



DEPARTMENT OF THE ARMY  
BASE REALIGNMENT AND CLOSURE  
ATLANTA FIELD OFFICE  
BRAC ENVIRONMENTAL COORDINATOR  
HAMILTON ARMY AIRFIELD  
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NOVATO, CALIFORNIA 94949



June 1, 2004

**DAIM-BO-A-HA**

Subject: Forwarding the *Work Plan Coastal Salt Marsh Pre-Remedial Action Sampling*, Hamilton Army Airfield, Novato, CA.

Ms. Naomi Feger  
Regional Water Quality Control Board  
1515 Clay Street, Suite 1400  
Oakland, CA 94612

Dear Ms. Feger,

The Army is pleased to provide the *Work Plan Coastal Salt Marsh Pre-Remedial Action Sampling*, Hamilton Army Airfield, Novato, CA for your files.

The draft final of this document was distributed on November 25, 2003. The field work was accomplished in accordance with the draft final work plan as well as comments and concerns expressed by the US Fish and Wildlife Service and the Regional Water Quality Control Board. The enclosed Narrative of Changes was developed to document the modifications from the draft final work plan that were implemented in the field.

As discussed in our May 7, 2004 meeting, additional sampling will be conducted as pre-excavation confirmation sampling. This will be done as a part of the Remedial Action design phase. This submittal satisfies Task 11 of Board Order No. R2-2003-0076 Site Cleanup Requirements – Hamilton Army Airfield.

If you have any questions, please contact me at (415) 883-6386.

Sincerely,

Edward Keller, P.E.  
BRAC Environmental Coordinator  
Hamilton Army Airfield

Enclosure

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**Hamilton Army Airfield, Novato, CA 94949**  
**June 2004**

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After evaluations of analytical concentrations and discussions between the Army and Regional Water Quality Control Board representative with input from the US Fish and Wildlife Service, the following changes were made to the sampling plan in the Coastal Salt Marsh, Pre-Remedial Action Sampling Work Plan.

#### Boat Dock

One sample “under the Boat Dock” was added when the proposed area of excavation was increased to include the area around the Foster Wheeler sample number 37, which had levels of barium, lead, and zinc above the action goals.

Samples in the channel at the Boat Dock will be changed from depth to surface as the results of previous sampling indicated metals concentrations in the surface sediments with concentrations dropping off at depth. Results will be evaluated to determine if excavation in these sediments is warranted.

#### Area 14

There are no changes to the plan at Area 14.

#### Historic Outfall Drainage Ditch (HODD)

At the Historic Outfall Drainage Ditch (HODD) the sample in the ditch at location TWA-SD07–30 (3-foot depth) had elevated metals, particularly manganese and nickel. The proposed excavation depth is increased from 2 to 3 feet and the samples at this north excavation of the ditch will be collected from 3 to 3.5 feet. Another, previous sample location, TWA-SD25, is west of the HODD towards the levee road. The surface sample at this location had elevated lead. Three step-out samples were collected to evaluate if lead is an area concern or if the previous result was an anomaly.

#### East Levee Construction Debris Disposal Area (ELCDDA)

At the East Levee Construction Debris Disposal Area (ELCDDA) the PCB analysis for the surface sample to be collected at location CSM-CDA-SD-363, will be changed from arochlors to the homologue method 1668A. This method provides lower detection limits and therefore is a better indicator of total PCBs at lower concentrations.

Three sample locations have been added in the vicinity of the ELCDDA - Burn Pit. Two of the sample locations were analyzed for metals. These locations are to the east and south of the burn area. The third sample location was in the mouth of the Outfall Drainage Ditch and had samples collected at three depths. Each of these samples was analyzed for pentachlorophenol and phenol. These compounds had been identified in drainage ditch sediment samples.

#### Outfall Drainage Ditch (ODD)

The 14 ODD sample locations proposed in the work plan remained the same. The downstream five locations had a bottom sample and two sidewall samples as proposed in the draft work plan. Sidewall samples in the upstream nine locations were deleted with the anticipation that sidewalls will not exist when the marsh plain excavations in the

vicinity of the ODD are completed. The nine bottom samples were collected. The analytical method for homologues, 1668A, was used instead of the Arochlor method.

For the five samples collected from the walls and floor of the proposed excavation at the Building 39 outfall basin, PCBs were evaluated using the homologue method.

#### Former Sewage Treatment Plant (FSTP) Outfall

At the adjacent marsh plain from the Former Sewage Treatment Plant (FSTP) outfall, depth and surface samples were added to the proposed locations to better characterize metals and PCBs. Within the FSTP outfall channel a sample location was added to help characterize the extent (depth) of the anticipated excavation.

#### High Marsh Plain

For sampling in the high marsh plain, the Army completed an evaluation to define the probable lateral extent and depth of chemicals of concern (COCs). The sampling regimen changed at these locations in part to obtain a broader representation of the entire marsh plain surface. COCs have been identified predominantly in surface sediments with levels of most constituents dropping off at depth. A few anomalous results exist at depth. Eight samples in the southern part of the marsh plain that had been proposed for defining the eastern edge of the excavation had only surface samples collected at the originally proposed locations. The homologue method was substituted for the Arochlor analyses where PCBs were analyzed. Three originally proposed samples, associated with the eastern extent of the ODD excavation and the depth of the anticipated marsh plain excavation, were deleted. Six samples originally proposed to define the depth of the excavation on the west side of the ODD were collected at the surface to better define the extent of COCs in surface sediments between the ODD and the levee. Six samples originally proposed to define the surface and depth concentrations of inorganics and organics were collected only at depth to define the excavation bottom.

The balance of samples associated with the west and east Antenna Debris Areas and the marsh plain excavation delineation samples were replaced by samples arranged across the northern part of the marsh in a grid with 5 columns and 9 rows spaced approximately 75 feet apart. Samples were collected from each grid intersection or node for a total of 45 sample locations. Nodes geo-referenced on the plan were identified in the field using a global positioning system apparatus. A depth as well as a surface sample was collected at one of the sample locations. Depth and surface sample locations are based on evaluation of the existing data and on anticipated impacts from COCs near the storm water outfalls. Samples will be evaluated for metals, PCBs (homologues), and pesticides.

#### South Marsh Plain

Samples were collected in the south marsh plain at two additional locations associated with the previous sample location TWA-SD02. This sample had elevated copper and zinc as well as other metals concentrations slightly above their respective action goals.

### Mid and South Marsh Plain DDT Surface Sediment Survey

The Army collected surface sediment samples at 20 additional locations in the middle and southern area of the marsh. Five groups of four samples per group were collected in linear paths, which extended from a starting location approximately 100 feet east of the perimeter levee, perpendicular to the levee. Each sample was spaced approximately 75 to 100 feet apart extending eastward in the marsh from the initial sample location in the row. The five rows of samples were spaced between 600 and 900 feet along the levee starting in the area north of the ELCDDA to just north of the Boat Dock. The samples were collected to characterize concentrations of DDTs across the marsh plain where relatively few pesticide samples had been obtained previously. The surface sediment samples were analyzed for relative/qualitative concentrations of DDTs using Immuno-assay field test kits.

These changes to the Field Sampling Plan of the CSM Pre-Remedial Action Work Plan are updated in the Table 3-1 of the final plan. Due to the time constraints in completing the required sampling before the start of the California clapper rail nesting season, the Army was unable to complete the final revision of the plan before moving into the field. The field sampling occurred immediately after agreement on the changes was obtained between the Army and the lead agency, the Regional Water Quality Control Board.

Summary Table of Sample Changes to the  
Final Field Sampling Plan, Pre-Remedial Action Sampling, CSM, Hamilton AAF

Site	Changes or No. Of Samples Added / Removed	Proposed Depth	Sample Type	Analyses	Notes
Boat Dock UTD	1 sample added	0.5 foot	Confirmation in lieu of additional proposed excavation to the north to include the former sample HB-99-SD-37	Under the Dock analyte list. See attached Table 3-1. SW6010B, SW8081A	Sample added near F-W Sample No.37. Northeast side of proposed excavation extended outward ~10 feet. Two sidewall samples moved to this new excavation line.
Boat Dock Channel	3 samples removed, 5 surface samples remain	All samples will be collected at surface only.	Characterization of surface sediments in channel as step-ins from previous 2000-2001 samples	“In the BD Channel” analyte list. SW6010B	Metals only appeared to be elevated in previous surface samples. Surface sampling will confirm.
Area-14 - Motor Oil	No changes to plan	See Table 3-1	Delineation and Confirmation for proposed excavation laterally at depth of highest concentration and deeper to confirm extent	SW8015B	Defining excavation limits.
Area-14 Cobalt	No changes to plan	See Table 3-1	Characterization of cobalt as a release. Step-outs from CSM-A14-SD-375	SW6010B	Previous cobalt result had exceeded the 95th UCL
Historic ODD – Northern half of excavation	2 sample depths changed. 3 surface samples added around sample TWA-SD25.	2 at 3 feet 3 at surface	Confirmation of excavation depth for metals, dichlorprop.  Characterization around sample TWA-SD25 at surface.	SW6010B SW8151A	Sample TWA-SD7 in channel had metal detections at 2 to 2.5 feet. TWA-SD25 had elevated lead at surface.
Historic ODD – Southern half of excavation	No changes	2 samples at 1 foot	Confirmation for excavation of total DDTs	SW8081A	Defining excavation limits.
East Levee Construction Debris Disposal Area (ELCDDA) - PCBs	PCB Analytical method changed	1 sample at surface	Confirmation at surface of previous detection of PCBs at 2 feet, using homologue method.	1668A	Previous sample had been collected at 2 feet. Confirmation for surface.

Summary Table of Sample Changes to the  
Final Field Sampling Plan, Pre-Remedial Action Sampling, CSM, Hamilton AAF

Site	Changes or No. Of Samples Added / Removed	Proposed Depth	Sample Type	Analyses	Notes
ELCDDA – lead and zinc	No changes to plan	10 sidewall 4 floor and 4 archived samples from bay mud.	Confirmation of excavation limits.	SW6010B	Archived samples held for analysis pending results of 4 floor samples.
ELCDDA-Burn Pit	1 sample location added to mouth of the ODD adjacent to the burn pit – analyzed for PCP & Phenol at 3 depths. 2 samples added as step-outs from east and south excavation edges	3 PCP samples, one at surface, 1.5 feet and 3 feet collected from mouth of ODD. 2 metals samples at additional step-out locations	Verification and Characterization of PCP and phenol at mouth of ODD. Characterization of surface metals at step-outs from burn pit area	Add SW8270C – SIM at 3 added samples for PCP & phenols at ODD near north burn pit samples. Excavation sidewall and bottom samples get 1668A and SW8290. 4 bay mud samples get SW8015B	Pentachlorophenol had been detected in ditch sample at mouth of ODD. Sampling should confirm if PCP is still present. Metals detected above AGs in previous sampling, characterization of release.
Outfall Drainage Ditch (ODD)	All 14 Sample locations remain the same. Numbers of samples change.	5 Lower channel sample locations remain at 3 samples each - 1 at bottom and two sidewalls. Upper 9 locations sampled from excavation bottom only.	Confirmation of COC removal from excavated channel 1.5 feet out from channel wall and two feet below current channel bottom.	SW6010B, SW8015B, SW8270C, SW8081A at all locations and SW8151A at 3 upper most samples in vicinity of the ADA. Also 1668A for alternating samples as specified in Table 3-1	The upper nine sample locations will be removed presumably as part of the anticipated ADA and High Marsh excavations. No sidewalls would exist where the ADA and marsh excavations are below 2.5 feet. Upper 3 samples in ditch will be analyzed for MCPA and MCPP. PCB homologue method will be used instead of total arochlors.
ODD – Building 39 Outfall	Method change for PCBs only	3 sidewall at 2.5 feet and 2 floor samples at 2 to 2.5 feet below current bottom of outfall.	Confirmation of COC removal from excavated channel 1.5 feet out from channel wall and two feet below current channel bottom.	SW6010B, SW8015B, SW8270C, SW8081A, 1668A	See Work Plan Table 3-1.

Summary Table of Sample Changes to the  
Final Field Sampling Plan, Pre-Remedial Action Sampling, CSM, Hamilton AAF

Site	Changes or No. Of Samples Added / Removed	Proposed Depth	Sample Type	Analyses	Notes
Former Sewage Treatment Plant – Outfall Area	Sample locations remain, depths added	4 samples at surface, 3 samples at 1.5 feet, 2 samples at 2 feet.	Characterization of extent of metals and specific pesticides	SW6010B, SW8081A	Initially samples were proposed to characterize area. Samples from surface and depth will allow determination of excavation
Former Sewage Treatment Plant – Channel	1 sample location added at TP-SD3	Added sample at 1.5 foot depth, other location remains sampled from surface and 1.5 foot depth.	Delineation, characterization and confirmation of COC removal from channel for proposed excavation.	SW6010B, SW8081A, 1668A at channel samples at depth only	See Work Plan Table 3-1
High Marsh Plain South Area (eastern extension of proposed excavation)	Depth samples removed. PCB method changed to homologues. South 8 of 18 samples remain. Balance of samples (10) replaced, see “Grid” below.	All 8 at surface only	Characterization of marsh plain extent of COCs at surface.	SW6010B, 1668A at five of the 8 locations	Homologue method instead of Arochlors
High Marsh Plain South Area (eastern extension on ODD)	3 samples deleted	NA	Confirmation of excavation associated with ODD in marsh plain at 3.5 foot depth.	NA	See High Marsh Plain South Area (vertical extension of proposed excavation) below.
High Marsh Plain South Area (western extension of proposed excavation)	Sidewall samples moved to surface. PCB method changed. Northern most sample (7 <sup>th</sup> ) supplanted by “Grid”. See Grid below.	6 surface samples	Characterization of marsh plain extent of COCs at surface along western edge defined by levee.	SW6010B, Sw8015B, SW8270C, 1668A at 3 of the 6 locations, alternating along the levee	Homologue method changed from Arochlors. Surface will indicate areas where COCs affect marsh plain west boundary.

Summary Table of Sample Changes to the  
Final Field Sampling Plan, Pre-Remedial Action Sampling, CSM, Hamilton AAF

Site	Changes or No. Of Samples Added / Removed	Proposed Depth	Sample Type	Analyses	Notes
High Marsh Plain South Area (vertical extension of proposed excavation)	6 depth samples only. Surface samples removed. Northern most samples (10) supplanted by "Grid". See Grid below.	4 at 2 feet and 2 at 3 feet	Characterization /definition at depth and confirmation for proposed excavation (as defined by results).	SW6010B, 1668A at 3 of the 6 sample locations alternating down marsh	PCB homologue method replaces arochlor method.
Marsh Plain DDT Assay (survey of surface DDT)	20 surface samples added, to survey DDT concentrations using DDT Immuno-assay kits.	Marsh plain surface	Characterization in 5 strings of 4 samples each.	SW4042	Sample strings spaced 600 to 900 feet apart in undisturbed pickleweed stands across marsh. Samples in each string starting ~100 feet from levee and spaced ~ 100 feet apart.
Antenna Debris Disposal Area – East	All 15 samples supplanted by "Grid" samples. See Grid below.	Replacement Grid has varying depths. See below.	Characterization of entire area by samples from grid nodes.	See Grid below.	Results from sampling according to a grid appear to be more useful for evaluation of extent of COCs across marsh, including ADA.
Antenna Debris Disposal Area – West	All 14 samples supplanted by "Grid" samples. See Grid below.	Replacement Grid has varying depths. See below.	Characterization of entire area by samples from grid nodes.	See Grid below.	Results from sampling according to a grid appear to be more useful for evaluation of extent of COCs across marsh, including ADA.

Summary Table of Sample Changes to the  
Final Field Sampling Plan, Pre-Remedial Action Sampling, CSM, Hamilton AAF

Site	Changes or No. Of Samples Added / Removed	Proposed Depth	Sample Type	Analyses	Notes
<p>A Grid of sampling locations was applied to the entire northern area of the High Marsh Plain including the Antenna Debris Disposal Area. The Grid extends from an extension of the north property line down to the area of the marsh mid way between the Building 39 outfall and the Former Building 41 Outfall. The grid also extends from the levee (the western marsh boundary) to the east approaching the shoreline of San Pablo Bay. Grid spacing for sample location nodes is 75 feet in the north / south and east / west directions. See revised Figure 2-9. Five vertical lines with 75 foot spacing were labeled A, B, C, D, &amp; E defining the west to east direction across the marsh plain. Nine horizontal lines with 75 foot spacing were labeled 1 through 9 defining the north to south direction down the marsh plain. The intersections of the lines provide an evenly spaced sampling grid across and down the marsh plain with alpha and numeric designations defining the 45 resultant intersection nodes. The nodes were assigned sample numbers. Sample depths were assigned at the nodes according to the relative depths and COC concentrations of all previously obtained sample results within the High Marsh Plain, ADDA and ODD.</p>					
High Marsh Grid (A,B,C 1-9)	The 29 floor and sidewall samples of the ADA and the 24 High Marsh Plain sample locations with surface and depth samples are replaced by the 27 sample nodes of the Grid. Homologue analyses for PCBs as well as metals and pesticide analyses are applied to all 27 sample locations.	Samples will be collected from 27 locations from either surface (0 feet) or at 3 feet. Of these, 12 are surface samples and 18 are depth samples. Location node C-3 will have a sample collected from surface and depth. See Work Plan Table 3-1	Characterization at surface or depth across the marsh plain for COCs.	SW6010B, SW8081A, and 1668A	The 27 sample nodes defined by the intersections of lines A, B, & C and the numbered lines 1 through 9 cover the western area on the marsh plain within 225 feet of the levee and include the area where effects from DOD activities at the Antenna Debris Disposal Area and the pump station outfalls (Buildings 35 and 39) are relatively apparent. Contributing effects from other sources (San Pablo Bay) are not yet apparent.
High Marsh Grid (D, E 1-9)	The 29 floor and sidewall samples of the ADA and the 24 High Marsh Plain sample locations with surface and depth samples are replaced by the 18 sample nodes of the Grid. Homologue analyses for PCBs as well as metals and pesticide analyses are applied to all 18 sample locations.	All 18 samples to be collected at surface	Characterization at surface across the eastern side of the marsh plain for COCs.	SW6010B, SW8081A, and 1668A	The 18 sample nodes defined by the intersections of lines D & E and the numbered lines 1 through 9 cover the eastern area on the marsh plain within 200 feet of the San Pablo Bay shore line and encompass the area where effects from DOD activities and other sources are less certain.

Summary Table of Sample Changes to the  
 Final Field Sampling Plan, Pre-Remedial Action Sampling, CSM, Hamilton AAF

Site	Changes or No. Of Samples Added / Removed	Proposed Depth	Sample Type	Analyses	Notes
High Marsh near historical sewage pipeline	2 new, additional surface samples as stepouts to confirm metals detected in surface sample at TWA-SD02	Surface	Characterization at surface of the marsh plain for metals in the vicinity of the historical sewage pipeline.	SW6010B, SW8015B, SW8081A, 1668A	Primarily copper and zinc elevated above action goals. Other metals slightly over action goals.

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**WORK PLAN**  
**PRE-REMEDIAL ACTION SAMPLING**  
**COASTAL SALT MARSH**  
**HAMILTON ARMY AIRFIELD**  
**NOVATO, CALIFORNIA**

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Final

Prepared by:



**US Army Corps  
of Engineers ®**

Sacramento District  
Environmental Design Section

**June 2004**

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**TABLE OF CONTENTS**

1.0 Introduction..... 1-1

    1.1 Scope of Work ..... 1-1

    1.2 Regulatory Authorities..... 1-1

    1.3 Site Background..... 1-1

    1.4 Chemicals of Concern..... 1-2

2.0 Project Staffing and Schedule..... 2-1

    2.1 Project Staffing ..... 2-1

    2.2 Proposed Project Schedule..... 2-1

**LIST OF FIGURES**

Figure 1-1, Project Location Map..... 1-1

Figure 1-2, Coastal Salt Marsh Site Locations

Figure 2-1, Boat Dock Proposed Excavation Area and Sample Locations

Figure 2-2, Area 14 Proposed Excavation Area and Sample Locations

Figure 2-3, Historic Outfall Drainage Ditch Proposed Excavation Area and Sample Locations

Figure 2-4, East Levee Construction Debris Disposal Area Proposed Excavation Area and Sample Locations

Figure 2-5, ELCDDA Burn Pit Proposed Excavation Area and Sample Locations

Figure 2-6, Outfall Drainage Ditch & High Marsh Plain Proposed Excavation Area and Sample Locations

Figure 2-6A, Details of Outfall Drainage Ditch & High Marsh Plain Sample Locations

Figure 2-7, Former Sewage Treatment Plant Outfall Proposed Excavation Area and Sample Locations

Figure 2-8, Outfall Drainage Ditch, High Marsh Plain, and Antenna Debris Disposal Area Proposed Excavation Area and Depths

Figure 2-9, Antenna Debris Disposal Area Proposed Excavation and Sample Locations

Figure 2-10, Marsh Plain DDT Assay Area and Sample Locations

## **APPENDICES**

Appendix A: Data Quality Objectives

Appendix B: Field Sampling Plan

Appendix C: Quality Assurance Project Plan

Appendix D: Site Safety and Health Plan

Figures

**ACRONYMS**

CSMPAS	Coastal Salt Marsh Pre-remedial Action Sampling
DQO	Data Quality Objectives
DTSC	Department Of Toxic Substances Control
EDS	Environmental Design Section
FSP	Field Sampling Plan
HAAF	Hamilton Army Airfield
mg/kg	milligram/kilogram
OC	Organochlorine
PCBs	Polychlorinated Biphenyls
QAPP	Quality Assurance Project Plan
SFBRWQCB	San Francisco Bay Area Regional Water Quality Control Board
SSHP	Site Safety and Health Plan
TPH	Total Petroleum Hydrocarbons
USACE	U.S. Army Corps of Engineers
WP	Work Plan

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# WORK PLAN

## PRE-REMEDIAL ACTION SAMPLING

### COASTAL SALT MARSH

### HAMILTON ARMY AIRFIELD

## 1.0 INTRODUCTION

### 1.1 SCOPE OF WORK

This Work Plan (WP) presents the project scope, regulatory authorities, site background, and project objectives for the Coastal Salt Marsh Pre-remedial Action Sampling (CSMPAS) at the Hamilton Army Airfield (HAAF) in Novato, California. The CSMPAS is designed to collect the data necessary to verify vertical and lateral extent of contamination in proposed excavation sites.

The US Army Corps of Engineers (USACE), Sacramento District will perform the work. This WP includes a Field Sampling Plan (FSP), a Quality Assurance Project Plan (QAPP), and a Site Specific Health and Safety Plan (SSHP). The FSP presents detailed field procedures to be followed in performance of CSMPAS, sampling strategy and rationale, sampling locations, sample collection methods, and sample handling procedures. The QAPP presents procedures to ensure data quality objectives are met, including field and laboratory procedures and details of the analytical protocols. The SSHP presents measures to ensure the safety of all field personnel.

### 1.2 REGULATORY AUTHORITIES

The San Francisco Bay Area Regional Water Quality Control Board is the lead regulatory agency providing oversight.

### 1.3 SITE BACKGROUND

HAAF is located in Novato, CA. HAAF is a former Air Force Base and Army Airfield. The location of HAAF is shown in Figure 1-1. The Coastal Salt Marsh consists of the following sites to be remediated. Boat Dock, Area 14, Historic Outboard Drainage Ditch (ODD), East Levee Construction Debris Disposal Area including the Burn Pit, ODD, High

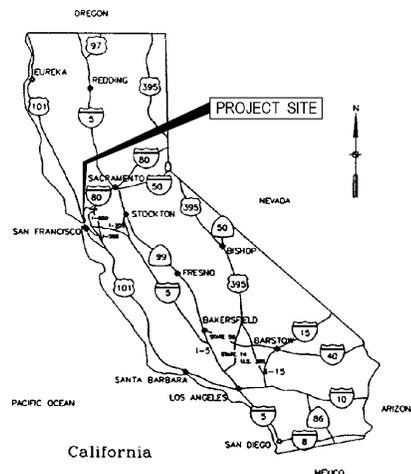


Figure 1-1: Project Location Map

Marsh, Former Sewage Treatment Plant Outfall, and the Antenna Debris Disposal Area. These locations of these sites within the Coastal Salt Marsh are illustrated in Figure 1-2.

#### 1.4 CHEMICALS OF CONCERN

The chemicals of concern are metals, organochlorine (OC) pesticides, three chlorinated herbicides (dichlorprop, MCPA and MCPP), extractable total petroleum hydrocarbons (TPH), two phenols, polychlorinated biphenyls (PCBs), and dioxin/furans. Action goals for these constituents originate from the *Main Airfield Parcel Record of Decision/Remedial Action Plan, Hamilton Army Airfield*, Final, August 2003. The action goals are listed below.

#### Action Goals for Pre-Remedial Action Sampling Coastal Salt Marsh, Hamilton Army Airfield

Contaminant	Action Goal (mg/kg)
<b>Metals</b>	
Barium	188
Beryllium	1.68
Cadmium	1.8
Cobalt	26.7
Copper	88.7
Lead	46.7
Manganese	1260
Mercury	0.58
Nickel	132
Silver	1
Zinc	169
<b>Semivolatile Organic Compounds</b>	
Pentachlorophenol	0.017
Phenol	0.13
<b>Total Petroleum Hydrocarbons (TPH)</b>	
TPH-Diesel/TPH-motor oil	144
<b>Pesticides/Herbicides/PCBs/Dioxins</b>	
Chlordanes, total	0.00479
DDTs, total	0.03

<b>Contaminant</b>	<b>Action Goal (mg/kg)</b>
Dichlorprop	0.14
MCPA	7.9
MCPP	3.0
Endrin Aldehyde	0.0064
Heptachlor	0.0088
Heptachlor Epoxide	0.0088
Polychlorinated Biphenyls (PCBs), Total	0.09
Dioxins (Total 2,3,7,8-tetrachlorodibenzo-p-dioxin Toxic Equivalencies)	0.000021

## **2.0 PROJECT STAFFING AND SCHEDULE**

### **2.1 PROJECT STAFFING**

The Environmental Design Section (EDS), Sacramento District, USACE will perform this work, under the supervision of Rick Meagher, Section Chief. Key project contacts are:

<u>Person</u>	<u>Responsibility</u>
Kathy Siebenmann	Technical Lead
Pamela Amie	Chemist
Tim Crummett	Field Lead, Geologist
Donna Maxey	Industrial Hygienist

### **2.2 PROPOSED PROJECT SCHEDULE**

The fieldwork for the CSM Pre-Remedial Action Sampling is scheduled for January 2003. The Data Report will be submitted within 30-days following the receipt of validated data.

# **APPENDIX A**

## **DATA QUALITY OBJECTIVES**

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**DATA QUALITY OBJECTIVES  
PRE-REMEDIAL ACTION  
SAMPLING  
COASTAL SALT MARSH  
HAMILTON ARMY AIRFIELD  
NOVATO, CALIFORNIA**

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Revised Submittal

Prepared by:



**US Army Corps  
of Engineers ®**

Sacramento District  
Environmental Design Section

**June 2004**

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**DATA QUALITY OBJECTIVES  
PRE-REMEDIAL ACTION SAMPLING  
COASTAL SALT MARSH  
HAMILTON ARMY AIRFIELD**

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The data quality objectives (DQOs) process identifies the overall objective of data needs and follows a documented process through to the sampling strategy. The purpose of using the data quality objectives process is to ensure that any sampling meets the needs of the project and the usability of the data is directly linked to the objective. Section 3.2 of the Quality Assurance Project Plan lists the seven steps of the DQO process as related to this project.

As a result of discussions between the Army and the Regional Water Quality Control Board (RWQCB) representatives, the original focus of the data quality objectives expanded from their definition of excavation limits, and verifying previous exceedences of action goals. The action goals were defined and presented in the *Main Airfield Parcel Record of Decision/ Remedial Action Plan, (ROD/RAP) Hamilton Army Airfield*, Final, August 2003. Additional concerns and numerical values regarding contaminant concentrations protective of ecological receptors were expressed in the US Fish & Wildlife Service (USFWS) Biological Opinion and amending letter, August 2003 and September 2003. Excavation areas and depths have been proposed based upon historical data. This sampling effort is designed not only to verify proposed excavation boundaries identified previously, but additionally, to further characterize chemical concentrations, metals and organics, across broader areas of the marsh plain and areas where characterization had been limited to one or two samples. The data will be used to confirm, enlarge, or decrease the proposed excavation areas. Additional samples used to characterize broader areas of the marsh plain will confirm whether or not excavation areas need to be expanded or additional sites need to be included for remediation. The data resulting from this sampling effort may also indicate the need for stepout sampling.

The following table summarizes the sampling strategy for each of the sites to be remediated. The attached figures illustrate the proposed excavation areas and the pre-remedial action sampling design. Historical sample identification numbers are presented for most sites with the contaminants of concern to identify which data were used to determine the sampling strategy; however, the outboard drainage ditch, antenna debris disposal area, and the high marsh site strategies were based upon data from samples that were too numerous to list. All historical data are presented in the *Coastal Salt Marsh Focused Feasibility Study Report, Hamilton Army Airfield*, Final, June 2003. The data obtained during this effort will be included with the historical data to form a more comprehensive marsh characterization dataset.

**Hamilton Army Airfield Coastal Salt Marsh Data Quality Objectives Summary Table**

<b>Figure/ Section Number</b>	<b>Site</b>	<b>Objective</b>	<b>Contaminants of Concern (COCs)</b>	<b>Proposed Depth of Excavation</b>	<b>Sampling Design (see associated figure)</b>
2.1	Boat Dock – Under the Dock	Verify lateral and vertical extent of contamination for proposed excavation	Lead, zinc, total chlordanes, total DDTs, heptachlor Epoxide (Samples 32, 34 through 39 at 0 feet depth	1 foot below the dock	9 sidewall and 2 floor samples. Sidewall samples collected midway between surface and proposed excavation depth (6 inches). Analyze for COCs.
	Boat Dock – In the Channel	Verify lateral extent of surface contamination to determine if excavation is needed	Barium, copper, lead, and zinc (HB-99-SD-33 at 0 feet depth and HB-99-BD-33A at 1 foot)	None proposed at this time.	5 surface samples. Analyze for COCs.
2.2	Area 14 – Motor Oil	Verify lateral and vertical extent of contamination for proposed excavation	Motor Oil (CSM-A14-SD- 370 at 2 and 4 feet bgs)	6 feet below ground surface (bgs)	1 sample at 6 feet bgs near former exceedence and four surrounding samples at 2 feet bgs. Analyze for TPH-motor oil.
	Area 14 - Cobalt	Confirm cobalt exceedence at that location. Lateral extent of cobalt contamination.	Cobalt (CSM-A14-SD- 371 at 2 feet bgs)	None proposed at this time.	1 sample at surface near former exceedence and three surrounding samples at 2 feet bgs. Analyze for cobalt.

## Hamilton Army Airfield Coastal Salt Marsh Data Quality Objectives Summary Table

Figure/ Section Number	Site	Objective	Contaminants of Concern (COCs)	Proposed Depth of Excavation	Sampling Design (see associated figure)
2.3	Historic ODD – northern half of excavation	Verify lateral and vertical extent of contamination in proposed excavation	Cadmium, cobalt, lead, manganese, nickel, zinc, dichlorprop (TWA-SD7 and CSM-HDD-SD-341 down to 3 feet bgs)	3 feet bgs	1 sample collected at 3 feet bgs at each end of proposed excavation. Analyze for COCs.
	Historic ODD – southern half of excavation	Lateral and vertical extent of contamination in proposed excavation	Total DDTs (CSM-HDD-SD-342 at surface)	1 foot bgs	1 sample collected at 1 foot bgs at each end of proposed excavation. Analyze for Total DDTs.
2.4	East Levee Construction Debris Disposal Area (ELCDDA) – PCBs	Confirm PCB contamination	Total PCBs (CSM CDA-SD-363 at 2 feet bgs)	None proposed at this time	1 sample collected at surface and 1 collected at 2 feet bgs near previous PCB exceedence. Analyze for PCB homologues.
	ELCDDA – lead and zinc	Verify lateral and vertical extent of contamination for proposed excavation	Lead and zinc (HT-10 and HT-15 down to 4 feet bgs)	1 foot below the fill	10 sidewall samples and 4 floor samples of proposed excavation area. Sidewall samples will be collected from the cap material (0.5 – 1.5 feet bgs) and floor samples will be 1 foot into the landfill material or groundwater level, whichever is most shallow. Analyze for lead and zinc. Archive 4 samples from bay mud below landfill material for possible analysis for lead and zinc, depending upon the results of the more shallow floor samples.
2.5	ELCDDA	Verify lateral	Total PCBs,	3 feet bgs	8 sidewall samples and 4 floor samples of proposed

## Hamilton Army Airfield Coastal Salt Marsh Data Quality Objectives Summary Table

Figure/ Section Number	Site	Objective	Contaminants of Concern (COCs)	Proposed Depth of Excavation	Sampling Design (see associated figure)
	Burn Pit	and vertical extent of contamination in proposed excavation	Dioxins (SB-ELBP-01, -04, -04a, and -08 down to 3 feet bgs); TPH-E (EL-SB-01, -03, and -04 down to 11.5 feet); Metals (HAAF-BP-1018-0, -1019-0 at surface)		excavation area. Sidewall samples collected midway between surface and excavation depth (1.5 feet bgs). Analyze for PCB homologues and dioxin congeners. In addition, 4 samples collected beneath floor of excavation 1 foot below bay mud interface. Analyze for TPH-E. 2 surface samples to east and south of Burn Pit. Analyze for metals.
2.6	Outfall Drainage Ditch (ODD)	Verify vertical and lateral extent of contamination in proposed excavation	Beryllium, cadmium, cobalt, copper, lead, manganese, nickel, silver, zinc, TPH-E, PCBs, PCP, phenol, total DDTs, total chlordanes, endrin aldehyde	2 feet below the bottom of the ditch (approximately 5 feet below marsh plain surface)	14 locations at ditch throughout the length of the north/south leg of the ODD, at the southern 5 locations collect 3 samples per location - 1 bottom and 2 sidewalls. Floor samples collected 2' to 2.5' below the center of the bottom of the ditch. Sidewall samples collected at half the distance between the marsh surface and the bottom of the proposed excavation (approx 2.5 to 3 feet below the marsh surface), 1.5 feet laterally beyond the current edge of the ditch. At the 9 northern sample locations collect bottom samples only, at depth indicated above. 3 samples (surface, 1.5', 3') at 1 location near mouth of ODD. (HAAF-BP-1014-3). Analyze for COCs.

## Hamilton Army Airfield Coastal Salt Marsh Data Quality Objectives Summary Table

Figure/ Section Number	Site	Objective	Contaminants of Concern (COCs)	Proposed Depth of Excavation	Sampling Design (see associated figure)
	ODD-Building 39 outfall	Verify vertical and lateral extent of contamination in proposed excavation	Beryllium, cadmium, cobalt, copper, lead, manganese, nickel, silver, zinc, TPH-E, PCBs, PCP, phenol, total DDTs, total chlordanes, endrin aldehyde	2 feet below the bottom of the outfall (approximat ely 5 feet below marsh plain surface)	3 sidewall and 2 floor samples of outfall basin. Floor samples collected 2' to 2.5' below sediment depth. Sidewall samples half the distance between the marsh surface and the bottom of the proposed excavation (approx 2.5 to 3 feet below the marsh surface), 1.5' outside of basin. Analyze for COCs.
2.7	Former Sewage Treatment Plant (FSTP) Outfall Area	Lateral extent of contamination to possibly expand the proposed excavation	Copper, lead, mercury, silver, zinc, total chlordanes, total DDTs (CSM- HM-SD-396 and -397, and TP-SD- 03 and -03A down to 1.5 feet bgs)	1.5 feet bgs	Six locations, 3 north and 3 south of the proposed excavation in stepouts of previous sample locations. All north samples collected from the surface and 1 sample at 1' bgs and 2 samples at 2' bgs; 3 south samples, 2 collected at 1.5' bgs and 1 collected at surface. Analyze for COCs.
	FSTP Channel	Lateral and vertical extent of contamination to determine length (and depth) of excavation	Copper, lead, mercury, silver, zinc, total chlordanes, total DDTs (TP-SD03 down to 1.5 feet bgs)	1.5 feet bgs	One location in channel downstream of previous sample locations. Samples collected on the surface of the marsh plain and 1.5 feet bgs. Analyze for COCs.

## Hamilton Army Airfield Coastal Salt Marsh Data Quality Objectives Summary Table

<b>Figure/Section Number</b>	<b>Site</b>	<b>Objective</b>	<b>Contaminants of Concern (COCs)</b>	<b>Proposed Depth of Excavation</b>	<b>Sampling Design (see associated figure)</b>
2.8 – Figure 2-6 for sample locations, Figure 2-8 for excavation depths	High Marsh Plain – Eastern extension of proposed excavation	Lateral extent of contamination in proposed excavation	Beryllium, cobalt, copper, lead, manganese, nickel, silver, zinc, PCBs	Varies; see Figure 2-8	8 surface locations along eastern boundary of proposed excavation in the high marsh from just north of the channel cut area to just south of the FSTP outfall pipeline. Analyze for COCs.
	High Marsh Plain – Western extension of proposed excavation	Determine lateral extent of ODD contamination towards the levee nearest the pump station outfalls, where contaminated effluent may have exceeded the banks of the ODD, to possibly expand the proposed excavation	Beryllium, cadmium, cobalt, copper, lead, manganese, nickel, silver, zinc, TPH-E, PCBs, PCP, phenol, total DDTs, total chlordanes, endrin aldehyde	None	6 locations west of the ODD throughout and starting just downstream of the pump station area. Collect 1 surface sample at each location. Analyze for COCs.
	High Marsh Plain – vertical extension of proposed excavation	Define vertical extent of contamination of proposed excavation	Beryllium, cobalt, copper, lead, manganese, nickel, silver, zinc, PCBs	Varies, see Figure 2-8	6 locations inside eastern boundary of proposed excavation at floor depth of proposed excavation. For floor depths, see Figure 2-8. 2 locations near and in channel cut at 3 to 3.5 feet bgs and 4 locations south of channel cut at 2' bgs. Analyze for COCs.

## Hamilton Army Airfield Coastal Salt Marsh Data Quality Objectives Summary Table

Figure/ Section Number	Site	Objective	Contaminants of Concern (COCs)	Proposed Depth of Excavation	Sampling Design (see associated figure)
	High Marsh Plain – Characterization near previous sample.	Characterize whether release of metals occurred near TWA-SD02	Copper, zinc	None proposed at this time	2 stepout locations southeast and southwest of TWA-SD02 collected at surface. Analyze for COCs.
	High Marsh Plain – Surface characterization – mid to south marsh - pesticide	Characterize DDTs across inner marsh plain in a series of five linear surveys of immuno-assay samples	DDTs semi-quantitative	None	20 surface sample locations - 5 rows, spaced approximately 600 to 900 feet apart, of samples; 4 samples in each row. Samples spaced approximately 75 to 100 feet apart. Rows extend west to east. First row starting at middle of the marsh north of ELCDDA. Four additional rows lined out along and perpendicular to the southern end of the levee. The last row of samples located in the marsh between the runway approach and the north side of Boat Dock area. Analyze for DDTs.

## Hamilton Army Airfield Coastal Salt Marsh Data Quality Objectives Summary Table

<b>Figure/ Section Number</b>	<b>Site</b>	<b>Objective</b>	<b>Contaminants of Concern (COCs)</b>	<b>Proposed Depth of Excavation</b>	<b>Sampling Design (see associated figure)</b>
2.9	High Marsh Plain – Surface and depth characterization– north marsh plain	Define lateral or vertical extent of contamination across north marsh plain in 46 grid samples	Diesel Range Organics, motor oil, total chlordanes, total DDTs, endrin aldehyde, heptachlor, heptachlor epoxide, PCBs by homologue	<p>2 to 5 feet bgs for inner excavations at ADA.</p> <p>3 feet bgs for outer ADA excavation.</p> <p>None proposed at this time for outer marsh plain.</p> <p>See Figure 2-9a</p>	5 columns and 9 rows of samples forming 45 sample locations at grid intersection “nodes”– samples collected at 3 feet or at surface. Locations A, B, C 1-9 , 11 surface samples and 17 samples & 3’ bgs [Location C-3, 1 surface and 1 3’bgs]. Locations D, E 1-9, 18 surface samples. Analyze for COCs.

# **APPENDIX B**

## **FIELD SAMPLING PLAN**

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**FIELD SAMPLING PLAN**  
**PRE-REMEDIAL ACTION SAMPLING**  
**COASTAL SALT MARSH**  
**HAMILTON ARMY AIRFIELD**  
**NOVATO, CALIFORNIA**

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Final

Prepared by:



**US Army Corps  
of Engineers ®**

Sacramento District  
Environmental Design Section

**June 2004**

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**TABLE OF CONTENTS**

1. Introduction..... 1-1

    1.1 Scope of Project ..... 1-1

    1.2 Scope of Report..... 1-1

    1.3 Site Location ..... 1-1

    1.4 Investigation Sites..... 1-2

    1.5 Project Staffing ..... 1-2

2. Sampling ..... 2-1

    2.1 Boat Dock ..... 2-1

    2.2 Area 14..... 2-1

    2.3 Historic ODD ..... 2-1

    2.4 East Levee Construction Debris Disposal Area (ELCDDA)..... 2-2

    2.5 ELCDDA – Burn Pit..... 2-2

    2.6 Outfall Drainage Ditch (ODD) ..... 2-2

    2.7 Former Sewage Treatment Plant (FSTP) Outfall Area..... 2-2

    2.8 High Marsh Plain ..... 2-2

    2.9 Antenna Debris Disposal Area..... 2-3

3. Soil Sampling..... 3-4

    3.1 Analytical Plan..... 3-4

4. Sampling Equipment and Procedures ..... 4-1

    4.1 Investigative Equipment and Procedures..... 4-1

    4.2 Quality Control Program..... 4-2

        4.2.1 Field Duplicates (QC Samples) ..... 4-2

        4.2.2 Matrix Spike/Matrix Spike Duplicates (MS/MSD) ..... 4-2

        4.2.3 Blanks ..... 4-3

    4.3 Equipment Decontamination Procedures..... 4-3

4.4	Sampling Containers And Preservation .....	4-4
5.	Sampling Documentation and Handling.....	5-1
5.1	Sample Numbering System.....	5-1
5.2	Sample Labels.....	5-2
5.3	Field Logbook.....	5-2
5.4	Sample Packaging and Shipping.....	5-3
5.5	Chain of Custody Procedures.....	5-4
6.	Investigation-Derived Waste .....	6-1
7.	References.....	7-1

**LIST OF FIGURES**

Figure 1-1, Project Location Map.....	1
---------------------------------------	---

**LIST OF TABLES**

Table 3-1, Summary of Proposed Analytical Parameters.....	10
---	----

**ACRONYMS**

CSM	Coastal Salt Marsh
CSMPAS	Coastal Salt Marsh Pre-remedial Action Sampling
COC	Chain-of-Custody
CWM	Clean Wide-Mouth
DQOs	Data quality objectives
EDS	Environmental Design Section
ELCDDA	East Levee Construction Debris Disposal Area
FSP	Field Sampling Plan
FSTP	Former Sewage Treatment Plant
GPS	Global Positioning System
HAAF	Hamilton Army Airfield
IDW	Investigation-derived waste
mg/kg	milligram per kilogram
MS/MSD	Matrix Spike/Matrix Spike Duplicate
ODD	Outboard Drainage Ditch
QAPP	Quality Assurance Project Plan
QC	Quality control
PCBs	Polychlorinated Biphenyls
SSHP	Site safety and health plan
Total DDTs	Sum of Dichlorodiphenyltrichloroethane, Dichlorodiphenyldichloroethane, and Dichlorodiphenyldichloroethylene (DDT + DDD + DDE)
USACE	U.S. Army Corps of Engineers
WP	Work Plan

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**FIELD SAMPLING PLAN  
PRE-REMEDIAL ACTION SAMPLING  
COASTAL SALT MARSH  
HAMILTON ARMY AIRFIELD**

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## **1. INTRODUCTION**

### **1.1 SCOPE OF PROJECT**

This Field Sampling Plan (FSP) describes the work to be performed during the Coastal Salt Marsh Pre-remedial Action Sampling (CSMPAS) at Hamilton Army Airfield (HAAF). The CSMPAS is designed to collect data that will be used to determine the lateral and vertical extent of contamination to determine the size of specific excavations.

The FSP outlines the methods of sampling and analysis of the nine areas. The US Army Corps of Engineers (USACE), Sacramento District is performing the Miscellaneous Site investigations.

### **1.2 SCOPE OF REPORT**

This FSP presents the site investigations sampling and analysis programs, sampling objectives, sampling strategy and rationale, sampling locations, sample collection methods, and sample handling procedures. The FSP is designed to ensure that field procedures and documentation are standardized so that data collected are valid and defensible. All field personnel will become familiar with the FSP prior to conducting fieldwork.

The FSP will be implemented in conjunction with the Quality Assurance Project Plan (QAPP) and the Site Safety and Health Plan (SSHP).

### **1.3 SITE LOCATION**

HAAF is located in Novato, CA. HAAF was a former Air Force Base and Army Airfield. The location of HAAF is shown in Figure 1-1.

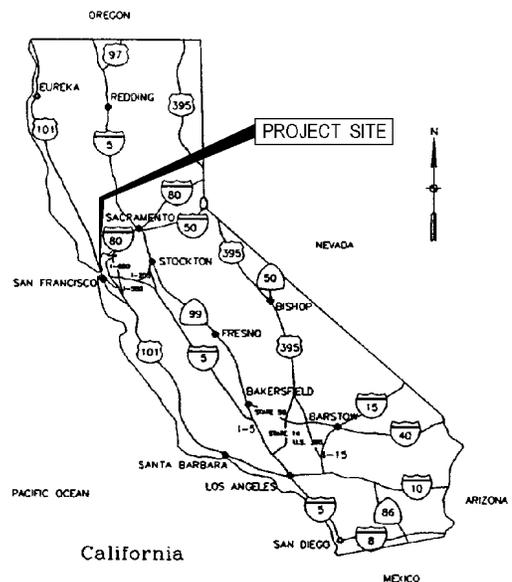


Figure 1-1: Project Location Map

## 1.4 INVESTIGATION SITES

The nine sites of the CSMPAS are listed below.

- Boat Dock
- Area 14
- Historic Outfall Drainage Ditch (ODD)
- East Levee Construction Debris Disposal Area (ELCDDA)
- ELCDDA – Burn Pit
- Outfall Drainage Ditch (ODD)
- Former Sewage Treatment Plant (FSTP) Outfall Area
- High Marsh
- Antenna Debris Disposal Area

The locations of these sites within the Coastal Salt Marsh are illustrated in Figure 1-2.

## 1.5 PROJECT STAFFING

This study is being designed and implemented by the Environmental Design Section (EDS), Sacramento District, and USACE under the general supervision of Rick Meagher, Section Chief. The technical design team includes:

<u>Personnel</u>	<u>Responsibility</u>
Kathy Siebenmann	Technical Team Lead
Pamela Amie	Chemist
Tim Crummett	Field Team Lead, Geologist
Donna Maxey	Industrial Hygienist

Each team member provides an integral part in completing this study, including preparation and implementation of the Data Quality Objectives (DQOs) and Work Plan (WP), performing fieldwork, and reporting.

## **2. SAMPLING**

This section provides the sample locations, number of samples, analytical methods, and the rationale for the sampling and analytical program. Investigation and sampling techniques and procedures are discussed in Section 4.0. Overall, the investigative approach includes only soil sampling. All sampling locations will be identified using a Global Positioning System (GPS).

During the performance of fieldwork, sampling locations and depths stated in this FSP might be adjusted and additional samples added based on field observations or conditions.

Please refer to Figure 1-2 while reading the descriptions below.

### **2.1 BOAT DOCK**

The boat dock is located in the southwest portion of the Coastal Salt Marsh. The boat dock and the adjacent channels and turnaround area were previously used by the military for emergency rescue operations in San Pablo Bay. The facility has been abandoned since the early 1970s, and only piers and the main platform remain. Aerial photographs suggest that maintenance of the channel and turnaround areas was discontinued during the 1960s.

### **2.2 AREA 14**

Area 14 was an area identified in a 1941 aerial photograph. The area is located north of the boat dock just east of the east levee. Little is known about this area although it may have been a fill, spoil, disposal, demolition area, or may simply have been seasonal ponding. In aerial photographs taken in 1946, 1952, and 1968, the area does not show and a portion of it was covered when the runway was extended.

### **2.3 HISTORIC ODD**

The historic outfall drainage ditch is located on the coastal salt marsh side of and parallel to the east perimeter levee. It runs from the southern edge of the ELCDDA south to the north side of the runway approach. Prior to construction of the runway extension and the ELCDDA, storm water runoff in the ODD flowed parallel to the east levee until discharge at the boat dock channel area.

## **2.4 EAST LEVEE CONSTRUCTION DEBRIS DISPOSAL AREA (ELCDDA)**

The east levee construction debris disposal area is centrally located and runs from the East Levee Road east to San Pablo Bay. This area was used primarily for disposal of construction debris from 1961 to 1972.

## **2.5 ELCDDA – BURN PIT**

The burn pit is located at the eastern end of the ELCDDA. The burn pit area extends out to San Pablo Bay and has a slightly higher elevation than most of the ELDCCA and the CSM. The nature and quantity of wastes burned at the site are not known and the only waste material evident at the surface is construction debris (broken bricks, concrete, etc.).

## **2.6 OUTFALL DRAINAGE DITCH (ODD)**

Airfield storm water is discharged into the Outfall Drainage Ditch during rainstorms. The ODD is located in the marsh about 20 feet from the east perimeter levee. It runs south, parallel to the levee, from the pump stations to the ELCDDA; turns east, and runs in the marsh parallel to the ELCDDA road toward San Pablo Bay. The ditch is considered an accumulation point for wastes associated with airfield storm water runoff.

## **2.7 FORMER SEWAGE TREATMENT PLANT (FSTP) OUTFALL AREA**

The FSTP Outfall Area is a channel that flows from the end of the FSTP outfall pipe to San Pablo Bay. The Army treated sanitary sewer wastes at the FSTP and discharged treated wastewater through the outfall pipe. The FSTP outfall pipe extends across the marsh approximately 445 feet from the east perimeter levee. The Outfall Area channel is approximately 130 feet long.

## **2.8 HIGH MARSH PLAIN**

The High Marsh Plain area is that portion of the CSM dominated by pickleweed and comprises most of the coastal salt marsh. It extends from the northern to the southern BRAC boundaries and east from the ODD nearly to the shoreline. The high marsh is regularly inundated by Bay waters and contains several perched ponds.

## **2.9 ANTENNA DEBRIS DISPOSAL AREA**

Antenna debris piles are located in the northern most portion of the CSM adjacent to the ODD. One debris pile is located on the east side of the ODD, one on the west. Visual inspection of this site suggests discarded material from the former antenna facilities and building demolition was placed here.

### 3. SOIL SAMPLING

Soil samples will be collected at each site as shown on Figures 2-1 through 2-10. Sample locations may be adjusted based on site conditions and accessibility. Soil samples will be collected from the sample locations at the depths shown in Table 3-1.

During the performance of fieldwork, sampling locations and depths stated in this FSP may be adjusted, deleted, or samples added, based on field observations or conditions. Any changes will be documented in both the field logbook and final reports.

#### 3.1 ANALYTICAL PLAN

The analytes, specific to each CSM site, were selected based on previous analytical results from the marsh. Sediment samples will be analyzed by the following methods:

- Metals: Method SW6010B/SW7471A
- Herbicides: Dichloroprop, MCP, MCPA: Method SW8151A
- Pesticides: Total DDT, Total Chlordanes, endrin aldehyde, heptachlor, heptachlor epoxide: Method SW8081A
- Total Petroleum Hydrocarbons Extractable (TPH-E): Method SW8015B
- PCB Homologues: Method 1668A
- Phenol and Pentachlorophenol: Method SW8270C
- Dioxin/Furans: Method SW8290.
- Total DDT in Soil Test Kit: Method SW4042

TABLE 3-1: Summary of Proposed Analytical Parameters					
SAMPLE IDENTIFICATION				ANALYTE PROGRAM	
MISCELLANEOUS SITES	SAMPLE ID	SAMPLING DESIGN	CONTAINER TYPE/NUMBER	ANALYTE	METHOD
Boat Dock – Under the Dock	HAAF-BD-801-0.5 HAAF-BD-802-0.5 HAAF-BD-803-0.5 HAAF-BD-804-0.5 HAAF-BD-967-0.5 (QC) HAAF-BD-805-0.5 HAAF-BD-806-0.5 HAAF-BD-807-0.5 HAAF-BD-808-0.5 HAAF-BD-809-0.5 HAAF-BD-810-1.0 HAAF-BD-990-1.0	9 sidewall (6 inches) and 2 floor (1 foot) samples. Collect sidewall samples midway between surface and proposed excavation depth. See Figure 2-1 for sample locations.	2 – 4 oz. or 1 – 8 oz. CWM jars with septa lid per sample	Total metals (full suite), total chlordanes, total DDTs, heptachlor epoxide	SW6010B and SW8081A
Boat Dock – In the Channel	HAAF-BD-811-0 HAAF-BD-812-0 HAAF-BD-813-0 HAAF-BD-814-0 HAAF-BD-815-0 HAAF-BD-968-0 (QC)	5 surface samples. Collect sidewall samples midway between surface and proposed excavation depth. See Figure 2-1 for sample locations.	2 – 4 oz. or 1 – 8 oz. CWM jars with septa lid per sample	Total Metals (full suite)	SW6010B
Area 14 – Motor Oil	HAAF-A14-819-2.0 HAAF-A14-969-2.0 (QC) HAAF-A14-820-2.0 HAAF-A14-821-2.0 HAAF-A14-822-2.0 MS/MSD HAAF-A14-823-6.0	1 central (6 feet) and 4 surrounding (2 feet) samples. See Figure 2-2 for sample locations.	2 – 4 oz. or 1 – 8 oz. CWM jars with septa lid per sample	TPH-E (motor oil)	SW8015B
Area 14 – Cobalt	HAAF-A14-824-2.0 HAAF-A14-825-2.0	1 central (surface) and 3 surrounding (2 feet) samples. See figure 2-2 for sample locations.	2 – 4 oz. or 1 – 8 oz. CWM jars with septa lid per sample	Total Metals (full suite)	SW6010B

TABLE 3-1: Summary of Proposed Analytical Parameters					
SAMPLE IDENTIFICATION				ANALYTE PROGRAM	
MISCELLANEOUS SITES	SAMPLE ID	SAMPLING DESIGN	CONTAINER TYPE/NUMBER	ANALYTE	METHOD
	HAAF-A14-826-2.0 HAAF-A14-827-0				
Historic ODD – northern half of excavation	HAAF-HODD-828-3.0 HAAF-HODD-829-3.0 HAAF-HODD-991-0 HAAF-HODD-992-0 HAAF-HODD-993-0	2 samples (3 feet) at each end of proposed excavation. See Figure 2-3 for sample locations. (-991 – 993, surface and SW6010B only)	2 – 4 oz. or 1 – 8 oz. CWM jars with septa lid per sample	Total Metals (full suite), dichlorprop	SW6010B and SW8151A
Historic ODD - southern half of excavation	HAAF-HODD-830-1.0 HAAF-HODD-831-1.0 HAAF-HODD-970-1.0 (QC)	2 samples (1 foot) at each end of proposed excavation. See Figure 2-3 for sample locations.	2 – 4 oz. or 1 – 8 oz. CWM jars with septa lid per sample	Total DDTs	SW8081A
East Levee Construction Debris Disposal Area (ELCDDA) - PCBs	HAAF-CDA-832-0	1 surface sample. This is a confirmation sample. See Figure 2-4 for sample locations. Associated with former sample location CSM-CDA-SD-363.	2 – 4 oz. or 1 – 8 oz. CWM jars with septa lid per sample	PCB Homologues	1668A

TABLE 3-1: Summary of Proposed Analytical Parameters					
SAMPLE IDENTIFICATION				ANALYTE PROGRAM	
MISCELLANEOUS SITES	SAMPLE ID	SAMPLING DESIGN	CONTAINER TYPE/NUMBER	ANALYTE	METHOD
ELCDDA – lead and zinc	HAAF-CDA-833-1.5	10 sidewall (0.5 – 1.5 feet in cap material) and 4 floor (1 foot into debris material or at groundwater if <1 ft.) samples. <u>Archive</u> 4 samples from bay mud taken below floor samples. See Figure 2-4 for sample locations.	2 – 4 oz. or 1 – 8 oz. CWM jars with septa lid per sample	Total Metals (full suite)	SW6010B
	HAAF-CDA-834-1.5				
	HAAF-CDA-835-1.5				
	HAAF-CDA-836-1.5				
	HAAF-CDA-971-1.5 (QC)				
	HAAF-CDA-837-1.5				
	HAAF-CDA-838-1.5				
	HAAF-CDA-839-1.5 MS/MSD				
	HAAF-CDA-840-1.5				
	HAAF-CDA-841-1.5				
	HAAF-CDA-842-1.5				
	HAAF-CDA-843-2.5				
	HAAF-CDA-843-BM				
	HAAF-CDA-844-2.5				
	HAAF-CDA-844-BM				
	HAAF-CDA-972-BM (QC)				
	HAAF-CDA-845-2.5				
	HAAF-CDA-845-BM				
HAAF-CDA-846-2.5					
HAAF-CDA-846-BM					

TABLE 3-1: Summary of Proposed Analytical Parameters					
SAMPLE IDENTIFICATION				ANALYTE PROGRAM	
MISCELLANEOUS SITES	SAMPLE ID	SAMPLING DESIGN	CONTAINER TYPE/NUMBER	ANALYTE	METHOD
ELLCCDDA – Burn Pit	HAAF-BP-851-1.5	8 sidewall (1.5 feet), 4 floor (3 feet) and 4 sub floor (1 foot below bay mud contact). See Figure 2-5 for sample locations.	2 – 4 oz. or 1 – 8 oz. CWM jars with septa lid per sample	PCB Homologues, dioxins and furans	1668A and SW8290 (PCP 8270C for 1014 only)
	HAAF-BP-852-1.5				
	HAAF-BP-853-1.5				
	HAAF-BP-854-1.5				
	HAAF-BP-855-1.5				
	HAAF-BP-856-1.5				
	HAAF-BP-857-1.5				
	HAAF-BP-858-1.5				
	HAAF-BP-859-3.0				
	HAAF-BP-860-3.0				
	HAAF-BP-861-3.0				
	HAAF-BP-862-3.0				
	HAAF-BP-1014-0				
	HAAF-BP-1014-1.5				
	HAAF-BP-1014-3.0				
HAAF-BP-859-1BM	2 surface samples stepped out from east and south sides of proposed excavation area. See Figure 2-5 for sample locations.	2 – 4 oz. or 1 – 8 oz. CWM jars with septa lid per sample	TPH-E	SW8015B	
HAAF-BP-860-1BM					
HAAF-BP-861-1BM					
HAAF-BP-973-1BM (QC)					
HAAF-BP-862-1BM					
HAAF-BP-1018-0	2 surface samples stepped out from east and south sides of proposed excavation area. See Figure 2-5 for sample locations.	2 – 4 oz. or 1 – 8 oz. CWM jars with septa lid per sample	Total Metals (full suite)	SW6010B	
HAAF-BP-1019-0					

TABLE 3-1: Summary of Proposed Analytical Parameters					
SAMPLE IDENTIFICATION				ANALYTE PROGRAM	
MISCELLANEOUS SITES	SAMPLE ID	SAMPLING DESIGN	CONTAINER TYPE/NUMBER	ANALYTE	METHOD
Outfall Drainage Ditch (ODD)	HAAF-ODD-867-2.5	Total of 24 primary samples plus QC samples.	2 – 4 oz. or 1 – 8 oz. CWM jars with septa lid per sample	Total Metals (full suite), TPH-E, PCBs Homologues, Pentachlorop henol (PCP), phenol, total DDTs, total chlordanes, endrin aldehyde, MCPP and MCPA	SW6010B, SW8015B, SW8270C, SW8081A and (SW8151A-only samples 878-880) (1668A for samples 867, 869, 871, 873, 875, 877, 879)
	HAAF-ODD-867-ES-2.5				
	HAAF-ODD-867WS-2.5				
	HAAF-ODD-868-2.5				
	HAAF-ODD-868ES-2.5	14 sampling locations, for 5 downstream ODD locations of 14 locations - 3 samples per location (1 floor and 2 sidewall) for 10 sidewall (midway between marsh surface and proposed excavation [proposed excavation is 2 feet below bottom of ditch] and 1.5 feet laterally beyond edge of ditch) and 5 floor (2 to 2.5 feet below bottom of ditch) samples. For balance of 9 samples, all collected from bottom of proposed excavation floor (2 to 2.5 feet below bottom of ditch). See Figure 2-6 for sample locations.			
	HAAF-ODD-868WS-2.5				
	HAAF-ODD-974WS-2.5 (QC)				
	HAAF-ODD-869-2.5				
	HAAF-ODD-869ES-2.5				
	HAAF-ODD-869WS-2.5				
	HAAF-ODD-870-2.5				
	HAAF-ODD-870ES-2.5				
	HAAF-ODD-870WS-2.5				
	HAAF-ODD-871-2.5				
	HAAF-ODD-871ES-2.5				
	HAAF-ODD-871WS-2.5				
	HAAF-ODD-872-2.5				
	HAAF-ODD-873-2.5 MS/MSD				
	HAAF-ODD-975-2.5 (QC)				
	HAAF-ODD-874-2.5				
HAAF-ODD-875-2.5					
HAAF-ODD-876-2.5 MS/MSD					
HAAF-ODD-877-2.5					
HAAF-ODD-878-2.5					
HAAF-ODD-879-2.5					
HAAF-ODD-880-2.5					
HAAF-ODD-976-2.5 (QC)					

TABLE 3-1: Summary of Proposed Analytical Parameters					
SAMPLE IDENTIFICATION				ANALYTE PROGRAM	
MISCELLANEOUS SITES	SAMPLE ID	SAMPLING DESIGN	CONTAINER TYPE/NUMBER	ANALYTE	METHOD
ODD – Building 39 outfall	HAAF-ODD-881-3.0 HAAF-ODD-977-3.0 (QC) HAAF-ODD-882-3.0 HAAF-ODD-883-3.0 HAAF-ODD-884-1.0 HAAF-ODD-885-1.0	3 sidewall (app. 2.5 – 3 feet) and 2 floor (2 to 2.5 feet) samples. Sidewall samples half the distance between the marsh surface and the bottom of the proposed excavation (excavation is 2 feet below the bottom of the outfall) and laterally 1.5 feet outside the basin. See Figure 2-6A for sample locations.	2 – 4 oz. or 1 – 8 oz. CWM jars with septa lid per sample	Total Metals (full suite), TPH-E, PCBs Homologues, Pentachlorophenol (PCP), phenol, total DDTs, total chlordanes, and endrin aldehyde	SW6010B, SW8015B, 1668A, SW8270C, and SW8081A
Former Sewage Treatment Plant – Outfall Area	HAAF-FTP-886-0 HAAF-FTP-886-1.5 HAAF-FTP-979-1.5 (QC) HAAF-FTP-887-0 HAAF-FTP-887-2.0 HAAF-FTP-888-0 HAAF-FTP-888-2.0 HAAF-FTP-889-1.5 HAAF-FTP-890-1.5 HAAF-FTP-994-0	4 (surface) samples, 3 samples nearest the outfall pipe collected at 1.5 feet and 2 north of and away from pipeline collected at 2.0 feet. See Figure 2-7 for sample locations.	2 – 4 oz. or 1 – 8 oz. CWM jars with septa lid per sample	Total Metals (full suite), total chlordanes, total DDTs	SW6010B, SW8081A
Former Sewage Treatment Plant - Channel	HAAF-FTP-891-0 HAAF-FTP-891-1.5 HAAF-FTP-995-1.5 HAAF-FTP-980-1.5 (QC)	2 locations, 1 (surface) and 2 (1.5 feet) samples from two channel locations. See Figure 2-7 for sample locations.	2 – 4 oz. or 1 – 8 oz. CWM jars with septa lid per sample	Total Metals (full suite), total chlordanes, total DDTs and PCB Homologues	SW6010B, SW8081A (1668A – 891 and 995 at depth, only)

TABLE 3-1: Summary of Proposed Analytical Parameters					
SAMPLE IDENTIFICATION				ANALYTE PROGRAM	
MISCELLANEOUS SITES	SAMPLE ID	SAMPLING DESIGN	CONTAINER TYPE/NUMBER	ANALYTE	METHOD
High Marsh Plain – Eastern extension of proposed excavation	HAAF-HM-893-0 HAAF-HM-894 -0 HAAF-HM-895-0 HAAF-HM-981-0 (QC) HAAF-HM-896-0 HAAF-HM-897-0 HAAF-HM-898-0 HAAF-HM-899-0 HAAF-HM-900-0	8 sample locations. 8 surface samples. See Figure 2-6 for sample locations.	2 – 4 oz. or 1 – 8 oz. CWM jars with septa lid per sample	Total Metals (full suite) and PCB Homologues	SW6010B, 1668A – 893, 894, 896, 898, 900, only)
High Marsh Plain - western extension of proposed excavation	HAAF-HM-914-0 HAAF-HM-984-0 (QC) HAAF-HM-915-0 HAAF-HM-916-0 HAAF-HM-917-0 MS/MSD HAAF-HM-918-0 HAAF-HM-919-0	6 locations- 6 surface samples. See Figure 2-6A for sample locations.	2 – 4 oz. or 1 – 8 oz. CWM jars with septa lid per sample	Total Metals (full suite), TPH-E, PCB Homologues, Pentachlorop henol (PCP), phenol, total DDTs, total chlordanes, and endrin aldehyde	SW6010B, SW8015B, SW8270C, and SW8081A (1668A -914, 916, 918, only)
High Marsh Plain – vertical extension of proposed excavation	HAAF-HM-921-2.0 HAAF-HM-922-2.0 HAAF-HM-923-2.0 HAAF-HM-924-2.0 MS/MSD HAAF-HM-978-2.0 (QC) HAAF-HM-925-3.0 HAAF-HM-926-3.0 HAAF-HM-985-3.0QC)	6 samples, bottom only. Depth varies, see Figure 2-8. See Figure 2-6 for sample locations.	2 – 4 oz. or 1 – 8 oz. CWM jars with septa lid per sample	Total Metals (full suite) and PCB Homologues	SW6010B and (1668A – 921, 923 and 925, only)

TABLE 3-1: Summary of Proposed Analytical Parameters					
SAMPLE IDENTIFICATION				ANALYTE PROGRAM	
MISCELLANEOUS SITES	SAMPLE ID	SAMPLING DESIGN	CONTAINER TYPE/NUMBER	ANALYTE	METHOD
High Marsh Grid (ABC 1-9)	HAAF-GRD-938-0	11 surface and 17 depth samples. Sample IDs indicate which are at surface and which are at 3-foot depth (by the final digits in the labels). Samples arranged in grid with grid nodes 75 feet apart. See Figure 2-9 for sample depths and locations.	2 – 4 oz. or 1 – 8 oz. CWM jars with septa lid per sample	Total Metals (full suite), total chlordanes, total DDTs, endrin aldehyde, heptachlor, heptachlor epoxide, and PCB Homologues	SW6010B, SW8081A and 1668A
	HAAF-GRD-939-0				
	HAAF-GRD-986-0 (QC)				
	HAAF-GRD-940-0				
	HAAF-GRD-941-3.0				
	HAAF-GRD-942-3.0				
	HAAF-GRD-943-3.0				
	HAAF-GRD-944-3.0				
	HAAF-GRD-945-0				
	HAAF-GRD-946-0				
	HAAF-GRD-947-3.0				
	HAAF-GRD-948-3.0				
	HAAF-GRD-987-3.0 (QC)				
	HAAF-GRD-949-3.0				
	HAAF-GRD-950-3.0				
	HAAF-GRD-951-3.0				
	HAAF-GRD-952-3.0				
	HAAF-GRD-953-3.0				
	HAAF-GRD-954-3.0				
	HAAF-GRD-955-0				
	HAAF-GRD-956-0				
	HAAF-GRD-957-0				
	HAAF-GRD-958-3.0				
	HAAF-GRD-959-3.0				
	HAAF-GRD-960-3.0				
HAAF-GRD-961-3.0					
HAAF-GRD-962-0					
HAAF-GRD-962-3.0					
HAAF-GRD-963-0					
HAAF-GRD-964-0					
HAAF-GRD-988-0 (QC)					
Final FSP					June 2004

TABLE 3-1: Summary of Proposed Analytical Parameters					
SAMPLE IDENTIFICATION				ANALYTE PROGRAM	
MISCELLANEOUS SITES	SAMPLE ID	SAMPLING DESIGN	CONTAINER TYPE/NUMBER	ANALYTE	METHOD
High Marsh Grid (DE 1-9)	HAAF-GRD-965-0	18 surface samples of outer marsh plain within 200 feet of San Pablo Bay. Samples arranged in grid with grid nodes 75 feet apart. See Figure 2-9 for sample depths and locations.	2 – 4 oz. or 1 – 8 oz. CWM jars with septa lid per sample	Total Metals (full suite), total chlordanes, total DDTs, endrin aldehyde, heptachlor, heptachlor epoxide, and PCB Homologues	SW6010B, SW8081A and 1668A
	HAAF-GRD-966-0				
	HAAF-GRD-996-0				
	HAAF-GRD-997-0				
	HAAF-GRD-998-0				
	HAAF-GRD-999-0				
	HAAF-GRD-1000-0				
	HAAF-GRD-1012-0 (QC)				
	HAAF-GRD-1001-0				
	HAAF-GRD-1002-0				
	HAAF-GRD-1003-0				
	HAAF-GRD-1004-0				
	HAAF-GRD-1005-0				
	HAAF-GRD-1013-0 (QC)				
	HAAF-GRD-1006-0				
	HAAF-GRD-1007-0				
	HAAF-GRD-1008-0				
	HAAF-GRD-1009-0				
HAAF-GRD-1010-0					
HAAF-GRD-1011-0					

TABLE 3-1: Summary of Proposed Analytical Parameters					
SAMPLE IDENTIFICATION				ANALYTE PROGRAM	
MISCELLANEOUS SITES	SAMPLE ID	SAMPLING DESIGN	CONTAINER TYPE/NUMBER	ANALYTE	METHOD
Marsh Plain DDT Survey (A 1-4 to E 1-4)	CSM A-01	20 surface samples of inner marsh plain within 400 feet of East Perimeter Levee. Samples arranged in rows with 75 to 100 foot spacing. Rows spaced in marsh approximately 600 to 900 feet apart. See Figure 2-10 for sample locations	2 – 4 oz. or 1 – 8 oz. CWM jars with septa lid per sample	DDTs using Immuno – Assay field test kits.	SW4042
	CSM A-02				
	CSM A-03				
	CSM A-04				
	CSM B-01				
	CSM B-02				
	CSM B-03				
	CSM B-04				
	CSM C-01				
	CSM C-02				
	CSM C-03				
	CSM C-04				
	CSM D-01				
	CSM D-02				
	CSM D-03				
	CSM D-04				
	CSM E-01				
	CSM E-02				
	CSM E-03				
	CSM E-04				

TABLE 3-1: Summary of Proposed Analytical Parameters					
SAMPLE IDENTIFICATION				ANALYTE PROGRAM	
MISCELLANEOUS SITES	SAMPLE ID	SAMPLING DESIGN	CONTAINER TYPE/NUMBER	ANALYTE	METHOD
High Marsh near historical sewage pipeline	HAAF-TWA2-1015-0 HAAF-TWA2-1017-0 (QC) HAAF-TWA2-1016-0	2 locations, 2 surface samples for marsh plain characterization between sample location TWA-SD02 and historical sewage pipeline. Associated with former sample location TWA-SD02 (TWA-SD2).	2 – 4 oz. or 1 – 8 oz. CWM jars with septa lid per sample	Total Metals (full suite), total chlordanes, total DDTs, endrin aldehyde, heptachlor, heptachlor epoxide, and PCB Homologues	SW6010B, SW8081A  1668A

## **4. SAMPLING EQUIPMENT AND PROCEDURES**

The CSMPAS-fieldwork will be conducted in accordance with the SSHP and the QAPP. The Army prepared the SSHP and the QAPP specifically for this investigation.

### **4.1 INVESTIGATIVE EQUIPMENT AND PROCEDURES**

Sediment samples will be collected for chemical analysis. The field crew will remove debris or vegetative cover to access the marsh plain sample locations. A clean spade and scoop will be used to obtain each surface sample (0-2 inches of undisturbed soil). Sample locations at various depths will be accessed using a spade, stainless steel soil auger (hand or power-driven), or pick and digging bar, as field conditions require.

Subsurface samples will be collected by inserting the soil auger or sampling tube to the appropriate sample collection depth. Samples will be collected as close to the defined depth interval as possible (preferably within one inch) and the actual depth of the sample below the ground's surface will be measured and recorded in the field logbook.

A backhoe may be used to remove debris or access sampling locations if necessary.

Samples for offsite analysis will be hand delivered to the laboratory daily or sent via Federal Express under chain of custody.

## 4.2 QUALITY CONTROL PROGRAM

The purpose of this section is to describe the field quality control (QC) samples that will be included to support the data quality presented in the QAPP. The sampling methodologies, preservation techniques, and decontamination procedures described in this FSP have been selected to ensure appropriate data quality. The appropriateness of the field sampling protocol will be verified by inclusion of QC samples as described below. Specific QC duplicate samples are included in Table 3-1.

### 4.2.1 Field Duplicates (QC Samples)

QC duplicate samples collected in the field will provide precision information for the entire measurement system, including sample acquisition, homogeneity, handling, shipping, storage, preparation, and analysis. The field duplicates will be placed in a separate sample jar from the normal sample after homogenization of the sample in the mixing bowl. The identity of these samples will be held blind to the analysts and laboratory personnel until the data are in deliverable form. Duplicate analyses will be performed on approximately 10% of the total investigative samples for each method. QC sample locations are defined in this FSP; however, the locations may be adjusted based on information determined in the field. Odors or visual indicators may be used to assist in directing the location of QC samples to areas suspected to have the highest concentrations of the contaminants of interest. Duplicate samples will be analyzed by the laboratory for the same parameters as the primary sample (i.e., the sample that is being duplicated).

### 4.2.2 Matrix Spike/Matrix Spike Duplicates (MS/MSD)

A Matrix Spike (MS) is an environmental sample to which known concentrations of analytes have been added. The MS is taken through the entire analytical procedure and the recovery of the analytes is calculated. Results are expressed as percent recovery. The MS is used to evaluate the effects of the sample matrix on the accuracy of the analysis.

A Matrix Spike Duplicate (MSD) is an environmental sample that is divided into two separate aliquots, each of which is spiked with known concentrations of analytes. The spiked aliquots are processed separately and the results compared to determine the effects of the matrix on the precision and accuracy of the analysis. Additional soil sample volumes will be collected for MS/MSD analyses in accordance with the QAPP. MSD sample locations are defined in this FSP; however, the locations may be adjusted based on information determined in the field.

### 4.2.3 Blanks

#### 4.2.3.1 Equipment Blanks

Contamination introduced by sampling equipment can be detected by analyzing equipment blanks. Equipment blanks will be collected for all non-disposable sampling equipment after decontamination has been performed. Equipment blanks will be obtained with reagent grade water that is determined to be free of the analyte of concern. Equipment blanks will be collected by pouring the reagent grade water over the sampling equipment and collecting the water in an amber glass jar. One equipment blank will be collected per method of analysis (SW6010B, SW8270C [modified], and SW8081A) for a total of 3.

#### 4.2.3.2 Temperature Blanks

A small sample container of water will be labeled as a temperature blank. One temperature blank will be included in each cooler. The temperature blank will be packaged and handled in the same manner as the other samples to assure that its temperature is representative of the samples in that cooler. The laboratory will use a calibrated thermometer to directly measure the temperature of this sample. The temperature reading from the temperature blank will be used to determine whether samples were stored under the appropriate thermal conditions.

## 4.3 EQUIPMENT DECONTAMINATION PROCEDURES

During sampling activities, appropriate decontamination measures will be taken to minimize sample contamination from sampling equipment.

All down-hole sampling equipment (excluding disposable equipment) will be decontaminated as described in the following paragraphs. Decontamination should be executed immediately prior to equipment use. Whenever this is not possible or practical, measures will be taken to assure that contamination of clean equipment will not occur. Clean disposable gloves will be worn while decontaminating sampling equipment and tools. Clean sampling equipment will not be placed on the ground or other contaminated surfaces prior to use. All non-disposable sampling equipment will be constructed of stainless steel and/or Teflon™.

Detergent and reagent grade water rinses are the first steps in the decontamination process. Deionized water will be stored in plastic containers and applied via pump sprayers or decanted directly from the storage container. The waste decontamination fluids will be collected and handled in accordance with Section 6.0.

Decontamination will consist of the following steps:

- 1) Wash with non-phosphate detergent;
- 2) Rinse with potable water;
- 3) Rinse with analyte-free water (type II reagent grade water or equivalent);
- 4) Air dry;
- 5) Wrap equipment completely with aluminum foil (shiny side out) and place in a plastic bag to prevent contamination, if equipment is to be stored or transported.

#### **4.4 SAMPLING CONTAINERS AND PRESERVATION**

For samples to be shipped offsite, the laboratory performing the analyses will supply sample containers for this project. For samples to be analyzed onsite, the appropriate sample containers will be supplied. A complete set of sampling containers will be prepared for each sample in advance of the sampling event. Containers will be labeled with the date, time, project name, sample number, samplers initials, parameters for analysis, and preservative. Temperature blanks will be used for all coolers containing samples requiring preservation at  $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$ .

## 5. SAMPLING DOCUMENTATION AND HANDLING

### 5.1 SAMPLE NUMBERING SYSTEM

A unique identification number will be assigned to each sample. The number is typically an alphanumeric sequence or integer that serves as an acronym to identify the sample. Specific sample identification procedures will follow the strategy outlined below:

Primary Sample	HAAF - designator – 8XX and –9XX
Duplicate Sample	HAAF - designator - 98X or HAAF- designator - 8XX - MS/MSD
Equipment Blank	HAAF - EB - Sequential Sample Number

<u>Designator</u>	<u>Site Name</u>
BD	Boat Dock
A14	Area 14
HDD	Historic ODD
CDA	ELCDDA
ELBP	ELCDDA – Burn Pit
ODD	ODD
FTP	Former Sewage Treatment Plant (FSTP)
HM	High Marsh Plain
ADE	Antenna Debris Disposal Area - East
ADW	Antenna Debris Disposal Area - West

XX is the sequential sample number, starting at 01. MS/MSD indicates a matrix spike duplicate. EB is the designator for equipment blanks. The equipment blank sequential sample number shall start at 1.

ODD sample identification numbers will be appended with B (bottom or floor of ditch), WS (west side of ditch), and ES (east side of ditch).

## 5.2 SAMPLE LABELS

The identification number references information pertaining to a particular sample. It is recorded on the sample container, in the field logbook, and on the sample chain-of-custody form. Following sample collection, the sample label is completed in waterproof ink and secured to the sample container with clear tape.

Each sample collected at the site will be labeled with the following information:

- Sample identification number;
- Site name;
- Date and time of collection;
- Name of person collecting the sample;
- Analysis requested;
- Preservation;
- Any other information pertinent to the sample.

## 5.3 FIELD LOGBOOK

A field notebook bound with serially numbered pages will be used to record personnel on site, sample identification numbers, sampling date and time, and any significant observations or events during field activities. The project name, site location, sampling event, project leader, telephone number and address of contact office (should the book be misplaced or lost) will be listed in ink. The field notebook is intended to record events during sampling in sufficient detail to allow field personnel to reconstruct events that transpired during the project

The Sampling Team Leader, who will sign and date the notebook prior to initiation of fieldwork will maintain the field notebook. If it is necessary to transfer the logbook to alternative personnel during the course of fieldwork, the person relinquishing the logbook will sign and date the logbook at the time the logbook is transferred and the person receiving the logbook will do likewise. Crossing a line through the entry and entering the correct information will make corrections to erroneous data. The correction will be initialed and dated by the person making the entry. Unused portions of logbook pages will be crossed out, signed, and dated at the end of each workday. Logbook entries must be dated, legible, in ink, and contain accurate documentation. Language used will be objective, factual, and free of personal opinions. Hypotheses for observed phenomena may be recorded, however, they must be clearly indicated as such and only relate to the subject observation.

The sample identification number, sample media, number of containers and laboratory analyses to be conducted are recorded with the sample identification number in the field log book and on the chain-of-custody.

The date and time of sample preparation and collection, and the personnel who conducted sampling are recorded with the sample identification number in the field logbook and on the chain-of custody form. The names of visitors and other persons on site are also recorded in the field logbook. Sampling personnel will also record the ambient weather conditions and other conditions at the sampling location that may affect sample collection, the apparent representativeness of the sample, or sample analysis in the field log book.

#### **5.4 SAMPLE PACKAGING AND SHIPPING**

Samples will be transported as soon as possible after sample collection for immunoassay field test kit analysis or offsite laboratory analysis. The following procedures are to be used when packing and transporting samples to the offsite laboratory:

- Use rigid plastic coolers;
- Tape the cooler drain closed both inside and out;
- Wrap glass containers with cushioning material;
- Package samples in individual plastic bags and place in cooler;
- Place a temperature blank in the cooler;
- Package ice in double plastic bags and place bags around, among, and on top of the samples;
- Put paperwork (chain-of-custody record, etc.) in a waterproof plastic bag and tape it to the inside lid of the cooler;
- Tape the cooler lid shut with fiber-reinforced tape;
- Place two signed custody seals on cooler, one at the front right and one at the back left of cooler;
- Attach completed shipping label to the top of cooler and ship following the carrier's instructions.

Sample coolers are typically shipped by overnight express carrier to the laboratory. A copy of the bill of lading (air bill) is to be retained and becomes part of the sample custody

documentation. The offsite laboratory will be notified in advance of all shipments, preferably by telephone on the day of shipment and by advanced scheduling.

## **5.5 CHAIN OF CUSTODY PROCEDURES**

Custody of samples must be maintained and documented from the time of sample collection to completion of the analyses. Each sample will be considered to be in the sampler's custody, and the sampler will be personally responsible for the care and custody of the samples until they are delivered to the courier service for delivery to the laboratory. A sample is considered to be under a person's custody if:

- The sample is in the person's physical possession;
- The sample is in view of the person after that person has taken possession;
- The sample is secured by that person so that no one can tamper with the sample; or
- The sample is secured by that person in an area that is restricted to authorized personnel.

All samples will be accompanied to the offsite laboratory by a chain-of-custody (COC) form. For these sampling events the COC record forms will be developed electronically using EPA Superfund program Forms II Lite software. The chain-of-custody form contains the following information:

- Project name;
- Sample numbers;
- Sample collection point;
- Date and time of collection of samples (these must match the date and time recorded on the sample label);
- Sample matrix description;
- Analyses requested for each sample;
- Preservation method;
- Number and type of containers used;
- Any special handling or analysis requirements;
- Signature of person collecting the samples;
- Signature of persons involved in the chain of possession; and

- Names and telephone numbers of the project point of contacts (POCs).

The chain-of-custody record forms will be filled out with ink. Prior to packaging samples for shipment, all samples should be double checked against the chain of custody form. When the samples are transferred from one party to another, the individuals will sign, date, and note the time on the form. A separate COC will accompany each delivery of samples to the laboratory. The chain-of-custody form will be included in the cooler used for preservation and transport of the samples. The sampling personnel will retain a copy of the form.

## **6. INVESTIGATION-DERIVED WASTE**

Expected or potential sources of investigation-derived waste (IDW) for this project include rinse water from decontamination procedures. The waste decontamination fluids will be collected during the decontamination procedures. Rinse water shall be collected in separate buckets during decontamination. All containers shall be Department of Transportation (DOT) approved. Each container shall be labeled with a potential hazardous waste label indicating date sample was collected and Contaminated Waste Water. IDW in each container shall be characterized prior to disposal. If the characterization results indicate the materials in a container are hazardous, the container shall be labeled with a Hazardous Waste Label. USACE will dispose of the small amounts of IDW in accordance with all Federal, state, and local regulations.

Personal Protective Equipment (PPE), including nitrile gloves and tyvek overalls/booties, will be handled as non-hazardous waste.

The field report will document IDW disposal.

## 7. REFERENCES

CH2MHILL 2003. *Coastal Salt Marsh Focused Feasibility Study Report*, Hamilton Army Airfield, Novato, California. June.

*Main Airfield Parcel Record of Decision/Remedial Action Plan, Hamilton Army Airfield, Public Comment Final*, August 2003.

U.S. Environmental Protection Agency (EPA), 1996, *Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Third Edition*, December 1996.

U.S. Fish and Wildlife Service Biological Opinion and amending letter, August 2003 and September 2003.

# **APPENDIX C**

## **QUALITY ASSURANCE PROJECT PLAN**

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**QUALITY ASSURANCE PROJECT PLAN  
PRE-REMEDIAL ACTION SAMPLING  
COASTAL SALT MARSH  
HAMILTON ARMY AIRFIELD  
NOVATO, CALIFORNIA**

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Final

Prepared by:



**US Army Corps  
of Engineers®**

Sacramento District  
Environmental Design Section

**June 2004**

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**TABLE OF CONTENTS**

1.0	INTRODUCTION .....	1-1
1.1	Site Location and Project Objectives .....	1-1
1.2	QAPP Objectives and Use .....	1-2
2.0	PROJECT ORGANIZATION AND RESPONSIBILITIES .....	2-1
2.1	Corps of Engineers.....	2-1
2.2	Project Management .....	2-1
2.2.1	Technical Team Leader.....	2-1
2.2.2	Project Chemist.....	2-2
2.2.3	Health and Safety Manager.....	2-2
2.2.4	Sampling Team Leader .....	2-2
2.2.5	Field Crew.....	2-2
3.0	QUALITY OBJECTIVES FOR ENVIRONMENTAL DATA.....	3-1
3.1	Characteristics of Data Quality .....	3-1
3.2	Data Quality Objectives .....	3-2
4.0	SAMPLE ACQUISITION, CUSTODY, MANAGEMENT, AND DECONTAMINATION .....	4-1
5.0	ANALYTICAL METHODS AND CALIBRATION.....	5-1
5.1	Sample Preparation and Analytical Methods - Organic.....	5-3
5.1.1	Method SW3550B: Sonication Extraction.....	5-3
5.1.2	Method SW3630C: Silica Gel Cleanup .....	5-4
5.1.3	Method SW3640A: Gel-Permeation Cleanup .....	5-4
5.1.4	Method 3660B: Sulfur Cleanup .....	5-4
5.1.5	Method SW8081A/8082: Organochlorine Pesticides/Polychlorinated Biphenyls (PCBs).....	5-4
5.1.6	Modified Method SW8270C: Phenol and Pentachlorophenol by GC/MS .....	5-5
5.1.7	Method SW8151A: Chlorinated Herbicide – Dichloroprop.....	5-5
5.1.8	Method SW8290: Dioxins by High Resolution GC/High Resolution MS .....	5-5
5.1.9	Method 1668A: Toxic Polychlorinated Biphenyls by Isotope Dilutions HRGC/HRMS .....	5-6
5.1.10	Method SW8015B Modified: Total Petroleum Hydrocarbons.....	5-6
5.2	Sample Preparation and Analysis Methods - Inorganic.....	5-7
5.2.1	Method SW3050B: Acid Digestion of Sediments, Sludges, and Soils.....	5-7
5.2.2	Method SW6010B: Inductively Coupled Plasma-Atomic Emission Spectrometry .....	5-7
5.2.3	Method SW7471A: Cold Vapor Atomic Absorption Spectroscopy.....	5-8
5.2.4	Method SW4042: Total DDT in Soil Test Kits .....	5-8
6.0	QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES.....	6-1
6.1	Calibration Procedures and Frequency .....	6-1
6.1.1	Gas Chromatography .....	6-1
6.1.2	GC/MS analysis .....	6-2
6.1.3	Inductively Coupled Argon Plasma-Atomic Emission Spectrometry (ICPES) Metals.....	6-3

6.1.4	Atomic Absorption Spectroscopy .....	6-3
6.2	Standard and Reagent Preparation .....	6-4
6.3	Field Quality Control Checks .....	6-5
6.4	Laboratory Quality Control Checks .....	6-5
6.4.1	Analytical Batch (Preparation Batch) .....	6-5
6.4.2	Blanks .....	6-6
6.4.3	Laboratory Control Samples .....	6-6
6.4.4	Matrix Spikes and Matrix Spike Duplicates .....	6-7
6.4.5	Surrogate Recoveries and Standard Additions .....	6-7
6.4.6	Calibration Standard .....	6-7
6.4.7	Reference Standard .....	6-8
6.4.8	Laboratory Performance Evaluation Samples .....	6-8
6.5	Corrective Action .....	6-8
6.6	Documentation .....	6-9
7.0	DATA REDUCTION, VALIDATION AND REPORTING .....	7-1
7.1	Laboratory .....	7-1
7.1.1	Data Reduction and Validation .....	7-1
7.1.2	Data Reporting .....	7-2
7.1.3	External Data Validation and Quality Assurance Reports .....	7-7
7.2	Field Activities .....	7-7
7.2.1	Data Reduction .....	7-7
7.2.2	Data Integrity .....	7-7
7.2.3	Data Validation .....	7-7
7.2.4	Data Storage .....	7-8
8.0	PREVENTIVE MAINTENANCE .....	8-1
9.0	LABORATORY PROCEDURES USED TO ASSESS DATA QUALITY AND DETERMINE SENSITIVITY .....	9-1
9.1	Data Quality Assessment .....	9-1
9.1.1	Precision .....	9-1
9.1.2	Accuracy .....	9-2
9.1.3	Representativeness .....	9-3
9.1.4	Completeness .....	9-3
9.1.5	Comparability .....	9-4
9.2	Sensitivity .....	9-4
9.2.1	Method Detection Limit (MDL) .....	9-4
9.2.2	Quantitation Limit (QL) .....	9-4
10.0	CORRECTIVE ACTION FOR UNACCEPTABLE QUALITY CONTROL DATA .....	10-1
10.1	Field Activities .....	10-1
10.2	Laboratory .....	10-1
10.3	Non-routine Occurrence Reports .....	10-2
11.0	REFERENCES .....	11-1
11.1	Environmental Protection Agency (EPA) .....	11-1
11.2	U.S. Army Corps of Engineers (USACE) .....	11-1

---

11.3 Other Documents ..... 11-1

**LIST OF TABLES**

Table 5-1. Summary of Analytical Methods..... 5-1

Table 5-2. Preservation and Holding Times ..... 5-3

Table 8-1. Routine Laboratory Instrument Maintenance..... 8-1

**ATTACHMENT A**

Table A-1	Summary of Calibration and Internal Quality Control Procedures for Method SW6010B (Metals)
Table A-2	Summary of Calibration and Internal Quality Control Procedures for Method SW7471A (Mercury)
Table A-3	Summary of Calibration and Internal Quality Control Procedures for Modified Method SW8015B (TPH)
Table A-4	Summary of Calibration and Internal Quality Control Procedures for Method SW8081A (Organochlorine Pesticides)
Table A-5	Summary of Calibration and Internal Quality Control Procedures for Method SW8082 (PCBs)
Table A-6	Summary of Calibration and Internal Quality Control Procedures for Method SW8270C (SVOCs)
Table A-7	Summary of Calibration and Internal Quality Control Procedures for Method SW8290 (Dioxin/Furans)
Table A-8	Summary of Calibration and Internal Quality Control Procedures for Method 1668A (PCB Homologues)
Table A-9	Summary of Calibration and Internal Quality Control Procedures for Method SW8151A (Chlorinated Herbicides)
Table A-10	Summary of Internal Quality Control Procedures for Method SW4042 (Total DDT in Soil Test Kit)

**ATTACHMENT B**

Table B-1	Quantitation Limits and Action Goals for Metals by Method SW6010B, Mercury by Method SW7471A
Table B-2	Quantitation Limits and Action Goals for Extractable Total Petroleum Hydrocarbons by Method SW8015B
Table B-3	Quantitation Limits and Action Goals for Organochlorine Pesticides by Method SW8081A

Table B-4	Quantitation Limits and Action Goals for Polychlorinated Biphenyls Compounds by Method SW8082
Table B-5	Quantitation Limits and Action Goals for Semi-volatile Organic Compounds by Method SW8270C
Table B-6	Quantitation Limits and Action Goals for Dioxins Congeners by Method SW8290
Table B-7	Quantitation Limits and Action Goals for PCB Homologues by Method 1668A
Table B-8	Quantitation Limits and Actions Goals for Chlorinated Herbicides by Method SW8151A

## ATTACHMENT C

Table C-1	Data Qualifier Convention for Inorganic Analyses
Table C-2	Data Qualifier Convention for GC Analyses
Table C-3	Data Qualifier Convention for GC/MS Analyses

### LIST OF ACRONYMS AND ABBREVIATIONS

ADR	Automated Data Review
BRAC	Base Realignment and Closure
CCB	Continuing Calibration Blank
CCC	Calibration Check Compounds
CCV	Continuing Calibration Verification
CDQAR	Chemical Data Quality Assessment Report
CESPK	Corps of Engineers, Sacramento District
CL	Control Limit
COC	Chain of Custody
CSM	Coastal Salt Marsh
CVAA	Cold Vapor Atomic Absorption
DL	Detection Limit
DoD	Department of Defense
DQO	Data Quality Objectives
DTSC	California Department of Toxic Substances Control
ECD	Electron Capture Detector
EDD	Electronic Data Deliverable
ELCD	Electrolytic Conductivity Detector
EPA	Environmental Protection Agency
FSP	Field Sampling Plan
GC	Gas Chromatograph
HAAF	Hamilton Army Airfield

ICAL	Initial Calibration
ICB	Initial Calibration Blank
ICP	Inductively Coupled Plasma (Spectroscopy)
ICS	Interference Check Standard
ICV	Initial Calibration Verification
IS	Internal Standard
LCS	Laboratory Control Sample
LIMS	Laboratory Information Management System
MDL	Method Detection Limit
MS	Matrix Spike
MSA	Method of Standard Addition
MSD	Matrix Spike Duplicate
µg/kg	micrograms per kilogram
mg/kg	milligrams per kilogram
ng/kg	nanograms per kilogram
NELAC	National Environmental Laboratory Accreditation Conference
PARCC	Precision, Accuracy, Representativeness, Comparability, and Completeness
P.E.	Professional Engineer
PM	Project Manager
QL	Quantitation Limit
QA	Quality Assurance
QAC	Quality Assurance Chemist
QAPP	Quality Assurance Project Plan
QC	Quality Control
RF	Response Factor
RPD	Relative Percent Difference
ROD/RAP	Record of Decision/Remedial Action Plan
RRF	Relative Response Factor
RSD	Relative Standard Deviation
RT	Retention Time
SD	Serial Dilution

SIM	Selective Ion Monitoring
SOPs	Standard Operating Procedures
SPCC	System Performance Check Compounds
Total DDTs	Sum of DDD, DDE, and DDT concentrations
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
WP	Work Plan

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**QUALITY ASSURANCE PROJECT PLAN  
PRE-REMEDIAL ACTION SAMPLING  
COASTAL SALT MARSH  
HAMILTON ARMY AIRFIELD**

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## **1.0 INTRODUCTION**

This Quality Assurance Project Plan (QAPP) presents functions, procedures, and specific quality assurance (QA) and quality control (QC) activities designed to achieve the data quality goals for the various objectives of the sampling efforts at nine in-board sites described in the Data Quality Objectives (DQOs) at Hamilton Army Airfield Coastal Salt Marsh. This project is conducted by the Environmental Design Section of the U.S. Army Corps of Engineers, Sacramento District (CESPK) under the Defense Environmental Restoration Program (DERP) for the Army Base Realignment and Closure (BRAC) environmental office. This QAPP is prepared in accordance with guidelines set forth in the following documents:

- EPA QA/R-5, EPA Requirements for Quality Assurance Project Plans (U.S. EPA, 2001).
- USACE ER-1110-1-263, Chemical Data Quality Management for Hazardous Wastes Remedial Activities, (Department of Army, 1998)
- Department of Navy, Quality Systems Manual for Environmental Laboratories, Department of Defense, 2002)

This document accompanies the Work Plan (WP), DQOs, and the Field Sampling Plan (FSP).

### **1.1 Site Location and Project Objectives**

The proposed excavation sites locations are illustrated in Figure 1-2 of the Work Plan. The objectives for the following excavation sites included in this sampling effort are summarized below. To achieve the objectives, samples will be collected from the following sampling locations and depths based upon the results of any previous sampling and analyzed for contaminants previously identified for the area. The results will be compared to selected criteria values developed for Hamilton Army Airfield sites.

Boat Dock Under the Dock – Verify lateral and vertical extent of contamination  
Boat Dock In the Channel – Verify lateral and vertical extent of contamination  
Area 14 Motor Oil – Verify lateral and vertical extent of contamination

Area 14 Cobalt – Confirm cobalt exceedence and lateral extent  
Historic Outfall Drainage Ditch (ODD) Northern Half of Excavation – Verify lateral and vertical extent of contamination  
Historic ODD Southern Half of Excavation – Verify lateral and vertical extent of contamination  
East Levee Construction Debris Disposal Area (ELCDDA) – Confirm PCB contamination  
ELCDDA Lead and Zinc - Verify lateral and vertical extent of contamination  
ELCDDA Burn Pit- Verify lateral and vertical extent of contamination  
Outfall Drainage Ditch – Verify lateral and vertical extent of contamination  
ODD Building 39 Outfall - Verify lateral and vertical extent of contamination  
Former Sewage Treatment Plant (FSTP) Outfall Area - Verify lateral extent of contamination and determine possible expansion of excavation  
FSTP Channel – Verify lateral and vertical extent of contamination and determine length of excavation  
High Marsh Plain Boundary Excavation – Verify lateral extent of contamination  
High Marsh Plain Inside Boundary Excavation – Define vertical extent of contamination  
High Marsh Plain Eastern Extension of ODD – Verify lateral extent of ODD contamination in high marsh  
Western Extension of Proposed Excavation – Verify lateral extent of ODD contamination towards levee  
Marsh Plain DDT Assay - survey of surface DDT  
Antenna Debris Disposal Area East – Define lateral and vertical extent of contamination  
Antenna Debris Disposal Area West – Define lateral and vertical extent of contamination

## 1.2 QAPP Objectives and Use

Standard procedures and specifications are established to ensure that all laboratories produce comparable data, and that data quality is consistently assessed and documented. The specific objectives of this QAPP are to:

- provide standardized references and quality specifications for all anticipated field sampling, analysis, and data review procedures required for the project sites;
- provide guidance and criteria for selected field and analytical procedures; and
- establish procedures for reviewing and documenting compliance with field and analytical procedures.

The fieldwork will include removal of soil in area of proposed excavation, soil sample collection, packaging, and shipping to offsite laboratory for analysis.

## **2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES**

### **2.1 Corps of Engineers**

The following Sacramento District, Corps of Engineers personnel have been assigned to accomplish the sampling design and execution required supporting this project. The USACE Project Manager is Ray Zimny. The project execution will be performed under the general supervision of Rick Meagher P.E., Chief of Environmental Design Section. The technical team consists of the following personnel:

Project Chemist/Technical Team Leader: Kathy Siebenmann (916) 557-7180  
Geologist/Sampling Team Leader: Tim Crummett (916) 557-6942  
Health & Safety Manager: Donna Maxey (916) 557-7437  
USACE fax number: (916) 557-7465

### **2.2 Project Management**

The Project Manager (PM) will be responsible for the effective conduct of all work. The PM will be the primary contact for regulatory agencies, senior management and the technical team for the USACE. The PM will be responsible for oversight and approval of project performance, planning, financial management, scheduling, quality of work and compliance with all project criteria. The PM will also review reports and any resulting corrective action disposition.

#### **2.2.1 Technical Team Leader**

The Technical Team Leader will be responsible for reviewing the sampling plans and associated field activities, and ensuring that all sampling activities conform to the QAPP. The Project Leader will oversee quality assurance of field activities. Prior to the start of field activities, preparatory meetings will be held with the field crew. If field conditions require modifications to protocol outlined in the SAP or if questions arise, the Sampling Team Leader or field crew will contact the Technical Team Leader for direction. The Technical Team Leader will also be responsible for overseeing the project and subcontractors, directing field crews, and the compilation of data. The Technical Team Leader reports to the Section Chief.

### **2.2.2 Project Chemist**

The Project Chemist will have a “hands on” role in management of project tasks associated with sampling and analysis. These tasks include:

- Coordination with the analytical laboratory to ensure readiness to implement project specific requirements,
- Review of analytical data as it becomes available to ensure conformance with quality standards, and
- Implementation of corrective actions in accordance with QAPP specifications when review of data uncovers deficiencies.

### **2.2.3 Health and Safety Manager**

The certified industrial hygienist is responsible for the general health and safety plan development and training for field personnel. This individual is also responsible for ensuring that health and safety procedures are understood and followed by all field personnel, and for reporting and correcting any violations of policy or regulations.

### **2.2.4 Sampling Team Leader**

The Sampling Team Leader will be responsible for quality assurance of field activities and for executing all work elements related to the sampling program, including documenting field activities, maintaining field notes and photographs, maintaining a record of onsite personnel and visitors, and implementing the sampling plan. These tasks include instruction of field personnel in sampling and preservation requirements and general oversight of field personnel involved in sampling activities.

### **2.2.5 Field Crew**

Field crew personnel will be responsible for performance of project mobilization, demobilization, sample collection and oversight. Field personnel will report to the Sampling Team Leader. Field personnel will include members of the USACE Environmental Engineering Branch, Sacramento District.

### **3.0 QUALITY OBJECTIVES FOR ENVIRONMENTAL DATA**

#### **3.1 Characteristics of Data Quality**

The term “data quality” refers to the level of uncertainty associated with a particular data set. Data quality associated with environmental measurement is a function of the sampling plan rationale and procedures used to collect the samples, as well as of the analytical methods and instrumentation used in making the measurements. Uncertainty cannot be entirely eliminated from environmental data. However, quality assurance programs effective in measuring uncertainty in data are employed to monitor and control excursions from the desired data quality objectives (DQOs). The DQO process and data needs are specified in Attachment A. Sources of uncertainty that can be traced to the sampling component are poor sampling plan design, incorrect sample handling, faulty sample transportation, and inconsistent use of standard operating procedures. The most common sources of uncertainty that can be traced to the analytical component of the total measurement system are calibration and contamination.

The purpose of this QAPP is to ensure that the data collected are of known and documented quality and useful for the purposes for which they are intended. The procedures described are designed to obtain data quality indicators for each field procedure and analytical method. Data quality indicators include the PARCC parameters (i.e., Precision, Accuracy, Representativeness, Comparability, and Completeness). To ensure that quality data continues to be produced, systematic checks must show that test results and field procedures remain reproducible and that the analytical methodology is actually measuring the quantity of analytes in each sample.

A laboratory certified by the State of California and validated by the USACE or successfully audited by National Environmental Laboratory Accreditation Conference (NELAC) auditors will generate all laboratory chemical data. Laboratories must have an in-place program for data reduction, validation, and reporting as discussed in Section 7.0. The reliability and credibility of analytical laboratory results can be corroborated by the inclusion of a program of scheduled replicate analyses, analyses of standard or spiked samples, and analysis of split samples with QA laboratories for some projects. Regularly scheduled analyses of known duplicates, standards, and spiked samples are a routine aspect of data reduction, validation, and reporting procedures.

All data that will be collected for this project will be definitive data using EPA procedures and will be usable in identification, characterization, and engineering design. The data obtained will conform to the quality control requirements specified in the following text and the tables accompanying this document.

### **3.2 Data Quality Objectives**

To generate data that will meet the project objectives, it is necessary to define the types of decisions that will be made, identify the intended use of the data, and design a data collection program. Data Quality Objectives (DQOs) are defined as an integrated set of thought processes, which define data quality requirements based on the intended use of the data. Data Quality Objectives are necessary in obtaining sufficient data of known defensible quality for the intended use. The DQO process will assist in determining the appropriate sampling design, detection and quantitation limits, analytical methods, and sample handling procedures.

#### Step 1: State the Problem

The Army is responsible for removing contaminated soil, at unacceptable levels, due to historical operations at Hamilton Army Airfield. Nine sites within the Coastal Salt Marsh have been identified as areas containing soil contaminants above acceptable levels.

#### Step 2: Identify the Decision

The decision is to determine the dimensions at each site that will be excavated within each area of contamination in the Coastal Salt Marsh.

#### Step 3: Identify the Inputs to the Decision

The analytical results will be compared to selected action goal values developed for the Hamilton Army Airfield sites. These values are listed in Section 1.4 of the attached Work Plan. In addition, the following information will be used to determine the most effective sampling strategy.

<b>Area(s) of Concern</b>	<b>Information Required</b>	<b>Location of Information</b>	<b>SI Activity to Provide Information</b>
Boat Dock:  Under the Dock and In the Channel	Historical data  Vertical and lateral extent of contamination	USACE Sampling Data Report, FW Remedial Design Report, CSM Focused Feasibility Study (FFS) and ROD/RAP  To be collected as part of this sampling effort	Previous Sampling Investigations  Soil sample collection and analysis for metals and pesticides
Area 14	Historical data  Vertical and lateral extent of contamination	USACE Sampling Data Report, FFS and ROD/RAP  To be collected as part of this sampling effort	Previous Sampling Investigations  Soil sample collection and analysis for extractable total petroleum hydrocarbons (TPH-E) and metals
Historical Outfall Drainage Ditch (ODD) – northern half of excavation	Historical data  Vertical and lateral extent of contamination	USACE Sampling Data Report, Woodward-Clyde Environmental Investigation, FFS and ROD/RAP  To be collected during this sampling effort	Previous Sampling Investigations  Soil sample collection and analysis for metals and pesticide dichlorprop
Historic ODD – southern half of excavation	Historical data  Vertical and lateral extent of contamination	USACE Sampling Data Report, FFS and ROD/RAP  To be collected during this sampling effort	Previous Sampling Investigations  Soil sample collection and analysis total DDTs
East Levee Construction Debris Disposal Area (ELCDDA) – PCBs	Historical data  Confirmation of PCB contamination	USACE Sampling Data Report, FFS and ROD/RAP  To be collected during this sampling effort	Previous Sampling Investigations  Soil sample collection and analysis for PCBs and homologues.
ELCDDA – lead and zinc	Historical data  Vertical and lateral extent of contamination	USACE Sampling Data Report, FFS and ROD/RAP  To be collected during this sampling effort	Previous Sampling Investigations  Soil sample collection and analysis for metals
ELCDDA – Burn Pit	Historical data	USACE Sampling Data Report, IT Remedial Investigation Report, FFS and ROD/RAP	Previous Sampling Investigations

<b>Area(s) of Concern</b>	<b>Information Required</b>	<b>Location of Information</b>	<b>SI Activity to Provide Information</b>
	Vertical and lateral extent of contamination	To be collected during this sampling effort	Soil sample collection and analysis for PCB homologues, TPH-E, and dioxin congeners
ODD	Historical data	FFS and ROD/RAP	Previous Sampling Investigations
	Vertical and lateral extent of contamination	To be collected during this sampling effort	Soil sample collection and analysis for metals, TPH-E, PCBs, SVOCs and pesticides
ODD – Bldg 39 outfall	Historical data	FFS and ROD/RAP	Previous Sampling Investigations
	Vertical and lateral extent of contamination	To be collected during this sampling effort	Soil sample collection and analysis for metals, TPH-E PCBs, SVOCs and pesticides
Former Sewage Treatment Plant (FSTP) Outfall Area	Historical data	USACE Sampling Data Report, FFS and ROD/RAP	Previous Sampling Investigations
	Lateral extent of contamination	To be collected during this sampling effort	Soil sample collection and analysis for metals and PCBs
FSTP – Channel	Historical data	USACE Sampling Data Report, FFS and ROD/RAP	Previous Sampling Investigations
	Lateral and vertical extent of contamination	To be collected during this sampling effort	Soil sample collection and analysis for metals, pesticides and PCBs
High Marsh Plain	Historical data	FFS and ROD/RAP	Previous Sampling Investigations
	Lateral extent of contamination	To be collected during this sampling effort	Soil sample collection and analysis for metals and PCBs
High Marsh Plain – eastern extension of ODD	Historical data	FFS and ROD/RAP	Previous Sampling Investigations
	Lateral extent of ODD contamination into the high marsh	To be collected during this sampling effort	Soil sample collection and analysis for metals, TPH-E PCBs, SVOCs and pesticides
High Marsh Plain –	Historical data	FFS and ROD/RAP	Previous Sampling Investigations

<b>Area(s) of Concern</b>	<b>Information Required</b>	<b>Location of Information</b>	<b>SI Activity to Provide Information</b>
Plain – western extension of proposed excavation	Lateral extent of ODD contamination towards levee nearest the pump station outfall	To be collected during this sampling effort	Soil sample collection and analysis for metals, TPH-E PCBs, SVOCs and pesticides
High Marsh Plain	Historical data	FFS and ROD/RAP	Previous Sampling Investigations
	Vertical extent of contamination	To be collected during this sampling effort	Soil sample collection and analysis for metals and PCBs
Marsh Plain DDT Assay	Lateral survey of surface DDT concentrations	To be collected during this sampling effort	Soil sample collection and kit analysis for total DDT
Antenna Debris Disposal Area – East	Historical data	FFS and ROD/RAP	Previous Sampling Investigations
	Lateral and vertical extent of contamination	To be collected during this sampling effort	Soil sample collection (includes step outs) and analysis for TPH-E (diesel and motor oil), pesticides and PCBs
Antenna Debris Disposal Area - West	Historical data	FFS and ROD/RAP	Previous Sampling Investigations
	Lateral extent of contamination	To be collected during this sampling effort	Soil sample collection (includes step outs) and analysis for TPH-E (diesel and motor oil), pesticides and PCBs

#### Step 4: Define the Boundaries

**Spatial Boundaries:** The areas to be sampled have been physically identified based upon previous data and historical photographs.

**Time Boundaries:** The project should be performed between December 2003 and February 2004 due to the mating and nesting habits of endangered species that may be present in the Coastal Salt Marsh. All field sampling events are scheduled for January 2004 through February 2004. The field sampling may occur in more than one phase of sampling.

Sampling must be scheduled to coincide with the low tide to minimize the water in the ODD and any that may cover portions of the Coastal Salt Marsh.

#### Step 5: Develop a Decision Rule

The following decision rules apply to all areas of the Coastal Salt Marsh.

- If any individual analytical results are equal to or greater than the action goal values from the Hamilton AAF ROD/RAP 2003, then a step-out sampling strategy will be assessed for the site to further define the boundaries of the excavation vertically and horizontally. However, this type of sampling methodology will not be performed under this work effort until all sampling data from a site have been evaluated.
- If all individual analytical results are less than the action goals values, enough information will be available to determine if the limits of the excavation have been defined or if step-in sampling methodology will be performed because there is not enough historical data available to determine the limits of the excavation.

#### Step 6: Specify Tolerable Limits on Decision Errors

The decision errors inherent in selecting sampling locations and analyzing chemicals in soil and sediment consist of potential errors in sample design, location, heterogeneity, and sample analysis.

- Many of the sampling locations were selected using a judgmental sampling strategy based upon historical data. For all sampling locations, the assumption is that the sampling locations and numbers of samples will be representative of the immediate area at each investigation area. The number of samples is selected to minimize any decision errors; however, a high degree of heterogeneity would increase the probability of decision errors. Heterogeneity may be assessed by comparing the field duplicate sample results and will be considered in data interpretation. The use of site-specific visual, spatial, and analytical information should reduce the probability of sample design and location errors.
- The acceptable range of decision errors as a consequence of analytical errors will be evaluated during the data review, evaluation and validation process. Data found outside of acceptance criteria during validation will be qualified as estimated or rejected, as appropriate. The nature of the deficiency and the proximity to the associated action level will be used to assess the usability of the data. Adherence to quality control protocols in this QAPP should reduce the probability of analytical errors.

### Step 7: Optimize the Sampling Design

Both judgmental (authoritative) and systematic sampling strategies apply to these areas within the Coastal Salt Marsh, based upon EPA guidance (EPA 2000a). Judgmental sampling was used when previous data was available and the horizontal and/or vertical boundary of the area to be excavated was not adequately defined. The initial sampling point and the spacing for the systematic sampling strategy was selected based upon the historical use of the site, visual observation, and characteristics of similar sites where the extent has previously been defined.

#### **4.0 SAMPLE ACQUISITION, CUSTODY, MANAGEMENT, AND DECONTAMINATION**

Sample acquisition, custody, management, and decontamination procedures are described in the Field Sampling Plan (FSP).

The samples will be sent to a State of California and USACE certified or NELAC audited laboratory. The USACE certification includes in-depth audits to determine if quality assurance and quality control measures are in place and adequate. These audits are based upon many of the same elements as the NELAC audits:

- Sample custody procedures
- Calibration procedures and documentation
- Completeness of data forms, notebooks and other reporting requirements
- Data review and validation procedures
- Data storage, filing and record keeping procedures
- QC procedures, tolerances and documentation
- Operating conditions of facilities and equipment
- Documentation of training and maintenance activities, systems and operations overview
- Security of laboratory automated systems.

The address and point of contact will be listed here after selection of the laboratory.

Point of Contact: Jim Carter  
Emax Laboratories, Inc.  
1835 West 205<sup>th</sup> Street  
Torrance, California 90501  
Telephone: (310) 618-8889  
Fax: (310) 618-0818  
Email: [jcarter@emaxlabs.com](mailto:jcarter@emaxlabs.com)

## 5.0 ANALYTICAL METHODS AND CALIBRATION

This section contains brief descriptions of preparation and analytical methods that will be used to analyze soil samples collected for this project. These methods are listed in Table 5-1.

**Table 5-1. Summary of Analytical Methods**

<b>Analytes</b>	<b>Preparatory</b>	<b>Analytical Methods</b>
Metals (arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, lead, manganese, nickel, silver, vanadium and zinc)	SW3050B	SW6010B
Mercury	As per the Method	SW7471A
Dichloroprop	SW3550B	SW8151A
Total DDTs (summation of DDT, DDE, DDD), heptachlor, heptachlor epoxide, total chlordanes (summation of alpha chlordane and gamma chlordane), endrin aldehyde	SW3550B, SW3630C	SW8081A
Total Petroleum Hydrocarbons Extractables (TPH-E) (diesel, motor oil)	SW3550B, SW3630C	SW8015B mod.
Polychlorinated Biphenyls (PCBs)	SW3550B, SW3630C	SW8082
PCB Homologues	As per the Method	Method 1668A
Phenol, Pentachlorophenol	SW3550B, SW3630C	SW8270C
Dioxins	SW3550B	SW8290
Total DDT in Soil Test Kit	As per the Method	SW4042

If during the course of a project, it becomes necessary to apply a different quantitation limit

because of changes in instrument capabilities, the Project Chemist will be notified and approval must first be obtained in instances where higher quantitation limits result. Methodology references contain specific QC criteria associated with the particular methods. These specific requirements include calibration and QC samples, and are described in detail within the methods. Daily performance tests and demonstrations of precision and accuracy are required. These calibration and QC samples are listed in Attachment A to this QAPP.

The laboratory methods identified in this document were published by the United States Environmental Protection Agency (U.S. EPA) in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods SW-846*, Third Edition (November 1986; Revision 1, July 1992; and Revision 2, November 1992, Update I, August 1993, Update II, September 1994, Update III, 1998). Preservation and holding times for these analytical procedures are presented in Table 5-2. Attachment A summarizes the calibration and the internal quality control procedures; Attachment B lists the quantitation limits and action goals that will be used for this project.

**Table 5-2. Preservation and Holding Times**

<b>Method</b>	<b>Chemical Preservation</b>	<b>Holding Time</b>	<b>Temperature Preservation</b>
SW8151A	None	14 days before extraction, 40 days after extraction	Cool to 4°C
SW8081A	None	14 days before extraction, 40 days after extraction	Cool to 4°C
SW 8015B mod.	None	14 days before extraction, 40 days after extraction	Cool to 4°C
Method 1668A	None	14 days before extraction, 40 days after extraction	Cool to 4°C
SW8082	None	14 days before extraction, 40 days after extraction	Cool to 4°C
Modified SW8270C	None	14 days before extraction, 40 days after extraction	Cool to 4°C
SW8290	None	14 days before extraction, 40 days after extraction	Cool to 4°C
SW6010B	None	40 days before digestion, 6 months after digestion	None
SW7471A	None	28 days to analysis	Cool to 4°C

## **5.1 Sample Preparation and Analytical Methods - Organic**

The following sections briefly summarize the sample preparation and analytical methods to be performed for the determination of organic analytes.

Elemental sulfur is encountered in many sediments, industrial effluents, and sample containing biological material such as algae. Sulfur, if not removed, presents an interference in many organic analysis procedures, especially pesticide analysis using an electron capture detector. All samples submitted for organic analysis will undergo a various cleanup method, depending upon the interferences encountered following extraction. Not all potential cleanup methods are included below. The Project Chemist should be advised of any alternative cleanup methods proposed by the laboratory.

### **5.1.1 Method SW3550B: Sonication Extraction**

Method 3550B is a procedure for extracting nonvolatile and semivolatile organic compounds from solids such as soils, wastes, and sludges. The sonication process ensures intimate contact of the sample matrix with the extraction solvent. A weighted portion of the solid

material is mixed with the anhydrous sodium sulfate, ground to form a free-flowing powder, and then dispersed into the methylene chloride. The extract is separated from the sample by vacuum or gravity filtration, or centrifugation, and then dried with anhydrous sodium sulfate and concentrated to an appropriate volume for analysis.

#### **5.1.2 Method SW3630C: Silica Gel Cleanup**

Generally, solid-phase extraction cartridges filled with silica gel are used. Aliquots of sample extract are loaded onto the cartridges that are then eluted with suitable solvents, depending upon the analysis method. The collected fractions are analyzed by the appropriate method.

#### **5.1.3 Method SW3640A: Gel-Permeation Cleanup**

The extract is passed through a column containing a hydrophobic gel absorbent. The column is then flushed with clean organic solvents to separate the interferences from the analytes of interest by retention time.

#### **5.1.4 Method 3660B: Sulfur Cleanup**

The extract is shaken with either copper or tetrabutylammonium sulfite to remove interfering sulfur from the extract. The mixture is allowed to settle and the eluent is removed for analysis.

#### **5.1.5 Method SW8081A/8082: Organochlorine Pesticides/Polychlorinated Biphenyls (PCBs)**

Method 8081A/8082 is used to determine the concentration of various organochlorine pesticides and PCBs as aroclors. For this project the methods will be used to determine the concentration of DDD, DDE, DDT (total DDT), total chlordane (alpha and gamma chlordane), heptaclor, heptaclor epoxide, endrin aldehyde and aroclors on a gas chromatograph (GC). Prior to analysis, the sample is extracted into solution. An aliquot of solution is injected into an open-tubular capillary column, and detected by an electron capture detector (ECD) or electrolytic conductivity detector (ELCD). Any compounds identified tentatively in the primary analysis are confirmed on a second GC column.

### **5.1.6 Modified Method SW8270C: Phenol and Pentachlorophenol by GC/MS**

Method SW8270C is used to quantify most neutral, acidic, and basic organic compounds that are soluble in methylene chloride. For this project the method will be used to determine the concentrations of phenol and pentachlorophenol (PCP). The concentrated extract is injected into a gas chromatograph for separation and detected by mass spectrometry. Mass spectrometry provides a characteristic ion pattern for fragmented target analytes, providing a high level of confidence in compound identification. Compounds are quantitated by comparing the response of a characteristic ion to the average response from a 5-point calibration. The internal standard technique is used for calibration.

### **5.1.7 Method SW8151A: Chlorinated Herbicide – Dichloroprop**

Method SW8151A is used to determine chlorinated phenoxy acid herbicides compounds. For this project the method will be used to determine the concentration of dichloroprop. The concentrated extract is injected into a GC with a wide-bore fused-silica capillary column. The GC is temperature programmed to separate the analytes within the capillary column. The compounds are then detected by the ECD.

Qualitative identification is achieved by detecting a peak within a known retention time window of a target compound on two dissimilarly phased capillary columns. Sample quantitation is achieved by comparing the area response of a peak to the area response from a five-point calibration curve.

### **5.1.8 Method SW8290: Dioxins by High Resolution GC/High Resolution MS**

This method is appropriate for the determination of tetra-, penta-, hexa-, hepta-, and octa-chlorinated dibenzo-p-dioxins (PCDDs) and furans (PCDFs) in soil and sediment. Method SW8290 uses matrix-specific extraction, analyte-specific cleanup, and high-resolution capillary column gas chromatography/high resolution mass spectrometry (HRGS/HRMS) techniques. The sensitivity of the method is dependent upon the level of interference within a given matrix. The analysis includes a technique for calculating the detection limit for each of the chlorination levels and each congener by using the noise level present in the elution window and the height of the chromatographic peak of the internal standard. Method SW8290 requires 10 isotopically labeled analogs of target analytes to be spiked into each sample before extraction to assess matrix effects on method performance. Target analytes are quantitated relative to the isotope analog; therefore, their calculated concentration is compensated for extraction efficiency.

### **5.1.9 Method 1668A: Toxic Polychlorinated Biphenyls by Isotope Dilutions HRGC/HRMS**

Method 1668A is used to determine coplanar PCBs, mono- through ortho-substituted PCB congeners, and ten PCB homologues in water, soil, sediment, and other sample matrices. Method 1668A is a performance-based method; variances from the exact procedure in the method are allowed as long as the specifications for quality are met. This method uses a GC/HRMS/Selective Ion Monitoring (SIM). The method is based upon the combined features of SW8082 to measure PCB homologues and Method 1668A to extract, cleanup, sample extracts, and measure toxic PCB congener target compounds.

### **5.1.10 Method SW8015B Modified: Total Petroleum Hydrocarbons**

Method SW8015B modified is used to determine the total petroleum hydrocarbons (TPH) quantitated as gasoline and diesel as described by the California DHS LUFT Manual (October 1989).

Extractable TPH component, diesel is first extracted via Method 3510 (separatory funnel) for water-based matrices. Methylene chloride is used as the extracting solvent. Typically, one liter of water is extracted and concentrated in volume. Analysis is accomplished on a GC equipped with a capillary or megabore column and FID detector. For this project diesel #2 and motor oil are contaminants of concern.

Identification and quantitation of TPH components (both 8015B mod. methods) is based on pattern recognition techniques and requires a greater degree of analytical judgment than other GC methods. The TPH chromatograms consist of groups of peaks that have a general shape or pattern and fall within a noted carbon range (i.e., number of carbon atoms in the molecule). Gasoline and diesel fuel will be used to calibrate the instruments and determine response factors for quantitation of sample results. No second-column confirmation will be performed because identification is based on pattern recognition and not retention time (where false positives due to interference are likely). In addition, motor oil will be analyzed as identification standard for chromatographic pattern recognition, i.e., the resulting patterns and carbon ranges will be used to compare to sample chromatograms for identification. The sample results will be reported as gasoline, diesel fuel, or motor oil according to the closest matching carbon range. The concentrations are determined by quantitating the sample against either gasoline (Method 8015B-purgeable) or diesel (Method 8015B-extractable). Often, unknown or un-calibrated

hydrocarbons are encountered; therefore, the concentration reported is considered estimated. Carbon ranges and significant deviations of the pattern from the patterns of reported analytes will be described in the analytical report.

<u>Analyte</u>	<u>Carbon Range for Quantitation</u>
Diesel range organics	C12 - C24
Motor Oil	C24 - C36

Quantitation of both standards and samples will be performed by adding the area from all peaks from the baseline to the height of the peaks. In cases where the range of the pattern in the sample extends outside of the gasoline, diesel fuel, or lubricating oil standard ranges, the area throughout the range of the sample pattern should be quantitated (relative to gasoline or diesel) and reported as the analyte (gasoline, diesel, motor oil etc.) closest in carbon range to the sample pattern. The GC will be calibrated via the external standard technique. The average response factor is used for quantitation.

## **5.2 Sample Preparation and Analysis Methods - Inorganic**

The following sections briefly summarize the sample preparation and analysis methods to be performed for the determination of inorganic analytes.

### **5.2.1. Method SW3050B: Acid Digestion of Sediments, Sludges, and Soils**

This digestion procedure is used for the preparation of solid samples for analysis by inductively coupled plasma/atomic emission spectroscopy (ICP). A mixture of nitric acid, and the material to be analyzed is refluxed in a covered Griffin beaker or equivalent. This step is repeated with additional portions of nitric acid until the digestate is light in color or until its color has stabilized. Hydrogen peroxide is then added and the mixture warmed. The digestate is then cooled and brought to a low volume with water. If the digestate contains suspended solids, it must be centrifuged, filtered, or allowed to settle before analysis.

### **5.2.2 Method SW6010B: Inductively Coupled Plasma-Atomic Emission Spectrometry**

ICP determines elements in solution. The sample requires digestion by Method SW3050B for soil prior to analysis.

The method provides a simultaneous or sequential multi-element determination of elements by ICP. Element-emitted light is measured by optical spectrometry. Samples are nebulized and

the resulting aerosol is transported to the plasma torch. Element-specific atomic line emission spectra are produced by radio frequency inductively coupled plasma. The spectra are dispersed and photo-multiplier tubes monitor the intensities of the lines. The spectra are the physical property of the element and the intensity is proportional to the concentration of the element in solution.

### **5.2.3 Method SW7471A: Cold Vapor Atomic Absorption Spectroscopy**

Method SW7471A is based on the absorption of radiation at the 253.7 nm wavelength by mercury vapor. The mercury is reduced to the elemental state and aerated from solution in a closed system. The mercury vapor passes through a cell positioned in the light path of an atomic absorption spectrophotometer. Absorbance is measured as a function of mercury concentration. Quantitation is accomplished by comparing the absorbance to a five-point calibration curve prepared from standards of known mercury concentration.

### **5.2.4 Method SW4042: Total DDT in Soil Test Kits**

Method SW4042 is based on the use of polyclonal antibodies that bind either DDT or DDT-Enzyme Conjugate. These antibodies are immobilized to the walls of the test tubes. When DDT is present in the sample, it competes with DDT-Enzyme Conjugate for a limited number of antibody binding sites. Since there are the same numbers of antibody binding sites on every test tube and each test tube receives the same number of DDT-Enzyme Conjugate molecules, a sample that contains a low concentration of DDT allows the antibody to bind many DDT-Enzyme Conjugate molecules. Therefore, a low concentration of DDT produces a dark blue solution. Conversely, a high concentration of DDT allows fewer DDT-Enzyme Conjugate molecules to be bound by the antibodies, resulting in a lighter blue solution.

## **6.0 QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES**

### **6.1 Calibration Procedures and Frequency**

All instruments and equipment used during sample analysis are operated, calibrated, and maintained according to the manufacturer's guidelines and recommendations, as well as criteria set forth in the applicable analytical methods. Personnel properly trained in these procedures will operate, calibrate, and maintain the instruments. Laboratory capabilities will be demonstrated initially for instrument and reagent/standards performance as well as accuracy and precision of analytical methodology.

Calibration of instruments is required to ensure that the analytical system is operating correctly and functioning at the proper sensitivity to meet established quantitation limits. Each instrument will be calibrated with standard solutions appropriate to the type of instrument and the linear range established for the analytical method presented in Section 5.0. The frequency of calibration and calibration verification and the concentration of calibration standards are determined by the manufacturer's guidelines and the analytical method. Calibration procedures for all instruments are summarized in the method-specific tables in Attachment A. All samples must be bracketed by passing calibration check samples for the majority of methods. Failure to bracket all samples with acceptable calibration checks may result in the reanalysis of affected samples.

#### **6.1.1 Gas Chromatography**

The field of chromatography involves a variety of instrumentation and detection systems. While calibration standards and acceptance criteria vary depending on the type of system and analytical methodology required for a specific analysis, the general principles of calibration apply uniformly. As outlined in EPA SW-846 procedures, each chromatographic system is calibrated prior to performance of analyses using five concentrations by external standard technique for all columns. The lowest calibration standard shall be within a factor of two relative to the QL, and the others corresponding to the expected range of concentrations or defining the working range of the detector. This is done on each chromatographic column and each instrument at the beginning of the contract period and each time a new column is installed. The results are used to determine a calibration curve and response factors for each analyte. Initial calibration consists of determining the working range, establishing limits of detection, and establishing retention time windows. The calibration is checked on a daily basis to ensure that

the system remains within specifications. Second column confirmation is required for single compound analytes.

Continuing calibration standards are analyzed to check the instrument response relative to the initial calibration curve at the beginning and end of each analytical run. Calibration checks are also performed for overall system performance and for retention time shifts, as specified in SW-846. Individual and standard mixes are analyzed to establish response factors and absolute retention time. The response factors and retention times are verified throughout the analytical run and at the end of the analytical sequence. Each analyte must be within its retention time window or the analyst shall take corrective action. For GC analyses conducted on this project, the response factor must agree with the factor determined during the initial 5-point calibration within 15% for quantitation analysis utilizing SW-846 methodology.

The instrumental detection limit, the linear range of the instrument, and interference effects must be established for each individual analyte on that particular instrument. The calibration is verified initially prior to sample analysis using an independent second source standard. Calibration verification standards are analyzed after every 10 samples using a midrange calibration check standard and must be within 15% of the expected value.

### **6.1.2 GC/MS analysis**

Each day prior to analysis of samples, the instrument is tuned with bromofluorobenzene for volatile compounds and decafluorotriphenylphosphine for semivolatile compounds or other tuning criteria as specified by the method used. Mass spectral peaks must conform both in mass numbers and relative intensity to method-specified requirements before analyses can proceed.

The instrument is then calibrated for all target compounds. An initial calibration curve is produced to define the working range to establish criteria for identification. All GC/MS instruments are calibrated at five different concentrations for analytes of interest, using the procedures outlined in SW-846. Method system performance check compounds (SPCC's) must show a minimum mean response factor and method calibration check compounds (CCC) must show a relative standard deviation (RSD) less than the method specified standard for the initial calibration to be considered valid. On a daily basis, SPCC's must meet the same criteria relevant for the initial calibration and CCCs must show a minimum percent drift relative to the expected concentration of the CCC to be considered valid. This initial calibration is evaluated on a daily basis to ensure that the system is within calibration. If the daily standard does not meet the

established criteria, the system is recalibrated. These procedures will be modified for selective ion monitoring.

Following a successful tune, the initial five-point calibration is verified by a single mid-range concentration standard. The calibration is verified daily prior to sample analysis using an independent second source standard. This initial calibration can be utilized as long as the calibration verification remains valid.

### **6.1.3 Inductively Coupled Argon Plasma-Atomic Emission Spectrometry (ICPES) Metals**

Plasma emission spectrophotometry, also termed inductively coupled argon plasma (ICP) spectrometry, is calibrated daily using either one standard solution and one blank or a four-point calibration (3 levels plus blank). For the single standard calibration, the calibration standard must be within the demonstrated linear range of the instrument. The instrumental detection limit, the linear range of the instrument, and interference effects must be established for each individual analyte on that particular instrument. The linear range is verified at the time of the analysis by analyzing the highest calibration standard as a sample, the results of which must be within  $\pm 5\%$  of its true value. The calibration is verified initially prior to sample analysis using an independent second source standard at a concentration mid-range of the calibration. Continuing calibration checks are analyzed after every 10 samples using a mid-range calibration check standard and must be within  $\pm 10\%$  of the expected value. Sensitivity is established at the lower calibration level by analyzing a low level standard at the QL (3 to 5 times the MDL). Calibration blanks are analyzed after all calibration check standards and no analytes may be detected above one-half the QL. An interelement check standard is analyzed at the beginning and end of each analytical run, to verify that interelement and background correction factors have remained constant. Results outside of the established criteria trigger reanalysis of samples.

### **6.1.4 Atomic Absorption Spectroscopy**

The instrument must be calibrated and checked for contamination before each set of samples. An initial calibration (ICAL) consists of a minimum of a blank and three calibration standards. The least concentrated standard will be at a concentration corresponding to the QL. The remaining standards will define the working range of the instrument. A linear regression fit of the calibration data must yield a correlation coefficient must be at least 0.995. Failure to meet these criteria will require recalibration and possible preparation of a new set of standards. Prior to sample analysis, an initial calibration verification (ICV), consisting of a second source standard, and an initial calibration blank (ICB) will be analyzed to verify the quantitation and to detect any contamination. A continuing calibration verification (CCV) at a mid-curve

concentration and CCB will be analyzed every 10 samples and at the end of analytical sequence. If the CCV value varies from the predicted concentration by more than + 10% then the analysis must be stopped. The problem must be identified and corrected, and rerun the impacted samples. All samples must be bracketed by calibration standards that meet the stated criteria.

## **6.2 Standard and Reagent Preparation**

A critical element in the generation of quality data is the purity and traceability of the standard solutions and reagents used in the analytical operations. The preparation and maintenance of standards and reagents will be performed per the specified analytical methods presented in Section 5.0. The laboratory shall continually monitor the quality of reagents and standard solutions through a series of well-documented standard operating procedures (SOPs). In general, SOPs for standards preparation should incorporate the following items:

- Documentation and labeling of date received, lot number, date opened, and expiration date;
- Documentation of traceability;
- Preparation, storage, and labeling of stock and working solutions; and
- Establishing and documenting expiration dates and disposal of unusable standards.

Primary reference standards and standard solutions used by the laboratory are to be obtained from the National Institute of Standards and Technology, or other reliable commercial sources to ensure the highest level of purity possible. All standards and standard solutions shall be catalogued to identify the supplier, lot number, purity/concentration, receipt/preparation date, preparer's name, method of preparation, expiration date, and all other pertinent information included in the specific SOP.

Standard solutions and reagents are validated prior to use. Validation procedures can range from a check for chromatographic purity to verification of the concentration of the standard using a standard prepared at a different time, concentration or source. Reagents are examined for purity by subjecting an aliquot or subsample to the analytical method in which it will be used; for example, every lot of dichloromethane (for organic extractables) is analyzed for undesirable contaminants prior to use in the laboratory. Stock and working standards are checked regularly for signs of deterioration, such as discoloration, formation of precipitates, or change in concentration.

### **6.3 Field Quality Control Checks**

Quality control checks in the field will include the collection of field duplicate, equipment rinsate and temperature blank samples. These QC checks are described in Section 4.2 of the FSP.

### **6.4 Laboratory Quality Control Checks**

The Project Laboratories will have a QA/QC program that monitors data quality with internal QC checks. Internal QC checks are used to answer two questions:

- 1) Are laboratory operations in-control, (i.e., operating within acceptable QC guidelines), during data generation?
- 2) What effect does the sample matrix have on the data being generated?

Laboratory performance QC is based on the use of a standard control matrix to generate precision and accuracy data that are compared, on a daily basis, to control limits. This information, in conjunction with method blank data, is used to assess daily laboratory performance.

The second question is addressed with matrix-specific QC. Matrix-specific QC is based on the use of an actual environmental sample for precision and accuracy determinations and commonly relies on the analysis of matrix spikes, matrix spike duplicates, and surrogate standards. This information, supplemented with field blank results, is used to assess the effect of the matrix and field conditions on analytical data.

Laboratory performance QC will be provided as a standard part of every routine analysis. Matrix-specific QC frequency will be required per the tables in Attachment A. A brief summary of the required QC samples follows. The type and frequency of QC samples performed by the laboratory will be according to the specified analytical method.

#### **6.4.1 Analytical Batch (Preparation Batch)**

The analytical batch is defined as a set of samples that are extracted/analyzed concurrently or sequentially. The analytical batch will not exceed 20 samples. Significant gaps (greater than two hours) in the analytical sequence will result in the termination of the previous sequence and the initiation of a new analytical sequence. The analytical batch shall be analyzed sequentially on a single instrument. The practice of "holding a batch open" and performing a single set of batch QC samples for all analyses performed during that period is unacceptable.

The laboratory shall, at a minimum, analyze internal QC samples at the frequency specified in this QAPP for all analytical methods. These QC samples for each analytical batch

shall include method blanks (MB) and laboratory control samples (LCS). Definitions for the QC samples described above are provided in Chapter 1, Update III to EPA SW-846. The matrix used for LCS analyses shall be reagent grade water for aqueous analyses and reagent sand for soil/sediment matrices.

Second column confirmation for all GC sample analyses involving identification of discrete peaks with detected concentrations will be required, as per the methods. Second column confirmation is not required for concentrations reported between the MDL and the QL.

#### **6.4.2 Blanks**

Two types of blanks routinely analyzed in the laboratory are method blanks and reagent blanks. Method blanks and reagent/solvent blanks are used to assess laboratory procedures as possible sources of sample contamination.

Method or preparation blanks for all samples consist of deionized water or reagent sand that is subjected to the entire analytical procedure, including extraction, distillation, digestion, etc., as appropriate for the analytical method being utilized. One method blank will be analyzed for each analytical batch (minimum of one per day; one every 12 hours for GC/MS analyses). If the blank does not meet acceptance criteria, the source of contamination will be investigated and appropriate corrective action will be taken and documented. Investigation includes an evaluation of the data to determine the extent and effect of the contamination on the sample results. Corrective actions may include reanalysis of the blank and/or reparation and reanalysis of the blank and all associated samples. No method blank may exhibit a detected concentration greater than the quantitation limit. However, exceptions may be made when the analyte is not detected in the related sample. Sample results are not corrected for blank contamination unless required by the analytical method.

Reagent/solvent blanks consist of individual reagents or solvents subjected to the entire analytical procedure as appropriate for the analytical method being utilized. The blanks are only used if contamination problems are indicated by the method blank or if a new lot of materials are being checked before use.

#### **6.4.3 Laboratory Control Samples**

Laboratory control samples (LCS) are used as a means of evaluating the efficiency of the analytical process. As discussed above, LCS is used to generate precision and accuracy data that are compared, on a daily basis, to control limits. Laboratory control samples are subjected to the entire sample procedure, including extraction, digestion, etc., as appropriate for the analytical method utilized. They are generally introduced into an analytical batch (20 samples)

immediately before extraction or analysis. LCS samples will be performed for both inorganic and organic laboratory methods.

#### **6.4.4 Matrix Spikes and Matrix Spike Duplicates**

A Matrix Spike (MS) is an environmental sample to which known concentrations of analytes have been added. The MS is taken through the entire analytical procedure and the recovery of the analytes is calculated. Results are expressed as percent recovery. The MS is used to evaluate the effect of the sample matrix on the accuracy of the analysis.

A Matrix Spike Duplicate (MSD) is a duplicate of the environmental sample described above, each of which is spiked with known concentrations of analytes. The two spiked samples are processed separately and the results compared to determine the effects of the matrix on the precision and accuracy of the analysis. Results are expressed as relative percent difference (RPD) and percent recovery (%R).

#### **6.4.5 Surrogate Recoveries and Standard Additions**

Surrogates are organic compounds which are similar to the analytes of interest in chemical behavior, but which are not normally found in environmental samples. Surrogates are added to samples to monitor the effect of the matrix on the accuracy of the analysis for each sample. Results are reported in percent recovery. Laboratories routinely add surrogates to samples requiring GC or GC/MS analysis and report these surrogate recoveries to the client. The laboratory does not modify its operations based on surrogate recoveries in environmental samples. However, obvious problems with sample preparation and analysis (e.g. evaporation to dryness, leaking septum, etc.) which can lead to poor surrogate spike recoveries must be ruled out prior to attributing low surrogate recoveries to matrix effects.

Standard Additions is the practice of adding a series of known amounts of an analyte to an environmental sample. The fortified samples are then analyzed and the recovery of the analytes calculated. The practice of standard addition is generally used with metals analysis and wet chemistry to determine the effect of the sample matrix on the accuracy of the analyses.

#### **6.4.6 Calibration Standard**

A calibration standard is prepared in the laboratory by dissolving a known amount of a purchased pure compound or standard mix in an appropriate matrix. The final concentration calculated from the known quantities is the true value of the standard. The results obtained from these standards are used to generate a standard curve and thereby quantify the compound in the environmental sample.

#### **6.4.7 Reference Standard**

A reference standard is prepared in the same manner as a calibration standard or may be obtained from National Institute of Standards and Testing (NIST). A reference standard is obtained from a source independent of the source of the calibration standard. The concentration of the known quantity is the “true” value of the standard. A reference standard is not carried through the same process used for the environmental samples, but is analyzed without digestion or extraction. A reference standard result is used to validate an existing concentration calibration standard file or calibration curve. The reference standard can provide information on the accuracy of the instrumental analytical method independent of various sample matrices.

#### **6.4.8 Laboratory Performance Evaluation Samples**

At a minimum the contract laboratory will participate in at least one performance evaluation program.

The performance evaluation samples are single blind (prepared by the laboratory from ambulated standards) and are often associated with the regular laboratory audits performed by the agencies.

#### **6.5 Corrective Action**

The Sampling Team Leader is responsible for initiating corrective action and for implementation of all corrective actions with respect to the field sampling operations. The laboratory QA Director in consultation with the Project Chemist is responsible for implementing corrective actions in the laboratory. It is their combined responsibility to see that all analytical and sampling procedures are followed as specified and that the data generated meet the acceptance criteria. The acceptance criteria for some of the QC samples (LCS, surrogate recoveries) will be those calculated by the laboratory as control limits. The number of samples used to develop the statistical control limits shall be all those analyzed within the previous six months or a minimum of 20 data points. The comparison control limits in Attachment A are to ensure that the laboratory can produce data with acceptable accuracy. If the laboratory statistical limits are consistently different from the comparison limits, a different laboratory shall be selected for that analytical method, or an alternate analytical or preparation method shall be selected that increases the accuracy of the laboratory. Corrective action procedures are summarized for each method in Attachment A.

Corrective actions for the laboratory may include, but are not limited to:

- Reanalyzing samples;

- Correcting laboratory procedures;
- Recalibrating instruments using freshly prepared standards;
- Replacing solvents or other reagents that give unacceptable blank values;
- Training laboratory personnel in correct sample preparation and analysis procedures; and
- Accepting data with an acknowledged and documented level of uncertainty.

Whenever corrective action is deemed necessary, the Laboratory Director will ensure that the following steps are taken:

- The problem is defined;
- The cause of the problem is investigated and determined;
- Appropriate corrective action is determined; and
- Corrective action is implemented and its effectiveness verified.

## **6.6 Documentation**

All calibration information, instrument maintenance and repair are recorded by the laboratory on appropriate forms developed for SW-846 procedures. Out-of-control analyses are generally described on a QA/QC discrepancy form and submitted to the laboratory supervisor for corrective action. Copies are distributed to the laboratory QA coordinator and laboratory director for approval, and to the case file. The calibration information is filed with the raw data.

## **7.0 DATA REDUCTION, VALIDATION AND REPORTING**

### **7.1 Laboratory**

#### **7.1.1 Data Reduction and Validation**

All analytical data generated within the laboratories shall be reviewed prior to report generation to assure the validity of the reported data. The data validation process consists of data generation, reduction, and three levels of documented review. In each stage, the review process will be documented by the signature of the reviewer and the date reviewed.

The analyst who generates the analytical data will have the prime responsibility for the correctness and completeness of the data. All data will be generated and reduced following protocols specified in laboratory SOPs. Each analyst will review the quality of his or her work based on an established set of guidelines outlined in the SOPs. The analyst will review the data package to ensure that:

- The correct samples were analyzed and reported in appropriate units,
- Preservation and holding time requirements were met,
- Sample preparation information is correct and complete,
- Appropriate SOPs have been followed,
- Analytical results are correct and complete,
- QC samples are within established control limits,
- Blanks are within appropriate QC limits,
- Special sample preparation and analytical requirements have been met, and
- Documentation is complete (e.g., all anomalies in the preparation and analysis have been documented, anomaly forms are complete; holding times are documented, etc.).

The data reduction and validation steps shall be documented, signed and dated by the analyst. The analyst will then pass the data package to an independent reviewer, who will perform an independent review of the data package. This review is also to be conducted according to an established set of guidelines and to be structured to ensure that:

- Calibration data are scientifically sound, appropriate to the method, and completely documented,

- QC samples are within established guidelines,
- Qualitative identification of sample components is correct
- Quantitative results are correct,
- Documentation is complete and correct (e.g., anomalies in the preparation and analysis have been documented; anomaly forms are complete; holding times are documented, etc.), and
- The data are ready for incorporation into the final report; and the data package is complete and ready for data archive.

The review is to be structured so that all calibration data and QC sample results are reviewed and all of the analytical results from 10% of the samples are checked back to the bench sheet. If no problems are found with the data package, the review is complete. If any problems are found with the data package, an additional 10% of the samples will be checked to the bench sheet. This process will continue until no errors are found or until the data package has been reviewed in its entirety.

Data reviews shall be documented and the signature of the reviewer and the date of review recorded. The reviewed data are then approved for release and a final report is prepared. Before the report is released to the client, the data are reviewed for completeness and to ensure that the data satisfy the overall objectives of the project. The Laboratory Project Manager typically does this review.

Each step of this review process involves evaluation of data quality based on both the results of the QC data and the professional judgment of those conducting the review. This application of technical knowledge and experience to the evaluation of the data is essential in ensuring that data of high quality are generated consistently.

### **7.1.2 Data Reporting**

At the conclusion of all analytical work for this project, the primary laboratory will submit a comprehensive certificate of analysis. The final certificates of analysis will be submitted no later than 21 days after the last sample has been submitted to the laboratory for the project. All samples shall be reported in a legally defensible package and electronic data deliverable (EDD) format consistent with the USACE, Sacramento District Automated Data Review (ADR) format. The data package may be submitted in a read-only electronic file, compatible with Adobe

Acrobat reader.

The data package for organics analyses will consist of a case narrative, chain-of-custody documentation, cooler receipt form, summary of results for environmental samples, summary of QA/QC results, and the data. Legible copies of all data will be organized systematically on numbered pages. The data for compound identification and quantitation must be sufficient to support all results presented in other sections of the data package. This section of the data package will include legible copies of the data for environmental samples (arranged in increasing order of field ID), and instrument calibration, QA/QC analyses, sample extraction and cleanup logs, instrument analysis logs for each instrument used. Instrument analysis logs are particularly important because they provide the basic link between all sample analyses and QC information (calibration, matrix spike, etc.). Instrument analysis logs for all instruments used for sample data for each analysis will include measurement printouts and quantitation reports for each instrument used.

Raw data will be available for further inspection, if required, and maintained in the central job file. All records related to the analytical effort are maintained at the primary laboratory in secured filing cabinets (i.e., cost information, scheduling, and custody). All records are maintained for five years after the final report is issued. Types of records to be maintained for the project include the following:

- Chain-of-custody records, including: information on the sampler's name, date of sampling, type of sampling, location of sampling, location of sampling station, number and type of containers used, signature of sampler relinquishing samples to non-contract personnel (e.g., Federal Express agent) with the date and time of transfer noted, signature of primary laboratory sample custodian receiving samples with date and time noted
- Cooler receipt form documenting sample conditions upon arrival at the laboratory.
- Any discrepancy/deficiency report forms due to problems encountered during sampling, transportation, or analysis
- Sample destruction authorization forms containing information on the manner of final disposal of samples upon completion of analysis
- All laboratory notebooks including raw data readings, calibration details, QC checks, etc

- Hard copies of data system printouts (chromatograms, mass spectra, ICP data files, etc.)
- Tabulation of analytical results with supporting quality control information

#### **7.1.2.1 Case Narrative**

The case narrative will be written and the laboratory director or his/her designee will authorize the release of data. Items to be included in the case narrative are the field sample ID with the corresponding laboratory ID, parameters analyzed in each sample and the methodology used (EPA method numbers or other citation), detailed description of all problems encountered and corrective actions taken, discussion of possible reasons for out-of-control QA/QC results, and observations regarding any occurrences which may affect sample integrity or data quality.

#### **7.1.2.2 Chain-of-Custody Documentation**

Legible copies of chain-of-custody forms for each sample will be maintained in the data package. Cooler log-in sheets will be associated with the corresponding chain-of-custody form. Any integral laboratory-tracking document will also be included.

#### **7.1.2.3 Summary of Environmental Results**

For each environmental sample analysis, this summary shall include field ID and corresponding laboratory ID, sample matrix, date of sample extraction (if applicable), date and time of analysis, identification of the instrument used for analysis, instrument specifications, weight or volume of the sample used for analysis/extraction, dilution or concentration factor used for the sample extract, method detection limit or sample quantitation limit, definitions of any data qualifiers used, and analytical results.

#### **7.1.2.4 Summary of QA/QC Results**

The following QA/QC results will be presented in summary form. Details specified in Section 7.1.2.3 also will be included for the summary of QA/QC results. Acceptance limits for all categories of QC criteria will be provided with the data.

##### **7.1.2.4.1 Organic Analyses (General)**

The summary of QA/QC results for organic analyses will include:

- Initial Calibration - The concentrations of the standards used for analysis and the date and time of analysis. The response factor, percent relative standard deviation (%RSD), and retention time for each analyte (as applicable, GC, HPLC and GC/MS)

analyses) will be included in initial calibration summaries. A statement should also be made about the samples or dates for which a single initial calibration applies.

- Daily Calibration and Mid-level Standard - The concentration of the calibration standard used for daily calibration and/or the mid-level calibration check will be reported. The response factor, percent difference, and retention time for each analyte will be reported (GC and GC/MS). Daily calibration information will be linked to sample analyses by summary.
- Method Blank Analyses - The concentrations of any analytes found in method blanks will be reported even if detected amounts are less than the QL. The environmental samples and QA/QC analyses associated with each method blank will be stated.
- Surrogate Standard Recovery - The name and concentration of each surrogate compound added will be detailed. The percent recovery of each surrogate compound in the samples, method blanks, matrix spike/matrix spike duplicates and other QA/QC analyses will be summarized with sample IDs such that the information can be linked to sample and QA/QC analyses.
- Precision and Accuracy - For matrix spike/matrix spike duplicate analyses, the sample results, spiked sample results, percent recovery, and RPD with the associated control limits will be detailed. For laboratory duplicate analyses, the RPD between duplicate analyses will be reported as applicable. For laboratory QC check and/or LCS analyses, the percent recovery and acceptable control limits for each analyte will be reported. All batch QC information will be linked to the corresponding sample groups.
- Compound Identification (GC, HPLC, GC/MS): The retention times and the concentrations of each analyte detected in environmental and QC/QC samples will be reported for both primary and confirmation analyses. Mass spectra will also be included for reported detections in samples and for detections identified in the quantitation report, but ruled out during analyst review.
- Method Detection Limit (MDL): The MDL study result sheet will have laboratory heading, instrument identification, analysis date, spike level, average recovery, standard deviation and calculated MDL for each analyte.

In addition, the summary of QA/QC results for organic analyses will include the following information relating specifically to the method used.

#### **7.1.2.4.2 GC and GC/MS Analyses**

This section of the data package will include legible copies of the data for environmental samples (arranged in increasing order of field ID, primary and confirmation analyses). The raw data for each analysis will include chromatograms (with target compound, internal standard, and surrogate compounds labeled by name) with a quantitation report and/or area printout. GC/MS analyses will also include the mass spectra or ion chromatograms for each reported analyte.

#### **7.1.2.4.3 Inorganic Analyses**

The summary of QA/QC results for the inorganic analyses will include:

- Initial Calibration: The source of the calibration standards, true value concentrations, found concentrations, the percent recovery for each element analyzed, and the date and time of analysis will be reported.
- Continuing Calibration Verification: The source of the calibration standard, true value concentrations, found concentrations, the percent recovery for each element analyzed, and the date and time of analysis will be reported.
- Method Blank Analyses: The concentrations of any analytes found in initial calibration, continuing calibration blank, and in the preparation blank will be reported. The date and time of analysis also will be reported.
- Precision and Accuracy - Matrix Spikes and Sample Duplicates: For matrix spike analyses, the sample results, spiked sample results, percent recovery, spiking solution used, and the control range for each element will be detailed. For post digestion spikes, the concentrations of the spiked sample, the sample result, the spiking solution added, and recovery and control limits will be detailed. For laboratory duplicates, the original concentration, duplicate concentration, relative percent difference, and control limits will be detailed. Date and time for all analyses will be recorded.
- Precision and Accuracy - Laboratory Control Samples: The source of the laboratory control sample, true value concentrations, found concentrations, percent recovery for each element analyzed, and the date and time of analysis will be reported.

- Method of Standard Additions (MSA): This summary must be included when MSA analyses are required for analysis by Graphite Furnace AA. The absorbance values and the corresponding concentration values, the final analyte concentrations, and correlation coefficients will be reported for all analyses. Date and time of analysis will be recorded for all analyses.
- Method Detection Limit (MDL): The MDL study result sheet will have laboratory heading, instrument identification, analysis date, spike level, average recovery, standard deviation and calculated MDL for each analyte.

### **7.1.3 External Data Validation and Quality Assurance Reports**

The laboratory data will be validated using guidelines in Attachment C. The validation guidelines are based on EPA SW-846 methods and the EPA National Functional Guidelines for Organic and Inorganic Data Review. The Project Chemist, or designee, will review the data and prepare a Quality Control Summary Report (QCSR). The QCSR presents all laboratory and field QC results and any qualifiers applied to the data. The Project Chemist will discuss the data usability and precision based upon all information that affects the quality of the data (not just laboratory QC results) in a Chemical Data Quality Assessment Report (CDQAR).

## **7.2 Field Activities**

### **7.2.1 Data Reduction**

Since no field screening equipment will be used during this sampling event, data reduction is not applicable.

### **7.2.2 Data Integrity**

Integrity of information and data on field activities shall be maintained by the Project Leader. Integrity of the field sample custody is accomplished by the field staff, according to the sample custody procedures discussed in Section 5.0. This information is generated in the field and recorded in the project field logbook and on the sample chain-of-custody form, shall be verified before sample shipping, and confirmed at the laboratory upon their receipt of the samples.

### **7.2.3 Data Validation**

Validation of information and data on field activities shall be conducted as a QC procedure by the Project Leader. The Project Manager shall review laboratory results and field data before

use. Field logbooks and chain-of-custody forms shall be crosschecked to each other and to the laboratory results to assure conformity of sample identification numbers. This information is compared to results of duplicate and blank samples, and field conditions at the time of sample collection will be taken into account when qualifying the sample analytical results.

Hardcopy analytical deliverable per Section 7.0 shall be presented to the USACE Project Chemist and the Data Management Supervisor. The originals shall be archived at the laboratory for a minimum of ten years. The laboratory shall provide analytical data in electronic data EDD format.

The USACE project chemist will validate the data using the ADR system software developed by Laboratory Data Consultants (LDC). The USACE project chemist shall develop the EDD project library in accordance with the ADR format, and QAPP requirements herein. The library shall be forwarded to the laboratory prior to start of the fieldwork.

#### **7.2.4 Data Storage**

Field and laboratory data shall be stored in hard copy and floppy disk format (when applicable) as part of the project file. This information is retained in the project file until project completion and closeout. Upon project closeout, all records shall be archived for permanent storage.

## 8.0 PREVENTIVE MAINTENANCE

To minimize downtime and interruption of analytical work, preventive maintenance is routinely performed on each analytical instrument. Each laboratory shall have detailed SOPs on file that describe preventive maintenance procedures and schedules. All service and maintenance will be conducted by qualified laboratory staff or under service agreement with the manufacturer or their approved agent. All repairs, adjustments, and calibrations will be documented in a maintenance notebook or data sheet that will be maintained in a permanent file. The instrument notebook will clearly document the date, the problem description, corrective action taken, results of actions, and the name of the person performing the work. Table 8-1 lists common laboratory preventative maintenance parameters for laboratory instrumentation.

**Table 8-1. Routine Laboratory Instrument Maintenance**

<b>Instrument</b>	<b>Operation</b>	<b>Frequency</b>
Gas Chromatography	Change septum Change injection port liner Change column  Bake detectors	Daily when used Daily when used As needed (when standard response decreases or sample carryover is noted, approximately monthly) As needed (when standard response decreases or sample carryover is noted, approximately monthly)
GC/MS	Clean source	As needed (show reduced sensitivity)
Atomic Absorption Spectrometer	Warm up instrument for 30 min. Digital readout values checked; check gas flows, cell alignment, wavelength, Photo multiplier voltage and lamp voltage Tygon tubing replaced Change contact rings Replace optical lens	Daily when used Daily when used Quarterly or as needed Daily, as needed or when used 6 months, or if deterioration is observed
Balances	Calibrate by manufacturer	Annually / verify monthly
Ovens/Refrigerators	Check temperature	Daily

## **9.0 LABORATORY PROCEDURES USED TO ASSESS DATA QUALITY AND DETERMINE SENSITIVITY**

### **9.1 Data Quality Assessment**

The effectiveness of a QA program is measured by the quality of data generated by the laboratory. Data quality is judged in terms of its PARCC parameters as presented in Section 3.0. These terms are described as follows:

#### **9.1.1 Precision**

Precision is a measure of the reproducibility of analyses under a given set of conditions. Precision can be assessed by replicate measurements of duplicate control samples, reference materials, or environmental samples. The routine comparison of precision is measured by the relative percent different (RPD) between duplicate control sample measurements with control limits established at plus three standard deviations from the mean RPD of historical duplicate control sample data. The overall precision of a sampling event has a sampling and an analytical component. The following QC data will be collected to determine sampling and analytical precision:

- Laboratory Control Standards and duplicates (LCD/LCSD) as well as matrix spikes and matrix spike duplicates (MS/MSD) will be used as a measure the precision of the analytical process for organic analyses. LCS/LCSD and/or MS/MSD samples will be run on each batch of samples up to a maximum of 20.
- Field duplicate samples, submitted to the laboratory “blind”, measure the precision of the entire measurement system including sampling and analytical procedures. Field duplicate samples will be collected at a rate of 1 per 10 primary samples.
- Laboratory duplicates will be performed for every inorganic analytical batch. The maximum size of each batch shall not exceed 20 samples.

The RPD between the two samples may be used to estimate precision where:

$$\text{RPD} = \frac{|D_1 - D_2|}{(D_1 + D_2)} \times 200$$

$RPD$  = *absolute relative percent difference*

$D_1$  = *first sample value*

$D_2$  = *second sample value (duplicate)*

Note: If the laboratory determines that failure to meet QC criteria for accuracy or precision is a result of objectively verifiable matrix effects, no further re-extractions will be required. However, the narrative must contain an explicit description of the laboratory's rationale in this regard with reference to objectively verifiable features of raw data. The sufficiency of the laboratory's explanation will be determined by the Project Manager or an appointed representative.

### 9.1.2 Accuracy

Accuracy is a determination of how close the measurement is to the true value. Accuracy can be assessed using laboratory control samples, standard reference materials, or spiked environmental samples. Unless specified otherwise in special contracts, the laboratory shall monitor accuracy by comparing laboratory control sample results with control limits established at plus or minus three standard deviation units from the mean of historical laboratory control sample results. The accuracy of the data submitted for this project will be assessed in the following manner:

- Accuracy for each sample will be checked by calculating surrogate percent recoveries, as applicable.
- The percent recovery of matrix spikes, matrix spike duplicates, and/or laboratory control samples will be calculated.
- The level of target compounds that are found (if any) in laboratory method blanks will be checked. If a target compound is found above the practical quantitation limit in the method blank corresponding to a batch of samples and the same target compound is found in a sample, the data will not be background subtracted but will be flagged to indicate the result in the blank.

Accuracy is presented as percent recovery. Since accuracy is often determined from spiked samples, laboratories commonly report accuracy as

$$\% \text{ Recovery} = \frac{R}{S} \times 100$$

Where:  $S$  = spiked concentration

$R$  = reported concentration

Note: If the laboratory determines that failure to meet QC criteria for accuracy or precision is a result of objectively verifiable matrix effects, no further re-extractions will be required. However, the narrative must contain an explicit description of the laboratory's rationale in this regard with reference to objectively verifiable features of raw data. The sufficiency of the laboratory's explanation will be determined by the Project Manager or an appointed representative.

### 9.1.3 Representativeness

Representativeness is a qualitative parameter that reflects the extent to which a given sample is characteristic of a given population at a specific location or under a given environmental condition. Representativeness is best satisfied by making certain that sampling locations are selected properly, a sufficient number of samples are collected, and an appropriate sampling technique is employed. Variations at a sampling point will be evaluated based on the results of field duplicates. Some samples may require analysis of multiple phases to obtain representative results. Analytical data should represent the sample analyzed regardless of the heterogeneity of the original sample matrix. Sample representativeness will also be evaluated on the basis of results from method blanks and trip blanks.

### 9.1.4 Completeness

Completeness will be evaluated qualitatively and quantitatively. The qualitative evaluation of completeness will be determined as a function of all events contributing to the sampling event including items such as correct handling of COC forms, incorporation of QC samples at the appropriate frequency, etc. The quantitative description of completeness will be defined as the percentage of contract laboratory controlled QC parameters that are acceptable. The goals for completeness are as follows: contract (95%), analytical (85%), technical (95%), and field sampling completeness (100%). Contract completeness is a measure of the results that meets contract requirements relative to the number of reported results expressed as a percentage. Analytical completeness is a measure of all unqualified results relative to the number of reported results expressed as a percentage. Technical completeness is a measure of the usable results relative to the number of reported results expressed as a percentage. Field sampling completeness is a measure of the number of samples collected relative to the number of samples

planned expressed as a percentage.

### **9.1.5 Comparability**

Comparability expresses the confidence with which one data set can be compared to another data set measuring the same property. To ensure comparability, field procedures will be standardized and field operations will adhere to standard operating procedures. Laboratory data comparability will be assured by use of established and approved analytical methods, consistency in the basis of analysis (wet weight, volume, etc.), and consistency in reporting units ( $\mu\text{g/L}$ ,  $\text{mg/kg}$ , etc.). Analysis of standard reference materials will follow USEPA or other standard analytical methods, which utilize standard units of measurement, methods of analysis, and reporting format.

## **9.2 Sensitivity**

### **9.2.1 Method Detection Limit (MDL)**

The method detection limit (MDL) is the lowest concentration at which a specific analyte in a matrix can be measured and reported with 99-percent confidence that the analyte concentration is greater than zero. MDLs are experimentally determined for each target analyte of the method. Each individual instrument will maintain a current MDL study. MDLs are based on the results of seven spikes of **clean matrix** at the estimated MDL and are statistically calculated in accordance with the Title 40, Code of Federal Regulations Part 136 (40 CFR 136), Attachment B. The standard deviation of the seven replicates is determined and multiplied by 3.143 (i.e., the 99-percent confidence interval from the one-sided student t-test). The MDLs are updated annually and whenever significant instrument maintenance is performed (i.e., GC Column, AA lamp, etc.).

### **9.2.2 Quantitation Limit (QL)**

The quantitation limit is defined by the lowest concentration in the multi-point initial calibration. The QL will be greater than 3 times the MDL, and is the lowest level for quantitation decisions based on individual measurements for a given method and representative matrix. The QL for this project is based on a project-specific action level and the capability of the method and laboratory. Detected results above the MDL but below the QL, are qualified with a J flag due to the very low comparator values. The J flag will denote the sample results as below the QL and as qualitative, estimated concentrations. This increases the probability of false positive results at these low concentrations, especially for the sample matrix anticipated for this project. However,

analyst judgment will be used to determine if an apparent detected value should be reported or appears to be a false positive due to the sample matrix (e.g., from baseline “noise”).

If dilution to bring the reported concentration of a single compound of interest within the linear range of the calibration, results in non-detect values for all other analytes with detected concentrations in the initial sample analysis, the results of the original run and the dilution will be reported with appropriate notations in the narrative of the report. Matrix effects (i.e., highly contaminated samples requiring dilution for analysis, dilution to bring detected levels within the range of calibration, and matrix interference requiring elevation of detection limits) will be considered in assessing compliance with the requirements for sensitivity. Cleanup procedures will be used to minimize interferences and lower the QLs to those required. In addition, the sample aliquot will be increased from the standard mass to make up for the increased QLs when data is reported on a dry weight basis (these samples are expected to be at least 50% moisture). This increased aliquot size may also increase the matrix interferences, as they too will have increased in mass. The QLs required by this project are listed in the method-specific tables in Attachment B of this document.

## **10.0 CORRECTIVE ACTION FOR UNACCEPTABLE QUALITY CONTROL DATA**

### **10.1 Field Activities**

All technical staff will be responsible for reporting all suspected technical nonconformances by initiating a nonconformance report of any issued deliverable or document. All staff will be responsible for reporting all suspected QA nonconformance by initiating a nonconformance report.

The Project Leader will be responsible for ensuring that corrective actions for nonconformance are implemented by:

- Evaluating all reported nonconformance;
- Controlling additional work on nonconforming items;
- Determining disposition or action to be taken;
- Maintaining a log of nonconformance;
- Reviewing nonconformance reports;
- Evaluating disposition or action taken; and
- Ensuring nonconformance reports are included in the final site documentation in document control.

Any staff member who discovers or suspects a nonconformance, which is an identified or suspected deficiency in an approved document, is responsible for initiating a nonconformance report. The Project Leader will ensure that no additional work, which is dependent on the nonconforming activity, is performed until the nonconformance report is corrected. The Project Leader will also be responsible for carrying out corrective action as initiated by the program QA manager. Each nonconformance report will be evaluated and the disposition and action taken will be recorded.

### **10.2 Laboratory**

When errors, deficiencies, or out-of-control situations exist, the QA program provides systematic procedures, called "corrective actions", to resolve problems and restore proper functioning to the analytical system (see section 5.0).

Laboratory personnel are alerted that corrective actions may be necessary if:

- QC data are outside the acceptable windows for precision and accuracy;
- Blanks, duplicate control samples or single control samples contain contaminants above acceptable levels;
- Undesirable trends are detected in spike recoveries or RPD between duplicates;
- There are unusual changes in detection limits;
- Deficiencies are detected by the QA department during internal or external audits or from the results of performance evaluation samples; or
- Inquiries concerning data quality are received from clients.

Corrective action procedures are often handled at the bench level by the analyst, who reviews the preparation or extraction procedure for possible errors, checks the instrument calibration, spike and calibration mixes, instrument sensitivity, and so on. If the problem persists or cannot be identified, the matter is referred to the laboratory supervisor, manager and/or QA department for further investigation. Once resolved, full documentation of the corrective action procedure is filed with the project records.

### **10.3 Non-routine Occurrence Reports**

Nonconforming equipment, items, activities, conditions and unusual incidents that could affect compliance with project requirements shall be identified, controlled, and reported in a timely manner. A nonconformance is defined as a malfunction, failure, deficiency, or deviation that renders the quality of an item unacceptable or indeterminate. The nonconformance Report shall describe the finding on the form provided for this purpose and notify the Technical Team Leader. Each nonconformance shall be reviewed and a disposition given for the item, activity, or condition. The disposition of a nonconformance shall be documented and approved by the Project Manager for the issuance of the nonconformance.

In the laboratory, the Laboratory Project Manager is responsible for assessment of QC sample information. If data fall outside accepted limits, the Laboratory Project Manager shall immediately notify the Laboratory Manager and the responsible group leader. If the situation is not corrected and an out-of-control condition occurs or is expected to occur, the Laboratory

Project Manager shall notify the Project Chemist and the Project Manager. The Laboratory Manager, Laboratory Project Manager, and the group leaders are responsible for identifying the source of the nonconformance and initiating corrective action. Completion of corrective action should be evidenced by data returning to prescribed acceptable limits. Evidence should be provided to the Project Manager to close out the nonconformance.

The modification, repair, re-work, or replacement of nonconforming equipment, items, or activities utilized either in the field or in the laboratory shall require the re-verification of acceptability. The Project Manager and QA/QC Officer shall concur on whether these actions require immediate (within 72 hours) corrective action be completed and verified before site work continues. Since nonconformances usually occur in the field, the Sampling Team Leader or his designee shall normally complete the corrective action.

The equipment, item, or activity that has the deficiency may be temporarily stopped while the nonconformance is being investigated. If, in the opinion of the Technical Team Leader or Project Manager, the nonconformance does not significantly affect the technical quality or use of the work, the work may continue pending resolution of the nonconformance. The basis for such decisions shall be documented on the Nonconformance Report and submitted to the QA/QC officer for review and approval. The documentation shall include the statement that the decision was made prior to continuing with the work. The records of nonconformance and their disposition shall be kept in the project files.

At a minimum, all variances, cost or schedule impacts, shall indicate the corrective action taken or planned and nonconformances shall be discussed in the technical reports.

The laboratory will send written reports of all significant non-routine occurrence events to the project chemist within 48 hours of occurrence of non-routine events for laboratory work. These reports will identify and fill out the Nonconformance Report:

- the problem,
- corrective actions taken,
- verbal / written instructions from the USACE project chemist regarding re-extraction and reanalysis of project samples and/or other applicable corrective actions to be taken.

Significant events are occurrences impacting cost of work, schedule of work, and quality of environmental analytical data.

<u>Pre-Remedial Action Sampling, CSM, Hamilton AAF</u>			
<b>NONCONFORMANCE REPORT</b>			
			NR NO.
PROJECT NUMBER		PAGE	OF
PROJECT NAME			DATE:
1. NONCONFORMANCE DESCRIPTION			
IDENTIFIED BY:			DATE:
2. PROPOSED CORRECTIVE ACTION, INCLUDING INITIATION AND COMPLETION DATES			
TO BE PERFORMED BY:			
3. APPROVAL FOR PROPOSED CORRECTIVE ACTION			
Project Manager:			DATE:
QA/QC Officer:			DATE:
4. CORRECTIVE ACTION TAKEN (IF DIFFERENT FROM THAT PROPOSED)			
5. CORRECTIVE ACTION COMPLETE			
PERFORMED BY:			DATE:
VERIFIED BY:			DATE:

**CC:**

**PROGRAM MANAGER:**

**PROJECT MANAGER:**

**QA/QC OFFICER:**

**OTHER:**

## **11.0 REFERENCES**

### **11.1 Environmental Protection Agency (EPA)**

EPA 2001. *EPA Requirements for Quality Assurance Project Plans*, EPA QA/R-5, Final Interim Final, March.

EPA 2000a. *Guidance for Data Assessment*, USEPA QA/G-9, Final, July.

EPA 2000b. *Guidance on the Data Quality Objectives Process*, USEPA QA/G-4, Final, September.

EPA 1998. *Test Methods for Evaluating Solid Waste*, USEPA SW-846, Third Edition, (Update III), June.

*National Functional Guidelines for Inorganics Data Review*, USEPA Contract Laboratory Program, EPA 540/R-94/013.

*National Functional Guidelines for Organic Data Review*, USEPA Contract Laboratory Program, EPA 540/R-94/012.

### **11.2 U.S. Army Corps of Engineers (USACE)**

*Requirements for the Preparation of Sampling and Analysis Plans*, Engineering Manual EM. 200-1-3, 1998.

*Chemical Data Quality Management for Hazardous Waste Remedial Activities*, Engineering Regulation 1110-1-263, October 1990.

### **11.3 Other Documents**

CH2MHILL 2003. *Coastal Salt Marsh Focused Feasibility Study Report*, Hamilton Army Airfield, Novato, California. June.

*Record of Decision Remedial Action Plan*, Hamilton Main Airfield Parcel, September 2003.

# **ATTACHMENT A**

**Table A-1**  
**Summary of Calibration and Internal Quality Control Procedures for Method SW6010B (Metals)**

<b>Analytical Method</b>	<b>Applicable Parameter</b>	<b>Quality Control Check</b>	<b>Minimum Frequency</b>	<b>Acceptance Criteria</b>	<b>Corrective Action</b>
SW6010B (or SW6020)	Metals	Calibration	Daily	Low level check standard $\pm 20\%$ , or $r > 0.995$	<ol style="list-style-type: none"> <li>1) Identify and repeat analysis for outlying points</li> <li>2) Recalculate using valid points</li> </ol>
		ICV/CCV	Daily: before sample analysis, every 10 samples, and at the end of the analytical sequence	% Recovery $\pm 10\%$	<ol style="list-style-type: none"> <li>1) Reanalyze ICV/CCV</li> <li>2) If still out, identify and correct problem</li> <li>3) Recalibrate and reanalyze all samples since last valid CCV</li> </ol>
		ICB/CCB	Beginning of sequence, every 10 samples, and at end of sequence	Analytes < MDL	<ol style="list-style-type: none"> <li>1) Reanalyze ICB/CCB</li> <li>2) If still out, identify and correct problem</li> <li>3) Recalibrate and reanalyze all samples since last valid CCB</li> </ol>
		Method Blank	1 per preparation batch	All analytes < $\frac{1}{2}$ QL	<ol style="list-style-type: none"> <li>1) Investigate possible contamination source</li> <li>2) Take appropriate corrective action</li> <li>3) Repeat instrument blank analysis</li> <li>4) Redigest and reanalyze all samples processed with a contaminated blank at no cost to USACE, unless analyte is not detected in associated samples or present at greater than 10x blank concentration.</li> <li>5) Flag sample results associated with blank contamination</li> </ol>
		ICSA ICSB	Beginning and end of analytical sequence	% Recovery $\pm 20\%$ for target analytes	<ol style="list-style-type: none"> <li>1) Investigate cause</li> <li>2) Correct problem</li> <li>3) Reanalyze ICSA and ICSB and all samples analyzed before or after the non-compliant ICS</li> </ol>

Analytical Method	Applicable Parameter	Quality Control Check	Minimum Frequency	Acceptance Criteria	Corrective Action
SW6010B (or SW6020)	Metals	LCS	1 per sample preparation batch	Comparison recovery limits 80-120%	1) Reanalyze LCS. 2) If still out identify and correct problem. 3) Reprepare and reanalyze affected samples.
		Matrix Spike (MS) (level of spike must be less than the mid-level standard of the calibration curve)	1 per preparation batch	Comparison recovery limits 75-125%	1) Evaluate for supportable matrix effect. 2) If no interference is evident re-extract and reanalyze MS once. 3) If still out report both sets of data.
		Matrix Duplicate (D) or Matrix Spike Duplicate (MSD)	1 per preparation batch	RPD <25	1) Recalculate result; if still out: 2) Evaluate for supportable matrix effect. 3) If no interference is evident reanalyze affected sample(s) and narrate any outliers.
		Post Digestion Spike	When matrix spike fails	Recovery 75-125%	Perform method of standard addition for all samples with similar matrix
		Serial Dilution (SD) (1:4 dilution)	As needed, when result is > 50x the IDL	Agreement between undiluted and diluted results $\pm 10\%$	Flag result
		Method of Standard Addition (MSA)	As needed for samples with confirmed matrix effects	$r > 0.995$	Consider alternative sample preparation or analysis methods to reduce interference and discuss with project chemist
		QL	Low point on initial calibration curve.	QLs established shall not exceed those required by project; Refer to accompanying table.	QLs that exceed established criteria shall be submitted to USACE for approval prior to any project samples analyses

All corrective actions associated with USACE project work shall be documented and the records maintained by the laboratory.

Test Methods for Evaluating Solid Waste, SW-846, USEPA, December 1998.

CV	= Continuing Calibration Verification	ICV	= Initial Calibration Verification	DL	= Detection Limit
QL	= Quantitation Limit	GC	= Gas Chromatograph	LCS	= Laboratory Control Sample
RF	= Response Factor	MDL	= Method Detection Limit	RPD	= Relative Percent Difference
MS	= Matrix Spike	RSD	= Relative Standard Deviation	RT	= Retention time
MSD	= Matrix Spike Duplicate				

**Table A-2**  
**Summary of Calibration and Internal Quality Control Procedures for Method SW7471A (Mercury)**

<b>Analytical Method</b>	<b>Applicable Parameter</b>	<b>Quality Control Check</b>	<b>Minimum Frequency</b>	<b>Acceptance Criteria</b>	<b>Corrective Action</b>
SW7471A	Mercury	Calibration (5 standards and blank)	Daily	$r > 0.995$	<ol style="list-style-type: none"> <li>1) Identify and repeat analysis for outlying points</li> <li>2) Recalculate using valid points</li> </ol>
		ICV/CCV	Daily: before sample analysis, every 10 samples, and at the end of the analytical sequence	ICV: % Recovery $\pm 10\%$ CCV: % Recovery $\pm 20\%$	<ol style="list-style-type: none"> <li>1) Reanalyze ICV/CCV</li> <li>2) If still out, identify and correct problem</li> <li>3) Recalibrate and reanalyze all samples since last valid CCV</li> </ol>
		ICB/CCB	Beginning of sequence, every 10 samples, and at end of sequence	Analytes < MDL	<ol style="list-style-type: none"> <li>1) Reanalyze ICB/CCB</li> <li>2) If still out, identify and correct problem</li> <li>3) Recalibrate and reanalyze all samples since last valid CCB</li> </ol>
		Method Blank (MB)	1 per sample preparation batch	Analytes < $\frac{1}{2}$ QL	<ol style="list-style-type: none"> <li>1) Investigate possible contamination source</li> <li>2) Take appropriate corrective action</li> <li>3) Repeat instrument blank analysis</li> <li>4) Redigest and reanalyze all samples processed with a contaminated blank at no cost to USACE, unless analyte is not detected in associated samples or present at greater than 10x blank concentration.</li> <li>5) Flag sample results associated with blank contamination</li> </ol>
		LCS	1 per sample preparation batch	Comparison recovery limits 80-120%	<ol style="list-style-type: none"> <li>1) Reanalyze LCS.</li> <li>2) If still out identify and correct problem.</li> <li>3) Reprepare and reanalyze affected samples.</li> </ol>

Analytical Method	Applicable Parameter	Quality Control Check	Minimum Frequency	Acceptance Criteria	Corrective Action
SW7471A	Mercury	Matrix Spike (MS) (level of spike must be less than the mid-level standard of the calibration curve)	1 per preparation batch	Comparison recovery limits 80-120%	1) Evaluate for supportable matrix effect. 2) If no interference is evident re-extract and reanalyze MS once. 3) If still out report both sets of data.
		Matrix Duplicate (D) or Matrix Spike Duplicate (MSD)	1 per sample batch	RPD <20	1) Recalculate result; if still out: 2) Evaluate for supportable matrix effect. 3) If no interference is evident reanalyze affected sample(s) and narrate any outliers.
		QL	Low point on initial calibration curve.	QLs established shall not exceed those required by project; Refer to accompanying table.	QLs that exceed established criteria shall be submitted to USACE for approval prior to any project samples analyses

All corrective actions associated with USACE project work shall be documented and the records maintained by the laboratory.

Test Methods for Evaluating Solid Waste, SW-846, USEPA, December 1998.

- |  |  |                                   |
|--|--|-----------------------------------|
| CV = Continuing Calibration Verification | ICV = Initial Calibration Verification | DL = Detection Limit              |
| QL = Quantitation Limit                  | GC = Gas Chromatograph                 | LCS = Laboratory Control Sample   |
| RF = Response Factor                     | MDL = Method Detection Limit           | RPD = Relative Percent Difference |
| MS = Matrix Spike                        | RSD = Relative Standard Deviation      | RT = Retention time               |
| MSD = Matrix Spike Duplicate             |  |                                   |

Table A-3

## Summary of Calibration and Internal Quality Control Procedures for Method SW8015B (TPH)

Analytical Method	Applicable Parameter	Quality Control Check	Minimum Frequency	Acceptance Criteria	Corrective Action
SW8015B	Total Petroleum Hydrocarbons	Five-point calibration	Biannually or when daily calibration verification fails	RSD for average RF <20%	1) Identify and repeat analysis for outlying points 2) Recalculate using valid points
		CCV	Daily: before sample analysis, every 10 samples, and at the end of the analytical sequence	Response for all analytes within $\pm 15\%$ of expected value for primary and secondary column	1) Reanalyze CCV 2) If still out, identify and correct problem 3) Recalibrate and reanalyze all samples since last valid CCV
		Method Blank	1 per preparation batch	All analytes < $\frac{1}{2}$ QL	1) Investigate possible contamination source 2) Take appropriate corrective action 3) Repeat instrument blank analysis 4) Reextract and reanalyze all samples processed with a contaminated blank at no cost to USACE, unless analyte is not detected in associated samples or present at greater than 10x blank concentration. 5) Flag sample results associated with blank contamination
		LCS	1 LCS per preparation batch	Comparison recovery limits 65-135%	1) Reanalyze LCS. 2) If still out identify and correct problem. 3) Reextract and reanalyze affected samples.
		MS and MSD (level of spike must be less than the mid-level standard of the calibration curve)	1 MS/MSD per preparation batch	Comparison recovery limits 65-135% and RPD <35% for soil samples RPD >20 % for water samples	1) Evaluate for supportable matrix effect. 2) If no interference is evident re-extract and reanalyze MS/MSD once. 3) If still out report both sets of data.

Analytical Method	Applicable Parameter	Quality Control Check	Minimum Frequency	Acceptance Criteria	Corrective Action
SW8015B	Total Petroleum Hydrocarbons	Surrogate spikes  QL	Every sample, spike, standard, and method blank  Low point on initial calibration curve.	Comparison recovery limits 65-135%  QLs established shall not exceed those required by project; Refer to accompanying table.	1) Recalculate result; if still out: 2) Evaluate for supportable matrix effect. 3) If no interference is evident reanalyze affected sample(s) and narrate any outliers. QLs that exceed established criteria shall be submitted to USACE for approval prior to any project samples analyses

All corrective actions associated with USACE project work shall be documented and the records maintained by the laboratory.

Test Methods for Evaluating Solid Waste, SW-846, USEPA, December 1998.

- |   |  |                                   |
|---|--|-----------------------------------|
| CCV = Continuing Calibration Verification | ICV = Initial Calibration Verification | DL = Detection Limit              |
| QL = Quantitation Limit                   | GC = Gas Chromatograph                 | LCS = Laboratory Control Sample   |
| RF = Response Factor                      | MDL = Method Detection Limit           | RPD = Relative Percent Difference |
| MS = Matrix Spike                         | RSD = Relative Standard Deviation      | RT = Retention time               |
| MSD = Matrix Spike Duplicate              | TPH = Total Petroleum Hydrocarbons     |                                   |

Table A-4

## Summary of Calibration and Internal Quality Control Procedures for Method SW8081A (Organochlorine Pesticides)

Analytical Method	Applicable Parameter	Quality Control Check	Minimum Frequency	Acceptance Criteria	Corrective Action <sup>a</sup>
SW 8081A	Organochlorine Pesticides	ICAL five-point minimum	Initially and as required	$\% \text{RSD} \leq 20\%$ or $r \geq 0.9995$	1) Check calculation 2) Recalibrate as necessary
		ICV	Daily, prior to sample analysis	$\pm 25\%$ difference from expected concentration.	1) Check calculation 2) Rerun ICV 3) Recalibrate as necessary
		CCV	After every 10 samples and end of sequence	$\pm 15\%$ difference from expected concentration.	1) Check calculation 2) Rerun ICV 3) Reanalyze samples subsequent to failed CCV 4) Recalibrate as necessary
		Method Blank	1 per preparation batch	All analytes $< \frac{1}{2}$ QL	1) Investigate possible contamination source 2) Take appropriate corrective action 3) Repeat instrument blank analysis 4) Reextract and reanalyze all samples processed with a contaminated blank at no cost to USACE, unless analyte is not detected in associated samples or present at greater than 10x blank concentration. 5) Flag sample results associated with blank contamination

Analytical Method	Applicable Parameter	Quality Control Check	Minimum Frequency	Acceptance Criteria	Corrective Action <sup>a</sup>
SW 8081A	Organochlorine Pesticides and Chlorinated Herbicides	MS and MSD (level at the mid-level standard)	1 MS/MSD per preparation batch	Comparison Recovery Limits 60-140% RPD < 35 for soils; RPD < 20 for waters	1) Evaluate for supportable matrix effect. 2) If no interference is evident, reextract and reanalyze MS/MSD once. 3) If still out report both sets of data.
		LCS (prepared with second source standard)	LCS per preparation batch	Recovery within project limits see applicable Table	1) Check calculations 2) Reanalyze LCS, if passes, report. 3) If still out, reextract and reanalyze LCS and its associated samples.
		Surrogate Spike	Every sample, method blank, and standard.	See applicable Table	1) Check calculations. 2) Assess impact and narrate outlier. 3) Re-analyze once. 4) Reextract if both surrogates are outside of acceptance limits.
		Degradation Standards	Every 24 hours	Breakdown of Endrin < 25% or 4'4-DDT < 20%	1) Evaluate system 2) Rerun Degradation 3) Perform system maintenance.
		QL	Low point on initial calibration curve.	QLs established shall not exceed those required by project; Refer to accompanying table.	QLs that exceed established criteria shall be submitted to USACE for approval prior to any project samples analyses

All corrective actions associated with USACE project work shall be documented and the records maintained by the laboratory. Test Methods for Evaluating Solid Waste, SW-846, USEPA, December 1998.

CCV	= Continuing Calibration Verification	ICV	= Initial Calibration Verification	DL	= Detection Limit
QL	= Quantitation Limit	GC	= Gas Chromatograph	LCS	= Laboratory Control Sample
RF	= Response Factor	MDL	= Method Detection Limit	RPD	= Relative Percent Difference
MS	= Matrix Spike	RSD	= Relative Standard Deviation	RT	= Retention time
MSD	= Matrix Spike Duplicate	TPH	= Total Petroleum Hydrocarbons		

**Table A-5**  
**Summary of Calibration and Internal Quality Control Procedures for Method SW8082 (PCBs)**

<b>Analytical Method</b>	<b>Applicable Parameter</b>	<b>Quality Control Check</b>	<b>Minimum Frequency</b>	<b>Acceptance Criteria</b>	<b>Corrective Action<sup>a</sup></b>
SW8082	Polychlorinated Biphenyls	ICAL five-point minimum	Initially and as required	$\% \text{ RSD} \leq 20\%$ or $r \geq 0.9995$	1) Check calculation 2) Recalibrate as necessary
		ICV	Daily, prior to sample analysis	$\pm 25\%$ difference from expected concentration.	1) Check calculation 2) Rerun ICV 3) Recalibrate as necessary
		CCV	After every 10 samples and end of sequence	$\pm 15\%$ difference from expected concentration.	1) Check calculation 2) Rerun ICV 3) Reanalyze samples subsequent to failed CCV 4) Recalibrate as necessary
		MS and MSD (level at the mid-level standard of the calibration curve)	1 MS/MSD per preparation batch	Recovery and RPD within project limits	1) Evaluate for supportable matrix effect. 2) If no interference is evident reextract and reanalyze MS/MSD once. 3) If still out report both sets of data.
		Method Blank	1 per analytical batch, not to exceed 10 samples	All analytes $< \frac{1}{2}$ QL	1) Check calculation 2) Recalibrate as necessary 3) If sample results are ND, no action 4) Reextract and reanalyze all samples $< 10X$ the blank contamination 5) Report blank results down to the MDL

Analytical Method	Applicable Parameter	Quality Control Check	Minimum Frequency	Acceptance Criteria	Corrective Action <sup>a</sup>
SW8082	PCBs	LCS (prepared with second source standard)	LCS per preparation batch	Recovery within project limits see applicable Table	1) Check calculations 2) Reanalyze LCS, if passes, report. 3) If still out, reextract and reanalyze LCS and its associated samples.
		Surrogate Spike	Every sample, method blank, and standard.	See applicable Table	1) Check calculations. 2) Assess impact and narrate outlier. 3 Re-analyze once. 4) Reextract if both surrogates are outside of limits. 5) Narrate any outliers.
		QL	Low point on initial calibration curve.	QLs established shall not exceed those required by project; Refer to accompanying table.	QLs that exceed established criteria shall be submitted to USACE for approval prior to any project samples analyses

All corrective actions associated with USACE project work shall be documented and the records maintained by the laboratory.

Test Methods for Evaluating Solid Waste, SW-846, USEPA, December 1998.

- |   |  |                                   |
|---|--|-----------------------------------|
| CCV = Continuing Calibration Verification | ICV = Initial Calibration Verification | DL = Detection Limit              |
| QL = Quantitation Limit                   | GC = Gas Chromatograph                 | LCS = Laboratory Control Sample   |
| RF = Response Factor                      | MDL = Method Detection Limit           | RPD = Relative Percent Difference |
| MS = Matrix Spike                         | RSD = Relative Standard Deviation      | RT = Retention time               |
| MSD = Matrix Spike Duplicate              | TPH = Total Petroleum Hydrocarbons     |                                   |

**Table A-6**  
**Summary of Calibration and Internal Quality Control Procedures for Method SW8270C**

<b>Analytical Method</b>	<b>Applicable Parameter</b>	<b>Quality Control Check</b>	<b>Minimum Frequency</b>	<b>Acceptance Criteria</b>	<b>Corrective Action</b>
SW8270C	SVOCs	Instrument tune (DFTPP)	Once per 12-hour shift	Ion abundance criteria as described in SW8270	1) Reanalyze standard 2) Adjust MS tune until analysis of BFB passes specifications
		Degradation check using 4,4'-DDT, PCP and benzidine		Degradation of DDT to DDE and DDD $\leq 20\%$ ; PCP and benzidine should have normal area response and show no peak tailing	
		Five-point calibration (for all analytes)	Biannually or when daily calibration verification fails	RSD $\leq 15$ (non-CCCs $\leq 30$ ) r $\geq 0.995$ Avg RF $> 0.30$ (non-SPCCs $> 0.05$ )	1) Identify and repeat analysis for outlying points 2) Recalculate using valid points
		CCV	Every 12 hrs, prior to sample analysis	Same RF criteria as for initial calibration Response for all analytes within $\pm 20\%$ of expected value	1) Reanalyze CCV 2) If still out, identify and correct problem 3) Recalibrate and reanalyze all samples since last valid CCV
		Internal Standard	Every sample, spike, standard and method blank	IS area count within 2x from daily CCV RT must have $< 30$ second change from daily CCV	1) Inspect mass spectroscopy or GC for malfunctions 2) Take appropriate corrective actions 2) Reanalyze affected samples

Analytical Method	Applicable Parameter	Quality Control Check	Minimum Frequency	Acceptance Criteria	Corrective Action
SW8270C	SVOCs	Method Blank	1 per preparation batch	All analytes < ½ QL	1) Investigate possible contamination source 2) Take appropriate corrective action 3) Repeat instrument blank analysis 4) Reextract and reanalyze all samples processed with a contaminated blank at no cost to USACE, unless analyte is not detected in associated samples or present at greater than 10x blank concentration. 5) Flag sample results associated with blank contamination
		LCS (prepared from second source standard)	1 LCS per preparation batch	Comparison recovery limits 60-120%	1) Reanalyze LCS. 2) If still out identify and correct problem. 3) Reextract and reanalyze affected samples.
		MS and MSD (level of spike must be less than the mid-level standard of the calibration curve) Surrogate spikes	1 MS/MSD per preparation batch	Comparison recovery limits 45-135% RPD < 50	1) Evaluate for supportable matrix effect. 2) If no interference is evident re-extract and reanalyze MS/MSD once. 3) If still out report both sets of data.
		Surrogate spikes	Every sample, spike, standard, and method blank	Comparison recovery limits 60-120%	1) Recalculate result; if still out: 2) Evaluate for supportable matrix effect. 3) If no interference is evident reanalyze affected sample(s) and narrate any outliers.
QL	Low point on initial calibration curve.	QLs established shall not exceed those required by project; Refer to accompanying table.	QLs that exceed established criteria shall be submitted to USACE for approval prior to any project samples analyses		

All corrective actions associated with USACE project work shall be documented and the records maintained by the laboratory.

Test Methods for Evaluating Solid Waste, SW-846, USEPA, December 1996.

CV= Continuing Calibration Verification	ICV = Initial Calibration Verification	DL = Detection Limit
GC= Gas Chromatograph	QL = Quantitation Limit	
LCS = Laboratory Control Sample	RF = Response Factor	
MDL = Method Detection Limit	RPD = Relative Percent Difference	MS = Matrix Spike
RSD = Relative Standard Deviation	RT = Retention time	MSD = Matrix Spike Duplicate

**Table A-7  
Summary of Calibration and Internal Quality Control Procedures for Method SW8290 (Dioxin/Furans)**

<b>Analytical Method</b>	<b>Applicable Parameter</b>	<b>Quality Control Check</b>	<b>Minimum Frequency</b>	<b>Acceptance Criteria</b>	<b>Corrective Action</b>
SW8290	Dioxin/Furans	Instrument tune (PFK recommended)	Once per 12-hour shift	Ion abundance criteria as described in SW8290	1) Reanalyze standard 2) Adjust MS tune until analysis of PFK passes specifications
		Five-point calibration (for all analytes)	When daily calibration verification fails or when a new lot of standard solutions are used	RSD $\leq$ 20 for unlabeled analytes RSD $\leq$ 30 for labeled analytes S/N ratio $\geq$ 10 Method ion abundance criteria met	1) Identify and repeat analysis for outlying points 2) Recalculate using valid points
		ICV	Every 12 hrs, prior to sample analysis and at the end of the 12-hour period	RF $\pm$ 20% of initial calibration mean RF for unlabeled analytes; $\pm$ 30% for labeled analytes End of 12-hour period is $\pm$ 25% and $\pm$ 35% Method ion abundance criteria met as for initial calibration	1) Reanalyze CCV 2) If still out, identify and correct problem 3) Recalibrate and reanalyze all samples since last valid CCV
		Internal Standard	Every sample, spike, standard and method blank	IS recovery 40-135%	1) Inspect mass spectrometer or GC for malfunctions 2) Take appropriate corrective actions 2) Reanalyze affected samples or flag data

Analytical Method	Applicable Parameter	Quality Control Check	Minimum Frequency	Acceptance Criteria	Corrective Action
SW8290	Dioxin/Furans	Method Blank (IS fortified blank)	1 per preparation batch	All analytes < ½ QL	1) Investigate possible contamination source 2) Take appropriate corrective action 3) Repeat instrument blank analysis 4) Reextract and reanalyze all samples processed with a contaminated blank at no cost to USACE, unless analyte is not detected in associated samples or present at greater than 10x blank concentration. 5) Flag sample results associated with blank contamination
		Duplicate Analysis	1 per preparation batch	≤ 25 RPD	1) Evaluate for method or instrument malfunction 2) reanalyze duplicate once. 3) If still out report both sets of data.
		MS and MSD	1 MS/MSD per preparation batch	Comparison recovery limits 45-135%RPD < 20	1) Evaluate for supportable matrix effect. 2) If no interference is evident re-extract and reanalyze MS/MSD once.
		QL	Low point on initial calibration curve.	QLs established shall not exceed those required by project; Refer to accompanying table.	3) If still out report both sets of data. QLs that exceed established criteria shall be submitted to USACE for approval prior to any project samples analyses

All corrective actions associated with USACE project work shall be documented and the records maintained by the laboratory.

Test Methods for Evaluating Solid Waste, SW-846, USEPA, December 1996.

ICV = Initial Calibration Verification

DL = Detection Limit

GC= Gas Chromatograph

QL = Quantitation Limit

RF = Response Factor

MS = Matrix Spike

MDL = Method Detection Limit

RPD = Relative Percent Difference

RSD = Relative Standard Deviation

MSD = Matrix Spike Duplicate

**Table A-8****Summary of Calibration and Internal Quality Control Procedures for Method 1668A (PCB Homologues)**

<b>Analytical Method</b>	<b>Applicable Parameter</b>	<b>Quality Control Check</b>	<b>Minimum Frequency</b>	<b>Acceptance Criteria</b>	<b>Corrective Action</b>
1668A	PCB Homologues	Instrument tune (PFK)	Once per 12-hour shift	Ion abundance criteria as described in Table 7 of Method 1668A	1) Reanalyze standard 2) Adjust MS tune until analysis of PFK passes specifications
		Five-point calibration (for all analytes)	When daily calibration verification fails	RSD < 20, if not, then r > 0.995 Ion abundance ratios met S/N ratio ≥ 10	1) Identify and repeat analysis for outlying points 2) Recalculate using valid points
		ICV	Every 12 hrs, prior to sample analysis	S/N ratio ≥ 10 Response for all analytes within method criteria of expected value RT criteria within method requirements	1) Reanalyze ICV 2) If still out, identify and correct problem 3) Recalibrate and reanalyze all samples since last valid ICV
		Internal Standard	Every sample, spike, standard and method blank	IS area count within 2x from daily CCV RT must have <30 second change from daily CCV 25-150% recovery	1) Inspect mass spectroscopy or GC for malfunctions 2) Take appropriate corrective actions 3) Reanalyze affected samples

<b>Analytical Method</b>	<b>Applicable Parameter</b>	<b>Quality Control Check</b>	<b>Minimum Frequency</b>	<b>Acceptance Criteria</b>	<b>Corrective Action</b>
1668A	PCB Homologues	Method Blank	1 per preparation batch	All analytes < ½ QL	1) Investigate possible contamination source 2) Take appropriate corrective action 3) Repeat instrument blank analysis 4) Reextract and reanalyze all samples processed with a contaminated blank at no cost to USACE, unless analyte is not detected in associated samples or present at greater than 10x blank concentration. 5) Flag sample results associated with blank contamination
		QC Check Sample (prepared from second source standard)	1 per initial calibration	Recovery limits meet method requirements	1) Reanalyze QC check standard. 2) If still out, recalibrate.
		Ongoing Precision and Recovery Standard (OPR)	1 per preparation batch	Recovery limits and RPDs meet method requirements	1) Evaluate for errors. 2) Re-extract and reanalyze, and cleanup OPR and associated data.
		QL	Low point on initial calibration curve.	QLs established shall not exceed those required by project; Refer to accompanying table.	QLs that exceed established criteria shall be submitted to USACE for approval prior to any project samples analyses

All corrective actions associated with USACE project work shall be documented and the records maintained by the laboratory.

ICV = Initial Calibration Verification

GC = Gas Chromatograph

QL = Quantitation Limit

QC= Quality Control

RF = Response Factor

RPD = Relative Percent Difference

MS = Matrix Spike

RSD = Relative Standard Deviation

RT = Retention time

MSD = Matrix Spike Duplicate

**Table A-9****Summary of Calibration and Internal Quality Control Procedures for Method SW8151A (Chlorinated Herbicides)**

<b>Analytical Method</b>	<b>Applicable Parameter</b>	<b>Quality Control Check</b>	<b>Minimum Frequency</b>	<b>Acceptance Criteria</b>	<b>Corrective Action<sup>a</sup></b>
SW8151A	Chlorinated Herbicides	ICAL five-point minimum	Initially and as required	$\% \text{RSD} \leq 20\%$ or $r \geq 0.9995$	1) Check calculation 2) Recalibrate as necessary
		ICV	Daily, prior to sample analysis	$\pm 25\%$ difference from expected concentration.	1) Check calculation 2) Rerun ICV 3) Recalibrate as necessary
		CCV	After every 10 samples and end of sequence	$\pm 15\%$ difference from expected concentration.	1) Check calculation 2) Rerun ICV 3) Reanalyze samples subsequent to failed CCV 4) Recalibrate as necessary
		Method Blank	1 per preparation batch	All analytes $< \frac{1}{2}$ QL	1) Investigate possible contamination source 2) Take appropriate corrective action 3) Repeat instrument blank analysis 4) Reextract and reanalyze all samples processed with a contaminated blank at no cost to USACE, unless analyte is not detected in associated samples or present at greater than 10x blank concentration. 5) Flag sample results associated with blank contamination

Analytical Method	Applicable Parameter	Quality Control Check	Minimum Frequency	Acceptance Criteria	Corrective Action <sup>a</sup>
SW 8151A	Chlorinated Herbicides	MS and MSD (level at the mid-level standard)	1 MS/MSD per preparation batch	Comparison Recovery Limits 85-115% RPD < 35 for soils; RPD < 20 for waters	1) Evaluate for supportable matrix effect. 2) If no interference is evident, reextract and reanalyze MS/MSD once. 3) If still out report both sets of data.
		LCS (prepared with second source standard)	LCS per preparation batch	Recovery within project limits see applicable Table	1) Check calculations 2) Reanalyze LCS, if passes, report. 3) If still out, reextract and reanalyze LCS and its associated samples.
		Surrogate Spike	Every sample, method blank, and standard.	See applicable Table	1) Check calculations. 2) Assess impact and narrate outlier. 3) Re-analyze once. 4) Reextract if both surrogates are outside of acceptance limits.
		QL	Low point on initial calibration curve.	QLs established shall not exceed those required by project; Refer to accompanying table.	QLs that exceed established criteria shall be submitted to USACE for approval prior to any project samples analyses

All corrective actions associated with USACE project work shall be documented and the records maintained by the laboratory. Test Methods for Evaluating Solid Waste, SW-846, USEPA, December 1998.

- |   |  |                                   |
|---|--|-----------------------------------|
| CCV = Continuing Calibration Verification | ICV = Initial Calibration Verification | DL = Detection Limit              |
| QL = Quantitation Limit                   | GC = Gas Chromatograph                 | LCS = Laboratory Control Sample   |
| RF = Response Factor                      | MDL = Method Detection Limit           | RPD = Relative Percent Difference |
| MS = Matrix Spike                         | RSD = Relative Standard Deviation      | RT = Retention time               |
| MSD = Matrix Spike Duplicate              | TPH = Total Petroleum Hydrocarbons     |                                   |

**Table A-10****Summary of Internal Quality Control Procedures for Method SW4042 (Total DDT in Soil Test Kit)**

<b>Analytical Method</b>	<b>Applicable Parameter</b>	<b>Quality Control Check</b>	<b>Minimum Frequency</b>	<b>Acceptance Criteria</b>	<b>Corrective Action</b>
SW4042	Total DDTs	Two-point calibration standards at 0.2 and 1.0 mg/kg	Prepare and analyze during sample preparation and analysis for each batch	Response of the standards should be inversely relational to concentration	Reanalyze batch
		Method Blank	1 per batch	Response greater than the 0.1 mg/kg standard response	Investigate possible source of problem. Take appropriate corrective action. Reanalyze batch.
		Duplicate preparation and analysis	1 per batch	Equivalent result (< 0.2 mg/kg; >0.2 <1 mg/kg; or >1 mg/kg)	Identify potential source of problem and correct. If source is not apparent, reanalyze same sample and duplicate in following batch to verify heterogeneity.

# **ATTACHMENT B**

**Table B-1**  
**Quantitation Limits and Screening Guidance for**  
**Metals by Method SW6010B [or SW6020]**  
**Mercury by Method SW7471A**

<b>Parameter</b>	<b>Analyte</b>	<b>Soil MDL<sup>1</sup> (mg/kg)</b>	<b>Soil QL (mg/kg)</b>	<b>Action Goals (mg/kg)</b>
SW6010B	Arsenic	0.26	5	23
	Barium	0.034	100	188
	Beryllium	0.014	0.5	1.68
	Boron	0.79	20	71.6
	Cadmium	0.028	0.5	1.8
	Chromium	0.097	10	149
	Copper	0.095	10	88.7
	Cobalt	0.043	10	26.7
	Lead	0.16	20	46.7
	Manganese	0.042	100	1260
	Nickel	0.13	10	132
	Silver	0.02	0.5	1
	Vanadium	0.033	10	136
Zinc	0.55	10	169	
SW7471A	Mercury	0.017	0.1	0.58

<sup>1</sup> Report the test result to MDL and “J” flag the result below the QL. These detection limits were calculated using a clean matrix and may not be achievable with the samples collected for this project. By reporting down to the detection limit, there is an increased probability of low-level false positives.

<sup>2</sup> Action Goals – Coastal Salt Marsh Sites, ROD/RAP

Notes: Both MDLs and QLs for soil in the tables are undiluted. Actual reported concentrations will be adjusted for dry weight and any dilution.

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

NE = not established

QL = Quantitation Limit

**Table B-2**  
**Quantitation Limits and Screening Guidance for**  
**Extractable Total Petroleum Hydrocarbons by Method SW8015B**

<b>Parameter</b>	<b>Analytical Method</b>	<b>Analyte</b>	<b>Method Detection Limits<sup>1</sup> (MDL) (mg/kg)</b>	<b>Soil QL (mg/kg)</b>	<b>Action Goals<sup>2</sup> (mg/kg)</b>
Total Petroleum Hydrocarbons – Extractable	SW8015B	Diesel (C12–C24) Motor Oil (C24–C36)	0.784	100	144

<sup>1</sup> Report the test result to MDL and “J” flag the result below the QL. These detection limits were calculated using a clean matrix and may not be achievable with the samples collected for this project. By reporting down to the detection limit, there is an increased probability of low-level false positives.

<sup>2</sup> Action Goals – Coastal Salt Marsh Sites, ROD/RAP

Note: Both MDLs and QLs for soil in the tables are undiluted. Actual reported concentrations will be adjusted for dry weight and dilution.

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

QL = Quantitation Limit

**Table B-3**  
**Quantitation Limits and Screening Guidance for**  
**Organochlorine Pesticides by Method SW8081A**

Parameter	Analyte	Soil		Action Goals <sup>2</sup> (µg/kg)
		MDL <sup>1</sup> (µg/kg)	QL (µg/kg)	
Organochlorine Pesticides SW8081A	Alpha-Chlordane	NE	2	4.79 (total Chlordanes)
	Gamma-Chlordane	NE	2	4.79 (total Chlordanes)
	4,4'-DDD	NE	4.5	24 (total DDTs)
	4,4'-DDE	NE	4.5	24 (total DDTs)
	4,4'-DDT	NE	4.5	24 (total DDTs)
	Endrin aldehyde	NE	4	6.4
	Heptachlor	NE	2	8.8
	Heptachlor Epoxide	NE	2	8.8
	<b>Surrogates:</b>			
	Decachlorobiphenyl	NA	NA	NA
Tetrachloro-m-xylene	NA	NA	NA	

<sup>1</sup> Report the test result to MDL and “J” flag the result below the QL. These detection limits were calculated using a clean matrix and may not be achievable with the samples collected for this project. By reporting down to the detection limit, there is an increased probability of low-level false positives.

<sup>2</sup> Action Goals – Coastal Salt Marsh Sites, ROD/RAP

Notes: Both MDLs and QLs for soil in the tables are undiluted. Actual reported concentrations will be adjusted for dry weight and dilution.

MDL = method detection limit

QL = quantitation limit

NE = Not Established

µg/kg = micrograms per kilogram

Total DDT = summation of DDD, DDE and DDT result values. Non-detects will not be calculated in the summation.

**Table B-4**  
**Quantitation Limits and Screening Guidance for**  
**Polychlorinated Biphenyls by Method SW8082**

Parameter	Analyte	Soil		Action Goals (µg/kg)
		MDL <sup>1</sup> (µg/kg)	QL (µg/kg)	
<b>Polychlorinated Biphenyls (PCBs) SW8082</b>	Aroclor-1016	NE	20	NE
	Aroclor-1221	NE	20	NE
	Aroclor-1232	NE	20	NE
	Aroclor-1242	NE	20	NE
	Aroclor-1248	NE	20	NE
	Aroclor-1254	NE	20	NE
	Aroclor-1260	NE	20	NE
	Total PCBs*	NE	20	90
	<b>Surrogates:</b>			
	<b>Decabchlorobiphenyl</b>	NA	NA	NA
<b>Tetrachloro-m-xylene</b>	NA	NA	NA	

<sup>1</sup> Report the test result to MDL and “J” flag the result below the QL. These detection limits were calculated using a clean matrix and may not be achievable with the samples collected for this project. By reporting down to the detection limit, there is an increased probability of low-level false positives.

<sup>2</sup> Action Goals – Coastal Salt Marsh Sites, ROD/RAP

Notes: Both MDLs and QLs for soil in the tables are undiluted. Actual reported concentrations will be adjusted for dry weight and dilution.

\* Total PCBs is a summation of the detected Aroclors.

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

QL = Quantitation Limit

Total PCBs\* = summation of aroclors result values. Non-detects will not be calculated in the summation.

**Table B-5**  
**Quantitation Limits and Screening Guidelines for**  
**Phenol and Pentachlorophenol by Method SW8270C**

<b>Parameter</b>	<b>Analyte</b>	<b>Soil MDL<sup>1</sup> (µg/kg)</b>	<b>Soil QL (µg/kg)</b>	<b>Action Goals<sup>2</sup> (µg/kg)</b>
SW8270C	Pentachlorophenol	NE	10	17
	Phenol	NE	30	130
	<b>Surrogate</b> p-Terphenyl	N/A	N/A	N/A

<sup>1</sup> Report the test result to MDL and “J” flag the result below the QL. These detection limits were calculated using a clean matrix and may not be achievable with the samples collected for this project. By reporting down to the detection limit, there is an increased probability of low-level false positives.

<sup>2</sup> Action Goals – Coastal Salt Marsh Sites, ROD/RAP

Note: Both MDLs and QLs for soil in the tables are undiluted. Actual reported concentrations will be adjusted for dry weight and dilution.

QL = Quantitation Limit    MDL = Method Detection Limit    NE = not established

**Table B-6**  
**Quantitation Limits and Screening Guidance for**  
**Dioxin Congeners by Method SW8290**

<b>Compound</b>	<b>QL (ng/kg)</b>	<b>Equivalency Factor</b>	<b>Action Goal<sup>1</sup> (ng/kg)</b>
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	NE	1	21
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	NE	0.5	NE
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	NE	0.1	NE
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	NE	0.1	NE
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	NE	0.1	NE
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	NE	0.01	NE
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	NE	0.001	NE
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	NE	0.1	NE
1,2,3,7,8-Pentadibenzofuran (PCDF)	NE	0.05	NE
2,3,4,7,8-Pentadibenzofuran (PCDF)	NE	0.5	NE
1,2,3,4,7,8-Hexadibenzofuran (HxCDF)	NE	0.1	NE
1,2,3,6,7,8-Hexadibenzofuran (HxCDF)	NE	0.1	NE
2,3,4,6,7,8-Hexadibenzofuran (HxCDF)	NE	0.1	NE
1,2,3,7,8,9-Hexadibenzofuran (HxCDF)	NE	0.1	NE
1,2,3,4,6,7,8-Heptadibenzofuran (HpCDF)	NE	0.01	NE
1,2,3,4,7,8,9-Heptadibenzofuran (HpCDF)	NE	0.01	NE
Octachlorodibenzofuran (OCDF)	NE	0.001	NE

<sup>1</sup> Action Goals – Coastal Salt Marsh Sites, ROD/RAP

ng/kg = nanograms per kilogram  
 QL = Quantitation Limit  
 TEQ = 2,3,7,8-TCDD equivalency  
 NE = not established

**Table B-7**  
**Quantitation Limits and Screening Guidance for**  
**Polychlorinated Biphenyl Homologues by Method 1668A**

Parameter	Analyte	Soil		Action Goals <sup>2</sup> (µg/kg)
		MDL <sup>1</sup> (µg/kg)	Maximum QL (µg/kg)	
<b>Polychlorinated Biphenyls (PCBs) 1668A</b>	Monochlorobiphenyls	NE	50	NE
	Dichlorobiphenyls	NE	50	NE
	Trichlorobiphenyls	NE	50	NE
	Tetrachlorobiphenyls	NE	50	NE
	Pentachlorobiphenyls	NE	50	NE
	Hexachlorobiphenyls	NE	50	NE
	Heptachlorobiphenyls	NE	50	NE
	Octachlorobiphenyls	NE	50	NE
	Nonachlorobiphenyls	NE	50	NE
	Decachlorobiphenyl	NE	50	NE
	Total PCBs*	NE	50	90

<sup>1</sup> Report the test result to MDL and “J” flag the result below the QL. These detection limits were calculated using a clean matrix and may not be achievable with the samples collected for this project. By reporting down to the detection limit, there is an increased probability of low-level false positives.

<sup>2</sup> Action Goals – Coastal Salt Marsh Sites, ROD/RAP

Notes: Both MDLs and QLs for soil in the tables are undiluted. Actual reported concentrations will be adjusted for dry weight and dilution.

\* Total PCBs is a summation of the detected concentrations of homologues. Non-detects will not be calculated in the summation.

MDL = Method Detection Limit

QL = Quantitation Limit

**Table B-8**  
**Quantitation Limits and Screening Guidelines for**  
**Dichlorprop by Method SW8151A**

<b>Parameter</b>	<b>Analyte</b>	<b>Soil MDL<sup>1</sup> (µg/kg)</b>	<b>Soil QL (µg/kg)</b>	<b>Action Goals<sup>2</sup> (µg/kg)</b>
SW8151A	Dichlorprop	NE	5.0	140
	<b>Surrogate</b> 2,4-Dichlorophenylacetic acid	N/A	N/A	N/A

<sup>1</sup> Report the test result to MDL and “J” flag the result below the QL. These detection limits were calculated using a clean matrix and may not be achievable with the samples collected for this project. By reporting down to the detection limit, there is an increased probability of low-level false positives.

<sup>2</sup> Action Goals – Coastal Salt Marsh Sites, ROD/RAP

Note: Both MDLs and QLs for soil in the tables are undiluted. Actual reported concentrations will be adjusted for dry weight and dilution.

NE = Not Established

# ATTACHMENT C

**Table C-1**  
**Data Qualifier Convention for Inorganic Analyses**

Quality Control Item	Evaluation	Data Qualifier Flag			Sample(s) Qualified
		Detects		Non-detects	
		Non Biased	Biased		
<b>HOLDING TIMES</b>	1) Holding time exceeded by 2 times or less 2) Holding time exceeded by greater than 2 times	J	J-	UJ R	Sample
<b>INITIAL CALIBRATION</b>	1) $r < 0.995$	J	J	UJ	All samples in same instrument batch
<b>INITIAL CALIBRATION VERIFICATION (ICV)</b>	1) % Recovery > 110% but $\leq$ 125% (Hg, % Recovery > 120% but $\leq$ 135%) 2) % Recovery > 125% (Hg, % Recovery > 135%) 3) % Recovery < 90% but $\geq$ 75% (Hg, % Recovery < 80% but $\geq$ 65%) 4) % Recovery < 75% (Hg, % Recovery < 65%)	J R J J	J+ R J- J-	No qual. No qual. UJ R	All samples bracketed by ICV
<b>CONTINUING CALIBRATION VERIFICATION (CCV)</b>	1) % Recovery > 110% but $\leq$ 125% (Hg, % Recovery > 120% but $\leq$ 135%) 2) % Recovery > 125% (Hg, % Recovery > 135%) 3) % Recovery < 90% but $\geq$ 75% (Hg, % Recovery < 80% but $\geq$ 65%) 4) % Recovery < 75% (Hg, % Recovery < 65%)	J R J J	J+ R J- J-	No qual. No qual. UJ R	All samples bracketed by CCV
<b>METHOD BLANK CONTAMINATION</b>	Sample results less than or equal to 5 times the blank contamination	U	U	No qual.	All samples in the same Analytical (Preparation) Batch

<b>MATRIX SPIKE RECOVERY</b>	1) % Recovery < CL but $\geq 30\%$	J	J-	UJ	All samples from same site and similar matrix interference
	2) % Recovery < 30%	J	J-	R	
	3) % Recovery > CL 4) RPD > CL	J	J+	No qual. UJ	
<b>LABORATORY CONTROL SAMPLE RECOVERY</b>	1) % Recovery < CL but $\geq 50\%$	J	J-	UJ	All samples in the same Analytical (Preparation) Batch
	2) % Recovery < 50%	J	J	R	
	3) % Recovery > CL	J	J+	No qual.	
	4) RPD > CL	J	J	UJ	
<b>REPORTING LIMITS</b>	Reporting limits not matching the project specified limits	No qual.	No qual.	No qual.	Sample (noted in outlier report) Sample
	Reported result less than the project reporting detection limit.	J	J	No qual.	
<b>FIELD DUPLICATES</b>	RPD > CL	No qual.	No qual.	No qual.	Non-compliant results
<b>FIELD BLANKS EQUIPMENT BLANKS</b>	Sample results within 5 times blank contamination	U	U	No qual.	All samples in the same sampling event

Alternate qualifiers are acceptable on a case-by-case basis based upon validator's professional judgment. All deviations from the above qualification scheme shall be documented.

**Table C-2**  
**Data Qualifier Convention for GC Analyses**

Quality Control Item	Evaluation	Data Qualifier Flag			Sample(s) Qualified
		Detects		Nondetects	
		Non Biased	Biased		
<b>HOLDING TIMES (Extraction/Analysis)</b>	1) Holding time exceeded by 2 times or less 2) Holding time exceeded by greater than 2 times		J- J-	UJ R	Sample
<b>COOLER TEMPERATURE</b>	1) > 6 and ≤10 degrees Centigrade 2) >10 degrees Centigrade 3) < 2 degrees Centigrade	J J No qual.	J- J- No qual.	UJ R No qual.	All samples shipped in the affected cooler. (Shipping Batch)
<b>INITIAL CALIBRATION</b>	1) %RSD > 20% 2) $r < 0.995$	J J	J J	UJ UJ	All samples in the same instrument batch
<b>INITIAL CALIBRATION VERIFICATION (ICV)</b>	1) % Difference > +25% 2) % Difference < -25% and ≥ -50% 3) % Difference < -50%	J J J	J+ J- J-	No qual. UJ R	All samples bracketed by the ICV
<b>CONTINUING CALIBRATION (CCV)</b>	1) % Difference > +15% 2) % Difference < -15% and ≥ -50% 3) % Difference < -50%	J J J	J+ J- J-	No qual. UJ R	All samples bracketed by the CCV
<b>METHOD BLANK CONTAMINATION</b>	1) Common lab contaminant results less than or equal to 10 times the blank contamination 2) Other compound results less than or equal to 5 times the blank contamination	U U	U U	No qual. No qual.	All samples in the same Analytical (Preparation) Batch
<b>SURROGATE RECOVERY</b>	1) % Recovery < CL but ≥ 10% 2) % Recovery < 10% 3) % Recovery > CL	J J J	J- J- J+	UJ R No qual.	Sample

Quality Control Item	Evaluation	Data Qualifier Flag			Sample(s) Qualified
		Detects		Nondetects	
		Non Biased	Biased		
<b>MATRIX SPIKE RECOVERY</b>	1) % Recovery < CL but $\geq 10\%$ 2) % Recovery < 10% 3) % Recovery > CL 4) RPD > CL	J J J J	J- J- J+ J	UJ R No qual. UJ	Parent Sample
<b>LABORATORY CONTROL SAMPLE RECOVERY</b>	1) % Recovery < CL but $\geq 10\%$ 2) % Recovery < 10% 3) % Recovery > CL 4) RPD > CL	J J J J	J- J- J+ J	UJ R No qual. UJ	All samples in the same Analytical (Preparation) Batch
<b>REPORTING LIMITS</b>	Reporting limits not matching the project specified limits.	No qual.	No qual.	No qual.	Sample (noted in outlier report) Sample
	Results reported below the project reporting detection limit.	J	J	No qual.	
<b>FIELD DUPLICATES</b>	1) RPD > CL	No qual.	No qual.	no qual.	Non-compliant results
<b>FIELD BLANKS EQUIPMENT BLANKS</b>	1) Common lab contaminant results within 10 times blank contamination	U	U	No qual.	All samples in the same sampling event
	2) Other lab contaminant results within 5 times blank contamination	U	U	No qual.	
<b>TRIP BLANKS</b>	1) Common lab contaminant results within 10 times blank contamination	U	U	No qual.	All samples in the same Shipping Batch
	2) Other lab contaminant results within 5 times blank contamination	U	U	No qual.	

Alternate qualifiers are acceptable on a case-by-case basis based upon validator professional judgment. All deviations from the above qualification scheme shall be documented.

**Table C-3**  
**Data Qualifier Convention for GC/MS Analyses**

Quality Control Item	Evaluation	Data Qualifier Flag			Sample(s) Qualified
		Detects		Nondetects	
		Non Biased	Biased		
<b>HOLDING TIMES (Extraction/Analysis)</b>	1) Holding time exceeded by 2 times or less	J	J-	UJ	Sample
	2) Holding time exceeded by greater than 2 times	J	J-	R	
<b>COOLER TEMPERATURE</b>	1) > 6 and ≤10 degrees Centigrade	J	J-	UJ	All samples shipped in the affected cooler (Shipping Batch)
	2) >10 degrees Centigrade	J	J-	R	
	3) < 2 degrees Centigrade	No qual.	No qual.	No qual.	
<b>INSTRUMENT TUNING</b>	1) Ion abundance criteria not met	JN	JN	R	All samples associated to an initial calibration, if tune is associated to an initial calibration. All samples in same instrument batch, if tune is associated with a calibration verification.
<b>INITIAL CALIBRATION</b>	1) Average RRF < 0.05	J	J	R	All samples associated with the initial calibration
	2) %RSD > 30%	J	J	UJ	
	3) $r < 0.995$	J	J	UJ	
<b>INITIAL CALIBRATION VERIFICATION (ICV)</b>	1) Average RRF < 0.05	J	J	R	All samples associated to the ICV
	2) % Difference > +25%	J	J+	no qual.	
	3) % Difference < -25% and ≥ -50%	J	J-	UJ	
	4) % Difference < -50%	J	J-	R	

Quality Control Item	Evaluation	Data Qualifier Flag			Sample(s) Qualified
		Detects		Nondetects	
		Non Biased	Biased		
<b>CONTINUING CALIBRATION VERIFICATION (CCV)</b>	1) Average RRF < 0.05 2) % Difference > +25% 3) % Difference < -25% and $\geq$ -50% 4) % Difference < -50%	J J J J	J J+ J- J-	R no qual. UJ R	All samples in the instrument batch
<b>METHOD BLANK CONTAMINATION</b>	1) Common lab contaminant and tentatively identified compound (TIC) results less than or equal to 10 times blank contamination 2) Other compound results less than or equal to 5 times blank contamination	U U	U U	No qual. No qual.	All samples in the same analytical batch (preparation batch)
<b>SURROGATE RECOVERY</b>	1) % Recovery < CL but $\geq$ 10% 2) % Recovery < 10% 3) % Recovery > CL Note: For semivolatile analysis, two or more surrogates in a fraction must be out of criteria for qualification unless recovery < 10%.	J J J	J- J- J+	UJ R no qual.	Sample
<b>MATRIX SPIKE RECOVERY</b>	1) % Recovery < CL but $\geq$ 10% 2) % Recovery < 10% 3) % Recovery > CL 4) RPD > CL	J J J J	J- J- J+ J	UJ R no qual. UJ	Parent Sample
<b>LABORATORY CONTROL SAMPLE RECOVERY</b>	1) % Recovery < CL but $\geq$ 10% 2) % Recovery < 10% 3) % Recovery > CL 4) RPD > CL	J J J J	J- J- J+ J	UJ R no qual. UJ	All samples in the same analytical batch (preparation batch)

Quality Control Item	Evaluation	Data Qualifier Flag			Sample(s) Qualified
		Detects		Nondetects	
		Non Biased	Biased		
<b>REPORTING LIMITS</b>	1) Reporting limits not matching the project specified limits 2) Results reported below the project reporting detection limit.	No qual. J	No qual. J	No qual. No qual.	Sample
<b>FIELD DUPLICATES</b>	1) RPD > CL	No qual.	No qual.	no qual.	Non-compliant results
<b>FIELD BLANKS</b> <b>EQUIPMENT BLANKS</b>	1) Common lab contaminants and tentatively identified compound (TIC) results within 10 times blank contamination 2) Other lab contaminant results within 5 times blank contamination	U U	U U	No qual. No qual.	All samples in the same sampling event

Alternate qualifiers are acceptable on a case-by-case basis based upon validator professional judgment. All deviations from the above qualification scheme shall be documented.

# **APPENDIX D**

## **SITE SPECIFIC HEALTH AND SAFETY PLAN**

**SITE SAFETY AND HEALTH PLAN**

**HAMILTON AIRFIELD  
Novato, California**

Approved by: *Marilyn J. Brewer* Date: *1/9/04*  
*for* A.R. Smith  
Chief, Safety and Occupational Health Office

Prepared by: *Donna R. Maxey* Date: *1/9/04*  
Donna R. Maxey  
Project Safety and Health Officer

*Kathy Sieb* Date: *1/9/04*  
Kathy Siebenmann  
Project Team Lead



U.S. Army Corps of Engineers  
Sacramento District

JANUARY 2004

This document was prepared using the guidance of ER 385-1-92. It is prepared for the sole use of the U.S. Army Corps of Engineers, Sacramento District.

## **SITE SAFETY AND HEALTH PLAN**

### **HAMILTON AIRFIELD Novato, California**

Approved by: \_\_\_\_\_ Date: \_\_\_\_\_  
A.R. Smith  
Chief, Safety and Occupational Health Office

Prepared by: \_\_\_\_\_ Date: \_\_\_\_\_  
Donna R. Maxey  
Project Safety and Health Officer

\_\_\_\_\_ Date: \_\_\_\_\_  
Kathy Siebenmann  
Project Team Lead



U.S. Army Corps of Engineers  
Sacramento District

JANUARY 2004

This document was prepared using the guidance of ER 385-1-92. It is prepared for the sole use of the U.S. Army Corps of Engineers, Sacramento District.

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## TABLE OF CONTENTS

1.0	INTRODUCTION.....	4
1.1	Policy Statement .....	4
1.2	Purpose.....	4
1.3	Supplemental SSHP .....	4
1.4	Accident Prevention Plan.....	5
1.5	Compliance .....	5
1.6	Applicability .....	5
1.7	Notification Requirements .....	5
1.8	References.....	5
1.9	SSHP Organization .....	5
1.10	Activity Hazard Analysis (AHA).....	6
2.0	SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION .....	6
2.1	Contaminant Characterization .....	6
3.0	HAZARD/RISK ANALYSIS .....	7
3.1	General.....	7
3.2	Chemical Hazards .....	7
3.3	Physical Hazards .....	8
3.4	Biological Hazards.....	8
3.5	Radiological Hazards .....	8
3.6	Safety Hazards .....	8
3.7	Hazard Analysis .....	8
3.8	Hazard Communication Program .....	9
4.0	STAFF ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES .....	9
4.1	SPK Chain of Command.....	9
4.2	SPK Personnel Responsibility and Authority .....	9
5.0	Training.....	11
5.1	General.....	11
6.0	PERSONAL PROTECTIVE EQUIPMENT .....	13
6.1	Personal Protective Equipment Program .....	13
6.2	PPE Ensemble.....	13
6.3	Fit-For-Duty .....	15
6.4	Respirator Protective Program.....	15
7.0	Medical Surveillance.....	15
7.1	General.....	15
7.2	Medical Surveillance Coordinator .....	15
7.3	Medical Examinations .....	15
7.4	Medical Records .....	16
7.5	Emergency Medical Assistance and First Aid .....	16
8.0	RADIATION DOSIMETRY .....	16
9.0	EXPOSURE MONITORING/AIR SAMPLING PROGRAM.....	16
9.1	General.....	16
9.2	Dust Control.....	16
9.3	Heat or Cold Stress Monitoring .....	16
10.0	HEAT / COLD STRESS MONITORING .....	16

---

---

10.1	General.....	16
10.2	Heat Stress .....	16
10.3	Cold Stress .....	17
11.0	STANDARD OPERATING SAFETY PROCEDURES, ENGINEERING CONTROLS AND WORK PRACTICES .....	17
11.1	Field Safety Requirements.....	17
11.2	Hearing Conservation .....	18
11.3	Heavy Equipment Operations .....	18
11.4	Weather .....	18
11.5	Slips, Trips, Falls .....	18
11.6	Cuts and Scrapes .....	18
11.7	Buried / Overhead Utilities .....	18
12.0	SITE CONTROL MEASURES .....	18
12.1	Work Zones.....	18
12.2	Authorized Personnel.....	18
12.3	Communication Systems .....	18
13.0	PERSONAL HYGIENE AND DECONTAMINATION.....	19
14.0	EQUIPMENT DECONTAMINATION.....	19
15.0	EMERGENCY EQUIPMENT AND FIRST AID REQUIREMENTS .....	19
16.0	EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES .....	19
16.1	Local Fire / Police / Rescue .....	19
16.2	General.....	19
16.3	Spill and Discharge Control.....	19
16.4	Emergency Response Plan and Contingency Procedures.....	19
17.0	ACCIDENT PREVENTION.....	20
17.1	Daily Safety and Health Inspections.....	20
17.2	Accident or Incident.....	21
17.3	Accident Investigations.....	21
18.0	LOGS, REPORTS, AND RECORDKEEPING .....	21
18.1	Recordkeeping .....	21
18.2	Accident Reporting and Investigation .....	21

Figure 1-1	Site Location Map .....	25
Figure S-2	Emergency Route Map .....	26

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## **PART I**

### **1.0 INTRODUCTION**

This Site Safety and Health Plan (SSHP) establishes the responsibilities, requirements, and procedures for the protection of U.S. Army Corps of Engineers (USACE) Sacramento District (SPK) field personnel during site activities involving preliminary non-intrusive activities (i.e., initial site visits, pre-work plan visits); contractor quality assurance audits; and sampling (soil). This SSHP is prepared for the sole use of SPK personnel.

#### **1.1 Policy Statement**

SPK's policy is to provide a safe and healthful work environment for field personnel. Field personnel will receive the appropriate training, equipment, medical, and other resources necessary to complete assigned tasks in a safe manner.

##### **1.1.1 Safety / Health Responsibilities**

SPK's Project Manager (PM), Project Safety and Health Officer (PSHO) and Site Safety and Health Officer (SSHO) will cooperatively implement the requirements of this SSHP / Accident Prevention Plan (APP).

#### **1.2 Purpose**

The purpose of this SSHP is to heighten awareness of the Hazards present, enhance the safety and health of SPK's site personnel performing field work at Hamilton Airfield Guidelines for emergency response. This SSHP is written to meet the safety and health requirements in EM 385-1-1 and ER 385-1-92 as well as OSHA AF requirements (29 CFR 1926.65 / 29 CFR 1910.120). The procedures and guidelines contained herein are based upon the best available information regarding the physical, chemical, biological, radiological, and safety hazards known, or suspected to be present at HAAF at the time of this SSHP's preparation. Specific requirements may be revised if new information is received or site conditions change. Any revisions to this plan will be made with the knowledge and concurrence of the PM, PSHO, and the Chief of the Safety and Occupational Health Office (SOH).

#### **1.3 Supplemental SSHP**

This SSHP supplements any contractor's SSHP when SPK personnel are auditing the contractor.

##### **1.3.1 Contractor's SSHP**

Contractors are responsible for their own SSHP and the safety and health of their employees. Contractor developed SSHP(s) are available to SPK personnel.

##### **1.3.2 Multi-Employer Job Setting**

Under OSHA AF, each employer is required to provide a safe and healthful working environment for its employees. SPK may be simultaneously working in conjunction with other contractors. In this situation, the activities of one employer could cause harm to the

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employees of another employer. SPK and contractors will present the particular safety and health issues associated with each day's activities at the daily tailgate safety meeting.

#### 1.4 Accident Prevention Plan

This SSHP also serves as the Accident Prevention Plan (APP) as required by EM 385-1-1 (Appendix A).

#### 1.5 Compliance

SPK personnel will comply with this SSHP, any contractor prepared SSHP, applicable Federal, state, and local environmental laws, and occupational safety and health regulations.

#### 1.6 Applicability

SPK site personnel are responsible for reading, understanding and abiding by this SSHP and documenting such understanding through signing the SSHP's Employee Acknowledgment Form.

#### 1.7 Notification Requirements

The PM will be immediately notified of the following:

- a. Any required site evacuation, e.g., based on contractor air monitoring data.
- b. Any fatality or admission of one or more site personnel to the hospital. The PM will be responsible for notifying the employee's supervisor, the SOH and the client.
- c. Any site physical Hazard where continued site work could lead to possible death or permanent injury.

#### 1.8 References

The SSHP and subsequent activities will comply with the following referenced documents, at a minimum:

- a. Title 29 Code of Federal Regulations (CFR) 29 CFR 1926.65 / 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response*.
- b. USACE, *Safety and Health Requirements Manual*, EM 385-1-1.
- c. USACE, *Safety and Occupational Health Document Requirements for Hazardous, Toxic and Radioactive Waste (HTRW) Activities*, ER 385-1-92.
- d. NIOSH/OSHAAF/USCG/EPA, *Occupational Safety and Health Guidance Manual for Hazardous Waste Activities*.

#### 1.9 SSHP Organization

This SSHP is comprised of two sections.

##### 1.9.1 Section 1

This section addresses site specific safety and health issues. It includes a site description and contaminant characterization a safety and health risk/Hazard analysis for chemical, physical, biological, safety, and radiological Hazards; monitoring requirements and

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action levels for upgrading or downgrading personal protective equipment (PPE) or evacuating the site; and emergency assistance information.

### 1.9.2 Section II

Section II (under development) includes general safety and health procedures common to SPK field efforts at any site. Section II describes the roles and responsibilities of field personnel with respect to safety and health, safety training requirements, medical surveillance program, descriptions of different levels of PPE, and standard safety procedures such as safety inspections, emergency response planning, Hazard communication, and spill containment. Information in this section will aid SPK employees when conducting contractor quality assurance audits.

### 1.9.3 SPK-OM-385-1-1

This SSHP will be utilized in conjunction with SPK's *Safety and Occupational Health Policy and Procedures Manual*, OM 385-1-1.

### 1.10 Activity Hazard Analysis (AHA)

Before activities begin, a safety and health tailgate meeting will be conducted by the SSHA and contractors to review the AHAs. This meeting will include a review of potential Hazards and control measures necessary to perform project activities safely as well as any contingency planning in the event of an emergency.

#### 1.10.1 SPK Tasks

Work tasks include non-intrusive activities (i.e., initial site visits, pre-work plan visits); contractor quality assurance audits; and sampling (soil).

#### 1.10.2 Contractor Tasks

The Contractor's work tasks are described in the contractor's SSHP(s).

## **2.0 SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION**

The Hamilton Airfield is located in Novato, California. HAAF was a former Air Force Base and Army Field. The location for sampling for this site safety health plan will consist of the Coastal Salt Marsh area. The following sites will be sampled, the Boat Dock, Area 14, Historic Outboard Drainage Ditch (ODD), East Levee Construction Debris Disposal Area including Burn Pit, ODD, High Marsh, Former Sewage Treatment Plant Outfall, and Antenna Debris Disposal Area. These are all sites within the Coastal Marsh area. Soil sampling will consist of hand augers and the use of a drill rig for the sampling areas that require depths beyond 4 ft bgs.

### 2.1 Contaminant Characterization

A list of potential contaminants found or known to be present at HAAF is included as attachment Table 1 – Occupational Health Exposure and Toxicological Properties for Contaminants of Potential Concern. Compilation of this list is based on results of previous studies or selecting the likely contaminants based on site history and prior site uses/activities.

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### 3.0 HAZARD/RISK ANALYSIS

#### 3.1 General

This SSHP identifies the chemical, physical, biological, radiological, safety, and OE/CWM Hazards may be encountered. The AHA identifies potential Hazards and control measures to be implemented to eliminate or reduce each Hazard to an acceptable level.

##### 3.1.1 Tasks

- a. Non-intrusive visits.
- b. Soil sampling in Coastal Marsh Crust areas (various locations and depths).

#### 3.2 Chemical Hazards

Known or suspected chemical Hazards exist at HAAF (see attached Table 1). These include potential exposure to a variety of metals such as lead, antimony, copper and zinc, explosive compounds, volatile and semi-volatile organic compounds, pesticides, PCBs, and dioxins. The chemicals are either known or suspected to exist at HAAF, with their respective exposure limits, are listed. The OSHA permissible exposure limit (PEL) and short-term exposure limit (STEL), the American Conference of Governmental Industrial Hygienist (ACGIH<sup>®</sup>) Threshold Limit values (TLV<sup>®</sup>), and the National Institute for Occupational Health and Safety (NIOSH) Immediately Dangerous to Life and Health (IDLH) concentrations are listed, if available, for each chemical. The actual exposure limit concentrations of these materials vary, depending upon the media in which the chemicals are present and site activities. Based on current information, it is suspected the surface and subsurface at HAAF may be contaminated with some or all of the compounds listed in the table. Actual contaminants encountered may not be limited to these. Personal exposures to these chemicals may be through inhalation, ingestion, skin and eye contact, skin absorption, or by a combination of these routes. Additionally, SPK will evaluate safety and health Hazards for Hazardous substances brought on site for the execution of site activities.

##### 3.2.1 Chemicals of Potential Concern (COPC)

**Table 1 – Occupational Health Exposure and Toxicological Properties of COC**

COC	OSHA PEL	NIOSH REL	ACGIH TLV	IDLH
PAH	0.2 mg/m <sup>3</sup>	0.1 mg/m <sup>3</sup> (10 hour exposure)	NA	80 mg/m <sup>3</sup>
Heavy Metals (Pb, C, N, Z, etc.)	TWA 0.50 mg/m <sup>3</sup>	TWA 0.50 mg/m <sup>3</sup>	NA	100 mg/m <sup>3</sup>
Semi-Volatile Cmpds	TWA 0.50 mg/m <sup>3</sup> (skin)	TWA 0.50 mg/m <sup>3</sup> (skin)	NA	2.5 mg/m <sup>3</sup>
Pesticides/Herbicides/PCBs/Dioxins	Ca TWA 0.5 mg/m <sup>3</sup> (skin)	TWA 1 mg/mg <sup>3</sup> (skin)	NA	Ca [500 mg/mg <sup>3</sup> ]

### 3.2.2 Chemical Information and Material safety Data Sheets (MSDS)

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 will be made available to the affected employees. MSDSs will be available for Hazardous materials brought to the site by SPK and any contractor. It is not anticipated SPK will bring any Hazardous chemicals to the site in support of site activities.

### 3.2.3 Action Levels

Action levels are not required for SPK activities. SPK will comply with the contractor's actions levels for sites being audited.

### 3.3 Physical Hazards

Potential Hazards from physical agents include noise, heat and cold stress, solar radiation, weather, lifting, slipping, tripping, or falling,

### 3.4 Biological Hazards

Biological Hazards include insects, spiders, ticks and fleas, rattlesnakes, scorpions, rodents, and plants with thorns, spines and needles.

- a. Snakes and insects are found throughout HAAF. Possible cover and Habitat for these shall be minimized in the field operations area.
- b. Hantavirus exposure is also a potential Hazard. Potential risk factors for Hantavirus exposure include disturbing mice nests or areas with visible mouse droppings.

### 3.5 Radiological Hazards

There is no evidence of ionizing radiation sources or radioactive waste disposal at HAAF; therefore, no specific radiation screening is planned. In the event information is provided contradicts with this assumption, this SSHP will be amended to include appropriate screening and action levels for Halting or altering site work. SPK will not use nuclear sourced equipment (i.e., soil compaction nuclear density gauge, XRF).

### 3.6 Safety Hazards

Safety Hazards from SPK and contractor site conditions and activities include excavation, slips, trips, and falls on same surface, electrical, equipment and machinery, weather, etc. SPK will ensure the controls implemented to address these safety Hazards comply with applicable sections of EM 385-1-1.

### 3.7 Hazard Analysis

This certifies SPK assessed the type, risk level, and severity of Hazards for the tasks and selected appropriate personal protective equipment in accordance with 29 CFR 1910.132

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### 3.7.1 Heavy Equipment Operations

Prudent care will be exercised when moving about machinery of any kind. Personnel will be aware the use of certain protective equipment may limit dexterity and visibility, and may increase the difficulty in performing certain tasks.

### 3.7.2 Vehicle Traffic

Employees may be exposed to vehicle accident Hazards associated with the operation of vehicles during the project. Seat belts will be worn and basic speed laws followed.

### 3.7.3 Heavy Lifting

During manual lifting tasks, personnel will lift with the force of the load suspended on their legs and not their backs. They are to maintain a straight back and hold the object close to the body. Mechanical lifting devices or help from a fellow field team member will be sought when the object is too heavy for one person to lift.

### 3.7.4 Slip/Trip/Fall

All field members are to be vigilant in providing clear footing, identify obstructions, holes or other tripping Hazards, and maintaining an awareness of uneven terrain and slippery surfaces. Working at heights above six feet is not anticipated.

### 3.7.5 Noise

All field personnel will be required to wear hearing protective devices in areas where normal communication cannot be understood when field personnel are within three feet from one another and when working within 20 feet of heavy equipment.

## 3.8 Hazard Communication Program

SPK includes a Hazard communication program in SPK-OM-385-1-1.

## **4.0 STAFF ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES**

The operational and safety and health responsibilities will be undertaken by qualified and competent safety and health professionals. Each person assigned specific safety and health responsibilities is identified.

### 4.1 SPK Chain of Command

Ms. Kathy Siebenmann is the Technical Team Lead, Ms. Donna Maxey is the Project Safety and Health Officer, Mr. A.R. Smith is the District Chief of Safety and Occupational Health, and the SSHO/Field Team Lead will be determined.

### 4.2 SPK Personnel Responsibility and Authority

SPK personnel are responsible for performing tasks in a safe and healthful manner, preventing unnecessary risk of Hazardous exposure to field personnel, other site personnel, the public, or the environment. Each individual is responsible for acknowledging and following applicable safe work rules and guidelines in this SSHP and the contractor's SSHP(s) and using best professional judgment in minimizing the potential for injury or adverse health associated with activities governed by this SSHP.

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#### 4.2.1 Project Manager

As the senior management representative, the PM is responsible for defining project objectives, allocating resources, determining the project delivery team, and evaluating project outcome. The PM will ensure the reporting, scheduling, and budgetary obligations are met.

#### 4.2.2 Site Safety and Health Officer

Day-to-day safety and industrial hygiene support, including air monitoring, training, daily site safety inspections, will be provided by a designated SSHO who will report activities to the PSHO.

#### 4.2.3 Field Personnel

All personnel will attend a project-specific briefing conducted by the PSHO or SSHO. This briefing is used to orient all site personnel to the nature of the site, the scope of work, the contents of the SSHP and any unique site conditions warrant explanation.

#### 4.2.4 Project Safety and Health Officer

The PSHO is responsible for the development, technical assistance, and oversight of this SSHP. The PSHO shall ensure all health and safety program documents comply with Federal, state and local health and safety requirements. If necessary, the PSHO will modify the SSHP to adjust for on-site changes that affect safety and/or health. The PSHO will coordinate with the SSHO on all modification to the SSHP and will be available for consultation when required.

#### 4.2.5 Chief, Safety and Occupational Health Office

The Chief, SOH is responsible for verifying that SPK personnel are current participants in the medical surveillance program, have current respiratory fit test (if applicable), complete safety and health training; and providing quality assurance for consistency with Corps policy and procedure. The SPK SOH may conduct a site safety audit. This audit will be to check for conformance with the SSHP. Findings will be written up and discussed with the PM, PSHO and SSHO to ensure that any deficiencies are corrected.

#### 4.2.6 Other Key Safety and Health Personnel

- a. SPK will utilize the services of Dr. Lee Wugofski, MD, of the Division of Federal Occupational Health (DFOH) unit. Dr. Wugofski is certified in occupational medicine.
- b. SPK will utilize laboratories which are proficient to conduct personnel, area, and environmental analysis for organic and inorganic chemicals; fully equipped to analyze the required NIOSH, OSHA, and EPA analyses; and currently participating in the American Industrial Hygiene Association (AIHA) Proficiency Analytical Testing (PAT) Program and is certified by AIHA.

#### 4.2.7 Key Personnel

Technical Team Leader	Kathy Siebenmann	(916) 557-7180
Chief SOH	Arthur R Smith	(916) 557-6973

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Project Safety and Health Officer	Donna Maxey	(916) 557-7437
Site Safety and Health Officer	Tim Crummett	(916) 557-6942
Public Health Service (PHS)	Marion Conley, RN	(916) 930-2290
Occupational Physician (PHS)	Dr. Lee Wugfoski, MD	(415) 556-2975

#### 4.2.8 *Site Visitors*

Visitors may be present at the project site during field activities. These individuals may include SPK staff, regulatory agency personnel, client personnel, and visitors. The SSHO will provide a brief overview of the field activities to the site visitors.

### **5.0 Training**

#### 5.1 General

All personnel who enter a Hazardous waste site must recognize and understand the potential Hazards to health and safety. It is the intent of this SSHP to provide every person a level of health and safety training consistent with their job function and responsibility. SPK on-site personnel have completed formal Hazardous waste operations (HAZWOPER) training and will complete an on-site briefing on this SSHP, the AHA, PPE, and Hazard communication. SPK personnel performing on-site activities will be familiar with the contents of this SSHP along with any contractor's SSHP(s), and sign the SSHP Employee Acknowledgment form.

##### 5.1.1 *Additional Training*

In addition to the OSHA Hazardous waste operations and emergency response regulations, there are other ancillary safety and health regulations governing certain training aspects for these projects. These additional training requirements include:

- a. Respiratory Protection (29 CFR 1910.134).
- b. Hearing Conservation (29 CFR 1910.95).
- c. Hazard Communication (29 CFR 1910.1200 / 1926.59).
- d. Bloodborne Pathogens (29 CFR 1910.1030).

##### 5.1.2 *Initial Training*

Field personnel Have completed 40 hours of off-site instruction, and a minimum of three days actual field experience under the direct supervision of a trained, experienced supervisor.

##### 5.1.3 *Supervisory Training*

The Field Team Lead/SSHO Has completed 8 additional hours of specialized training on managing such operations.

##### 5.1.4 *Refresher Training*

All site workers will complete 8 hours of off-site refresher training annually on the items covered in the 40-hour initial training program.

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#### 5.1.5 Site-Specific Training

Site-specific training covering site Hazards, procedures, and contents of the SSHP to all personnel, including those assigned only to the Support Zone who Have met the requirements of 29 CFR 1926.65. Training will be conducted prior to job start-up and as needed thereafter. The PSHO or SSHO will conduct initial site-specific training to ensure that employees have a thorough understanding of the SSHP, standard operating procedures (SOPs), and physical, safety, biological, radiological, and chemical Hazards of the site.

#### 5.1.6 Daily Tailgate Safety Meetings

All personnel who enter the exclusion and contamination reduction zones will attend the daily tailgate safety meeting. This meeting, conducted by the SSHO and/or contractor, will cover specific health and safety issues, site activities, changes in site conditions, and will review topics covered in the initial health and safety meeting as they apply to daily activities.

#### 5.1.7 Respiratory Protection

Respiratory protection training is included in the initial 40-hours and 8-hour update HAZWOPER training.

#### 5.1.8 Hazard Communication

In accordance with the OSHA Hazard Communication standard (29 CFR 1910.1200 / 29 CFR 1926.59), copies of all material safety data sheets (MSDS), container labeling, and chemical health Hazards for Hazardous chemical materials brought onto any project site and used during site operations will be available. Site-specific training on the chemicals of concern will be provided. General Hazard communication training will be conducted during the HAZWOPER training.

#### 5.1.9 Bloodborne Pathogens and CPR/First Aid

Selected employees have been trained in CPR and first aid for emergency use only. An introduction to the Bloodborne Pathogens standard will be provided during the CPR/First Aid Training.

#### 5.1.10 Hearing Conservation

Hearing conservation is included in the initial 40-hour and 8-hour refresher HAZWOPER training classes.

#### 5.1.11 Confined Space Entry

Confined space entry is not anticipated nor permitted without a revision to this SSHP. General awareness of confined space entry training is provided in the 40-hour initial and 8-hour refresher HAZWOPER training classes. Under no circumstance will employees not specifically trained in confined space safety be permitted to enter a confined space.

#### 5.1.12 Excavation and Trenching

Excavating and trenching will not be conducted by contractors or SPK personnel.

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#### 5.1.13 Emergency Response Procedures

All employees will be made aware of the project emergency assistance network and the most probable route of evacuation in the event of an emergency.

#### 5.1.14 Site-Specific Rules and Disciplinary Procedures

Prior to the initiation of field activities, employees will be instructed in specific safety rules. Employees will be instructed in the use of the “buddy” system; the buddy system will be used at all times when employees are within an exclusion or contamination reduction zone.

#### 5.1.15 Documentation of Training

Documentation of training is the responsibility of SPK’s SOH.

#### 5.1.16 First Aid / CPR

At least two SPK, or contractor persons trained in a minimum of both American Red Cross first-aid techniques and CPR will be on site whenever activities occur.

### **6.0 PERSONAL PROTECTIVE EQUIPMENT**

#### 6.1 Personal Protective Equipment Program

SPK will develop a site-specific PPE program. This program will supplement SPK’s Protective Clothing and Equipment program, SPK OM 385-1-1, Appendix J. The program will address the elements of 29 CFR 1926.65(g)(5), 29 CFR 1910.132 (General Requirements) and 29 CFR 1910.134 (Respiratory Protection).

#### 6.2 PPE Ensemble

SPK will specify minimum PPE ensembles (including respirators) necessary for each task/operation based on the Hazard/risk analysis, including potential heat stress and associated safety Hazards.

##### 6.2.1 Site-Specific Personal Protective Equipment

Based on the Hazard assessment, including the review of the existing analytical data and related toxicological information, proposed activities, performance characteristics of the PPE relative to the requirements and limitations of the site, the task-specific conditions and durations, it is anticipated that Level D is the initial level of protection during SPK tasks. Personnel shall use the PPE ensemble as described in the contractor’s SSHP when conducting contractor audits.

##### 6.2.2 Level D

Level D consists of the following:

- a. Long pants and sleeved shirts with collars.
  - b. Safety boots/shoes meeting the specifications of American National Standards Institute (ANSI) Z41.
  - c. Safety glasses (may be tinted for outdoors work). All approved eye protection must meet the specifications of ANSI Z87.1. The use of contact lenses is
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discouraged during Level D operations, but not prohibited. Safety glasses will be used in addition to the contact lenses.

- d. Impervious gloves will be worn during all site activities that could result in direct contact with potentially contaminated soil or other items.
- e. Hearing protection (if required). The protective device must Have a noise reduction rating capable of providing the wearer with enough protection so as to reduce the received noise level to below 85 dBA.

Because of recent concerns of Hantavirus, which has resulted in several deaths in the Southwestern part of the United States, respirators may be worn by site personnel in Level D ensembles. For this reason, air purifying respirators (APR), Half-faced or full-faced, with either a dust filter or high efficiency particulate air (HEPA) filter (P100) will be made available. The dust filter will suffice, as the Hantavirus is typically transported via dust particles.

### 6.2.3 Level C

Level C protective equipment will be designated by SPK Personnel and may consist of the following:

- a. Chemical-resistant coveralls. This may include polyethylene coated Tyvek, or Saranex.
- b. Safety shoes with disposable boots covers or, Chemical-resistant steel toed boots, meeting the specifications of ANSI Z41.
- c. Chemical resistant gloves. This includes: disposable inner and outer gloves, such as polyvinyl alcohol and 4H or Silver Shield.
- d. Work gloves as necessary to prevent cuts, scrapes, and pinches.
- e. Half-faced or full-faced APR with HEPA (P100) cartridges, Safety glasses, goggles or face shield when wearing a Half-face APR, meeting the specifications of ANSI Z87.1. There is no longer an OSHA prohibition for the use of contact lenses with respiratory protective devices. Individuals who feel that the contact lens provides them superior vision and comfort may use them with respirators.
- f. Hardhat meeting the specifications of ANSI Z89.1.
- g. Cuffs sealed to boots or gloves with duct tape, or equivalent.
- h. Hearing protection as necessary depending on measured decibel readings in the field.
- i. Reflective traffic vests.

### 6.2.4 Level B and Level A

SPK personnel will not use Level B and Level A PPE.

### 6.2.5 Modification of PPE

Based on actual field conditions and on-site monitoring activities, modification in the PPE may be necessary. Modifications may include PPE upgrades to a higher degree of protection, downgrades, or substitutions such as use of engineering controls. The SSHO may modify the initial levels of PPE in response to additional site information, with the approval of the PSHO.

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### 6.3 Fit-For-Duty

Site personnel will Have a current medical "fit-for-duty" clearance to use respiratory and other PPE.

### 6.4 Respirator Protective Program

All respiratory protective equipment will be National Institute for Occupational Safety and Health (NIOSH) approved. SPK maintains a written respiratory protective equipment program detailing selection, fit testing, use, cleaning, maintenance, and storage of respiratory protective equipment, as well as medical approval for individual use.

## **7.0 Medical Surveillance**

### 7.1 General

Personnel performing on-site HTRW activities participate in an ongoing medical surveillance program meeting the requirements of 29 CFR 1926.65 and ANSI Z-88.2.

### 7.2 Medical Surveillance Coordinator

SPK's SOH has contracted the services of a Board-Certified Occupational Physician at DFOH to provide the bi-annual (more frequent on physicians recommendation) medical surveillance exams. The physician will review all medical examinations and will be available for medical consultation on an "as-needed" basis.

### 7.3 Medical Examinations

On-site SPK personnel have successfully completed a pre-placement or periodic/updated physical examination. The medical surveillance provided to the employee includes a judgment by the medical examiner of the ability of the employee to use negative-pressure respiratory equipment. Any employee found to have a medical condition that could directly or indirectly be aggravated by exposure to the COPC or by the use of respiratory equipment will not be employed for the project.

#### 7.3.1 Contents of Medical Examination

SPK's SOH in consultation with the DFOH has established the minimum content of the medical examination based upon probable HTRW site conditions, potential occupational exposures and required protective equipment.

#### 7.3.2 Injury or Illness

Any injury or illness (whether on or off the job) may require work restrictions after the employee returns to work. If the injury or illness required seeing a physician, either the attending physician or the physician giving the employment physical will be involved in the decision of when the employee will return to work, and if any work restrictions will apply.

#### 7.3.3 Certification of Participation

The SOH will maintain the certification of employee participation in the medical surveillance program and the written opinion from the attending physician.

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#### 7.4 Medical Records

Personnel Medical records will be maintained by DFOH.

##### 7.4.1 Project Specific Medical Monitoring

There are no HAAF specific medical monitoring elements.

#### 7.5 Emergency Medical Assistance and First Aid

Prior to work start-up, an emergency medical assistance network will be established. The Fire Department, ambulance service, and clinic or hospital emergency room are identified. A vehicle will be available on-site during all work activities to transport injured personnel to the identified emergency medical facility. At least two field team members (SPK, HAAF or contractor) will be certified to render both CPR and First Aid. A first aid kit, including necessary protection against bloodborne pathogens, will be available. An adequate supply of fresh potable water for emergency eye wash purposes or a portable emergency eyewash, also will be available depending on the site hazards. A map and directions indicating the fastest route to the hospital emergency room will be posted.

### **8.0 RADIATION DOSIMETRY**

Radiological hazards are not anticipated for this project.

### **9.0 EXPOSURE MONITORING/AIR SAMPLING PROGRAM**

#### 9.1 General

Exposures to the COPCs above their PEL/TLV are not anticipated for these SPK outdoor tasks; there will be no direct-reading or integrated personal monitoring. If conditions are not as anticipated, work will stop until a monitoring program is established and monitoring equipment is obtained. Contractor may monitor intrusive activities that they conduct.

#### 9.2 Dust Control

SPK activities will not require dust control.

#### 9.3 Heat or Cold Stress Monitoring

Heat or cold stress will be monitored qualitatively. Personnel will not conduct strenuous activities that will require heat stress monitoring. Personnel will take breaks in air-conditioned vehicles.

### **10.0 HEAT / COLD STRESS MONITORING**

#### 10.1 General

Heat and cold stress will be monitored qualitatively.

#### 10.2 Heat Stress

The stress of working in a hot environment can cause a variety of illnesses including heat exhaustion or heat stroke; the latter can be fatal. Use of personal protective equipment

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can significantly increase heat stress. To reduce or prevent heat stress, SPK will implement scheduled rest periods and require controlled beverage consumption to replace body fluids and salts.

#### 10.2.1 Monitoring for Heat Stress

Personnel are trained to recognize the symptoms of heat stress and the appropriate action to take upon recognition.

#### 10.3 Cold Stress

During the winter months, cold stress may be an occupational stress. Frostbite and hypothermia are the primary concerns. Personnel will take breaks in a heated vehicle.

### **11.0 STANDARD OPERATING SAFETY PROCEDURES, ENGINEERING CONTROLS AND WORK PRACTICES**

SPK will develop and implement applicable and feasible engineering and work practice controls to reduce and maintain employee exposure at or below the OSHA PELs for the COPCs. SPK will develop and implement, as applicable, standard operating procedures (SOP), to include but not limited to:

- a. Site rules/prohibitions (buddy system, eating/drinking/smoking restrictions).
- b. Work permit requirements (e.g., radioactive work, excavation, hot work, confined space). Not applicable for SPK tasks.
- c. Material Handling procedures (soils, liquids, radioactive material). Not applicable for SPK tasks.
- d. Drum/container Handling procedures and precautions (opening, sampling, overpacking). Not applicable for SPK tasks.
- e. Confined space entry procedures. Not applicable
- f. Hot work, sources of ignition, fire protection/prevention. Not applicable.
- g. Electrical safety (ground-fault protection, overhead power line avoidance). Not applicable for SPK tasks.
- h. Excavation and trenching safety. Not applicable for SPK tasks.
- i. Guarding of machinery and equipment. Not applicable for SPK tasks.
- j. Lockout/Tagout. Not applicable for SPK tasks.
- k. Fall protection. Not applicable for SPK tasks.
- l. Hazard Communication.
- m. Illumination. Work will be conducted during daylight hours.
- n. Sanitation. Work breaks, eating, and drinking will be in the field vehicle or other suitable location outside the restricted area.
- o. Engineering controls.
- p. Process Safety Management. Not applicable.
- q. Signs and labels. Not applicable for SPK tasks.

#### 11.1 Field Safety Requirements

The field safety requirements and procedures applicable to this project include safe work practices, work zones, site control, safety meetings, safety inspections, accident reporting and investigations, sanitation, and housekeeping.

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### 11.2 Hearing Conservation

A hearing conservation program will be implemented at the site when noise exposures equal or exceed an 8-hour TWA of 85 A-weighted decibels (dBA). Audiometric testing is part of the medical surveillance program. Hearing protection will be worn by personnel working with or around heavy equipment.

### 11.3 Heavy Equipment Operations

Personnel will stay clear of contractor's operating equipment. Personnel will approach operating equipment only from the operator's angle of view and only after making eye contact with the operator. Personnel will wear reflective traffic vests.

### 11.4 Weather

SPK activities will be suspended during severe weather conditions.

### 11.5 Slips, Trips, Falls

These potential Hazards are likely due to slippery surfaces and uneven terrain. SPK personnel will watch where they walk.

### 11.6 Cuts and Scrapes

The potential for jagged-edged objects and general cuts and scrapes exist. SPK personnel will wear appropriate PPE.

### 11.7 Buried / Overhead Utilities

This is a contractor responsibility.

## **12.0 SITE CONTROL MEASURES**

Currently there is no site control in progress for the HAAF site.

### 12.1 Work Zones

SPK tasks will be conducted in restricted areas; the 3-work zones will not be required. The contractors will establish work zones (Exclusion (EZ), Contamination Reduction (CRZ), and Support (SZ), including restricted and regulated areas) at HTRW sites based on the contamination characterization data and the hazard/risk analysis.

### 12.2 Authorized Personnel

Only authorized personnel will enter regulated areas associated with the field activities. The SSHO will establish the bounds of the regulated areas. The following measures will be taken to assure site security. All workers entering the regulated areas will be subject to the provisions of the SSHP. The SSHO will have the responsibility and authority to enforce this requirement.

### 12.3 Communication Systems

Two types of communications systems will be available for workers assigned to field projects. One system will ensure adequate communication between site personnel, and

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the other will ensure the ability to contact personnel and emergency assistance off the site.

### **13.0 PERSONAL HYGIENE AND DECONTAMINATION**

A formal decontamination station is not applicable for SPK activities. Decontamination will occur within the gravel firing range area. Wet-wipes will be used as an alternative procedure before eating and drinking.

### **14.0 EQUIPMENT DECONTAMINATION**

Sampling equipment will be decontaminated between sampling locations. Disposable equipment will be containerized and removed from the area. No heavy equipment will be used by SPK personnel.

### **15.0 EMERGENCY EQUIPMENT AND FIRST AID REQUIREMENTS**

The following items, as appropriate, will be available for on-site use:

- a. First aid equipment and supplies.
- b. Emergency Eyewashes/showers (ANSI Z-358-1) (determined by SSHO)
- c. Fire Extinguishers (determined by SSHO)

Contractors may have additional emergency equipment at their job sites.

### **16.0 EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES**

#### **16.1 Local Fire / Police / Rescue**

Local fire/police/rescue authorities having jurisdiction and nearby medical facilities that could be utilized for emergency treatment of injured personnel will be contacted to notify them of upcoming site activities and potential emergency situations, to ascertain their response capabilities, and to obtain a response commitment.

#### **16.2 General**

This section contains emergency response procedures specific to this project, including telephone numbers for the closest medical facilities capable of providing emergency service for hazardous waste site workers, a map showing the locations of these medical facilities. Additionally, telephone numbers for the Poison Control Center, local police, fire department (including emergency rescue squad), and SPK management contacts have been provided. The SSHO will be responsible for taking necessary action and contacting the appropriate emergency contacts and SPK personnel in case of emergency.

#### **16.3 Spill and Discharge Control**

Not applicable for SPK activities

#### **16.4 Emergency Response Plan and Contingency Procedures**

SPK personnel will be prepared to respond and act quickly in the event of an emergency. Pre-planning measures will include employee training, fire and explosion prevention and

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protection, chemical spill and discharge prevention and protection, and safe work practices to avoid personal injury or exposure.

#### 16.4.1 *Medical Emergency Response*

In the event of severe physical or chemical injury, emergency response personnel will be summoned for emergency medical treatment and ambulance service. The emergency medical responders will be utilized to provide care to severely injured personnel. Transportation routes and maps will be posted in each vehicle prior to the initiation of on-site activities.

#### 16.4.2 *Emergency Response Contacts*

Field Team Leader/SSHO	Tim Crummett	(916) 557-6942
	On-Site Cell	(916) 261-9499
Project Safety and Health Officer	Donna Maxey	(916) 557-7437
Chief SHO	A.R. Smith	(916) 557-6973
Public Health Service (PHS)	Marion Conley, RN	(916) 930-2290
Occupational Physician (PHS)	Dr. Lee Wugfoski, MD	(415) 556-2975
SPK District 24 Hr Answering Service		(916) 452-1535
<b>Novato Community Hospital</b>		<b>(415) 897-3111</b>
<b>180 Rowland Way</b>		
<b>Novato, CA 94945</b>		
Poison Control Center		(800) 222-1222
Fire/Police Emergency		911

#### 16.4.3 *Personal Exposure or Injury*

The SSHO will call for emergency assistance if needed. As soon as practical, the SSHO will contact the Section Supervisor. Staff assigned to this project will be briefed on procedures.

#### 16.4.4 *Emergency Equipment*

The SSHO will have a cell phone at the site; the SSHO will determine if it functions at the individual sites. The SSHO will assure communication with HAAF security.

### **17.0 ACCIDENT PREVENTION**

#### 17.1 Daily Safety and Health Inspections

Daily safety and health inspections will be conducted by the SSHO to determine if site operations are in accordance with the approved SSHP, OSHA, and USACE requirements.

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### 17.2 Accident or Incident

In the event of an accident or incident, the SSHO will immediately notify the Technical Team Lead and the employee's supervisor. Within three working days of any reportable accident/injury/illness, the employee and their supervisor will complete and submit to the SOH Office an Accident Report on ENG Form 3394, CA-1 and/or CA-2, and other applicable forms. The PM will complete and submit DA Form 285 for all Class A and B accidents.

### 17.3 Accident Investigations

All injuries, occupational illnesses, vehicle accidents, and incidents with potential for injury or loss will be investigated, appropriate corrective measures taken to prevent recurrence, and continually improve the safety and health of the work site.

## 18.0 **LOGS, REPORTS, AND RECORDKEEPING**

The following logs, reports, and records will be developed, retained, and submitted to the PM:

- a. Daily safety inspection logs (may be part of the Daily QC Reports).
- b. Employee/visitor register.
- c. Environmental and personal exposure monitoring/sampling results (contractor provided).

### 18.1 Recordkeeping

The PM will maintain reports generated by the Field Team Leader.

### 18.2 Accident Reporting and Investigation

All SPK personnel are required to report all near misses, injuries, illnesses, and accidents to their immediate supervisor. The supervisor will immediately arrange appropriate medical care as required. Once immediate medical care for the injured personnel has been accomplished, the supervisor will complete and submit the appropriate report forms required by the SOH Office and Human Resources. All near misses, injuries, illnesses, and accidents shall be investigated. The supervisor of the injured employee will investigate the conditions that led to the accident with the assistance of the Chief, SOH. They will document how the accident occurred and identify unsafe acts or conditions what occurred or existed at the time of the accident. Corrective actions will be determined and implemented to prevent recurrence of the accident, and responsibility for implementation of corrective actions will be assigned.

## ACTIVITY HAZARD ANALYSIS

### ACTIVITY: Site Visit/Sampling

Principal Steps	Potential Hazards	Recommended Controls
1. Non-intrusive visits	<u>Chemical Hazards:</u> See Tables 1 <u>Radiological Hazards:</u> None anticipated <u>Biological Hazards:</u> Rattlesnakes, insects,	<u>Chemical Hazards</u> 1. Level D PPE, upgrade to Level C as determined by SPK Personnel.
2. Soil Sampling	spiders, ticks, fleas	<u>Radiological Hazards:</u> None





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**TRAINING ACKNOWLEDGMENT FORM**

By signing this certificate, you are acknowledging that you have completed the following formal training:

SITE-SPECIFIC TRAINING: I have completed the SPK/contractor site-specific training  
\_\_\_\_\_ Employee Initials

RESPIRATORY PROTECTION: I have been trained in accordance with SPK's Respiratory Protection Program, SPK OM 385-1-1. I have been trained in the proper work procedures and use and limitations of the respirator(s) I will potentially wear. I Have been trained in and will abide by the facial hair policy. SPK employees will evacuate the site if conditions require an upgrade to EPA/OSHA Level C PPE (which includes respiratory protection) if not trained, medically evaluated or provided a respirator.  
\_\_\_\_\_ Employee Initials

MEDICAL EXAMINATION: I have had a medical examination within the [last twelve months] [two years] which was paid for by the Corps of Engineers. The examination included: health history, pulmonary function tests and may have included an evaluation of a chest x-ray. A physician made a determination regarding my physical capacity to perform work tasks on the project while wearing protective equipment including a respirator. I was personally provided a copy and informed of the results of that examination. The Chief of SOH Office evaluated the medical certification provided by the physician. The physician determined that there:

- a. Were no limitations to performing the required work tasks;  
\_\_\_\_\_ Employee Initials
- b. Were identified physical limitations to performing the required work tasks.  
\_\_\_\_\_ Employee Initials

Employee's Signature \_\_\_\_\_ Date \_\_\_\_\_

Employee's Name \_\_\_\_\_  
(Printed)

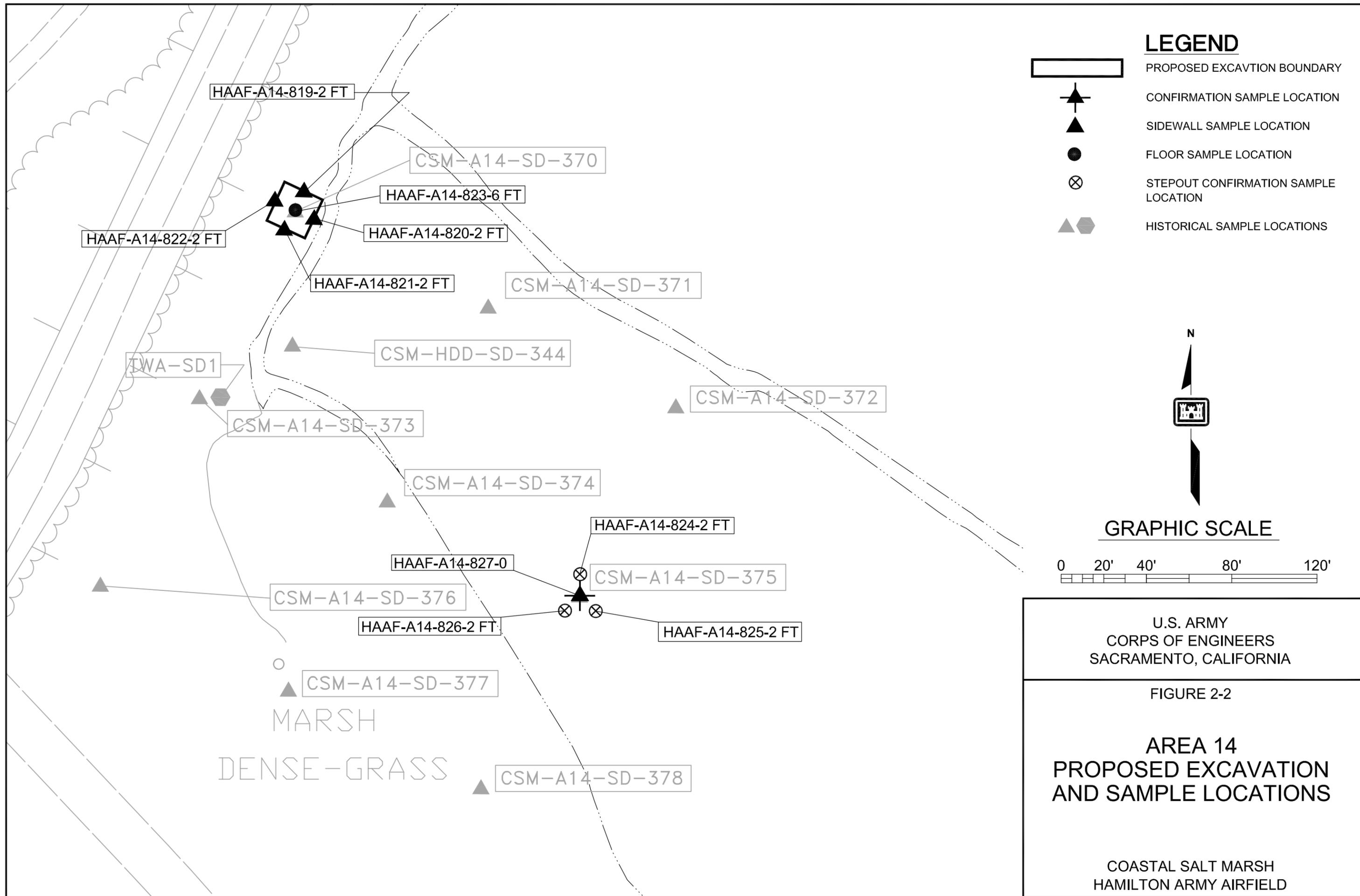
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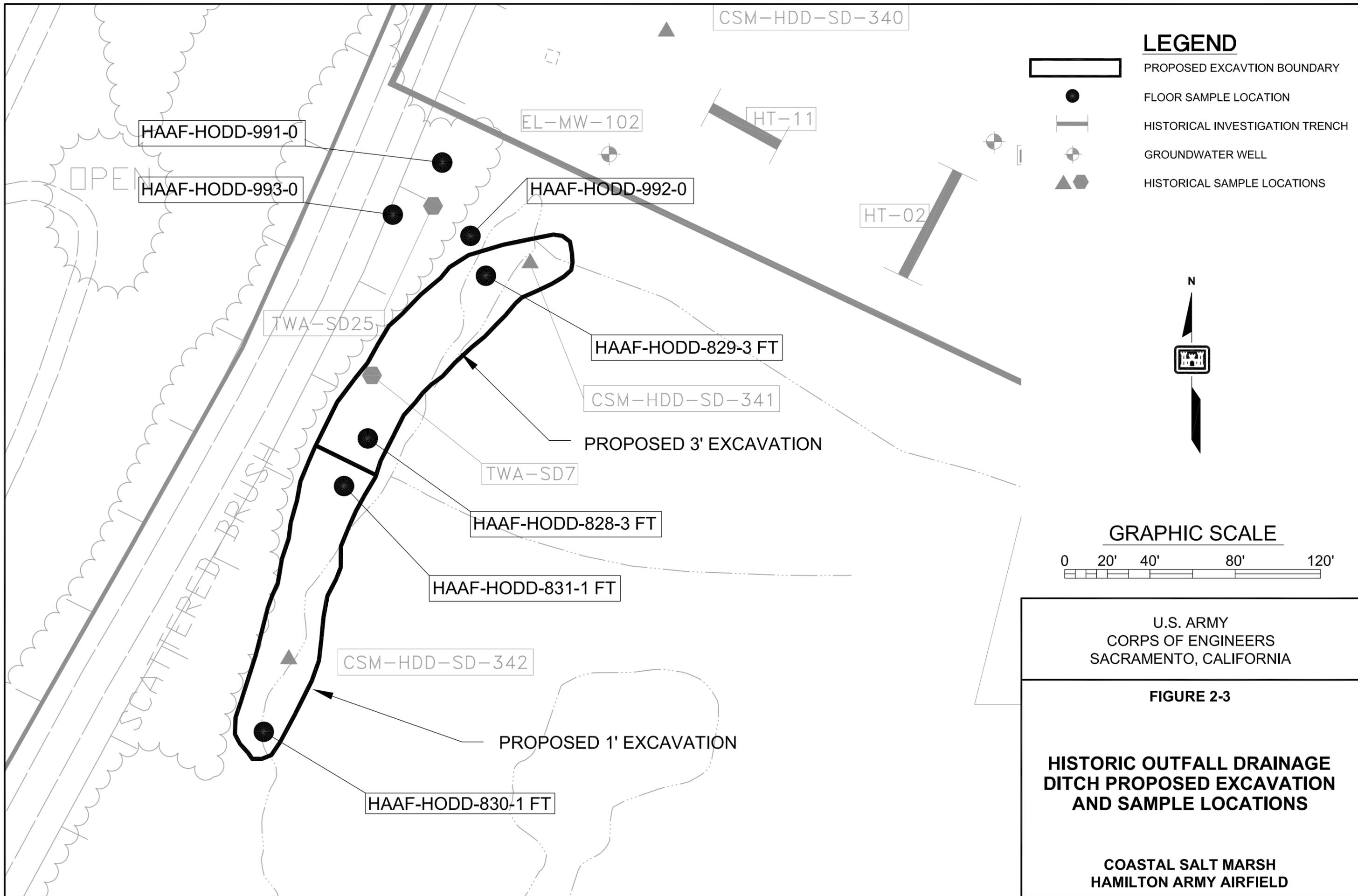




# **FIGURES**







HAAF-HODD-991-0

HAAF-HODD-993-0

EL-MW-102

HT-11

HAAF-HODD-992-0

HT-02

TWA-SD25

HAAF-HODD-829-3 FT

CSM-HDD-SD-341

PROPOSED 3' EXCAVATION

TWA-SD7

HAAF-HODD-828-3 FT

HAAF-HODD-831-1 FT

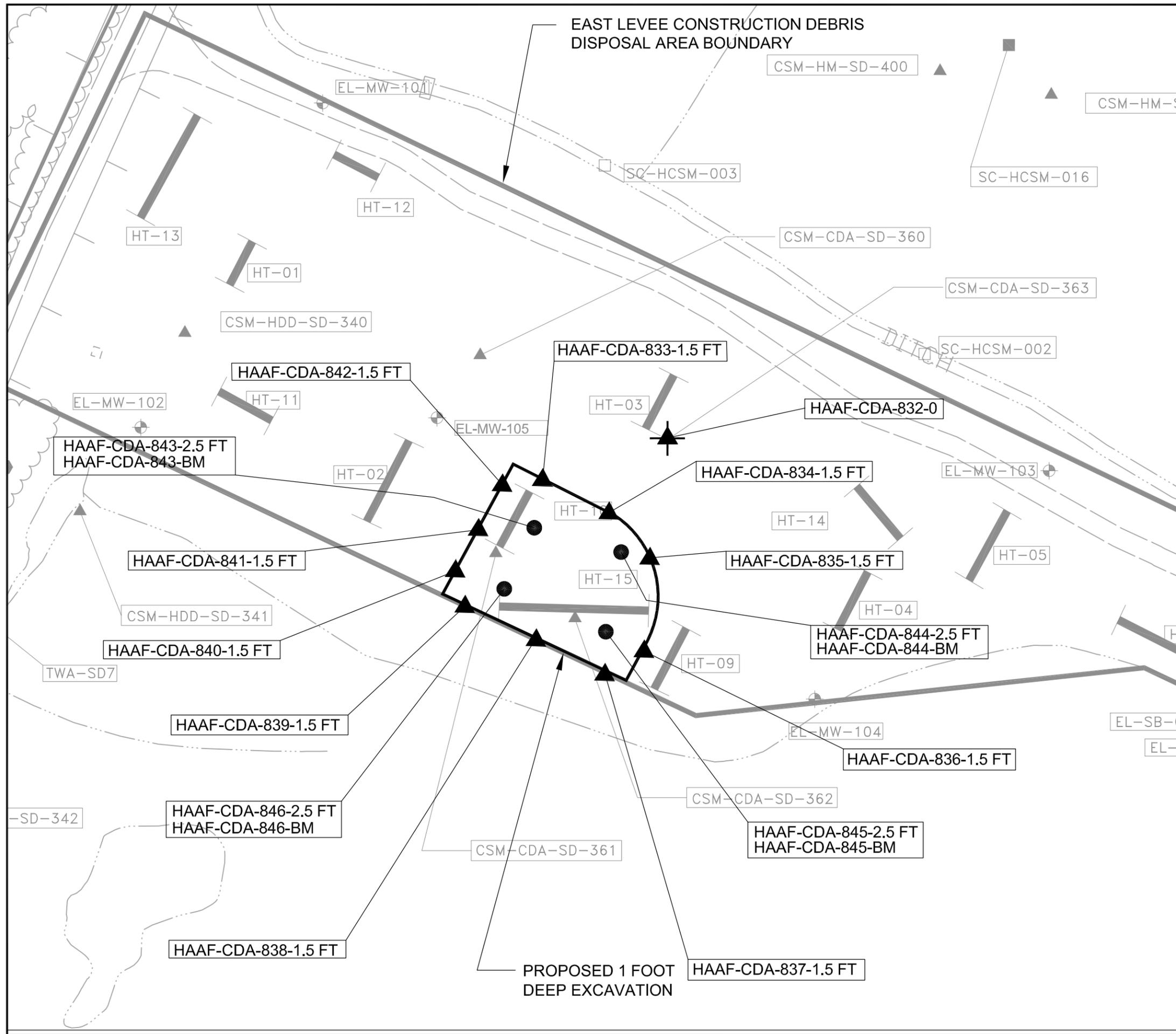
CSM-HDD-SD-342

PROPOSED 1' EXCAVATION

HAAF-HODD-830-1 FT

OPEN

SCATTERED BRUSH



### LEGEND

- PROPOSED EXCAVATION BOUNDARY
- CONFIRMATION SAMPLE LOCATION
- SIDEWALL SAMPLE LOCATION
- FLOOR SAMPLE LOCATION
- HISTORICAL INVESTIGATION TRENCH
- GROUNDWATER WELL
- HISTORICAL SAMPLE LOCATIONS

N

**GRAPHIC SCALE**

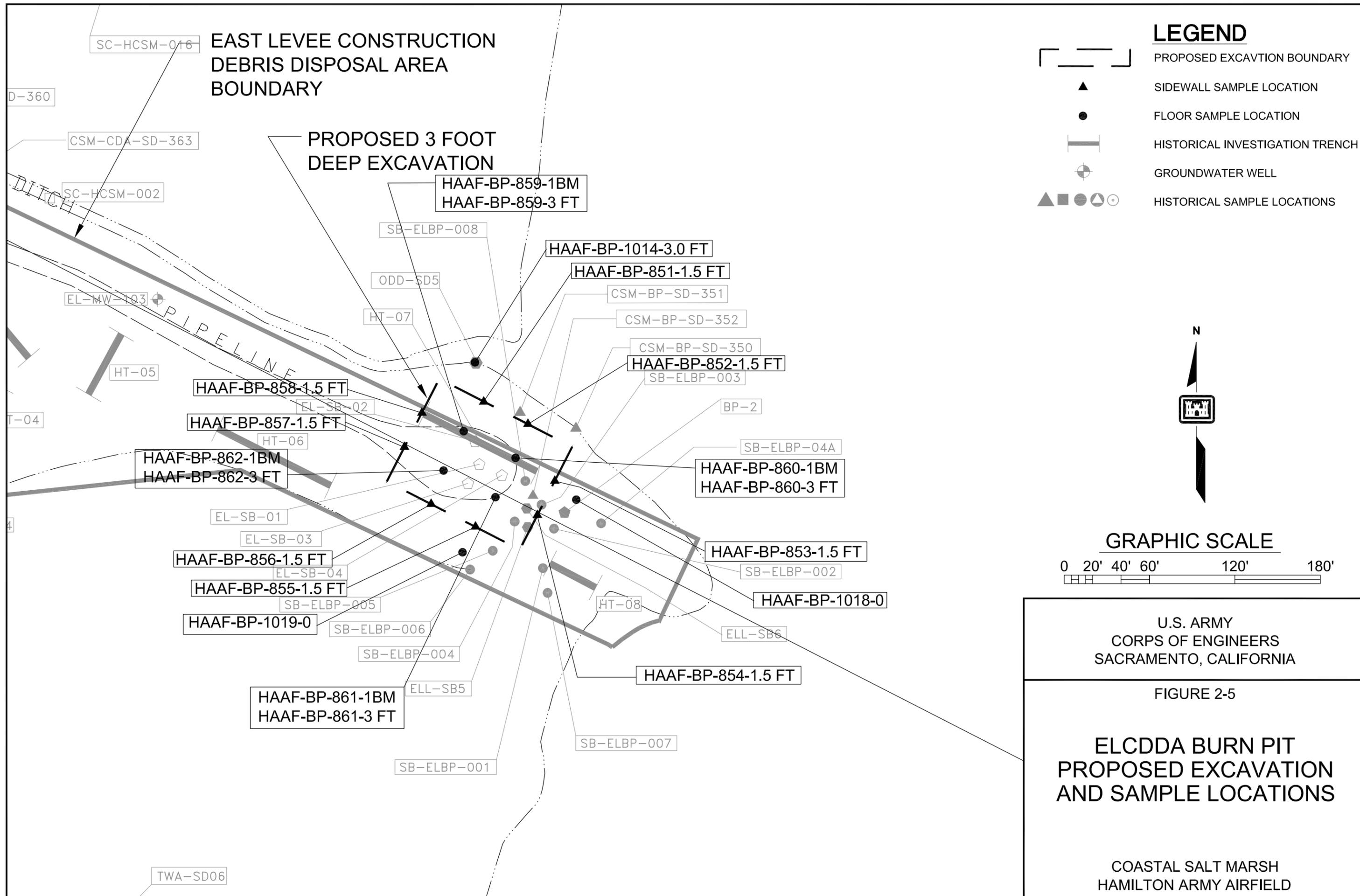
0 20' 40' 60' 120' 180'

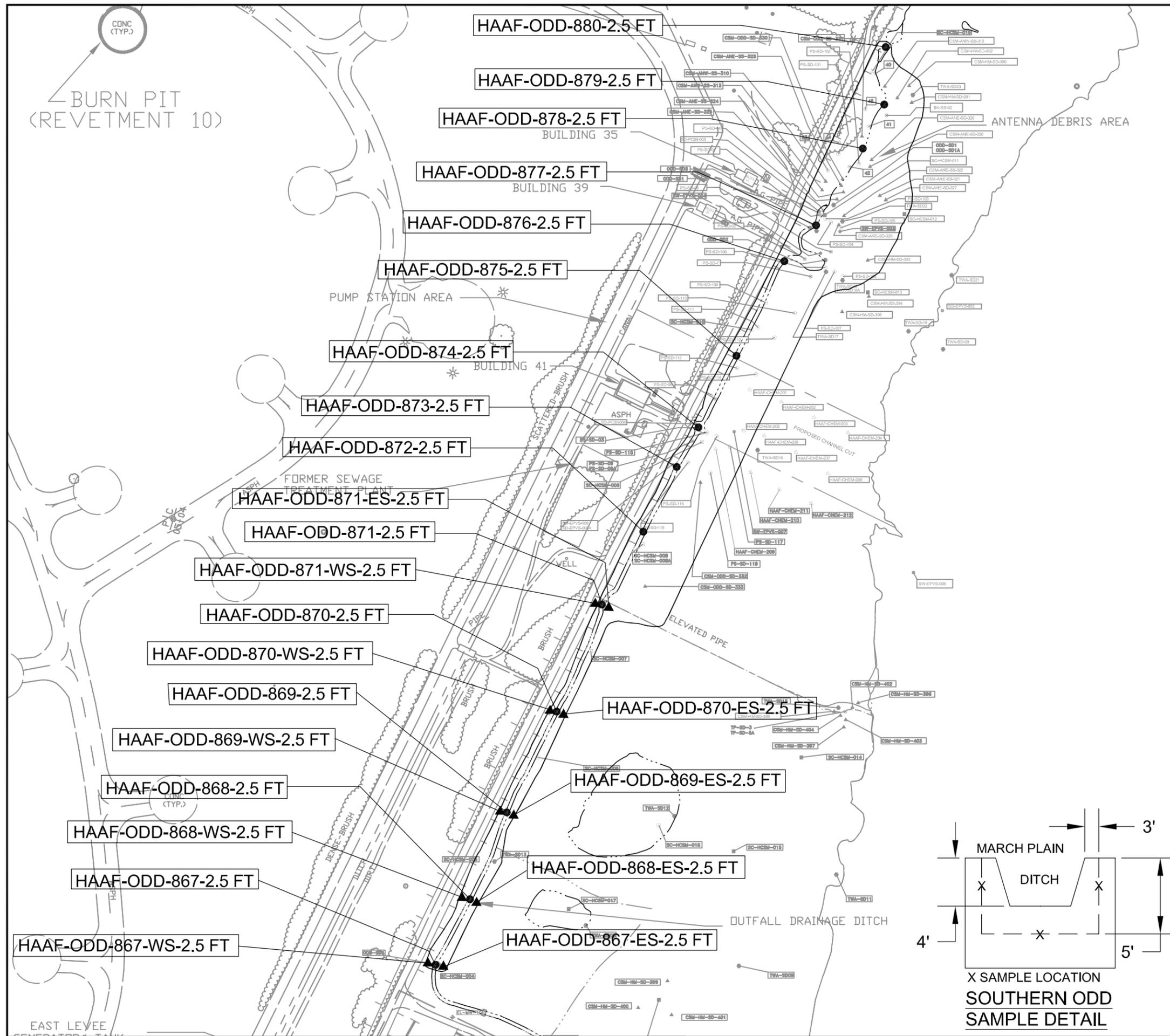
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FIGURE 2-4

**EAST LEVEL CONSTRUCTION  
DEBRIS DISPOSAL AREA  
PROPOSED EXCAVATION  
AND SAMPLE LOCATIONS**

COASTAL SALT MARSH  
HAMILTON ARMY AIRFIELD



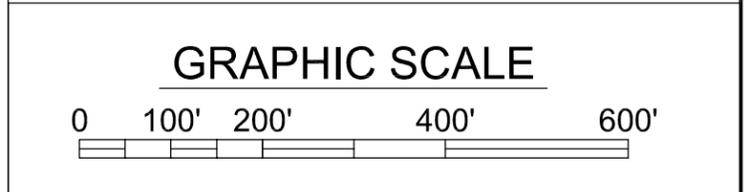


### LEGEND

-  PROPOSED EXCAVATION BOUNDARY
-  SIDEWALL SAMPLE LOCATION
-  FLOOR SAMPLE LOCATION
-  HISTORICAL SAMPLE LOCATIONS



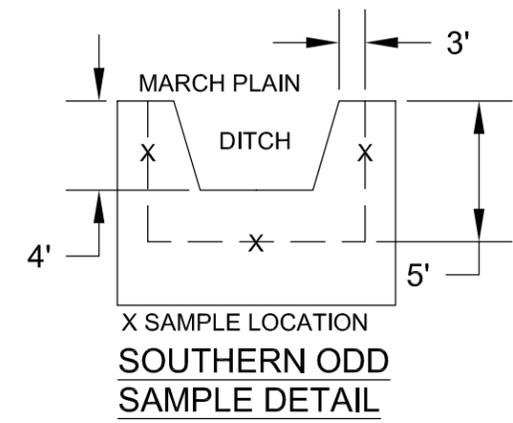
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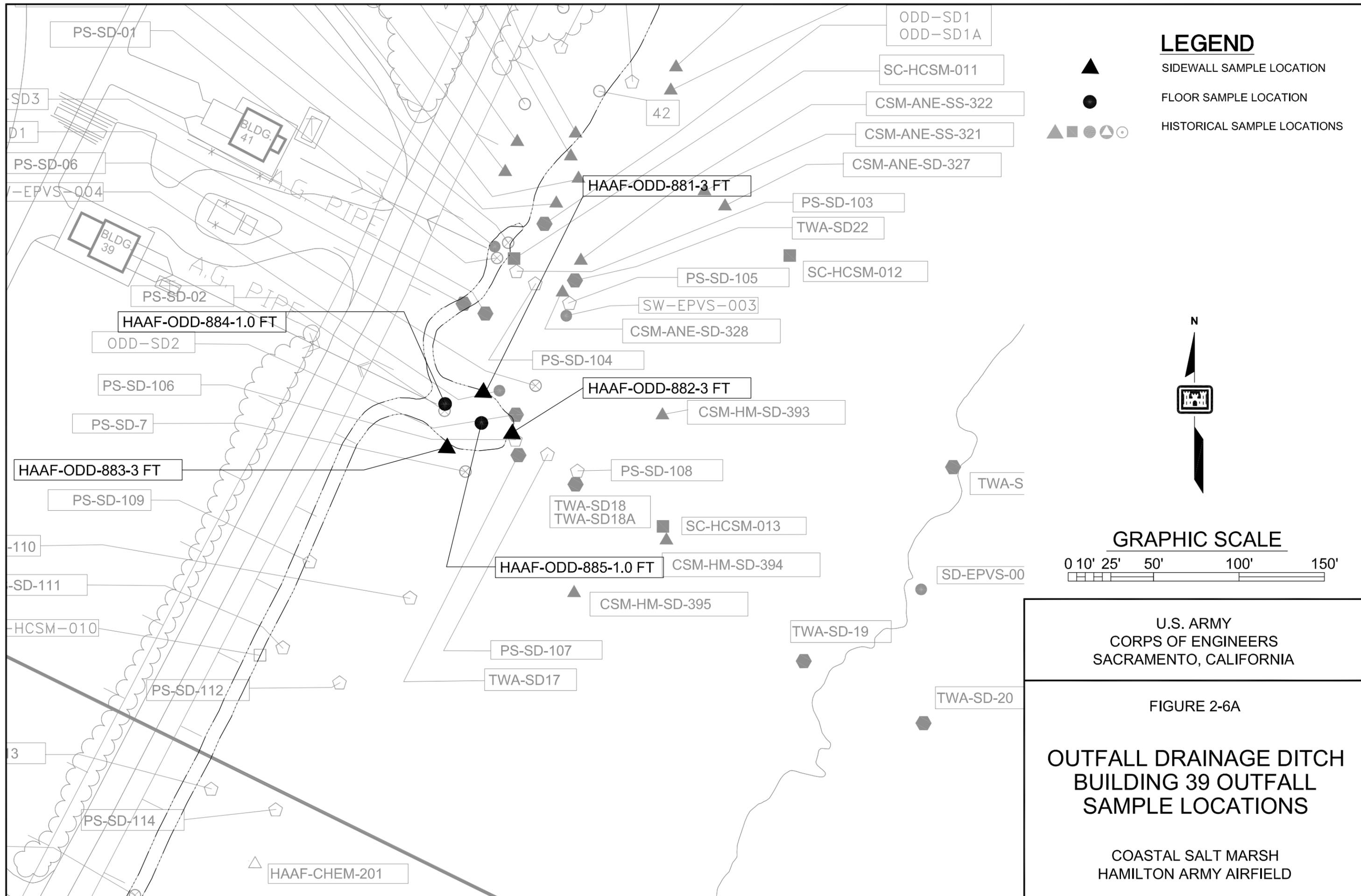


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FIGURE 2-6  
**OUTFALL DRAINAGE DITCH  
PROPOSED EXCAVATION  
AND SAMPLE LOCATIONS**

COASTAL SALT MARSH  
HAMILTON ARMY AIRFIELD





PS-SD-01

ODD-SD1  
ODD-SD1A

SC-HCSM-011

CSM-ANE-SS-322

CSM-ANE-SS-321

CSM-ANE-SD-327

42

HAAF-ODD-881-3 FT

PS-SD-103

TWA-SD22

SC-HCSM-012

PS-SD-105

SW-EPVS-003

CSM-ANE-SD-328

PS-SD-104

HAAF-ODD-882-3 FT

CSM-HM-SD-393

PS-SD-108

TWA-SD18  
TWA-SD18A

SC-HCSM-013

TWA-S

HAAF-ODD-885-1.0 FT

CSM-HM-SD-394

CSM-HM-SD-395

SD-EPVS-00

PS-SD-107

TWA-SD-19

TWA-SD17

TWA-SD-20

BLDG 41

BLDG 39

PS-SD-02

HAAF-ODD-884-1.0 FT

ODD-SD2

PS-SD-106

PS-SD-7

HAAF-ODD-883-3 FT

PS-SD-109

-110

-SD-111

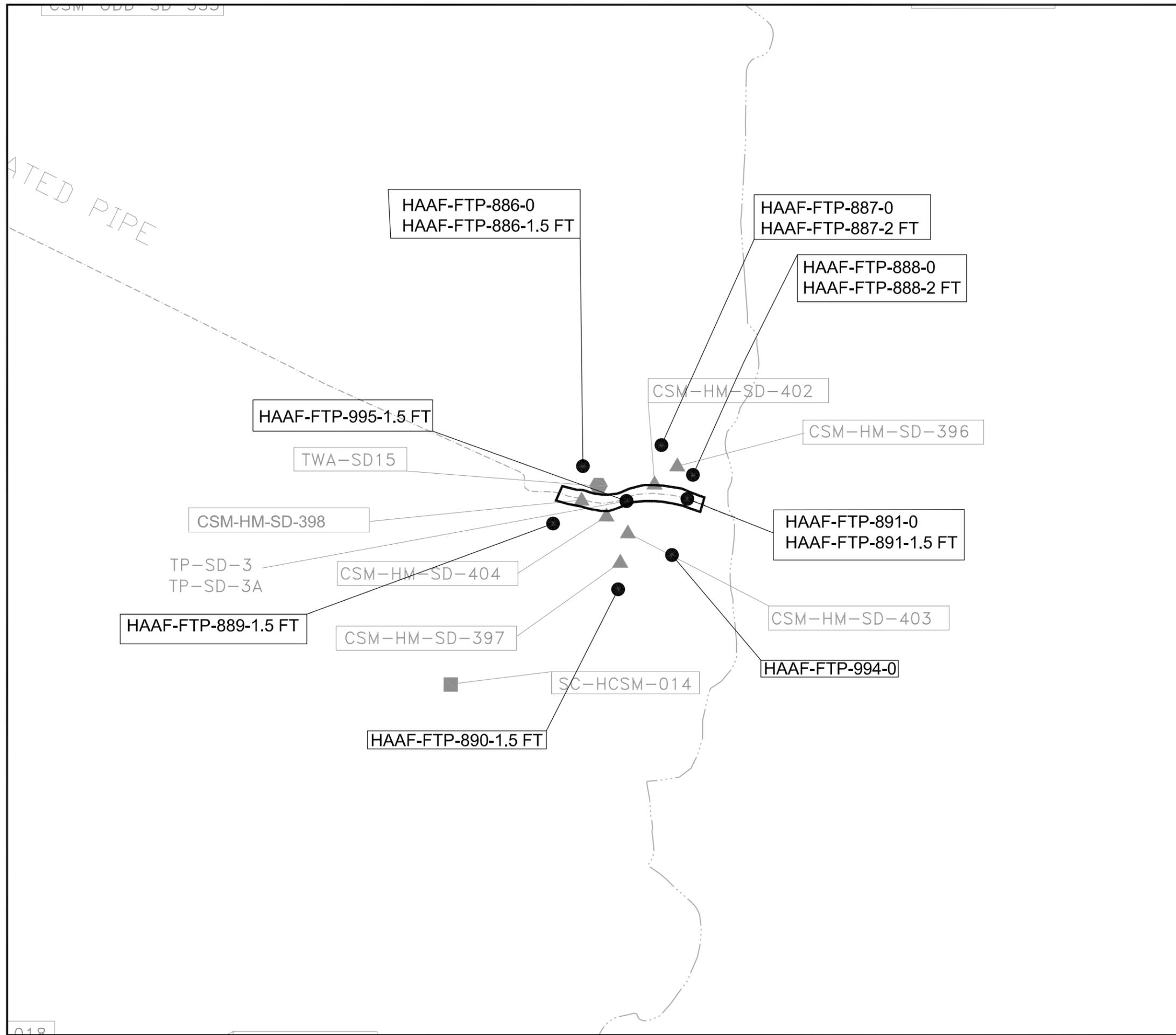
-HCSM-010

PS-SD-112

3

PS-SD-114

HAAF-CHEM-201



**LEGEND**

-  PROPOSED EXCAVATION BOUNDARY
-  PROPOSED SAMPLE LOCATION
-  HISTORICAL SAMPLE LOCATIONS

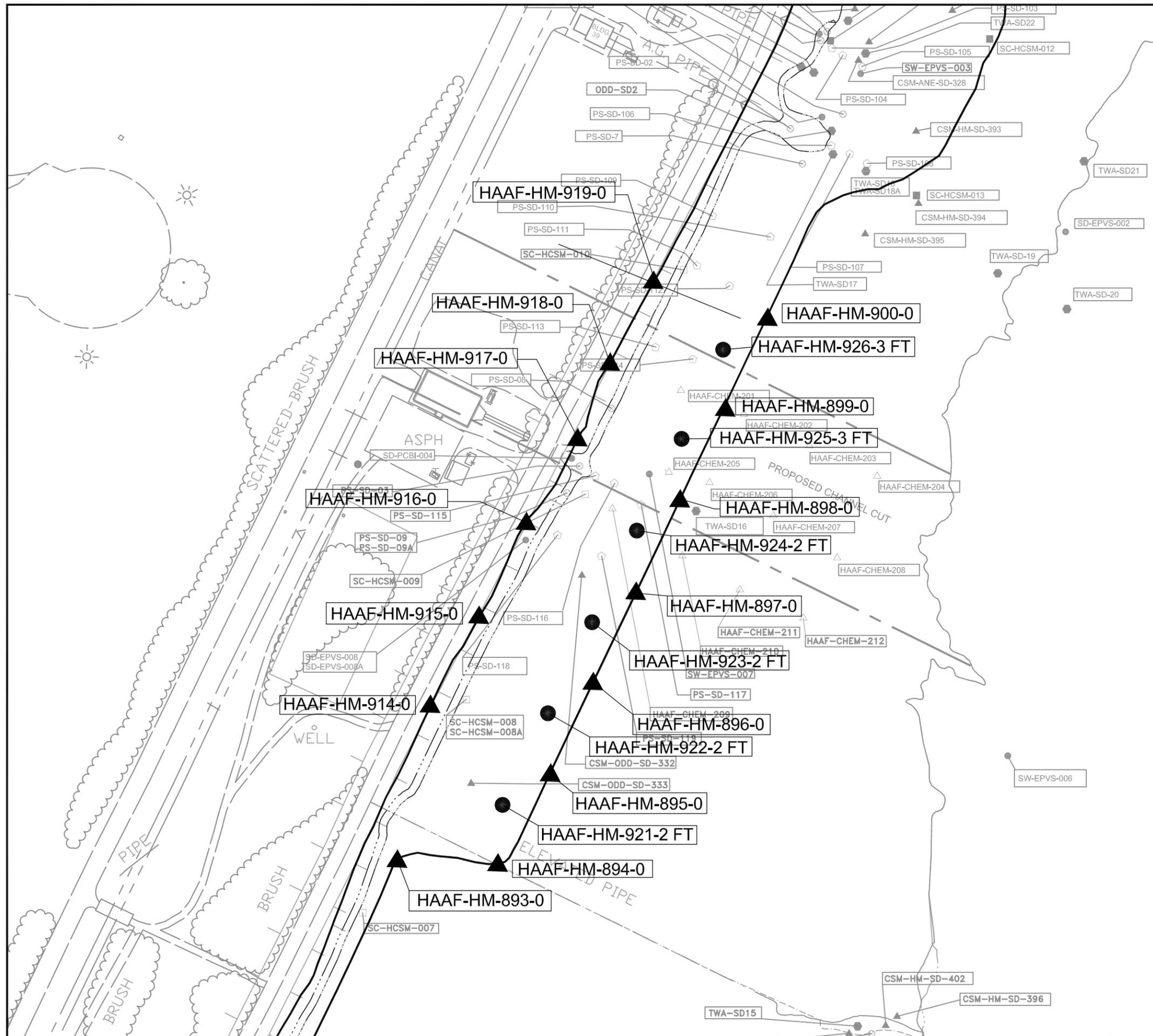


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FIGURE 2-7

**FORMER SEWER TREATMENT  
PLANT OUTFALL AND CHANNEL  
PROPOSED EXCAVATION  
AND SAMPLE LOCATIONS**

COASTAL SALT MARSH  
HAMILTON ARMY AIRFIELD



**LEGEND**

-  PROPOSED EXCAVATION BOUNDARY
-  SIDEWALL SAMPLE LOCATION
-  FLOOR SAMPLE LOCATION
-  HISTORICAL SAMPLE LOCATIONS

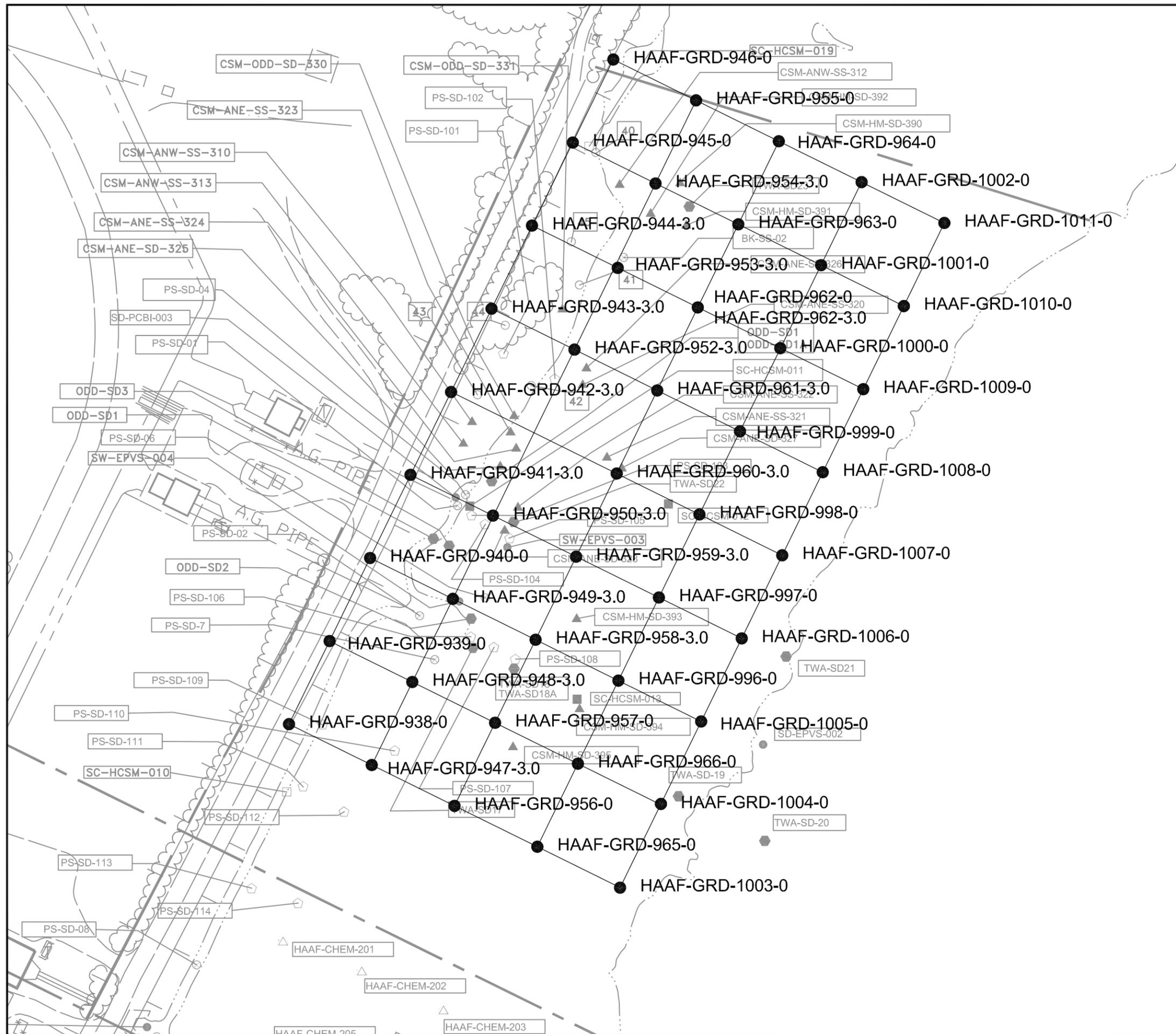


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FIGURE 2-8

**HIGH MARSH PLAIN  
PROPOSED EXCAVATION  
AND SAMPLE LOCATIONS**

COASTAL SALT MARSH  
HAMILTON ARMY AIRFIELD



**LEGEND**

- FLOOR SAMPLE LOCATION
- ▲ ■ ● ▲ ○ HISTORICAL SAMPLE LOCATIONS

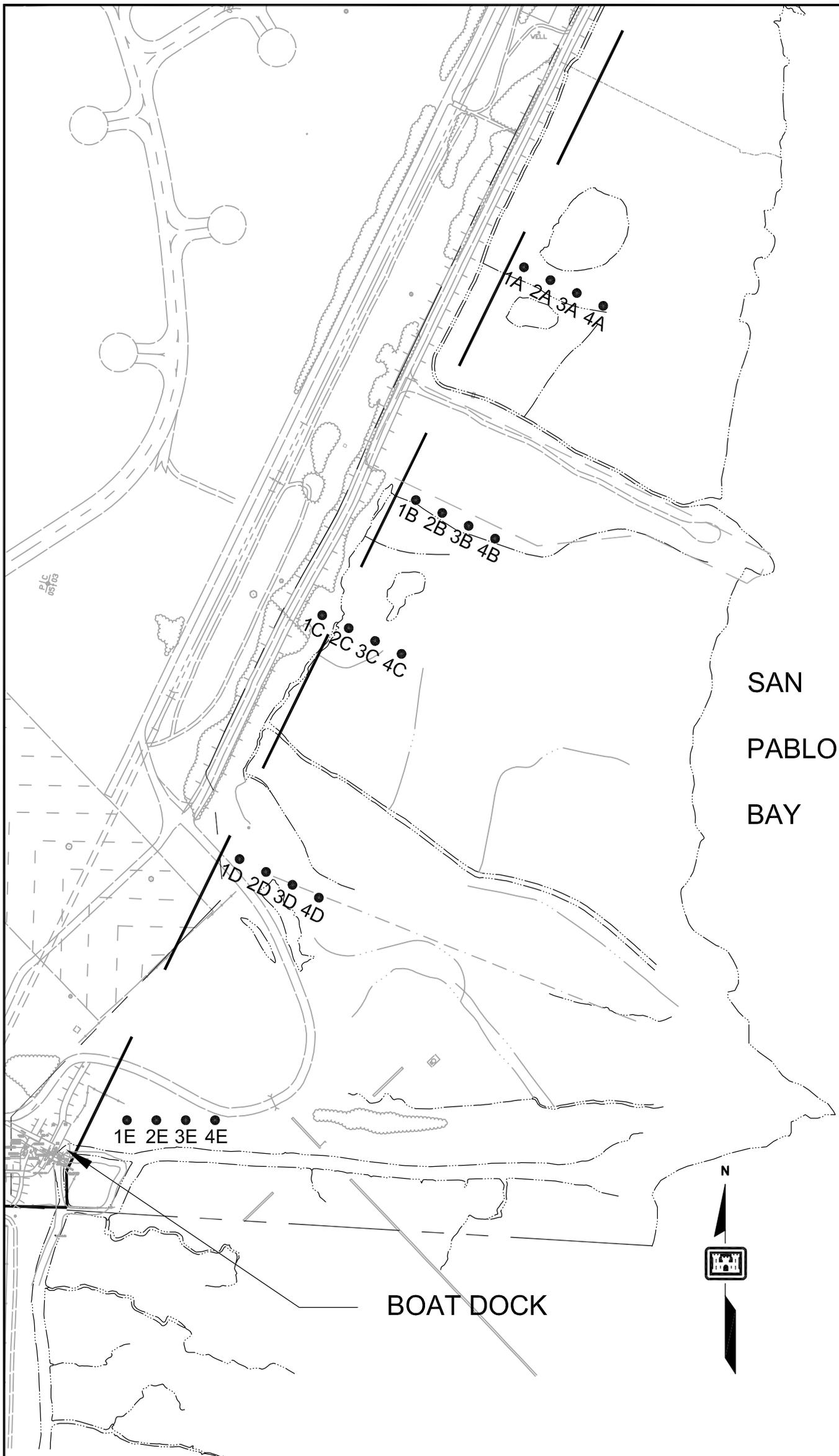


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FIGURE 2-9

**HIGH MARSH GRID  
PROPOSED  
SAMPLE LOCATIONS**

COASTAL SALT MARSH  
HAMILTON ARMY AIRFIELD



SAN  
PABLO  
BAY

BOAT DOCK



GRAPHIC SCALE

0 150' 300' 600' 900'

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FIGURE 2-10

MARSH PLAIN  
DDT ASSAY

COASTAL SALT MARSH  
HAMILTON ARMY AIRFIELD