MS/MSD compounds. Because of the high concentrations of target compounds, MS/MSD samples will not be submitted with NAPL samples.

Performance Evaluation (PE) Samples

PE samples will be submitted to the laboratories to evaluate the accuracy of the total petroleum hydrocarbon (TPH), SVOC, PCP, and VOC analyses; PE samples will be submitted double blind for chemical analysis. Four soil samples will be submitted to the FASP laboratory for TPH-diesel extended (TPH-Dx) analysis. Eight soil samples will be submitted to the EPA Region 9 Laboratory for PAH and PCP analysis. Eight soil samples will be submitted to the EPA Region 9 Laboratory for VOC analysis. The PE samples will be spiked by the commercial supplier with the site contaminants of concern at concentrations consistent with those previously observed in soil and groundwater at the site. All PE samples will be certified by the manufacturer and recovery limits will be determined by historical database results. One PE sample for each matrix will be analyzed the first day of mobile laboratory analysis for that matrix. The PE sample results will immediately be compared to the vendor's documented acceptable control limits by the USACE Technical Leader. Sample analysis will not continue until the laboratory has met certified PE sample acceptance limits and approval has been obtained from the USACE Technical Leader. Assuming criteria have been met, a second sample of that matrix will be analyzed at random the same week, with the remaining PE samples submitted blind to the laboratory at regular intervals through the remaining analysis schedule. The PE supplier will fill pre-cleaned sample bottles with the PE material. PE samples will be submitted to the laboratory using the same naming conventions used for the investigation samples, as described in Section 4.2.

Temperature Blanks

One temperature blank will be prepared and submitted to the fixed laboratory with each cooler. The temperature blank will consist of a sample jar containing water, which will be packed in the cooler in the same manner as the rest of the samples. The temperature blank is to be used to measure the cooler temperature upon receipt of the cooler at the laboratory.

3.2 PHASE ONE: EVALUATE NAPL MIGRATION NORTH OF OR IN OLD MORMON SLOUGH

The FY99 NAPL investigation data suggest that significant NAPL contamination occurs at the north side boundary of the McCormick and Baxter property (i.e., along Old Mormon Slough). The FY00 NAPL investigation will determine if NAPL has migrated beyond the current

McCormick and Baxter property line, and, if so, the lateral and vertical extent of that migration. Figure 3-1 presents the decision process that will be used during Phase One.

SCAPS Borings

SCAPS LIF/CPT pushes will initially be used to determine whether NAPL contamination has migrated north of Old Mormon Slough. The SCAPS LIF will be used to identify petroleum, oil, and lubricants (POLs) and PAHs exceeding site-specific threshold concentrations in the vadose zone, capillary fringe, and below the water table. SCAPS LIF penetrations will initially be conducted at 15 locations along the northern boundary of Old Mormon Slough, beginning at the northwest corner of the Dutra property and repeating approximately every 100 feet. All SCAPS LIF penetrations will be pushed to the maximum depth achievable. The estimated maximum depth of SCAPS penetration is 150 feet. Actual placement of the SCAPS equipment will be dependent on physical obstructions and access restrictions encountered on the Dutra and Stockton Cold Storage properties. Continuous fluorescence measurements will be collected for the entire length of each SCAPS push to provide an indication of relative concentrations of contaminants. The SCAPS CPT will be used simultaneously to provide continuous geotechnical and stratigraphic information that will aid in interpreting contaminant distribution. The initial 15 SCAPS LIF push locations are presented in Figure 6-1 of the Work Plan Addendum. In addition to the 15 LIF pushes, eight soil samples will be collected at two additional SCAPS locations (four samples per push) and analyzed by the EPA Region 9 Laboratory for PAHs/PCP using a modified version of EPA SW-846 Method 8270 and by the Region 9 FASP on-site laboratory for TPH-Dx fingerprinting using a modified version of EPA SW-846 Method 8015. Two additional SCAPS soil sampling pushes (four samples per push) will be located in an area behind a sheet piling wall on the Dutra property that was constructed in 1987 to contain dredge spoils from Old Mormon Slough. These samples will be analyzed by the EPA Region 9 Laboratory for trace metals using the Contract Laboratory Program (CLP) ILM03.0 Method and SVOCs using SW Method 8270.

Rotosonic Borings

Two to four rotosonic borings will be drilled to 250 feet bgs at locations selected based on the SCAPS LIF and soil sample results. The borings are expected to be placed in areas with significant NAPL contamination representative of different contaminant signatures and where representative stratigraphic information can be obtained. If the SCAPS LIF and soil sample results indicate that contamination has not migrated north of the Slough, one boring location will be sited across from the Cellon process area and another across from SB-099. The other two rotosonic boring locations are contingent on the SCAPS LIF and soil data, and will be completed only if necessary. A maximum of 200 soil samples (i.e., one sample per every 5 feet or 50 samples per borehole) will be collected and analyzed for TPH-Dx. If TPH is detected, the samples will be analyzed for polycyclic aromatic hydrocarbons (PAHs)/PCP. If TPH is not detected in all samples, 10 percent of the samples will randomly be selected and analyzed for PAHs/PCP.

Monitoring Wells

Once the rotosonic borings are advanced to the final depth, 4-inch-diameter monitoring wells may be installed to enable groundwater sampling, which will be conducted at a later date. The need for monitoring well installation and screened intervals will be determined in the field. The primary purpose of these wells would be to allow long-term monitoring to determine if site contamination is migrating in the groundwater north of Old Mormon Slough.

3.2.1 NAPL Detected North of Old Mormon Slough

SCAPS LIF and Soil Sample Pushes

If NAPL contamination is detected north of Old Mormon Slough, the SCAPS LIF sensor will be used to characterize the horizontal and vertical extent of POL and PAHs exceeding site-specific threshold concentrations in the vadose zone, capillary fringe, and saturated zone located north of Old Mormon Slough. SCAPS LIF penetrations will be conducted at a maximum of 45 locations repeating approximately every 100 feet. Actual SCAPS penetration and soil push locations will be determined in the field, based on the initial data and conditions encountered on the Dutra and Stockton Cold Storage properties. All SCAPS LIF penetrations will be made to the maximum depth achievable. The estimated maximum depth of SCAPS penetration is 150 feet. Continuous fluorescence measurements will be collected for the entire length of each SCAPS push to provide an indication of relative concentrations of contaminants. The SCAPS CPT will simultaneously be used to provide continuous geotechnical and stratigraphic information that will aid in interpreting contaminant distribution. In addition to the 45 LIF pushes, 72 soil samples (i.e., a maximum of 4 samples per push) will be collected at 18 additional SCAPS locations and analyzed by the EPA Region 9 Laboratory for PAHs/PCP using a modified version of EPA SW-846 8270. TPH fingerprinting will be conducted on the soil samples by the Region 9 FASP on-site laboratory using a modified version of EPA SW-846 Method 8015. The analytical procedures and method quality objectives (MQOs) have been incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan* (USACE 1999). SCAPS soil samples also may be collected for moisture content, bulk density, effective porosity, NAPL saturation, TOC, cation exchange capacity (CEC), permeability to water, and grain size using the methods described in Section 4. PTS Laboratory will perform all physical and geochemical analyses.

Contingency Rotosonic Borings

Contingency rotosonic soil borings may be conducted at a maximum of five locations where the SCAPS rig met refusal before the desired end depth was achieved or before soil contamination was sufficiently characterized. These soil borings will be completed to 250 feet bgs. Soil samples will be collected approximately every 5 feet (i.e., a maximum of 100) for TPH-Dx analyses, as well as the soil physical parameters listed above. Soil samples will be analyzed for PAHs/PCP if TPH is detected. If TPH is not detected in the soil samples, 10 percent of the samples will randomly be selected and analyzed for PAHs/PCP. A subset of these samples may be selected for the soil physical and geochemical analyses listed above.

SCAPS Pushes From Barge

If necessary to fill data gaps, the SCAPS LIF sensor will be used to characterize the horizontal and vertical extent of POL and PAHs exceeding site-specific threshold concentrations beneath Old Mormon Slough. All SCAPS LIF penetrations will be pushed to a depth of 170 linear feet below mud line (bml), or the maximum depth possible to provide sufficient data to determine the lateral and vertical extent of contamination underneath Old Mormon Slough. SCAPS depth limitation is based on soil type and the ability of SCAPS to operate over water and from a barge. The actual number of SCAPS LIF penetration locations will be based on the results of the SCAPS data collected during the initial on-shore activities.

3.2.2 NAPL Not Detected North of Old Mormon Slough

SCAPS Borings From Barge

If NAPL contamination is not detected north of Old Mormon Slough during the initial activities, the SCAPS LIF sensor will be used to characterize the horizontal and vertical extent of POL and PAHs exceeding site-specific threshold concentrations in the sediments beneath Old Mormon Slough. SCAPS LIF penetrations will be conducted at 18 locations in Old Mormon Slough repeating approximately every 100 feet, as shown in Figure 6-1 of the Work Plan Addendum. All SCAPS LIF penetrations will be pushed to the maximum depth achievable to provide sufficient data to determine the lateral and vertical extent of contamination underneath Old Mormon Slough. Penetration depth limitation is based on soil type and the ability of SCAPS to operate over water and from a barge. The maximum depth achievable is estimated to be 170 feet. Using 170-foot penetrations will be consistent with the overall sampling scope conducted during the FY99 NAPL investigation, takes into account a maximum 20-foot slough depth, and is planned to intercept the NAPL contamination migration suggested by the FY99 data. The number of SCAPS pushes is based on the 100-foot centers and sample collection density used during the FY99 NAPL investigation, as well as the FY99 investigation results. The actual number of SCAPS LIF penetration locations may be more or less than 18, and will be based on the results of the SCAPS data collected during the initial activities. In addition, the actual depth of SCAPS penetration may be more or less than 170 feet bml. Based on the SCAPS performance in 1999, the specified penetration depth should be within its capabilities. In addition to the SCAPS LIF pushes, eight soil samples will be collected from an additional two push locations and analyzed for TPH-Dx by the Region 9 FASP on-site laboratory using a modified version of EPA SW-846 Method 8015 and by the Region 9 Laboratory for PAHs/PCP using a modified version of EPA SW-846 Method 8270. Soil samples also may be collected for treatability study analyses to be performed at the EPA Kerr Laboratory. The analytical procedures and MQOs have been incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan* (USACE 1999).

Contingency Rotosonic Borings From Barge

In the event SCAPS cannot effectively operate from a barge, a maximum of five contingency rotosonic soil borings will be completed to 170 feet bml. Soil samples will be collected approximately every 5 feet (i.e., 34 samples per borehole or a maximum of 170 samples) and analyzed for TPH. Soil samples will be analyzed for PAHs/PCP if TPH is detected. If TPH is not detected in any soil samples, 10 percent of the soil samples will be selected randomly to be analyzed for PAHs/PCP. The TPH analyses will be performed by the Region 9 FASP on-site laboratory using a modified version of EPA SW-846 Method 8015 and the PAH/PCP analyses will be performed by the Region 9 Laboratory using a modified version of EPA SW-846 Method 8270.

3.3 PHASE TWO: DEFINE THE EASTERN AND SOUTHEASTERN LIMITS OF THE NAPL CONTAMINATION

SCAPS Borings

SCAPS LIF will be used to determine how far NAPL contamination has migrated to the east and southeast. Approximately 20 SCAPS LIF penetrations will be used to characterize the horizontal and vertical extent of NAPL and POL exceeding site-specific threshold concentrations in the vadose zone, capillary fringe, and saturated zone east of SE-79, southeast of the DSW-4 wells, and south of SE-97. The most likely locations for the 12 initial SCAPS LIF penetrations are presented in Figure 6-1 of the Work Plan Addendum. A dynamic approach to selecting sampling locations has been adopted to allow for incorporation of newly acquired data into the field plan, and so the final penetration and sample collection locations are likely to be different than those presented on Figure 6-1. Figure 3-2 presents the decision process that will be used during the field activities conducted during Phase Two. All SCAPS LIF penetrations will be made to the maximum depth achievable. The estimated maximum depth of SCAPS penetration is 150 feet. Actual placement of the SCAPS penetrations will be dependent on the physical obstructions encountered on and access to the UPRR property. Locations may be limited due to railroad tracks and overhead obstructions. Continuous fluorescence measurements will be collected for the entire length of each SCAPS push to provide an indication of the relative contaminant concentrations. The SCAPS CPT will simultaneously be used to provide continuous geotechnical and stratigraphic information that will aid in interpreting contaminant distribution. In addition to the 20 LIF penetrations, five SCAPS pushes will be conducted to collect soil samples from four depth intervals (i.e., a maximum of 20 soil samples). Soil samples will be analyzed by the EPA FASP on-site laboratory for TPH fingerprinting using a modified version of EPA SW-846 Method 8015. Soil samples will be analyzed for PAHs/PCP by the EPA Region 9 Laboratory using a modified version of EPA SW-846 Method 8270. The analytical procedures MQOs have been incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan* (USACE 1999).

Contingency Rotosonic Borings

Contingency soil borings will be drilled at up to five locations where the SCAPS rig met refusal before the desired end depth was achieved or before soil contamination was sufficiently characterized. Soil samples will be collected approximately every 5 feet in each borehole (i.e., 20 samples per borehole or a maximum of 100 samples). Soil samples will be collected at changes in soil type or in intervals where contamination is suspected based on odor or visible evidence. Soil samples will be analyzed for TPH-Dx by the FASP on-site laboratory. Samples in which TPH is detected will be submitted to the EPA Region 9 Laboratory for PAHs/PCP analysis. If all soil samples collected contain no detectable TPH concentrations, then 10 percent of the samples collected will randomly be selected and analyzed for PAHs/PCP.

3.4 PHASE THREE: CHARACTERIZE PCP CONTAMINATION IN THE CELLON PROCESS AREA AND A-ZONE GROUNDWATER

During the FY99 NAPL investigation, analysis of a surface soil sample confirmed the presence of percent levels of PCP within the Cellon process area near SE-08. In addition, the groundwater data suggests that there potentially is a separate LNAPL plume carrying PCP and dioxin contamination in the shallow A-zone groundwater. PCP occurs in high concentrations in the A-zone groundwater several hundred feet from areas with creosote NAPL, but was not detected in the overburden soils at representative concentrations. Historical information indicates that the Cellon process was developed in the 1970s as an alternative to using large quantities of fossil fuels as the PCP carrier. The PCP was dissolved in liquid petroleum gas (LPG), along with selected co-solvents (e.g., diisopropyl ether and methyl isobutyl ketone [MIBK]). The LPG carrier was recovered under vacuum after treatment.

The PCP investigation has been developed to more completely characterize the PCP contamination and the suspected LNAPL that could be acting as a long-term source of PCP groundwater contamination in areas outside the creosote-based NAPL contamination. Figure 3-3 presents the decision process that will be used during the field activities conducted during Phase Three. The investigation will be conducted in specific events that proceed from areas suspected to be less contaminated or where contamination is suspected to be confined to the saturated zone to areas that are known to be highly contaminated. In general, this investigation will focus on the subsurface soils at the top of the current water table to approximately 40 feet bgs to include the suspected LNAPL smear zone created by the rising water table over the past 10 or more years. All soil samples will be collected in 2-foot intervals beginning at the top of the highest recorded water table to approximately 40 feet below ground surface (bgs), or as determined in the field, except at the PCP mixing shed, where soil samples will be collected from the ground surface to approximately 40 feet bgs (or as determined in the field). These events will begin near the A-zone wells (i.e., A3, A4, A5, and A6) and the southern property perimeter, if required, move to the PCP mixing shed, and conclude in the PCP disposal area. Due to the progressive nature of this investigation, the following events have been developed for the PCP/LNAPL investigation:

- Event One — Determine the areal extent of LNAPL and PCP contamination outside areas where the A-zone is known to be contaminated with creosote NAPL and along the southern property boundary.

- Event Two — Identify PCP and LNAPL contamination in the subsurface soils around the PCP mixing shed.

- Event Three — Determine the presence of a subsurface confining structure and the extent of surficial PCP contamination in the PCP disposal area.

3.4.1 Event One: Characterize PCP/LNAPL Contamination in A-Zone Groundwater

SCAPS Soil Sample Pushes

A maximum of four SCAPS soil sample pushes near A3, A4, A5, and A6 will be completed. Soil samples will be collected beginning approximately 2 feet above the maximum recorded water table. The borings will be completed to a maximum depth of 40 feet bgs or an alternate depth determined in the field. A maximum of 56 soil samples (i.e., 14 soil samples per push location) will be collected. Soil cores will be examined for the presence of LNAPL using the hydrophobic dye shake test. Soil samples from each 2-foot core will be analyzed for a modified list of VOCs using a modified version of EPA SW-846 Method 8260 by the EPA Region 9 Laboratory and PCP and TPH using modified versions of EPA SW-846 Methods 8081 and 8015 by the EPA Region 9 FASP laboratory.

Microwells

If NAPL was not observed visually or analytically identified in the initial four direct push soil borings, up to nine microwells may be installed, as necessary, to delineate LNAPL. Groundwater or LNAPL samples will be collected and analyzed for VOCs plus TICs and SVOCs/PCP using EPA SW-846 Methods 8260 and 8270, respectively, and dioxins/furan using EPA Method 1613. If LNAPL is present groundwater samples will not be collected.

Contingency SCAPS Soil Sample Pushes

If LNAPL is detected in the four direct push soil borings near A3, A4, A5, and A6, or Cellon process type VOCs are detected in the soil samples at levels indicating LNAPL presence, complete a maximum of seven SCAPS soil sampling pushes to determine the areal extent of LNAPL and PCP contamination outside areas where the A-zone is known to be contaminated with creosote NAPL and along the southern property boundary. Soil samples will be collected beginning approximately 2 feet above the maximum recorded water table. The borings will be completed to a maximum depth of 40 feet bgs or an alternate depth determined in the field. A maximum of 98 soil samples (i.e., 14 soil samples per push location) will be collected. Soil cores will be examined for the presence of LNAPL using the hydrophobic dye shake test. Each 2-foot section of core will be analyzed for a modified list of VOCs using a modified version of EPA SW-846 Method 8260 by the EPA Region Laboratory and PCP and TPH using modified versions of EPA SW-846 Methods 8081 and 8015, respectively, by the EPA Region 9 FASP Laboratory.

3.4.2 Event Two: Identify Surficial PCP and LNAPL Contamination at the PCP Mixing Shed

Complete two SCAPS soil sampling pushes from ground surface to a maximum of 40 feet bgs, or an alternative depth determined in the field, at the PCP mixing shed. Collect a maximum of 42 soil samples (i.e., a maximum of 21 soil samples per push location). Soil cores will be examined for the presence of LNAPL using the hydrophobic dye shake test. Each 2-foot section of soil core will be analyzed for a modified list of VOCs using a modified version of EPA SW-846 Method 8260 by the EPA Region Laboratory and PCP and TPH using modified versions of EPA SW-846 Methods 8081 and 8015, respectively, by the EPA Region 9 FASP Laboratory.

3.4.3 Event Three: Identify Confining Structure and Extent of Surficial PCP in the PCP Disposal area

Complete a maximum of 10 SCAPS soil sampling pushes from ground surface to approximately 20 feet bgs (or alternative depth determined in the field). Collect a maximum of 100 samples (i.e., a maximum of 10 soil samples per push location). Soil cores will be examined for the presence of LNAPL using the hydrophobic dye shake test. Soil samples will be analyzed for a modified list of VOCs using a modified version of EPA SW-846 Method 8260 by the EPA Region 9 Laboratory and PCP and TPH using modified versions of EPA SW-846 Methods 8081 and 8015, respectively, by the EPA Region 9 FASP Laboratory.

3.5 PHASE FOUR: CHARACTERIZE SUBSURFACE FEATURES NEAR FY99 INVESTIGATION LOCATIONS SE-003, SB-052, AND SE-095

During the FY99 NAPL investigation, the SCAPS encountered refusal at 16 feet bgs at several locations near the southeast corner of the stormwater retention ponds. The type and characteristics of the obstruction are important to determine as these features potentially could affect implementation of remedial actions at the site. A backhoe excavator will be used to characterize the unknown subsurface feature located near SE-3, SE-52, and SE-95 by excavating two 25-foot by 10-foot by 20-foot trenches. All characterization will be conducted visually on the soils contained in the excavator bucket. The primary purpose of this excavation is to characterize the subsurface soils and determine if an underground structure exists where SCAPS LIF encountered refusal at 16 feet bgs during the FY99 NAPL Investigation. The core technical team will describe the subsurface soils and recommend further investigation, as required, until the unknown feature is sufficiently characterized. Figure 3-2 presents the decision process that will be used during field activities conducted during Phase Four.

3.6 REMEDIAL DESIGN GROUNDWATER MONITORING

An interim groundwater monitoring strategy during remedial design (RD) is needed for the site to monitor the extent and magnitude of groundwater contamination. Groundwater monitoring data will be useful to protect downgradient receptors, observe NAPL movement, enhance the conceptual site model (CSM), and determine if natural attenuation may be limiting the mobility of contamination. The first quarter of the remedial design groundwater monitoring will be conducted as part of this NAPL field investigation. Groundwater monitoring will consist of the following components:

- Sampling selected wells for naphthalene, PCP, and PAHs
- Measuring NAPL thickness in selected wells
- Sampling selected monitoring wells for natural attenuation parameters
- Measuring groundwater elevations in all on- and off-site project monitoring wells

All wells to be used in the above listed tasks are shown in Figures 6-2 through 6-6 of the Work Plan Addendum.

3.6.1 Groundwater Sampling

Groundwater samples will be collected from 49 wells for dissolved-phase contaminants and/or natural attenuation parameters using dedicated bladder pumps and the low-flow sampling procedure. The purpose of each well is described in Section 6.7.1 and Table 6-6 of the Work Plan Addendum. Low-flow sampling will be conducted according to the low-flow sampling SOP in Appendix A. Dedicated bladder pumps will be installed in all wells scheduled for groundwater sampling (Table 3-2). The dedicated pumps will be installed according to the SOP in Appendix A. All existing pumps in these wells will be removed, wrapped in plastic, and put into storage. Purge water generated during groundwater sampling will be contained in 55-gallon drums approved by the Department of Transportation, which will be labeled and stored on site prior to disposal. Details of the management and disposition of the purge water are contained in the IDW Plan Addendum. Wells will be analyzed for some or all of the following constituents according to the schedule given in Table 3-2:

- SVOCs using EPA SW-486 Method 8270
- PCP using EPA SW-486 Method 8151
- Routine field parameters including redox potential, pH, temperature, specific conductivity, dissolved oxygen, and turbidity (all locations)
- Natural attenuation parameters including dissolved oxygen, carbon dioxide, hardness, and total iron conducted using field test kits; and total and dissolved manganese, sulfate, chloride, nitrate, nitrite, and methane conducted in the laboratory

3.6.2 NAPL Monitoring

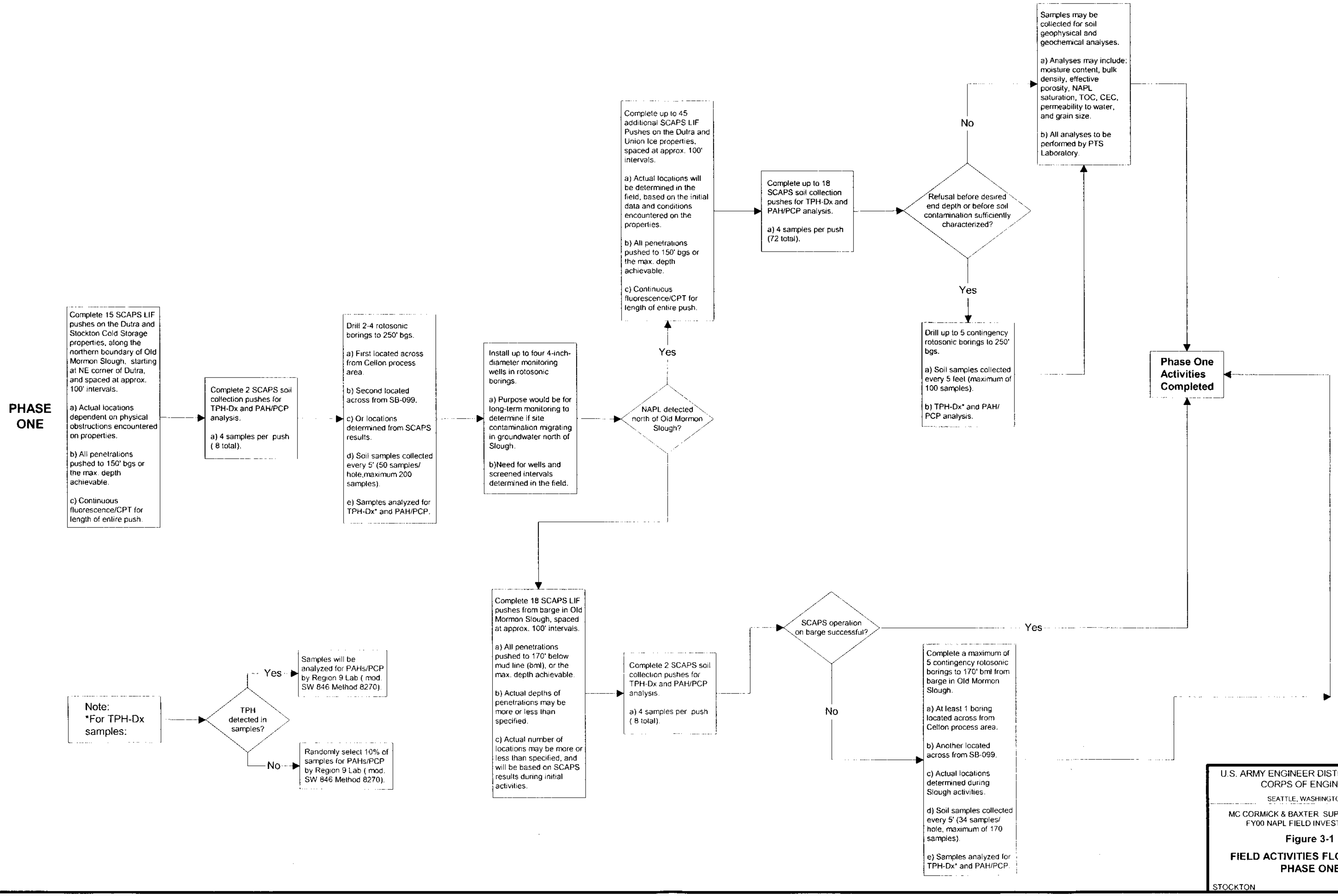
To determine if NAPL is migrating in the subsurface and monitor the extent of NAPL contamination, monitoring wells that are within NAPL contaminated zones and in the path of potentially moving NAPL will be inspected for the presence of LNAPL and dense nonaqueous-phase liquid (DNAPL). The following wells will be inspected for NAPL: A-3, A-4, A-5, A-6, A-8, A-10, MW-1A, ONS-2A, DSW-4B, DSW-5B, DSW-6B, ONS-1B, DSW-1C, DSW-4C, DSW-6C, ONS-1C, DSW-1D, OFS-4D, ONS-1D, and OFS-4E.

The presence of NAPL will be determined using the following procedure. An oil-water interface probe will be used to check for and measure LNAPL, if present, by retrieving the probe and checking for oil on the probe. A bailer will be used to measure the thickness of LNAPL if the probe does not give reliable results. If LNAPL is suspected in A-zone wells in the Cellon process area, hydrophobic dye (e.g., Sudan IV) will be used. The probe should be cleaned before being used to check for DNAPL. A bailer will be used to measure the thickness of DNAPL if the probe does not give reliable results.

All observations will be recorded in the field sampling book and on the NAPL thickness/ sampling form in Appendix B. NAPL samples will not be collected for laboratory analysis as part of the remedial design groundwater sampling.

3.6.3 Groundwater Elevation Measurements

The depth to groundwater will be measured in all on- and off-site project monitoring wells. Groundwater depth will be measured from a surveyed control point associated with each well (Table 3-3). Groundwater depth measurements will be made using an electronic probe capable of measuring groundwater depth to 0.01 foot. All groundwater depth measurements will be made within a 5-day period and will be made no sooner than within 72 hours after any intrusive well activity (e.g., groundwater sampling, NAPL inspection, pump installation or removal).



Complete 15 SCAPS LIF pushes on the Dutra and Stockton Cold Storage properties, along the northern boundary of Old Mormon Slough, starting at NE corner of Dutra, and spaced at approx. 100' intervals.

a) Actual locations dependent on physical obstructions encountered on properties.

b) All penetrations pushed to 150' bgs or the max. depth achievable.

c) Continuous fluorescence/CPT for length of entire push.

Complete 2 SCAPS soil collection pushes for TPH-Dx and PAH/PCP analysis.

a) 4 samples per push (8 total).

Drill 2-4 rotosonic borings to 250' bgs.

a) First located across from Cellon process area.

b) Second located across from SB-099.

c) Or locations determined from SCAPS results.

d) Soil samples collected every 5' (50 samples/ hole, maximum of 200 samples).

e) Samples analyzed for TPH-Dx* and PAH/PCP.

Install up to four 4-inch-diameter monitoring wells in rotosonic borings.

a) Purpose would be for long-term monitoring to determine if site contamination migrating in groundwater north of Slough.

b) Need for wells and screened intervals determined in the field.

Complete up to 45 additional SCAPS LIF Pushes on the Dutra and Union Ice properties, spaced at approx. 100' intervals.

a) Actual locations will be determined in the field, based on the initial data and conditions encountered on the properties.

b) All penetrations pushed to 150' bgs or the max. depth achievable.

c) Continuous fluorescence/CPT for length of entire push.

Complete up to 18 SCAPS soil collection pushes for TPH-Dx and PAH/PCP analysis.

a) 4 samples per push (72 total).

Samples may be collected for soil geophysical and geochemical analyses.

a) Analyses may include: moisture content, bulk density, effective porosity, NAPL saturation, TOC, CEC, permeability to water, and grain size.

b) All analyses to be performed by PTS Laboratory.

Drill up to 5 contingency rotosonic borings to 250' bgs.

a) Soil samples collected every 5 feet (maximum of 100 samples).

b) TPH-Dx* and PAH/PCP analysis.

Complete 18 SCAPS LIF pushes from barge in Old Mormon Slough, spaced at approx. 100' intervals.

a) All penetrations pushed to 170' below mud line (bml), or the max. depth achievable.

b) Actual depths of penetrations may be more or less than specified.

c) Actual number of locations may be more or less than specified, and will be based on SCAPS results during initial activities.

Complete 2 SCAPS soil collection pushes for TPH-Dx and PAH/PCP analysis.

a) 4 samples per push (8 total).

Complete a maximum of 5 contingency rotosonic borings to 170' bml from barge in Old Mormon Slough.

a) At least 1 boring located across from Cellon process area.

b) Another located across from SB-099.

c) Actual locations determined during Slough activities.

d) Soil samples collected every 5' (34 samples/ hole, maximum of 170 samples).

e) Samples analyzed for TPH-Dx* and PAH/PCP.

Note:
*For TPH-Dx samples:

Samples will be analyzed for PAHs/PCP by Region 9 Lab (mod. SW 846 Method 8270).

Randomly select 10% of samples for PAHs/PCP by Region 9 Lab (mod. SW 846 Method 8270).

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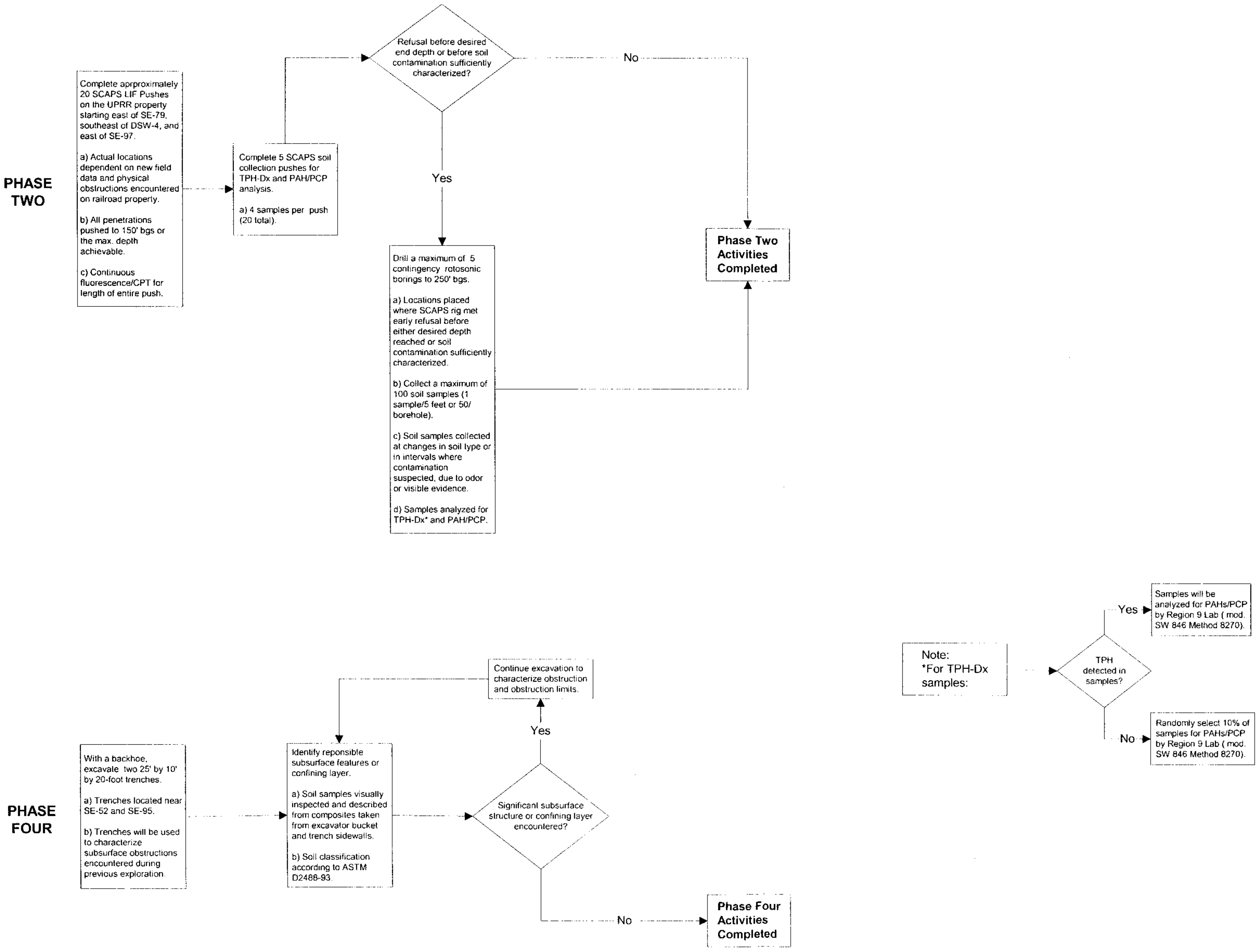
Figure 3-1

FIELD ACTIVITIES FLOW CHART PHASE ONE

STOCKTON CALIFORNIA



Complete aprproximately 20 SCAPS LIF Pushes on the UPRR property starting east of SE-79, southeast of DSW-4, and east of SE-97.

a) Actual locations dependent on new field data and physical obstructions encountered on railroad property.

b) All penetrations pushed to 150' bgs or the max. depth achievable.

c) Continuous fluorescence/CPT for length of entire push.

Complete 5 SCAPS soil collection pushes for TPH-Dx and PAH/PCP analysis.

a) 4 samples per push (20 total).

Refusal before desired end depth or before soil contamination sufficiently characterized?

Drill a maximum of 5 contingency rotosonic borings to 250' bgs.

a) Locations placed where SCAPS rig met early refusal before either desired depth reached or soil contamination sufficiently characterized.

b) Collect a maximum of 100 soil samples (1 sample/5 feet or 50/ borehole).

c) Soil samples collected at changes in soil type or in intervals where contamination suspected, due to odor or visible evidence.

d) Samples analyzed for TPH-Dx* and PAH/PCP.

Phase Two Activities Completed

With a backhoe, excavate two 25' by 10' by 20-foot trenches.

a) Trenches located near SE-52 and SE-95.

b) Trenches will be used to characterize subsurface obstructions encountered during previous exploration.

Identify reponsible subsurface features or confining layer.

a) Soil samples visually inspected and described from composites taken from excavator bucket and trench sidewalls.

b) Soil classification according to ASTM D2488-93.

Significant subsurface structure or confining layer encountered?

Continue excavation to characterize obstruction and obstruction limits.

Phase Four Activities Completed

Note:
*For TPH-Dx samples:

TPH detected in samples?

Samples will be analyzed for PAHs/PCP by Region 9 Lab (mod. SW 846 Method 8270).

Randomly select 10% of samples for PAHs/PCP by Region 9 Lab (mod. SW 846 Method 8270).

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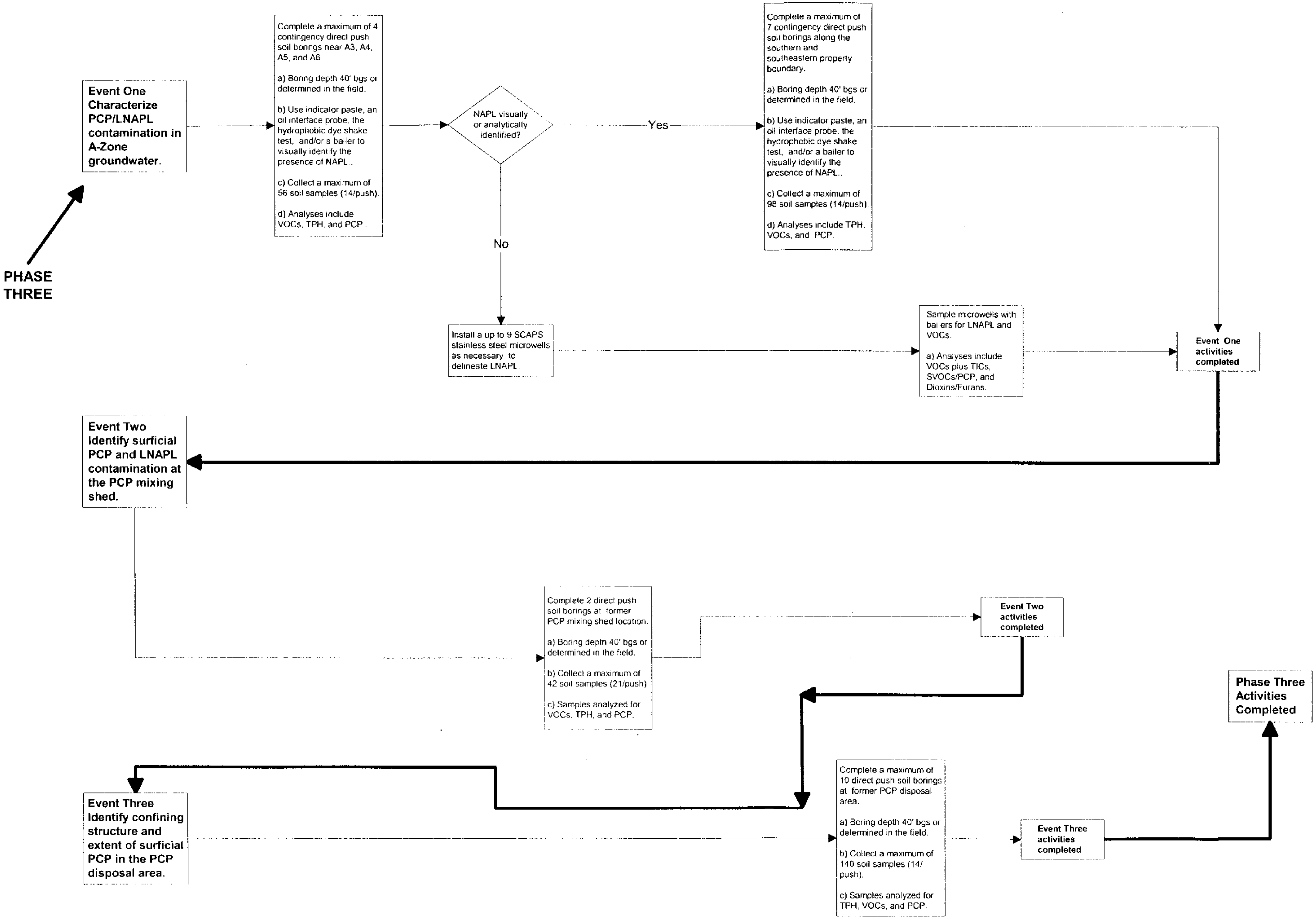
Figure 3-2

FIELD ACTIVITIES FLOW CHART
PHASE TWO AND PHASE FOUR

STOCKTON CALIFORNIA



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FY00 NAPL FIELD INVESTIGATION

Figure 3-3

FIELD ACTIVITIES FLOW CHART
PHASE THREE

STOCKTON CALIFORNIA

Table 3-1
Field Activities

Field Activity	Laboratory	Soil Column	Soil	Groundwater	NAPL
SCAPS LIF					
TPH by fluorescence	SCAPS team	X			
Stratigraphy	SCAPS team	X			
SCAPS Soil Sampling Phase One and Two					
TPH-Dx	Region 9 FASP		X		
PAH and PCP	Region 9 Laboratory		X		
TOC, density, porosity, permeability, grain size, cation exchange capacity	PTS		X		
Metals (no mercury)	EPA Region 9 Laboratory		X		
SCAPS Soil Sampling Phase Three					
VOCs	Region 9 Laboratory		X		
PCP	Region 9 FASP		X		
TPH	Region 9 FASP		X		
Contingency Soil Borings					
TPH-Dx	Region 9 FASP		X		
PAH and PCP	Region 9 Laboratory		X		
TOC, density, porosity, permeability, grain size, cation exchange capacity	PTS		X		
Continuous Soil Borings/Monitoring Wells					
Treatability testing	EPA Kerr Laboratory		X		
TOC, density, porosity, permeability, grain size, cation exchange capacity	PTS		X		
NAPL saturation	PTS		X		
TPH-Dx	Region 9 Laboratory		X		
PAHs and PCP	Region 9 Laboratory		X		
Phase Three SCAPS Microwells and Monitoring Wells					
VOCs and TICs	Region 9 Laboratory			X	X
SVOCs	Region 9 Laboratory			X	X
PCP	Columbia Analytical Services			X	X
Dioxin	Pacific Analytical Laboratories			X	X
Viscosity	EPA Kerr Laboratory				X
Solubility	EPA Kerr Laboratory				X
Oil-water interfacial tension	EPA Kerr Laboratory				X
Wettability	EPA Kerr Laboratory				X
Remedial Design Groundwater Sampling					
SVOCs - Complete TCL	Region 9 Laboratory			X	
PCP	Columbia Analytical Services			X	
Total and dissolved manganese	Region 9 Laboratory			X	
Sulfate, chloride, nitrate, nitrite	Region 9 Laboratory			X	
Methane	Columbia Analytical Services			X	
Field meters (redox, pH, temp, specific conductance, dissolved oxygen, turbidity)	On-site			X	
Hach kits (dissolved oxygen, CO_2, hardness, total iron)	On-site			X	

Note:
X - indicates measurement or analysis will be conducted

Table 3-2
Monitoring Well Sampling and Analyses

	Analyses		
Well ID	**EPA SW-846 Method 8270**	**EPA SW-846 Method 8151**	**Natural Attenuation Parameters**
A-Zone			
A-3	X		
A-4	X		
A-5	X		
A-6	X		X
A-7	X		
DSW-2A	X	X	
OFS-2A	X	X	
OFS-3A	X	X	
OFS-4A1	X	X	X
OFS-5A	X	X	X
OS-1A	X	X	
OS-4A	X	X	X
B-Zone			
DSW-2B	X	X	
DSW-3B	X	X	X
DSW-5B	X	X	X
DSW-7B	X	X	X
OFS-1B	X	X	
OFS-3B	X	X	
OS-1B	X	X	X
OS-4B	X	X	
C-Zone			
DSW-1C	X	X	X
DSW-2C	X	X	
DSW-3C	X	X	X
DSW-6C	X		
DSW-7C	X	X	X
OFS-2C	X	X	
OFS-3C	X	X	
OFS-4C	X	X	
ONS-1C	X	X	X
ONS-2C	X		
OS-1C	X	X	X
OS-4C	X	X	

Table 3-2 (Continued)
Monitoring Well Sampling and Analyses

Well ID	Analyses		
	EPA SW-846 Method 8270	EPA SW-846 Method 8151	Natural Attenuation Parameters
D-Zone			
DSW-1D	X	X	X
DSW-2D	X	X	X
OFS-1D	X	X	X
OFS-2D	X	X	
OFS-3D	X	X	
OFS-4D	X		
ONS-1D	X	X	X
ONS-2D	X		
OS-5D	X	X	
E-Zone			
DSW-2E	X	X	
MW-2E	X	X	
OFS-3E	X	X	
OFS-4E	X	X	X
OFS-5E	X	X	X
OS-1E	X	X	X
OS-2E	X	X	
OS-3E	X	X	X
TOTALS	49	40	21

Note:
X - indicates measurement or analysis will be conducted

Table 3-3
Wells for Groundwater Elevation Measurements

Well ID	MW Measurement Point Elevation (feet NGVD88)	Groundwater Measured From:
A-1	12.15	Outer casing
A-2	10.86	Outer casing
A-3	15.41	Outer casing
A-4	12.95	Outer casing
A-5	11.65	Outer casing
A-6	11.01	Outer casing
A-7	11.43	Outer casing
A-8	13.51	Inner casing
A-10	12.96	Outer casing
DSW-1B	10.87	Outer casing
DSW-1C	10.54	Outer casing
DSW-1D	11.07	Outer casing
DSW-2A	10.90	Outer casing
DSW-2B	10.86	Outer casing
DSW-2C	10.56	Outer casing
DSW-2D	11.00	Outer casing
DSW-2E	11.03	Outer casing
DSW-3B	11.83	Outer casing
DSW-3C	13.12	Outer casing
DSW-4B	9.97	Inner casing
DSW-4C	9.75	Inner casing
DSW-4D	13.11	Outer casing
DSW-4E	11.11	Outer casing
DSW-5B	11.49	Outer casing
DSW-6B	13.53	Outer casing
DSW-6C	13.68	Outer casing
DSW-7A	9.75	Monument
DSW-7B	9.77	Monument
DSW-7C	9.77	Monument
MW-1A	15.23	Outer casing
MW-2E	14.65	Outer casing
OFS-1A	7.44	Monument
OFS-1B	7.40	Monument
OFS-1C	7.39	Monument
OFS-1D	7.45	Monument
OFS-2A	7.65	Monument
OFS-2C	7.67	Monument
OFS-2D	7.48	Monument
OFS-3A	8.14	Monument
OFS-3B	8.15	Monument
OFS-3C	8.18	Monument

Table 3-3 (Continued)
Wells for Groundwater Elevation Measurements

Well ID	MW Measurement Point Elevation (feet NGVD88)	Groundwater Measured From:
OFS-3D	8.22	Monument
OFS-3E	8.28	Monument
OFS-4A1	7.85	Monument
OFS-4A2	7.70	Monument
OFS-4C	7.72	Monument
OFS-4D	7.57	Monument
OFS-4E	7.71	Monument
OFS-5A	12.63	Monument
OFS-5C	12.60	Monument
OFS-5E	12.56	Monument
ONS-1B	11.20	Monument
ONS-1C	11.11	Monument
ONS-1D	11.03	Monument
ONS-2A	12.96	Monument
ONS-2B	13.09	Monument
ONS-2C	12.80	Monument
ONS-2D	12.91	Monument
OS-1A	9.51	Monument
OS-1B	9.52	Monument
OS-1C	9.20	Monument
OS-1E	8.87	Monument
OS-2E	7.95	Outer casing
OS-3E	6.43	Monument
OS-4A	8.21	Monument
OS-4B	8.26	Monument
OS-4C	8.08	Monument
OS-5B	11.70	Monument
OS-5C	11.70	Monument
OS-5D	11.56	Monument
OS-6B	9.76	Monument
OS-6C	9.69	Monument
OS-6D	9.84	Monument

Note:
MW - monitoring well

4.0 SAMPLE HANDLING AND DOCUMENTATION

This section describes sample handling and documentation procedures. The procedures described are designed to provide a thorough record of events surrounding the collection of each sample, and to ensure, as far as can be accomplished in the field, that data collected are useable.

4.1 FIELD LOGBOOKS

Permanently bound field books with waterproof paper will be used as field logbooks because of their compact size, durability, and secure page binding. The pages of the logbook should be numbered consecutively and should not be removed for any reason. Entries will be made in black waterproof indelible ink.

Logbooks will document the procedures performed by field personnel. Each entry should be dated, legible, and contain accurate and complete documentation of the individual's activities. Documentation in the field logbook will be at a level of detail sufficient to explain and reconstruct field activities without relying on recollection by the field team members. Because the logbook is a complete documentation of field procedures, it should contain only facts and observations. Language should be objective, clear, concise, and free of personal interpretation or terminology that might be misconstrued.

No erasures will be allowed. If an incorrect entry is made, the information will be crossed out with a single strike mark and the change initialed and dated by the team member making the change.

Field logbooks will be identified by the project name and a project-specific number (e.g., "Logbook #1 for McCormick and Baxter Superfund FY00 NAPL Field Exploration"), and stored in the field project files when not in use. Field logbooks will be photocopied after the field investigation, and photocopies will be stored in the project files. After field activities are completed, logbooks will be stored in the permanent project file.

4.2 SAMPLE IDENTIFICATION AND LABELING

To provide a sample tracking mechanism, each sample collected will be given a sample identification number using the numbering system described below. The sample identification number will include the sample type, station number, and an identification of the type of sample (e.g., primary and field split). The site name and sampling date will not be included in the sample identification number because this information will be recorded on the sample label and chain of custody form. Sample type, station number, and depth, sampling round designations are shown below. A sample identification number will be based on digits from each column, and will include dashes as shown in the examples below.

Task	Sample Type	Station Number[a]	Depth Interval or Sampling Round
SCAPS – exploration	SE	0100-0160	feet bgs
SCAPS – soil	SS	0100-0160	feet bgs
SCAPS – groundwater	SG	0100-0160	feet bgs
SCAPS – NAPL	SN	0100-0160	feet bgs
Soil boring – soil	SB	020-034	feet bgs
Monitoring well – groundwater	GW[b]	Well ID (e.g., OFS1)	02
Monitoring well – NAPL	NW[b]	Well ID (e.g., OFS1)	02

[a] Duplicate - add integer of 5000 to station number
Field/rinsate blank - add integer of 7000 to station number
Performance evaluation - add integer of 9000 to station number
[b] If NAPL (NW) sample collected, then no groundwater (GW) sample collected at that station

Note: Specify MS or MSD in comment section of the chain of custody form

MS/MSD samples will not be designated in the primary sample number. The sample to be used for MS/MSD will be specified in the comment section of the chain of custody. Sample volumes to be archived will be labeled “ARCHIVE” and designated with the same sample identification number as the primary sample. The QC field duplicate, field/rinsate blank, and performance evaluation PE samples will be identified with a fictitious station number of the primary sample.

The fictitious station numbers used to identify QC field duplicates, field/rinsate blanks, and PE samples will consist of a constant integer added to the number of the primary sample location that has been chosen as the QC station. A field duplicate sample will be designated by adding the integer 5000 to the station number from which it was collected. A field/rinsate blank sample will be designated by adding the integer 7000 to the station number from which the blank is collected. A PE sample will be designated by adding the integer 9000 to the primary station number that has been designated as the QA station. No indication that a sample is a duplicate will be provided on the sample label or chain of custody form. Cross-references for duplicate and blank sample numbers will be clearly recorded in the field book and field logs.

Example 1: A SCAPS soil sample collected from a depth of 5 to 6.5 feet bgs at sampling station SE100 would be labeled SS0100-5-6.5.

Example 2: A SCAPS groundwater sample collected from a depth of 2.5 feet within SCAPS exploration station SE100 would be labeled SG0100-2.5.

Example 3: A SCAPS NAPL sample collected from a depth of 10 feet bgs from SCAPS exploration station SE107 would be labeled SN0107-10.

Example 4: A primary soil sample collected from soil boring number SB020 at 15 to 16.5 feet bgs would be labeled SB020-15-16.5.

Example 5: A blind field duplicate of primary sample SB020-15-16.5 would be labeled SB5020-15-16.5.

Example 6: A field/rinsate blank collected after sampling primary sample SB020-15.-16.5 would be labeled SB7020-15-16.5.

Example 7: A groundwater sample collected from monitoring well number ONS1D from the second round of groundwater sampling would be labeled GWONS1D02.

Sample labels, whether blank or pre-printed, will contain an abbreviated summary of the logbook entry for the sample. The following information should be included on sample container labels:

- Project name
- Sample identification number
- Date and time of sampling
- Name of sampling personnel
- Type of sample preservatives added
- Matrix
- Analyses to be performed

An example of a sample container label is shown in Appendix B.

4.3 SAMPLE DELIVERY GROUP

Soil and groundwater samples will be sent to the analytical laboratories in sample delivery groups (SDGs). Each SDG will consist of primary samples, blind field duplicates, associated MS/MSD samples, and/or rinsate blanks.

4.4 SAMPLE PRESERVATION AND HANDLING

This section describes the techniques used to handle and preserve samples once collected, including descriptions of sample containers, preservation techniques, and storage requirements.

4.4.1 Sample Containers

Soil and groundwater samples (primary as well as QC) will be collected in glass or plastic containers purchased by the USACE. The containers will have screw-type lids to ensure the bottles are adequately sealed. Teflon inserts located inside the lids of the containers will prevent sample reaction with the lid and improve the quality of the seal. Samples that are being collected for VOC analysis will be collected directly into EnCore™ samplers. Tables 4-1 through 4-9 list the specific container types, volumes, number of containers, and holding times for each analysis, including soil, groundwater, and NAPL for the field laboratories and fixed laboratory.

The containers will be precleaned and certified under chain of custody. Commercially available precleaned jars are acceptable. The field team will record batch numbers for the bottles in the logbook. With this documentation, bottles can be traced and bottle wash analyses can be reviewed.

4.4.2 Sample Preservation

The field team will add the required preservatives to the sample bottles that will be used for groundwater and rinsate blanks. Waterproof labels will be attached to the bottles, on which the type of analysis and the type and amount of preservative will be written.

Sample preservation procedures are used to maintain the original character of analytes during storage and shipment. Regardless of the nature of the sample, absolute stability for all constituents cannot be achieved. Preservation techniques, such as pH control and refrigeration, may retard physicochemical and biochemical changes. As a general rule, analyzing the sample as soon as possible is the best way to minimize physicochemical and biochemical changes.

All samples will be placed in the appropriate sample container and refrigerated (on ice or ice-substitute in a cooler) immediately upon sample collection. The samples will be immediately transferred to the mobile field laboratory. The VOC samples will be preserved in the field prior to shipment. Samples will be shipped to the fixed laboratory on a daily basis. The analytical laboratories will meet all specified holding times and should make every effort to prepare and analyze the samples immediately after they are received. Chemical preservation, sample container types, and temperature requirements for the analyses performed in this investigation are shown in Tables 4-6 through 4-9.

4.4.3 Storage Requirements

Samples will be placed in secure, on-site storage, or remain in the possession of the sampling personnel until they are shipped or delivered to the laboratory. Immediately after collection, and during shipment to the analytical laboratory, samples will be stored in the on-site freezer, coolers on ice or an ice-substitute at approximately 4°C. Either ice packaged in plastic storage bags or prepackaged ice-substitute will be used to maintain the temperature in the shipping containers at approximately 4°C. Ice will be replenished as needed to ensure adequate cooling of samples during storage and shipping. Samples to be archived on site for potential chemical analyses (i.e., continuous boring) will be stored at 4°C.

4.5 SAMPLE DOCUMENTATION

Entries into the logbook or other relevant sampling forms for sampling events will include, but not necessarily be limited to, the following:

- Project name, location, and number
- Rationale for collecting the sample
- Date and time of sampling
- Sample numbers
- Cross-reference of numbers for split and blank samples
- Media sampled
- Geographical location of the sampling point in reference to site facilities
- Physical location of the sampling point, such as depth below surface
- Method of sampling, including procedures, equipment, and any departure from the procedures specified in the Work Plan or Sampling and Analysis Plan Addenda
- Rationale for any deviations from FY00 Management Plan Addendum procedures and documentation
- Results of field measurements, such as photoionization detector (PID)
- Sample preservation
- Type and quantity of container used for each sample

- Weather conditions at the time of sampling and previous events which may influence the representative nature of a sample—at a minimum, include temperature, approximate wind speed and direction, and sky cover
- Photographic information—briefly describe what was photographed and why, the date and time, the compass direction of the picture, number of the frame on the roll, and roll number
- Sketches, when appropriate, with reference points tied to existing structures in the area (i.e., trees, existing monitoring wells)
- Analyses requested
- Disposition of the sample (i.e., where it is being shipped)
- Airbill number of sample shipment, when applicable
- Other pertinent observations, such as the presence of other persons on the site (those associated with the job or members of the press, special interest groups, or passersby), and actions by others that may affect performance of site tasks
- Type of health and safety clothing/equipment used
- Name(s) of sampling personnel

4.6 CHAIN OF CUSTODY PROCEDURES

Verifiable sample custody is an integral part of all field and laboratory operations associated with this field exploration. The primary purpose of the chain of custody procedures is to document the possession of the samples from collection through storage and analysis to reporting. Chain of custody forms will become the permanent records of sample handling and shipment. The Field Investigation Manager or his/her designee will be responsible for monitoring compliance with chain of custody procedures.

Field sampling personnel are responsible for the care and security of samples from the time the samples are collected until they have been turned over to the shipping agent or laboratory. A sample is considered to be in one’s custody if it is in plain view at all times, in the physical possession of the sampler, or stored in a locked place where tampering is prevented.

Empty coolers containing ice or ice substitute will be available at the study area for use each day in the field. Samples collected during the day will be stored in shipping coolers beginning at the time of collection. The coolers will be locked inside the field vehicle or other secure location when sampling personnel are not present.

A chain of custody form will be filled out for samples in each cooler, starting when the first sample of each batch is collected. An example of the chain of custody record that will be used is shown in Appendix B. Each chain of custody form will contain the following information:

- Sample identification numbers
- Date and time of sampling
- Type of sample and number of sample containers associated with each sampling point
- Total number of sample containers in cooler
- Unique cooler identification number
- List of analyses requested
- Name and signature of sampling personnel
- Shipping air bill number, when applicable
- Comments regarding MS/MSD samples, or any other information that is necessary for the laboratory
- Spaces for transfer of custody acknowledgment

When the chain of custody forms are complete, field team members will crosscheck the form for possible errors. If samples are repackaged for shipping or delivery, one team member will crosscheck the chain of custody with the samples that are packed while another team member packages the samples. Corrections will be made to each record with a single strike mark that is dated and initialed. The person who initials corrections will be the same person that relinquishes custody of the samples. The chain of custody forms will be signed and dated, placed in resealable plastic bags, and taped to the inside lid of the respective cooler.

4.6.1 Transfer to Project Laboratories

After a cooler of samples is packaged and the chain of custody form has been completed, the cooler will be closed, sealed with packing tape, and sampling personnel will affix two signed and dated custody seals so that if it is opened the seals will be broken. An example of a custody seal is provided in Appendix B. Custody seals will contain the sample team member's signature, which must match the signature on the chain of custody forms, and the collection date.

Coolers, completed with chain of custody documentation, will be hand-delivered to the field laboratory, and sent by courier or shipped by overnight courier to the fixed laboratory by the sampling team. The shipping agent will not enter into the formal chain of custody procedures, and therefore will not sign the chain of custody form. Copies of bills of lading provided by the shipping agent will be kept with chain of custody forms in order to document shipping procedures.

4.6.2 Laboratory Custody Procedures

A cooler receipt form will be filled out by the laboratory (Appendix B). Upon receipt by the laboratory, custody seals will be inspected and the custody forms signed and dated by laboratory personnel. Laboratory personnel will verify sample numbers and the conditions of each cooler. Shipping manifests and custody forms signed and dated by laboratory personnel will be considered sufficient documentation of sample custody transfer from the sampler, through the shipping agent, to the analyst in the contracted analytical laboratory.

A copy (pink) of each custody form will be retained by the sampling team for the project file and the original (yellow and white) will be sent with the samples. Bills of lading will also be retained as part of the documentation for the custody records. In conjunction with data reporting, the analytical laboratory will return the original custody forms to the project manager for inclusion into the central project file.

4.7 DAILY CHEMICAL QUALITY CONTROL REPORTS

Field activities will be documented via the daily chemical quality control report (DCQCR) form. An example DCQCR form is included in Appendix B. The reports will be prepared and submitted daily, and will summarize field and laboratory activities and results. Data generated on site by the mobile field laboratory, all field measurement data, and field-sampling decisions will be made available to the USACE Technical Team Leader within 24 hours of sample collection. The DCQCR will contain the following information:

- Project information

- Work performed, samples collected including associated QA/QC samples, and personnel involved
- Weather
- Available analytical results, physical parameter measurements, calculation results, and required QC data
- Field audits performed and results
- Sampling, sample handling, chemical parameter measurement problems, deviations from the approved plan, and corrective actions taken
- Signatures of field personnel completing the DCQCR and initials of personnel making changes
- Summary of verbal or written instructions for retesting or changes of work

The DCQCR will be completed at the end of each day. Copies of field forms, mobile field laboratory data summary forms, and pages of field logbook completed for that day’s work will be referenced on the form and attached to minimize transcription errors. Forms and attachments will be completed within 24 hours and posted on the website without attachments. The Technical Team Leader or Field Investigation Manager will be responsible for completing and posting the DCQCR.

Table 4-1
Mobile Field Laboratory Sampling and Analysis Summary—Soil

Method	Method Reference	Primary Samples	Field Duplicate (10%)	Field/Rinse Blank (5%)	MS/MSD (5%)
SCAPS Soil Sampling					
PCP	Region 9 FASP SOP - Modified	315	32	15	15
TPH-Dx	Region 9 SOP - Modified	475	48	23	23
TPH by fluorescence	SCAPS SOP (ASTM D 6187)	Continuous	NA	NA	NA
Contingency Soil Borings					
TPH-Dx	Region 9 SOP - Modified	Up to 200	Up to 20	Up to 10	Up to 10

Note:
NA - not applicable

Table 4-2
Mobile Field Laboratory or In-Field Sampling and Analysis Summary—Groundwater

Method	Method Reference	Primary Samples	Field Duplicate (10%)	Field/Rinse Blank (5%)	MS/MSD (5%)
Remedial Design Groundwater Sampling					
Field meters for redox potential, pH, temperature, specific conductance, dissolved oxygen, and turbidity	Field meters	49	NA	NA	NA
Field test kits for dissolved oxygen, carbon dioxide, hardness, and total iron	HACH test kits Chemets (dissolved oxygen)	21	3	NA	NA

Note:
NA - not applicable

Table 4-3
Fixed Laboratory Sampling and Analysis Summary—Soil

Method	Method Reference	Primary Samples	Field Duplicate (10%)	Field/Rinse Blank (5%)	MS/MSD (5%)
SCAPs Soil Sampling					
PAHs and PCP - rapid TAT	Region 9 SOP with modifications	60	6	3	3
VOCs plus TICs	Region 9 SOP with modifications	Up to 310	Up to 32	Up to 16	Up to 16
Metals	CLP RAS	8	1	1	1
Moisture content	ASTM D2216	0 to 20	0 to 2	NA	NA
TOC	Walkley-Black	0 to 20	0 to 2	NA	0 to1
Grain size	ASTM D422/D4464	0 to 20	0 to 2	NA	NA
Porosity	API RP40	0 to 20	0 to 2	NA	NA
Permeability	EPA Method 9100/ ASTM 5084	0 to 20	0 to 2	NA	NA
Density	ASTM D2937	0 to 20	0 to 2	NA	NA
Cation exchange capacity	EPA Method 9081	0 to 20	0 to 2	NA	NA
NAPL saturation	PTS SOP	0 to 20	0 to 2	NA	NA
Treatability testing	Kerr Lab SOP	0 to 20	0 to 2	NA	NA
Contingency Soil Borings					
PAHs and PCP - standard TAT	Region 9 SOP	20	2	1	1
PAHs and PCP- rapid TAT	Region 9 SOP with modifications	Up to 150	Up to 15	Up to 8	Up to 8
Moisture content	ASTM D2216	0 to 20	0 to 2	NA	NA
TPH-Dx	Region 9 FASP Lab SOP	20	2	1	1
TOC	Walkley-Black	0 to 20	0 to 2	NA	0 to1
Grain size	ASTM D422/D4464	0 to 20	0 to 2	NA	NA
Porosity	API RP40	0 to 20	0 to 2	NA	NA
Permeability	EPA Method 9100/ ASTM 5084	0 to 20	0 to 2	NA	NA
Density	ASTM D2937	0 to 20	0 to 2	NA	NA
Cation exchange capacity	EPA Method 9081	0 to 20	0 to 2	NA	NA
NAPL saturation	PTS SOP	0 to 20	0 to 2	NA	NA
Treatability testing	Kerr Lab SOP	0 to 20	0 to 2	NA	NA

Note:
NA - not applicable

Table 4-4
Fixed Laboratory Sampling and Analysis Summary—LNAPL

Method	Method Reference	Primary Samples	Field Duplicate (10%)	Field/Rinse Blank (5%)	BS/BSD (5%)
Phase Three SCAPS Microwell and Monitoring Well Sampling					
PCP[a]	EPA SW-846 Method 8151	0 to 2	0 to 1	NA	1
SVOCs/PCP	EPA SW-846 Method 8270	0 to 2	0 to 1	NA	1
VOCs plus TICs	EPA SW-846 Method 8260	0 to 2	0 to 1	NA	1
TPH-Dx	Region 9 SOP No. 385	0 to 2	0 to 1	NA	1
Dioxin[a]	EPA Method 1613B	0 to 2	0 to 1	NA	1
Viscosity	Kerr Lab SOP (ASTM D445)	0 to 2	0 to 1	NA	NA
Density	Kerr Lab SOP (ASTM D1481)	0 to 2	0 to 1	NA	NA
Solubility	Kerr Lab SOP	0 to 2	0 to 1	NA	NA
Wettability	Kerr Lab SOP	0 to 2	0 to 1	NA	NA
Boiling point	Kerr Lab SOP (ASTM D86)	0 to 2	0 to 1	NA	NA
Oil-water interfacial tension	Kerr Lab SOP (ASTM D971)	0 to 2	0 to 1	NA	NA

[a] PCP and dioxin in microwells only by these methods.

Notes:
BS/BSD - blank spike/blank spike duplicate
NA - not applicable

Table 4-5
Fixed Laboratory Sampling and Analysis Summary—Groundwater

Method	Method Reference	Primary Samples	Field Duplicate (10%)	Field/Rinse Blank (5%)	MS/MSD (5%)
Phase Three SCAPS Microwell Groundwater Sampling					
SVOCs/PCP	EPA SW-846 Method 8270	0 to 9	1	1	1
PCP	EPA SW-846 Method 8151	0 to 9	1	1	1
VOCs plus TICs	EPA SW-846 Method 8260	0 to 9	1	1	1
Dioxin	EPA Method 1613B	0 to 9	1	1	1
Monitoring Well Sampling					
SVOC TCL - standard and TAT	EPA SW-846 Method 8270	49	4	2	2
PCP	EPA SW-846 Method 8151	40	4	2	2
Methane	Kampbell, Wilson, and Vandegrift technique	21	3	2	2
Total manganese	EPA Method 200.7	21	3	2	3 (MS/lab duplicate) (10% frequency)
Dissolved manganese	EPA Method 200.7	21	3	2	3 (MS/lab duplicate) (10% frequency)
Sulfate, chloride, nitrate, nitrite	EPA Method 300 series	21	3	2	2 (MS only)

Table 4-6
SCAPS and FASP Laboratory Sample Containers, Preservation, and Holding Times—Soil

Method	Method Reference	Container	Preservative	Holding Time
SCAPS				
TPH by fluorescence	SCAPS SOP (ASTM D 6187)	NA	NA	NA
Region 9 FASP				
PCP	Region 9 SOP - 8081 Modified	4-oz wide mouth	4 ± 2 °C	7 days to extraction/ 30 days to analysis
TPH-Dx	Region 9 SOP - Modified	4-oz wide mouth	4 ± 2 °C	7 days to extraction/ 30 days to analysis

Notes:
NA - not applicable
TBD - to be determined

Table 4-7
Fixed Laboratory Sample Containers, Preservation, and Holding Times—Soil

Method	Method Reference	Container	Preservative	Holding Time
Region 9 Laboratory				
PAHs and PCP TPH-Dx	Region 9 SOP - Modified Region 9 SOP	4-oz glass wide mouth	4 ± 2 °C	14 days to extraction/ 30 days to analysis
VOCs (i.e., ethers and ketones)	Region 9 SOP - Modified	EnCore^{TM} sampler 5 gram	4 ± 2 °C	24 hours to extraction 7 days to analysis
Kerr Laboratory				
Treatability testing	Kerr Lab SOP	1-L glass wide mouth	None	None
PTS Laboratories				
Moisture content	ASTM D2216		None	None
TOC	Walkley-Black	4-oz glass	4 ± 2 °C	28 days
Grain size	ASTM D422		None	None
Porosity	API RP40		None	None
Permeability	SW-846 EPA Method 9100/ ASTM 5084		None	None
Density	ASTM D2937		None	None
Cation exchange capacity	EPA SW-846 Method 9081		None	None
NAPL saturation	PTS SOP	16-oz glass	4 ± 2 °C	None
Pacific Analytical Laboratories				
Dioxin/furans	EPA Method 1613	4-oz glass wide mouth	4 ± 2 °C	7 days to extraction/ 40 days to analysis

Table 4-8
Fixed Laboratory Sample Containers, Preservation, and Holding Times—LNAPL

Method	Method Reference	Container	Required Volume	Preservative	Holding Time
Columbia Analytical Services					
TPH-Dx and SVOC TCL w/ TICs	Modified EPA SW-846 Method 8015; EPA SW-846 Method 8270C	40-mL amber glass vial	5 mL	4 ± 2 °C	None
VOCs plus TICs	EPA SW-846 Method 8260	40-mL amber glass vial	5 mL	4 ± 2 °C	None
Kerr Lab					
Viscosity	Kerr Lab SOP	1-L amber glass	< 20 mL	4 ± 2 °C	None
Density	Kerr Lab SOP		100 mL		
Solubility	Kerr Lab SOP		100 mL		
Wettability	Kerr Lab SOP		50 mL		
Oil-water interfacial tension	Kerr Lab SOP		750 mL		
Boiling point distribution	PTS Lab SOP	4-oz glass wide mouth	100 mL	4 ± 2 °C	None

Table 4-9
Fixed Laboratory Sample Containers, Preservation, and Holding Times—Groundwater

Method	Method Reference	Container	Preservative	Holding Time
Region 9 Laboratory				
SVOC TCL	EPA SW-846 Method 8270C	1-L amber glass	4 ± 2 °C	7 days to extraction/ 40 days to analysis
VOCs plus TICs	EPA SW-846 Method 8260	3 40-mL amber glass vial	4 ± 2 °C, HCl to pH <2	14 days
TOC	EPA Method 415.1	250-mL amber glass	4 ± 2 °C, pH<2 with H2SO4	28 days
Total manganese	EPA Method 200.7	500-mL HDPE	4 ± 2 °C, pH<2 with HNO_3	6 months
Dissolved manganese	EPA Method 200.7	500-mL HDPE, field filtered	4 ± 2 °C, pH<2 with HNO_3	6 months
Sulfate, chloride, nitrate, nitrite	EPA Method 300 series	500-mL HDPE	4 ± 2 °C	28 days; 48 hours for nitrate/nitrite
Kerr Laboratory				
Density	Kerr Lab SOP	500-mL HDPE	4 ± 2 °C	None
Extra	—	1-L amber glass	4 ± 2 °C	—
Pacific Analytical Laboratories				
Dioxin/furans	EPA Method 1613B	1-L amber glass	4 ± 2 °C	7 days to extraction/ 40 days to analysis
Columbia Analytical Services (CAS)				
Methane	Kampbell, Wilson, and Vandegrift technique	3 40-mL glass vial	4 ± 2 °C, HCl to pH <2	14 days
PCP	EPA SW-846 Method 8151	1-L amber glass	4 ± 2 °C	7 days to extraction/ 40 days to analysis

5.0 SAMPLE PACKAGING AND SHIPPING

5.1 SAMPLE PACKAGING

The procedures and material used for sample packaging must adequately protect the sample container from accidental breakage during shipping. Sample packaging and labeling will conform to the requirements of Appendix F of USACE Engineering Regulation ER-1110-1-263 (USACE 1996). Glass sample containers will be placed into plastic bags, and will be wrapped and cushioned in inert packing material such as Styrofoam®, closed-cell foam packing material, or plastic bubble wrap. Plastic sample containers do not require individual cushioning material, but should be packed well to prevent movement during transport. Caps will be screwed on tightly. The plastic sample containers will be placed into individual, resealable plastic bags, which will then be sealed. Ice or ice-substitute will be placed in the container in a manner to ensure adequate and equal cooling for all samples.

5.2 SAMPLE SHIPPING

All sample containers will be placed inside a strong shipping container, such as a metal or plastic picnic cooler with a hard plastic liner. The shipping container should be sufficient to prevent leaks or spills of ice water or potentially broken sample containers. The drainage hole at the bottom of the cooler will be taped shut so that the contents from potential broken containers of prepackaged ice, ice substitute, or sample will not escape. The shipping container lid will be adequately secured with tape to prevent opening during shipping. The shipping container will be adequately cleaned between shipments to prevent cross-contamination of samples.

Transfer of samples from the project site to the project analytical laboratory is expected to be performed by the field personnel. Deliveries that will arrive at a laboratory or at the courier’s office to be picked up by laboratory personnel must be arranged with the laboratory before shipping occurs. There will be daily communication with the FASP laboratory to avoid overloading the laboratory with samples. The maximum number of samples the laboratory can accommodate per day is 20 for TPH analyses and 28 per day for VOC analyses. Communication with the laboratory will ensure more regular delivery of samples and smoother receipt of analytical results.

Addresses, telephone numbers, and contacts of the laboratories analyzing samples for the project are presented in Table 5-1. Samples will be shipped to Columbia Analytical Services, Pacific Analytical Laboratories, and PTS Laboratories, Inc., using an overnight shipping company.

Table 5-1
Project Laboratories Contact Information

Laboratory	Address and Contact
SCAPS Team, USACE Tulsa District (Mobile field laboratory with SCAPS)	USACE, Tulsa District 1645 South 101 East Ave. Tulsa, OK 74128 Contact: Steve Brewer Phone: (918) 832-4122
EPA Region 9 FASP (Mobile field laboratory)	1337 S. 46th Street, Building 201 Richmond, CA 94804-4698 Contact: Liza Finley Phone: (510) 412-2334 Contact: Jeff Mays, Contractor (field) Phone: (510) 412-2367
EPA Region 9 Laboratory	1337 S. 46th Street, Building 201 Richmond, CA 94804-4698 Contact: Mary O’Donnell Phone: (415) 744-1533 Backup Contact: Rich Bauer Phone: (510) 412-2312 Fax: (510) 412-2300
Columbia Analytical Services, Inc.	1317 S. 13th Ave, P.O. Box 479 Kelso, WA 98626 Contact: Richard Craven Phone: (360) 577-7222 Fax: (360) 636-1068
EPA Robert S. Kerr Environmental Research Laboratory (Kerr Lab)	919 Kerr Research Drive Ada, OK 74820 Contact: Eva Davis Phone: (580) 436-8548 Fax: (580) 436-8703
Environmental Resources Associates	5540 Marshall Street Arvada, CO 80002 Contact: Joel Holtz Phone: (303) 431-8454 Fax: (303) 431-0159
PTS Laboratories, Inc.	8100 Secura Way Santa Fe Springs, CA 90670 Contact: Richard Young Phone: (562) 907-3607 Fax: (562) 907-3610
Pacific Analytical Laboratories	6349 Paseo del Lago Carlsbad, CA 92009 Contact: Steven Parsons Phone: (760) 931-1766 Fax: (760) 931-9479

6.0 FIELD CORRECTIVE ACTIONS

The ultimate responsibility for maintaining quality throughout the field explanation rests with the USACE Project Manager. The day-to-day responsibility for assuring the quality of field and laboratory data rests with the Technical Team Leader, Field Investigation Managers, the project QA/QC Officer, and the Laboratory Program Administrator.

Any nonconformance with the established QC procedures will be expeditiously identified and controlled. Where procedures are not in compliance with the established protocol, corrective actions will be taken immediately. Subsequent work that depends on the nonconforming activity will not be performed until the identified nonconformance is corrected.

The Technical Team Leader and/or Field Investigation Managers will review the procedures being implemented in the field for consistency with the established protocols. Sample collection, preservation, labeling, etc., will be checked for completeness. Where procedures are not strictly in compliance with the established protocol, the deviations will be field documented and reported to the project QA/QC Officer. Corrective actions will be defined by the Field Investigation Manager and USACE Technical Team Leader and documented as appropriate. Upon implementation of the corrective action, the Field Investigation Managers will provide the project QA/QC Officer with a written memo documenting field implementation. The memo will become part of the field exploration project file.

7.0 FIELD SCHEDULE

Table 7-1 provides a tentative schedule and the possible order and dates to complete the field tasks described in this SAP Addendum.

Table 7-1
Project Schedule

Project Task	Start Date	Finish Date
McCormick and Baxter Field Work		
Site walk-through and preliminary location surveys	W/E 5/29/00	Same
SCAPS mobilization and field preparation	05/31/00	06/04/00
SCAPS Work Period 1: Conduct pre-selected LIF pushes north of the slough	06/05/00	06/14/00
SCAPS Work Period 2: Phase Three VOCs/PCP	06/19/00	06/29/00
SCAPS Work Period 3: Phase One Old Mormon Slough; mobilize rotosonic drill rig	07/07/00	07/240/00
SCAPS Work Period 4: Continue Phase Three; begin Phase Two investigation	07/31/00	08/09/00
SCAPS Work Period 5: Continue Phase Two investigation and rotosonic investigation	08/15/00	08/30/00
SCAPS Work Period 6	09/15/00	09/13/00
SCAPS Work Period 7	09/19/00	09/25/00
SCAPS demobilization	09/26/00	09/28/00
Groundwater sample collection	10/02/00	10/15/00
FASP Field Analysis		
FASP lab mobilization	06/05/00	06/07/00
Conduct field analysis	06/12/00	09/25/00
FASP lab demobilization	09/25/00	09/27/00
Reporting		
SCAPS report	10/03/00	11/08/00
Preliminary summary of data	10/15/00	11/15/00
Draft investigation report	11/15/00	12/31/00
Final investigation report	01/31/01	02/28/01

8.0 REFERENCES

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APPENDIX A

Field Standard Operating Procedures

CONTENTS

SOP for Microwell Installation and Environmental Sampling by Site Characterization and Analysis Penetrometer System (SCAPS) incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999)

Scope of Work—Subsurface Explorations

USACE Sample Collection and Preparation Strategies for Volatile Organic Compounds in Solids

SOP for Dedicated Bladder Pump Installation

Seattle District HTRW Design Center SOP for Low-Flow Groundwater Purging and Sampling Using Dedicated Bladder Pump System incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999)

Scope of Work – Barge for Subsurface Explorations

SCOPE OF WORK
SUBSURFACE EXPLORATIONS
McCormick and Baxter Superfund Site
Stockton, California

CONTRACTOR:

CONTRACT NUMBER:

POC: Telephone:
Fax:

1.0 GENERAL REQUIREMENTS

This scope of work (SOW) describes the subsurface explorations to be performed using rotosonic technology at the McCormick and Baxter (M&B) Superfund Site, in Stockton, California on or about 19 June 2000. All work described in this SOW is contingent upon available funding. This SOW consists of drilling a minimum of two (2) boreholes (referred to as Primary Borings) using rotosonic technology to an approximate depth of 250 feet, collecting soil samples for chemical analysis and lithological characterization. Depending on funding availability, other options will be completed though not necessarily in the order presented in the SOW. Depending on new site data, the SOW also consists of drilling a minimum of two additional boreholes (referred to as Option 1), using rotosonic technology to an approximate depth of 250 feet, and collecting soil samples for chemical analysis and lithological characterization. This SOW also consists of drilling up to five borings using rotosonic technology to an approximate depth of 250 feet and collecting soil samples for chemical analysis and lithologic characterization. These borings (referred to as Option 2) will be continuously cored to the maximum depth, logged, and sampled at various intervals from a depth specified in the field (approximately 100 feet below ground surface [bgs] or as designated by the field geologist) to an approximate depth of 250 feet bgs. The individual options may not be in order of operation. The Primary and Option 1 borings will be continuously cored from ground surface to the maximum depth (approximately 250 feet bgs). This SOW includes an option to convert up to four of the Option 1 borings to monitoring wells. The wells may be installed to the maximum depth of 250 feet bgs as specified by the field geologist. An additional option may consist of up to five borings, drilled from a barge in Old Mormon Slough (referred to as Option 3) and continuously cored to maximum depth, logged, and sampled at various intervals from the mud line (approximately 12 feet below the water line) to an approximate depth of 170 linear feet below the mud line. Another option (referred to as Option 4) may consist of drilling up to five borings continuously cored to a maximum depth, to be logged and sampled at various intervals from a depth specified in the field (approximately 100 feet bgs) to an approximate depth of approximately 250 feet bgs.

2.0 PROJECT BACKGROUND AND LOCATION

The M&B wood preserving company operated on a 29-acre site at 1295 W. Washington Street in Stockton, California, from 1942 until 1990. M&B chemically treated wood products in pressure cylinders with various preservation solutions containing creosote, pentachlorophenol (PCP), arsenic, copper, chromium, and zinc. Solvents or carriers for these preservatives reportedly included petroleum-based fuels such as fuel oil kerosene and diesel, butane, and ether. The chemicals of concern (COC) identified for the M&B site are PCP, carcinogenic polycyclic aromatic hydrocarbon (cPAH), arsenic, dioxins/furans and naphthalene. Dioxins/furans are believed to have originated as manufacturing impurities contained in the PCP solution.

The M&B site is located in an industrial area near the junction of the I-5 interchange. The northern boundary of the site borders Old Mormon Slough, which empties into the Port of Stockton turning basin on the San Joaquin River. The site terrain is relatively flat and the only remaining aboveground structures at the site are an office building, two storage sheds, a large asphalt pad, older unused buildings, a wooden tower, a number of building foundations, and a stormwater collection system lift station. The former processing areas and tank farm are paved, and the rest of the site is unpaved with limited vegetative cover. A layer of gravel between 1 and 3 feet thick is found across most of the site. The subsurface strata most likely to be encountered are alluvial fan and fluvial deposits including silt, silty clay, clayey silt, silty sand, sand, and coarse-grained sands and gravels.

Drilling is likely to occur at off-site locations, directly north of the M&B Superfund site. Appropriate rights-of-entry shall be obtained by the lead agency (EPA) to perform work at off-site locations. The Contractor shall arrange for all site entry though Randy Olsen, U.S. Army Corps of Engineers (USACE) at (916) 557-5285.

3.0 PROTECTION OF SITE

The Contractor shall maintain existing survey monuments and existing structures, and protect them from damage from equipment and vehicular traffic. Any items damaged on site by the Contractor shall be repaired to USACE specifications by the Contractor at the Contractor’s expense. Any items damaged at an off-site location by the Contractor shall be repaired to the property owner’s specification. Local and state water and air pollution requirements will be met and closely monitored.

All litter and debris will be cleaned up daily and placed in containers for proper disposal. After completion of work, the Contractor shall remove all debris, waste, trash, and unused materials or supplies and shall restore the site as nearly as possible to its original condition. The Contractor shall minimize dust during drilling activities, allowing time and personnel for dust control as needed.

4.0 DESCRIPTION OF WORK AND SERVICES

The Contractor shall furnish all services, materials, equipment, supplies, and personnel necessary to perform the services as required and described in this SOW. The Pricing Schedule summarizes work to be completed for this SOW and is provided in Section 11. *All work described in this SOW is contingent upon availability of funds.*

The work to be performed includes the following activities:

- **Primary Borings:** A minimum of two borings drilled and continuously cored from the ground surface to an approximate depth of 250 feet bgs. The borings will be continuously logged and sampled from the surface to an approximate depth of 250 feet, as determined by USACE field personnel. Up to two, 4-inch-diameter monitoring wells may be installed to a depth of up to 250 feet bgs.

- **OPTION 1:** Up to two borings drilled and continuously cored from ground surface to an approximate depth of 250 feet bgs. The borings will be continuously logged and sampled from the surface to an approximate depth of 250 feet, as determined by USACE field personnel. Up to two 4-inch-diameter monitoring wells may be installed to a depth of up to 250 feet bgs.

- **OPTION 2:** Up to five additional borings may be located north of the site and continuously cored from a specified depth (approximately 100 feet bgs) to approximately 250 feet bgs.

- **OPTION 3:** If contamination is not detected during initial activities north of the site, up to five borings may be drilled from a barge in the Old Mormon Slough. The borings will be advanced to approximately 170 linear feet below the mud line.

- **OPTION 4:** Up to five additional borings may be located on or within the site and continuously cored from a specified depth (approximately 100 feet bgs) to approximately 250 feet bgs.

All borings will be drilled to characterize the extent of NAPL contamination and define the subsurface geology. All boring locations will be finalized in the field and will be drilled to approximately 250 feet bgs, as determined by USACE field personnel. The Contractor shall be prepared to drill to a maximum depth of 300 feet bgs if requested. Soil will be logged in all the boreholes, samples will be collected for analysis at designated intervals, and boring locations will be finalized by the USACE field geologist. Soil samples will be analyzed by on-site and off-site laboratories. The soil cores from the Option 2 and Option 4 borings will be continuously logged and sampled by USACE field personnel from a specific depth of approximately 100 feet bgs to approximately 250 feet bgs. The drilling shall be performed using Level D personal protective equipment (PPE) but the Contractor shall be prepared to upgrade to Level C PPE during drilling if required.

4.1 Personnel

The Contractor shall provide personnel consisting of at least one experienced operator and two helpers. The operator shall have a minimum of 5 years experience operating the equipment provided, including the rotosonic drill rig. A second helper is required due to the potential for off-site drilling and to implement dust control measures. Supplies will be stored on site and transported, as needed, to off-site drilling locations. Decontamination of all equipment shall occur on site in a specified location and will require transport of materials to the off-site location, as needed. Also, dust control measures (wet method) may be implemented, which will require Contractor personnel to spray on- and off-site work areas using the water truck.

All individuals, including barge personnel, shall have the required EPA and OSHA training for hazardous waste operations in accordance with 29 CFR 1910.120 (40-hour OSHA certified), and the driller and at least one helper are required to have a Class B driver’s license, with air-brake endorsement. The license and endorsement are needed to operate the water truck on public roadways (transport to/from site and on- and off-site locations). The Contractor shall have a current C-57 California State Water Well Drillers’ License to perform the services specified in this scope of work. The Contractor shall also supply qualified personnel to operate/transport a barge to and from the site if Option 3 is authorized. The Contractor’s personnel shall be required to provide respirator fit tests.

The Contractor is also responsible for the security for all its equipment and/or materials left off site during drilling activities. The security may include fencing, security personnel, etc., to offset the possibility of theft and/or vandalism of equipment. Any damage to the Contractor’s equipment shall be at the Contractor’s expense.

4.2 Equipment

The Contractor shall provide one rotosonic drill rig, two water tanks, and a water truck; the Contractor shall also supply a barge and all other necessary equipment if Option 3 is authorized. The rotosonic rig shall be capable of drilling boreholes to depths of at least 300 feet using at least 6-inch outer diameter (OD) casing for the borings in Option 2, 3, and 4; and 8-inch (OD) casing for the borings in Option 1. The equipment must allow for the collection of soil samples by a

California-modified split spoon sampler and a 3.5-inch-diameter core barrel in 5-foot and 10-foot sections. The drill rig shall be fully maintained in good condition and complete with all necessary accessories and supplemental equipment conforming to the manufacturer's specifications for the type and size required.

Soil sample containers will be provided and collected by USACE personnel. The Contractor will supply all drums necessary to containerize drill cuttings and development water, as specified in Section 4.9.

The Contractor shall also supply two portable water tanks that together shall be able to contain 600 gallons of return water. Two tanks are needed due to the distance from the evaporation pad (on site) to potential boring locations off site. The Contractor shall also supply one water truck with at least a 2,000-gallon tank capacity to supply water for drilling and dust control. The water truck shall be fully maintained in good condition and complete with all necessary accessories and supplemental equipment conforming to the manufacturer's specifications for the type and size required. The driller and at least one helper shall have the appropriate, current license to operate the water truck on public roadways, as specified in Section 4.1. The drill rig shall be capable of drilling from a barge if option 3 is required. The barge shall be sufficient to allow for safe and efficient drilling/sample collection to occur if Option 3 is authorized.

The Contractor is responsible for maintaining its equipment. Any down time associated with the maintenance or repair of any piece of the equipment will be at the cost of the Contractor and not the Federal Government. The Contractor is also responsible for security for all off-site work to prevent/deter theft, destruction, and/or vandalism to the Contractor's property/equipment. The Government will *not* be held liable or responsible for any theft, vandalism, or destruction to the Contractor's equipment.

4.3 Soil Sampling

4.3.1 Primary Borings

Two borings will be drilled using an 8-inch OD casing and a 3.5-inch-diameter core barrel to collect soil samples. The core barrel will be advanced ahead of the casing for sample collection. Soil samples will be collected continuously from the ground surface to the total depth of the hole (determined in the field by the USACE geologist up to an approximate depth of 250 feet bgs). Soil samples will be vibrated out of the core barrel and into a plastic sleeve, knotted at both ends. Up to four of the borings <u>may</u> be completed as monitoring wells to a depth to be determined by the USACE field personnel, in accordance to the specifications outlined in Sections 4.5 and 4.6.

The Contractor shall wear clean nitrile gloves during all drilling, decontamination, and sampling activities. Gloves shall be changed prior to each soil sample collected and between each borehole.

Precautions shall be taken to fully contain water and soil cuttings produced during borehole drilling, sampling, abandonment, and decontamination of equipment. To minimize the potential for surface contamination, drill cuttings will be containerized immediately or contained using 4-millimeter-thick plastic sheets encircling the area adjacent to the drill flight. During drilling, borehole cuttings generated will be transferred from the plastic sheets to 55-gallon drums.

Uncompleted, open boreholes will be secured each time the boring is left unattended (predominantly overnight). The boreholes shall be covered to prevent access to the borehole. *At a minimum*, the hole shall be covered with heavy sheet metal (off site) or 2-inch plywood (on site) and traffic cones. Perimeter safety tape shall encircle the borehole, as well. All completed boreholes shall be abandoned by the end of each day, in accordance with Section 4.8 - Borehole Abandonment. The locations of these borings will be north of the Old Mormon Slough and special security precautions and extra time must be allocated for drilling activities.

4.3.2 Option 1 Borings

Up to two borings will be drilled using an 8-inch OD casing and a 3.5-inch diameter core barrel to collect soil samples. The core barrel will be advanced ahead of the casing for sample collection. Soil samples will be collected continuously from the ground surface to the total depth of the hole (determined in the field by the USACE geologist up to an approximate depth of 250 feet bgs). Soil samples will be vibrated out of the core barrel and into a plastic sleeve, knotted at both ends. Up to four of the borings may be completed as monitoring wells to a depth to be determined by the USACE field personnel, in accordance to the specifications outlined in Sections 4.5 and 4.6.

The Contractor shall wear clean nitrile gloves during all drilling, decontamination, and sampling activities. Gloves shall be changed prior to each soil sample collected and between each borehole.

Precautions shall be taken to fully contain water and soil cuttings produced during borehole drilling, sampling, abandonment, and decontamination of equipment. To minimize the potential for surface contamination, drill cuttings will be containerized immediately or contained using 4-millimeter-thick plastic sheets encircling the area adjacent to the drill flight. During drilling, borehole cuttings generated will be transferred from the plastic sheets to 55-gallon drums.

Uncompleted, open boreholes will be secured each time the boring is left unattended (predominantly overnight). The boreholes shall be covered to prevent access to the borehole. *At a minimum*, the hole shall be covered with heavy sheet metal (off site) or 2-inch plywood (on site) and traffic cones. Perimeter safety tape shall encircle the borehole, as well. All completed boreholes shall be abandoned by the end of each day, in accordance with Section 4.8 - Borehole Abandonment. The locations of these borings will be north of the Old Mormon Slough and special security precautions and extra time must be allocated for drilling activities.

4.3.3 Monitoring Well Installation (Optional)

A maximum of four monitoring wells may be installed in the contingency boreholes to a maximum depth of approximately 250 feet. The boreholes, if Option 1 is exercised, will be drilled using an 8-inch casing to allow for potential installation of monitoring wells. The wells will be constructed with 4-inch-diameter schedule 40 mild/carbon steel casing with appropriate surface completion additions (either riser or flush mount as determined by USACE field personnel), locking well cap, and prepacked, stainless steel, wire-wrapped, well screen. Dielectric couplings (capable of withstanding steam injection) shall be installed between the stainless steel screen and the mild steel casing. The wells will have 10-foot screened intervals with a 0.02-inch screen slot size and will be prepacked with a sand filter pack consisting of clean No. 20 Monterey sand. The No. 20 Monterey sand (filter pack) will extend at least 1 foot below the screened interval and extend 3 feet above the screen interval. The sand will be placed below and above the prepacked screen using a tremie pipe. The top of the filter pack will be continuously sounded during retraction of the temporary casing by the Contractor to ensure that the filter pack remains within the casing during removal. A bentonite clay seal will be placed above the filter pack with a maximum thickness of 5 feet and shall not be placed within nonaqueous-phase liquid (NAPL), if present. The seal will be installed using 3/8-inch diameter bentonite pellets and the minimum hydration time for the bentonite seal will be 1 hour. Halliburton Class G – 40 percent silica flour cement grout will be mixed with a mechanical grout mixer (progressive cavity pump) and placed from the top of the clay seal to the ground surface using a tremie pipe. Centralizers will be placed at the top of the screen and every 40 feet above to the surface. The Contractor shall furnish and use stainless steel centralizers for centralizers that contact the ends of the screen and PVC centralizers for centralizers that contact the mild steel riser.

The wells may be screened at a depth other than the final depth of the boring. The difference between the final depth of the boring and the bottom of the well screen may be significant and may require the placement of a cement grout seal below the well screen using a tremie pipe. Sufficient time (i.e., 72 hours) will be required to allow the grout to set before constructing the well.

The Contractor shall be notified by the USACE a minimum of 10 days before the installation of each well in order to have the well materials delivered on site.

4.3.4 Option 2 Boreholes

A maximum of five borings will be drilled using a 6-inch OD casing to advance to a depth specified by the USACE field personnel (approximately 100 feet bgs). Once the casing has been advanced to the specified depth and excess soil has been removed, a 3.5-inch OD core barrel will be advanced in front of the casing to collect a continuous core sample. The core barrel will be advanced in either 5-foot or 10-foot runs (determined by the USACE representative). Samples will be collected from the specified depth (approximately 100 feet bgs) to the total depth of the borehole (approximately 250 feet bgs). Some soil samples may be requested from between the ground surface and the specified depth (approximately 100 feet bgs). Soil samples will be vibrated out of the core barrel and into a plastic sleeve, knotted at both ends. The Contractor shall take direction from the USACE field personnel before proceeding with each run. The most likely locations of these borings will be north of the site and special security precautions and extra time must be allocated for drilling activities.

4.3.5 Option 3 Boreholes

A maximum of five borings may be drilled from a barge. The barge shall be of sufficient size to allow for safe and efficient drilling and sample collection. The drilling shall be on the Old Mormon Slough off the Stockton Deep Water Channel on the San Joaquin River. The Old Mormon Slough is approximately 2,500 feet long and 180 feet wide and most of slough is approximately 10 feet deep. The slough has an approximately 3-foot tidal influence. A 3.5-inch OD core barrel will be advanced from the mud line in front of the casing to collect a continuous core sample. The core barrel will be advanced in either 5-foot or 10-foot runs (determined by the USACE representative). Samples will be collected from the mud line to the total depth of the borehole approximately 170 linear feet below the mud line. Soil samples will be vibrated out of the core barrel and into a plastic sleeve, knotted at both ends. The Contractor shall take direction from the USACE field personnel before proceeding with each run.

4.3.6 Option 4 Boreholes

A maximum of five borings may be drilled using a 6-inch OD casing to advance to a depth specified by the USACE field personnel (approximately 100 feet bgs). Once the casing has been advanced to the specified depth and excess soil has been removed, a 3.5-inch OD core barrel will be advanced in front of the casing to collect a continuous core sample. The core barrel will be advanced in either 5-foot or 10-foot runs (determined by the USACE representative). Samples will be collected from the specified depth (approximately 100 feet bgs) to the total depth of the borehole (approximately 250 feet bgs). Some soil samples may be requested from between the ground surface and the specified depth (approximately 100 feet bgs). Soil samples will be vibrated out of the core barrel and into a plastic sleeve, knotted at both ends. The Contractor shall take direction from the USACE field personnel before proceeding with each run.

4.4 Monitoring Well Development (Option)

A maximum of four monitoring wells will be developed by surging, bailing, and pumping. The surge block will have a diameter slightly smaller (approximately 1/8 inch) than the inside diameter of the well casing. The well casing will be pumped prior to surging to ensure that an adequate flow of water is entering the well. Surging will begin slowly across the entire length of the well screen. The pace of the surging motion will be gradually increased until the surge block has a vertical velocity of 3 to 5 feet per second. Well surging will be alternated with pumping approximately every 15 minutes during development to clean accumulations of sediment from the well and to allow the USACE representative to determine the progress of the well development. Development shall continue for a minimum of 4 hours or until the USACE representative determines that the well is adequately developed for sampling purposes. At the end of development, the drillers will clean all sediment from the bottom of the well. The development water will be pumped into 55-gallon drums supplied by the Contractor. Wells with NAPL present will not be developed, at the discretion of the USACE representative.

4.5 Well Completion (Option)

Flush mount or steel riser completions shall be determined in the field by the USACE representative and shall depend on the site conditions. Wells with aboveground completions shall be constructed above the surface using a 5-foot length of steel casing. Steel riser completions shall extend 2.5 feet above ground surface. The casing will be installed on the same day the grout is placed. Flush mounted well completions shall consist of appropriate monitoring well completion boxes with bolt-down or locking covers. The flush mount boxes shall have a drain hole installed to prevent water from accumulating in the box. A 4-foot square protective concrete pad approximately 6 inches thick and 3 inches below ground surface will be poured around the steel casing. The pad shall slope away from the casing to prevent water from pooling adjacent to the casing. Protective steel posts shall be installed around each well with riser completions. A minimum of three posts, at least 3 feet high, shall encircle the well to protect against vehicular damage to the well. The location of the posts shall not impede access to the well by personnel and shall be located at least 2 feet from the well. A locking cover will be installed on top of the protective casing and locking expansion plugs are required for flush mounted wells. Padlocks will be provided by the USACE and will be placed on each monitoring well.

4.6 Decontamination

The Contractor shall decontaminate all equipment that will be placed into the borehole and all equipment that may come in contact with soil samples. Equipment shall be decontaminated prior to and after each boring. All decontamination water shall be stored in portable tanks (see Section 4.2) or 55-gallon drums. The Contractor shall provide five 5-gallon buckets and three clean brushes for decontamination of the split-spoon sampler. The Contractor shall wear clean nitrile gloves during decontamination activities. Water is available on site for decontamination activities.

Decontamination procedures for drilling equipment shall be as follows:

- Rinse with a pressure steam cleaner
- If visible dirt or oil is present on the equipment, wash with laboratory-grade, phosphate-free detergent and potable water, and rinse with pressure steam cleaner

- Air dry

The Contractor shall decontaminate sampling equipment, including samplers and sample sleeves prior to each sample collection. Decontamination procedures are as follows:

- Wash with laboratory-grade phosphate-free detergent and water solution
- Rinse with potable water
- Rinse with ASTM Type II reagent-grade water
- Rinse with pesticide-grade acetone and pesticide-grade hexane
- Air dry

USACE shall construct a temporary decontamination pad at the former concrete pole washing area for use by the Contractor. The decontamination pad shall be used by the Contractor for steam cleaning drilling equipment while working on the M&B property. The Contractor shall be required to furnish a decon pad for all off-site work (north of the slough). Water used for equipment decontamination shall be containerized and allowed to evaporate.

4.7 Borehole Abandonment

Once sampling of the borehole has been completed, the Contractor shall abandon the borehole. Halliburton Class G - 40 percent silica flour cement grout shall be used to abandon the boreholes, with 7.5 to 9 gallons of water per 90-pound sack of cement. Grouting material shall be mixed with a mechanical grout mixer and pumped through a tremie pipe in one continuous operation from the bottom of the interval to be sealed to the top. Boreholes will be abandoned in compliance with the state and county well abandonment requirements. The Contractor will use caution when abandoning boreholes over water.

4.8 Investigation-Derived Waste

All soil cuttings and waste fluids generated will be separated and placed into 55-gallon drums by the Contractor. The Contractor shall furnish approximately 50 DOT-approved 55-gallon drums and shall transport the drums to a centralized storage area on site. **(The actual number of drums to be provided by the Contractor will be based on whether contingency borings will be drilled, and whether on-site facilities are capable of handling the wastewater volume.)** No drums will be left unattended at an off-site location. Drums shall *not* be filled to more than 75 percent capacity. Each drum shall be labeled by the USACE field personnel prior to relocation to the on-site storage area. The current storage site is located beneath a cover on the M&B Superfund site and is gated to limit access. Should the current facility reach capacity, another storage area will be designated by the USACE field personnel.

5.0 PROJECT SUBMITTALS

Prior to *any* on-site work, the Contractor will submit the following items to the USACE Project Leader. No mobilization will occur until the USACE Project Leader has reviewed the following documents:

- C-57 California State Water Well Drillers License
- Current 40-Hour OSHA certifications
- Certificate of medical surveillance
- Certificate of respirator fit test
- Proof of Worker's Compensation Insurance
- Contractor's Site Health and Safety Plan **(Approval of the Site Health and Safety Plan is required by USACE prior to any mobilization to the site.)**
- Summary of drill rig operator's work experience

The Contractor will address all USACE comments on the Site Health and Safety Plan and a final version of the submittal will be provided to the USACE Project Engineer. The Contractor shall submit his Site Health and Safety Plan to the USACE 15 days after the Notice to Proceed. The Contractor must obtain USACE final approval of submittals a minimum of 12 days before mobilization to the site. If Option 3 is exercised, the Contractor shall prepare a Site Health and Safety Plan Addendum to address potential hazards associated with barge drilling in accordance with Appendix A, the submittal shall be received by the USACE 14 calendar days before mobilization to the barge and shall be approved by the USACE before mobilization is allowed.

The Contractor shall provide to the USACE a daily report documenting the Contractor's on-site personnel, the amount of drilling (footage), material used, hours worked, repairs completed (including down time for repairs and anticipated repair completion schedule, if repair time exceeds work day), and any accidents or unusual events. This daily report shall be provided within 24 hours after the actual workday.

6.0 HEALTH AND SAFETY

OSHA Standard 29 CFR 1926.65(b) [Cal-OSHA Standard 8 CCR § 5192(b)] requires employers to develop and implement a written safety and health program (SHP) for employees involved in hazardous waste operations. The SHP documents the general safety and health program(s)/plan(s)/standard operating procedures(s) (SOPs). The Contractor shall provide written certification that the SHP has been developed and is being maintained. The Contractor shall make the SHP available upon request by the Government.

The site-specific program requirements of the OSHA Standards 29 CFR 1926.65 shall be integrated into one site-specific document, the Site Safety and Health Plan (SSHP). The SSHP shall interface with the Contractor's SHP. Any portions of the SHP that are referenced in the SSHP shall be included as appendices to the SSHP. The SSHP shall incorporate the requirements of 29 CFR 1926.65 (8 CCR § 5192) (Hazardous Waste Operations and Emergency Response); 8 CCR § 3203 (Injury and Illness Prevention Program); Corps of Engineers EM 385-1-1 (Accident Prevention Plan); Appendix B of ER 385-1-92 (Safety and Occupational Health Document Requirements for Hazardous, Toxic, and Radioactive Waste [HTRW] and Ordnance and Explosive Waste [OEW] Activities); and other federal, state, and local regulations. The Contractor's Health and Safety Manager shall sign and date the SSHP prior to submittal. Site work shall not commence on a project until the COR has accepted the SSHP. The Contractor shall refer to Attachment 1 for details.

All personnel on site shall be equipped with Modified Level D clothing at all times. Modified Level D equipment includes the following:

- Hard hat
- Steeled-toed boots
- Safety glasses with sideshields
- Hearing protection
- Nitrile gloves
- Life vests and other water safety devices if Option 4 is authorized

All recordable accidents/injuries/illnesses shall be reported immediately. A completed ECG 3394, Accident Investigation Report, shall be submitted within 2 working days in accordance with AR 385-40 and USACE Supplement 1 to the regulation. The Contractor shall submit the Safety and Health Plan to the USACE representative for approval prior to **any** on-site work. All comments shall be addressed and final approval by the USACE Project Engineer must be obtained by the Contractor prior to **any** mobilization and work at the site.

The Contractor shall assess the workplace to determine if hazards are present that necessitate the use of PPE. The Contractor's Certified Industrial Hygienist shall verify that the required workplace assessment has been performed through a written certification (29 CFR 1910.132). The Contractor shall specify minimum PPE ensembles (including respirators) necessary for each task/operation based on the hazard assessment. The Contractor shall establish and justify upgrade / downgrade / evacuation criteria based upon the action levels established. It is anticipated that EPA/OSHA Level C PPE may be required for this project.

7.0 USA UTILITY CLEARANCE

USA Utility clearance will be obtained by the USACE for the M&B Property and associated sites.

8.0 PERIOD OF SERVICE

All work and services shall be complete 150 calendar days after Notice to Proceed.

All options shall be completed within the overall 150-calendar-day period of service.

The work shall be scheduled for 10-hour days, starting at 0700 and ending at 1730. The work will be completed in increments of 10 days on and 4 days off. Rescheduling shall be at direction of the USACE.

All work shall be scheduled and coordinated with the USACE Project Leader, Randy Olsen, at (916) 557-5285. Field work is scheduled to begin on or about 19 June 2000. Fourteen-calendar-day notice will be provided to the Contractor if Option 3 (drilling from barge) is authorized and 12-calendar-day notice will be provided to the Contractor for all other options or for any changes made to the schedule or SOW.

9.0 OPTIONS FOR ADDITIONAL SERVICES

The Government may require the Contractor to perform any and all the additional services stated in the SOW. The Government may exercise the contract options at any time before 1 September 2000 at the stated option price.

10.0 CONTRACTOR CAUTION STATEMENT

The Contractor is cautioned to take no guidance during the course of this work from any source that deviates from the requirements stated in this SOW unless directed by the Contracting Officer. The Contractor shall immediately notify the USACE Project Engineer, Randy Olsen, of any guidance received that is not directed by the Contracting Officer.

Randy Olsen
Project Engineer

11.0 PRICING SCHEDULE

This pricing schedule shall be completed by the Contractor and submitted with any attachments as needed as the Contractor's official bid. The Contractor shall furnish labor, materials, equipment, and incidental costs necessary for subsurface explorations at McCormick and Baxter Superfund Site, Stockton, California, in accordance with the attached SOW. The bid shall be in to the USACE Contracting office by April 3, 2000.

Item No	Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
001	Mobilization and Demobilization includes delivery and removal of all equipment and supplies to be furnished by the Contractor, restoration of the site to its original conditions, and submittals.	1	Job	Lump Sum (LS)	
002	Primary Boreholes—Drill Rig Rental for a maximum of two borings to an approximate depth of 250 feet bgs, including equipment, labor, materials, supplies, and incidental costs. Labor includes, but is not limited to drilling of boreholes, sample collection, standby time caused by USACE personnel, borehole abandonment, monitoring well installation, transport of equipment, supplies and materials to on- and off-site location, and decontamination of equipment. Equipment includes but is not limited to, decontamination equipment, drill rig, and water truck; equipment for collecting and transferring waste fluids to 55-gallon drums and for collection of soil samples; monitoring well installation equipment; and equipment for borehole abandonment.	110	Hr		
003	Primary Boreholes—Installation of a maximum of two monitoring wells, includes all materials and supplies associated with well installation, i.e., mild/carbon steel casing, prepacked stainless steel wire-wrapped well screen, dielectric couplings, bentonite plug, sand pack, Halliburton Class G-40 percent silica flour cement, centralizers (stainless steel and PVC), and well completion (flush mount or steel riser completion) etc.	500	Ft		
004	Primary Boreholes—Well Development includes rental of development rig and includes all equipment, labor, material, and supplies for the development of a maximum of two monitoring wells.	12	Hr		
005	Primary Boreholes—Borehole Abandonment, Baseline Borings. Includes equipment, labor, materials, and supplies (Halliburton Class G-40 percent silica flour cement).	500	Ft		
006	Primary Boreholes—Security	250	Hr		
007	Primary Boreholes—DOT-approved, clean, 55-gallon drums for containment and storage of soil cuttings and wastewater.	8	Ea.		

Item No	Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
008	OPTION 1—Drill Rig Rental for a maximum of two borings to an approximate depth of 250 feet bgs, including equipment, labor, materials, supplies, and incidental costs. Labor includes, but is not limited to drilling of boreholes, sample collection, standby time caused by USACE personnel, borehole abandonment, monitoring well installation, transport of equipment, supplies, and materials to on- and off-site location, and decontamination of equipment. Equipment includes but is not limited to, decontamination equipment, drill rig, and water truck; equipment for collecting and transferring waste fluids to 55-gallon drums and for collection of soil samples; monitoring well installation equipment; and equipment for borehole abandonment.	110	Hr		
009	OPTION 1—Installation of a maximum of two (2) monitoring wells, includes all materials and supplies associated with well installation; i.e., mild/carbon steel casing, prepacked stainless steel wire-wrapped well screen, dielectric couplings, bentonite plug, sand pack, Halliburton Class G-40 percent silica flour cement, centralizers (stainless steel and PVC) and well completion (flush mount or steel riser completion) etc.	500	Ft		
010	OPTION 1—Well Development. Rental of development rig and includes all equipment, labor, material, and supplies for the development of a maximum of two monitoring wells.	12	Hr		
011	OPTION 1—Borehole Abandonment, Baseline Borings. Includes equipment, labor, materials, and supplies (Halliburton Class G-40 percent silica flour cement).	500	Ft		
012	OPTION 1—Security	250	Hr		
013	OPTION 1—DOT-approved, clean, 55-gallon drums for containment and storage of soil cuttings and wastewater.	8	Ea.		
014	OPTION 2—Drill Rig Rental for a maximum of five borings to an approximate depth of 250 ft bgs, including equipment, labor, materials, supplies, and incidental costs. Labor includes, but is not limited to, drilling of boreholes, sample collection, standby time caused by USACE personnel, borehole abandonment, transport of equipment, supplies, and materials to on- and off-site locations, and the decontamination of equipment. Equipment includes, but is not limited to, decontamination equipment, drill rig, and water truck; equipment for collecting and transferring waste fluids to 55-gallon drums and for collection of soil samples and monitoring well installation equipment; and equipment for borehole abandonment.	175	Hr		

Item No	Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
015	OPTION 2—Borehole Abandonment, Baseline Borings. Includes equipment, labor, materials, and supplies (Halliburton Class G-40 percent silica flour cement).	1250	Ft		
016	OPTION 2—Security	348	Hr		
017	OPTION 2—DOT-approved, clean, 55-gallon drums for containment and storage of soil cuttings and wastewater.	20	Ea.		
018	OPTION 3—Drill Rig Rental for a maximum of five borings from a barge to an approximate depth of 170 linear feet below the mud line, including equipment, labor, materials, supplies, and incidental costs. Labor includes, but is not limited to, drilling of boreholes, sample collection, standby time caused by USACE personnel, borehole abandonment, transport of equipment, supplies and materials to on- and off-site locations, and the decontamination of equipment. Equipment includes, but is not limited to, decontamination equipment, drill rig, and water truck; equipment for collecting and transferring waste fluids to 55-gallon drums and for collection of soil samples; monitoring well installation equipment; and equipment for borehole abandonment.	175	Hr		
019	OPTION 3—Mobilization and Demobilization includes delivery and removal of all equipment and supplies to be furnished by the Contractor, restoration of the site to its original conditions, and submittals.	1	Job	Lump Sum (LS)	
020	OPTION 3—Barge rental for a maximum of 18 days including equipment, labor, materials, supplies, and incidental costs. Equipment includes but is not limited to barge, equipment necessary to move the barge from on boring to the next, skiff and/or boat for daily off-loading and on-loading personnel, personal and marine safety equipment.	18	Daily		
021	OPTION 3—Borehole Abandonment, Contingency Borings. Includes equipment, labor, materials and supplies (Halliburton Class G-40 percent silica flour cement).	850	Ft		
022	OPTION 3—Security	348	Hr		
023	OPTION 3—DOT-approved, clean, 55-gallon drums for containment and storage of soil cuttings and wastewater.	20	Ea.		
024	OPTION 4—Drill Rig Rental for a maximum of five borings to an approximate depth of 250 ft bgs, including equipment, labor, materials, supplies, and incidental costs. Labor includes, but is not limited to, drilling of boreholes, sample collection, standby time caused by USACE personnel, borehole abandonment, transport of equipment, supplies and materials to on- and off-site locations, and the decontamination of	175	Hr		

Item No	Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
	equipment. Equipment includes, but is not limited to, decontamination equipment, drill rig, and water truck; equipment for collecting and transferring waste fluids to 55-gallon drums and for collection of soil samples; monitoring well installation equipment; and equipment for borehole abandonment.				
025	OPTION 4—Borehole Abandonment. Includes equipment, labor, materials, and supplies (Halliburton Class G-40 percent silica flour cement).	1250	Ft		
026	OPTION 4—Security	348	Hr		
027	OPTION 4—DOT-approved, clean, 55-gallon drums for containment and storage of soil cuttings and wastewater.	20	Ea.		

Subtotal (without option item sets) $___________
Subtotal Option Item only $___________

GRAND TOTAL (includes base bid and option items) $__________

ATTACHMENT 1
SAFETY AND HEALTH REQUIREMENTS

1 General Requirements: A critical Contractor performance evaluation factor throughout all aspects of the rotosonic drilling and optional barge-mounted rotosonic drilling operation is the safety and health of affected on-site personnel, potential off-site receptors, and the protection of the environment. Accordingly, detailed safety and health criteria, practices, and procedures shall be developed and implemented to provide proper control of and protection against the unique safety, chemical, physical, radiological, and biological hazards. This attachment describes in general terms, the minimum Contractor safety, health, and emergency response requirements for activities that involve employee exposure or the reasonable possibility for employee exposure to safety and health hazards.

The Contractor shall have an ongoing Safety and Health Program (SHP) meeting the most current requirements of federal, California, USACE, and local laws, regulations, and guidance. In addition, the Contractor shall prepare, implement, and enforce a Site Safety and Health Plan (SSHP) for all site work performed under this contract. The Contractor shall ensure that all safety and health provisions are followed by its subcontractors, suppliers, and support personnel. The Contractor shall utilize the services of qualified personnel, as defined in Appendix B of ER 385-1-92 and this attachment, to oversee the development and implementation of required safety and health documents.

2 References:

a. United States Army Corps of Engineers (USACE), *Safety and Health Requirements Manual*, EM 385-1-1, September 1996

b. USACE, *Safety and Occupational Health Document Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) and Ordnance and Explosive Waste (OWE) Activities*, ER 385-1-92, March 18, 1994

c. Occupational Safety and Health Administration (OSHA) Standards 29 CFR 1910, Occupational Safety and Health Standards

d. OSHA Standards 29 CFR 1926, Safety and Health Regulations for Construction

e. OSHA 29 CFR 1926.65, Hazardous Waste Operations and Emergency Response

f. OSHA 29 CFR 1910.132, Personal Protective Equipment, General Requirements

g. OSHA 29 CFR 1915, Occupational Safety and Health Standards for Shipyard Employment

h. United States Coast Guard (USCG), 33 CFR, Navigation and Navigable Waters

i. Federal Acquisition Regulation, F.A.R. Clause 52.236-13: Accident Prevention

j. Nuclear Regulatory Commission Standards (NRC), 10 CFR 20, Standards for Protection Against Radiation

k. NIOSH/OSHA/USCG/EPA, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, October 1985

l. EPA, *Standard Operating Safety Guides*, July 1988

m. American Conference of Governmental Industrial Hygienists (ACGIH), *1999 TLVs® and RELs®, Threshold Limit Values for Chemical Substances and Physical Agents.*

n. CAL-OSHA, 8 CCR Chapter 4, Subchapter 7, General Safety Orders

o. CAL-OSHA, 8 CCR Chapter 4, Subchapter 4, Construction Safety Orders

p. Other state, local, and regional safety and health requirements

3 Definitions: The following definitions are provided to help the Contractor to fully understand the various requirements of this attachment.

a. Accident Prevention Plan (APP): A written plan that describes work to be performed and measures to be taken to control hazards associated with materials, services, or equipment. The SSHP may serve as the APP provided it addresses all content requirements of Appendix A of EM 385-1-1.

b. Activity Hazard Analysis: A written form that defines the activities to be performed and identifies the sequence of work, the specific hazards anticipated, and the control measures to be implemented. The format shall be in accordance with Figure 1-1 of EM 385-1-1.

c. Emergency Response Plan: A written plan, which becomes part of the SSHP, to handle anticipated emergencies.

d. Safety and Health Program (SHP): A written safety and health program that describes general occupational safety and health requirements.

e. Site Safety and Health Plan (SSHP): A written plan that describes the site-specific methods by which personnel will meet the safety and health requirements. An SSHP shall be developed for each facility.

f. Injury and Illness Prevention Program (IIPP): The SSHP may serve as the IIPP provided it addresses all content requirements of 8 CCR § 3203.

4 Safety and Health Program (SHP): All Contractors and subcontractors performing on-site hazardous waste activities are required to develop and implement a written Safety and Health Program (general safety and health program elements), in compliance with the requirements of OSHA standard 29 CFR 1926.65 (b)(1) through (b)(4). The Contractor shall provide written certification that the SHP has been developed and is being maintained. The Contractor shall make the SHP available upon request by the Government. Any portions of the SHP that are referenced in the SSHP shall be included as appendices to the SSHP.

5 Site Safety and Health Plan (SSHP): The Contractor shall prepare the detailed site-specific safety and health elements as described in this attachment. The SSHP shall be designed to identify, evaluate, and control safety, health, biological, and radiological hazards, and provide for emergency response. All subcontractors shall comply with the Contractor's SSHP. The SSHP shall be developed, approved, and implemented by a Certified Industrial Hygienist (CIH) and shall comply with all federal, state, regional, and local health and safety requirements. Matters of interpretation of standards shall be submitted to the appropriate administrative agency for resolution. The SSHP shall be kept on site and incorporate the elements contained in Appendix B of ER 385-1-92 and as amplified in this attachment. Some requirements of this section are not intended to dictate site operations and procedures for safety and health, but to specify the information pertaining to the Contractor's safety and health program that is required to be presented in the submittal. Where a specific element is not applicable, the Contractor shall make negative declaration in the plan to establish that adequate consideration was given the topic, and a brief justification for its omission. The CIH and Project Manager shall sign and date the SSHP. Daily safety and health inspections shall be conducted to determine if site operations are conducted in accordance with the approved SSHP, OSHA, USACE, and contract requirements. The Contractor shall correct any deficiencies. The SSHP shall address the safety and health hazards of each phase of site operation. Details about some activities may not be available when the initial SSHP is prepared and submitted. Therefore, the SSHP shall address, in as much detail as possible, all anticipated tasks, their related hazards and anticipated control measures. Further details shall be included in the activity hazard analyses.

The final SSHP generated by the Contractor under this contract shall be furnished to the Contracting Officer (CO) in MS Word 6.0 or higher software, IBM PC compatible format.

a. Acceptance and Modification: The SSHP shall be submitted to the CO for review prior to on-site activities. The CO will review the SSHP to determine if it meets the intent of the safety and health requirements specified. Deficiencies will be brought to the attention of the Contractor, and the Contractor shall revise the SSHP to correct the deficiencies.

The Contractor shall not perform any on-site work until the SSHP has been accepted by the CO, and the Contractor is in full compliance with its terms. Changes and modifications to the SSHP shall be made by the Contractor's CIH with the concurrence of the CO. All hazardous waste operations shall be performed according to the approved SSHP. Any violations of the provisions of the SSHP shall be cause for stopping all affected work until the matter has been corrected.

b. Site Safety and Health Plan Elements: As a minimum, the SSHP shall contain the following elements of ER 385-1-92 and as amplified in this attachment.

1. Site Description and Contamination Characterization: The Contractor shall describe the site location, topography, approximate size, and the past uses of the site, and compile a complete list of the contaminants found or known to be present in site areas to be impacted by work performed. Compilation of this listing shall be based on results of previous studies, or, if studies are not available, the list shall include the likely contaminants based on site history and prior site uses/activities. The Contractor shall include, as applicable, chemical names, the media in which contaminants are found, locations on site, and estimated quantities/volumes to be impacted by site work.

2. Hazard Assessment and Risk Analysis: The Contractor shall provide a complete description of the work to be performed. The Contractor shall identify the chemical, physical, biological, radiological, and safety hazards that may be encountered for each task. Each task is to be discussed separately. A table shall be provided showing chemical hazards anticipated on site along with chemical names, concentration ranges, media in which found, locations on site, estimated quantities/volumes, the applicable OSHA regulatory standards (PELs - TWA, STEL, ceiling concentrations, and skin designation), the most current American Conference of Governmental Industrial Hygienist (ACGIH) threshold limit values (TLVs) and NIOSH-recommended exposure levels (RELs), ionization potential, cancer designation (e.g., Proposition 65 identification), routes and sources of exposure, and physical and toxicological properties. Selection of chemicals as indicators of hazard shall be based on media concentrations, toxicity, volatility, or potential for air entrainment at hazardous levels, and frequency of detection. The Contractor shall specify and justify action levels based upon airborne exposure concentrations and direct skin contact potentials for upgrades and/or downgrades in personal protective equipment levels, implementation of engineering controls and work practice controls, for emergency evacuation of on-site personnel, and for the prevention and/or minimization of public exposure to hazards created by on-site activities. The Contractor shall evaluate exposure to hazardous substances brought on site for the execution of site activities, the potential for injuries from site conditions and activities (e.g., excavation, slips, trips, and falls, electricity, equipment and machinery, etc.), potential for injury from physical agents (e.g., noise, heat and cold stress, vibration, non-ionizing radiation, solar radiation, etc.), the risk to human health from radioactive materials or ionizing radiation, and the potential for illness due to biological agents (e.g., poisonous plants, animals, insects, microorganisms, etc.).

3. Staff Organization, Qualification, and Responsibility: Each person assigned specific safety and health responsibilities shall be identified, and their qualifications and

experience documented by resume in the SSHP. The organizational structure, with lines of authority and overall responsibilities for safety and health of the Contractor and all subcontractors, shall be discussed. An organizational chart showing the lines of authority for safety shall be provided. The Contractor shall obtain the CO's acceptance before replacing any member of the safety and health staff. The request shall include the name and qualifications of each proposed replacement.

(a) Project Superintendent: The Contractor shall provide evidence that the Contractor's full-time on-site project superintendent is designated as, and is qualified to be, a competent person through training in accordance with 29 CFR 1926.32 and 29 CFR 1926.65. The project superintendent shall be experienced in the administration and supervision of hazardous waste projects, including work practices, investigative methods, protective measures for personnel, inspection of work areas, generated waste containment and disposal procedures, decontamination units installation and maintenance requirements, and site safety and health requirements. This designated on-site superintendent shall be responsible for compliance with applicable federal, state, and local requirements, and the Contractor's SSHP. The Contractor shall submit evidence that this person has a minimum of 2 years on-the-job hazardous waste operations supervisory experience.

(b) Certified Industrial Hygienist: The Contractor shall utilize the services of an Industrial Hygienist certified by the American Board of Industrial Hygiene (ABIH) to prepare the Contractor's SSHP, perform initial site-specific training, direct air monitoring and assist the Contractor's superintendent in implementing and ensuring that safety and health requirements are complied with during the performance of all work. The CIH shall visit the site at least once per month for the duration of activities and be available for emergencies, and on a weekly basis, review results of air monitoring and accident reports. The CIH shall have a minimum of 2 years of comprehensive experience in planning and overseeing hazardous waste activities.

(c) Site Safety and Health Officer (SSHO): It is not anticipated that the CIH will be on site continuously throughout the course of the project. Day-to-day industrial hygiene and safety support, including air monitoring, training, and daily site safety inspections, shall be provided by a designated SSHO who shall report directly to the CIH. The Contractor shall ensure the SSHO has a minimum of 2 years working experience in the chemical industry and/or chemical waste disposal industry where EPA Level C personal protective equipment was required, a sound working knowledge of federal and state occupational safety and health regulations, and training in air monitoring practices and techniques. The SSHO shall be assigned to the site at all times when hazardous waste operations are being performed. The SSHO shall have authority to stop work. If the Contractor's operations are performed during more than one work shift per day, an SSHO shall be present for each shift.

(d) Persons Trained in First Aid/CPR. The Contractor shall maintain on site any time hazardous waste operations are conducted at least two persons who are currently trained in first aid and CPR by the American Red Cross or other agency. These persons shall also meet the training requirements specified by the Bloodborne Pathogens standard, 29 CFR 1910.1030. These persons may perform other duties but must be immediately available to render first aid when needed. The names and documentation of training shall be provided.

(e) Occupational Physician. The Contractor shall utilize the services of a licensed physician who is certified in occupational medicine by the American Board of Preventative Medicine, or who, by necessary training and experience is Board-eligible to manage the medical surveillance program. The physician shall have extensive experience in the occupational health area and be familiar with this site’s hazards and the scope of this project. The Contractor shall submit, in writing, the medical consultant’s name, qualifications, and knowledge of the site’s conditions and proposed activities. The physician shall be responsible for developing and implementing a medical monitoring program in compliance with 29 CFR 1926.65.

(f) Testing Laboratory: The Contractor shall provide the name, address, and telephone number of each testing laboratory selected to perform the occupational sample analyses and report the results. Written verification of the following criteria, signed by the testing laboratory principal and the Contractor shall be submitted: (1) The laboratory is proficient to conduct personnel, area, and environmental analysis for organic and inorganic chemicals. The laboratory shall be fully equipped to analyze the required NIOSH, OSHA, and EPA analyses. (2) The laboratory is currently participating in the American Industrial Hygiene Association (AIHA) Proficiency Analytical Testing (PAT) Program and is certified by AIHA.

4. Chemical Information and Material Safety Data Sheets: Prior to the commencement of work, all available information concerning the chemical, physical, and toxicologic properties of each substance known or expected to be present on site shall be made available to the affected employees. Material Safety Data Sheets (MSDSs) are required for chemicals brought on site. This information shall also be included in the SSHP.

5. Accident Prevention: Daily safety and health inspections shall be conducted to determine if site operations are in accordance with the approved SSHP, OSHA, USACE, and contract requirements. In the event of an accident or incident, the Contractor shall immediately notify the CO. Within 2 working days of any reportable accident/injury/illness, the Contractor shall complete and submit to the CO an accident report on ENG Form 3394 in accordance with AR 385-40 and USACE supplements to that regulation.

6. Training: Although OSHA regulations permit varying levels of training based on employee responsibility and exposure potential, the Contractor shall provide training to include (a) initial for all personnel (40 hours of formal off-site hazardous waste activity training, and 3 days field experience under the direct supervision of a trained experienced supervisor), (b) supervisory (an additional 8 hours supervisory training for supervisory personnel), (c) site-specific, and (d) refresher training. Worker courses taken more than 1 year prior to commencement of work are acceptable provided that the individual has

successfully completed the annual refresher training. All persons entering an exclusion or contamination reduction zone shall be given a pre-entry site safety and health briefing. The content, duration, and frequency, of training required for that person shall be described and verified. The Contractor shall append copies of training certificates for its employees to the SSHP.

7. Personal Protective Equipment: A written Personal Protective Equipment (PPE) Program shall be provided in the SSHP. The program shall address all the elements of 29 CFR 1926.65(g)(5) and 29 CFR 1910.134. The Contractor shall specify minimum PPE ensembles (including respirators) necessary for each task/operation based on the hazard assessment/risk analysis, including potential heat stress and associated safety hazards. The plan shall include specific types and materials for protective clothing and respiratory protection. The plan shall establish and justify upgrade/downgrade/evacuation criteria based upon the action levels established. Site workers must have a current medical “fit-for-duty” clearance to use respiratory and other PPE.

8. Medical Surveillance: All personnel performing on-site activities shall participate in an ongoing medical surveillance program meeting the requirements of 29 CFR 1926.65, and ANSI Z-88.2. The medical examination protocols and results shall be overseen by a licensed physician who is certified in occupational medicine by the American Board of Preventive Medicine, or who by necessary training and experience is Board-Eligible. Minimum specific examination content and frequency based on probable site conditions, potential occupational exposures, and required protective equipment shall be provided. Certification of employees’ participation in the medical surveillance program and the written opinion from the attending physician shall be appended to the SSHP.

9. Radiation Dosimetry: Not anticipated.

10. Exposure Monitoring/Air Sampling Program: Where it has been determined that there may be potential employee exposures to and/or off-site migration of hazardous concentrations of airborne substances, appropriate direct-reading (real-time) air monitoring and time-integrated (time-weighted average [TWA]) air sampling shall be conducted in accordance with applicable regulations (i.e., OSHA, EPA, NRC, state). Air monitoring and air sampling must accurately represent concentrations of airborne contaminants encountered on, and leaving, the site. Sampling and analytical methods following NIOSH criteria (for on-site personnel), and EPA (for site perimeter or off-site locations) shall be appropriately utilized. Personnel monitoring samples shall be analyzed only by laboratories successfully participating in, and meeting the requirements of the American Industrial Hygiene Association’s Proficiency Analytical Testing or Laboratory Accreditation Program. Representative meteorological data shall be evaluated and used as an adjunct in determining site layout, and perimeter and any off-site monitoring locations. Where perimeter monitoring/sampling is not deemed necessary, a suitable justification for its exclusion shall be provided. Noise monitoring shall be conducted as needed, depending on the hazard/risk analysis. All monitoring/sampling results shall be

evaluated and appropriate action implemented based upon “action levels.” All personnel exposure monitoring records shall be maintained in accordance with 29 CFR 1910.20.

11. Heat/Cold Stress Monitoring: Heat and /or cold stress monitoring protocols shall be specified and implemented, as appropriate. Physiological monitoring protocols and work/rest schedules shall be developed. The NIOSH/OSHA/ USCG/EPA *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* provides protocols for prevention of heat stress. Heat stress monitoring shall commence at temperatures of 70 degrees Fahrenheit and above. Cold stress monitoring, to help prevent frostbite and hypothermia, shall be conducted following the most current published American Conference of Governmental Industrial Hygienist (ACGIH) cold stress standards.

12. Standard Operating Safety Procedures, Engineering Controls and Work Practices: The SSHP shall specify the following: (a) Site rules/prohibitions (buddy system, eating/drinking/smoking restrictions, etc.); (b) work permit requirements (e.g., radioactive work, excavation, hot work, confined space, etc.); (c) material handling procedures (soils, liquids, radioactive materials); (d) drum/container handling procedures and precautions (opening, sampling, overpacking); (e) confined space entry procedures; (f) hot work, sources of ignition, fire protection/prevention, and electrical safety (ground-fault protection, overhead power line avoidance, etc.); (g) excavation and trench safety; (h) guarding of machinery and equipment; (i) lockout/tagout procedures; (j) fall protection; (k) hazard communication; (l) illumination; (m) sanitation; (n) engineering controls; (o) process safety management; and (p) signs and labels.

13. Site Control Measures: The Contractor shall establish work zones. Access points and work zone delineation (Exclusion Zone, Contamination Reduction Zone, Support Zone) shall be based upon the contamination characterization data and the hazard/risk analysis performed. The SSHP shall include a site map delineating the zones. The SSHP shall also describe on-site and off-site communications, site security (physical and procedural), and general site access.

14. Personal Hygiene and Decontamination: The SSHP shall specify necessary facilities and their locations, and provide detailed standard operating procedures, frequencies, supplies, and materials to accomplish decontamination of site personnel.

15. Equipment Decontamination: The SSHP shall specify necessary facilities, equipment, and their locations; provide detailed procedures, frequencies, supplies, and materials for decontamination; and describe methods to determine adequacy of decontamination of equipment used on site. For sites where radioactive contamination is present, the SSHP shall include levels of removal and fixed contamination acceptable for release from the exclusion zone.

16. Emergency Equipment and First Aid Requirements: The SSHP shall include a discussion of emergency equipment and first aid requirements.

17. Emergency Response and Contingency Procedures (On-Site and Off-Site): Local fire/police/rescue authorities having jurisdiction and nearby medical facilities that could be utilized for emergency treatment of injured personnel shall be contacted in order to notify them of upcoming site activities and potential emergency situations, to ascertain their response capabilities, and to obtain a response commitment. An Emergency Response Plan, which complies with 29 CFR 1926.65(l), and which, as a minimum, addresses the following elements, shall be developed and implemented: (1) pre-emergency planning and procedures for reporting incidents to appropriate government agencies for potential chemical exposures, personal injuries, fires/explosions, environmental spills and releases, and discovery of radioactive materials; (2) personnel roles, lines of authority, communications; (3) posted instructions and list of emergency contacts: physician/nearby medical facility, fire and police departments, ambulance service, federal/state/local environmental agencies, CIH, and Contracting Officer; (4) emergency recognition and prevention; (5) site topography, layout, and prevailing weather conditions; (6) criteria and procedures for site evacuation (emergency alerting procedures/employee alarm system, emergency PPE and equipment, safe distances, places of refuge, evacuation routes, and site security and control); (7) specific procedures for decontamination and medical treatment of injured personnel; (8) route maps to nearest pre-notified medical facility; (9) criteria for initiating community alert program, contacts, and responsibilities; and (10) critique of emergency responses and follow-up. If all personnel will be evacuated from the site and not allowed to assist in handling the emergency, the emergency response plan may be replaced by an emergency action plan complying with 29 CFR 1910.38(a).

18. Logs, Reports, and Recordkeeping: The following logs, reports, and records shall be developed, retained, and submitted to the CO: (1) training logs (site-specific and visitor) and records of radiological instructions and notices to workers; (2) daily safety inspection logs (may be part of the daily QC reports); (3) equipment maintenance logs; (4) employee/visitor register; and (5) environmental and personal exposure monitoring/sampling results.

6 Accident Prevention Plan: The SSHP may serve as the Accident Prevention Plan provided it addresses all content requirements of 29 CFR 1926.65 and Appendix A of EM 385-1-1. The Accident Prevention Plan elements required by EM 385-1-1 but not specifically covered in the SSHP shall be addressed in this section. The Accident Prevention Plan shall be attached to and become part of the SSHP.

7 Activity Hazard Analyses: The Contractor shall prepare an Activity Hazard Analysis for each phase of work. The format shall be in accordance with Figure H of EM 385-1-1. The analysis shall define the activities to be performed and identify the sequence of work, the specific hazards anticipated, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level. Work shall not proceed on that phase until the activity hazard analysis has been accepted and a preparatory meeting has been conducted by the Contractor to discuss its contents with everyone engaged in the activities, including government on-site representatives. The activity hazard analyses shall be continuously reviewed and when appropriate modified to address changing site conditions or operations, with the concurrence of

the CIH, the Site Superintendent, and the CO. Activity hazard analyses shall be attached to and become a part of the SSHP.

8 Emergency Response and Contingency Procedures: Emergency Response and Contingency Procedures as required by 29 CFR 1926.65 shall be prepared. The following emergency equipment items shall be immediately available for on-site use: (1) first aid equipment and supplies approved by the consulting physician; (2) emergency eyewashes/showers; (3) emergency respirators; (4) spill control materials and equipment; and (5) fire extinguishers. The Contractor shall provide telephone numbers and points of contact for emergency services and the appropriate governmental representatives. A map showing the route to the hospital that has been contacted and informed of the type of work and potential hazards on the site shall be provided.

9 Certification of Hazard Assessment: The Contractor shall assess the workplace to determine if hazards are present that necessitate the use of personal protective equipment. The Contractor shall verify that the required workplace hazard assessment has been performed through a written certification (29 CFR 1910.132).

USACE Sample Collection and Preparation Strategies for Volatile Organic Compounds in Solids

(July 1998)

Scope

This document was generated to help implement sample collection and handling procedures that will minimize losses of volatile organic compounds (VOCs) in solid samples and thus obtain more representative VOC results for U.S. Army Corps of Engineers (USACE) environmental projects.[1] This document supplements existing guidance provided in SW-846 Method 5035 in order to resolve and clarify certain technical issues and deficiencies. This policy guidance does not address all facets of VOC sampling and analysis. For example, it does not address laboratory glassware cleaning procedures, the instrumental analysis of VOCs in the laboratory, and sampling design (e.g., how to obtain statistically representative samples of environmental populations). The document presents guidance for the selection of SW-846 methods for the analysis of VOCs in solid matrices and addresses select aspects of sample collection, handling, preparation, and shipment.

Unlike most analytical methods published in SW-846, implementation of Method 5035 impacts multiple technical disciplines. Therefore, successful implementation will require increased communication among members of the project planning team. The final selection of sampling protocol (e.g. field preservation versus EnCore^{TM} sampler) will require input from all data users (e.g. project managers, risk assessors, regulatory specialists, etc.) as well as data implementors (e.g. chemists, geologists, etc). Data Quality Objectives (DQOs) for the project should determine which sampling protocol will be selected.

Introduction

Traditionally, soils and other solid samples have been collected and analyzed for VOCs predominately using the “low-level” method described in SW-846 Method 5030 or 5030A (Update I). Samples were typically collected in 40 ml to 60 ml VOC vials with PTFE-lined septa using techniques that diminished the integrity of the samples. The physical disruption of the native soil structure that resulted during soil sampling exposed VOCs to open atmospheric conditions, giving rise to high analyte losses. In addition, the threads of vials and jars often became covered with small quantities of soil when the samples were being transferred. This prevented the formation of an air tight seal and gave rise to additional losses during storage. The samples were also transported and stored without any preservative measures other than to cool to 4ºC prior to being opened for subsampling in preparation for analysis by heated purge-and-trap

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[1] The term “volatile organic compounds” refers to low molecular weight compounds which possess boiling points below 200^{o}C, are insoluble or slightly soluble in water, and have been traditionally analyzed by purge-and-trap methods.

analyses by GC or GC/MS. Because this storage temperature does not necessarily prevent biological degradation of aromatic VOCs, additional losses may have resulted for these and other compounds. To exacerbate matters, the sample handling procedures performed at the laboratory gave rise to additional VOC losses (e.g., the escape of headspace VOCs when the vials were opened at the laboratory and the losses arising from additional sample disaggregation when subsamples were taken for weighing and subsequent analysis). The samples were then analyzed directly by purge-and-trap.

A “high-level” method was also available (described in Methods 5030 and 5030A). For high-concentration samples, the laboratory could alternatively extract the samples with methanol (or another water-miscible extraction solvent), and subsequently analyze aliquots of the methanol extracts after aqueous dilution, using the purge-and-trap analysis procedure for aqueous samples. Methanol is an excellent preservative for VOCs. However, since methanol was not added in the field at the time of sample collection and the sample collection process was giving rise to high VOC losses (e.g., due to the disaggregation of samples during collection), the addition of methanol at the laboratory was ineffective in stemming VOC losses. Most of the VOCs were being lost before the samples even arrived at the laboratory. In addition, the analyses performed by methanol extractions typically represented a small fraction of the total VOC analyses performed.

A large body of evidence from both federal and private sectors indicated that the procedures described in Methods 5030 and 5030A were giving rise to unrepresentative results as analyte losses from sample collection and analysis were resulting in large negative biases (discrepancies were typically an order of magnitude or more). There were many incidents in which samples were shipped to the laboratory and subsequently reported to be “clean” when field personnel were confident that the samples had been collected from contaminated areas (based on sight or odor descriptions). Hence, alternative sampling techniques were occasionally implemented. The most common involved sleeves or liners (e.g., in the shape of cylindrical tubes) being placed inside sampling devices such as split spoons. The sleeves were then removed and the ends were sealed for transport to the laboratory. This reduced surface exposure. The soils were extruded from the sleeves in the laboratory prior to analysis. However, when the sleeves were only partially filled, headspace losses were problematic. Furthermore, when the sample containers arrived at the laboratory, it was necessary to weigh the samples after they were extruded, resulting in VOC losses.

To address significant problems with the VOC analyses, the methodology for the solid VOC analyses was dramatically revised in Update III of SW-846 (published in the June 13, 1997 Federal Register). In particular, Method 5030A was deleted for the low-level VOC solid analyses and was primarily replaced with Method 5035. A revised high-level method for solids was also presented in Method 5035. However, although the methodology described in Update III of SW-846 represents a significant improvement over that described in prior versions, there are still significant issues that need to be addressed and certain aspects of the methodology that needs to be clarified for USACE work. A higher degree of coordination is required between field and laboratory personnel. Samples must be handled differently from the onset of sample collection, depending upon the action levels for the project and the anticipated concentrations of VOCs at the site.

Summary of Current Method 5035

The two analytical techniques that will be addressed are methanol extraction and vapor partitioning. The new "low-level" method for VOCs is performed by vapor partitioning per Method 5035 (heated purge-and-trap). The new "high-level" VOC method is performed using methanol extraction per Method 5035. After the solid samples are extracted with methanol (or some other water miscible solvent), as described in Method 5035, the extracts are diluted with water and are analyzed essentially as aqueous samples per Method 5030A (purge-and-trap). From an analytical perspective, the low-level method is still a direct analysis method by vapor partitioning and the high-level method still involves solvent extraction followed by a vapor-partitioning analysis technique. The revised methods predominantly differ with respect to the manner in which solid samples are collected and prepared for analysis.

In order to minimize VOC losses, the sample collection and preparation procedures were dramatically modified for both the low-level and high-level methods. The revised sample collection techniques greatly reduce the time in which samples are exposed to atmospheric conditions. In order to help maintain the physical structure of samples for a cohesive granular material, a hand-operated coring device must be used to collect samples of appropriate size for laboratory analysis (e.g., cylindrical soil columns are extruded into vials using disposable plastic syringes with the tapered front ends removed). Chemical preservatives (e.g., sodium bisulfate solution or methanol) must be present in the collection vial prior to introducing the subsample for both the revised low-level and high-level methods. Field personnel transfer samples immediately into preweighed vials containing chemical preservatives. The vials are weighed in the field before use and are subsequently reweighed after the sample aliquots are added to obtain the net sample weights. Alternatively, in order to avoid weighing and preserving the samples in the field, samples for both the low-level and high-level methods may be collected and subsequently stored without preservation, for a maximum of 48 hours, in a coring device such as the EnCore™ [2] sampler (from En Chem, Inc.).

It should be noted that the sample vials for the low-level method are designed to be placed directly in the laboratory's instrument (e.g. auto sampler) so that they remain hermetically sealed until the VOCs are withdrawn during analysis. Therefore, it is critical that only the 40-mL VOC vial (and not the 60 ml VOC vial) that contain the magnetic stir bars be used for the low-level analysis. Recommend that disposable stir bars be used since memory effects have been reported with magnetic stir bars that have been re-used. The entire content of each vial is processed during instrumental analysis. Hence, when low-level VOC analyses of solids are required (as with the collection of aqueous samples for VOCs), it is necessary to collect at least two collocated samples. This gives the laboratory an opportunity to perform an additional analysis should the first analysis be unacceptable. Furthermore, since the vials remain sealed, dilutions cannot be performed for high-concentration samples. Hence, when low-level VOC analyses are required, unless screening for VOCs is performed in the field (to determine whether the samples contain high VOC concentrations), a collocated sample for the high-level method must be collected with each set of low-level samples. Furthermore, since aqueous acidic solutions are

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[2] EnCore™ sampler, En Novative Technologies, Inc., 124 Bellevue St., Green Bay, WI 4302

used to preserve samples for the low-level analyses, low-level samples must be tested for carbonate interferences in the field before the samples are containerized. However, the high concentration method does not suffer from these complications. Carbonates are not problematic for methanol preservation and methanol sample extracts may be diluted in the laboratory when concentrations exceed the calibration range of the instrument. In addition, when samples are preserved with methanol, field personnel are not limited to single grab samples (as in the low-level method) but may subsample several locations in a core or split spoon.

Data Quality Objectives and Selection of Methodology

The development of well defined DQOs during the planning stages of the project is vital to the selection of appropriate methodology. Prior to the selection of methodology, the potential contaminants of concern must be carefully identified. When the nature of the contamination is not well known (e.g., PA/SI), method-specified target analyte lists are typically selected by default. However, in many situations a target analyte list can be reduced based upon historic industrial process and waste disposal practices at the site. If there is no reason to suspect the presence of a contaminant it may be appropriate to omit them from the method analyte list. Since low-level analyses are usually more resource-intensive than high-level analyses, it recommended that rationale for the testing of the more toxic contaminants be carefully evaluated prior to analytical testing (since these contaminants will possess the lowest action levels).

Action levels should be established once the contaminants of concern have been identified (e.g., using regulatory and risk-based criteria). As an illustration, Table 1 lists U.S. EPA Region III Risk-Based Concentrations (RBCs) and Region IX Preliminary Remediation Goals (PRGs) for both residential or industrial sites. Individual states may also impose screening levels that are more restrictive than those listed in Table 1. In order to establish screening level for human-health risk assessment, the PRGs/RBCs listed in Table 1 are typically divided by 10 for noncarcinogenic endpoints (to allow for the presence of multiple contaminants and to ensure that the Hazard Index [HI] does not exceed unity). The Biological Technical Assistance Group (BTAG) RBCs were taken from the *Revised Region III BTAG Screening Levels*, 8-9-95. It is emphasized that these values are extremely conservative (they are based on toxicity to the most sensitive test species) and may not be appropriate for the ecological receptors found on a typical USACE hazardous, toxic, and radioactive waste site. Unfortunately, in the absence of a site-specific biota survey, combined with a literature search for receptor-specific toxicity values, this is the only screening-level information that is typically available. The proposed soil screening level (SSL) values are based upon extremely unrealistic assumptions (e.g., an infinite source of contaminant in constant contact with ground water) and are not recommended for screening purposes. There are times, however, when screening against these values will be required by regulators.

Once action levels are established during the planning stages of the project, in order to select methodology with adequate sensitivity (i.e., to determine whether the low-level or high-level VOC analyses are more appropriate), the action levels must be compared to the quantitation limits of the laboratory that will be performing the actual analyses. Ideally, the action level for each target analyte should be at least two times greater than the laboratory's corresponding quantitation limits.

It is important to note that laboratories frequently fail to report scientifically valid quantitation limits. Quantitation limits have been generally defined as three to ten times the laboratory determined method detection limits. Quantitation limits should be established from the laboratory's lowest calibration standard and then adjusted for method-specific factors such as sample volume and dilutions.. Laboratory detection limits are typically the method detection limits (MDLs) defined in 40 CFR, Part 136, Appendix B. The detection limits for the high-level method are typically 50 times higher than those for the low-level method due to sample dilution (100 uL methanol extract in 4.9 ml water). However, it should be noted that laboratory method detection limit studies are typically performed using "clean matrices" (e.g., sand) and may not reflect method sensitivity in actual environmental matrices of interest. Since, in general, the extraction efficiency for methanol is greater than that for vapor partitioning methods, if the MDL studies were to be performed in actual environmental matrices, the disparity between the detection limits would probably be less prominent (especially for matrices high in organic carbon).

Due to limited data available, a single laboratory's volatile organic compound list (method 8260B), method detection limits and quantitation limits for both the low-level and high-level methods are listed in Table 1. These should not be interpreted as "default" or contract-required compound list, detection and quantitation limits but are presented to illustrate how action levels, quantitation limits, and detection limits should be evaluated to select appropriate analytical methodology.

Sampling and Analysis Strategy

In general, the selection of methodology—the low-level versus the high-level method—will not only be dependent upon the DQOs (as discussed above), but will also be dependent upon the VOC concentrations of the environmental matrices being sampled. This is illustrated in the flow chart shown at Figure 1. As shown in Figure 1, the high-level method is used when VOC action levels or site VOC concentrations are high. The low-level method is used when project action levels and site VOC concentrations are both low. Hence, when action levels are low, the selection of methodology will be dependent upon the level of site contamination; the high level method is typically required when VOC concentrations are greater than 200 ug/kg.

When action levels are low, both low-level *and* high-level samples must be collected or field screening must be performed to determine whether low-level *or* high-level samples must be collected. The collection of both low-level and high-level samples for fixed-laboratory analyses constitutes the most conservative approach and is recommended (e.g., unless definitive on-site analyses are being performed). Furthermore, unless a field GC is being used to screen the samples, it is recommended that field screening be performed according to procedures described in "SOP for On-site Estimation of the Total Concentration at Sampling Locations," developed by the USACE Cold Regions Research and Engineering Laboratory.

Screening at the laboratory is recommended regardless of whether samples were screened in the field (although laboratory screening is more important when field screening is not performed). When both low-level and high-level samples are submitted to the laboratory, the laboratory must screen the samples prior to analysis or perform both low-level and high-level analyses on a "trial-and-error" basis. For example, if the laboratory does not perform screening, initially analyzes a sample using the high-level method, and VOCs are not detected or are detected below the quantitation limits, then the laboratory would be required to analyze the corresponding collocated low-level sample. Conversely, if the low-level sample is initially analyzed and exceeds the calibration range of the instrument, then the laboratory would be required to analyze the corresponding sample using the high-level method.

Regardless of the methodology employed, several collocated samples will generally be required for each sample location (e.g., for each sampling depth for a soil boring). The exact number of required collocated samples will be dependent upon a number of factors; these include the following: Analytical methodology (the high-level versus the low-level method), the field screening results when low-level analyses are required, the laboratory's protocols for screening of samples, and requirements for field QC samples (e.g., matrix spikes and duplicates). For example, when low-level analyses are required and site VOC concentrations are known to be low (e.g., from field screening results), at least two samples must be collected for analysis. When low-level analyses are required and the site VOC concentrations are unknown, at least two samples must be collected for potential low-level analysis and one sample must be collected for potential high-level analysis. However, if the laboratory plans to screen the samples, an aliquot may be taken from the high-level sample or an additional sample may be collected. In addition to the samples collected for instrumental (or potential instrumental) analysis, one collocated sample must be collected for a moisture content determination in order to report the VOC results on a dry-weight basis. Samples for moisture content determinations would not be chemically preserved and may be collected in conventional VOC vials. For quality control samples, one additional sample must be collected for the field duplicate and two additional samples for the matrix spike/matrix spike duplicate. Therefore, a site of unknown VOC concentration and a full set of QC would require a total of six samples; two for low-level analysis, one for high-level analysis, one for field duplicate, and two for matrix spike/matrix spike duplicate. However, given proper coordination with the laboratory and their screening process and batching sequence and the additional sample collected for the low-level analysis, the actual number could be reduced to five samples.

Sample Collection and Preparation Protocols

All VOC sampling procedures for solid waste and soils material for VOC analysis should be compliant with the following criteria. It is important to note that Method 5035 describes laboratory analytical procedures as well as sample preparatory procedures performed in the field and laboratory. Samples analyzed by the low-level and high-level methods should be collected in the field using one of two possible sampling protocols[3] described below. Unless samples are being collected using sampling protocol 1, all soil samples should be chemically preserved in some manner.

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[3] It should be noted that the Engineer Manual does not identify the two sampling strategies as "sampling protocol 1" and "sampling protocol 2." This nomenclature was selected to conveniently describe the sampling strategies discussed in the manual.

Sampling Protocol 1

This sampling protocol consists of a coring device that also serves as a shipping container. Presently, the EnCore^{TM} sampler is the only commercially available coring device that was designed to collect, store and transfer soils with minimal loss of VOCs. The disposable EnCore^{TM} sampler was designed to be a single use coring device that can also store soil in a sealed, headspace-free state without loss in sample integrity. Most soils that require sampling will consist of cohesive granular materials that allow use of such a coring device. EnCore^{TM} currently has available a hand operated coring tool for obtaining 5-gram samples. A 25-gram sampler is also available for the purposes of Toxicity Characteristic Leaching Procedure testing. Note when a 25-gram sampler is used to collect, store and transfer soils from the field, it should not be subsampled in the lab into 5-gram aliquots.

The following is general guidance for the collection of a soil sample using the EnCore^{TM} sampler (or other types of coring tools such as a disposable plastic syringe). After the split spoon is opened and a fresh surface is exposed to the atmosphere, the sample collection process should be completed in a minimal amount of time. Visual inspection and an appropriate screening method may be selected to determine the interval of the soil core to be sampled. Removing a sample from a material should be done with the least amount of disruption (disaggregation) as possible. Additionally, rough trimming of the sampling location’s surface layers should be considered if the material may have already lost VOCs (been exposed for more than a few minutes) or if it may be contaminated by other waste, different soil strata, or vegetation. Removal of surface layers can be accomplished by scraping the surface using a clean spatula, scoop or knife. When inserting a clean coring tool into a fresh surface for sample collection, air should not be trapped behind the sample. An undisturbed sample is obtained by pushing the barrel of the coring tool into a freshly exposed surface and removing the corer once filled. Then the exterior of the barrel should be quickly wiped with a clean disposable towel to ensure a tight seal and the cap snapped on the open end. The sampler should be labeled, inserted into the sealable pouch, immediately cooled to 4 ± 2ºC and prepared for shipment to the lab. If samples are going to be shipped near the weekend or holiday, it is critical to coordinate with the receiving lab to ensure holding time of 48 hours for the EnCore^{TM} sampler is met. Note that a coring device made from a disposable syringe cannot be used for storage or shipment. A separate collocated sample must be collected to determine moisture content.

Sampling Protocol 1 is advantageous because weighing and the addition of preservatives in the field are not required. Because sample preparation is performed at the laboratory, exposure hazards and DOT shipping issues arising from the field application of preservatives such as methanol are avoided. However, samples must be stored at 4 ± 2 C and prepared for analysis within 48 hours of collection. The short holding time for sample preparation usually requires additional coordination with the analytical laboratory and may incur additional costs. Furthermore, the sampling protocol will not be applicable to all solid environmental matrices. Some geological materials are impossible to core (e.g., gravels and hard dry clays).

Sampling Protocol 2

Unlike the first sampling protocol (which applies to only cohesive granular materials), Sampling Protocol 2 is applicable to all solid matrices. As in the first protocol, in order to minimize the physical disruption of the sample, a coring device (e.g., a disposable plastic syringe with the tapered front end cut off and the rubber cap removed from the plunger) is used to transfer cohesive material into the sample vials. Information on how to transfer non-cohesive materials is discussed later. However, all environmental samples must be weighed and chemically preserved immediately in the field rather than in the laboratory. For example (unless there are carbonates), when performing low-level analyses by Method 5035, samples must be preserved in an aqueous sodium bisulfate solution in the field.

VOC vials and bottles used to store samples should be prepared prior to transferring the sample to the container. That is, methanol (or other chemical preservative) and surrogate compounds should be present in the container, and the tared weight recorded prior to introduction of the sample. The difference in weight, measured before and after the sample is introduced, is used to establish the sample's wet weight. All of the containers used for the preparation of samples should be made of glass and have a thick septum cushion between the sealing material (PTFE) liner and cap (rigid plastic screw cap or aluminum crimp top). PTFE-lined caps for bottles should have flexible septum backing and be at least 10 mils thick to ensure a liquid or airtight seal. The appropriate volume and analytical-grade of methanol (or other chemical preservative) may be added by field personnel or the lab that supplies the containers. The lab should also be responsible for providing trip blanks, ambient blanks (e.g. methanol), and introducing the surrogate compounds. Once the methanol (or other chemical preservative) is placed in the vial, it should only be opened to add the subsample.

The sampling protocol for the collection of soil samples using the disposable plastic syringe should follow the same general description identified above for the EnCore^{TM} sampler up until the coring device is removed from the freshly exposed surface being sampled. After this point, follow the steps identified below.

Each sample container should contain methanol (or other chemical preservative) prior to adding the sample. Furthermore, the tared weight of the container should be recorded. If the containers are filled with methanol (or other chemical preservative) by the lab, the meniscus should be marked with a permanent marker to evaluate evaporation or accidental spillage in the field or during shipment. Any sample container that shows a loss of methanol (e.g. meniscus below the line marked by the lab) should be discarded. Since the vial or bottle contains methanol (or other chemical preservative), it should be held at an angle when extruding the sample into the container to minimize splashing. Just before capping, a visual inspection of the lip and threads of the sample vessel should be made, and any foreign debris should be removed with a clean towel, allowing an airtight seal to form. The vial should be gently tapped while holding in an upright position. The purpose of the agitation is to ensure that the preservative completely contacts the soil surfaces and disaggregate any large clumps. The sample vials should not be shaken vigorously or up and down. The weight of each container should be measures and entered into a permanent log book. The difference in weight of the container, measured before and after the sample is added, is used to determine the sample's wet weight. The samples should be placed immediately inside a cooler in an upright position and cooled to 4 ± 2ºC. Because of packaging constraints for shipping (e.g. need for inner receptacles), it is absolutely critical that samples be pre-chilled to 4 ± 2ºC prior to shipment. The samples should then be prepared for shipment to the laboratory following the criteria and regulatory considerations described at the end of this guidance. A separate collocated sample must also be collected to determine moisture content.

If soils are granular or wet enough to flow it may be necessary following the coring to cover the open end of the coring device with aluminum foil in a manner that will maintain sample integrity until the device is rotated up to prevent any losses of material. When sampling gravel, or a mixture of gravel and fines, that cannot be easily obtained or transferred using coring tools, as a last resort, a sample can be quickly transferred using a clean spatula or scoop. Typically the collection vial or bottle will contain methanol (or other chemical preservative), therefore, samples should be dislodged with minimal splashing and without the spatula or scoop contacting the liquid contents. For some solids, a wide-bottom funnel or similar channeling device may be necessary to facilitate transfer to the container and prevent compromising of the sealing surfaces of the container. Caution should be taken in the interpretation of the data obtained from materials that fit this description. Losses of VOCs are likely because of the nature of the sampling method and the noncohesive nature of the material exposes more surface area to the atmosphere than for other types of samples. Another potential source of error during the subsampling process, is the separation of coarser materials from fines, which can skew the concentration data if the different particle sizes, which have different surface areas, are not properly represented in the sample. Therefore, caution should be taken in the interpretation of the data obtained from noncohesive materials.

Some materials (e.g. cemented or noncohesive granular material) that require sampling may be to hard for coring tools to penetrate. Samples of such material can be collected by fragmenting a larger portion of the material using a clean chisel to generate aggregate(s) of a size that can be placed into a VOC vial or bottle containing methanol (or other chemical preservative). When transferring the aggregate(s), precautions must be taken to prevent compromising the sealing surfaces and threads of the container. Losses of VOCs by using this procedure are dependent on the location of the contaminant relative to the surface of the material being sampled. Therefore, caution should be taken in the interpretation of the data obtained from materials that fit this description. As a last resort when this task cannot be performed onsite, a large consolidated sample can be collected in a vapor-tight container and transported to the laboratory for subsampling. Collection, fragmenting, and adding the sample to a container should be accomplished as quickly as possible.

Guidance for the Implementation of Method 5035

Since it is anticipated that cohesive soils (and other aggregate granular material) will primarily be the matrices of interest and Method 5035 will primarily be used to perform both the low-level and high-level VOC analyses, the implementation of Method 5035 for cohesive soils will be discussed in additional detail (based upon this guidance and the guidance presented in SW-846). This section of document addresses several implementation problems that arise when samples are collected using sampling protocol 2.

Field Weighing

When field personnel collect samples using the second sampling protocol, they essentially perform the following activities for both the low and high-level methods: Field personnel weigh the vials containing the liquid preservatives (e.g., aqueous sodium bisulfate and methanol for the low-level and high-level methods, respectively), collect the samples using some type of coring device (e.g., a syringe with its tip removed), extrude the sample cores into the vials, and reweigh the filled vials (to determine the exact weight of the sample added to the preservative).[4] A net sample weight of about five grams is required (assuming a soil density of 1.7 g/cm^3 this corresponds to a soil volume of about 3 cm^3).

The laboratory may add the chemical preservatives to the vials prior to shipping them to the field. Alternatively, field personnel may add the preservatives to the vials immediately prior to the addition of the sample cores.[5] According to Method 5035, all weights must be recorded to within ± 0.01 g. In addition, if methanol is added to the vials in the laboratory, Method 5035 states that the field personnel must verify the weights of the vials containing the methanol to within ± 0.01 g before the core samples are placed into the vials. Although it may be desirable to record weights to the nearest 0.01 g, weight verification to the nearest 0.01 g is often impractical under field conditions. To the extent possible under field conditions, samples should be collected in a “protected” environment to permit accurate weighing. However, accuracy to within ± 0.01 g requires very controlled conditions available to only a limited number of sites (e.g., the weighing must be performed in a building or mobile laboratory). Weights should be recorded to the nearest 0.1 g and verified to the nearest 0.1 g (i.e., to within ± 0.15 g) for both the low-level and high-level analyses. The error associated with a 0.1 g mass discrepancy for a 5-gram sample will not be significant, relative to method analytical error (e.g., there is a 15% error tolerance for instrumental error alone).

Presence of Carbonates

Since acidic preservatives are added to samples collected for low-level analyses, the presence of carbonates are problematic. When low-level samples are preserved in the field, all soil samples should be tested for carbonates prior to sample collection. If effervescence is observed, preservation by acidification is inappropriate. Samples that react with acid preservatives (i.e., effervesce) should be disposed as investigation derived waste (IDW) and not sent to the laboratory for analyses since the analytical results will not be representative of the VOC concentrations in the environmental matrix being sampled.

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[4] According to Method 5035, after sample collection, the sample vials should also be weighed at the laboratory to verify the field weights.

[5] For the low-level method of Method 5035, the preservative consists of 1-gram of sodium bisulfate to 5 mL H_2O (the pH must be $\leq$ 2). For the high-level method, 5-grams of sample is added to 5 mL of methanol.

If carbonates are present, the following options should be considered: performing on-site analysis of the samples (e.g., using a field GC), collecting the samples using sampling protocol 1 and analyzing them at the laboratory within 48 hours of sample collection, or preserving the samples with methanol. Preliminary holding time studies on a reduced list of volatile organic compounds indicate that samples collected without chemical preservation using the EnCore™ sampler will maintain their integrity for up to 7 days when stored at 4 ± 2 C and up to 14 days when stored at -12 ± 3 C. However, the EnCore Sampler has not been demonstrated for compounds with boiling points less than 30 C (e.g. bromomethane, chloroethane, chloromethane, or vinyl chloride). Additional guidance on extending the storage time will be provided as it becomes available. Field preservation with alternative chemical preservation (e.g., copper sulfate) can also be used. However, it should be noted that the techniques described are based upon limited data. As a consequence, in order to use these preservation techniques, regulatory approval and “additional demonstration of performance” would usually be required. For example, “additional demonstration of performance” may involve the collection of duplicates for a portion of the total number of site samples (e.g., 20% of the samples). For each duplicate pair, one sample would be collected using the EnCore™ sampler and analyzed within 48 hours. All the remaining samples would be preserved prior to analysis using one of the techniques described. If the duplicate results were comparable (i.e., within duplicate precision limits), then one would conclude that the protocols maintained integrity of the samples and that the results corresponding to these samples are acceptable (with respect to preservation and holdings times).

Contamination

When samples are preserved with methanol in the field, it is especially critical to avoid the introduction of contamination from external sources such as vehicular emissions or dust. Hence, when samples are preserved with methanol in the field, a methanol blank should be exposed to field conditions during the sample collection process.

Regulatory Considerations for Sample Shipping for Method 5035

With the recent promulgation of EPA SW-846 Method 5035, a number of concerns and inquires have been made regarding the potential regulatory impacts to field personnel tasked with sampling, preserving, and shipping environmental samples using this method. When samples are collected using the second sampling protocol above, DOT shipping requirements (as well as health and safety issues) need to be taken into account for the preservatives. Depending on the quantity and method of packaging, sodium bisulfate and methanol may be DOT Hazardous Materials and may be subject to the DOT hazardous materials regulations. It should be noted that DOT regulations associated with the use of preservatives in the field may be avoided by using the first sampling protocol (e.g., EnCore™ core samples do not require chemical preservation in the field).

This section addresses specific aspects of the Department of Transportation (DOT) and International Air Transportation Association (IATA) regulations for the shipment of samples prepared in the field for laboratory analysis by Method 5035. When it is necessary to preserve samples in the field, there are three possible sample shipment scenarios: 1) small quantity exception; 2) limited quantity DOT hazardous material; or 3) fully regulated DOT hazardous material. These three options and associated requirements are outlined below.

Shipment as a Small Quantity Exception

The recommended way to ship methanol or sodium bisulfate preserved samples is in accordance with 49 CFR 173.4 under the small quantity exception. If the criteria of this regulation as described below are met, shippers are not subject to the DOT Hazardous Materials Regulations or the associated personnel training. The Hazardous, Toxic, and Radioactive Waste Center of Expertise is coordinating with the Packaging, Storage, and Containerization Center at Tobbyhanna Army Depot, Tobbyhanna, PA to develop standard 49 CFR 173.4 tested and certified packaging to be used by field personnel.

Criteria

Inner Container Limit: 30 ml {49 CFR 173.4(a)(1)(i)}

Total Net Quantity Outer Package Limit: 500 ml {IATA Dangerous Goods Regulations}
Package Certification: 49 CFR 173.4 (a)(10) Certification

Shipping Paper: Not Required, but Air waybill must be marked "Dangerous Goods in Excepted Quantities"

Marking: 49 CFR 173.4 (a)(10) Certification

Labeling: Not Required

Placarding: Not Required

DOT HMR Training: Not Required

NOTE: DOT considers the 30 ml inner container limit to include both methanol and soil because by definition the contents of the vial are a slurry containing free liquid. Therefore, in order to not exceed this 30 ml criteria and assuming a 1:1 ratio of methanol to soil, the recommended volume of methanol should not exceed 10 ml. The absolute volume would be 15 ml of methanol to 15 grams of soil.

Shipment as Limited Quantity Exception

Methanol or sodium bisulfate preserved samples greater than 49 CFR 173.4 inner-container quantities (e.g. 30 ml) will void the 49 CFR 173.4 small quantity exception and samples should be shipped in accordance with the DOT Limited Quantity Exception.

Criteria

Inner Container Limit: 49 CFR 172.101 Table, Column 8A criteria and for air transportation 49 CFR 172.101 Table, Column 9A/9B

Outer Container Limit: 49 CFR 172.101 Table, Column 8A criteria and for air transportation 49 CFR 172.101 Table, Column 9A/9B

Package Certification: 49 CFR 172.101 Table, Column 8A criteria

Shipping Paper: Required

Marking: PSN, UN#, orientation arrows, shipper name & address

Labeling: Required for air transportation 49 CFR 172.101 Table, Column 6

Placarding: Not required

DOT HMR Training: Required {49 CFR 172.700}

DOT Regulated Hazardous Materials Shipments, Fully Regulated

If shippers *do not* take a limited quantity exception and their materials are regulated in commerce, they must have DOT specification packages and will have to consider the “cooler” a DOT overpack in accordance with 49 CFR 173.25.

Criteria

Inner Container Limit: For air transportation 49 CFR 172.101 Table, Column 9A/9B

Outer Container Limit: For air transportation 49 CFR 172.101 Table, Column 9A/9B

Package Certification: UN Specification 49 CFR 172.101 Table, Column 8B criteria

Shipping Paper: Required

Marking: PSN, UN# orientation arrows, shipper name and address, inner packages comply with prescribed specifications 173.25(a)(4)

Labeling: As Required by 49 CFR 172.101 Table, Column 6

Placarding: As Required by 49 CFR 172.500

DOT HMR Training: Required

Site Safety

Methanol is a toxic and flammable liquid. Therefore, methanol must be handled with all safety precautions related to toxic and flammable liquids. Inhalation of methanol vapors must be avoided. Vials would be opened quickly during the sample preservation procedure. Methanol must be handled in a ventilated area. Protective gloves should be worn when vials containing methanol are handled. Methanol should be stored away from open flames, areas of extreme heat, and other ignition sources. Vials containing methanol should be refrigerated (e.g., stored in coolers with ice).

Sodium bisulfate is a strong mineral acid and must be handled with all safety precautions related to acids. Contact with the skin and eyes should be avoided. Protective gloves and eye protection should be worn with vials containing sodium bisulfate.

Costs for Implementing Method 5035

There will be additional costs associated with the implementation of Method 5035. The major laboratory cost associated with the new method is the $25,000.00 price tag for the auto-sampler. However, this cost is incurred no matter which sampling protocol is selected. The costs associated with the actual sampling process is discussed further. The cost of the EnCore^{TM} containers is higher than conventional VOC vials. Assuming three cores will be required for each sampling location, the cost of the EnCore^{TM} containers is approximately $25 dollars more than conventional containers (including the plastic syringes used to collect the samples). In addition to the containers, there is a one time cost for the stainless steel T-Handle and Extrusion tools ($125.00 and $175.00 respectively) needed to use the EnCore^{TM} samplers. The alternative costs associated with performing preservation in the field is more significant. Preservation in the field may take up to an additional 50 percent of time to collect, preserve and weigh the sample vials because of the immediate need to both collect and preserve the soil samples. This in turn may require an additional person on site. The personnel responsible for preserving and weighing the samples should be experienced in analytical techniques. Since methanol acts as an absorbent to volatile vapors, ambient blanks will also be necessary at the cost of one volatile analysis. The cost to ship the Small Quantity Exception is equivalent to shipping the EnCore^{TM} sampler. However, the surcharge to ship as Limited Quantity Exception can more than double the cost. Therefore, actual cost impact to a project is more significant for field preservation then shipment via the EnCore^{TM} sampler.

The most significant issue that must be addressed is the collection of samples in a soil boring that will be analyzed based on field screening results. For example, in the case of 100 foot boring, samples may be collected every 10 feet with the stipulation that the three samples that exhibit the highest field screening result will be submitted to the lab for analysis. While field screening will determine which samples are analyzed, the method 5035 protocol requires collection of all samples (e.g. EnCore^{TM} or field preserved) immediately. The net result in both cases are seven sample intervals will be discarded. Samples collected by the EnCore^{TM} samplers will result in an excess of 21 samples (a minimum of three samplers per interval). Samples collected and immediately field preserved will also result in excess of 21 sample containers. However, unlike the EnCore^{TM} samplers that can be extruded and treated as IDW, the preserved samples must be managed as a hazardous waste (e.g. lab pack) unless excluded because it meets the criteria of a conditionally exempt small quantity generator’s waste.

Possible Chemical Interactions

Although not substantiated, there have been two occurrences with methanol and sodium bisulfate preservation that require some discussion. In the first case, soils that contain aluminum silicates may act as a catalyst causing the conversion of methanol to acetone. The possible mechanism for this interaction is being researched. In the second case, soils like lignite or peat contain a polymeric constituent known as humic acid that may also interact with sodium bisulfate to form acetone. Until either of these two mechanisms can be confirmed or denied, projects should evaluate the potential for acetone to be a site contaminant. For example, if acetone is not an analyte of concern, then the issue may not impact your project decisions. However, those projects that cannot remove acetone from the analyte list should be aware of these possible interactions and any acetone detects should be evaluated. A logical source of acetone contamination is the laboratory. Therefore, site specific sources should always be assessed and not necessarily attributed to one of the above interactions.

Alternative Storage Container for Soils

A recent study (U.S. Analytical Laboratory - Kimberly, Wisconsin) has shown that soil samples may also be collected in conventional 40 ml VOA vials with Teflon lined septa (e.g. vials generally used to collect water samples for VOA analysis). This soil sample collection procedure follows the generally accepted practice to generate a soil core of appropriate dimension from the freshly exposed surface being sampled. At this point, the soil core is extruded into an empty (e.g. no preservative), pre-weighed VOA vial (that may contain a cross shaped magnetic stir bar) and immediately closed. Although there is head space in the vial, the study demonstrated that there is little or no loss of volatiles from the vial (provided the septum remains in tact and is properly sealed). Once collected, the vial is then placed inside a cooler, chilled to 4 ± 2ºC and sent to the laboratory for analysis. The holding time study indicated that samples collected without chemical preservation will maintain their integrity for 5 to 7 days when stored at 4 ± 2ºC (in the 40 ml VOA vial). Therefore, upon receipt of samples from the field, the laboratory would have 5 to 7 days to add methanol or other preservative to the vials (by puncturing the septum with a 22-gauge needle or smaller). Note this study was performed with the full list of volatile organic compounds and not a subset of compounds (e.g. 63 compounds including compounds with boiling points less than 30ºC). Additional guidance on extending the storage time (for both pre- and post-preservation) for this procedure will be provided if it becomes available.

Like Sampling Protocol 1, this procedure is advantageous because weighing and the addition of preservatives (e.g. methanol) in the field are not required. In addition, sample preparation is performed at the laboratory, exposure hazards, and DOT shipping issues arising from the field application of preservatives such as methanol are avoided. Note, this is a closed-system that follows the intent of using a hermetically sealed vial as identified in method 5035. Prior to implementation regulatory approval would be recommended.

References

Engineer Manual 200-1-3 Requirements for the Preparation of Sampling and Analysis Plans

Test Methods for Evaluating Solid Waste, SW-846 Final Update III, Method 5035 Closed System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples. U.S. EPA, December 1996

U.S. Environmental Protection Agency, "Clarification Regarding Use of SW-846 Methods", Office of Solid Waste and Emergency Response, August 7, 1998.

Table 1: VOC soil screening levels versus method sensitivity for the low-level and high-level methods reported in units of mg/kg (ppm).

COMPOUND	LOW LEVEL		HIGH LEVEL		REGION IX		REGION III		BTAG[3]	SSL[4]
	MDL	QL*	MDL	QL**	IND.[1]	RES.[2]	IND.[1]	RES.[2]	RBC	
Acetone	na	na	0.160	0.5	8,800	2,100	200,000	7,800	na	8
Acrolein	na	na	0.100	0.5	0.34	0.1	41,000	1,600	na	na
Acrylonitrile	0.00056	0.005	0.02	0.25	0.47 c	0.19 c	11 c	1.2 c	na	na
Allyl chloride	0.00067	0.005	0.04	0.25	33,000	3,200	100,000	3,900	na	na
Benzene	0.0005	0.005	0.02	0.25	1.4 c	0.63 c	200 c	22 c	0.1 fa	0.02
Bromochloromethane	0.00032	0.005	0.020	0.25	na	na	na	na	na	na
Bromodichloromethane	0.0003	0.005	0.02	0.25	1.4 c	0.63 c	92 c	10 c	na	0.3
Bromoform	0.00056	0.005	0.024	0.25	240 c	56 c	720 c	81 c	na	0.5
Bromomethane	0.001	0.01	0.020	0.5	23	6.8	2,900	110	na	0.1
2-Butanone (MEK)	na	na	na	na	27,000	7,100	1,000,000	47,000	na	na
Carbon disulfide	0.00072	0.005	0.024	0.25	24	7.5	200,000	7,800	na	14
Carbon tetrachloride	0.00055	0.005	0.021	0.25	0.5 c	0.23 c	44 c	4.9 c	<0.3 fa	0.03
Chlorobenzene	0.00041	0.005	0.021	0.25	220	65	41,000	1,600	0.1 fa	0.6
Chlorodibromomethane	0.00028	0.005	0.020	0.25	23 c	5.3 c	68 c	7.6 c	na	0.2
Chloroethane	0.00035	0.005	0.020	0.25	na	na	820,000	31,000	na	33
2-Chloroethyl vinyl ether	0.00031	0.005	0.038	0.25	na	na	51,000	2,000	na	na
Chloroform	0.00075	0.01	0.024	0.5	0.53 c	0.25 c	940 c	100 c	<0.3 fa	0.3
Chloromethane	0.00053	0.005	0.025	0.25	2.6 c	1.2 c	440 c	49 c	na	0.007
1,2-Dibromo-3-chloropropane	0.00088	0.01	na	na	1.4 c	0.32 c	4.1 c	0.46 c	na	0.0006
1,2-Dibromoethane	0.00043	0.005	0.023	0.25	0.02 c	0.0049 c	0.067 c	0.0075 c	5 fl	0.0002
Dibromomethane	0.00055	0.005	0.023	0.25	na	na	na	na	na	na
1,2-Dichlorobenzene	0.00057	0.005	0.022	0.25	700 s	700 s	180,000	7,000	<0.1 fa	6
1,3-Dichlorobenzene	0.00062	0.005	0.024	0.25	860 s	500 s	180,000	7,000	na	na
1,4-Dichlorobenzene	0.00081	0.01	0.024	0.5	8.5 c	3.6 c	240 c	27 c	<0.1 fa	1
cis-1,4-Dichloro-2-butene [5]	na	na	0.080	0.25	0.017 c	0.0075 c	na	na	na	na
trans-1,4-Dichloro-2-butene [5]	0.00032	0.005	0.065	0.25	na	na	na	na	na	na
Dichlorodifluoromethane	0.00061	0.005	0.023	0.25	310	94	410,000	16,000	na	7.5
1,1-Dichloroethane	0.00037	0.005	0.025	0.25	17,000	5,000	200,000	7,800	<0.3 fa	11
1,2-Dichloroethane	na	na	0.020	0.25	0.55 c	0.25 c	63 c	7 c	870 fa	0.01
1,1-Dichloroethene	0.00056	0.005	0.023	0.25	0.08 c	0.037 c	9.5 c	1.1 c	na	0.03
trans-1,2-Dichloroethene	0.00059	0.005	0.025	0.25	270	78	20,000	780	<0.3 fa	0.2
1,2-Dichloropropane	0.00033	0.005	0.018	0.25	0.68 c	0.31 c	84 c	9.4 c	na	0.02
cis-1,3-Dichloropropene [6]	0.00020	0.005	0.025	0.25	0.55c	0.25 c	33 c	3.7 c	<0.3 fa	0.001

	LOW LEVEL		HIGH LEVEL		REGION IX		REGION III		BTAG[3]	
COMPOUND	MDL	QL*	MDL	QL**	IND.[1]	RES.[2]	IND.[1]	RES.[2]	RBC	SSL[4]
trans-1,3-Dichloropropene [6]	0.00026	0.005	0.024	0.25	na	na	na	na	na	na
Ethyl ether	0.00068	0.01	0.035	0.5	1,800 s	1,800 s	410,000	16,000	na	na
Ethylbenzene	0.00045	0.005	0.023	0.25	230 s	230 s	200,000	7,800	0.1fa	5
Hexachlorobutadiene	0.00072	0.01	0.024	0.5	24 c	5.7 c	73 c	8.2 c	na	0.1
2-Hexanone	0.00081	0.01	0.055	0.5	na	na	na	na	na	na
Iodomethane	0.00041	0.005	0.060	0.25	na	na	na	na	na	na
Isopropylbenzene	0.00072	0.01	0.020	0.5	na	na	na	na	na	na
Methylene chloride	na	na	0.025	0.25	18 c	7.8 c	760 c	85 c	<0.3 fa	0.01
4-Methyl-2-pentanone (MIBK)	0.00061	0.005	0.065	0.25	2,800	770	160,000	6,300	na	na
Naphthalene	0.00057	0.005	0.023	0.25	na	na	na	na	na	na
Styrene	0.00043	0.005	0.019	0.25	680 s	680 s	410,000	16,000	0.1 fa	2
1,1,1,2-Tetrachloroethane [7]	0.00042	0.005	0.021	0.25	5.4 c	2.4 c	220 c	25 c	<0.3 fa	na
1,1,2,2-Tetrachloroethane [7]	0.00036	0.005	0.020	0.25	1.1 c	0.45 c	29 c	3.2 c	<0.3 fa	0.001
Tetrachloroethene (PCE)	0.00078	0.01	0.022	0.5	17 c	5.4 c	110 c	12	<0.3 fa	0.04
Toluene	0.00054	0.005	0.022	0.25	880 s	790	410,000	16,000	0.1 fa	5
1,2,4-Trichlorobenzene [7]	0.0008	0.01	0.023	0.5	5,500 s	570	20,000	780	<0.1 fa	2
1,1,1-Trichloroethane [7]	0.00033	0.005	0.020	0.25	3,000 s	1,200	72,000	2,700	<0.3 fa	0.9
1,1,2-Trichloroethane [7]	0.00041	0.005	0.025	0.25	1.6 c	0.65 c	100 c	11 c	<0.3 fa	0.01
Trichloroethene (TCE)	0.00052	0.005	0.021	0.25	7.0 c	3.2 c	520 c	58 c	<0.3 fa	0.02
Trichlorofluoromethane	0.00068	0.005	0.022	0.25	1,800	380	610,000	23,000	na	13
1,2,3-Trichloropropane	0.00095	0.01	0.023	0.5	50	15	10,000	390	na	na
Vinyl acetate	na	na	0.085	0.25	2,600	780	1,000,000	78,000	na	84
Vinyl chloride	0.00053	0.005	0.018	0.25	0.035 c	0.016 c	3 c	0.34 c	0.3 fa	0.01
o-Xylene [7]	0.00051	0.005	0.022	0.25	320 s	320 s	1,000,000	160,000	<0.1 fa	na
m-Xylene [7,8]	0.00014	0.005	0.022	0.25	320 s	320 s	1,000,000	160,000	<0.1 fa	na
p-Xylene [7,8]	0.00014	0.005	0.022	0.25	320 s	320 s	na	na	<0.1 fa	na

<u>FOOTNOTES / REMARKS</u>:

[1] Industrial Exposures
[2] Residential Exposures
[3] Biological Technical Assistance Group
[4] Soil Screening Level
[5] PRG/RBC is not isomer-specific
[6] CASRNs identified in Method 5035 and the PRG/RBC table do not agree. Note also that the PRG/RBC tables do not specify cis or trans.
[7] BTAG values are not isomer-specific.
[8] MDLs apply to total m/p-xylene

The letter “c” denotes a carcinogenic endpoint.
The letter “m” indicates that the value is based on a non-risk “ceiling limit” of 10^5 mg/kg (or maximum).
The letter “s” indicates that the value is based on the EPA Region IX soil saturation equation

* Quantitation limits for the low level method were established as the typical lowest-level standard of the initial calibration.

** Quantitation limits for the high-level method were established by multiplying the on-column concentration of the typical lowest level initial calibration standard times 50 to account for dilution of the samples (100 uL in 4.9 ml water)

Note: Shading indicates compounds that have at least one soil screening criteria less than quantitation limit of high-level method

na - Information not available

Dedicated Bladder Pump Installation SOP

Dedicated Well Wizard® Model T1200M bladder pumps shall be used to accomplish the low-flow ground water purging and sampling from designated monitoring wells at this site. These pumps are field controlled to operate at low-flow rates between 350 –450 milliliters per minute. The pumps operate with a unique, gentle action ideal for low-flow sampling. Timed on/off cycles of compressed air (determined by pump controller settings) alternately squeeze the flexible bladder to displace water out of the pump (and out the discharge tubing), and release it to allow bladder refill by submergence without creating any disturbance that could possibly affect sample chemistry.

Each bladder pump consists of a stainless steel casing and Teflon bladder with a check ball-valve at the bladder discharge and inlet ends. Teflon-lined polyethylene twin bonded tubing (consisting of 3/8-inch O.D. sample tubing and ¼-inch O.D. compressed air supply tubing) is connected to the pump and to a well cap at the top of the PVC riser.

Pumping rates are regulated by a specialized Well Wizard® air controller unit. The compressed air source for the controller may be a Well Wizard®12-volt DC air compressor, gasoline-powered motor/air compressor, or a compressed nitrogen bottle. Air hoses with quick connect fittings supply air to the controller, and connect the controller to the bladder pump quick connect air fitting on the PVC well cap.

Bladder Pump Installation

The bladder pump manufacturer shall be provided with sufficient monitoring well and pump intake depth specifications to allow selection of correct tubing lengths and well caps. The well "delta" (distance from top of well riser, and top of protective steel casing) shall also be measured to ensure sufficient space for bladder pump quick connect fittings and sample tubing on the new PVC well cap. The manufacturer shall then preassemble the complete pump system for each well (bladder pump without inlet screen, bonded sample and air tubing, water level probe and tubing, and well cap with quick connect fittings). A stainless steel pump inlet screen shall be attached to each pre-assembled bladder pump system per manufacturer's specifications prior to being installed into the designated monitoring well.

Pump system installation consists of: unlocking/opening the protective steel well cover; opening and removing the existing riser cap; carefully lowering the bladder pump, water level probe and uncoiled tubing assembly into the designated monitoring well; and securely seating the PVC well cap containing the brass quick-connect fittings. The protective steel well cover may then be securely locked.

Immediately following pump installation, the surface of the new PVC well cap should be surveyed for elevation to allow for corrected static water level readings. Pumps shall be checked for satisfactory operation after waiting for a recommended 24-hour period to allow for tubing stretch. Static water levels shall also be measured after waiting the 24-hour period.

SCOPE OF WORK
BARGE FOR SUBSURFACE EXPLORATIONS
McCormick and Baxter Superfund Site
Stockton, California

CONTRACTOR:

CONTRACT NUMBER:

POC: Telephone:
Fax:

1.0 GENERAL REQUIREMENTS

This scope of work (SOW) describes the use of a barge to complete subsurface explorations with a Site Characterization and Analysis Penetrometer System (SCAPS) unit, at the Old Mormon Slough adjacent to the McCormick and Baxter (M&B) Superfund Site, in Stockton, California (Attachment 1). The SCAPS unit uses penetrometer technology to determine soil physical properties, while measuring chemical properties, and to obtain soil and groundwater samples. The drilling shall be on the Old Mormon Slough off the Stockton Deep Water Channel on the San Joaquin River. The Old Mormon Slough is approximately 2,500 feet long and 180 feet wide and most of slough is approximately 10 feet deep. The slough has an approximately 3-foot tidal influence. From the barge, the SCAPS unit will conduct approximately 18 penetrations beneath the slough at locations determined by U.S. Army Corps of Engineers (USACE) personnel.

2.0 PROJECT BACKGROUND AND LOCATION

The M&B wood preserving company operated on a 29-acre site at 1295 West Washington Street in Stockton, California, from 1942 until 1990. M&B chemically treated wood products in pressure cylinders with various preservation solutions containing creosote, pentachlorophenol (PCP), arsenic, copper, chromium, and zinc. Solvents or carriers for these preservatives reportedly included petroleum-based fuels such as fuel oil kerosene and diesel, butane, and ether. The chemicals of concern (COCs) identified for the M&B site are PCP, carcinogenic polynuclear aromatic hydrocarbons (cPAHs), arsenic, dioxins/furans, and naphthalene. Dioxins/furans are believed to have originated as manufacturing impurities contained in the PCP solution.

The M&B site is located in an industrial area near the junction of the I-5 interchange and State Route 4. The northern boundary of the site borders Old Mormon Slough, which empties into the Port of Stockton turning basin on the San Joaquin River. The site terrain is relatively flat, and the only remaining aboveground structures at the site are an office building, two storage sheds, a wooden tower, several unused buildings, an asphalt pad, and a lift station for a stormwater collection system. The former processing areas and tank farm are paved, and the rest of the site is unpaved with limited vegetative cover. A layer of gravel between 1 and 3 feet thick is found across most of the site. The subsurface strata most likely to be encountered are alluvial fan and fluvial deposits including silt, silty clay, clayey silt, silty sand, sand, and coarse-grained sands and gravels.

Personnel from the U.S. Environmental Protection Agency (EPA) and the USACE Albuquerque, Seattle, Sacramento, and Tulsa Districts are conducting a characterization of the slough sediments to determine the extent of creosote contamination. Data collected from previous investigations suggest that slough sediment contamination is likely.

The Contractor shall arrange for site entry though Randy Olsen, USACE at (916) 557-5285.

3.0 PROTECTION OF SITE

The Contractor shall maintain existing survey monuments and existing structures and protect them from damage from equipment and vehicular traffic. Any items damaged by the Contractor shall be repaired to USACE specifications by the Contractor at the Contractor’s expense. Local and state water and air pollution requirements will be met and closely monitored.

All litter and debris will be cleaned up daily and placed in containers for proper disposal. After completion of work, the Contractor shall remove all debris, waste, trash, and unused materials or supplies and shall restore the site as closely as possible to its original condition.

The Contractor shall make every effort to mitigate the possibility of spills caused by the investigation operations. If a non-HAZWOPER-qualified Barge Contractor is selected, this Contractor is not authorized to provide emergency response operations for releases of, or substantial threats of releases of, hazardous substances. The Contractor shall provide a sorbing hydrophobic boom or pad in the event of a hydrocarbon slick or sheen produced by the investigation operations. The sorbing equipment shall conform to the requirements and specifications contained in US Coast Guard (USCG) regulations. The Tulsa District’s (SCAPS) Site Safety and Health Plan (SSHP) shall discuss cleanup and decontamination.

4.0 DESCRIPTION OF WORK AND SERVICES

The Contractor shall furnish all services, materials, equipment, supplies, and personnel necessary to perform the services as required and described in this SOW. The Pricing Schedule summarizes work to be completed for this SOW. All work is contingent upon available funding.

The Contractor is responsible for locating the nearest accessible loading and off-loading location to the site. The Contractor is responsible for loading, off-loading, securing and transporting the SCAPS rig to the site from loading location. The Contractor is responsible for securing the barge in a specific location so that the SCAPS rig can push to a specified depth. It is imperative that there is no movement of the barge from the specified location during drilling, as movement may cause damage to the SCAPS drill rig. The Contractor is responsible for any damage to the SCAPS rig caused by the movement of the barge during drilling operations.

Extreme caution will be used when operating within Old Mormon Slough to prevent or minimize disturbance to the slough sediments since the sediment may be contaminated. The Contractor shall use best management practices (BMPs) to ensure that physical displacement of the bottom sediments to the surface especially near the mouth of the slough is minimized or prevented. BMPs may include moving the barge during high tide. During daily travel to and from the barge, the support launch will observe "make no wake" speeds and slower depending on the observed sediment disturbance. When maneuvering the barge into place, the support vessel operator will use the minimum viable speed and throttle slowly to minimize sediment disturbance caused by propeller wash. When securing the barge for SCAPS operation, the methods of securing shall be evaluated depending on SCAPS requirements, including tying off to existing pilings (preferred method), anchoring, or placing spuds (least preferred method). If anchorage or spuds placement is used, then the securing equipment will be placed and removed slowly so that sediments will settle off and not be distributed through the water column.

Securing devices that come in contact with the slough sediments will be decontaminated at the end of each operating day by qualified USACE personnel. Visible sediments will be removed from the equipment using a high-pressure power washer. Bails or sorbing materials may be placed to collect the residual sediment and the material shall be containerized.

The Contractor is requested to move the barge to a new boring at the end of the drilling day so that drilling may commence early each morning using BMPs.

4.1 PERSONNEL

The Contractor shall provide all necessary personnel consisting of at least one experienced barge pilot and one helper. The operator shall have a minimum of 3 years experience operating the equipment provided. The Contractor shall have a current Marine/River License and applicable insurance/permits to perform the services specified in this scope of work.

4.2 EQUIPMENT

The Contractor shall provide one barge capable of allowing a SCAPS drill rig to complete borings to a specified depth (approximately 150 feet bgs). The equipment must allow for the safe working conditions for the SCAPS crew during casing and rod penetration and removal and sample collection, and the movement of personnel around the drilling equipment. The work area required by the SCAPS drill rig and grouting/decontamination trailer is approximately 20 feet by 70 feet (see figures in Attachment 1). The barge shall be fully maintained, in good condition, and complete with all necessary accessories and supplemental equipment conforming to the manufacturer's specifications for the type and size required. The Contractor shall provide all appropriate safety equipment for all personnel aboard, which may include approximately four to six USACE personnel. The Contractor shall meet all standards and specifications as outlined in EM 385-1-1 3 September 1996 (The Safety and Health Requirements Manual) and 29 CFR 1915 (Maritime Standards).

The barge shall be of sufficient size to allow for a 20- by 70-foot work area with a minimum of a 6- to 8-inch hole (moon pool) to accommodate the downhole casing and rods. The hole will also be center of gravity for the SCAPS drill rig. The hole needs to be located approximately 28 feet from the end of the work area, along the centerline of the barge. The 6- to 8-inch, minimum, hole should be rigid and cased to withstand the lateral force of the push pipe. Therefore the Contractor shall ensure that the barge is stable and maintains the exact location regardless of weather or tidal conditions. The SCAPS equipment weight is approximately 50,000 pounds.

During SCAPS operations, USACE personnel will establish an exclusion zone, which is an area where contamination can occur. During intrusive sampling, the exclusion zone will include the area of the vessel in which sediments are handled. Only authorized field personnel will be allowed in the exclusion zone.

The Contractor shall provide the necessary equipment/boat to transport USACE personnel to and from the barge each day at any time. The Contractor shall provide a minimum of three USGS-approved personnel flotation devices for the government use.

The Contractor is responsible for equipment maintenance. Any downtime associated with the maintenance or repair of any piece of the equipment will be at the cost of the Contractor, and not the federal government.

5.0 PROJECT SUBMITTALS

Prior to *any* on-site work, the Contractor will submit the following items to the USACE Project Leader. Five copies of all documents shall be submitted. No mobilization will occur until the USACE Project Leader has reviewed the following documents:

- Proof of Worker's Compensation Insurance
- Marine/River License
- Applicable Insurance & Permits
- Contractor's Accident Prevention Plan (APP) and Injury and Illness Prevention Program (IIPP)

The Contractor shall submit an APP and Injury and IIPP to USACE. The Contractor will address all USACE comments and a final version of the submittal will be provided to the USACE Project Engineer. The Contractor must obtain USACE final approval of submittals a minimum of 12 days before mobilization to the site.

The Contractor shall provide USACE with a daily report documenting the Contractor's on-site personnel, material used, hours worked, repairs completed (including downtime for repairs and anticipated repair completion schedule if repair time exceeds work day), and any accidents or unusual events. This daily report shall be provided within 24 hours after the actual workday.

6.0 HEALTH AND SAFETY

Cal-OSHA requires employers to develop and implement a written IIPP. The IIPP shall be integrated into one site-specific document along with the USACE-required APP and Activity Hazard Analysis (AHA).

The Contractor's IIPP shall interface with the USACE Tulsa District SSHP. The IIPP shall incorporate the requirements of Cal-OSHA Standard 8 CCR §1509, §3203, and §8350 *(Injury and Illness Prevention Program)*; the USACE APP and AHA (Appendix A and Figure 1-1, respectively, in EM 385-1-1, Safety and Health Requirements Manual, 3 September 1996); and other federal, state and local regulations. Site work shall not commence on a project until the COR has accepted the IIPP. The Contractor and its employees shall read and follow the IIPP.

The Contractor shall not conduct any hazardous waste operations or be in the exclusion or contamination reduction zone when others are conducting hazardous waste operations.

All recordable accidents/injuries/illnesses shall be reported immediately. A completed ECG 3394, Accident Investigation Report, shall be submitted within 2 working days in accordance with AR 385-40 and USACE Supplement 1 to the regulation.

7.0 PERIOD OF SERVICE

All work and services shall be completed within 60 calendar days of the notice to proceed.

The work shall be scheduled for 12-hour days, starting at 0600 and ending at 1830. The work will be completed in a minimum of 13 consecutive days, but is not expected to extend for more than 20 consecutive days. Rescheduling shall be at the direction of USACE.

All work shall be scheduled and coordinated with the USACE Project Leader, Randy Olsen at (916) 557-5285. USACE will provide the Contractor with a minimum of 12 (calendar) days for notification to proceed or for any changes made to the schedule or SOW.

8.0 OPTIONS FOR ADDITIONAL SERVICES

The government may require the Contractor to perform any and all the additional services stated in the SOW. The government may exercise the contract options at any time before 1 August 2000 at the stated option price.

9.0 CONTRACTOR CAUTION STATEMENT

The Contractor is cautioned to take no guidance from any source during the course of this work, that deviates from the requirements stated in this SOW unless directed by the Contracting Officer. The Contractor shall immediately notify the USACE Project Engineer, Randy Olsen, of any guidance received that is not directed by the Contracting Officer.

Randy Olsen
Project Engineer

10.0 PRICING SCHEDULE

This pricing schedule shall be completed by the Contractor and submitted with any attachments needed as the Contractor's official bid. The Contractor shall furnish labor, materials, equipment, and incidental costs necessary to provide a barge for subsurface exploration of Old Mormon Slough adjacent to the McCormick and Baxter Superfund Site, Stockton, California, in accordance with the attached SOW. The bid shall be provided to the USACE Contracting office by June 1, 2000.

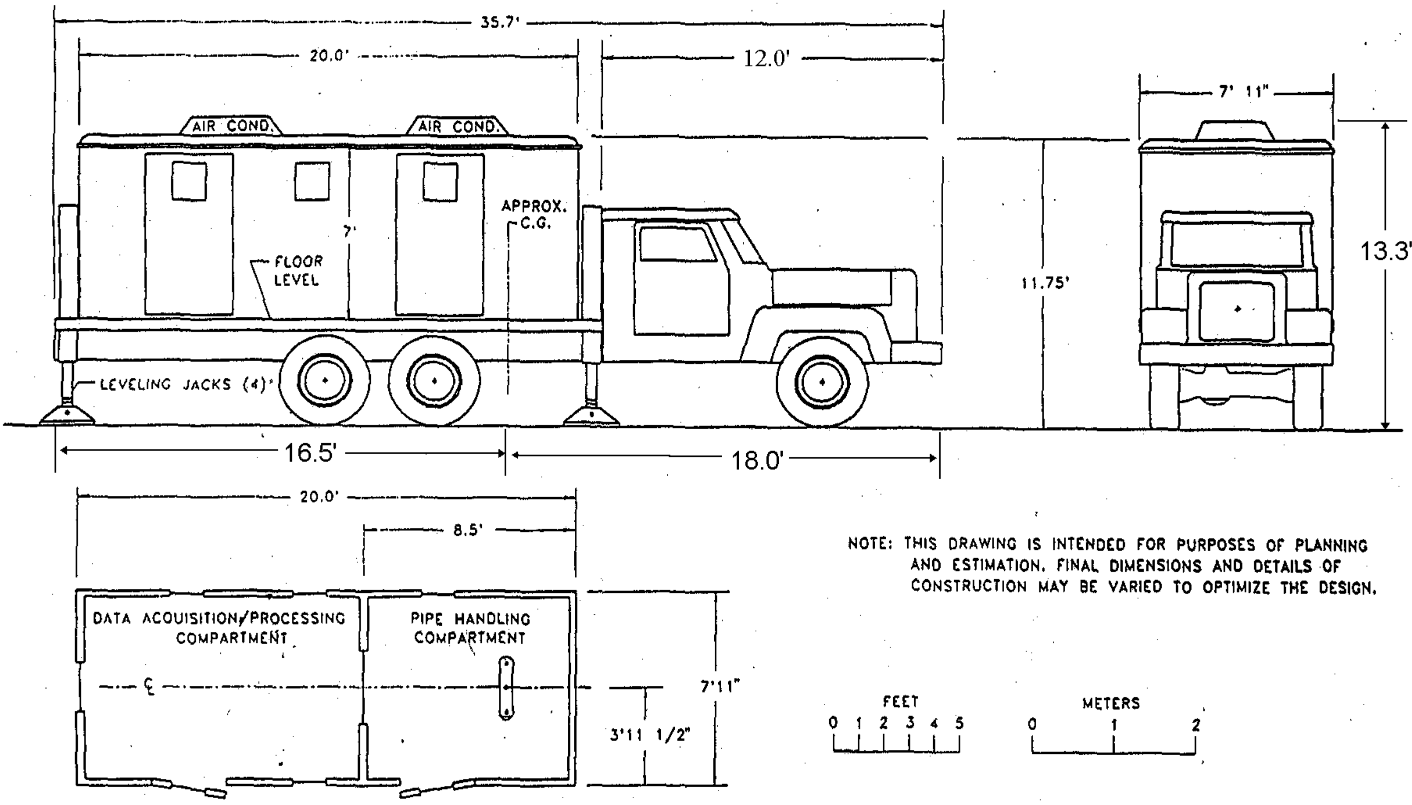
Item No.	Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
001	Mobilization and Demobilization includes delivery and removal of all equipment and supplies to be furnished by the Contractor, restoration of the site to its original conditions, and submittals.	1	Job	Lump sum (LS)	
002	Barge Rental includes moving and setting up between approximately 18 SCAPS penetration locations in Old Mormon Slough. Rental includes all labor, equipment, and supplies associated with the safe operation of a barge-mounted drill rig (including, but not limited to, life vests, buoys, and navigation/hazard lights), equipment/boat for drill crew daily egress/access, loading and off-loading equipment, materials/equipment for securing SCAPS rig to barge, stability equipment, and spill prevention equipment.	13	Day		

ATTACHMENT 1

SCAPS Unit

Figure 1-1. Photo of SCAPS truck with support trailer

DESIGN CONCEPT FOR TRUCK MOUNTED HAZARDOUS WASTE SITE PENETROMETER SYSTEM



NOTE: THIS DRAWING IS INTENDED FOR PURPOSES OF PLANNING AND ESTIMATION. FINAL DIMENSIONS AND DETAILS OF CONSTRUCTION MAY BE VARIED TO OPTIMIZE THE DESIGN.

Figure 3-1. Design concept for SCAPS truck

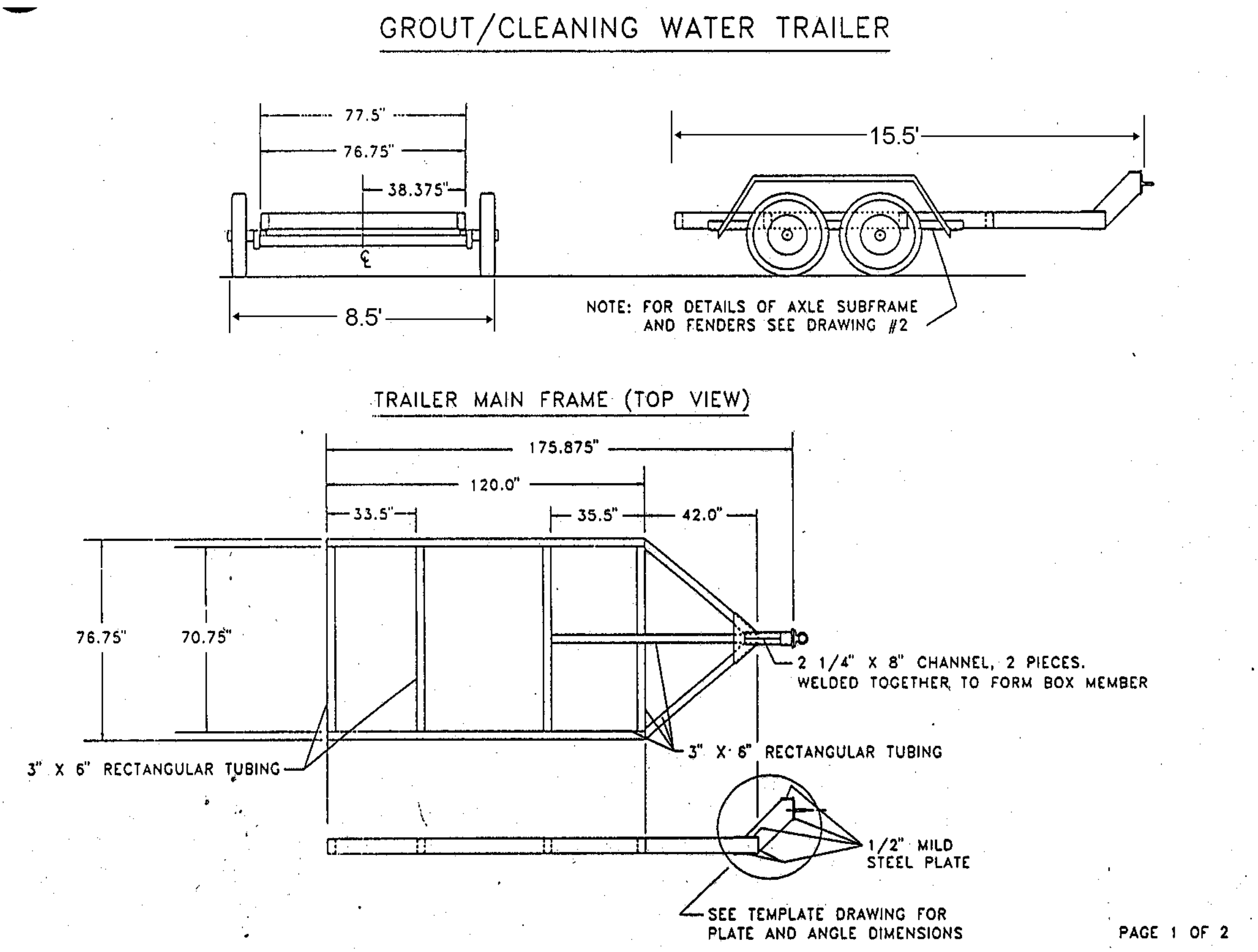


Figure 3-2a. Grout/cleaning water trailer (trailer details)

ATTACHMENT 2

SAFETY AND HEALTH REQUIREMENTS

1 General Requirements: A critical Contractor performance evaluation factor throughout all aspects of the barge-mounted SCAPS operation is the safety and health of affected on-site personnel and potential off-site receptors and the protection of the environment. Accordingly, detailed safety and health criteria, practices, and procedures shall be developed and implemented to provide proper control of and protection against the unique safety, chemical, physical, radiological, and biological hazards. This attachment describes, in general terms, the minimum Contractor safety, health, and emergency response requirements for activities that involve employee exposure or the reasonable possibility for employee exposure to safety and health hazards.

The Contractor shall have an ongoing Safety and Health Program (SHP) meeting the most current requirements of federal, California, USACE, and local laws, regulations, and guidance. In addition, the Contractor shall prepare, implement, and enforce a Site Safety and Health Plan (SSHP) for all site work performed under this contract. The Contractor shall ensure that all safety and health provisions are followed by its subcontractors, suppliers, and support personnel. The Contractor shall utilize the services of qualified personnel, as defined in Appendix B of ER 385-1-92 and this attachment, to oversee the development and implementation of required safety and health documents.

2 References:

a. United States Army Corps of Engineers (USACE), Safety and Health Requirements Manual, EM 385-1-1, September 1996

b. USACE, Safety and Occupational Health Document Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) and Ordnance and Explosive Waste (OWE) Activities, ER 385-1-92, March 18, 1994

c. Occupational Safety and Health Administration (OSHA) Standards 29 CFR 1910, Occupational Safety and Health Standards

d. OSHA Standards 29 CFR 1926, Safety and Health Regulations for Construction

e. OSHA 29 CFR 1926.65, Hazardous Waste Operations and Emergency Response

f. OSHA 29 CFR 1910.132, Personal Protective Equipment, General Requirements

g. OSHA 29 CFR 1915, Occupational Safety and Health Standards for Shipyard

Employment

h. United States Coast Guard (USCG), 33 CFR, Navigation and Navigable Waters

i. Federal Acquisition Regulation, F.A.R. Clause 52.236-13: Accident Prevention

j. Nuclear Regulatory Commission Standards (NRC), 10 CFR 20, Standards for Protection Against Radiation

k. NIOSH/OSHA/USCG/EPA, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, October 1985

l. EPA, Standard Operating Safety Guides, July 1988

m. American Conference of Governmental Industrial Hygienists (ACGIH), 1999 TLVs® and RELs®, Threshold Limit Values for Chemical Substances and Physical Agents.

n. CAL-OSHA, 8 CCR Chapter 4, Subchapter 7, General Safety Orders

o. CAL-OSHA, 8 CCR Chapter 4, Subchapter 4, Construction Safety Orders

p. Other state, local, and regional safety and health requirements

3 Definitions The following definitions are provided to help the Contractor to fully understand the various requirements of this attachment.

a. Accident Prevention Plan (APP): A written plan that describes work to be performed and measures to be taken to control hazards associated with materials, services, or equipment. The SSHP may serve as the APP provided it addresses all content requirements of Appendix A of EM 385-1-1.

b. Activity Hazard Analysis: A written form that defines the activities to be performed and identifies the sequence of work, the specific hazards anticipated, and the control measures to be implemented. The format shall be in accordance with Figure 1-1 of EM 385-1-1.

c. Emergency Response Plan: A written plan, which becomes part of the SSHP, to handle anticipated emergencies.

d. Safety and Health Program (SHP): A written safety and health program that describes general occupational safety and health requirements.

e. Site Safety and Health Plan (SSHP): A written plan that describes the site-specific methods by which personnel will meet the safety and health requirements. A SSHP shall be developed for each facility.

f. Injury and Illness Prevention Program (IIPP): The SSHP may serve as the IIPP provided it addresses all content requirements of 8 CCR § 3203.

4 Safety and Health Program (SHP): All Contractors and subcontractors performing on-site hazardous waste activities are required to develop and implement a written Safety and Health Program (general safety and health program elements), in compliance with the requirements of OSHA standard 29 CFR 1926.65 (b)(1) through (b)(4). The Contractor shall provide written certification that the SHP has been developed and is being maintained. The Contractor shall make the SHP available upon request by the Government. Any portions of the SHP that are referenced in the SSHP shall be included as appendices to the SSHP.

5 Site Safety and Health Plan (SSHP): The Contractor shall prepare the detailed site specific safety and health elements as described in this attachment. The SSHP shall be designed to identify, evaluate, and control safety, health, biological, and radiological hazards, and provide for emergency response. All subcontractors shall comply with the Contractor's SSHP. The SSHP shall be developed, approved, and implemented by a Certified Industrial Hygienist (CIH) and shall comply with all federal, state, regional, and local health and safety requirements. Matters of interpretation of standards shall be submitted to the appropriate administrative agency for resolution. The SSHP shall be kept on site and incorporate the elements contained in Appendix B of ER 385-1-92 and as amplified in this attachment. Some requirements of this section are not intended to dictate site operations and procedures for safety and health, but to specify the information pertaining to the Contractor's safety and health program that is required to be presented in the submittal. Where a specific element is not applicable, the Contractor shall make negative declaration in the plan to establish that adequate consideration was given the topic, and a brief justification for its omission. The CIH and Project Manager shall sign and date the SSHP. Daily safety and health inspections shall be conducted to determine if site operations are conducted in accordance with the approved SSHP, OSHA, USACE, and contract requirements. The Contractor shall correct any deficiencies. The SSHP shall address the safety and health hazards of each phase of site operation. Details about some activities may not be available when the initial SSHP is prepared and submitted. Therefore, the SSHP shall address, in as much detail as possible, all anticipated tasks, their related hazards and anticipated control measures. Further details shall be included in the activity hazard analyses.

The final SSHP generated by the Contractor under this contract shall be furnished to the Contracting Officer (CO) in MS Word 6.0 or higher software, IBM PC compatible format.

a. Acceptance and Modification: The SSHP shall be submitted to the CO for review prior to on-site activities. The CO will review the SSHP to determine if it meets the intent of the safety and health requirements specified. Deficiencies will be brought to the attention of the Contractor, and the Contractor shall revise the SSHP to correct the deficiencies. The Contractor shall not perform any on-site work until the SSHP has been accepted by the CO, and the Contractor is in full compliance with its terms. Changes and modifications to the SSHP shall be made by the Contractor's CIH with the concurrence of the CO. All hazardous waste operations shall be performed according to the approved SSHP. Any violations of the provisions of the SSHP shall be cause for stopping all affected work until the matter has been corrected.

b. Site Safety and Health Plan Elements: As a minimum, the SSHP shall contain the following elements of ER 385-1-92 and as amplified in this attachment.

1. Site Description and Contamination Characterization: The Contractor shall describe the site location, topography, approximate size, and the past uses of the site, and compile a complete list of the contaminants found or known to be present in site areas to be impacted by work performed. Compilation of this listing shall be based on results of previous studies or, if studies are not available, the list shall include the likely contaminants based on site history and prior site uses/activities. The Contractor shall include, as applicable, chemical names, the media in which the contaminants are found, locations on site, and estimated quantities/volumes to be impacted by site work.

2. Hazard Assessment and Risk Analysis: The Contractor shall provide a complete description of the work to be performed. The Contractor shall identify the chemical, physical, biological, radiological, and safety hazards that may be encountered for each task. Each task is to be discussed separately. A table shall be provided showing chemical hazards anticipated on site along with chemical names, concentration ranges, media in which found, locations on site, estimated quantities/volumes, the applicable OSHA regulatory standards (PELs - TWA, STEL, ceiling concentrations, and skin designation), the most current American Conference of Governmental Industrial Hygienist (ACGIH) threshold limit values (TLVs) and NIOSH-recommended exposure levels (RELs), ionization potential, cancer designation (e.g., Proposition 65 identification), routes and sources of exposure, and physical and toxicological properties. Selection of chemicals as indicators of hazard shall be based on media concentrations, toxicity, volatility, or potential for air entrainment at hazardous levels, and frequency of detection. The Contractor shall specify and justify action levels based upon airborne exposure concentrations and direct skin contact potentials for upgrades and/or downgrades in personal protective equipment levels, implementation of engineering controls and work practice controls, for emergency evacuation of on-site personnel, and for the prevention and/or minimization of public exposure to hazards created by on-site activities. The Contractor shall evaluate exposure to hazardous substances brought on site for the execution of site activities, the potential for injuries from site conditions and activities (e.g., excavation, slips, trips, and falls, electricity, equipment and machinery, etc.), potential for injury from physical agents (e.g., noise, heat and cold stress, vibration, non-ionizing radiation, solar radiation, etc.), the risk to human health from radioactive materials or ionizing radiation, and the potential for illness due to biological agents (e.g., poisonous plants, animals, insects, microorganisms, etc.).

3. Staff Organization, Qualification, and Responsibility: Each person assigned specific safety and health responsibilities shall be identified, and their qualifications and experience documented by resume in the SSHP. The organizational structure, with lines of authority and overall responsibilities for safety and health of the Contractor and all subcontractors, shall be discussed. An organizational chart showing the lines of authority for

safety shall be provided. The Contractor shall obtain the CO's acceptance before replacing any member of the safety and health staff. The request shall include the name and qualifications of each proposed replacement.

(a) Project Superintendent: The Contractor shall provide evidence that the Contractor's full-time on-site project superintendent is designated as, and is qualified to be, a competent person through training in accordance with 29 CFR 1926.32 and 29 CFR 1926.65. The project superintendent shall be experienced in the administration and supervision of hazardous waste projects, including work practices, investigative methods, protective measures for personnel, inspection of work areas, generated waste containment and disposal procedures, decontamination units installation and maintenance requirements, and site safety and health requirements. This designated on-site superintendent shall be responsible for compliance with applicable federal, state and local requirements, and the Contractor's SSHP. The Contractor shall submit evidence that this person has a minimum of 2 years on-the-job hazardous waste operations supervisory experience.

(b) Certified Industrial Hygienist: The Contractor shall utilize the services of an Industrial Hygienist certified by the American Board of Industrial Hygiene (ABIH) to prepare the Contractor's SSHP, perform initial site-specific training, direct air monitoring and assist the Contractor's superintendent in implementing and ensuring that safety and health requirements are complied with during the performance of all work. The CIH shall visit the site at least once per month for the duration of activities and be available for emergencies, and on a weekly basis, review results of air monitoring and accident reports. The CIH shall have a minimum of 2 years of comprehensive experience in planning and overseeing hazardous waste activities.

(c) Site Safety and Health Officer (SSHO): It is not anticipated that the CIH will be on site continuously throughout the course of the project. Day-to-day industrial hygiene and safety support, including air monitoring, training and daily site safety inspections, shall be provided by a designated SSHO who shall report directly to the CIH. The Contractor shall ensure the SSHO has a minimum of 2 years working experience in the chemical industry and/or chemical waste disposal industry where EPA Level C personal protective equipment was required, a sound working knowledge of federal and state occupational safety and health regulations, and training in air monitoring practices and techniques. The SSHO shall be assigned to the site at all times when hazardous waste operations are being performed. The SSHO shall have authority to stop work. If the Contractor's operations are performed during more than one work shift per day, an SSHO shall be present for each shift.

(d) Persons Trained in First Aid/CPR: The Contractor shall maintain on site any time hazardous waste operations are conducted at least two persons who are currently trained in first aid and CPR by the American Red Cross or other agency. These persons shall also meet the training requirements specified by the Bloodborne Pathogens standard, 29 CFR 1910.1030. These persons may perform other duties but must be immediately available to render first aid when needed. The names and documentation of training shall be provided.

(e) Occupational Physician: The Contractor shall utilize the services of a licensed physician who is certified in occupational medicine by the American Board of Preventative Medicine, or who, by necessary training and experience is Board-eligible to manage the medical surveillance program. The physician shall have extensive experience in the occupational health area and be familiar with this site's hazards and the scope of this project. The Contractor shall submit, in writing, the medical consultant's name, qualifications, and knowledge of the site's conditions and proposed activities. The Physician shall be responsible for developing and implementing a medical monitoring program in compliance with 29 CFR 1926.65.

(f) Testing Laboratory: The Contractor shall provide the name, address, and telephone number of each testing laboratory selected to perform the occupational sample analyses and report the results. Written verification of the following criteria, signed by the Testing Laboratory principal and the Contractor shall be submitted: (1) The laboratory is proficient to conduct personnel, area, and environmental analysis for organic and inorganic chemicals. The laboratory shall be fully equipped to analyze the required NIOSH, OSHA, and EPA analyses. (2) The laboratory is currently participating in the American Industrial Hygiene Association (AIHA) Proficiency Analytical Testing (PAT) Program and is certified by AIHA.

4. Chemical Information and Material Safety Data Sheets: Prior to the commencement of work, all available information concerning the chemical, physical, and toxicologic properties of each substance known or expected to be present on site shall be made available to the affected employees. Material Safety Data Sheets are required for chemicals brought on site. This information shall also be included in the SSHP.

5. Accident Prevention: Daily safety and health inspections shall be conducted to determine if site operations are in accordance with the approved SSHP, OSHA, USACE, and contract requirements. In the event of an accident or incident, the Contractor shall immediately notify the CO. Within 2 working days of any reportable accident/injury/illness, the Contractor shall complete and submit to the CO an accident report on ENG Form 3394 in accordance with AR 385-40 and USACE supplements to that regulation.

6. Training: Although OSHA regulations permit varying levels of training based on employee responsibility and exposure potential, the Contractor shall provide training to include (a) initial for all personnel (40 hours of formal off-site hazardous waste activity training, and 3 days field experience under the direct supervision of a trained experienced supervisor), (b) supervisory (an additional 8 hours supervisory training for supervisory personnel), (c) site-specific, and (d) refresher training. Worker courses taken more than 1 year prior to commencement of work are acceptable provided that the individual has successfully completed the annual refresher training. All persons entering an exclusion or contamination reduction zone shall be given a pre-entry site safety and health briefing. The content, duration, and frequency, of training required for that person shall be described and verified. The Contractor shall append copies of training certificates for its employees to the SSHP.

7. Personal Protective Equipment: A written Personal Protective Equipment (PPE) Program shall be provided in the SSHP. The program shall address all the elements of 29 CFR 1926.65(g)(5) and 29 CFR 1910.134. The Contractor shall specify minimum PPE ensembles (including respirators) necessary for each task/operation based on the hazard assessment/risk analysis, including potential heat stress and associated safety hazards. The plan shall include specific types and materials for protective clothing and respiratory protection. The plan shall establish and justify upgrade/downgrade/evacuation criteria based upon the action levels established. Site workers must have a current medical "fit-for-duty" clearance to use respiratory and other PPE.

8. Medical Surveillance: All personnel performing on-site activities shall participate in an ongoing medical surveillance program meeting the requirements of 29 CFR 1926.65, and ANSI Z-88.2. The medical examination protocols and results shall be overseen by a licensed physician who is certified in occupational medicine by the American Board of Preventive Medicine, or who by necessary training and experience is Board-eligible. Minimum specific exam content and frequency based on probable site conditions, potential occupational exposures, and required protective equipment shall be provided. Certification of employees' participation in the medical surveillance program and the written opinion from the attending physician shall be appended to the SSHP.

9. Radiation Dosimetry: Not anticipated.

10. Exposure Monitoring/Air Sampling Program: Where it has been determined that there may be potential employee exposures to and/or off-site migration of hazardous concentrations of airborne substances, appropriate direct-reading (real-time) air monitoring and time-integrated (time-weighted average [TWA] air sampling shall be conducted in accordance with applicable regulations (OSHA, EPA, NRC, state). Air monitoring and air sampling must accurately represent concentrations of airborne contaminants encountered on, and leaving, the site. Sampling and analytical methods following NIOSH criteria (for on-site personnel), and EPA (for site perimeter or off-site locations) shall be appropriately utilized. Personnel monitoring samples shall be analyzed only by laboratories successfully participating in, and meeting the requirements of the American Industrial Hygiene Association's Proficiency Analytical Testing or Laboratory Accreditation Program. Representative meteorological data shall be evaluated and used as an adjunct in determining site layout, and perimeter and any off-site monitoring locations. Where perimeter monitoring/sampling is not deemed necessary, a suitable justification for its exclusion shall be provided. Noise monitoring shall be conducted as needed, depending on the hazard/risk analysis. All monitoring/sampling results shall be evaluated and appropriate action implemented based upon "action levels." All personnel exposure monitoring records shall be maintained in accordance with 29 CFR 1910.20.

11. Heat/Cold Stress Monitoring: Heat and /or cold stress monitoring protocols shall be specified and implemented, as appropriate. Physiological monitoring protocols and work/rest schedules shall be developed. The NIOSH/OSHA/ USCG/EPA *Occupational Safety*

and Health Guidance Manual for Hazardous Waste Site Activities provides protocols for prevention of heat stress. Heat stress monitoring shall commence at temperatures of 70 degrees Fahrenheit and above. Cold stress monitoring, to help prevent frostbite and hypothermia, shall be conducted following the most current published American Conference of Governmental Industrial Hygienist (ACGIH) Cold stress standards.

12. Standard Operating Safety Procedures, Engineering Controls, and Work Practices: The SSHP shall specify the following (a) site rules/prohibitions (buddy system, eating/drinking/smoking restrictions, etc.); (b) work permit requirements (e.g., radioactive work, excavation, hot work, confined space, etc.); (c) material handling procedures (soils, liquids, radioactive materials); (d) drum/container handling procedures and precautions (opening, sampling, overpacking); (e) confined space entry procedures; (f) hot work, sources of ignition, fire protection/prevention, and electrical safety (ground-fault protection, overhead power line avoidance, etc.; (g) excavation and trench safety; (h) guarding of machinery and equipment; (i) lockout/tagout procedures; (j) fall protection; (k) hazard communication; (l) illumination; (m) sanitation; (n) engineering controls; (o) process Safety Management; and (p) signs and labels.

13. Site Control Measures: The Contractor shall establish work zones. Access points and work zone delineation (Exclusion Zone, Contamination Reduction Zone, Support Zone) shall be based upon the contamination characterization data and the hazard/risk analysis performed. The SSHP shall include a site map delineating the zones. The SSHP shall also describe on-site and off-site communications, site security (physical and procedural), and general site access.

14. Personal Hygiene and Decontamination: The SSHP shall specify necessary facilities and their locations, and provide detailed standard operating procedures, frequencies, supplies, and materials to accomplish decontamination of site personnel.

15. Equipment Decontamination: The SSHP shall specify necessary facilities, equipment, and their locations; provide detailed procedures, frequencies, supplies, and materials for decontamination; and describe methods to determine adequacy of decontamination of equipment used on site. For sites where radioactive contamination is present, the SSHP shall include levels of removal and fixed contamination acceptable for release from the exclusion zone.

16. Emergency Equipment and First Aid Requirements: The SSHP shall include a discussion of emergency equipment and first aid.

17. Emergency Response and Contingency Procedures (On-Site and Off-Site): Local fire/police/rescue authorities having jurisdiction and nearby medical facilities that could be utilized for emergency treatment of injured personnel shall be contacted in order to notify them of upcoming site activities and potential emergency situations, to ascertain their response capabilities, and to obtain a response commitment. An Emergency Response Plan, which

complies with 29 CFR 1926.65(l), and which, as a minimum, addresses the following elements, shall be developed and implemented: (1) pre-emergency planning and procedures for reporting incidents to appropriate government agencies for potential chemical exposures, personal injuries, fires/explosions, environmental spills and releases, and discovery of radioactive materials; (2) personnel roles, lines of authority, communications; (3) posted instructions and list of emergency contacts: physician/nearby medical facility, fire and police departments, ambulance service, federal/state/local environmental agencies, CIH, and Contracting Officer; (4) emergency recognition and prevention; (5) site topography, layout, and prevailing weather conditions; (6) criteria and procedures for site evacuation (emergency alerting procedures/employee alarm system, emergency PPE and equipment, safe distances, places of refuge, evacuation routes, and site security and control); (7) specific procedures for decontamination and medical treatment of injured personnel; (8) route maps to nearest pre-notified medical facility; (9) criteria for initiating community alert program, contacts, and responsibilities; and (10) critique of emergency responses and follow-up. If all personnel will be evacuated from the site and not allowed to assist in handling the emergency, the emergency response plan may be replaced by an emergency action plan complying with 29 CFR 1910.38(a).

18. <u>Logs, Reports, and Recordkeeping</u>: The following logs, reports, and records shall be developed, retained, and submitted to the CO: (1) training logs (site-specific and visitor) and records of radiological instructions and notices to workers; (2) daily safety inspection logs (may be part of the daily QC reports); (3) equipment maintenance logs; (4) employee/visitor register; and (5) environmental and personal exposure monitoring/sampling results.

6 <u>Accident Prevention Plan</u>: The SSHP may serve as the Accident Prevention Plan provided it addresses all content requirements of 29 CFR 1926.65 and Appendix A of EM 385-1-1. The Accident Prevention Plan elements required by EM 385-1-1 but not specifically covered in the SSHP shall be addressed in this section. The Accident Prevention Plan shall be attached to and become part of the SSHP.

7 <u>Activity Hazard Analyses</u>: The Contractor shall prepare an Activity Hazard Analysis for each phase of work. The format shall be in accordance with Figure 1-1 of EM 385-1-1. The analysis shall define the activities to be performed and identify the sequence of work, the specific hazards anticipated, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level. Work shall not proceed on that phase until the activity hazard analysis has been accepted and a preparatory meeting has been conducted by the Contractor to discuss its contents with everyone engaged in the activities, including the government on-site representatives. The activity hazard analyses shall be continuously reviewed and when appropriate modified to address changing site conditions or operations, with the concurrence of the CIH, the Site Superintendent, and the CO. Activity hazard analyses shall be attached to and become a part of the SSHP.

8 <u>Emergency Response and Contingency Procedures</u>: Emergency Response and Contingency Procedures as required by 29 CFR 1926.65 shall be prepared. The following emergency equipment items shall be immediately available for on-site use: (1) first aid

equipment and supplies approved by the consulting physician; (2) emergency eyewashes/showers; (3) emergency respirators; (4) spill control materials and equipment; and (5) fire extinguishers. The Contractor shall provide telephone numbers and points of contact for emergency services and the appropriate governmental representatives. A map showing the route to the hospital that has been contacted and informed of the type of work and potential hazards on the site shall be provided.

9 Certification of Hazard Assessment: The Contractor shall assess the workplace to determine if hazards are present that necessitate the use of personal protective equipment. The Contractor shall verify that the required workplace hazard assessment has been performed through a written certification (29 CFR 1910.132).

APPENDIX B

Standard Field Forms

CONTENTS

SCAPS Tulsa District Corps of Engineers CPT/LIF Report Form: Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

SCAPS and Soil Boring Logs (HTRW Drilling Log): Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

Groundwater Sampling Data Sheet: Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

Well Development Report: Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

Field Sample Data and Chain of Custody Sheet: Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

Sample Container Label and Chain of Custody Seal: Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

Cooler Receipt Form: Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

Daily Chemical Quality Control Report Form: Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

NAPL Thickness/Sampling Form: Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration* (USACE 1999).

PART II – QUALITY ASSURANCE PROJECT PLAN ADDENDUM

CONTENTS

CONTENTS (Continued)

CONTENTS (Continued)

APPENDIXES

TABLES

ABBREVIATIONS AND ACRONYMS

ASTM	American Society for Testing and Materials
bgs	below ground surface
CPT	cone penetrometer testing
CSM	conceptual site model
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
FASP	Field Analytical Support Program
FSP	field sampling plan
GC/FID	gas chromatography/flame ionization detector
GC/MS	gas chromatography/mass spectroscopy
GMS	Groundwater Monitoring System
GPC	gel permeation chromatography
FY99	Fiscal Year 1999
FY00	Fiscal Year 2000
LCS	laboratory control sample
LIF	laser-induced fluorescence
LNAPL	light nonaqueous-phase liquid
MDL	method detection limit
MIBK	methyl isobutyl ketone
MQL	method quantitation limit
MRL	method reporting limit
MS/MSD	matrix spike/matrix spike duplicate
NAPL	nonaqueous-phase liquid
PAH	polycyclic aromatic hydrocarbon
PCP	pentachlorophenol
PE	performance evaluation
PFE	pressurized fluid extraction
POL	petroleum, oil, and lubricant
QAPP	quality assurance project plan
QC	quality control
SAP	sampling and analysis plan
SCAPS	Site Characterization and Analysis Penetrometer System
SOP	standard operating procedure
SVOC	semivolatile organic compound
TCL	target compound list
TIC	tentatively identified compound
TOC	total organic carbon
TPH	total petroleum hydrocarbon

ABBREVIATIONS AND ACRONYMS

TPH-Dx	total petroleum hydrocarbon – diesel extended
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compounds

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP), in conjunction with the Field Sampling Plan (FSP), make up the Sampling and Analysis Plan (SAP), which is an integral part of the Management Plan Addendum for the McCormick and Baxter Superfund site field exploration. The Fiscal Year 2000 (FY00) investigation is a continuation of the field activities conducted in Fiscal Year 1999 (FY99) to characterize the creosote nonaqueous-phase liquid (NAPL) contamination for the in situ thermal treatment evaluation. The FY00 investigation also includes activities to confirm the presence of and determine the nature and extent of a suspected light NAPL (LNAPL) carrier outside areas where the A-zone groundwater is known to be contaminated with creosote NAPL and along the southern property boundary.

The FY00 Management Plan Addendum builds on the FY99 Management Plan by incorporating requirements and specifications by reference and detailing FY00-specific information where appropriate. The purpose of the SAP is to assure production of high quality data that meet project objectives and requirements and accurately characterize measurement parameters specific to the FY00 NAPL investigation. The SAP provides protocols for collecting samples, measuring and controlling data, and documenting field and laboratory methods so that the data are technically and legally defensible. The SAP was prepared in accordance with guidelines contained in U.S. Army Corps of Engineers (USACE) requirements (USACE 1994).

The remainder of this section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

2.0 ANALYTICAL DATA QUALITY OBJECTIVES

The primary objectives of this field exploration are to determine if NAPL has migrated beyond the current McCormick and Baxter property line, and, if so, to define the lateral and vertical extent of that migration, refine our understanding of the NAPL migrating from the McCormick and Baxter site, and complete the conceptual design for the in situ thermal treatment technology evaluation.

A secondary objective for this investigation is to collect groundwater data to enhance the conceptual site model (CSM) and determine whether natural attenuation may be limiting the mobility of contamination.

2.1 CHEMICALS OF CONCERN

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

2.2 DATA COLLECTION APPROACH

A dynamic sampling and analysis process was developed to generate data to meet project objectives. A logical chain of reasoning will be followed so that the data gathered supports the conclusions made by the technical staff. This investigation allows for changes in the number of locations/samples as the investigation progresses, and results from the early stages will be evaluated and incorporated in refining the site conceptual model prior to additional data collection. A more detailed description of the sampling rationale and project data quality objective (DQOs) can be found in Section 6.2 of the Work Plan Addendum.

The remainder of this section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

2.2.1 Field Portable Instruments

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

2.2.2 On-Site Mobile Laboratory

The on-site mobile laboratory (EPA Region 9 Field Analytical Support Program [FASP] laboratory) will analyze soil samples collected during Site Characterization and Analysis

Penetrometer System (SCAPS) sampling for total petroleum hydrocarbon-diesel extended (TPH-Dx), and pentachlorophenol (PCP).

TPH-Dx analysis gives estimated concentrations of total petroleum hydrocarbons (TPH) and gives profiles of different fuel types present in samples. Profiles (i.e., analysis chromatograms) will be evaluated qualitatively by an experienced analyst who will identify fuel types present based on a library of fuel type standards previously analyzed. These uncertainties in concentration and identity are acceptable for this project because it still allows the identification of presence or absence of TPH at the site. Additionally, the rapid assessment for TPH-Dx will allow a greater number of measurements and more representative sampling throughout the site. TPH-Dx results will be evaluated immediately in the field by the technical team who will make decisions on subsequent sampling locations to assure that the extent of different fuel types present at the site are identified.

Soil samples will be analyzed in the field following a modified version of EPA SW-846 Method 8081 to characterize PCP contamination across the historical water table in areas located within and downgradient from the PCP source area. The on-site analysis will allow rapid assessment of the PCP source area, which will minimize the effort necessary within a known hazardous area, and the extent of the PCP contamination in the groundwater at the southern and southeastern property boundaries. The PCP results will be evaluated immediately in the field by the technical team who will make decisions on subsequent sampling locations to ensure that the PCP source area has been defined and the nature and extent of the down gradient PCP has been determined.

2.2.3 Off-Site Fixed Laboratories

Several off-site fixed laboratories will analyze soil and groundwater samples for physical and/or chemical characteristics. Rapid turnaround analysis for polycyclic aromatic hydrocarbons (PAHs), PCP, and volatile organic compounds (VOCs) will be required only for soil collected during SCAPs sampling. Soil results will be reported on a wet weight basis. Results will be evaluated as soon as they become available by the technical team who will make decisions on subsequent sampling locations to assure that the extent of different hydrocarbon types present at the site are identified. Dry weight results will be reported with final data packages. All other fixed laboratory analyses will be performed with routine turn around times because results are not needed immediately to define the extent of the NAPL contamination. Methods and laboratories were selected that could provide data to support design needs of the thermal treatment systems.

2.3 ANALYTICAL METHODS

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

2.4 ANALYTICAL METHOD DETECTION LIMITS, QUANTITATION LIMITS, AND REPORTING LIMITS

Sensitivity requirements for all methods and matrices are driven by the DQOs. Specific requirements by method and matrix are presented in Table 2-1. Discussion of the definitions for method detection limits (MDL), quantitation limits (MQL), and reporting limits (MRL) is presented in Sections 2.4.1, 2.4.2 and 2.4.3, respectively. All laboratories proposed for the FY00 NAPL Investigation are presented in Table 2-2.

2.4.1 Method Detection Limit

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

2.4.2 Method Quantitation Limit

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

2.4.3 Method Reporting Limit

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

Table 2-1
Analytical Target Parameter And Quantitation Drivers

Test Method	Matrix	Driver
TPH by LIF	Soil	Technology limitations and site-specific factors. Threshold values (reporting limits) will be determined in the field.
TPH-Dx by GC/FID (FASP and Region 9 Laboratory)	Soil	Less than LIF threshold value.
SVOC (Region 9 Laboratory)	Soil	Soil target cleanup levels for the protection of groundwater. (All method reporting limits are below cleanup levels except for benzo[a]pyrene.)
SVOCs (Region 9 Laboratory)	Groundwater	The groundwater reporting limit will be equal to the federal maximum contaminant level (MCL) for drinking water or the Preliminary Remediation Goal (PRG) for those compounds that do not have an MCL. A final groundwater remedy has not been selected for this site; thus no regulation-driven groundwater action levels have been determined.
PCP (CAS)	Groundwater	The groundwater reporting limit will be equal to the federal maximum contaminant level (MCL) for drinking water. A final groundwater remedy has not been selected for this site; thus no regulation-driven groundwater action levels have been determined.
PCP (FASP)	Soil	The soil target reporting limit will be 1.0 ppm. However, this limit will be dependent on analytical method limitations.
VOCs (Region 9 Laboratory)	Soil and groundwater	Solubility of suspected LNAPL carrier (e.g., diisopropyl ether and MIBK)
Other analyses	Soil and LNAPL	Engineering design requirements
SVOCs/TPH	NAPL	Concentration determined by dilution.

Table 2-2
Project Laboratories

Laboratory	Methods	Matrix	Address and Contact
EPA Region 9 FASP	TPH-Dx	Soil	1337 S. 46th St., Building 201 Richmond, CA 94804-4698 Office Contact: Liza Finley Telephone: (510) 412-2334 Field Contact: Jeff Mays, Contractor Telephone: (510) 412-2367
	PCP	Soil	
EPA Region 9 Laboratory	TPH-Dx	Soil	1337 S. 46th Street, Building 201 Richmond, CA 94804-4698 Contact: Mary O'Donnell Telephone: (415) 744-1533 Backup Contact: Rich Bauer Telephone: (510) 412-2312 Reception: (510) 412-2300
	SVOCs	Soil	
	VOCs	Soil	
	TOC	H_2O	
	Total and dissolved manganese	H_2O	
	Anions	H_2O	
Pacific Analytical Laboratories	Dioxins/furans	Groundwater	6349 Paseo del Lago Carlsbad, CA 92009 Contact: Steve Parsons Telephone: (760) 931-1766 Facsimile: (760) 931-9479
EPA Robert S. Kerr Environmental Research Laboratory (Kerr Lab)	Treatability testing	Soil	919 Kerr Research Drive Ada, OK 74820 Contact: Eva Davis Telephone: (580)436-8548
	Density	LNAPL	
	Viscosity	LNAPL	
	Oil-water interfacial Tension	LNAPL	
	Wettability	LNAPL	
Columbia Analytical Services	SVOCs, VOCs, low-level PCP, and methane	Groundwater and NAPL	317 S. 13th Ave., P.O. Box 479 Kelso, WA 98626 Contact: Richard Craven Telephone: (360) 577-7222 Facsimile: (360) 636-1068
Environmental Resources Associates	Performance evaluation samples	PE samples	5540 Marshall Street Arvada, CO 80002 Contact: Joe Holtz Telephone: (303) 431-8454 Facsimile: (303) 431-0159
PTS Laboratories, Inc.	Grain size	Soil	8100 Secura Way Santa Fe Springs, CA 90670 Contact: Richard Young Telephone: (562)907-3607 Facsimile: (562) 907-3610
	Porosity	Soil	
	Cation exchange capacity	Soil	
	Density	Soil	
	NAPL saturation	Soil	
	TOC	Soil	
	Permeability	Soil	

3.0 METHODS AND QUALITY CONTROL FOR FIELD ACTIVITIES

This section describes field measurement procedures, sample handling, and coordination procedures between the sampling team and analytical laboratories. Detailed sampling procedures are discussed in the Field Sampling Plan (FSP).

3.1 FIELD MEASUREMENT METHODS

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

3.1.1 Air Monitoring for Health and Safety

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

3.1.2 Groundwater Field Measurements

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

3.1.3 SCAPS Cone Penetrometer Testing (CPT) and Laser-Induced Fluorescence (LIF)

A SCAPS equipped with LIF sensors will be used to define the horizontal and vertical extent of the petroleum hydrocarbon plume. At the same time, the SCAPS will be equipped with geotechnical sensors (cone pressure and sleeve friction) that will be used to provide simultaneous and continuous geotechnical and stratigraphic information. At the end of each penetration by the SCAPS, sensor data will be plotted as a function of depth and archived. Brief descriptions of each of these sensors are included below. The standard operating procedures (SOPs) for the SCAPS LIF are included in the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

Visual evaluation of soil cores for NAPL contamination will be compared against LIF data. Sample intervals representative of different soil types, different emission spectra, and different emission intensity will be selected based on SCAPS LIF and geotechnical sensor measurements. SCAPS will be used to obtain soil samples from these locations for on-site TPH-Dx and PCP analyses. The EPA FASP team has committed to deploying the same mobile laboratory facility used in 1999 to the site during the FY00 investigation.

Soil samples will be collected for VOCs directly from the EnCore™ sample syringe. The soil samples will be preserved by the EPA Region 9 FASP laboratory with sodium bisulfate or methanol and shipped to the Region 9 Laboratory for analysis using a modified version of EPA SW-846 Method 8260.

TPH-Dx and PAH soil data will be used for on-site validation and calibration of the fluorescence response obtained by the SCAPS LIF sensor. These data will assist with determining the relationship between LIF response and TPH and PAH concentration over the range of site soil and contaminant types. The relationship between LIF signal, TPH-Dx, and PAH soil data will be evaluated by the technical team. The TPH-Dx and PAH data will be used to determine the contaminant concentration above which NAPL is suspected. The SCAPS LIF data will be used to define the boundary of the NAPL and petroleum, oil, and lubricant (POL) contamination above the site-specific threshold concentration.

Hydrocarbon Presence Using LIF

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

Soil Classification Using Geotechnical Sensors

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

3.2 FIELD MEASUREMENT INSTRUMENT CALIBRATION PROCEDURES

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

3.3 SAMPLE HANDLING, CONTAINERS, PRESERVATION, AND HOLDING TIMES

Sample containers, preservation, and holding times are summarized by matrix in Tables 4-6 to 4-9 in the FSP. Soil samples will be collected in glass or plastic containers or EnCore™ samplers purchased for the project. The containers will have screw-type lids to assure adequate sealing of the bottles. Lids of the containers will have Teflon® inserts to prevent sample reaction with the lid and to improve the quality of the seal.

This remainder of this section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

3.4 COORDINATION WITH ANALYTICAL LABORATORIES

This section is incorporated by reference to the June 16, 1999*, McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

4.0 QUALITY CONTROL SAMPLES

Field quality control (QC) and laboratory QC samples will be employed to evaluate data quality. Quality control samples are controlled samples introduced into the analysis stream whose results are used to review data quality and to calculate the accuracy and precision of the chemical analysis program. The purpose of each type of QC sample, collection and analysis frequency, and evaluation criteria are described in this section. Collection and analysis frequency are summarized in Tables 4-1 through 4-5. Laboratory reporting limits are listed in Appendix A. Laboratory control limits are listed in Appendix B.

This remainder of this section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

4.1 FIELD QUALITY CONTROL SAMPLES

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

4.1.1 Rinsate and Field Blanks

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

4.1.2 Field Duplicates

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

4.1.3 Matrix Spike/Matrix Spike Duplicates

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

4.1.4 Performance Evaluation Samples

Performance evaluation (PE) samples will be submitted to the laboratories to evaluate the accuracy of the TPH, semivolatile organic compound (SVOC), PCP, and VOC analyses. PE samples will be submitted double blind for chemical analysis. Four soil samples will be submitted to the FASP laboratory for TPH-Dx and PCP analyses. Eight soil samples will be submitted to the EPA Region 9 Laboratory for PAH/PCP and VOC analyses. The PE samples will be spiked by the commercial supplier with the site chemicals of concern at concentrations consistent with those previously observed in soil and groundwater at the site. One PE sample will be analyzed the first day of laboratory analysis. The PE sample results will be immediately compared to the documented vendor acceptable control limits by the USACE Project Technical Team Leader. Sample analysis will not continue until the laboratory has met certified PE sample acceptance limits and approval has been obtained from the USACE Project Technical Team Leader. Assuming criteria have been met, a second sample of that matrix will be analyzed at random the same week, with the remaining PE samples submitted blind to the laboratory at regular intervals through the remaining analysis schedule.

The PE material will be from commercial sources. The PE supplier will fill pre-cleaned sample bottles with the PE material. Fictitious sample identification numbers will be assigned in the field as described in Section 4.2 of the FSP.

4.2 LABORATORY QUALITY CONTROL SAMPLES

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

4.2.1 Initial and Continuing Calibration Samples

Laboratory instrument calibration requirements are summarized in Tables 4-2 through 4-5, and are discussed in Section 6.

4.2.2 Method Blanks

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

4.2.3 Surrogate Spikes

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

4.2.4 Laboratory Control Samples

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

4.2.5 Laboratory Duplicate Samples

This section is incorporated by reference to the June 16, 1999*, McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

Table 4-1
Field Quality Control Sample Collection Summary—Soil, Groundwater, and NAPL

Sample Type	Laboratory	Frequency
Rinsate/field blanks	Mobile, fixed	5 percent
Field duplicates	Mobile, fixed	10 percent of all samples
Matrix spike/matrix spike duplicates (or laboratory duplicates)	Mobile, fixed	5 percent of all samples or as specified in the method-specific SOP
Performance evaluation samples	Mobile, fixed	See Section 4.1.4

Table 4-2
Mobile Field Laboratory Quality Control Sample Summary—Soil

Method	Method Blanks[a]	Laboratory Duplicates (Percent)	MS/MSD (Percent)	Laboratory Control Sample[a]	Surrogate	Initial Calibration	Continuing Calibration
PCP	1/batch	NA	5	1/batch	All samples	3-pt	After every 12 hours
TPH-Dx	1/batch	NA	5	1/batch	All samples	3-pt	After every 12 hours
TPH by fluorescence	NA	NA	NA	NA	NA	Multi-point (Rhodamine 6G)	Before and after each push

[a] Batch is equivalent to 20 or fewer samples prepared and analyzed together with common QC samples

Notes:
MS/MSD - matrix spike/matrix spike duplicate
NA - not applicable

Table 4-3
Fixed Laboratory Quality Control Sample Summary—Soil

Method	Method Blanks[a]	MS/MSD (Percent)[b]	LCS (Blank Spike)[a]	Surrogate	Initial Calibration	Initial Calibration Verification	Continuing Calibration Standard[c]
PAHs and PCP - rapid TAT	1/batch	5	1/batch	All samples	3-pt	1/batch	After every 12 hours
PAHs and PCP - standard TAT	1/batch	5	1/batch	All samples	5-pt	1/batch	After every 12 hours
VOCs	1/batch	5	1/batch	All samples	3-pt	1/batch	After every 12 hours
TPH-Dx	1/batch	5	5 percent	All samples	5-pt	1/batch	After every 12 hours
Metals (CLP RAS list, no mercury)	1/batch	5	1/batch	NA	See SOP	1/batch	After every 10 samples
TOC	1/batch	5	1/batch	NA	2-pt	NA	After every 10 samples
Grain size	NA	5[d]	NA	NA	NA	NA	NA
Porosity	NA	NA	NA	NA	NA	NA	NA
Permeability	NA	NA	NA	NA	NA	NA	NA
Density	NA	5[d]	NA	NA	NA	NA	NA
Cation exchange capacity	1/batch	5	1/batch	NA	1-pt	Standard and blank with every batch	Standard and blank after every 10 samples
NAPL saturation	1/batch	5	1/batch	NA	NA	NA	NA

[a] Batch is equivalent to 20 or fewer samples prepared and analyzed together with common QC samples.
[b] MS/MSD for organics; MS/laboratory duplicate for inorganics
[c] Continuing calibration blank samples are analyzed immediately after continuing calibration standards.
[d] Laboratory duplicate only

Notes:
LCS - laboratory control sample
MS/MSD - matrix spike/matrix spike duplicate
NA - not applicable
TAT - turn-around time

Table 4-4
Fixed Laboratory Quality Control Sample Summary—NAPL

Method	Method Blanks[a]	MS/MSD (Percent)[b]	LCS (Blank Spike)[a]	Surrogate	Initial Calibration	Initial Calibration Verification	Continuing Calibration Standard[c]
SVOCs Target Compound List (TCL) with TICs	1/batch	NA	5 percent	All samples	5-pt	1/batch	After every 10 samples
VOCs plus TICs	1/batch	NA	1/batch	All samples	3-pt	1/batch	After every 12 hours
TPH-Dx	1/batch	NA	1/batch	All samples	5-pt	1/batch	After every 10 samples
Viscosity	NA	NA	NA	NA	NA	NA	NA
Density	NA	NA	NA	NA	NA	NA	NA
Solubility	NA	NA	NA	NA	NA	NA	NA
Wettability	NA	NA	NA	NA	NA	NA	NA
Boiling point distribution	NA	NA	NA	NA	NA	NA	NA
Oil-water interfacial tension	NA	NA	NA	NA	NA	NA	NA

[a] Batch is equivalent to 20 or fewer samples prepared and analyzed together with common QC samples.
[b] MS/MSD for organics; MS/laboratory duplicate for inorganics
[c] Continuing calibration blank samples are analyzed immediately after continuing calibration standards.

Notes:
LCS - laboratory control sample
MS/MSD - matrix spike/matrix spike duplicate
NA - not applicable

Table 4-5
Fixed Laboratory Quality Control Sample Summary—Groundwater

Method	**Method Blanks**[a]	**MS/MSD (Percent)**[b]	**LCS (Blank Spike)**[a]	**Surrogate**	**Initial Calibration**	**Initial Calibration Verification**	**Continuing Calibration Standard**[c]
PAHs and PCP – standard TAT	1/batch	5	1/batch	All samples	5-pt	1/batch	After every 12 hours
PCP	1/batch	5	1/batch	All samples	5-pt	1/batch	After every 12 hours
VOCs	1/batch	5	1/batch	All samples	3-pt	1/batch	After every 12 hours
TOC	N/A	5	1/batch	N/A	5-pt	1/batch	After every 10 samples
Dioxins/furans	This information is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999)						
Methane	1/batch	5	1/batch	All samples	3-pt	1/batch	After every 12 hours
Total and dissolved manganese	Daily or 1/batch	10 (MS/laboratory duplicate)	Daily or 1/batch	NA	2-point	After initial calibration and at the end of the analytical run	After every 10 samples
Anions	Daily or 1/batch	10 (MS/laboratory duplicate)	Daily or 1/batch	NA	6-point	After initial calibration and at the end of the analytical run	After every 10 samples

[a] Batch is equivalent to 20 or fewer samples prepared and analyzed together with common QC samples.
[b] MS/MSD for organics; MS/lab duplicate for inorganics
[c] Continuing calibration blank samples are analyzed immediately after continuing calibration standards.

Notes:
LCS - laboratory control sample
MS/MSD - matrix spike/matrix spike duplicate
NA - not applicable
TAT - turn-around time
TBD - to be determined

5.0 LABORATORY ANALYTICAL METHODS

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

The SOPS for all analytical methods are incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999) except those described in Sections 5.6 through 5.11 following. The SOPs for the mobile field laboratory and fixed laboratory methods for soil are summarized in Tables 5-1 and 5-2. The fixed laboratory methods for groundwater and NAPL are summarized in Tables 5-3 and 5-4.

5.1 TARGET COMPOUND LIST FOR SEMIVOLATILES ANALYSIS

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

5.2 NONAQUEOUS-PHASE LIQUID ANALYTICAL APPROACH

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

5.3 EPA REGION 9 LABORATORY PROPOSED APPROACH FOR SVOC ANALYSIS OF HYDROCARBON-CONTAMINATED SOIL SAMPLES

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

5.4 ADDENDUM TO EPA REGION 9 LABORATORY SOP NO. 385 FOR TPH-DX

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

5.5 ADDENDUM TO EPA REGION 9 LABORATORY SOP NO. 315 FOR SEMIVOLATILE ORGANIC COMPOUND ANALYSES

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

5.6 ADDENDUM TO EPA REGION 9 LABORATORY SOP NO. 305 FOR VOLATILE ORGANIC COMPOUND ANALYSIS

The EPA Region 9 Laboratory SOP No. 305 is amended to include only those compounds listed in Table 5-5. The QC limits and quantitation limits for ketones and ethers in soil are provided in Table 5-6.

5.7 COLUMBIA ANALYTICAL LABORATORY SOP NO. SOC-8151M FOR PCP ANALYSIS

The laboratory will analyze groundwater for PCP using the Columbia Analytical Services SOP SOC-8151M, which is included in Appendix C.

5.8 COLUMBIA ANALYTICAL SERVICES LABORATORY SOP NO. SOC-8270C FOR SEMIVOLATILE ORGANIC COMPOUND ANALYSIS

The laboratory will analyze NAPL for SVOCs using the Columbia Analytical Services SOP No. SOC-8270C, which is included in Appendix C.

5.9 COLUMBIA ANALYTICAL SERVICES LABORATORY SOP NO. SOC-8260C FOR VOLATILE ORGANIC COMPOUND ANALYSIS

The laboratory will analyze NAPL for VOCs plus TICs using the Columbia Analytical Services SOP No. SOC-8260C, which is included in Appendix C.

5.10 EPA REGION 9 LABORATORY SOP FOR PCP ANALYSIS

The EPA Region 9 FASP laboratory PCP analysis SOP is summarized below. The complete SOP is provided in Appendix C.

1. Weigh out approximately 5 g sample into a 40-mL vial.

2. Add sodium sulfate to dry sample. Sufficient sodium sulfate has been added when no clumps remain, and soil/sodium sulfate mixture can be mixed freely.

3. Add 4-chlorophenol surrogate to sample.

4. Add 20 mL 4:1 hexane/acetone to sample and cap. (4:1 hexane/acetone was chosen because that is the solvent used in the R9 laboratory to perform PFE extractions of SVOCs in soil, and it provided comparable results when used for the ultrasonic extraction.)

5. Shake sample vigorously (or mix using vortex mixer to ensure thorough solvent contact). Place vial in ultrasonic bath and sonicate for 1 hour.

6. Transfer an aliquot of the solvent from the sample vial to an autosample vial and analyze using the GC/ECD.

7. The GC/ECD will be calibrated over the range of 50 to 500 ng/mL, using a total of three calibration points. The GC will be set up with a 0.53 mm i.d. Rtx-50 column. Samples will be calculated using the average response factor of the initial calibration.

8. A daily calibration check standard at a concentration of the midpoint of the initial calibration will be analyzed to confirm that the initial calibration is still good. Midpoint is 250 mg/L.

9. Quantitation limit is 1 mg/kg.

10. Initial Calibration percent RDS is 30 percent. Calibration verification is 40 percent difference.

11. Laboratory control sample and matrix spike is 60 to 140 percent recovery.

Table 5-1
Mobile Field Laboratory Method Summary—Soil

Analyte	Method Reference	Preservation Method	Extraction Method	Cleanup Method	Instrument Detector
PCP	Region 9 SOP - SW-846 8081M	Refrigeration	Vortex in methanol	None	Photometer
VOCs (ethers and ketones)	Region 9 SOP - No. 902	Refrigeration	Direct purge	None	GC/MS
TPH-Dx	Region 9 SOP - Modified	Refrigeration	Vortex in hexane	NA	GC/FID
TPH by fluorescence	SCAPS SOP (ASTM D 6187)	NA	NA	NA	Fluorescence detector (photodiode array with optical multichannel analyzer)

Note:
NA- not applicable

Table 5-2
Fixed Laboratory Method Summary—Soil

Analyte	Method Reference	Preservation Method	Extraction Method	Cleanup Method	Instrument/ Detector
PAHs and PCP (rapid and standard TAT)	Region 9 SOP - No. 315	4 ± 2 °C	PFE	GPC	GC/MS
VOCs plus TICs	Region 9 SOP No. 305	4 ± 2 °C Sodium bisulfate or methanol	Direct purge	NA	GC/MS
TPH-Dx	Region 9 SOP	4 ± 2 °C	PFE	NA	GC/FID
TOC	Walkley-Black	4 ± 2 °C	Dean-Stark	None	Titration with Fe SO_4
Grain size	ASTM D 422-63	None	NA	NA	NA
Porosity	API RP40	None	Toluene	None	NA
Permeability (hydraulic conductivity)	ASTM D5084	None	NA	NA	NA
Density	ASTM D2937	None	NA	NA	NA
Cation exchange capacity	EPA SW-846 Method 9081	None	Sodium acetate	NA	Atomic absorption
NAPL saturation (oil and grease)	PTS SOP	4 ± 2 °C	PTS SOP	NA	Analytical balance

Notes:
GPC - gel permeation chromatography
NA - not applicable
PFE - pressurized fluid extraction
TAT - turn-around time

Table 5-3
Fixed Laboratory Method Summary—Groundwater

Analyte	Method Reference	Preservation Method	Extraction Method	Cleanup Method	Instrument/ Detector
PAHs and PCP (rapid and standard TAT)	Region 9 SOP No. 315	4 ± 2 °C	PFE	GPC	GC/MS
PCP	CAS SOP No. SOC-8151M	4 ± 2 °C	Liquid/liquid extraction with ethyl ether	NA	GC/ECD
TOC	EPA Method 415.1	4 ± 2 °C	NA	NA	Dohrman Total Organic Carbon Analyzer DC-190
Dioxins/furans	EPA Method 1613B	4 ± 2°C	Separatory funnel	Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999)	High resolution GC/MS
Methane	Kampbell, Wilson, and Vandegrift technique	HCl to pH < 2, 4 ± 2°C	None	None	GC/FID
Total and dissolved manganese	Region 9 SOP No. 505	Nitric acid to pH <2, 4 ± 2°C	Acid digestion	None	ICP-ES
Anions	Region 9 SOP No. 530	4 ± 2°C	None	None	Dionex ion chromatography

Notes:
GPC - gel permeation chromatography
NA - not applicable
PFE - pressurized fluid extraction
TAT - turn-around time
TBD - to be determined

Table 5-4
Fixed Laboratory Method Summary—NAPL

Analyte	Method Reference	Preservation Method	Extraction Method	Cleanup Method	Instrument/ Detector
SVOCs Target Compound List with TICs	CAS SOP No. SOC-8270C	Refrigeration	NA	NA	GC/MS
VOCs with TICs	CAS SOP No. VOC-8260C	Refrigeration	NA	NA	GC/MS
TPH-Dx	Region 9 SOP No. 385	Refrigeration	NA	NA	GC/FID
Viscosity	Kerr Laboratory SOP (ASTM D1296)	Refrigeration	NA	NA	Brookfield Rotational Viscometer Model DV-1
Density	Kerr Laboratory SOP	Refrigeration	NA	NA	Balance
Solubility	Kerr Laboratory SOP	Refrigeration	Methylene chloride	NA	GC/MS
Wettability	Kerr Laboratory SOP	Refrigeration	NA	NA	Visual inspection
Boiling point distribution/distillation	Kerr Laboratory SOP (ASTM D86)	Refrigeration	NA	NA	Thermometer
Oil-water interfacial tension	Kerr Laboratory SOP (ASTM D971)	Refrigeration	NA	NA	Fisher Surface Tensiometer Model 20

Notes:
NA - not applicable
PFE - pressurized fluid extraction

Table 5-5
VOC Target Compound List and Proposed Minimum RRF, %RSD and %D Criteria for Initial Calibration and Continuing Calibration for VOC Analysis at McCormick and Baxter Site

Analyte	Min. RRF	Max. %RSD	Max. %D
Dichlorodifluoromethane	0.1	40	40
Chloromethane	0.01	NA	NA
Vinyl chloride	0.1	40	40
Bromomethane	0.1	NA	NA
Chloroethane	0.01	NA	NA
Trichlorofluoromethane	0.1	40	40
1,1-Dichloroethene	0.1	40	40
Acetone	0.01	NA	NA
Carbon disulfide	0.01	NA	NA
Methylene chloride	0.01	NA	NA
trans-1,2-Dichloroethene	0.01	NA	NA
Methyl tert-butyl ether	0.1	40	40
1,1-Dichloroethane	0.2	40	40
Ethyl tert-butyl ether	0.01	NA	NA
cis-1,2-Dichloroethene	0.01	NA	NA
2-Butanone	0.01	40	40
Chloroform	0.2	40	40
1,2-Dichloroethane-d4 (ss)	0.01	NA	NA
1,2-Dichloroethane	0.1	40	40
1,1,1-Trichloroethane	0.1	40	40
Isopropyl ether	0.01	40	40
t-Amyl methyl ether	0.01	40	40
Carbon tetrachloride	0.1	40	40
Benzene	0.3	40	40
Trichloroethene	0.1	40	40
1,2-Dichloropropane	0.01	NA	NA
Bromodichloromethane	0.1	NA	NA
cis-1,3-Dichloropropene	0.1	40	40
trans-1,3-Dichloropropene	0.1	40	40
1,1,2-Trichloroethane	0.1	40	40
Dibromochloromethane	0.05	NA	NA
4-Methyl-2-pentanone	0.01	40	40
Toluene-d8 (ss)	0.01	NA	NA
Toluene	0.3	40	40
Tetrachloroethene	0.1	40	40
1,3-Dichloropropane	0.1	40	40
2-Hexanone	0.01	40	40
1,2-Dibromoethane	0.01	NA	NA
Chlorobenzene	0.5	40	40
Ethylbenzene	0.1	40	40
Xylene (m & p)	0.2	40	40
Xylene (ortho)	0.2	40	40
Styrene	0.2	40	40
Bromoform	0.01	NA	NA
Bromofluorobenzene (ss)	0.2	NA	NA
1,1,2,2-Tetrachloroethane	0.05	40	40
1,2,3-Trichloropropane	0.05	40	40
1,3-Dichlorobenzene	0.4	40	40
1,4-Dichlorobenzene	0.4	40	40
1,2-Dibromo-3-chloropropane	0.01	NA	NA
Diisopropyl ether	0.01	40	40

Table 5-6
QC Limits and Quantitation Limit for Ketones and Ethers in Soil for Analysis to Be Performed by FASP in Mobile Laboratory at McCormick and Baxter Site

Analyte	Min. RRF	Initial Calibration Max. %RSD	Continuing Calibration Max. %D	Quantitation Limit (µg/kg)	LCS Recovery Limits (%)
Acetone	0.01	40	40	10	50-150
Methyl-t-butyl ether (MTBE)	0.01	40	40	10	50-150
Ethyl-t-butyl ether	0.01	40	40	10	50-150
2-Butanone	0.01	40	40	10	50-150
Diisopropylether	0.01	40	40	10	50-150
t-amyl methyl ether (TAME)	0.01	40	40	10	50-150
4-Methyl-2-pentanone (MIBK)	0.01	40	40	10	50-150
2-Hexanone	0.01	40	40	10	50-150

Surrogate Recoveries:

1,2-dichloroethane-d4	70-121
Toluene-d8	84-138
Bromofluorobenzene	59-113

6.0 INSTRUMENT CALIBRATION AND MAINTENANCE

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

7.0 ANALYTICAL DATA QUALITY INDICATORS

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

8.0 PREVENTATIVE MAINTENANCE

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

9.0 CORRECTIVE ACTIONS

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

10.0 LABORATORY DATA REDUCTION, DELIVERABLES, QA REVIEW, AND REPORTING

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

11.0 PERFORMANCE AND SYSTEM AUDITS

This section is incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

12.0 REFERENCES

U.S. Army Corps of Engineers (USACE). 1999. *McCormick and Baxter Superfund Site Final Management Plan for NAPL Field Exploration*. June 16, 1999.

———. 1994. *Requirements for the Preparation of Sampling and Analysis Plans.* EM 200-1-3. September 1994.

APPENDIX A

Laboratory Reporting Limits

Table A-1
SCAPS and Region 9 FASP Laboratory Reporting Limits—Soil

Analyte	Method Reference	Laboratory	Reporting Limit
PCP	Region 9 SOP	Region 9 FASP	1 ppm
TPH-Dx	Region 9 SOP - Modified	Region 9 FASP	100 mg/kg
TPH by Fluorescence	SCAPS SOP (ASTM D 6187)	SCAPS	TBD in the field

Note:
TBD - to be determined

Table A-2
Region 9 and Other Fixed Laboratory Reporting Limits—Groundwater

Analyte	Method Reference	Laboratory	Reporting Limit
PAHs and PCP (rapid and standard TAT)	Region 9 SOP No. 315	Region 9	Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).
SVOCs	CAS SOP No. SOC-8270C	Columbia Analytical Services	See Appendix C
PCP	CAS SOP No. SOC-8151M	Columbia Analytical Services	See Appendix C
VOCs	CAS SOP No. VOC-8260B	Columbia Analytical Services	See Appendix C
TOC	EPA Method 415.1	Region 9	2,000 µg/L
Dioxins/furans	EPA Method 1613	Pacific Analytical Laboratory	Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).
Methane	Kampbell, Wilson, and Vandegrift technique	Columbia Analytical Services	Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).
Total and dissolved manganese	Region 9 SOP No. 505	Region 9	Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).
Anions	Region 9 SOP No. 530	Region 9	Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

Table A-3
Region 9 and Other Fixed Laboratory Reporting Limits—Soil

Analyte	Method Reference	Laboratory	Reporting Limit
PAHs and PCP (rapid TAT)	Region 9 SOP - No. 315	Region 9	PAHs and dibenzofuran: 20 mg/kg wet PCP: 50 mg/kg wet
PAHs and PCP (standard TAT)	Region 9 SOP No. 315	Region 9	PAHs and dibenzofuran: 0.33 mg/kg PCP: 0.83 mg/kg
VOCs plus TICs	Region 9 SOP No. 305	Region 9	5 to 50 µg/kg for VOCs and 100 µg/kg for TICs (see Appendix C and Table 5-6)
TPH-Dx	Region 9 SOP	Region 9	100 mg/kg
Metals	CLP RAS	Region 9	1 mg/kg to 2.5 mg/kg
TOC	Walkley-Black	PTS	100 mg/kg
Grain size	ASTM D 422-63	PTS	NA
Porosity	API RP 40	PTS	NA
Permeability (hydraulic conductivity)	ASTM D5084	PTS	NA
Density	ASTM D2937	PTS	0.01 g/cc
Cation exchange capacity	EPA SW-846 Method 9081	PTS	0.01 meq/g (measured as sodium)
NAPL saturation (oil and grease)	PTS SOP	PTS	0.01 g

Notes:
g - grams
g/cc - grams per cubic centimeter
mg/kg - milligrams per kilogram
NA - not applicable
ng/kg - nanograms per kilogram
TAT - turn-around time

Table A-4
Region 9 and Other Fixed Laboratory Reporting Limits—NAPL

Analyte	Method Reference	Laboratory	Reporting Limit
SVOCs plus TICs - standard TAT	CAS SOP No. SOC-8270C	Region 9	PAHs and dibenzofuran: 0.33 mg/kg PCP: 0.83 mg/kg
VOCs plus TICs	CAS SOP No. VOC-8260B	Region 9	5 to 50 μg/kg for VOCs and 100 μg/kg for TICs
TPH-Dx	Region 9 SOP No. 385	Region 9	100 mg/kg
Viscosity	Kerr Laboratory SOP (ASTM D1296)	Robert S. Kerr Laboratory	NA
Density	Kerr Laboratory SOP	Robert S. Kerr Laboratory	0.01 g/cc
Solubility	Kerr Laboratory SOP	Robert S. Kerr Laboratory	NA
Wettability	Kerr Laboratory SOP	Robert S. Kerr Laboratory	NA
Boiling point distribution/distillation	Kerr Laboratory SOP (ASTM D86)	Robert S. Kerr Laboratory	NA
Oil-water interfacial tension	Kerr Laboratory SOP (ASTM D971)	Robert S. Kerr Laboratory	NA

Notes:
g/cc - grams per cubic centimeter
μg/kg - micograms per kilogram
mg/kg - milligrams per kilogram
NA - not applicable
TAT - turn-around time

APPENDIX B

Laboratory Control Limits

Table B-1
SCAPS and Region 9 FASP Laboratory Control Limits—Soil

Analyte	Method Reference	Laboratory	Control Limits
PCP	EPA Region 9 SOP	FASP	Surrogate, MS%R: 60 - 140% Duplicate RPD: 30% Calibration Verification: 40%
TPH-Dx	Region 9 SOP - Modified	Region 9 FASP	Surrogate, MS %R: 50-150% Duplicate RPD: 50%
TPH by fluorescence	SCAPS SOP (ASTM D 6187)	SCAPS	NA

Note:
NA - not applicable

Table B-2
Region 9 and Other Fixed Laboratory Control Limits—Soil

Analyte	Method Reference	Laboratory	Control Limits
PAHs and PCP	Region 9 SOP No. 315	Region 9	Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).
VOCs plus TICs	Region 9 Laboratory SOP No. 305	Region 9	See Appendix C and Tables 5-5 and 5-6
TPH-Dx	Region 9 SOP	Region 9	Surrogate, MS %R: 50-150% Duplicate RPD: <50%
Metals	CLP RAS	Region 9	MS %R: 75-125% Duplicate RPD: 35%
TOC	Walkley-Black	PTS	MS %R: ±5% Duplicate RPD: <20%
Grain size	ASTM D 422-63	PTS	RPD: <20%
Porosity	API RP40	PTS	± 0.02% pore volume
Permeability (hydraulic conductivity)	ASTM D5084	PTS	NA
Density	ASTM D2937	PTS	RPD: <20%
Cation exchange capacity	EPA SW-846 Method 9081	PTS	MS and LCS: 80-120% RPD: <20%
NAPL saturation (oil and grease)	PTS SOP	PTS	Calibration Std: 80-120%

Note:
NA - not applicable

Table B-3
Region 9 and Other Fixed Laboratory Control Limits—Groundwater

Analyte	Method Reference	Laboratory	Control Limits
PAHs and PCP (rapid and standard TAT)	Region 9 SOP No. 315	Region 9	Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).
SVOCs	CAS SOP No. SOC-8270C	Columbia Analytical Services	See Appendix C
PCP	CAS SOP No. SOC-8151M	Columbia Analytical Services	See Appendix C
VOCs	CAS SOP No. VOC-8260 B	Columbia Analytical Services	See Appendix C
TOC	EPA Method 415.1	Region 9	MS %R: 45-125% Duplicate RPD: <20%
Dioxins/furans	EPA Method 1613	Pacific Analytical Laboratory	Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).
Methane	Kampbell, Wilson, and Vandegrift technique	Columbia Analytical Services	MS/LCS %R: 50-150% Duplicate RPD: <20%
Total and dissolved manganese	Region 9 SOP No. 505	Region 9	Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).
Anions	Region 9 SOP No. 530	Region 9	Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

Note:
TBD - to be determined

Table B-4
Region 9 and Other Fixed Laboratory Control Limits—NAPL

Analyte	Method Reference	Laboratory	Control Limits
TPH-Dx	Region 9 SOP No. 385	Region 9	Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).
PAHs and PCP - standard TAT	CAS SOP No. SOC-8270C	Region 9	Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).
VOCs plus TICs	CAS SOP No. VOC-8260B	Columbia Analytical Services	See Appendix C
Viscosity	Kerr Laboratory SOP (ASTM D1296)	Robert S. Kerr Laboratory	Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).
Density	Kerr Laboratory SOP	Robert S. Kerr Laboratory	Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).
Solubility	Kerr Laboratory SOP	Robert S. Kerr Laboratory	Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).
Wettability	Kerr Laboratory SOP	Robert S. Kerr Laboratory	Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).
Boiling point distribution/distillation	Kerr Laboratory SOP (ASTM D86)	Robert S. Kerr Laboratory	Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

Table B-4 (Continued)
Region 9 and Other Fixed Laboratory Control Limits—NAPL

Analyte	Method Reference	Laboratory	Control Limits
Oil-water interfacial tension	Kerr Laboratory SOP (ASTM D971)	Robert S. Kerr Laboratory	Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Final Management Plan for NAPL Exploration* (USACE 1999).

APPENDIX C

Standard Operating Procedures

CONTENTS

Site Characterization and Analysis Penetrometer System/Laser-Induced Fluorescence (SCAPS/LIF), incorporated by reference to the June 16, 1999, *McCormick and Baxter Final Management Plan for NAPL Exploration* (USACE 1999)

Region 9 FASP Procedure for Extracting TPH Soil Samples, incorporated by reference to the June 16, 1999, *McCormick and Baxter Final Management Plan for NAPL Exploration* (USACE 1999)

Region 9 Laboratory SOP 385 – Extractable Petroleum Hydrocarbons by GC/FID, incorporated by reference to the June 16, 1999, *McCormick and Baxter Final Management Plan for NAPL Exploration* (USACE 1999)

Region 9 Laboratory SOP 280 – Extraction of Petroleum Hydrocarbons in Soil Samples Using Pressurized Fluid Extraction, incorporated by reference to the June 16, 1999, *McCormick and Baxter Final Management Plan for NAPL Exploration* (USACE 1999)

Region 9 Laboratory SOP 290 – Extraction of Soil Samples Using Pressurized Fluid Extraction, incorporated by reference to the June 16, 1999, *McCormick and Baxter Final Management Plan for NAPL Exploration* (USACE 1999)

Region 9 Laboratory SOP 315 – Semivolatile Organics Analysis, incorporated by reference to the June 16, 1999, *McCormick and Baxter Final Management Plan for NAPL Exploration* (USACE 1999)

Region 9 Laboratory SOP 505 – Determination of Trace Elements in Water by Inductively Coupled Plasma – Atomic Emission Spectrometry, September 30, 1998, Revision 1, incorporated by reference to the June 16, 1999, *McCormick and Baxter Final Management Plan for NAPL Exploration* (USACE 1999)

Region 9 laboratory SOP 530 – Analysis of Anions by Ion Chromatography, August 12, 1998, Revision 1, incorporated by reference to the June 16, 1999, *McCormick and Baxter Final Management Plan for NAPL Exploration* (USACE 1999)

Region 9 Laboratory SOP 305, Volatile Organic Compound Analysis, February 10, 2000

Region 9 Laboratory SOP TBD, Total Organic Carbon.

PTS Laboratories – TOC by Walkley-Black Method, incorporated by reference to the June 16, 1999, *McCormick and Baxter Final Management Plan for NAPL Exploration* (USACE 1999).

PTS Laboratories – Porosity - API RP40, incorporated by reference to the June 16, 1999, *McCormick and Baxter Final Management Plan for NAPL Exploration* (USACE 1999)

CONTENTS (Continued)

PTS Laboratories – Dry or Native Bulk Density – ASTM D2937, incorporated by reference to the June 16, 1999, *McCormick and Baxter Final Management Plan for NAPL Exploration* (USACE 1999)

PTS Laboratories – Manual Distillation of Petroleum Products – ASTM D86, incorporated by reference to the June 16, 1999, *McCormick and Baxter Final Management Plan for NAPL Exploration* (USACE 1999)

PTS Laboratories – Particle Size by Mechanical Sieve – ASTM D422M-63, incorporated by reference to the June 16, 1999, *McCormick and Baxter Final Management Plan for NAPL Exploration* (USACE 1999)

PTS Laboratories – Cation Exchange Capacity EPA SW-846 Method 9081, incorporated by reference to the June 16, 1999, *McCormick and Baxter Final Management Plan for NAPL Exploration* (USACE 1999)

PTS Laboratories – Fluid Extractions – API RP40, incorporated by reference to the June 16, 1999, *McCormick and Baxter Final Management Plan for NAPL Exploration* (USACE 1999)

D.H. Kampbell, J. T. Wilson, and S.A. Vandegrift – "Dissolved Oxygen and Methane in Water by A GC Headspace Equilibration Technique." *Intern. J. Anal. Chem.* Vol. 36,, pp. 249-257., 1989

Columbia Analytical Services – Semivolatile Organic Compounds by GC/MS, EPA Method 8270CSOC-8270C, revision 1, June 16, 1999

Columbia Analytical Services – Volatile Organic Compounds by GC/MS, EPA Method 8260B, VOC-8260B, revision 2, July 7, 1999

Columbia Analytical Services – Chlorinated Phenols, Method 8151 Modified, SOC-8151M, revision 1, May 19, 1999

DATA NOT AVAILABLE ELECTRONICALLY

APPENDIX D

EPA Region 9 Analytical Request Forms for Dioxin Analyses

Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Management Plan for NAPL Field Exploration* (USACE 1999)

APPENDIX E

Kerr Laboratory Proposed Steam Inspection Treatability Study

Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Management Plan for NAPL Field Exploration* (USACE 1999)

APPENDIX F

Example Data Review Report

Incorporated by reference to the June 16, 1999, *McCormick and Baxter Superfund Site Management Plan for NAPL Field Exploration* (USACE 1999)

Investigation-Derived Waste Plan Addendum for FY 2000 NAPL Field Exploration
McCormick and Baxter Superfund Site
Stockton, California

APPROVAL PLAN

Army Corps of Engineers Project Manager: Cheryl Buckel

Date

Army Corps of Engineers Project Technical Leader:
Kira Lynch

Date

FINAL

INVESTIGATION-DERIVED WASTE PLAN ADDENDUM FOR FY 2000 NAPL FIELD EXPLORATION

McCormick and Baxter Superfund Site
Stockton, California

July 6, 2000

Prepared for

EPA
REGION 9

U.S. Environmental Protection Agency
Region 9
75 Hawthorne Street
San Francisco, California 94105-3901

Prepared by

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53F0072263

CONTENTS

ABBREVIATIONS AND ACRONYMS

bgs	below ground surface
bml	below mud line
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
EPA	U.S. Environmental Protection Agency
FASP	Field Analytical Support Program
FR	Federal Register
FY00	Fiscal Year 2000
IDW	investigation-derived waste
LIF	laser-induced fluorescence
NAPL	nonaqueous-phase liquid
PAH	polycyclic aromatic hydrocarbon
PPE	personal protective equipment
PID	photoionization detector
RCRA	Resource Conservation and Recovery Act
SCAPS	Site Characterization and Analysis Penetrometer System
SVOC	semivolatile organic compound
TPH	total petroleum hydrocarbon
UPRR	Union Pacific Rail Road
USACE	U.S. Army Corps of Engineers

1.0 INTRODUCTION

Investigation-derived waste (IDW) generated during the Fiscal Year 2000 (FY00) McCormick and Baxter Superfund site field exploration will be stored, handled, and disposed of according to this IDW Plan Addendum. The investigation to be conducted beginning in June will largely be sited north of the McCormick and Baxter site on the Dutra and Stockton Cold Storage properties and along the eastern portion of the site, on the Union Pacific Rail Road (UPRR) properties. This IDW Plan describes expected types of IDW (Section 2), storage and handling procedures (Section 3), evaluation of IDW to determine disposal methods and disposal options (Section 4), and a disposal plan (Section 5).

The field exploration is being conducted by the U.S. Army Corps of Engineers (USACE) Seattle, Sacramento, and Albuquerque Districts, in support of the U.S. Environmental Protection Agency (EPA) Region 9. As a federal Superfund site, federal, state, or local permits are not required for actions conducted pursuant to Comprehensive Environmental Response, Liability, and Compensation Act (CERCLA) Section 104 [40 CFR 300.400(e)]. Therefore, this IDW Plan Addendum follows guidelines set forth and regulations referenced in *Management of Investigation-Derived Wastes During Site Inspections* (USEPA 1991) and *Guide to Management of Investigation-Derived Wastes* (USEPA 1992).

IDW removed from the site will comply with the Off-Site Disposal Rule (FR 58, No. 182, September 22, 1993). The USACE will determine the manner in which waste will be characterized and will coordinate with the EPA for authority to dispose of IDW at an approved facility. The Region 9 CERCLA Off-Site Disposal Rule coordinators are Ms. Kandice Bellamy (415-744-2091) and Ms. Eve Levin (415-744-2110).

2.0 EXPECTED TYPES OF INVESTIGATION-DERIVED WASTE

The sampling methods and field laboratory analyses employed during this field exploration will generate IDW that may include soil, decontamination water, well development water, well purge water, personal protective equipment (PPE), disposable sampling equipment, and field laboratory waste. Based on the site history and on results of past investigations, potential contaminants in IDW may include semivolatile organic compounds (SVOCs), polycyclic aromatic hydrocarbons (PAHs), and petroleum hydrocarbons.

2.1 SOIL

Approximately 1,300 soil and 50 groundwater samples will be collected using a Site Characterization and Analyses Penetrometer system (SCAPS) probe, equipped with a laser-induced fluorescence (LIF) sensor, and a drilling rig (rotosonic drilling method). The LIF sensor will be calibrated in the field to detect the presence of hydrocarbons in the bulk soil matrix throughout the vadose zone, capillary fringe, and saturated zone. Soil cuttings generated from the borings will be placed in 55-gallon drums in preparation for disposal. All drums will be immediately labeled with boring identification, depth, date, time, and the name and telephone number of the USACE project manager.

Minimal soil cuttings are anticipated to be generated using the SCAPS soil sampling system or if microwells are installed. Approximately 0.2 cubic foot of soil cuttings may be generated for every 1 foot drilled with the drilling rig (except for continuous sampling) for the contingency borings. For the purposes of this IDW Plan Addendum, it is assumed that 10 SCAPS borings will meet refusal at 50 feet bgs, and that a drill rig will be required to complete the subsurface borings. This will result in approximately three to four drums per boring. Continuous cores will be collected from the four 250-foot soil borings north of Old Mormon Slough.

Approximately 970 soil samples will be collected from the SCAPS push and rotary sonic boring location located in areas off the McCormick and Baxter property, including Stockton Cold Storage (formerly Union Ice), Dutra, and UPRR. Based on the results of the FY99 nonaqueous-phase liquid (NAPL) investigation and the objectives of the FY00 NAPL investigation, significant vadose zone contamination is not considered to be likely. A maximum of four groundwater monitoring wells may be installed along the northern shore of Old Mormon Slough on the Stockton Cold Storage and Dutra properties. Drill cuttings generated from these soil borings, the contingency soil borings, and SCAPS pushes will be containerized and removed from the private property on a daily basis and stored with other IDW on the McCormick and Baxter property.

Depending on the results of the initial investigation phase, a rotosonic drill rig and barge may be mobilized to investigate subsurface contamination beneath Old Mormon Slough. Five contingency boreholes will be drilled to 170 feet below mud line (bml), which will result in approximately three drums of IDW. Three options are considered for moving the drummed IDW off the barge to the McCormick and Baxter property, which are listed below:

- Transporting the IDW from the barge staging site using the drilling support truck at the end of the slough investigation
- Transporting the IDW using a licensed waste hauler from the barge staging site at the end of the slough investigation
- Using a boom truck or crane to lift the drums from the barge onto the McCormick and Baxter property at the end of the slough investigation

2.2 DEVELOPMENT AND PURGE WATER

A maximum of 11 groundwater samples will be collected from 11 SCAPS push locations on site using tubing and a peristaltic pump for wells that are less than 28 feet below ground surface (bgs). SCAPS wells are generally sampled within 24 hours of completion and will not be purged if sampled during this timeframe. If the groundwater samples are not collected within 24 hours, the wells will be purged prior to sampling. A small volume (approximately 0.5 gallon) of purge water may be generated for each well.

In addition to the SCAPS borings, 49 existing monitoring wells will be sampled as part of the site investigation. Prior to sampling, the wells will be purged using low-flow rates that will limit the volume of purge water generated. One round of groundwater samples will be collected. It is estimated that, collectively, approximately 250 gallons of purge water may be generated during groundwater sampling activities.

A maximum of four 250-foot soil borings will be completed as monitoring wells on the private properties located north of Old Mormon Slough; however, groundwater sampling is not part of the NAPL investigation. Groundwater samples will be collected later in the year as part of the comprehensive groundwater monitoring program. After construction, the wells will be developed by bailing, pumping, and surging. Approximately 200 gallons of water may be generated from each well. Therefore, approximately 1,000 gallons of development water may be generated, which will be containerized, removed from the private property on a daily basis, and stored with other IDW on the McCormick and Baxter property.

The groundwater wells to be installed during the site investigation are not expected to contain significant evidence of contamination, such as stained soils, odors, or NAPL. However, if a significant level of NAPL is encountered, the wells will not be developed.

2.3 DECONTAMINATION WATER

Sampling equipment including stainless steel spoons and bowls, down-hole drilling equipment and non-disposable PPE will be decontaminated between each use and/or at the end of each workday. Decontamination activities will be conducted in the pole wash area, which includes a structure that will be used to contain the decontamination water. Decontamination water will be obtained from a source on site. The decontamination water will contain a minimum of phosphate-free detergent (Liquinox®), and trace quantities of soil. Approximately 200 gallons may be generated during the SCAPS investigation, 100 gallons during soil boring and monitoring well drilling and installation, and 100 gallons during groundwater sampling.

Small quantities of solvent waste will be generated when nondisposable sampling equipment that has contacted NAPL is given a final rinse with isopropyl alcohol and hexane. This solvent waste will be containerized in buckets and evaporated on site.

One temporary decontamination pad will be constructed on the Dutra property. A temporary decontamination pad will be constructed on the Stockton Cold Storage property located north of Old Mormon Slough if the McCormick and Baxter property cannot be accessed. Because of the uniform surface contamination across the site, a separate decontamination area is not needed on the UPRR property. All decontamination that occurs during the investigation on the UPRR property will be conducted on the McCormick and Baxter property. All waste produced by daily decontamination activities will be containerized, removed from the private property on a daily basis, if separate remote temporary decontamination pads are required, and stored with other IDW on the McCormick and Baxter property.

2.4 PERSONAL PROTECTIVE EQUIPMENT AND DISPOSABLE SAMPLING EQUIPMENT

Disposable PPE used during sample collection and handling may include Tyvek® and/or paper coveralls, and latex, solvex, or cloth gloves. Each member of the field crew may use two Tyvek® or paper coveralls, several pairs of latex gloves, and one or two pairs of solvex gloves per day. Occasionally, cloth outer gloves may be used in order to grip sample containers more effectively.

Disposable sampling equipment may include polyethylene bailers, plastic bags, and/or glass sample jars that will not be submitted to a laboratory. These items may contain small quantities of soil or groundwater and will be decontaminated prior to disposal.

The disposable polyethylene tubing used for sampling with the SCAPS sampling device may become contaminated with NAPL, which cannot be easily cleaned from the tubing. The potentially NAPL-contaminated tubing will be segregated from the tubing that has not contacted NAPL. The potentially NAPL-contaminated tubing will be stored in a 55-gallon drum and stored at the site for future disposal. All non-contaminated solid waste will be disposed of in a dumpster on site that will be taken to the local municipal landfill.

All discarded PPE and disposable sampling materials produced by daily investigation activities will be containerized, removed from the private property on a daily basis, and stored with other IDW on the McCormick and Baxter property.

2.5 FIELD LABORATORY WASTE

During the site investigation, the EPA Field Analytical Support Program (FASP) on-site field laboratories will analyze soil and groundwater for total petroleum hydrocarbon (TPH) fingerprinting. Waste material from the field lab will consist of the following:

- Excess sample material (soil and water)
- Used glass sample containers
- Solvent waste
- Miscellaneous lab waste (paper towels, gloves, etc.)

The Region 9 FASP laboratory will be located on the McCormick and Baxter property.

3.0 HANDLING AND STORAGE OF INVESTIGATION-DERIVED WASTE

This section describes handling and storage procedures for the IDW described in Section 2. As advocated in the EPA guidelines (USEPA 1991), the procedures are designed to minimize the amount of waste generated and for managing containerized waste in a protective manner until disposal options are evaluated.

3.1 SOIL

During the investigation, approximately 400 cubic feet (14.8 cubic yards or 3,000 gallons) of drill cuttings are anticipated to be produced. The typical handling/storage options for drill cuttings are:

- Spreading all cuttings at each individual drilling site
- Containerizing all cuttings in 55-gallon drums
- Field-screening the cuttings with a flame ionization detector (FID) to evaluate which cuttings can be spread and which should be containerized.

All cuttings will be stored on the McCormick and Baxter property in drums. Sampling personnel will record the approximate volume of cuttings and the boring location number for each batch of cuttings retained in the drums. Each drum containing cuttings will be clearly labeled with the following information:

- Date the drum was filled
- Project number
- Name and phone number of the USACE project manager and person in charge of containerizing soil
- Sample location numbers and depth from which the soil originated

The information will be entered on weatherproof labels affixed to the side of the drum. Label information along with copies of field documentation related to the drum contents will be kept in the project file. In addition to the weatherproof label, a code for tracking applicable field information will be painted with oil-based paint on the side of each drum.

The drums will be stored on site (i.e., within the McCormick and Baxter property boundary) in the lined and fenced drum storage area. The outside of the drums will be cleaned and dried before the drums are transported from the private property to the McCormick and Baxter property. The drums will remain in this location until laboratory analysis is complete and IDW disposal options are evaluated, as described in Section 4.

3.2 DEVELOPMENT AND PURGE WATER

Development and purge water generated during monitoring well installation and groundwater sampling will be stored in 55-gallon drums placed in the on-site (i.e., on the McCormick and Baxter property) drum storage area. The drums will be labeled with information similar to that used for the drums containing soil (Section 3.1). At the completion of the site investigation, the contents of the drums will be tested for TPH and SVOCs to evaluate disposal alternatives.

3.3 DECONTAMINATION WATER

Because of the uniform surface contamination across the site, a separate decontamination area is not needed on the UPRR property. Down-hole drilling equipment will be steam-cleaned (in a temporary decontamination area established on the Dutra property and also on the Stockton Cold Storage property if the McCormick and Baxter property is not accessible) between each soil boring to remove excess soil from the SCAPS rig equipment and drilling rods from the drill rig and to avoid cross contamination. In addition, sampling equipment, such as split spoons, stainless steel spoons and bowls, implements used to handle sample cores, and a submersible pump, will also be cleaned in the temporary decontamination areas between uses.

Hand-held sampling equipment and PPE will also be washed and rinsed. Detailed description of decontamination procedures is included in Section 3.1.9 of the Field Sampling Plan Addendum.

An estimated 400 gallons of decontamination solution are expected during the site investigation. Water will either be evaporated in a containment area on the McCormick and Baxter property or placed in 55-gallon drums with well water for temporary storage on the McCormick and Baxter property until final disposal is determined. Decontamination solvents will be minimized, collected in tanks, tubs, and buckets, and allowed to evaporate on the McCormick and Baxter property.

3.4 PERSONAL PROTECTIVE EQUIPMENT AND DISPOSABLE SAMPLING EQUIPMENT

Personal protective equipment will be decontaminated as described in Section 3.3 and double-bagged after use or at the end of each workday. The disposal bags will be tied shut and disposed of in the manner determined by the EPA, in accordance with the Off-Site Disposal Rule (FR 58, No. 182, September 22, 1993). A rented large-volume trash container will be provided on the McCormick and Baxter property to dispose of PPE and other non-contaminated solid waste for the duration of the field investigation.

The fluid pumped through the disposable polyethylene tubing used with the SCAPS rig will be visually screened in the field for NAPL. If NAPL has contacted the tubing, the tubing will be stored on the McCormick and Baxter property in a 55-gallon drum for future disposal. If NAPL has not contacted the tubing, it will be cleaned in the same manner as other sampling equipment and disposed of with the PPE.

3.5 FIELD LABORATORY WASTE

Waste material from the field laboratory used during the site investigation will be handled as follows:

- Excess soil sample material and wastewater will be placed in separate 55-gallon drums in preparation for disposal.

- Used sample containers will be disposed of with PPE. This waste is usually non-regulated; however, if regulated, it will be properly transported, treated, and disposed of by a licensed disposal facility.

- All solvent waste or other potentially contaminated laboratory waste will be lab-packed in preparation for disposal. The USACE will coordinate the appropriate disposal of the lab-packs in accordance with the CERLCA Off-Site Disposal Rule and with EPA Region 9 coordinators Ms. Kandice Bellamy and Ms. Eve Levin.

- If other field laboratory wastes (e.g., paper towels and gloves) are considered hazardous, the waste will be stored in 55-gallon drums in preparation for future disposal. If the waste is non-hazardous, it will be double-bagged and disposed of by the laboratory in a garbage container.

4.0 EVALUATION TO DETERMINE PROPER DISPOSAL

Containerized soil, decontamination water, well development water, and well purge water will be evaluated for proper disposal methods. The first step in evaluating IDW includes characterizing the waste to determine the types and concentrations of contaminants that it contains. Based on the results of characterization, appropriate treatment and/or disposal options will then be selected.

4.1 SOIL

During the site investigation, the drill cuttings generated will be containerized in 55-gallon drums. If laboratory analyses indicate that the drill cuttings are a Resource Conservation and Recovery Act (RCRA) hazardous waste, the soil will be containerized and stored on site and addressed during implementation of the final remedy, in accordance with EPA guidance.

4.2 WATER

Water generated during the FY00 NAPL investigation is estimated to total a maximum of 1,500 gallons. All water generated as part of the investigation will temporarily be stored in 55-gallon drums and then allowed to evaporate on site. Historical groundwater data will be used to segregate purge water for those wells known to contain NAPL.

4.3 DISPOSABLE EQUIPMENT

Proper disposal of containerized polyethylene tubing potentially contaminated with NAPL during the SCAPS groundwater sampling will be performed by a licensed waste disposal contractor.

4.4 FIELD LABORATORY WASTE

As discussed in Section 3.5, excess soil sample material from the borings will be placed in 55-gallon drums and excess water samples will also be stored in 55-gallon drums in preparation for future disposal. Glass sample containers will be crushed, tested and properly disposed of. Solvent waste will be lab-packed and disposed of in accordance with the CERCLA Off-Site Disposal Rule.

5.0 DISPOSAL OVERSIGHT

Off-site disposal, if performed, will comply with the Off-Site Disposal Rule. The USACE will coordinate with the EPA CERCLA Off-Site Rule coordinators for authority to dispose of IDW at an approved facility. Off-site disposal of hazardous IDW will require contracting an appropriate waste disposal company.

6.0 REFERENCES

U.S. Environmental Protection Agency (USEPA). 1992. *Guide to Management of Investigation-Derived Wastes.* Office of Emergency and Remedial Response Directive. 9345.3-03FS.

———. 1991. *Management of Investigation-Derived Wastes During Site Inspections.* EPA Document 540-G-91-009. Office of Emergency and Remedial Response Directive 9345.3-02. May 1991.

FINAL

SITE SAFETY AND HEALTH PLAN ADDENDUM FOR FY 2000 NAPL FIELD EXPLORATION

McCormick and Baxter Superfund Site
Stockton, California

July 6, 2000

Prepared for

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The Site Safety and Health Plan Addendum for FY 2000 NAPL field exploration at the McCormick and Baxter site will be distributed under separate cover.