Final

Main Airfield Parcel Record of Decision/Remedial Action Plan

Hamilton Army Airfield

Novato, California

August 2003

Department of the Army

California Department of Toxic Substances Control

Regional Water Quality Control Board

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Acronyms and Abbreviations

AET	apparent effects threshold
AMSF	Aircraft Maintenance and Storage Facility Area
ARARs	Applicable or Relevant and Appropriate Requirements
Army	U.S. Department of the Army
ASR	Archive Search Report
AST	aboveground storage tank
BAAQMD	Bay Area Air Quality Management District
BCDC	Bay Conservation and Development Commission
bgs	below ground surface
BHC	hexachlorocyclohexane
BMP	best management practice
BRAC	Base Realignment and Closure Act of 1988
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAM	California Assessment Manual
CAMU	corrective action management unit
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response Compensation and Liability Act of 1980
Certification	State Water Quality Certification
CFR	Code of Federal Regulations
cm/s	centimeters per second
COC	chemical(s) of concern
COPC	chemical(s) of potential concern
CWA	Clean Water Act
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene

DDT	dichlorodiphenyltrichloroethane
DHS	Department of Health Services
DoD	Department of Defense
DTSC	California Department of Toxic Substances Control
DWQ	Department of Water Quality
DWR	California Department of Water Resources
EBS	Environmental Baseline Survey
EIR	environmental impact report
ELCDDA	East Levee Construction Debris Disposal Area
EPA	U.S. Environmental Protection Agency
ER-L	effects range-low
ESI	Engineering Sciences, Inc.
ETC	Earth Technology Corporation
FFS	Focused Feasibility Study
FSTP	Former Sewage Treatment Plant
Fund	The Hazardous Substance Response Fund
FW	Foster Wheeler
GSA	General Services Administration
HAAF	Hamilton Army Airfield
HHERA	Human Health and Ecological Risk Assessment
HI	hazard index
HQ	hazard quotient
HTRW	Hazardous, Toxic, and Radiological Waste
HWRP	Hamilton Wetland Restoration Project
ILCR	incremental lifetime cancer risk
IT	International Technologies Corporation
JP-4	jet fuel
LDR	land disposal restriction
LSA	LSA Associates, Inc.

MCPA	methyl chlorophenoxy acetic acid
MCPP	mecoprop
MEK	methyl ethyl ketone
MW	monitoring well
NCP	National Oil and Hazardous Substance Contingency Plan
NEPA	National Environmental Policy Act
NGVD	National Geodectic Vertical Datum
NHP	New Hamilton Partners
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priority List
ODD	Outfall Drainage Ditch
ONSFL	onshore fuel line
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PDD	Perimeter Drainage Ditch
PEL	Permissible Exposure Limit
ppm	parts per million
PQL	Practical Quantitation Limit
PRG	Preliminary Remediation Goal
PSA	Pump Station Area
PWA	Philip Williams & Associates
RAO	remedial action objective
RAP	Remedial Action Plan
RART	Regulatory Agencies and Resource Trustees
RCRA	Resource Conservation and Recovery Act
RCRIS	Resource Conservation and Recovery Information System
RI	Remedial Investigation
ROD	Record of Decision
ROD/RAP	Record of Decision/Remedial Action Plan

RWQCB	Regional Water Quality Control Board
SARA	Superfund Amendments Reauthorization Act of 1986
SCC	California State Coastal Conservancy
SCRs	site cleanup requirements
SD	storm drain
SLC	State Lands Commission
SS	sanitary sewer
the State	DTSC and RWQCB
STLC	Soluble Threshold Limit Concentration
SVOC	semivolatile organic compound
SWRCB	State Water Resources Control Board
TBC	to be considered
TCDD	tetrachlorodibenzo-p-dioxin
TCLP	Toxicity Characteristic Leaching Procedure
TDS	total dissolved solids
TEQ	toxicity equivalence
TMV	toxicity, mobility, volume
TPH	total petroleum hydrocarbons
TPH-d	TPH-diesel
TPH-e	total petroleum hydrocarbons extractables
TPH-g	TPH-gasoline
TPH-motor	total petroleum hydrocarbon measured as motor oil
TPH-P	total petroleum hydrocarbons purgeables
TRPH	total recoverable petroleum hydrocarbons
TTLC	total threshold limit concentration
UCL	upper confidence limit
UHE	unknown extractable hydrocarbons
UHP	unknown purgeable hydrocarbons
U.S.	United States

USACE	United States Army Corps of Engineers
USAF	United States Air Force
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
UST	underground storage tank
VOC	volatile organic compound
WC	Woodward-Clyde
WCC	Woodward-Clyde Consultants
WCFS	Woodward-Clyde Federal Services
WDRs	Waste Discharge Requirements
WRDA	Water Resources Development Act

Executive Summary

Introduction

The following document was developed by the United States Department of the Army (Army), the California Department of Toxic Substances Control (DTSC), and the San Francisco Bay Regional Water Quality Control Board (RWQCB). The former Hamilton Army Airfield (HAAF) has been owned and operated by various branches of the Department of Defense from 1932 to the present. This closed military facility is on the State's Cortese List, but not on the National Priority List (NPL). The Army is responsible for environmental remediation of the Main Airfield Parcel at HAAF as the Department of Defense owner of the property at the time of closure under the Base Realignment and Closure Act of 1988 (BRAC).

This Record of Decision/Remedial Action Plan (ROD/RAP) presents the environmental response actions to be taken by the Army BRAC restoration program and additional environmental assurances to be provided by the Army Civil Works Program through the Hamilton Wetland Restoration Project (HWRP) to address potential risks associated with residual contaminants on the Main Airfield Parcel and restoration of a wetland at HAAF. For the Army, the term "environmental action" relates to Army BRAC response actions and the environmental assurance actions by the Army Civil Works Program.

The HAAF Main Airfield Parcel consists of two distinct areas: the Inboard and the Coastal Salt Marsh. The Inboard Area includes the eastern perimeter levee and property to the west of the eastern perimeter levee. The Coastal Salt Marsh Area includes the property east of the eastern perimeter levee. The Army BRAC program will perform the environmental response actions for the sites listed in Table ES-1, in accordance with: Executive Order 12580; the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) (42 USC section 9601 et seq.); and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). (All tables are included at the end of this Executive Summary.) These response actions will benefit the future land use plans for wetland restoration. The Army Civil Works Program, through the HWRP, and in accordance with Section 101(b)(3) of the Water Resources Development Act of 1999 (WRDA), will take actions to address the potential risks posed by Inboard Area-Wide DDTs and polynuclear aromatic hydrocarbons (PAHs) in soils adjacent to the runway. The Civil Works' ability to participate in the project is subject to the limitations of the project authority.

DTSC and RWQCB (collectively, the "State") are regulating these environmental actions as environmental response actions in accordance with the provisions of California Health and Safety Code; this document constitutes a RAP, subject to Chapter 6.8 of Division 20 of the California Health and Safety Code Section 25356.1. The RWQCB, with DTSC support, will be the lead state agency for oversight of the implementation of this ROD/RAP. The RWQCB, as authorized by the Porter Cologne Water Quality Control Act, will adopt site cleanup requirements (SCRs) to ensure implementation of the final approved ROD/RAP. Through these SCRs, the State will ensure that agreed-upon environmental assurance actions are taken to address residual concentrations of Inboard Area-Wide DDTs and PAHs

in soils adjacent to the runway through the imposition of Waste Discharge Requirements (WDRs) governing the implementation of the HWRP.

The State and Army acknowledge that they have different views regarding the scope of the Army's legal responsibility for the residual concentrations of Inboard Area-Wide DDTs and PAHs in soils adjacent to the runway. Nevertheless, both parties are in full agreement regarding the measures necessary to address the remaining contamination, including these residuals, on the HAAF site.

The Army anticipates transferring 630 of the 644-acre HAAF Main Airfield Parcel to the California State Coastal Conservancy (SCC) to become part of the HWRP. The remaining 14 acres are located under the New Hamilton Partners' levee; it is anticipated that this acreage will be transferred to the City of Novato. The majority of the coastal salt marsh is currently owned by the California State Lands Commission (SLC), having been transferred to the State of California from the Army in 1984. The HWRP is a federal project authorized by the WRDA. The U.S. Army Corps of Engineers, San Francisco District (USACE), will construct the HWRP, and will monitor and adaptively manage it for 13 years thereafter. The SCC, as the local sponsor, will be responsible for operation and maintenance of the HWRP from project completion forward. This ROD/RAP presents the environmental actions that will be conducted by the Army to protect public health and the environment based on the proposed future use of the property for wetland restoration. The Hamilton Reuse Plan designates the Main Airfield Parcel as open space for wildlife habitat restoration and wetland restoration use. If the HWRP does not proceed or is not completed, then this ROD/RAP may be reopened to address environmental actions for other land uses.

The information supporting the environmental actions is contained in the Administrative Record (see Appendix A). The content of the ROD/RAP is based on DTSC policy EO-95-007-PP and the U.S. Environmental Protection Agency's (EPA's) *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents* (EPA, 1999).

Site Description and History

HAAF is a former military installation located on a diked and subsided bayfront parcel in Novato, California. A perimeter levee excludes tidal waters from the inboard area of the former installation. The 644-acre Main Airfield Parcel and other parts of HAAF were identified for closure under BRAC. There are 10 acres of the Main Airfield Parcel that lie outboard of the perimeter levee in the coastal salt marsh. The remaining portion of the coastal salt marsh (78 acres) is on property owned by the SLC. Some of the sites addressed in this ROD/RAP extend beyond the Army Main Airfield Parcel boundary onto property owned by SLC. Figure ES-1 shows the areas that are the subject of this ROD/RAP. (All figures are included following the tables at the end of this Executive Summary.)

The U.S. Army Air Corps constructed HAAF on reclaimed tidal wetland in 1932. Before 1932, the area was known as "Marin Meadows" and had been used as ranch and farm land since the Mexican Land Grant (USACE, undated). Military operations began in December 1932. Bomber, transport, and fighter aircraft were based at the airfield. HAAF played a major role in World War II as a training field and staging area for Pacific Theater operations.

The Airfield was renamed Hamilton Air Force Base in 1947, when it was transferred to the newly created U.S. Air Force (USAF).

In the mid-1960s, the USAF began to curtail Base operations because of increased complaints about aircraft noise and concerns for air traffic and public safety (Earth Technology Corporation [ETC], 1994). In 1974, the USAF deactivated the Base and initiated transfer of the property to other military or government agencies. In the transfer process, the residential portion of the installation, along with support facilities, was transferred to the U.S. Navy in 1975. Custodial management of other areas was taken over by the General Services Administration (GSA). In 1976, the Army was given permission to use the runway and ancillary facilities and several other buildings for regular Army and Army Reserve operations. A parcel in the hangar area was transferred to the U.S. Coast Guard in 1983. The Army continued to use portions of HAAF on a permit basis until 1984, when the Army officially acquired portions of the airfield and property management responsibilities were transferred to the Presidio of San Francisco. Aircraft operations were again discontinued in 1994 when the base was closed.

The Inboard Area was used for various military functions. These functions were supported by underground storage tanks (UST), aboveground storage tanks (AST), transformers and transformer pads, storm drain and sanitary sewer systems, the Former Sewage Treatment Plant (FSTP) (including sludge drying beds), fuel lines, revetment areas, and the Perimeter Drainage Ditch (PDD), which collected runoff from the Base and some surrounding agricultural lands. Portions of the coastal salt marsh were used to support Department of Defense operations on the main airfield. Activities in the coastal salt marsh included emergency rescue operations in San Pablo Bay and disposal of construction debris. Transformers and transformer pads, a winch at the boat dock, and a burn pit at the East Levee Construction Debris Disposal Area (ELCDDA) supported these activities. Additional features of the coastal salt marsh include the Outfall Drainage Ditch (ODD), which receives stormwater runoff and drainage from the main airfield, and the FSTP Outfall, which received main airfield sanitary and industrial wastes from the FSTP.

Based on historical investigations and removal actions to date, the types of contaminants detected at various sites in the HAAF Main Airfield Parcel and adjacent coastal salt marsh include:

- Total petroleum hydrocarbons (TPH), TPH-diesel (TPH-d), TPH-gasoline (TPH-g), jet fuel (JP-4), or TPH-motor oil (TPH-motor)
- Metals
- Dioxins and furans
- Volatile organic compounds (VOCs), such as benzene, ethylbenzene, toluene, and xylenes
- Semivolatile organic compounds (SVOCs) including PAHs
- Polychlorinated biphenyls (PCBs)
- Pesticides/herbicides

Analytical data indicate the presence of residual DDTs throughout the Inboard Area (see Figure ES-2). Analytical data also indicate the presence s of residual PAHs in soils adjacent to the southern end of the runway (see Figure ES-2).

Goals and Objectives

The objective of this ROD/RAP is to remove and/or cover contamination in the Inboard Area, rendering it suitable for open-space wetland restoration. For the coastal salt marsh, the alternative is to remove contaminated soils to the maximum extent practical to protect public health and to maintain its wetland function. For the coastal salt marsh, if any contaminants remaining above action goals are still a concern within the excavated areas, the site will be backfilled to prevent direct exposure to those contaminants. To achieve these objectives, environmental action contaminant concentration goals (action goals) protective of wetland receptors (including sensitive species) are established in this ROD/RAP. The action goals are based primarily on site-specific ambient concentrations, in combination with RWQCB-developed numbers for San Francisco Bay Ambient sediments and NOAA effects-range low (ER-L) sediment concentrations. Table ES-2 presents these action goals. DDTs (DDT and its breakdown products DDE and DDD) have been found throughout the HAAF in surface soils. DDTs are persistent and bioaccumulative toxic substances. Based on professional judgment, in order to protect future receptors from potential risks associated with DDTs, the Army, DTSC, and RWQCB agreed that soils containing a total concentration of DDTs in excess of 1 part per million (ppm) will be excavated and disposed of offsite.

Alternatives

Four environmental action alternatives are presented in this document to address risks to human health and ecological receptors in a wetland environment. The four environmental action alternatives are:

- No Further Action
- Excavation and Offsite Disposal
- Manage In-Situ, with Monitoring and Maintenance, for Army BRAC Sites
- Manage Onsite, with Monitoring and Maintenance, for Army Civil Works Issues

Table ES-3 provides a determination of the preferred alternative for all known areas of chemical contamination.

Alternative 1, No Further Action

Under this alternative, no further action will be taken, and there will be no restrictions placed on the use of the site. For those sites in Table ES-3 that require no further action, the soil contaminant concentrations are currently at levels that do not pose an unacceptable risk to human health and the environment. This low level of residual contamination may have been achieved through previous soil removal actions; or the site did not initially have contaminants at concentrations that posed an unacceptable risk.

Alternative 2, Excavation and Offsite Disposal

Under this alternative, a site will be excavated and the soils will be disposed of at an appropriate offsite landfill facility. For a site that has been determined to require excavation,

Table ES-2 lists the action goals. For the Inboard Area Sites, excavation would continue until the action goals have been achieved. For the coastal salt marsh, excavation will continue until the action goals have been achieved, it is determined by joint agreement of the State and Army that further excavation is impractical, or the State and Army agree that the remaining contamination will not pose an unacceptable risk to human health and the environment.

Alternative 2 would only be considered for sites being addressed by the Army BRAC program shown on Table ES-1. This alternative was not considered for Inboard Area-Wide DDTs or PAHs near the runway. Based on the final HWRP design and geomorphic and scour analyses, sites on Table ES-1 that cannot meet the requirements of Alternative 3 shall be required to be remediated in accordance with Alternative 2.

Activities in the coastal salt marsh will be conducted in a manner that is sensitive to impacts to plants and animals. The excavated areas in the coastal salt marsh will be backfilled with either clean onsite soil or rehandled dredged material of similar physical characteristics, except in the area proposed as a channel cut by the HWRP.

Sites in the Inboard Area that are excavated and shown to meet the action goals identified in Table ES-2 shall be considered to be fully remediated and there will be no institutional controls placed on the use of the site. Excavation activities in the Inboard Area will need to be completed before levee breach. Sites in the coastal salt marsh that are excavated, but do not meet the action goals in Table ES-2, will have institutional controls and monitoring, as appropriate. See Institutional Controls, below, for further information.

Alternative 3, Manage In-Situ, with Monitoring and Maintenance, for Army BRAC Sites

Under this alternative, a performance criteria of 3 feet of stable cover is established for a site where residual concentrations exceed the action goals identified in Table ES-2. The purpose of the performance criteria for this alternative is to eliminate or significantly reduce any potential risk associated with residual concentrations of contaminants by preventing exposure of future wetland receptors to contaminated site soils. Alternative 3 is the final remedy for sites where residual concentrations of contaminants are greater than the action goals listed in Table ES-2 and where the performance criteria can be met.

Alternative 3 would only be considered for sites addressed by the Army BRAC program. This alternative was not considered for Inboard Area-Wide DDTs or PAHs near the runway. For sites where this alternative is selected, the remedy will be implemented by ensuring that 3 feet of stable cover, or equivalent, are provided throughout the life of the wetland. The performance criteria of 3 feet of stable cover shall be achieved from the date of the breach of the outboard levee and restoration of tidal action to the site. The HWRP design and geomorphic and scour analyses will be used to determine whether the performance criteria can be achieved. If affected soils remain in areas of the wetland restoration project that are subject to tidal scour, so that the performance criteria cannot be achieved, then the affected soils shall be excavated and disposed of offsite in accordance with Alternative 2.

The Army shall ensure that the HWRP, including implementation of its plan for monitoring and adaptive management, will achieve and maintain the 3 feet of stable cover, or equivalent, at each site where Alternative 3 is selected (Table ES-3). The duration of the

HWRP obligation shall extend to a date 13 years following the date of levee breach and reintroduction of tidal influence to the Inboard Area. This duration is the limit of the authorized implementation period of the HWRP and after, in accordance with federal law. Throughout the period of implementation of the HWRP and after, the Army and the property owner shall ensure that the remedy for these sites is maintained to the extent necessary to protect human health and the environment.

For sites where this alternative is selected, institutional controls in the form of land-use restrictions and monitoring, will be required where contamination remains at levels above the action goals. See Institutional Controls, below, for further information.

Alternative 4, Manage Onsite, with Monitoring and Maintenance, for Army Civil Works Issues

Under this alternative, performance criteria of 3 feet of stable cover or equivalent measures, as agreed to by the Army and the State, will be established for the areas specified below. The primary purpose of the performance criteria for this alternative is to eliminate or significantly reduce any potential risks associated with residual concentrations of Inboard Area-Wide DDTs and PAHs in soils adjacent to the runway, by preventing exposure of future wetland receptors to site soils contaminated with these compounds. This alternative applies only to sites being addressed by the Army Civil Works Program; it was not considered for BRAC sites listed in Table ES-1. Alternatives 1, 2, and 3 provide requirements for the Army BRAC program to address sites listed in Table ES-1.

Sampling indicates that all surface soils in the Inboard Area are affected by DDTs and soils adjacent to the southern end of the runway are affected by PAHs. The HWRP design and geomorphic and scour analyses will be used to determine whether the performance criteria can be achieved for those portions of the Inboard Area where residual DDTs and PAHs in site soils adjacent to the runway exceed the action goals, identified in Table ES-2, for DDTs and PAHs. Where residual contamination of site soils exceed the action goals for DDTs and PAHs, and the performance criteria cannot be met, the HWRP will, with the concurrence of the State, excavate some or all of the affected soils and manage them onsite. Following any such excavation, the HWRP shall address residual contamination of site soils exceeding the action goals, identified in Table ES-2, for DDTs and PAHs, including both those soils that have been excavated for onsite management and those soils left in place, by implementing 3 feet of stable cover or equivalent measures. The performance criteria shall consist of placement of 3 feet of stable cover of dredged material, or an appropriate alternative action providing a level of protection equivalent to 3 feet of stable cover, as agreed by the Army and RWQCB. This performance criteria shall be achieved as of the date of the breach of the outboard levee and restoration of tidal action to the site, and shall be maintained throughout the life of the wetland.

The Army Civil Works Program shall ensure, through both construction and implementation of its plan for monitoring and adaptive management, that the HWRP will achieve and maintain the performance criteria of 3 feet of stable cover or its equivalent. The duration of this HWRP obligation shall extend 13 years from the date of levee breach and reintroduction of tidal influence to the Inboard Area. This duration is the limit of the authorized implementation period of the HWRP, in accordance with federal law. Thereafter, the property owner shall ensure that the performance criteria for the Inboard Area-Wide DDTs and PAHs in soils adjacent to the runway are maintained to the extent necessary to

protect human health and the environment. The Army and the State have determined that the HWRP will likely be an appropriate and effective mechanism for implementing this alternative.

Institutional controls in the form of land use restrictions and monitoring will be required where contaminant concentrations of Inboard Area-Wide DDTs and PAHs in soils adjacent to the runway remain at levels above the action goals in Table ES-2. See Institutional Controls, below, for further information.

Institutional Controls

Institutional controls in the form of land use restrictions will be required where contamination remains above the action goals shown in Table ES-2. The institutional controls include the following requirements:

Grading, excavation, and intrusive activities must be conducted pursuant to a plan approved by the State.

The property shall not be used for residences, schools, daycare facilities, hospitals, hospices, or similar sensitive uses.

State and federal agencies must have access to the property. The property owner shall provide access, on an as-needed basis, minimizing any interference with the implementation, operation, or maintenance of the ecosystem restoration project. Appropriate federal and state agencies and their officers, agents, employees, contractors, and subcontractors will have the right, upon reasonable notice, to enter the property when it is necessary to carry out response actions or other activities consistent with the purposes of this ROD/RAP. Appropriate federal and state agencies and their officers, agents, employees, contractors, and subcontractors will also have the right, upon reasonable notice, to enter adjoining property, when it is necessary to carry out response actions or other activities consistent with the purposes of this ROD/RAP.

Areas or Activities to be Completed and Closed Out

Several areas of the HAAF property are still under investigation to determine the final activities necessary for protection of the wetlands reuse. The BRAC and GSA soil stockpiles that were generated from previous excavation activities are currently located on paved surfaces. These areas include the following sites identified in the Archive Search Report:

- Testing Range (ASR Site #4)
- Alleged HTRW Disposal Site (ASR Site #8)
- Skeet Range (ASR Site #18)
- Firing-In-Butt (ASR Site #19)

The RWQCB, through its SCR, will detail the process for further investigation and remediation (if needed) of these areas. If remediation is required, the action goals established in this ROD/RAP will apply. All required Army activities must be completed according to a schedule that does not interfere with the progress of the HWRP.

Public Participation

The ROD/RAP process provides an opportunity for public involvement in the decisionmaking process. The ROD/RAP, along with the California Environmental Quality Act (CEQA) Subsequent Environmental Impact Report (EIR), underwent a 45-day public review between June 5, 2003, and July 21, 2003. During the public review period, a notice was published in the *Marin Independent Journal* and the *Novato Advance*. The ROD/RAP and Subsequent EIR were made available for review at the following locations:

Hamilton Administrative Record Library
Hamilton Army Airfield
1 Burma Road
Novato, CA 94949
Contact: Ed Keller, 415-883-6386

Main Branch of the Novato Public Library
Reference Desk
1720 Novato Blvd.
Novato, CA 94947
Contact: Library, 415-898-4623

State of California
Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, CA 95826
Contact: Lance K. McMahan, 916-255-3674

California Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, CA 94612
Contact: Naomi Feger, 510-622-2328

A public meeting was held on July 9, 2003. The draft ROD/RAP and Subsequent EIR have been modified based on public input. With approval of the ROD/RAP, the action goals in this document have become the final action goals and the proposed environmental action alternatives have become the final environmental action for each site. The administrative record in Appendix A provides a list documents that provide additional information on various areas of the site.

Implementation

The RWQCB will adopt SCRs to ensure implementation of the final ROD/RAP. Future technical documents will address wetland design, implementation, operation and maintenance, and long-term monitoring. Figure ES-3 provides the schedule for completing the activities required by this ROD/RAP.

TABLE ES-1
Army BRAC Program Sites
Hamilton Main Airfield Parcel ROD/RAP

Inboard Area Sites
Revetment 18/Building 15
Building 20
Building 26
Building 35/39 Area
Building 41 Area
Building 82/87/92/94/Area (including storm drains)
Building 84/90
Building 86 (including storm drains)
East Levee Generator Pad
Former Sewage Treatment Plant (including sanitary and industrial waste lines)
Northwest Runway Area
Onshore Fuel Line • 54-inch-diameter storm drain segment • Northern segment • Hangar segment
Perimeter Drainage Ditch (PDD) • Lined outside HWRP-proposed channel cut • Lined within HWRP-proposed channel cut • Unlined
PDD Spoil Piles A, B, C, D, E, F, G, H, I, J, K, L, M, and N
Revetments 1 through 17 and 19 through 28 (including storm drains) and Historic Revetments
Tarmac East of Outparcel A-5
Coastal Salt Marsh Sites
Antenna Debris Disposal Area
Area 14
Boat Dock • Channel area • Nonchannel area
East Levee Construction Debris Disposal Area (including burn pit)
Former Sewage Treatment Plant Outfall
High Marsh Area • Proposed channel cut • Nonchannel cut
Historic Outfall Drainage Ditch
Outfall Drainage Ditch

TABLE ES-2
Action Goals
Hamilton Main Airfield Parcel ROD/RAP

Contaminant	Action Goals[a] (ppm)		Source[b]	
	Coastal Salt Marsh	Inboard Area	Coastal Salt Marsh	Inboard Area
Metals				
Arsenic	23	16.7	Site-Specific Sediment Ambient	BRAC Soils Ambient
Barium	188	190	Site-Specific Sediment Ambient	BRAC Soils Ambient
Beryllium	1.68	1.03	Site-Specific Sediment Ambient	BRAC Soils Ambient
Boron	71.6	36.9	Site-Specific Sediment Ambient	BRAC Soils Ambient
Cadmium	1.8	1.2	Site-Specific Sediment Ambient	ER-L
Chromium	149	112	Site-Specific Sediment Ambient	SF Bay Ambient
Cobalt	26.7	27.6	Site-Specific Sediment Ambient	BRAC Soils Ambient
Copper	88.7	68.1	Site-Specific Sediment Ambient	SF Bay Ambient
Lead	46.7	46.7	ER-L	ER-L
Manganese	1260	943	Site-Specific Sediment Ambient	BRAC Soils Ambient
Mercury	0.58	0.43	Site-Specific Sediment Ambient	SF Bay Ambient
Nickel	132	114	Site-Specific Sediment Ambient	BRAC Soils Ambient
Silver	1	1	ER-L	ER-L
Vanadium	136	118	Site-Specific Sediment Ambient	BRAC Soils Ambient
Zinc	169	158	Site-Specific Sediment Ambient	SF Bay Ambient
Semivolatile Organic Compounds (including PAHs)				
PAHs, total	4.022	4.022	ER-L	ER-L
Pentachlorophenol	0.017	--	HHERA—Marine Invertebrate	--
Phenol	0.13	--	HHERA—Marine Invertebrate	--
Petroleum Hydrocarbons				
TPH-dl/TPH-motor oil[c]	144	144	Presidio—Saltwater Ecological Protective Zone	Presidio—Saltwater Ecological Protective Zone
TPH-g/JP-4	12	12	Presidio—Saltwater Ecological Protective Zone	Presidio—Saltwater Ecological Protective Zone
Pesticides/Herbicides/PCBs/Dioxins				
BHCs, total	0.0048	--	Lindane AET (polychaete)	--
Chlordanes, total	0.00479	--	PEL	--
DDTs, total[d]	0.03	0.03	RART—California clapper rail	RART—California clapper rail
Dichlorprop	0.14	--	HHERA—California clapper rail	--
Endrin Aldehyde	0.0064[e]	--	HHERA—Marine Invertebrate	--
Heptachlor	0.0088[f]	--	HHERA—Marine Invertebrate	--

TABLE ES-2
Action Goals
Hamilton Main Airfield Parcel ROD/RAP

	Action Goals[a] (ppm)		Source[b]	
Contaminant	**Coastal Salt Marsh**	**Inboard Area**	**Coastal Salt Marsh**	**Inboard Area**
Heptachlor epoxide	0.0088	--	HHERA—Marine Invertebrate	--
MCPA	7.9[g]	--	HHERA—Marine Invertebrate	--
MCPP	3.0	--	PQL	--
Methoxychlor	0.09	--	HHERA—Marine Invertebrate	--
PCBs, total	0.09	--	HHERA—California clapper rail	--
Dioxins (Total TCDD TEQ)[h]	0.000021	--	EPA	--

NOTE: This is a comprehensive list of action goals. All action goals do not apply at each site. Site-specific action goals are discussed in Sections 2.2 and 3.2.

-- Not applicable

TCDD = tetrachlorodibenzo-p-dioxin
TEQ = toxicity equivalence

[a] If contamination above the action goals is found in the coastal salt marsh beyond those areas already identified as requiring remediation, the Army and State will determine whether additional or continued excavation is warranted by considering the potential risk to public health and the environment from the residual contaminants and the resulting habitat destruction.

[b] The sources of the action goals are:

- **Metals:** Background concentrations for metals were primarily used as action goals unless the background concentrations were less than available risk-based numbers. Site-specific ambient levels from Appendix A—U.S. Army, 2001, *Final Human Health and Ecological Risk Assessment*; Effects Range-Lows (ER-Ls) from Long, E.R, D.D. MacDonald, S.L. Smith, and F.D. Calder, 1995, "Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments," *Environmental Management,* 19:81-97; *San Francisco Bay RWQCB Staff Report: Ambient Concentrations of Toxic Chemicals in San Francisco Bay Sediments*, May 1998.
- **Petroleum hydrocarbons:** *Report of Petroleum Hydrocarbon Bioassay and Point-of-Compliance Concentration Determinations; Saltwater Ecological Protection Zone; Presidio of San Francisco, California,* Dated December 1997. The numbers in this report were developed for a similar site with similar ecological receptors.
- **PAHs:** ER-Ls from Long, E.R, D.D. MacDonald, S.L. Smith, and F.D. Calder, 1995, "Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments," Environmental Management, 19:81-97. The ER-Ls were used as action goals because the ER-Ls are accepted as being protective of ecological receptors.
- **SVOCs:** US Army, 2001, *Final Human Health and Ecological Risk Assessment.*
- **Pesticides, Herbicides, PCBs, and Dioxins:** Table 5-1 from the US Army, 2001, *Final Human Health and Ecological Risk Assessment* (marine invertebrate–amphipod and California clapper rail); practical quantitation limits (PQLs) from previous sampling events were used when no other ecologically-based numbers were available with achievable detection limits; U.S. EPA, 1993a, *Interim Report on Data and Methods for Assessment of 2,3,7,8-Tetrachlorodibenzo-p-dioxin Risks to Aquatic Life and Associated Wildlife*. (EPA/600/R-93/-055); for lindane and total chlordane, Screening Quick Reference Tables (SQuiRTs), NOAA, updated September 1999 were used as the best available ecological number when no other references were available. The DDT values were developed in the Coastal Salt Marsh Focused Feasibility Study (CH2M HILL, 2003).

[c] The action goal for TPH diesel/TPH motor oil is also used as the action goal for UHE (unknown hydrocarbons extractable).

[d] The total DDT concentration in the Coastal Salt Marsh Area or Inboard Area shall not exceed 1.0 ppm. Areas with total DDT concentrations greater than 1.0 ppm shall be excavated and disposed of offsite.

[e] The goal for Endrin Ketone is used as a surrogate for Endrin Aldehyde.

[f] The goal for Heptachlor Epoxide is used as a surrogate for Heptachlor.

[g] The goal for 2,4,D is used as a surrogate for MCPA.

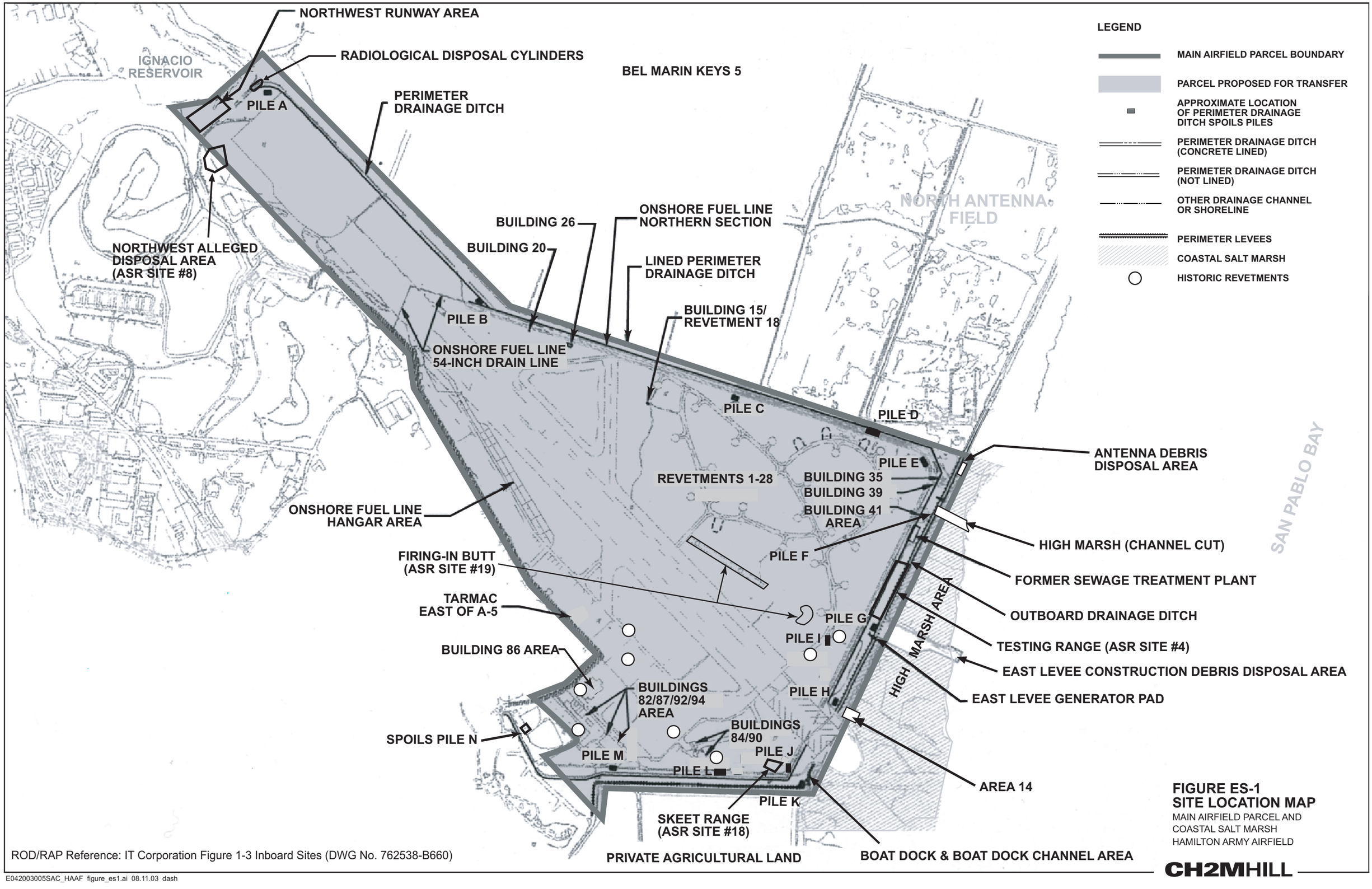
[h] Dioxin is only considered a COC at the ELCDDA Burn Pit.

TABLE ES-3
Summary of Preferred Alternatives

Alternative	Sites
1—No Further Action	Revetment 18/Building 15
	Building 20
	Building 84/90
	Perimeter Drainage Ditch (PDD) Spoils Piles E and H
	East Levee Generator Pad
	Tarmac East of Outparcel A-5
	Northwest Runway Area
	Revetments 5, 8 through 10, 15, 17, 20, 24, 27, and 28
	Radiological Waste Disposal Cylinders
2—Excavation and Offsite Disposal	East Levee Construction Debris Disposal Area (including burn pit)
	High Marsh Area • proposed channel cut • nonchannel cut
	Historic Outfall Drainage Ditch
	Outfall Drainage Ditch
	Boat Dock • nonchannel area • channel area
	Area 14
	Former Sewage Treatment Plant Outfall
	Antenna Debris Disposal Area
	Building 35/39 Area
	PDD Unlined (Addressing DDTs > 1 ppm)
	Building 41 Area
	PDD Spoils Pile F
	Revetments 6 and 7
	PDD, lined portion within proposed wetland channel
3—Manage In-Situ, with Monitoring, Maintenance, for Army BRAC Sites	Former Sewage Treatment Plant (including sanitary and industrial waste lines)
	Building 26
	Building 35/39 Area
	Building 82/87/92/94/Area (including storm drains)
	Building 86 (including storm drains)
	PDD (lined portion outside proposed wetland channel)
	PDD (unlined)
	PDD Spoil Piles A, B, C, D, G, I, J, K, L, M, and N
	Onshore Fuel Line • 54-inch-diameter Storm Drain Segment • Northern Segment • Hangar Segment
	Revetments 1 through 4, 11 through 14, 16, 19, 21 through 23, 25, and 26 (including storm drains and historic revetments)

TABLE ES-3
Summary of Preferred Alternatives

Alternative	Sites
4—Manage Onsite, with Monitoring and Maintenance, for Army Civil Works Issues	Inboard Area-Wide DDTs and PAHs in soils adjacent to the runway



ROD/RAP Reference: IT Corporation Figure 1-3 Inboard Sites (DWG No. 762538-B660)

FIGURE ES-1
SITE LOCATION MAP
MAIN AIRFIELD PARCEL AND
COASTAL SALT MARSH
HAMILTON ARMY AIRFIELD

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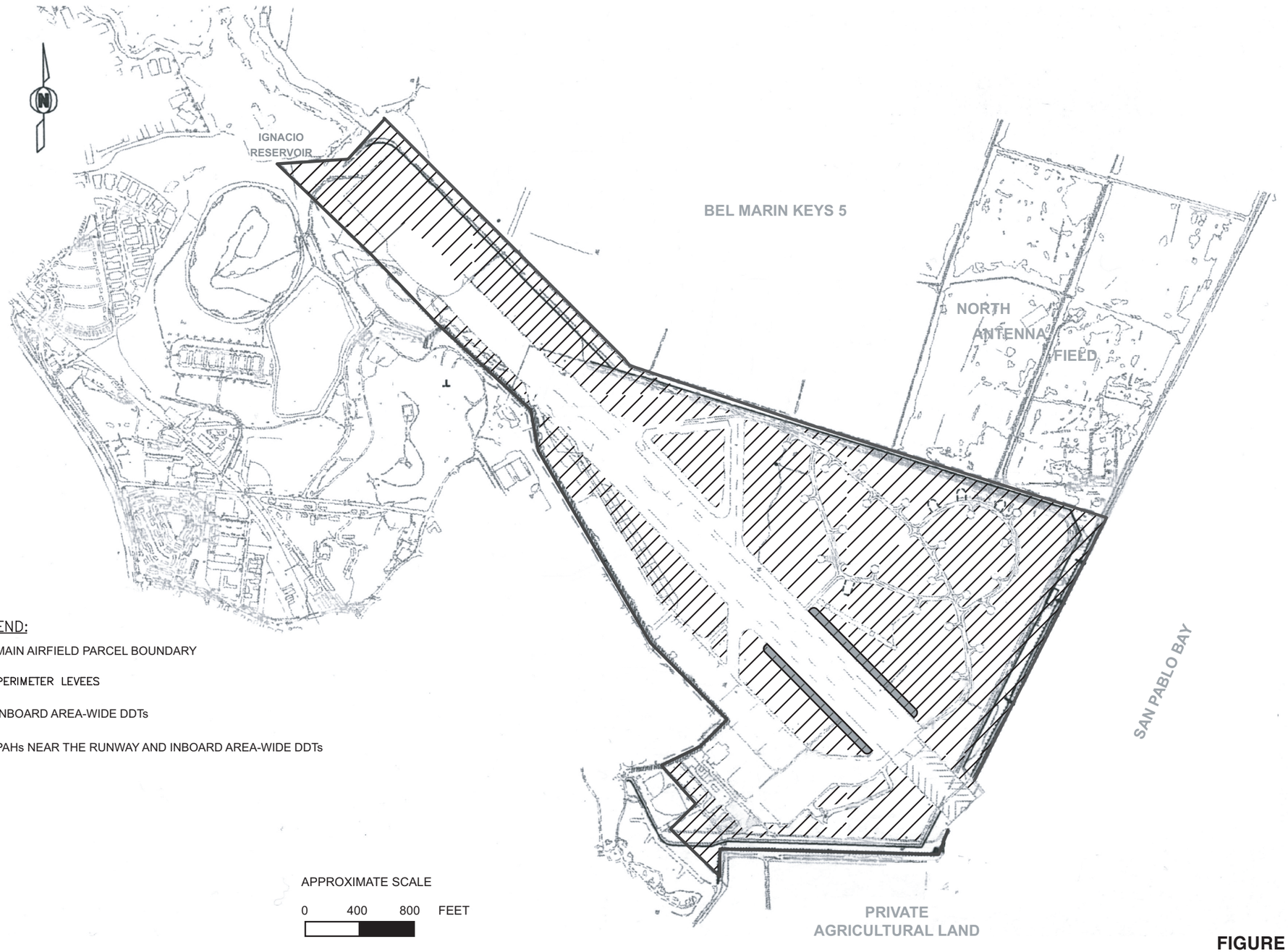
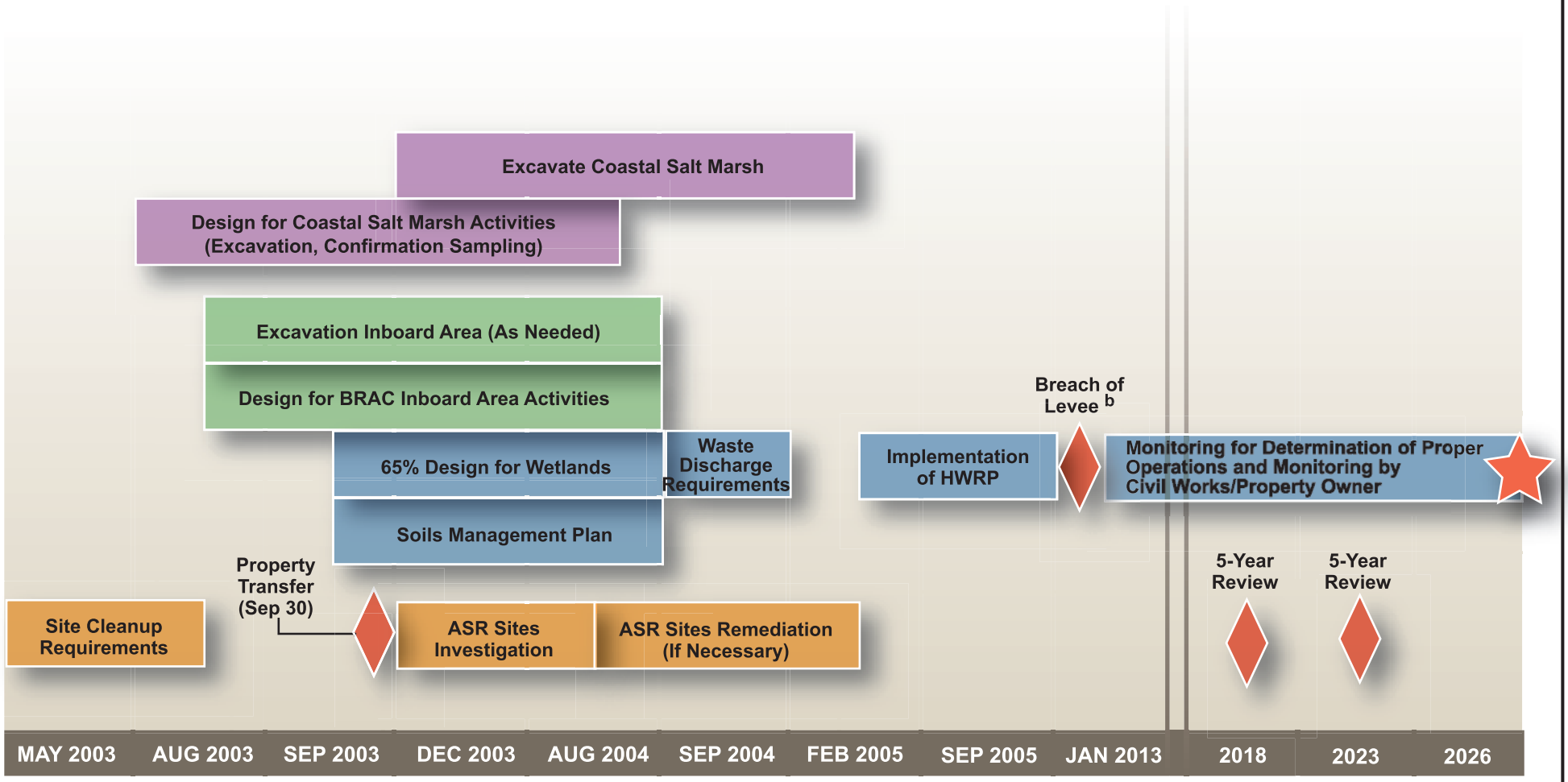


FIGURE ES-2
INBOARD AREA-WIDE DDTs AND PAHs NEAR THE RUNWAY MAIN AIRFIELD PARCEL
HAMILTON ARMY AIRFIELD

ROD/RAP Reference: IT Corporation Figure 1-3 Inboard Sites (DWG No. 762538-B660)

E042003005SAC_HAAF es_2.ai 05.01.03 dfacile

CH2MHILL



[a] *These dates are anticipated to be based on the current project understanding and are presented for planning purposes. The dates do not constitute obligations or deadlines and will be further refined through the adoption of the Site Cleanup Requirements.*

[b] *Completion of ROD/RAP requirements, except monitoring. Levee breach is currently expected to occur eight years after commencement of the HWRP implementation as along as the requirements of the ROD/RAP are met.*

FIGURE ES-3
APPROXIMATE SCHEDULE OF CLEANUP ACTIVITIES [a]
MAIN AIRFIELD PARCEL
HAMILTON ARMY AIRFIELD

SECTION 1

Introduction

This introduction provides the background and purpose of the Record of Decision/Remedial Action Plan (ROD/RAP), presents an overview of the property and sites being addressed, and describes the hydrogeological setting, ecological communities, and land uses of the property and sites. This introduction also presents the organization of the remainder of the document.

1.1 Background

This document was developed by the United States Department of the Army (Army), the Department of Toxic Substances Control (DTSC), and the Regional Water Quality Control Board (RWQCB). The Former Hamilton Army Airfield (HAAF) has been owned and operated by various branches of the Department of Defense from 1932 to the present. See Figure 1-1 for the location of HAAF. (All figures are included at the end of this section, following the tables for Section 1.) This closed military facility is on the State's Cortese List, but not on the National Priority List (NPL). The Army is responsible for environmental remediation of the Main Airfield Parcel at HAAF as the Department of Defense owner of the property at the time of closure under the Base Realignment and Closure Act of 1988 (BRAC). See Figure 1-2 for BRAC property locations.

This ROD/RAP presents the environmental response actions to be taken by the Army BRAC restoration program and additional environmental assurances to be provided by actions that the Army Civil Works Program will take through the Hamilton Wetland Restoration Project (HWRP) to address potential risks associated with residual contaminants on the Main Airfield Parcel at HAAF and restoration of a wetland at HAAF.

For the Army, the term "environmental actions" relates to Army BRAC response actions and the environmental assurance actions by the Army Civil Works Program. The HAAF Main Airfield Parcel consists of two distinct areas: (1) the Inboard Area includes the eastern perimeter levee and the property to the west of the eastern perimeter levee; and (2) the Coastal Salt Marsh Area includes the Army-owned property east of the eastern perimeter levee. This ROD/RAP evaluates sites located in the HAAF Main Airfield Parcel and adjacent coastal salt marsh owned by the California State Lands Commission (SLC). The Army BRAC program will perform the environmental response actions for the sites listed in Table 1-1 in accordance with Executive Order 12580; the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) (42 USC Section 9601 et seq.); and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). (All tables for this section are included at the end Section 1.) These response actions will benefit the future land use plans for wetland restoration. The Army Civil Works Program through the HWRP, and in accordance with Section 101 (b)(3) of the Water Resources Development Act of 1999 (WRDA), will take actions to address the potential risks posed by Inboard Area-Wide DDTs and polynuclear aromatic hydrocarbons (PAHs) in soils adjacent to the runway. The Civil Works' ability to participate in the project is subject to the limitations of the project authority.

DTSC and the RWQCB (collectively, the "State") are regulating these environmental actions as environmental response actions in accordance with the provisions of California Health and Safety Code; this document constitutes a RAP subject to Chapter 6.8 of Division 20 of the California Health and Safety Code Section 25356.1. The RWQCB, with DTSC support, will be the lead state agency for oversight of the implementation of this ROD/RAP. The RWQCB, as authorized by the Porter Cologne Water Quality Control Act, will adopt site cleanup requirements (SCRs) that will ensure implementation of the final approved ROD/RAP. Through these SCRs, the State will ensure that agreed-upon environmental assurance actions are taken to address residual concentrations of Inboard Area-Wide DDTs and PAHs in soils adjacent to the runway through the imposition of Waste Discharge Requirements (WDRs) governing the implementation of the HWRP.

The State and Army acknowledge that they have different views regarding the scope of the Army's legal responsibility for the residual concentrations of Inboard Area-Wide DDTs and PAHs in soils adjacent to the runway. Nevertheless, both parties are in full agreement as to the measures necessary to address the remaining contamination, including these residuals, on the HAAF site.

The Army anticipates transferring 630 of the 644-acre HAAF Main Airfield Parcel to the California State Coastal Conservancy (SCC) to become part of the HWRP. The remaining 14 acres is located under the New Hamilton Partners' levee and it is anticipated that this property will be transferred to the City of Novato. The majority of the coastal salt marsh is currently owned by the SLC, having been transferred to the State of California from the Army in 1984. The HWRP is a federal project authorized by the WRDA. The U.S. Army Corps of Engineers, San Francisco District (USACE), will construct the HWRP, and will monitor and adaptively manage it for 13 years thereafter. The SCC, as the local sponsor, would be responsible for operation and maintenance of the HWRP from project completion forward. This ROD/RAP presents the environmental actions to be conducted by the Army necessary to protect public health and the environment based on the proposed future use of the property for wetland restoration. The Hamilton Reuse Plan designates the Main Airfield Parcel as open space for wildlife habitat restoration and wetland restoration use. If the HWRP does not proceed or is not completed, this ROD/RAP may be reopened to address environmental actions for other land uses.

The information supporting the environmental actions is contained in the Administrative Record (see Appendix A). The content of the ROD/RAP is based on DTSC policy EO-95-007-PP and the U.S. Environmental Protection Agency's (EPA's) *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents* (EPA, 1999).

1.2 Facility Overview

HAAF is a former military installation located on a diked and subsided bayfront parcel in the City of Novato, California. A perimeter levee excludes tidal waters from the inboard area of the former installation. The 644-acre Main Airfield Parcel and other parts of HAAF were identified for closure under BRAC. There are 10 acres of the parcel that lie outboard of the perimeter levee in the coastal salt marsh. The remaining portion of the coastal salt marsh (approximately 78 acres) is located on property owned by the SLC. Some of the sites being addressed in this ROD/RAP extend beyond the Army BRAC property boundary onto property owned by the SLC. Figure 1-3 shows the areas that are the subject of this ROD/RAP.

The U.S. Army Air Corps constructed HAAF on reclaimed tidal wetland in 1932. Before 1932, the area was known as Marin Meadows and had been used as ranch and farm land since the Mexican Land Grant (USACE, undated). Military operations began in December 1932. Bombers, transport, and fighter aircraft were based at the airfield. HAAF played a major role in World War II as a training field and staging area for Pacific Theater operations. The Airfield was renamed Hamilton Air Force Base in 1947, when it was transferred to the newly created U.S. Air Force (USAF).

In the mid-1960s, the USAF began to curtail Base operations because of increased complaints about aircraft noise and concerns for air traffic and public safety (Earth Technology Corporation [ETC], 1994). In 1974, the USAF deactivated the Base and initiated transfer of the property to other military or government agencies. In the transfer process, the residential portion of the installation, along with support facilities, was transferred to the U.S. Navy in 1975. Custodial management of other areas was taken over by the General Services Administration (GSA). In 1976, the Army was given permission to use the runway and ancillary facilities and several other buildings for regular Army and Army Reserve operations. A parcel in the hangar area was transferred to the U.S. Coast Guard in 1983. The Army continued to use portions of HAAF on a permit basis until 1984, when the Army officially acquired portions of the airfield and property management responsibilities were transferred to the Presidio of San Francisco. Aircraft operations were again discontinued in 1994 when the base was closed.

The Inboard Area was used for a variety of military functions. These functions were supported by underground storage tanks (UST), aboveground storage tanks (AST), transformers and transformer pads, storm drain and sanitary sewer systems, the Former Sewage Treatment Plant (FSTP) (including sludge drying beds), fuel lines, revetment areas, and the Perimeter Drainage Ditch (PDD), which collected runoff from the Base, as well as from some surrounding agricultural lands. Portions of the coastal salt marsh were used to support Department of Defense operations on the main airfield. Activities within the coastal salt marsh included emergency rescue operations in San Pablo Bay and disposal of construction debris. Transformers and transformer pads, a winch at the boat dock, and a burn pit at the East Levee Construction Debris Disposal Area (ELCDDA) supported these activities. Additional features of the coastal salt marsh include the Outfall Drainage Ditch (ODD), which receives stormwater runoff and drainage from the main airfield, and the FSTP Outfall, which received main airfield sanitary and industrial wastes from the FSTP.

Based on historical investigations and removal actions to date, the types of contaminants detected at various sites within the HAAF Main Airfield Parcel and adjacent coastal salt marsh include:

- Total petroleum hydrocarbons (TPH), TPH-diesel (TPH-d), TPH-gasoline (TPH-g), jet fuel (JP-4), or TPH-motor oil (TPH-motor)
- Metals
- Dioxins and furans
- Volatile organic compounds (VOCs) such as benzene, ethylbenzene, toluene, and xylenes
- Semivolatile organic compounds (SVOCs) including PAHs

- Polychlorinated biphenyls (PCBs)
- Pesticides/herbicides

Analytical data indicate the presence of residual DDTs throughout the Inboard Area (see Figure 1-4). Analytical data indicate that residual PAHs are present in soils adjacent to the runway (see Figure 1-4).

1.3 Purpose

The objective of this ROD/RAP is to remove and/or cover contamination in the Inboard Area, rendering it suitable for open-space wetland restoration. For the coastal salt marsh, the alternative is to remove contaminated soils to the maximum extent practical to protect public health and to maintain its wetland function. For the coastal salt marsh, if any contaminants remaining above action goals are still a concern within the excavated areas, the site will be backfilled to prevent direct exposure to these contaminants. To achieve these objectives, environmental action contaminant concentration goals (action goals) protective of wetland receptors (including sensitive species) are established in this ROD/RAP. The action goals are based primarily on site-specific ambient concentrations, in combination with RWQCB-developed numbers for San Francisco Bay Ambient sediments in combination with National Oceanic and Atmospheric Administration (NOAA) effects-range low (ER-L) sediment concentrations. Table 1-2 presents these action goals. DDTs (DDT, and its breakdown products DDE and DDD) have been found throughout the HAAF in surface soils. DDTs are persistent and bioaccumulative toxic substances. It was agreed that soils containing a total concentration of DDTs in excess of 1 part per million (ppm) shall be excavated and disposed of offsite.

1.4 Hydrogeological Setting, Ecological Communities, and Land Uses

The following sections describe the hydrogeology, land use, biological habitats, and biota currently existing within the HAAF Main Airfield Parcel and adjacent marsh. This background information aids in the understanding of past work conducted within this area and is, in part, the basis for development of remedial alternatives.

1.4.1 Existing Hydrogeological Setting

Three shallow hydrogeologic units occur within the HAAF Main Airfield Parcel and adjacent marsh: fill, soft Bay Mud, and desiccated Bay Mud. The "fill" was originally used to reclaim the bay margin lowlands for agriculture and has very similar content and hydrogeological properties to the Bay Mud. A different type of "fill" referenced in the Remedial Investigation (RI) (IT, 1999a) is the imported construction material used for geotechnical applications and foundation and drainage properties and is not part of the hydrogeologic unit. This type of "fill" may be found in pipeline trenches and as a bridging layer beneath some of the formerly developed areas. This fill will be referred to as "imported fill" when used. Permeabilities and groundwater flow characteristics are summarized below:

- Fill materials have moderate to low hydraulic conductivities. Preferential groundwater flow through the fill may be controlled by the distributions of different fill types.
- Soft Bay Mud generally has low hydraulic conductivity. Preferential flow, if existent, is probably horizontal and confined to peat layers or shell lenses, which are discontinuous and limited in aerial extent.
- Desiccated Bay Mud has low hydraulic conductivity with some fracture permeability. The desiccation cracks are potentially transient in nature and may heal or infill during periods of saturation.

1.4.2 Groundwater Use

The HAAF is located on the eastern side of the Novato Creek groundwater basin and is part of the regional San Pablo groundwater basin defined by the drainage entering San Pablo Bay. Existing and potential beneficial uses of groundwater within the Novato Creek basin include municipal and domestic water supply, rare and endangered species preservation, freshwater wildlife habitats, and recreational use (RWQCB, 1995).

As part of the remedial assessment summary for the GSA Phase II Sale Area (IT, 1998), the available well records at the California Department of Water Resources (DWR) and Marin County Environmental Health were reviewed to evaluate the current regional uses of groundwater within the vicinity of the HAAF. The review included all domestic, industrial, and irrigation supply wells within a 2-mile radius of the airfield and included available DWR well logs and Marin County Environmental Health records. There are 11 supply wells located within a 2-mile radius of the HAAF. Most of the wells in the vicinity of the HAAF are used for domestic or irrigation supply, and all of these wells appear to be outside the influence of historical HAAF activities. Only one well is located within 1 mile of the HAAF property boundary.

Groundwater beneath the Main Airfield Parcel and adjacent marsh is not now, nor is it likely to be, used for drinking water. State Water Resources Control Board (SWRCB) Policy 88-63 specifies that total dissolved solids (TDS) in excess of 3,000 milligrams per liter (mg/L) renders groundwater unsuitable for drinking. The TDS concentrations in groundwater from monitoring wells across the property range from 819 to 18,270 mg/L with an average TDS concentration of 4,898 mg/L (IT, 1999a). These findings indicate that groundwater beneath the Main Airfield Parcel and adjacent marsh is generally unsuitable for drinking because the average TDS concentration exceeds the 3,000 mg/L limit.

Sampling activities for groundwater are discussed in Appendix B. Based on the findings presented in Appendix B, it is concluded that no further action is required for groundwater. Groundwater is not evaluated further in this ROD/RAP report.

1.4.3 Hydrology

HAAF is in the southern portion of the Novato Creek Drainage Basin and Watershed (EIP Associates, 1993). Historically, tidal marsh and mudflats covered the area. The main slough channel drainage system in the HAAF panhandle area (the rectangular area to the east of Ammo Hill and to the northwest of the triangular pond) drained to the northwest into the tidal reaches of Novato Creek (PWA, 1998), which then drained into San Pablo Bay.

Using a system of levees and drainage ditches, the area that is now HAAF was reclaimed for agricultural use in the late 1800s.

Surface water flow is generally from the upland areas in the west toward the San Pablo Bay in the east. From areas west of HAAF, Pacheco Creek and Arroyo San Jose carry surface water along the northwestern boundary of HAAF. Both Pacheco Creek and Arroyo San Jose discharge into the Ignacio Reservoir, which occupies approximately 120 acres and has a storage capacity of 480 acre-feet (JSA, 1998). The reservoir drains into Novato Creek through a leveed channel with a flap-gate outlet located at the Bel Marin Keys Boulevard bridge.

Stormwater drainage system conduits ranging in diameter from less than 12 inches to as large as 54 inches in diameter are distributed in several general areas of the HAAF. The component lines in each network span various distances and lie at various depths. One network drains the mid-airfield just north of the revetment area. Another network drains the revetment area itself, while a third drains the aircraft maintenance area to the west of the revetments. The drains in the Aircraft Maintenance and Storage Facility Area (AMSF) convey water to discharge into the PDD to the west of the central portion of the airfield (CH2M HILL, 2001). This water is then conveyed through a network of drainage ditches and the PDD, which conveys drainage to three pump stations (Buildings 35, 39, and 41) on the margin of San Pablo Bay.

Runoff from the adjacent Landfill 26 area and 40 acres in the northern Reservoir Hill area enters the panhandle and drains into the PDD, located parallel to the northern border of the airfield. The runoff from the north side of Reservoir Hill enters the panhandle through a culvert in the south corner of the panhandle. Modified underground storm drains along the northwest and southwest sides of the panhandle convey Reservoir Hill runoff into the northern PDD. The northern PDD conveys stormwater to the eastern end of the airfield, where the aforementioned three pumps transport runoff from the airfield into San Pablo Bay (JSA, 1998).

Seasonal surface runoff from the Landfill 26 area is routed around the landfill in grass-lined swales and temporary ponds into a small depression north of the landfill. This pond releases runoff to the panhandle via a 4-foot-diameter tide-gated culvert that empties into a drainage ditch, then enters a seasonal wetland mitigation site. When water in the wetland reaches an elevation of –3 feet National Geodetic Vertical Datum (NGVD), it spills over a constructed weir into the PDD (PWA, 1998). A portion of the PDD, located along the southern and eastern sides of the airfield, carries runoff from other parts of the airfield and from adjacent property west and south of the airfield to the HAAF pumps (PWA, 1998). The PDD system receives drainage from the New Hamilton Partnership development, the eastern portion of the Coast Guard housing area, and other areas adjacent to the west side of the airfield that are conveyed to the ditch in two outfalls: one near Reservoir Hill (west outfall) and one near the southwest corner of the airfield (east outfall) (JSA, 1998). The PDD collects and transports runoff inboard of the levees and routes it to pump stations on the east side of the property. Pumps transport the water over the levee where it discharges into the ODD (IT, 1997a), which empties into San Pablo Bay.

1.4.4 Existing/Future Land Use

Inboard Area

The Main Airfield Parcel has not been used for military operations since the mid-1980s with the exception of infrequent runway use before 1994. Currently, site features include paved areas such as parking areas, the abandoned runway and former revetment areas; nonpaved areas of both upland and wetland habitat; and several structures (most of which are abandoned). The Environmental Baseline Survey (CH2M HILL, 2003b) provides additional information on existing and former buildings and their uses. A wetland mitigation area was also constructed near the northern end of the former runway as a mitigation project associated with Landfill 26, which is located adjacent to the HAAF Main Airfield Parcel and is not a part of this ROD/RAP. As described in the previous section, the PDD provides drainage for properties adjacent to the Main Airfield Parcel including the New Hamilton Partnership development, the eastern portion of the Coast Guard housing area, the Landfill 26 area, and Reservoir Hill.

There are no residential housing or developed recreational areas within the HAAF Main Airfield Parcel and adjacent coastal salt marsh. However, adjacent properties that were part of the larger HAAF, particularly to the west, have been, or are in the process of being, developed for residential and/or commercial uses.

Wetlands restoration on the portion of the Inboard Area and the adjoining abandoned antenna field that, together, constitute the wetland project area is consistent with and helps implement applicable local, regional, and state plans, including the Hamilton Reuse Plan, the City of Novato General Plan, and the San Francisco Bay Conservation and Development Commission San Francisco Bay Plan. There are three wetland project objectives that satisfy the above-mentioned plans: (1) to create a diverse array of wetland and wildlife habitats that benefit a number of threatened, endangered, and other species; (2) to reduce in-water disposal of dredged material and beneficially reuse dredged sediment as wetland cover materials, as feasible; and (3) to facilitate the base-closure and reuse process.

This ROD/RAP evaluates the need for remediation and the remedial alternatives at HAAF based on its beneficial use as wetlands. Under the future wetlands end use, the existing levee adjacent to the airfield will be breached, and water from San Pablo Bay would be allowed to reclaim the airfield, eventually returning the area to a tidal marsh. Because much of the Inboard Area has subsided to elevations below that of a productive salt marsh, the HWRP plans to raise the elevation of the inboard area by placing imported fill material augmented by natural sedimentation. Initially, main tidal channels will be constructed and lower-order channels will form naturally.

The initial construction phase of the wetlands restoration project is scheduled for approximately 5 to 8 years. Following construction, the levee will be breached and the wetlands will be allowed to equilibrate and mature. The wetland is expected to reach maturity approximately 30 years after levee breach.

Coastal Salt Marsh

The coastal salt marsh will continue to serve as a functioning salt marsh habitat in the future. This ROD/RAP evaluates the remedial alternatives based on beneficial use as

wetlands. Under the future-wetlands end-use project, the coastal salt marsh will remain a tidal wetland after remediation.

1.4.5 Existing Biological Communities

This section contains descriptions of habitats and biota currently existing within the HAAF Main Airfield Parcel and the adjacent coastal salt marsh. This summary is not intended to be an exhaustive compilation of plants and wildlife but, rather, a list of potential ecological receptors.

Several studies since 1986 have characterized the biological resources (flora and fauna) in the vicinity of the HAAF Main Airfield Parcel. The surveys were conducted in support of environmental impact reports for base closure and subsequent use of BRAC property. The discussions of biological resources in this section are based on reports by EIP Associates (1986 and 1993) and USACE (1994). Information in these reports includes results of botanical field surveys conducted in August 1993 and May 1994, and wildlife surveys conducted in May 1994.

Additional wildlife investigations were conducted in 1997 and 1998 and include the following:

- Bat survey (LSA, 1997a)
- *California Clapper Rail* (*Rallus longirostris obsoletus*) *and California Black Rail* (*Laterallus jamaicensis coturniculus*) *Survey* (LSA, 1998)
- *Burrowing Owl* (*Athene cunicularia*) *Study and Relocation* (LSA, 1997a)
- *Red-legged Frog* (*Rana aurora*) *Survey* (LSA, 1997b)

There are some differences among the various HAAF documents as to which special-status species, of those not actually observed on the property or salt marsh areas, are likely to be present. The *Hamilton Wetland Restoration Plan, Volume II: Final EIR/EIS* (JSA, 1998) lists 56 special-status species and evaluates their potential for occurrence, or reports documented observations. It is concluded from this information that after elimination of species for which habitat is lacking or species that may only incidentally use the site, 14 special-status species are known to occur or are assumed to use suitable habitat at the site. These species include:

- Longfin smelt (*Spirinchus thaleichthys*)
- Central California steelhead (*Oncorhynchus mykiss*)
- Central California Coast Coho salmon (*Oncorhynchus kisutch*)
- Chinook salmon (*Oncorhynchus tshawytscha*)
- Double-crested cormorant (*Phalacrocorax auritus*)
- California brown pelican (*Pelicanus occidentalis californicus*)
- California clapper rail
- California black rail
- Northern harrier (*Circus cyaneus*)
- White-tailed kite (*Elanus leucurus*)
- Burrowing owl
- Salt marsh common yellowthroat (*Geothlypis trichas sinuosa*)

- San Pablo song sparrow (*Melospiza melodia samuelis*)
- Salt marsh harvest mouse (*Reithrodontomys raviventris*)

The California Department of Fish and Game also indicated the coastal salt marsh is appropriate habitat for the Suisun Shrew (*Sorex ornatus sinuosus*).

Habitats in the Inboard Area consist primarily of upland habitat (grassland), paved and or landscaped areas. Within the Inboard Area, a portion of the site (approximately 0.25 acre) lies within Ignacio Reservoir, which is a wetland created as a mitigation measure. Ignacio Reservoir provides habitat for several species. In addition, a wildlife habitat was established at the northwest end of the site as wetland mitigation for destruction of habitat associated with the construction of a cap over Landfill 26. The Inboard Area (excluding Ignacio Reservoir) also provides habitat for the gopher snake (*Pituophis catenifer*), western fence lizard (*Sceloporus occidentalis*), turkey vulture (*Cathartes aura*), red-tailed hawk (*Buteo jamaicensis*), white-tailed kite (*Elanus leucurus)*, northern harrier (*circus cyaneus*), American kestrel (*Falco sparverius*), California quail (*Callipepla californica*), ring-necked pheasant (*Phasianas colchicus*), savannah sparrow (*Passerculus sandwichensis*), western meadowlark (*Sturnella neglecta*), black-tailed jackrabbit (*Lepus bennettii*), desert cottontail (*Sylvilagus audubonii*), black-tailed deer (*Odocoileus hemionus*), coyote (*Canis latrans*), striped skunk (*Mephitis mephitis*), and raccoon (*Procyon lotor*). The western burrowing owl, a species of concern, has previously occurred in the Inboard Area and several individuals have been captured and relocated offsite. The seasonal wetlands provide foraging habitat for great egrets, (*Ardea alba*), red-winged blackbirds (*Agelaius phoeniceus*), shorebirds, killdeer (*Charadrius vociferus*), raccoon, and aquatic garter snakes (*Thamnophis* spp.). Coastal salt marsh and brackish marsh under tidal influence are located between the perimeter levee at the eastern end of the project area and the open water of San Pablo Bay (Figure 1-3). This habitat can be divided into three distinct zones, based on the frequency and duration of tidal inundation (Figure 1-5) (USACE, 2000):

- Low marsh is inundated daily and occupies the elevations between mean tide level and mean high water. In the project area, low marsh is adjacent to the open water of San Pablo Bay and is dominated by California cord grass (*Spartina foliosa*).

- Middle marsh habitat occupies the elevations between mean high water and mean higher high water and is dominated by common pickleweed (*Salicornia* sp). Middle marsh is predominant outboard of the perimeter levee and is inundated frequently throughout each month, although for shorter periods than low marsh.

- High transitional marsh habitat occupies the elevations between mean higher high water and the highest tide level; this habitat is inundated infrequently and for short periods. High marsh habitat occupies a narrow strip along the bay side of the levee and supports plant species that are tolerant of saline conditions, but have not adapted to frequent, long-term inundation, including salt grass (*Distichlis spicata*), alkali heath (*Frankenia salina*), fat-hen salt plant (*Atriplex patula ssp hastata [A. triangularis]*), and gum plant (*Grindelia* sp). The tidal coastal salt marsh community provides food, cover, and breeding habitat for many wetland-dependent wildlife species. The dense vegetation and large invertebrate populations typically associated with salt marshes provide ideal nesting and foraging conditions for a variety of bird species including rails, egrets, herons, waterfowl, and shorebirds. In addition to being important habitat for wetland-associated wildlife, the salt marsh community is also a crucial component of the San Pablo Bay ecosystem, providing

nutrients and organic matter to the mudflats and open water of the bay. These, in turn, are important habitats for a variety of waterfowl, shorebirds, and other water birds. Wildlife species observed in this habitat include double-crested cormorant, great blue heron (*Ardea herodias*), great egret, American coot (*Fulica americana*), killdeer, northern harrier (*Circus cyaneus*), black rail, California clapper rail, and San Pablo song sparrow. Other species expected to use coastal salt marsh habitat include the longfin smelt, small fish, invertebrates, raccoon, suisun shrew (*Sorex ornatus sinuosus*), salt marsh harvest mouse (*Reithrodontomys raviventris*), mallard (*Anas platyrhynchus*), sora (*Porzana carolina*), Virginia rail, the endangered California brown pelican (*Pelecanus occidentalis californicus*), salt marsh yellowthroat (*Geothlypis trichas sinuosa*), and willet (*Catoptrophorus semipalmatus*).

- Brackish marsh occurs along portions of the ODD. Because marsh vegetation associated with ditches occurs in narrow linear bands, these habitat areas typically support a lower diversity of wildlife than do larger, more contiguous units of brackish marsh. Drainage ditch banks and channels also provide foraging habitat and cover for species such as herons, egrets, and dabbling ducks, and movement corridors for striped skunks, raccoons, and other species.

1.5 Document Organization

This introduction has provided the background and purpose of the ROD/RAP, presented an overview of the property being addressed, and described the hydrogeological setting, ecological communities, and land uses of the property and sites.

The remainder of this document has been organized as follows:

Section 2 contains information regarding site background, risk assessment, action goals, remedial actions, remedial alternatives, and proposed actions for the Inboard Area sites.

Section 3 contains information regarding site background, risk assessment, action goals, remedial actions, remedial alternatives, and proposed actions for the coastal salt marsh.

Section 4 provides a summary of the proposed actions for sites located in both the Inboard Area and the coastal salt marsh.

Section 5 provides references for the ROD/RAP.

Appendices are as noted in the table of contents.

Tables and figures are provided following the primary sections in which they are cited. For example, tables and figures for Section 2.1 can be found following Section 2.1 text (with tables occurring first, followed by figures).

TABLE 1-1
Army BRAC Program Sites
Hamilton Main Airfield Parcel ROD/RAP

Inboard Area Sites
Revetment 18/Building 15
Building 20
Building 26
Building 35/39 Area
Building 41 Area
Building 82/87/92/94/Area (including storm drains)
Building 84/90
Building 86 (including storm drains)
East Levee Generator Pad
Former Sewage Treatment Plant (including sanitary and industrial waste lines)
Northwest Runway Area
Onshore Fuel Line • 54-inch-diameter storm drain segment • Northern segment • Hangar segment
Perimeter Drainage Ditch (PDD) • Lined outside HWRP-proposed channel cut • Lined within HWRP-proposed channel cut • Unlined
PDD Spoil Piles A, B, C, D, E, F, G, H, I, J, K, L, M, and N
Revetments 1 through 17 and 19 through 28 (including storm drains)
Tarmac East of Outparcel A-5
Coastal Salt Marsh Sites
Antenna Debris Disposal Area
Area 14
Boat Dock • Channel area • Nonchannel area
East Levee Construction Debris Disposal Area (including burn pit)
Former Sewage Treatment Plant Outfall
High Marsh Area • Proposed channel cut • Nonchannel cut
Historic Outfall Drainage Ditch
Outfall Drainage Ditch

TABLE 1-2
Action Goals
Hamilton Main Airfield Parcel ROD/RAP

	Action Goals[a] (ppm)		Source[b]	
Contaminant	**Coastal Salt Marsh**	**Inboard Area**	**Coastal Salt Marsh**	**Inboard Area**
Metals				
Arsenic	23	16.7	Site-Specific Sediment Ambient	BRAC Soils Ambient
Barium	188	190	Site-Specific Sediment Ambient	BRAC Soils Ambient
Beryllium	1.68	1.03	Site-Specific Sediment Ambient	BRAC Soils Ambient
Boron	71.6	36.9	Site-Specific Sediment Ambient	BRAC Soils Ambient
Cadmium	1.8	1.2	Site-Specific Sediment Ambient	ER-L
Chromium	149	112	Site-Specific Sediment Ambient	SF Bay Ambient
Cobalt	26.7	27.6	Site-Specific Sediment Ambient	BRAC Soils Ambient
Copper	88.7	68.1	Site-Specific Sediment Ambient	SF Bay Ambient
Lead	46.7	46.7	ER-L	ER-L
Manganese	1260	943	Site-Specific Sediment Ambient	BRAC Soils Ambient
Mercury	0.58	0.43	Site-Specific Sediment Ambient	SF Bay Ambient
Nickel	132	114	Site-Specific Sediment Ambient	BRAC Soils Ambient
Silver	1	1	ER-L	ER-L
Vanadium	136	118	Site-Specific Sediment Ambient	BRAC Soils Ambient
Zinc	169	158	Site-Specific Sediment Ambient	SF Bay Ambient
Semivolatile Organic Compounds (including PAHs)				
PAHs, total	4.022	4.022	ER-L	ER-L
Pentachlorophenol	0.017	--	HHERA—Marine Invertebrate	--
Phenol	0.13	--	HHERA—Marine Invertebrate	--
Petroleum Hydrocarbons				
TPH-dl/TPH-motor oil[c]	144	144	Presidio—Saltwater Ecological Protective Zone	Presidio—Saltwater Ecological Protective Zone
TPH-g/JP-4	12	12	Presidio—Saltwater Ecological Protective Zone	Presidio—Saltwater Ecological Protective Zone
Pesticides/Herbicides/PCBs/Dioxins				
BHCs, total	0.0048	--	Lindane AET (polychaete)	--
Chlordanes, total	0.00479	--	PEL	--
DDTs, total[d]	0.03	0.03	RART—California clapper rail	RART—California clapper rail
Dichlorprop	0.14	--	HHERA—California clapper rail	--
Endrin Aldehyde	0.0064[e]	--	HHERA—Marine Invertebrate	--
Heptachlor	0.0088[f]	--	HHERA—Marine Invertebrate	--

TABLE 1-2
Action Goals
Hamilton Main Airfield Parcel ROD/RAP

	Action Goals[a] (ppm)		Source[b]	
Contaminant	**Coastal Salt Marsh**	**Inboard Area**	**Coastal Salt Marsh**	**Inboard Area**
Heptachlor epoxide	0.0088	--	HHERA—Marine Invertebrate	--
MCPA	7.9[g]	--	HHERA—Marine Invertebrate	--
MCPP	3.0	--	PQL	--
Methoxychlor	0.09	--	HHERA—Marine Invertebrate	--
PCBs, total	0.09	--	HHERA—California clapper rail	--
Dioxins (Total TCDD TEQ)[h]	0.000021	--	EPA	--

NOTE: This is a comprehensive list of action goals. All action goals do not apply at each site. Site-specific action goals are discussed in Sections 2.2 and 3.2.

-- Not applicable

TCDD = tetrachlorodibenzo-p-dioxin
TEQ = toxicity equivalence

[a] If contamination above the action goals is found in the coastal salt marsh beyond those areas already identified as requiring remediation, the Army and State will determine whether additional or continued excavation is warranted by considering the potential risk to public health and the environment from the residual contaminants and the resulting habitat destruction.

[b] The sources of the action goals are:

- **Metals:** Background concentrations for metals were primarily used as action goals unless the background concentrations were less than available risk-based numbers. Site-specific ambient levels from Appendix A - U.S. Army, 2001, *Final Human Health and Ecological Risk Assessment*; Effects Range-Lows (ER-Ls) from Long, E. R, D. D. MacDonald, S. L. Smith, and F. D. Calder, 1995, "Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments," *Environmental Management,* 19:81-97; *San Francisco Bay RWQCB Staff Report: Ambient Concentrations of Toxic Chemicals in San Francisco Bay Sediments*, May 1998.
- **Petroleum hydrocarbons:** *Report of Petroleum Hydrocarbon Bioassay and Point-of-Compliance Concentration Determinations; Saltwater Ecological Protection Zone; Presidio of San Francisco, California,* Dated December 1997. The numbers in this report were developed for a similar site with similar ecological receptors.
- **PAHs:** ER-Ls from Long, E.R, D.D. MacDonald, S.L. Smith, and F.D. Calder, 1995, "Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments," Environmental Management, 19:81-97. The ER-Ls were used as action goals because the ER-Ls are accepted as being protective of ecological receptors.
- **SVOCs**: US Army, 2001, *Final Human Health and Ecological Risk Assessment*.
- **Pesticides, Herbicides, PCBs, and Dioxins:** Table 5-1 from the US Army, 2001, *Final Human Health and Ecological Risk Assessment* (marine invertebrate–amphipod and California clapper rail); practical quantitation limits (PQLs) from previous sampling events were used when no other ecologically-based numbers were available with achievable detection limits; U.S. EPA, 1993a, *Interim Report on Data and Methods for Assessment of 2,3,7,8-Tetrachlorodibenzo-p-dioxin Risks to Aquatic Life and Associated Wildlife*. (EPA/600/R-93/-055); for lindane and total chlordane, Screening Quick Reference Tables (SQuiRTs), NOAA, updated September 1999 were used as the best available ecological number when no other references were available. The DDT values were developed in the Coastal Salt Marsh Focused Feasibility Study (CH2M HILL, 2003).

[c] The action goal for TPH diesel/TPH motor oil is also used as the action goal for UHE (unknown hydrocarbons extractable).

[d] The total DDT concentration in the Coastal Salt Marsh Area or Inboard Area shall not exceed 1.0 ppm. Areas with total DDT concentrations greater than 1.0 ppm shall be excavated and disposed of offsite.

[e] The goal for Endrin Ketone is used as a surrogate for Endrin Aldehyde.

[f] The goal for Heptachlor Epoxide is used as a surrogate for Heptachlor.

[g] The goal for 2,4,D is used as a surrogate for MCPA.

[h] Dioxin is only considered a COC at the ELCDDA Burn Pit.

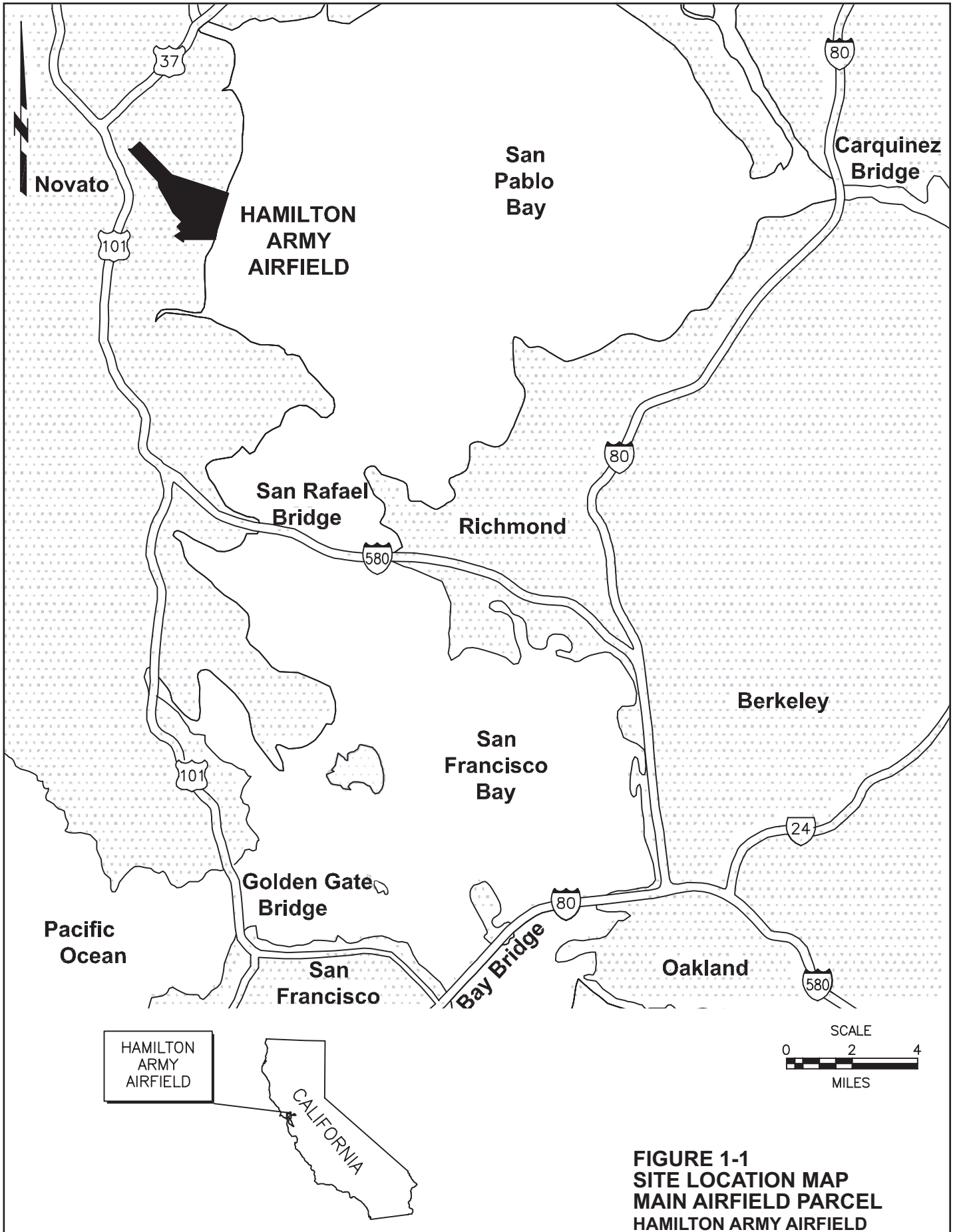
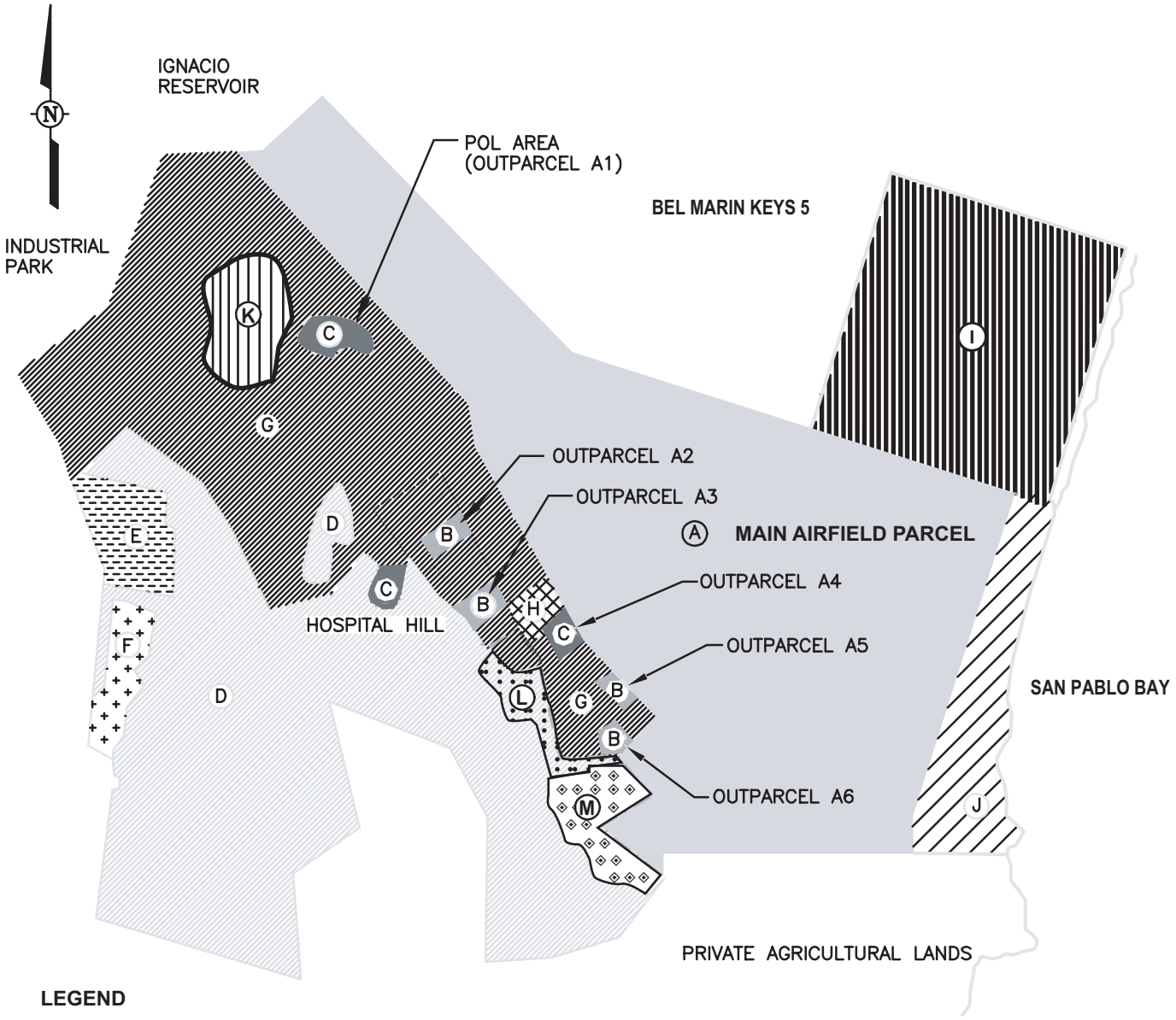


FIGURE 1-1
SITE LOCATION MAP
MAIN AIRFIELD PARCEL
HAMILTON ARMY AIRFIELD

EBS
Reference: IT Corporation Figure 1-1 Site Location Map

CH2MHILL

E042003005SAC_HAAF fig_1_1.ai 05.20.03 esm



LEGEND

- (A) MAIN AIRFIELD PARCEL
- (B) FORMER BRAC PROPERTY TRANSFERRED
- (C) BRAC PROPERTY SUBJECT TO SEPARATE ENVIRONMENTAL REMEDIAL DOCUMENTATION
- (D) TRANSFERRED NAVY PROPERTY
- (E) LANHAM HOUSING
- (F) NOVATO SCHOOL DISTRICT
- (G) TRANSFERRED GSA SALE PARCEL
- (H) U.S. COAST GUARD
- (I) NORTH ANTENNA FIELD
- (J) STATE OF CALIFORNIA COASTAL SALT MARSH
- (K) GSA PROPERTY - LANDFILL 26
- (L) PUBLIC BENEFIT CONVEYANCE FROM THE NAVY TO THE CITY OF NOVATO
- (M) NAVY PROPERTY

APPROXIMATE SCALE

0 1000 2000 FEET

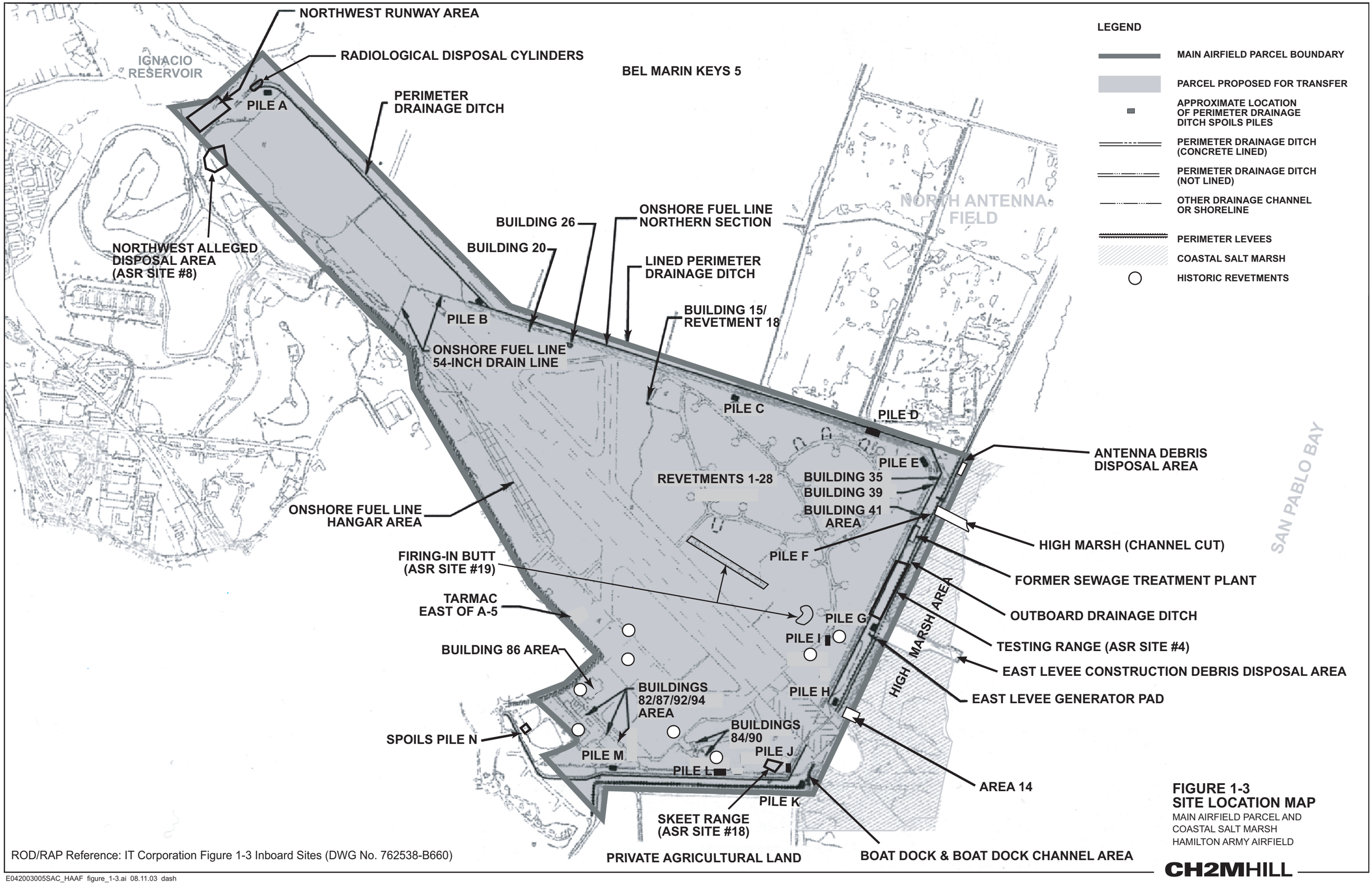
FIGURE 1-2
HAMILTON ARMY AIRFIELD
PROPERTY LOCATION MAP

EBS

Reference: IT Corporation Figure 2-1, BRAC Property Location Map (DWG No. 762538-A96)

E042003005SAC_HAAF fig_1_2.ai 05.22.03 dfacile

CH2MHILL



ROD/RAP Reference: IT Corporation Figure 1-3 Inboard Sites (DWG No. 762538-B660)

FIGURE 1-3
SITE LOCATION MAP
MAIN AIRFIELD PARCEL AND
COASTAL SALT MARSH
HAMILTON ARMY AIRFIELD

CH2MHILL

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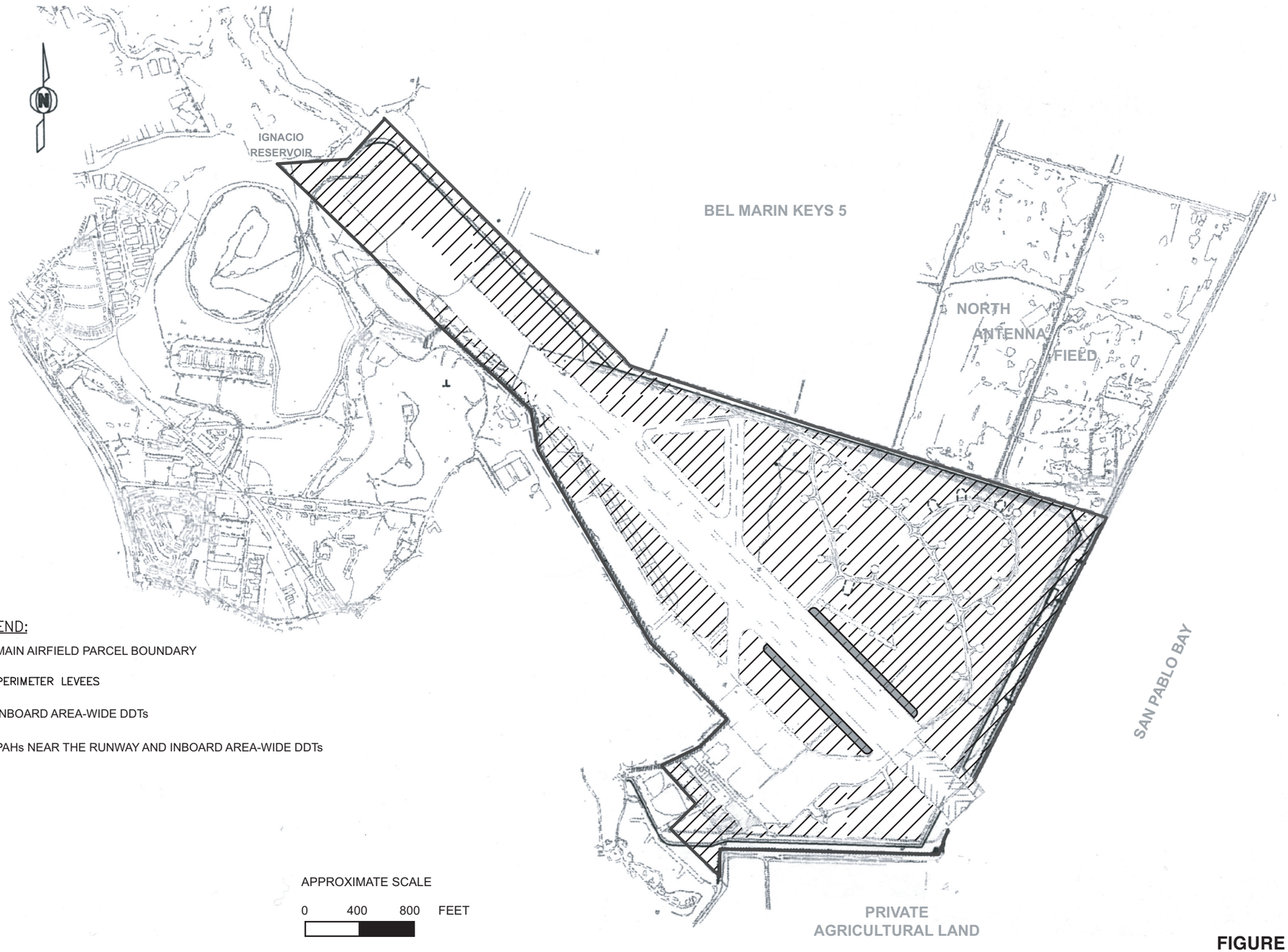
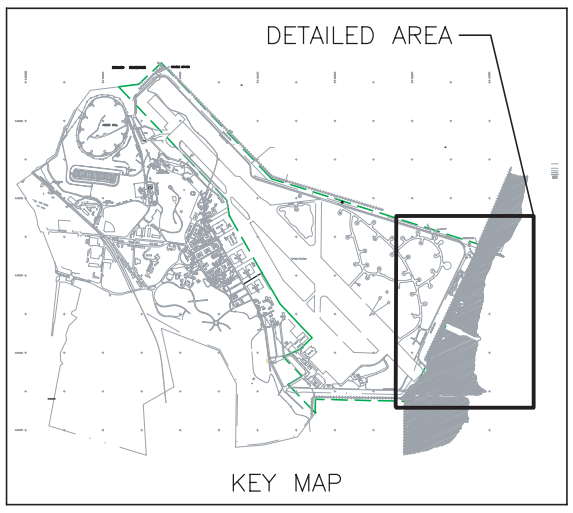


FIGURE 1-4
INBOARD AREA-WIDE DDTs AND PAHs NEAR THE RUNWAY MAIN AIRFIELD PARCEL
HAMILTON ARMY AIRFIELD

ROD/RAP Reference: IT Corporation Figure 1-3 Inboard Sites (DWG No. 762538-B660)

E042003005SAC_HAAF FIG_1_4.ai 05.01.03 dfacile

CH2MHILL



N

MAIN AIRFIELD PARCEL

LEVEE
VAULT
PUMP STATION AREA
ONSHORE AND OFFSHORE FUEL LINE
PERIMETER ROAD
PERIMETER DRAINAGE DITCH
LOW MARSH
ROAD
ROAD
LOW MARSH
CHANNEL
SAN PABLO BAY

LEGEND

- Main Airfield Parcel Boundary
- Perimeter Drainage Ditch
- Levee
- Coastal Salt Marsh Area
- Pond
- Middle Marsh*- the middle marsh is the predominant habitat outboard of the perimeter levee. This area occupies the elevations between mean high water and mean higher high water and is dominated by pickleweed . The middle marsh habitat is inundated frequently throughout each month, although for shorter periods of time than the low marsh.
- High Marsh*-- the high marsh is located in a narrow strip between the outboard levee and the ODD and several other areas of higher ground near the ELCDDA. This habitat occupies elevations between mean higher high water and the highest tide level and is inundated infrequently for only short periods of time.
- Low Marsh*- the low marsh is located adjacent to the open water of San Pablo Bay and in the ditches within the coastal salt marsh (i.e. ODD, Historic ODD and Boat Dock Channel). This habitat occupies the elevations between the mean tide level and mean high water and is inundated daily.

* Estimated habitat boundaries based on aerial photograph reviews

0 300

APPROXIMATE SCALE IN FEET

FIGURE 1-5
COASTAL SALT MARSH HABITATS
HAMILTON ARMY AIRFIELD

ROD/RAP

CH2MHILL

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SECTION 2.0

Inboard Area Sites

Section 2.0 contains all of the information related to the Inboard Area sites. This section is organized as follows:

2.1: Site Background and Extent of Contamination provides background information and discusses the nature of contamination for each site located in the Inboard Area. It includes a brief summary of the historical investigations and describes, in general terms, the nature of contamination found at the Inboard Area sites. Background information on each Army BRAC site is provided, along with a discussion of additional Army BRAC environmental concerns and other environmental issues to be addressed by the HWRP.

2.2: Overview of Risk Assessment and Action Goals provides an overview of the risk assessment and the process used to establish action goals for Inboard Area sites. It presents details about the processes used to determine contaminants of concern (COCs) and to establish action goals.

2.3: Remedial Action Objectives (RAOs) describes the goals that proposed remedial actions are expected to accomplish, the development of RAOs, identifies RAOs for the Inboard Area sites, and presents how the different agencies (DTSC, RWQCB, and Army) identify and implement their respective laws and standards for selection of remedies.

2.4: Summary and Evaluation of Alternatives summarizes the evaluation and selection of remedial alternatives for each of the Inboard Area sites recommended for further action. These sites are divided into three groups: Army BRAC sites, other Army BRAC Environmental Considerations, and HWRP Issues. This section summarizes the process used to evaluate alternatives for each of these groups.

Information for the Coastal Salt Marsh Area sites is presented in Section 3.0.

SECTION 2.1

Site Background and Nature of Contamination

This section provides background information and discusses the nature of contamination for each site located in the Inboard Area. Section 2.1.1 provides a brief summary of the historical investigations and describes in general terms the nature of contamination found at the Inboard Area sites. Section 2.1.2 identifies the sites within the Inboard Area that are evaluated in this ROD/RAP. Section 2.1.3 provides background on each Army BRAC site and identifies the nature of contamination and chemicals of concern (COCs). Section 2.1.4 discusses additional Army BRAC environmental concerns. Section 2.1.5 covers other environmental issues to be addressed by the HWRP.

2.1.1 Historical Investigations and Nature of Contamination

Numerous activities were conducted in the Inboard Area sites between 1985 and 2002. These activities included remedial investigations, interim removal actions, and a human health and ecological risk assessment. The findings of these activities are found in the following primary documents; a complete listing of the Administrative Record documents can be found in Appendix A:

- *Remedial Design Investigation Final Data Report* (FW, 2000): Two phases of sampling were completed at the paved revetment areas. The first phase of the investigation was conducted in the general revetment area to address data gaps and design issues associated with Inboard Area-Wide distribution of pesticides, PAHs, and metals. Phase 2 of the investigation was conducted to address site-specific issues associated with paved revetments that were formerly characterized using composite samples or had data gaps.

- *Comprehensive Remedial Investigation* (IT, 1999a): Inboard Area sites were investigated during the RI, which reviewed and evaluated previous investigation data; compared the results to newly collected data; and collected and analyzed soil, sediment, and water samples to determine whether the sites were affected by past activities. During the RI, additional background data were collected for metals. These data were combined with background data collected in previous investigations and used to determine baseline (or background) concentrations for metals and polynuclear aromatic hydrocarbons in sediment and soil. The Comprehensive Remedial Investigation combines data from activities conducted between 1985 and 1997.

- *1999 Interim Removal Action Data Report* (IT, 1999c): Interim removal actions were conducted at the following Inboard Area sites in 1999: Former Sewage Treatment Plant, Building 35/39 Area, Building 41, Building 82/87/92/94 Area, PDD Spoils Pile B, C, E, H, I, J, and L, and Revetment 9. Soil was excavated and disposed of offsite, and samples were collected following the removal actions.

- *1998 Interim Removal Action Data Report* (IT, 1999c): Interim removal actions were conducted at the following Inboard Area sites in 1998: FSTP, Building 20, Building 35/39 Area, Building 41 Area, Building 82/87/92/94 Area, Building 86, PDD, PDD Spoils Piles

A through E and G through N, East Levee Generator/Pad, Revetment 10, and Revetment 18/Building 15 Area. Soil was excavated and disposed of offsite, and samples were collected following the removal actions.

The types of contaminants detected at various sites within the Inboard Area include:

- TPH-d, TPH-g, JP-4, or TPH-motor
- Metals
- Dioxins and furans
- VOCs
- SVOCs including PAHs
- PCB
- Pesticides/herbicides

During the Focused Feasibility Study (FFS), data were reviewed from groundwater wells located in the vicinity of the Inboard Area sites where potential scour within channels may occur during the development and maturation of the wetland. The review concluded that groundwater does not pose a threat to surface water or aquatic receptors. As discussed in Appendix B, 18 groundwater monitoring wells were sampled in 2001 and 2002 (USACE, 2002a and 2002b). The results of recent groundwater sampling verified that groundwater beneath the Main Airfield Parcel does not adversely affect saltwater aquatic life or human health from past Department of Defense (DoD) activities (USACE, 2002a and 2002b).

2.1.2 Sites Evaluated in This ROD/RAP

Inboard Area sites evaluated in this ROD/RAP are divided into three groups: Army BRAC sites, other Army BRAC Environmental Considerations, and HWRP Issues. The sites included in each group are listed below and are shown in Figure 2.1-1 (following the tables at the end of this text). The text provided below also indicates how sites within each of the three groups are evaluated in the ROD/RAP. Section 2.4 provides details on the alternatives that are evaluated in this ROD/RAP.

2.1.2.1 Army BRAC Sites

Inboard Area Army BRAC sites that are addressed in this ROD/RAP are listed in Table 1-1.

This ROD/RAP determines the need for remedial action and fully develops and evaluates alternatives for each Army BRAC site that requires remedial action. This ROD/RAP evaluates Alternative 1, No Further Action; Alternative 2, Excavation and Offsite Disposal; and Alternative 3, Manage In-Situ, with Monitoring and Maintenance for Army BRAC Sites. Alternative 4 was developed specifically for issues that will be addressed by the HWRP, and is not evaluated for the Army BRAC sites. The Army BRAC program will perform the environmental response actions for the Army BRAC sites that require remedial action.

2.1.2.2 Other Army BRAC Environmental Concerns

In addition to the Army BRAC sites identified above, three other environmental concerns are addressed in this ROD/RAP by the Army BRAC program. These issues include a group of four sites identified by the Archive Search Report, the GSA/BRAC soil stockpiles located on the runway, and radiological cylinders.

The Archive Search Report sites addressed in this ROD/RAP are listed below:

- Testing Range—ASR Site #4
- Alleged Hazardous, Toxic, and Radiological Waste (HTRW) Disposal Site—ASR Site #8
- Skeet Range—ASR Site #18
- Firing-In-Butt—ASR Site #19

Section 4.0 provides a schedule of activities that will be completed by the Army BRAC program to address the Archive Search Report sites. Because information and data available for these sites are still undergoing review, decisions regarding the need for remedial action and the evaluation of alternatives for these sites are not included in this ROD/RAP. However, the Army, DTSC, and the RWQCB have agreed to complete the study/investigation activities listed in Section 4.0 for the Archive Search Report sites in accordance with the schedule indicated. Should remedial action be required at the Archive Search Report sites, the action goals included in this ROD/RAP will apply.

The RWQCB will determine what additional actions (if any) may be required with respect to the GSA/BRAC stockpiled soil currently on the runway (see Section 2.1.5.1). The Army will be responsible for conducting any additional actions required by the RWQCB.

No environmental concerns were identified for the Radiological Cylinders (see Section 2.1.4.3). Therefore no remedial action is proposed for this issue.

2.1.2.3 Hamilton Wetland Restoration Project Issues

The Army Civil Works Program, through the HWRP, will take actions described in this ROD/RAP to address the potential risks posed by the following environmental issues:

- Inboard Area-Wide DDTs
- PAHs in soil adjacent to the runway
- Lead-based paint

For the Inboard Area-Wide DDTs and PAHs in soil adjacent to the runway, this ROD/RAP evaluates two alternatives: Alternative 1, the No Further Action alternative; and Alternative 4, Manage Onsite, with Monitoring and Maintenance for the Army Civil Works Program. Alternative 4 was specifically developed for issues that will be addressed by the Army Civil Works Program through the HWRP. Alternatives 2 and 3 were not considered because they apply only to sites being addressed by the Army BRAC program.

To address possible lead contamination from lead-based paint at current and previously demolished building locations, the ROD/RAP selects the following alternative. The HWRP will provide 3 feet of stable cover over the footprint of the building and to a distance of 6 feet beyond the building footprint. If 3 feet of cover cannot be achieved, the soil area at these current and previously demolished building locations, plus 6 feet beyond the building perimeter, will be scraped to a depth of 6 inches and managed elsewhere on site beneath 3 feet of stable cover. The building foundation and any concrete/asphalt/hard foundation surface adjacent to the building may remain. The age of historical and existing buildings is described in the Environmental Baseline Survey (EBS) (CH2M HILL, 2003). No other alternatives were considered or evaluated.

2.1.3 Background and Nature of Contamination—Army BRAC Sites

The following subsections describe each Army BRAC site located in the Inboard Area, summarize the types of contaminants (metals, pesticides, TPH, etc.) detected at each site, describe any interim removal action work performed, and identify the ROD/RAP COCs detected at the site. As presented in Section 2.2, remedial actions are evaluated in this ROD/RAP for detections of residual COCs that are found above action goals. Action goals and COCs are defined in Section 2.2. Specific information regarding sample locations and individual sample results is available in the primary reports cited for each Inboard Area site. The location of each site is shown on Figure 2.1-1.

2.1.3.1 Former Sewage Treatment Plant

The FSTP was constructed in 1941/1942 and was located at the eastern edge of the Inboard Area, close to Perimeter Road and the PDD, and immediately southwest of the pump station area. Prior to construction of the FSTP, sewage was discharged to the San Pablo Bay through a pipeline extended approximately 600 feet to the Bay near the southeast end of the runway. The FSTP consisted of several buildings, a digester, and four sludge drying beds. The beds were unlined and were contained within earthen berms. Sewage generated at HAAF was processed by treatment at the FSTP. Treated effluent water was discharged into San Pablo Bay via an outfall pipe. Beginning in 1986, sewage from the remaining operating areas of HAAF was directed to the Novato Sanitation District. This site was identified in the Archive Search Report as ASR Site #2.

The FSTP buildings were demolished and the sludge, berms, and bed dikes were removed and disposed of in an offsite landfill in 1987 (IT, 1999).

The RI presented information regarding the former sludge drying beds, digester, and the abandoned sanitary sewer lines. Metals, PCBs (Aroclor 1254), DDT, and DDE were detected in the soil boring samples collected from around the former sludge drying beds at depths ranging from 1 to 6.5 feet below ground surface (bgs). There was one detection of DDE at depth of 11.5 feet bgs. PAHs and unknown extractable hydrocarbons (UHE) were also detected at depths ranging from 3.5 to 4 feet bgs and 2 feet bgs, respectively in a pothole sample. UHE, PAHs, DDT, and DDE were also detected in two soil borings drilled to the south and west of the monitoring well (MW) TP-MW-101 (IT, 1999). TPH-g; UHE; benzene, toluene, ethylbenzene, and xylene (BTEX); VOCs; heptaclor; and 13 metals were detected in one groundwater sample collected from the former monitoring well (IT, 1999). Monitoring well TP-MW-101 was removed during the 1998 interim removal actions. In addition, five water samples were collected from inside sanitary sewer lines SS-1 through SS-6. Metals, VOCs, one pesticide, and TPH, including UHE (IT, 1999) were detected in the water samples. Coliform bacteria were also detected in the SS-1 water sample.

An interim removal action was conducted in 1998 at the former sludge drying beds at the FSTP. Following the 1998 interim removal actions, metals, pesticides, and TPH-d were detected in the confirmation soil samples at depths ranging from 2.5 feet to 7.5 feet (the 7.5 feet bgs samples were collected only in the southeastern corner of the excavation). After the 1998 interim removal action, a black sludge layer was identified in soil located on the eastern side of the area , and was excavated in 1999. After the 1998 interim removal action, a black sludge layer was identified in soil located on the eastern side of the area and was excavated in 1999. Following the 1999 interim removal actions, DDD, DDT, dieldrin, silver,

mercury, and TPH-d were detected in confirmation samples at depths ranging from 3 to 4 feet bgs. Only DDT was detected above action goals at depths ranging from 3 to 10.5 feet bgs.

The evaluation of COCs during the ROD/RAP process did not identify any COCs for the FSTP. However, risk management evaluations determined that remedial action should be conducted to address individual detections of DDTs. To address these individual detections, DDTs are listed in Table 2.1-1.

2.1.3.2 Building 20

Building 20, on the northern Perimeter Road, was used to produce electricity for runway lighting, radar, or other activities. One transformer pad is adjacent to the east wall, and one diesel UST was buried on the southwest side of the building. The transformers have been removed (IT, 1999).

During a 1996 UST/AST investigation conducted by IT, an area of stained soil with a heavy hydrocarbon odor was observed about 10 feet west of the building. The UST and 10 feet of associated piping were removed during the RI. The UST excavation was extended to a depth of 10 feet bgs and the vertical extent of contamination from UHE, unknown purgeable hydrocarbons (UHP), and lead was determined to extend to 5 feet bgs. Lead was also detected in shallow soil samples collected from the northern, southwestern, and southern sides of Building 20 and in a water sample collected from the excavation. PCBs were not detected in soil samples collected from around the transformer pad and UHE and UHP were detected in one soil sample collected from the stained soil area (IT, 1999).

An interim removal action was conducted in the area of the former UST in 1998, and confirmation samples were collected at depths ranging from 5 to 10 feet bgs. Metals were the only constituents detected in confirmation samples; however, they were not detected above action goals.

The FFS evaluations did not identify any COCs at this site that could potentially pose a risk to human health or the environment (see FFS Table 1-7) (USACE, 2001). The FFS determined that no remedial action was required at this site to protect human health or the environment. Therefore, the No Further Action alternative was selected and this site is not evaluated in further detail in the ROD/RAP.

2.1.3.3 Building 26

Building 26 is located along the northern Perimeter Road, approximately 500 feet southeast of Building 20. A transformer pad is located on the west side of the building; the transformers have been removed (IT, 1999). One diesel UST was formerly located on the south side of the transformer pad, and a former AST was located inside the building. The UST excavation was backfilled.

During the RI, UHE was detected above its action goal at a depth of 5 feet bgs in the pothole sample collected from the northeastern side of the former UST, but not at 10 feet bgs in this same sample location. UHE was also detected above its action goal to the west and south of the former UST and Building 26, at depths ranging from 5 to 5.5 feet bgs, but not at 10 feet bgs. The action goal for TPH diesel is also used as the action goal for UHE. The horizontal extent of soil affected by fuel was estimated using the results of "step-out" samples, which showed declining concentrations away from the former UST location.

Table 2.1-1 lists the COCs for Building 26. Concentrations of COCs detected at this site exceed action goals.

2.1.3.4 Building 35/39 Area

The Building 35/39 Area is located near the northeast corner of the Inboard Area. Both buildings contain high-capacity pumps for the removal of water from the Main Airfield Parcel. The water is discharged via outfall pipes into the ODD, as discussed in Section 3.1.3.5, located immediately outside the perimeter levee in the coastal salt marsh, which flows into San Pablo Bay (IT, 1999). Features in this area include Building 35, which contains a large pump, and the former AST 6. AST 6 was formerly located at the northeastern corner of Building 35. AST 5 was located southeast of Building 39. Three active transformers are located midway between the two buildings, and outfall pipes are located at each building to discharge water from the pumps through the levee into the ODD (IT, 1999).

RI activities were conducted to assess potential impacts from PCBs to the soil around the transformer pad. PCBs were not detected in the soil samples at the transformer pad, but metals were detected in a groundwater sample collected from monitoring well PS-MW-101 (located northeast of Building 35). In addition, results of previous investigations detailed in the RI indicated that the surface soil was contaminated from toluene and PAHs near the fill port of former AST 5 at Building 39 and lead, PAHs, and toluene were detected in surface soil samples collected beneath former AST 6.

Following the 1998 interim removals in the Building 35/39 Area, UHE and lead were detected at depths ranging from 2.5 to 5 feet bgs in soil confirmation samples southwest of Building 39. In addition, lead, TPH, DDTs, UHE, and PAHs were detected at depths ranging from 3 to 7.5 feet bgs in soil confirmation samples collected following the 1999 interim removal actions. DDTs were detected above both action goals established for DDTs (0.03 and 1 ppm) at a depth of 4.5 feet bgs adjacent to the outfall pipeline for Building 35.

Table 2.1-1 lists the COCs for the Building 35/39 Area. Concentrations of COCs detected at this site exceed action goals.

2.1.3.5 Building 41 Area

Building 41 was a pump station in the southern portion of the pump station area. Two 1,100-gallon diesel USTs formerly located on the northwestern side of Building 41 supplied fuel for the pumps at the building. Structures in and around Building 41 have been removed. Features at the site included four inoperable diesel-powered pumps inside Building 41 and two former ASTs east of Building 41. Former Building 40 and three former transformers (on a concrete pad) were located northeast of Building 40. One outfall pipe extended 80 feet southeast from Building 41, through the levee, to a discharge point in the ODD in the coastal salt marsh (CH2M HILL, 2001). Discharges from the pipeline are believed to contribute to contamination in the ODD, as discussed in Section 3.1.3.5.

During the RI, soil samples were collected at Building 41 to determine the extent of TPH contamination from the former USTs and contamination of PCBs of the soil at the transformer pad. One groundwater sample was also collected from groundwater monitoring well PSA-MW-3 (located southeast of Building 41).

UHE and lead were detected along the southwestern side of the USTs at a depth of 8 feet bgs (IT, 1999). Lead was the only analyte detected in a step-out pothole sample collected from an area located across the PDD; the sample was collected to determine the westward extent of fuel contamination. PCBs were not detected in the soil samples collected from the transformer pad. Metals and UHE were detected in the groundwater sample collected from monitoring well PSA-MW3. Before the RI**,** lead was detected in several soil samples located near the northern side of Building 41.

During the 1998 interim removal conducted in the Building 41 Area, UHE and lead were detected in the confirmation samples. UHE and PAHs were detected above guidance levels (established for the interim removal action) in a boring collected adjacent to the northern section of Building 41. During the 1999 interim removal at the UST, TPH-d was detected in confirmation samples, which were collected at depths ranging from 4 to 9.5 feet bgs. TPH-d was detected above its action goal.

In February 2002, during remediation activities at Building 41, contaminated soil was removed and disposed of offsite. The analytical results of the soil removal activities are provided in *Final Construction Report Building 41 Demolition and Soil Removal, Spoils Pile F Removal, and Revetments 6 and 7 Removal* (IT, 2003). After reviewing the analytical data from that event, it was agreed that some additional samples are needed to determine whether the actions are complete. As a result, for the purposes of this report, this site is being evaluated as though the actions have not yet taken place.

The COCs for Building 41 are listed in Table 2.1-1. Concentrations of COCs detected at this site exceed action goals.

2.1.3.6 Building 82/87/92/94 Area

Building 82

Building 82 is a single-story structure located south of former Building 86 and approximately 50 feet from Perimeter Road. Building 82 was built in the area of former Building 91; an air freight terminal. Building 82 was used, in turn, for flight operations (IT, 1999), aircraft rescue, and first aid (CH2M HILL, 2001). Currently, Building 82 is used by the Marin County Sheriff's Department for storage of training and safety equipment and by the Army for its HAAF BRAC office**.** A transformer previously was located on a concrete pad northeast of the building. Also, one propane tank is located on the northeastern corner of the building. RI activities were conducted at Building 82 to identify PCB contamination in soil at the former transformer pad. PCB (Aroclor-1260) was detected in all soil samples; the highest concentration was found on the southeast side of the transformer pad at a depth of 10 to 17 inches bgs. However, PCBs were not detected in the step-out samples. In addition, UHE was detected in two pothole samples. Step-out samples were collected at depths ranging from 2 to 10 feet bgs.

During the 1998 interim removal actions, soil was removed from the Building 82 transformer pad to a depth of 4 feet bgs. UHE, UHP, and PCB were detected above their guidance levels (established for the interim removal actions) in confirmation soil samples at depths ranging from 2.5 to 4.5 feet bgs. The Army conducted an additional removal action in 1999 to address contamination identified at the Building 82 transformer pad following 1998 interim removal actions. Total petroleum hydrocarbon extractable (TPH-e) was detected in a groundwater

sample collected from one of the pothole wells; the concentration of TPH-e was below established water screening levels (IT, 2000b). TPH-d and lead were detected below guidance levels (established for the interim removal actions) in soil samples collected at depths ranging from 0.5 to 7 feet bgs. PCBs were not detected in soil samples collected from the 1999 excavation, and they were not detected in groundwater samples collected from the potholes.

The Army conducted an additional soil and groundwater investigation at Building 82 in September 2002 (Cerrudo Services, 2002). Soil and groundwater samples were collected inside and outside of Building 82 and were analyzed for TPH constituents and BTEX. No further action for groundwater is necessary at this site (see Appendix B).

Building 87

Building 87, located immediately south of the aircraft parking lot, was used to store products (5 gallons or less) such as paint, oil and grease, antifreeze, and solvents. Numerous 55-gallon drums of solvent and cleaning compounds were stored on horizontal dispensing racks in the area around Building 87. One metal CONEX container, located northwest of Building 87, contained unleaded gasoline in 5-gallon containers. The racks and drums were occasionally moved to various locations surrounding the building (IT, 1999).

During an investigation conducted by the Army in 1993, metals were detected above their background concentrations in the soil samples collected from around Building 87. Metals were also detected in groundwater samples collected from monitoring well AM-MW-104. PAHs, metals, TPH, and VOCs were detected in sediments collected from several catch basins in the storm drain system (ESI, 1993).

Building 92/94 Area

Buildings 92 and 94 are single-story structures located north of Building 82 and to the west of former Building 86. The buildings were used for aircraft maintenance and storage (IT, 1999) and to store supplies for aircraft rescue and offices (CH2M HILL, 2001). They are currently used to store records and sampling equipment. Three transformers were located on a concrete pad between Buildings 92 and 94. The asphalt is deteriorated on the southern, western, and eastern sides of the pad. Storage Area 3 was located on the eastern side of Building 94. The storage area contained five metal containers used to store maintenance related fluids such as fuel, paint, and solvents. Curbing or other surface containment did not surround the area.

In 1993, sampling activities were conducted at locations east of Building 94 (ESI, 1993). Soil samples were collected from two test pits and two soil borings. Metals were detected in the samples.

RI activities were conducted at the Building 92/94 Area to address the potential impacts on soil from PCBs. Aroclor-1260 was detected in soil samples collected from 0 to 2.5 feet bgs; however, it was not detected in the step-out samples. Lead was detected below its background concentration in a green-stained rocky fill that was observed during the step-out sampling; fuel hydrocarbons were not detected in the samples of stained fill (IT, 1999).

During the 1998 interim removal actions conducted at the Building 92/94 Area, PCBs were detected below the guidance level (established for the interim removal action) at a depth of 4.5 feet bgs in one confirmation sample. The sample was located along the southeast corner of the transformer pad.

The COCs for the Building 82/87/92/94 Area are listed in Table 2.1-1. Concentrations of COCs detected at this site exceed action goals.

2.1.3.7 Building 84/90 Area

The Building 84/90 Area is at the southeastern end of the former AMSF area, northwest of Perimeter Road and south of the taxiways. Building 84 was used for repair of aircraft electronics equipment (IT, 1999). A fenced enclosure just northeast of Building 84 formerly contained a concrete slab and three transformers. The transformers were removed in 1995 (IT, 1999). Three electrical units of unknown use are located on the northern exterior wall beneath an awning. There were no documented releases of hazardous materials at this site. This site was identified in the Archive Search Report as ASR Site #7.

Building 90 was an aircraft avionics shop (USACE, 2003). Based on the recent historic research conducted by the Army, the area was used for aircraft avionics maintenance activities, including radar systems testing and calibration (USACE, 2003). The southern end of the building is a small utility/electrical room, and two wash racks adjoin the west side of the building. A small sump is on the southern side of the building. This sump was used as a receiving structure for a floor drain inside the southern shed of Building 90. A fence-enclosed transformer pad adjoined the southern side of the building. The transformers were removed in 1991 (IT, 1999).

RI activities were conducted at Buildings 84 and 90 to assess potential impacts to the site from operations and potential PCB contamination from the transformers (IT, 1999). Metals and PAHs were detected in a surface soil sample collected from surface to 0.5 foot bgs near the awning on the north side of Building 84. PCB was not detected at the former transformer pad at Building 84 in surface samples (0 to 0.5 foot bgs). Metals, PAHs, and UHE were detected in soil near Building 90. The depth of the soil samples ranged from surface to 12 feet bgs. A groundwater sample was also collected from one soil boring drilled west of Building 90, adjacent to the edge of the wash racks. Lead was detected in the groundwater sample. No PCB was detected at the former transformer pad at Building 90.

The FFS evaluations did not identify any COCs at this site that could potentially pose a risk to human health or the environment (see FFS Table 1-7) (USACE, 2001). The FFS determined that no remedial action was required at this site to protect human health or the environment. Therefore, the No Further Action alternative was selected and this site is not evaluated in further detail in the ROD/RAP.

2.1.3.8 Building 86

Building 86 was an aircraft maintenance hangar located about 50 feet southeast of the New Hamilton Partners (NHP) levee. A flammable materials locker and at least one recirculating solvent parts cleaner were located in Building 86. Substances used and waste generated at the hangar included stripping and degreasing solvents, oils, and paints. Storage Area 1, near the northeastern corner of Building 86, was used for drum storage. Drums were placed horizontally on metal storage and dispensing racks. Waste material from activities at Building 86 were taken by U.S. Army personnel to a storage area located in the southwestern corner of the building (Storage Area 2). Storage Area 2 consisted of 55-gallon drums and smaller containers, which stored waste oils, waste fuel, and other maintenance-related fluids. The materials were stored within a metal container that rested on a gravel surface.

Building 86 was removed in 1998 (IT, 1999). The remaining building pad is adjoined by concrete aircraft aprons on the north, east, and south, and by a concrete slab on the west.

Before the RI, metal and PAH contaminants were detected in sediment samples collected from five storm drains located east and northeast of Building 86 (IT, 1999). The Army also removed soil affected by TPH from a small area located within 30 feet of Building 86 in 1995 (IT, 1996b).

RI activities were conducted at Building 86 to address the contamination of TPH and other chemicals to the soil, PCB contamination at the transformer pad, and the potential to contaminate groundwater at monitoring well AM-MW-101 (IT, 1999). UHE, UHP, lead, and one PAH were detected in samples along the interior and exterior drains at Building 86. UHE, UHP, and lead were also detected in soil samples collected from the western corner of Building 86. PCBs were not detected at the transformer pad. Metals and UHE were detected in a groundwater sample collected from monitoring well AM-MW-101.

During the 1998 interim removal, a storm drain investigation was conducted at Building 86 (IT, 2000a). Metals were detected in the soil along the portion of SD-1 located southeast of Building 86 at depths ranging from 5.5 to 11.5 feet bgs. Several PAHs were also detected above their guidance levels (established for the interim removal action) at a depth of 10 feet bgs in the soil sample collected along the portion of SD-1 north of Building 87.

The COCs for Building 86 are listed in Table 2.1-1. Concentrations of COCs detected at this site exceed action goals.

2.1.3.9 Perimeter Drainage Ditch

The PDD is a drainage channel constructed to convey surface water runoff to pump stations for lifting and discharge into the ODD and San Pablo Bay. The PDD also conveys water from portions of the GSA properties, from privately owned agricultural lands adjoining the airfield, and overflow from Ignacio Reservoir. Additionally, there is an open drainage ditch at the base of Reservoir Hill in the GSA Phase I Sale Area that connects to the north end of the PDD by an underground storm-drain pipe (IT, 1999). Historically, drainage from the adjacent Hamilton North Antenna Field also entered the PDD. Rainfall in the North Antenna Field currently ponds onsite, and no longer drains to the PDD. The PDD encompasses all of the Main Airfield Parcel, except for the western margin. For the purposes of this ROD/RAP, the PDD is divided into three sections: (1) the unlined PDD, (2) the lined PDD outside of the proposed HWRP channel cut, and (3) the lined PDD within the proposed HWRP channel cut. These areas are described below and are shown on Figure 2.1-1.

When HAAF was constructed in 1932, the PDD began at what is currently the discharge point of the 54-inch-diameter storm drain and ran around the perimeter of the Main Airfield Parcel, exiting the Main Airfield Parcel near the southwestern boundary. The Army lined this portion of the PDD with concrete in 1940 to expedite runoff and reduce maintenance costs associated with removing vegetation that impeded flow in the ditch (US Army, 1940). The concrete lining extends approximately 5 feet up the side of the ditch, with 3 to 4 feet of bare soil from the top of the liner to the top of the ditch. The concrete lining is cracked, and pieces of the concrete liner have broken away over the years. However, a vast majority of the lining is still intact. A portion of the lined PDD is located in the proposed HWRP channel cut (see Figure 2.1-1).

During the remedial design investigation, two surface soil samples were collected from partings or cracks located in the lined PDD. One of these locations was within the proposed HWRP channel cut area. Pesticides, herbicides, metals, and PAHs were detected in the samples (FW, 2000). The banks of the PDD above the concrete lining within the proposed HWRP channel cut were excavated in December 2001/January 2002, during the Building 41 demolition and soil-removal activities (IT, 2003).

In the 1950s, the drainage ditch was realigned to accommodate the extension of the runway. The new ditch began at the base of POL Hill, flowed north to a subsurface storm drain at the north end of the runway, and turned south to meet up with the original lined PDD, as shown on Figure 2.1-1. This portion of the PDD is not lined. The RI investigated the unlined portion of the PDD for PCBs, metals, PAHs, and pesticides. Metals, PAHs, and pesticides were detected in the unlined PDD sediments.

The unlined PDD was dewatered and sediment was removed during the 1998 interim removal actions. Following removal actions, the highest level of residual contamination in the unlined portion of the PDD was located in the northernmost section. UHE, metals, and pesticides were detected in the confirmation samples in the northern section of the unlined PDD. Dioxins, furans, DDTs, nickel, UHE, and benzo(b)fluoranthene were detected in the southern section of the unlined PDD. DDTs were detected above both action goals established for DDTs (0.03 and 1 ppm) within portions of the unlined PDD.

The COCs for the unlined PDD, lined PDD outside the proposed HWRP channel cut, and the lined PDD within the proposed HWRP channel cut are listed in Table 2.1-1. Concentrations of COCs detected at these sites exceed action goals.

2.1.3.10 PDD Spoils Piles

Since the 1930s, the PDD was periodically dredged to remove vegetative matter and sediment. During the 1990s, dredged material was placed in 14 separate locations, later designated Spoils Piles A through N. The spoils piles were identified based on review of aerial photographs and field reconnaissance (ETC, 1994).

Sampling activities were conducted at the PDD spoils piles in 1995 (WC, 1996). Metals, PAHs, oil and grease, chlordane, pesticides, methylene chloride, and SVOCs were detected in the spoils piles. Removal actions were conducted in 1998 at Spoils Piles A through E and G through N. Removal actions were conducted in 1999 at Spoils Piles B, C, E, H, I, J, and L. Following the 1998 and 1999 removal actions, the following residual contaminants were present at the former spoils piles locations:

- Spoils Pile A—Metals, UHE, and DDTs were detected in the confirmation sample at a depth of 1 foot bgs.
- Spoils Pile B—Metals, DDTs, endrin aldehyde, and endrin ketone were detected in confirmation samples at a depth of 0.5 foot bgs.
- Spoils Pile C—DDTs were detected in the confirmation sample, at a depth of 0.5 foot bgs.
- Spoils Pile D—Metals and DDTs were detected in the confirmation sample at a depth of 1 foot bgs.

- Spoils Pile E—DDTs were detected in confirmation samples collected from excavations at a depth of 0.5 foot bgs.
- Spoils Pile G—Metals and DDTs were detected in the confirmation sample at a depth of 0.5 foot bgs.
- Spoils Pile H—TPH-d and DDTs were detected in confirmation samples at a depth of 0.5 foot bgs.
- Spoils Pile I—During the 1999 removal action, no chemicals were detected in the confirmation sample collected at a depth of 0.5 foot bgs, which was analyzed for pesticides and TPH-e. Sample SS-PDSP-I01 (collected in 1998) was not removed during the 1999 removal action; beryllium and DDTs were detected in this sample at a depth of 1 foot bgs.
- Spoils Pile J—DDTs, benzo(a)pyrene, benzo(g,h,I)pyrene, indeno(1,2,3-cd)pyrene, and pyrene were detected in confirmation samples at a depth of 0.5 foot bgs.
- Spoils Pile K—Metals and DDTs were detected in a confirmation sample at a depth of 1 foot bgs.
- Spoils Pile L—Metals and DDT were detected in the 1998 interim removal action sample; these results were used in the risk assessment. However, the 1999 removal action removed the 1998 sample point, and nickel was the only contaminant detected in the confirmation sample at a depth of 0.5 foot bgs.
- Spoils Pile M—Metals and DDTs were detected in confirmation samples at a depth of 1 foot bgs.
- Spoils Pile N—Metals, UHE, benzo(a)pyrene, and DDTs were detected in confirmation samples at a depth of 1 foot bgs.

Interim removal actions were conducted for Spoils Pile F in 2002. Samples collected at Spoils Pile F in 1995 indicated metals, PAH, and DDT contamination. In February 2002, during remediation activities at Spoils Pile F, contaminated soil was removed and disposed of offsite. The analytical results of the soil removal activities are provided in *Final Construction Report Building 41 Demolition and Soil Removal, Spoils Pile F Removal, and Revetments 6 and 7 Removal* (IT, 2003). After reviewing the analytical data from that event, it was agreed that some additional samples are needed to determine whether the actions are complete. As a result, for the purposes of this report, this site is being evaluated as though the actions have not yet taken place.

The COCs for PDD Spoils Piles (except Spoils Piles E and H) are listed in Table 2.1-1. Concentrations of COCs detected at the Spoils Piles (except Spoils Piles E and H) exceed action goals.

The FFS evaluations did not identify residual COCs at Spoils Piles E or H that could potentially pose a risk to human health or the environment. The FFS determined that no remedial action was required at Spoils Piles E or H to protect human health or the environment. Therefore, the No Further Action alternative was selected and Spoils Piles E and H are not evaluated in further detail in the ROD/RAP.

2.1.3.11 East Levee Generator Pad

The East Levee Generator Pad is located midway between the FSTP and the southern end of the runway. One transformer pad and one generator pad were formerly adjacent to each other at a former AST site.

RI activities were conducted at this site to investigate contamination from PCBs at the former transformer location and contamination from fuel constituents at the former generator and AST locations (IT, 1999). Pesticides and metals were also investigated in the general vicinity of the site. PCBs were not detected in surface soil samples collected at the generator pad. However, lead, seven PAHs, and UHE were detected in the northern sample and lead and UHE were also detected in the southern sample.

Excavation activities were conducted beneath the generator pad during the 1998 interim removal actions (IT, 2000a). Although metals were detected in confirmation samples, no metals were detected above action goals.

The FFS evaluations did not identify any COCs at this site that could potentially pose a risk to human health or the environment (see FFS Table 1-7) (USACE, 2001). The FFS determined that no remedial action was required at this site to protect human health or the environment. Therefore, the No Further Action alternative was selected and this site is not evaluated in further detail in the ROD/RAP.

2.1.3.12 Onshore Fuel Line Sites

From circa 1945 until 1975, the onshore fuel line (ONSFL) was used to transport aviation gasoline and, later, JP-4 liquid fuels from the Offshore Fuel System to several locations around the airfield. Before the installation of the fuel line, fuel was delivered by rail or tanker truck.

The fuel line included an offshore portion, between the unloading terminal in the Bay and the booster pump station just inside the east levee, and an onshore portion, which extended from the booster pump station to the airfield hangars. This offshore portion was previously closed, as documented in letters from RWQCB and DTSC, dated July 30, 1999, and September 9, 1999 (RWQCB, 1999 and DTSC, 1999). For the purposes of evaluation during the RI and risk assessment, the ONSFL was divided into three sections:

- 54-inch Drain Line Segment (former 6-inch-diameter fuel pipeline that ran under the northwestern end of the runway via a 54-inch-diameter storm drainage culvert)
- Hangar Segment (southeast trending parallel fuel pipelines formerly located in the grassy area between the runway and the hangars)
- Northern Segment (former 6-inch-diameter fuel line along the northern perimeter of the Inboard Sites parcel)

The fuel lines were removed in 1995 except for the portion from the PDD to the levee, which was removed in 1998. Total purgeable petroleum hydrocarbon (TPH-p), ethylbenzene, xylenes, PAHs, and lead were detected in the soil samples collected after removal of the fuel lines. The soil located along the hangar fuel lines has been contaminated by petroleum hydrocarbons, PAHs, VOCs, and lead. Most of the contamination was located at depths ranging from 5 to 10 feet bgs (IT, 1999). However, during actions to remove the pipelines,

contaminated soils were returned to the excavation. Therefore, there may be contamination at or near the surface. The soil beneath the board-mounted transformer, located at the booster pump station in the northeastern corner of the Main Airfield Parcel, was investigated for PCBs during the RI. PCBs were not detected. Additional sampling also was conducted along previous sample areas of the fuel line to determine the extent of fuel contamination for locations with high concentrations of fuel contamination. Results of the soil sampling indicated that most of the contamination is within 20 feet of the trench; however, one location required step-outs to 50 feet beyond the trench.

The COCs for the ONSFL are listed in Table 2.1-1. Concentrations of COCs detected at this site exceed action goals.

2.1.3.13 Northwest Runway Area

The Northwest Runway Area was investigated initially as part of the GSA Phase II Sale Area (IT, 1998). The site is located at the extreme northern end of the Main Airfield Parcel, along the southeastern slope of the northern perimeter levee, between Ignacio Reservoir Marsh and an alkali marsh. This site was originally identified as an area of potential concern through an aerial photograph review, which showed possible surface disturbances. A geophysical survey conducted in this area identified anomalies that suggested that buried objects might be present at suspected Landfill 23 located primarily in the GSA Phase II Sale Area (IT, 1998). Soil and groundwater investigations did not encounter debris that was indicative of landfill activity. This site is also known as ASR Site #17.

Investigations of soil and groundwater began at this site in 1985. Metals, DDD, TPH, and bis(2-ethylhexyl)phthalate (a common laboratory contaminant) were detected in the soil samples collected along the northwestern runway area. No evidence of landfill activity was identified. Four groundwater monitoring wells (MW-PVC-1, -2, -3, and -4) were installed in August 1985, and were sampled between October 1985 and September 1986. Groundwater results are discussed in Appendix B.

In 1997, four direct-push soil samples were collected and temporary monitoring wells (TW-001 through -004) were installed in the boreholes (IT, 1998). The soil samples were collected at depths of 5, 10, and 15 feet bgs. Metals were detected in the soil; their concentrations were within the range of background concentrations (IT, 1998). Groundwater results are discussed in Appendix B.

This ROD/RAP did not identify any COCs at this site, so it was determined that no remedial action is required to protect human health and the environment. As a result, the No Further Action alternative has been selected and this site is not evaluated in further detail in this ROD/RAP.

2.1.3.14 Tarmac East of Outparcel A-5

The tarmac east of Outparcel A-5 is a taxiway connecting the former AMSF with the northwestern portion of the runway. The tarmac is located northwest of former Building 86 and adjoins and includes a portion of the NHP levee constructed at the boundary between the GSA and BRAC properties.

The tarmac was identified for further investigation when a petroleum hydrocarbon and PAH plume located at Outparcel A-5 was found to extend northeast onto the Main Airfield

Parcel. During the RI, PAH, lead, and UHP were detected in pothole samples collected at the tarmac east of Outparcel A-5. The maximum horizontal extent of the plume from Outparcel A-5 is approximately 20 feet east of the levee beneath the tarmac and within the levee easement (IT, 1999). The majority of the TPH-contaminated soil is beneath the concrete at about 3 feet bgs; however, contaminated soil may extend to 10 feet bgs (IT, 1999).

The FFS evaluations did not identify any COCs at this site that could potentially pose a risk to human health or the environment (see FFS Table 1-7) (USACE, 2001). The FFS determined that no remedial action was required at this site to protect human health and the environment. Therefore, the No Further Action alternative was selected, and this site is not evaluated in further detail in the ROD/RAP.

2.1.3.15 Revetment Area

The revetment area, located east of the runway, is transected by asphalt-paved taxiways that connect 28 circular-shaped parking areas (revetment turnouts) and extensive undeveloped areas. The revetments were used for aircraft staging and refueling before 1974, except for Revetments 6 and 10, which were used as an engine test pad and firefighter training area, respectively (IT, 1999). Fuels, solvents, and vehicles were periodically ignited and doused at Revetment 10 from 1975 to 1987. Aircraft fueling via fuel trucks was also reported to have occurred in the revetment area. Revetments 6 and 10 were also identified in the Archive Search Report; they were referred to as the Engine Test Area and the Burn Pit, respectively.

In addition to the 28 revetments discussed above, the Archive Search Report identified 8 historic revetments in the Main Airfield Parcel. Two of these were paved over during the construction of the aircraft maintenance area, two became dirt roads, and one has been revegetated by the surrounding grass. These 8 historic revetments have not been investigated.

Of the 28 revetment turnouts, 24 are paved with concrete, and 4 are unpaved (9, 11, 12, and 23). Each turnout is nearly encircled by an earthen berm approximately 1 foot high. A thin layer of sediment, grass, and weeds is now present at many of the turnouts. Revetment 18 includes the Building 15 Area because they are geographically close.

A series of storm drains and drop inlets were located throughout the revetment area (see Figure 2.1-1).

The revetments are grouped in this ROD/RAP to provide a clearer summary of the investigations conducted at each revetment and the results of these investigations. The following is the breakout of these groups:

- Revetments 1 through 4, 7, 8, 13 through 17, 19 through 22, and 24 through 28
- Revetment 5
- Revetment 6
- Revetments 9, 11, 12, and 23
- Revetment 10
- Revetment 18/Building 15

The following subsections discuss each group of revetments and their respective investigations.

Revetments 1 through 4, 7, 8, 13 through 17, 19 through 22, and 24 through 28

During the 1993 Army investigation, soil samples were collected from beneath the revetment pads (ESI, 1993). TPH and lead were detected at Revetments 1, 2, 3, 4, 7, 8, 13 through 17, 19, 20, 21, 22, 24, and 28. Bis(2-ethylhexyl)phthalate (a common laboratory contaminant) was detected at Revetments 3 and 8. SVOCs were detected in the composite soil samples at Revetments 7, 15, 19 (only in the duplicate sample), 20, and 27. Additional samples were collected from around the pads located at Revetments 17, 20, 26, and 27 (ESI, 1993). Four soil borings were drilled around each pad and soil samples were collected at 4 to 5 feet bgs. The soil samples were analyzed for TPH, BTEX, and lead. TPH was detected at Revetments 17, 26, and 27. Lead and one PAH were detected above baseline concentrations; however, BTEX was not detected.

In 1993, the Army installed two additional wells, RV-MW-103 at Revetment 20 and RV-MW-102 at Revetment 26 (ESI, 1993). No constituents were detected in groundwater samples collected from monitoring well RV-MW-103. Groundwater was not sampled at RV-MW-102 because recharge was insufficient (ESI, 1993).

RI activities were conducted at Revetments 17 and 27. Soil samples were collected from the revetment to obtain more accurate TPH results than previously reported. Lead was detected below its background concentration at Revetments 17 and 27.

In 1999, UHE and UHP were detected in the surface soil samples collected from Revetments 1, 7, 13, 19, 21, 22, and 26 (FW, 2000). UHE also was detected in the surface soil samples at Revetments 2, 14, 24, 25, and 28 and UHP was detected at Revetments 3 and 4. TPH-D also was detected at Revetment 19. Metals were detected in the surface soil samples collected from all of the revetments. PAHs were detected in the surface soil samples collected from Revetments 1, 2, 4, 7, 13, 19, 21, 22, 24, and 25. Analyses of Revetments 15 and 19 resulted in estimated detections of VOCs in surface soil samples and analyses at Revetment 27 resulted in confirmed detections of VOCs in surface samples (FW, 2000).

In February 2002, during remediation activities at Revetments 6 and 7, contaminated soil was removed and disposed of offsite. The analytical results of the soil removal activities are provided in *Final Construction Report Building 41 Demolition and Soil Removal, Spoils Pile F Removal, and Revetments 6 and 7 Removal* (IT, 2003). After reviewing the analytical data from that event, it was agreed that some additional samples are needed to determine whether the actions are complete. As a result, for the purposes of this report, this site is being evaluated as though the actions have not yet taken place.

Table 2.1-1 lists the COCs for Revetment 7. Concentrations of COCs detected at Revetment 7 exceed action goals.

The FFS evaluations did not identify any COCs at Revetments 8, 17, 24, or 27 that could potentially pose a risk to human health or the environment (see FFS Table 1-7) (USACE, 2001). The FFS determined that no remedial action was required at these sites. The evaluation of COCs during the ROD/RAP process identified cadmium and lead as COCs at Revetment 15 and cadmium as a COC at Revetment 20. However, for each revetment, the COCs were detected in only one sample and the concentrations detected were only slightly above the action goal. Risk management evaluations during the FFS determined that no

remedial action was necessary at Revetments 15 and 20. Therefore, Revetments 15 and 20 are not evaluated in further detail in this ROD/RAP.

The baseline risk assessment and FFS evaluations did not identify any contaminants at Revetment 28 that could potentially pose a risk to human health or the environment (see FFS Table 1-1) (USACE, 2001). The FFS determined that no remedial action was required at this site. Therefore, the No Further Action alternative was selected and this site is not evaluated in further detail in the ROD/RAP. COCs were identified at the remaining revetments covered in this subsection.

Revetment 5

In 1993, TPH and lead were detected in samples collected from Revetment 5 (ESI, 1993).

In 1996, monitoring wells RVT-MW-1 through RVT-MW-3 were installed around a catch basin located next to Revetment 5 (IT, 1999). There were 10 metals detected in the groundwater samples collected from these wells, but organics were not detected (IT, 1999).

In 1999, analyses of Revetment 5 resulted in estimated detections of VOCs in a surface soil sample collected beneath the pavement (FW, 2000). UHP was also detected in the surface soil sample.

The baseline risk assessment and FFS evaluations did not identify any contaminants at Revetment 5 that could potentially pose a risk to human health or the environment (see FFS Table 1-1) (USACE, 2001). The FFS determined that no remedial action was required at this site. Therefore, the No Further Action alternative was selected and this site is not evaluated in further detail in the ROD/RAP.

Revetment 6

In 1990, one monitoring well (RV-MW-101) was installed adjacent to Revetment 6 (IT, 1999). Groundwater results are discussed in Appendix B.

Also, in 1990, surface and subsurface soil samples were collected from the edge of Revetment 6. Lead, toluene, and bis(2-ethylhexyl)phthalate (a common laboratory contaminant) were detected in the soil. Lead was detected below its background concentration (IT, 1999). In addition, in 1995, Woodward-Clyde (WC) also collected two soil samples at depths ranging from 2.5 to 3 feet bgs. No analytes were detected in the soil samples (IT, 1999).

One soil sample was collected from Revetment 6 in 1998, during the RI, and was analyzed for TPH. Toluene and lead were detected in the soil sample.

In 1999, dioxins were detected in three surface soil samples collected from the revetment (FW, 2000). Metals, PAHs, UHE, and UHP also were detected in the surface soil samples.

In February 2002, during remediation activities at Revetment 6, contaminated soil was removed and disposed of offsite. The analytical results of the soil removal activities are provided in *Final Construction Report Building 41 Demolition and Soil Removal, Spoils Pile F Removal, and Revetments 6 and 7 Removal* (IT, 2003). After reviewing the analytical data from that event, it was agreed that some additional samples are needed to determine whether the

actions are complete. As a result, for the purposes of this report, this site is being evaluated as though the actions have not yet taken place.

Table 2.1-1 lists the COCs for Revetment 6. Concentrations of COCs detected at this site exceed action goals.

Revetments 9, 11, 12, and 23 (unpaved revetments)

In 1996, WC investigated Revetments 9, 11, 12, and 23. Soil samples were collected from depths ranging from surface to 6 inches bgs and 1 to 1.5 feet bgs; soil borings were also installed at two additional locations (IT, 1999). The soil samples were analyzed for TPH-d, TPH-g, TPH-JP-4, TPH-motor oil, BTEX, PAHs, VOCs, metals, and oil and grease. Ten metals were detected above baseline concentrations and TPH, BTEX, and VOCs were not detected. Acenaphthene was detected above its baseline concentration at Revetment 9 at a depth of 6 inches bgs; it was not detected at 1.5 feet bgs. In addition, eight temporary monitoring wells, RVT-TW1 through RVT-TW8, were installed in soil borings at these unpaved revetments. Groundwater samples were collected and analyzed for TPH-d, TPH-g, TPH-JP-4, BTEX, and PAHs. Xylene was detected in the groundwater at Revetment 9 and ethylbenzene was detected in the groundwater at Revetment 12.

Before the RI, 10 metals were detected in the soil samples collected from the unpaved revetments at depths ranging from surface to 1.5 feet bgs. Xylene was detected in groundwater samples collected from temporary monitoring wells at Revetment 9, and ethylbenzene was detected at Revetment 12. RI activities were conducted at Revetments 11 and 23. During the RI, gasoline and UHE were detected in the soil at Revetment 11 and five metals were detected at Revetment 23.

Following the 1999 interim removal actions at Revetment 9, lead was detected in confirmation samples at levels below action goals.

The FFS evaluations did not identify any COCs at Revetment 9 that could potentially pose a risk to human health or the environment (see Table FFS 1-1) (USACE, 2001). The FFS determined that no remedial action was required at Revetment 9. Therefore, the No Further Action alternative was selected and this site is not evaluated in further detail in the ROD/RAP. Table 2.1-1 lists the COCs for Revetments 11, 12, and 23. Concentrations of COCs are detected above action goals at Revetments 11, 12, and 23.

Revetment 10

In 1987, soil samples were collected from three soil borings at Revetment 10 (the firefighter training area) at depths ranging from 1 to 9 feet bgs. The concentrations of seven metals were detected above their background concentrations. The highest detection of TPH was detected at a depth of 1 foot bgs (IT, 1999). PAHs were not detected.

In 1993, surface and subsurface soil samples and groundwater samples were collected at the Revetment (ESI, 1993). Toluene, anthracene, chrysene, bis(2-ethylhexyl)phthalate (a common laboratory contaminant), and lead were detected in the soil samples. Lead and four PAHs were detected above their background concentrations. Ethylbenzene, toluene, xylene, and 1,3-dimethylbenzene were detected in subsurface soil samples. Methyl ethyl ketone (MEK) and TPH were detected in the groundwater samples.

During the RI, a PCB investigation was conducted at Revetment 10. PCBs were not detected in the soil samples collected from the area.

During the 1998 interim removal, three dioxins and one furan were detected in soil samples at a depth of 1 foot bgs on the eastern side of the excavation; however, the detected concentrations were below action goals.

The FFS evaluations did not identify any COCs at Revetment 10 that could potentially pose a risk to human health or the environment (see FFS Table 1-7) (USACE, 2001). The FFS determined that no remedial action was required at this site. Therefore, the No Further Action alternative was selected and this site is not evaluated in further detail in the ROD/RAP.

Revetment 18/Building 15 Area

Building 15 is south of Revetment 18, along the northern perimeter of the Main Airfield Parcel. Building 15 formerly contained a generator that provided electrical power for airfield activities, such as runway lighting (IT, 1999). One concrete transformer pad is adjacent to the western side of the building. One former 120-gallon AST was located northwest of Building 15. The AST stored diesel fuel for the generator inside the building. Three transformers were also formerly located on soil adjacent to the concrete pad located west of Building 15; they were removed in 1995 (IT, 1999).

Building 15 was investigated to determine environmental impacts from fuel storage and PCB contamination at the transformer location during the RI (IT, 1999). The AST and associated piping were removed. UHE and lead were detected in soil samples collected southeast of the former AST at a depth of 1.5 feet bgs. The excavation was extended to 10 feet bgs and additional samples were collected. UHE was detected above step-out criteria at 7 feet bgs, but TPH was not detected at 8.5 feet bgs. Step-out potholes were also excavated to a depth of 10 feet bgs, about 20 feet from each side of the excavation, and one groundwater sample was collected from the step-out pothole east of the concrete pad. UHE was not detected in the step-out pothole soil samples; however, it was detected in the groundwater sample. PCBs were not detected in the surface soil samples collected from around the concrete transformer pad northwest of Building 15.

During the 1998 interim removal, lead and UHE were detected in confirmation samples collected from the AST and transformer area at Building 15. The constituents were detected at depths ranging from 5.5 to 9.5 feet bgs, but were below action goals.

During the remedial design investigation, pesticides, UHP, and PAHs were detected in the surface soil sample collected in the Revetment 18 area, and VOCs were detected in the surface soil sample collected beneath the pavement at the revetment (FW, 2000).

The baseline risk assessment and FFS evaluations did not identify any contaminants at Revetment 18/Building 15 that could potentially pose a risk to human health or the environment (see FFS Table 1-1) (USACE, 2001). The FFS determined that no remedial action was required at this site. Therefore, the No Further Action alternative was selected and this site is not evaluated in further detail in the ROD/RAP.

2.1.4 Background and Nature of Contamination—Other Army BRAC Environmental Concerns

This section provides background information on other Army BRAC environmental concerns that are addressed in this ROD/RAP. Where information on the nature of contamination is available it is provided. COCs have not been identified for these areas of environmental concern.

2.1.4.1 Archive Search Report Sites

The St. Louis District of the U.S. Army Corps of Engineers was contracted by U.S. Army Forces Command in 2000 to conduct an archival search on behalf of the Army BRAC office at HAAF. The purpose was to identify locations where contamination from base operations may have occurred. The results of their investigation were published in the Archive Search Report (USACE, 2001). The Archive Search Report includes some sites previously identified by initial investigations conducted by the Army, as described in the preceding text. Portions of the Archive Search Report required further elaboration, clarification, or supportive documentation. The Army BRAC office conducted additional archives research and the results are presented in a Memorandum of Record dated February 2003 (USACE, 2003). For reference, the following descriptions correlate to the numbers delegated to them in the Archive Search Report, Plate 3 and both documents will be referenced jointly as USACE, 2001 and USACE, 2003.

Four Archive Search Report sites are evaluated in this ROD/RAP. Background information for each of these sites is provided below. The Army is in the process of evaluating and investigating these sites. Limited analytical data are currently available for the Alleged HTRW Disposal site (ASR Site #8). The Archive Search Report sites described below will follow a process of site investigation, then site contamination levels will be compared to action goals presented in Table 1-2, and if, based on this comparison, remediation is warranted, then the RWQCB SCRs will identify the procedure for completion.

Testing Range (ASR Site #4)

The Archive Search Report identified an area labeled as the "Testing Area" based on an aerial photograph dated August 1946. The area is described as a "rectangle approximately 1,000 feet by 100 feet between the sewage treatment plant and the black powder magazine." The Archive Search Report did not explain the basis for labeling the area as a "testing area;" however, the Army BRAC office has historical maps dated 16 May 1945 and 4 December 1952 that outline an area approximately 940 feet by 100 feet labeled "testing range." Neither the BRAC office nor the Archive Search Report team was able to locate accounts on how the site was used. Because Hamilton was not a research and development base, it is not likely that testing of weapons occurred here. Based on the survey of additional maps dated 25 February 1959, 15 December 1963, and 22 November 1963 that depict a portion of the testing range called a "firing range," the Army BRAC office concludes that the "testing range" may have been a small arms target practice area.

Alleged Hazardous, Toxic, and Radiological Waste Disposal Site (ASR Site #8)

In December of 2000, a local resident and former military facility inspector stated that during a routine inspection of Hamilton, in the mid-1980s, he was told various chemicals were improperly disposed of in an area near the north end of the runway (the alleged HTRW Disposal site). Previous sampling in the area included the collection and analysis of three samples within the area in question. Additionally, one boring conducted by URS Group for USACE San Francisco District in 2001-2002 was located within the boundaries of the alleged disposal area. No contamination or debris was reported from this work. The Army will conduct sampling in the area, and a Sampling and Analysis Plan is currently in review. For the purposes of future investigations, this area is being referred to as the Northwest Alleged Disposal Area.

Skeet Range (ASR Site #18)

A skeet range was identified in the Archive Search Report as ASR Site #18. The range was situated inboard, at the corner where South Boundary Road meets East Boundary Road and west of what is now the south runway extension. It is visible on aerial photography dating up to 26 April 1943, but is not observable in photographs beginning in 1946. COCs at a skeet range are lead and other metals from shot and PAHs associated with clay targets.

Firing-In-Butt (ASR Site #19)

A firing-in-butt was identified in the Archive Search Report as ASR Site #19. The Archive Search Report accurately located the historic Firing-In-Butt in the vicinity of the runway and Revetment 25. However, the Archive Search Report incorrectly shows the Butt as being closer to the firing line than photos indicate and incorrectly states the date of its removal. There were three hardstands and a "butt," which is a target surrounded by barricade material. Aircraft machine guns, on both sides of the aircraft, were fired into the earthen mound called a "butt" to check firing alignment. The hardstands with connecting road still exist and are visible in 1960s aerial imagery. The Butt was removed in its entirety in 1947, the disposition of the soil not known.

According to the *Closed, Transferring, and Transferred Range and Site Inventory Report, Hamilton Army Airfield* (URS, 2002), the site is considered to be a negligible explosives safety risk and no explosive-related action is necessary. The report goes on to say that because the aircraft were firmly fixed, there is low probability that rounds strayed from the intended target.

2.1.4.2 General Services Administration and BRAC Soil Stockpiles

Approximately 97 soil stockpiles are currently staged in rows on the runway. In 1995 and 1996, the soil was generated by the environmental remediation of GSA and BRAC properties adjacent to the Main Airfield Parcel. Minor amounts of additional soil were generated in 1997 and 1998. The soil was stockpiled on the runway located on the Main Airfield Parcel. Soil with concentrations above hazardous waste thresholds (lead, PCB, VOCs, pesticides or herbicides) were not stockpiled on the runway and were shipped offsite for disposal. TPH- and PAH-contaminated soils from petroleum sites are not regulated by CERCLA.

The stockpiles on the runway were evaluated for reuse in levees, as excavation backfill, or as capping soil. A plan of randomly generated sampling locations and a statistical approach to the evaluation of the sample results was employed to characterize the stockpiles and determine which stockpiles were ready for reuse and which had unacceptable levels of TPH or PAHs, so were not ready for immediate reuse. Based on the analysis of the sample results, some stockpiles were used in the NHP Levee, and other stockpiles were consolidated into piles of like chemical concentrations. Other piles were left in their original configuration. Additional samples were collected from a number of the consolidated stockpiles to characterize them after consolidation.

The stockpiles have been managed to prevent erosion and sediment transport by rainwater runoff. Each pile has been coated with a soil cement mixture to prevent erosion. Soil and rock berms and straw bales were placed around the stockpiles or at the perimeter of the airfield, taxiways, and former aircraft parking areas to manage and mitigate sediment in runoff from the airfield to the lower-lying grassland areas at the runway edges. The stockpiles were left in an "as-is" condition. The stormwater erosion berms have been maintained and stormwater sampling has been conducted since 1996.

The RWQCB will determine what additional actions (if any) may be required with respect to the management and reuse of the stockpiled soil. The Army will be responsible for conducting any additional actions required by the RWQCB.

2.1.4.3 Radiological Waste Disposal Cylinders

According to the *Base Realignment and Closure (BRAC) Historical Record Search to Identify any Residual Radioactive Material at Hamilton Army Airfield* by the Medical Physics Center 1994, two concrete-capped galvanized cylinders were buried, in accordance with Atomic Energy Commission policy, at Hamilton near an earthen levee in 1963. With the assistance of the U.S. Air Force, the cylinders, confirmed to contain electron tubes and wave-guides, were located northeast of the runway overrun levee. The cylinders were taken offsite on 14 September 1988 and disposed of at a low-level radiological disposal facility in Barnwell, South Carolina. Soil and water samples were taken internally, externally, and adjacent to each culvert, and were tested for radioactivity. All soil samples confirmed no migration of radioactivity to the nearby environment. After excavation of the cylinders, soil samples were collected from the former disposal site and analyzed for gamma spectrometry and tritium. No contamination was detected. After backfilling the excavation to grade, Geiger measurements showed no activity (Weston, 1990).

The California Department of Health Services (DHS) reviewed documentation of the radiological history of HAAF. DHS concluded that the cylinders had been removed from the base and that no contamination had occurred. The DHS findings were documented in a memorandum to the Army dated March 17, 2003 (DHS, 2003).

2.1.5 Background and Nature of Contamination—Environmental Issues Hamilton Wetland Restoration Program

Several issues related to residual contamination have been identified within the Inboard Area. These issues include residual Inboard Area-Wide DDTs, and PAHs in soil near the

runway, and lead-based paint. These issues will be addressed as part of the HWRP. Background information on these issues is provided in the sections below.

2.1.5.1 Residual Inboard Area-Wide DDTs and Polynuclear Aromatic Hydrocarbons Near the Runway

In 1999, the Army conducted a study to evaluate the potential for the presence of pesticides throughout the unpaved areas of the Main Airfield Parcel and the potential for PAHs to be located adjacent to the runway. This study and the results of the study are documented in the Remedial Design Investigation Final Data Report (FW, 2000). During the study, the Army collected 23 samples throughout the Main Airfield Parcel and near the runway to evaluate the presence or absence of pesticides and DDTs.

The study showed that approximately 270 acres of grassland have residual concentrations of DDTs. The concentrations of total DDTs detected ranged from 0.0181 to 0.935 ppm. The study also showed soil along the margins (within 50 feet) of the southern end of the runway contain residual PAHs. The PAH detections are greater along the southern end of the runway, which was the normal landing area. The concentrations of PAHS detected ranged from 0.036 to 54.9 ppm. The residual DDTs and PAHs may pose a potential risk to future wetland receptors if the receptors, or their prey items, are exposed to existing site soil during the development and maturation of the wetland.

The State and Army acknowledge that they have different views regarding the scope of the Army's legal responsibility for the residual concentrations of Inboard Area-Wide DDTs and PAHs in soil adjacent to the runway. Nevertheless, both parties are in full agreement as to the measures necessary to address the remaining contamination, including these residuals, on the HAAF site. Two Alternatives (Alternative 1 and Alternative 4) are developed and evaluated in this ROD/RAP for these issues.

2.1.5.2 Lead-Based Paint

Given the age of existing and previously demolished buildings in the Inboard Area, lead-based paint may have been used on the buildings. The age of historical and existing buildings is described in the EBS (CH2M HILL, 2003). Multiple alternatives are not evaluated in the ROD/RAP for lead-based paint issues. Instead, the ROD/RAP presents the following selected alternative.

To address possible lead contamination from paint used on the buildings, the HWRP will provide 3 feet of stable cover over the footprint of the building and to a distance of 6 feet beyond the building footprint. If 3 feet of cover cannot be achieved, the soil area at the current and previously demolished building locations plus 6 feet beyond the building perimeter will be scraped to a depth of 6 inches and managed elsewhere onsite beneath 3 feet of stable cover. The building foundation and any concrete/asphalt/hard foundation surface adjacent to the building may remain.

TABLE 2.1-1

Inboard Area Site-Specific COCs

Contaminants	Action Goals (ppm)	Former Sewage Treament Plant	Building 26	Building 35/39 Area	Building 41 Area	Building 82/87/92/94 Area	Building 86	PDD Unlined	PDD Lined (In proposed channel)	PDD Lined (Outside proposed channel)	PDD Spoils Pile A	PDD Spoils Pile B	PDD Spoils Pile C	PDD Spoils Pile D	PDD Spoils Pile F	PDD Spoils Pile G	PDD Spoils Pile I
Metals																	
Arsenic	16.7														X		
Barium	190					X											
Beryllium	1.03					X	X	X	X	X	X				X		X
Boron	36.9																
Cadmium	1.2						X					X					
Chromium	112						X										
Cobalt	27.6														X		
Copper	68.1											X					
Lead	46.7														X		
Manganese	943														X		
Mercury	0.43											X					
Nickel	114														X		
Silver	1											X					
Vanadium	118																
Zinc	158										X	X			X		
Semivolatile Organic Compounds (including PAHs)																	
PAHs, total	4.022				X		X								X		
Petroleum Hydrocarbons																	
TPH-diesel	144		X		X												
TPH-motor Oil	144																
TPH-gasoline	12																
TPH-JP-4	12																
Pesticides/PCBs/Dioxins																	
DDTs, total (onsite disposal)	0.03	X[a]		X				X	X	X	X		X	X	X	X	X
DDTs, total (offsite disposal)	1			X				X									

TABLE 2.1-1

Inboard Area Site-Specific COCs

Contaminants	Action Goals (ppm)	PDD Spoils Pile J	PDD Spoils Pile K	PDD Spoils Pile L	PDD Spoils Pile M	PDD Spoils Pile N	ONSFL-54-inch Line	ONSFL-Hanger Segment	ONSFL-Northern Segment	Revetment 1	Revetment 2	Revetment 3	Revetment 4	Revetment 6	Revetment 7	Revetment 11	Revetment 12	Revetment 13
Metals																		
Arsenic	16.7																	
Barium	190			X						X		X						
Beryllium	1.03																	
Boron	36.9																	
Cadmium	1.2									X	X		X					X
Chromium	112																	
Cobalt	27.6			X														
Copper	68.1											X				X	X	
Lead	46.7			X		X				X	X		X		X			X
Manganese	943											X						
Mercury	0.43																	
Nickel	114																	
Silver	1																	
Vanadium	118																	
Zinc	158			X														
Semivolatile Organic Compounds (including PAHs)																		
PAHs, total	4.022							X		X					X			X
Petroleum Hydrocarbons																		
TPH-diesel	144																	
TPH-motor Oil	144								X									
TPH-gasoline	12						X	X	X					X				
TPH-JP-4	12							X	X									
Pesticides/PCBs/Dioxins																		
DDTs, total (onsite disposal)	0.03	X	X		X	X												
DDTs, total (offsite disposal)	1																	

TABLE 2.1-1

Inboard Area Site-Specific COCs

Contaminants	Action Goals (ppm)	Revetment 14	Revetment 16	Revetment 19	Revetment 21	Revetment 22	Revetment 23	Revetment 25	Revetment 26
Metals									
Arsenic	16.7								
Barium	190		X	X				X	X
Beryllium	1.03								
Boron	36.9								X
Cadmium	1.2			X					
Chromium	112								
Cobalt	27.6								
Copper	68.1			X	X		X		
Lead	46.7			X					
Manganese	943								X
Mercury	0.43								
Nickel	114								
Silver	1								
Vanadium	118				X				
Zinc	158								
Semivolatile Organic Compounds (including PAHs)									
PAHs, total	4.022			X					
Petroleum Hydrocarbons									
TPH-diesel	144	X		X	X	X		X	X
TPH-motor Oil	144								
TPH-gasoline	12			X	X	X			X
TPH-JP-4	12								
Pesticides/PCBs/Dioxins									
DDTs, total (onsite disposal)	0.03								
DDTs, total (offsite disposal)	1								

x = Contaminant identified as a COC at site.

[a] Not a COC but risk management evaluation determined that remedial action is required for individual detection of DDT.

There are no COCs at the following sites:
Revetment 18/Building 15, Building 20, Building 84/90 Area, Tarmac East of Outparcel A-5, PDD Spoils Pile E, PDD Spoils Pile H, East Levee Generator Pad, Northwest Runway Area, and Revetments 5, 8, 9, 10, 15, 17, 20, 24, 27, and 28.

GRAPHIC SCALE

500 0 500 1000

(IN FEET)
1 inch = 500 ft.

NORTHWEST RUNWAY AREA

RADIOLOGICAL WASTE DISPOSAL CYLINDERS

PDD SPOILS PILE A

NORTHWEST ALLEGED DISPOSAL AREA (ASR SITE #8)

PDD–UNLINED PORTION

NORTH LEVEE

PERIMETER ROAD

ONSFL–54" DRAIN LINE SEGMENT

PDD SPOILS PILE B

BUILDING 20

BUILDING 26

PDD–LINED PORTION OUTSIDE HWRP CHANNEL CUT

ONSFL–NORTHERN SEGMENT

PDD SPOILS PILE C

REVETMENT 16

REVETMENT 15

REVETMENT 14

REVETMENT 12

REVETMENT 28

REVETMENT 11

REVETMENT 10

REVETMENT 26

PDD SPOILS PILE D

REVETMENT 9

REVETMENT 8

REVETMENT 7

REVETMENT 18/BUILDING 15

ONSFL–HANGAR SEGMENT

REVETMENT 19

REVETMENT 17

REVETMENT 20

REVETMENT 21

REVETMENT 22

REVETMENT 23

REVETMENT 24

REVETMENT 13

REVETMENT 27

REVETMENT 25

REVETMENT 3

FIRING–IN BUTT, (ASR SITE #19)

PDD SPOILS PILE E

BUILDINGS 35/39

REVETMENT 6

PDD LINED PORTION WITHIN PROPOSED HWRP CHANNEL CUT

PDD SPOILS PILE F

BUILDING 41 AREA

FORMER SEWAGE TREATMENT PLANT

REVETMENT 5

REVETMENT 4

TESTING RANGE, (ASR SITE #4)

REVETMENT 2

PDD SPOILS PILE G

REVETMENT 1

EAST LEVEE GENERATOR PAD

HISTORIC REVETMENTS

PDD SPOILS PILE I

PDD SPOILS PILE H

PDD SPOILS PILE J

PDD SPOILS PILE K

SKEET RANGE (ASR SITE #18)

PDD SPOILS PILE L

HISTORIC REVETMENTS

PDD SPOILS PILE M

PDD SOILS PILE N

BUILDINGS 84/90

BUILDINGS 82/87/92/94

BUILDING 86

TARMAC EAST OF OUTPARCEL A–5

LANDFILL 26

GSA PHASE II SALE PARCEL

LEGEND

- MAIN AIRFIELD PARCEL BOUNDARY
- AREAS ENLARGED IN FIGURE 2.4-2 THROUGH FIGURE 2.4-5
- LINED PERIMETER DRAINAGE DITCH OUTSIDE PROPOSED HWRP CHANNEL CUT
- LINED PERIMETER DRAINAGE DITCH WITHIN PROPOSED HWRP CHANNEL CUT
- UNLINED PERIMETER DRAINAGE DITCH
- STORMWATER DRAINAGE SYSTEM
- SEWER SYSTEM LINES

FIGURE 2.1-1
INBOARD AREA SITE LOCATIONS
HAMILTON ARMY AIRFIELD

ROD/RAP

CH2MHILL

E042003005SAC_HAAF Fig2.1-1.ai 8/7/03 esm

SECTION 2.2

Overview of Risk Assessment and Action Goals

This section provides an overview of the risk assessment and the process used to establish action goals for Inboard Area sites. Contamination at most of the sites was first evaluated in the risk assessment to make an initial determination of the contaminants of potential concern (COPCs), and the levels that pose a risk. The sites were further evaluated in the FFS based on preliminary action goals, and it was determined that 18 sites did not require further action. Further analysis of the data occurred during preparation of this ROD/RAP, resulting in changes to the action goals and further evaluation of the data. Through that process, two sites that had been identified in the FFS as not requiring further action were determined to require further action. Furthermore, several sites that had not been evaluated in the risk assessment or FFS were determined to require action based on the analytical data collected for those areas and the action goals in this ROD/RAP. The following subsections describe the process used to arrive at these decisions.

2.2.1 Risk Assessment Overview

The baseline risk assessment for HAAF was prepared by the Army for 63 BRAC property sites. The sites were divided into five coastal salt marsh sites and 58 Inboard Area sites. The risk assessment evaluated the Seasonal Wetland as an Inboard Area site; however, it was determined not to be a part of the HAAF Main Airfield Parcel, and is not addressed in this ROD/RAP. This section summarizes the baseline risk assessment for the 57 remaining Inboard Area sites located within the HAAF Main Airfield Parcel. These sites are listed in Table 1-1.

The baseline risk assessment estimated the potential risk that the residual contamination at sites within the Inboard Area may pose to human health and the environment at present, and during the development, maturation, and life of the wetland. The risk assessment assumed that exposure pathways are complete at all sites. For example, the baseline risk assessment assumed that human and ecological receptors were in direct contact with contaminants at a site even where existing contamination is currently covered or is planned to be covered in the future Wetland Restoration Project. Exposure to human or ecological receptors would not occur in this case, provided the contaminants remained covered. As a result, the baseline risk assessment presents a worst-case estimate of where and when remedial actions would be needed to protect human health and the environment for those Inboard Area sites evaluated. Key baseline risk assessment assumptions are as follows:

- Exposures may occur now and in the future because of the chemicals present in the soil or sediment.
- Human and ecological receptors will be present in the future.
- The receptors were assumed to be directly exposed to existing soil or sediment (i.e., the risk assessment did not consider the fact that some sites are covered with concrete or clean fill, or will be covered in the future with imported cover material).

- For the future redevelopment scenario, existing soils will become sediments that support estuarine and freshwater biota.
- The site will not be used for residential or industrial purposes, so these scenarios were not considered in the Human Health Ecological Risk Assessment (HHERA).

2.2.1.1 Baseline Ecological Risk Assessment

The Inboard Area sites are currently grassland habitats or seasonal wetlands, with the PDD supporting a small freshwater community. Construction of a wetland habitat is proposed for the site. The ecological risk assessment considered both current and future land use scenarios for the 57 sites by evaluating the risks to representative plants and animals under estuarine, freshwater, and grassland habitat scenarios for each site. Exposure pathways associated with direct uptake and ingestion were used to assess the risks to the following current and/or future ecological receptors and their associated habitats at the Inboard Area sites:

- **Estuarine Habitat –** algae, pickleweed, amphipods, bay shrimp, northern anchovies, juvenile salmonids, California clapper rail, California black rail, double-crested cormorant, and salt marsh harvest mouse
- **Freshwater Habitat –** algae, amphipods, mosquitofish, great blue heron, and snipe
- **Grassland Habitat –** terrestrial plants, black-tailed deer, California vole, raccoon, burrowing owl, and northern harrier

These receptors were primarily selected to represent specific trophic levels, but some species were selected to represent a trophic level and are also special-status protected species.

The 95 percent upper confidence limit (95th UCL) of the mean was used for the exposure concentrations in the ecological risk assessment (USACE, 2001). The UCL is the 95th percent upper confidence limit of the arithmetic mean concentration for the contaminant. If the 95th UCL exceeded the maximum detected concentration, the maximum concentration was used for the exposure point concentration. The maximum concentration was also used when the number of samples collected for a site was insufficient to calculate a 95th UCL.

The HHERA identified COCs for each Inboard Area site in Table 1-6 of the FFS (USACE, 2001). These COCs included contaminants related to DoD activities at the site that could adversely impact human health or the environment at present, or during the development, maturation, and life of the wetland.

2.2.1.2 Baseline Human Health Ecological Risk Assessment

Current and future land use scenarios were assessed during the HHERA for the Inboard Area sites. Recreational uses of the grassland and freshwater marsh environments were considered potentially complete exposure pathways under current land use conditions. Future land use conditions considered recreational uses of the grassland, freshwater marsh, and future estuarine environments as potentially complete exposure pathways. Based on the proposed land use, current and future land use exposure scenarios for humans were expected to be similar for terrestrial grassland and freshwater marsh environments; the Inboard Area sites are currently undeveloped. Residential and industrial scenarios were not

considered. Deed restrictions will specify that the property shall not be used for residences, schools, daycare facilities, hospitals, hospices, or other similar sensitive uses.

The following receptors and exposure pathways were considered for the Inboard Area sites for the HHERA (USACE, 2001):

- **Marsh Recreational User –** the exposure pathways considered for this receptor included incidental ingestion of affected soil, direct skin contact with contaminated soil, skin contact with surface water, and incidental ingestion of surface water.
- **Recreational Angler –** the exposure pathways considered for this receptor included ingestion of fish living in surface water, and ingestion of shellfish living in the water at the sediment/surface-water interface.
- **Grassland Recreational User –** the exposure pathways considered for this receptor included incidental ingestion of affected soil, direct skin contact with affected soil, and inhalation of windborne soil.

Groundwater and secondary pathways were not considered complete pathways.

The HHERA identified human health COCs for each Inboard Area site. Section 3 and Tables 3-6 through 3-24 of the HHERA identify and discuss the COCs. These COCs included contaminants that were related to DoD activities at the site that were judged to have the potential to adversely impact human health during the development and maturation of the wetland.

2.2.2 Action Goals

The objective of this ROD/RAP is to remove and/or cover contamination at the Inboard Area, rendering it suitable for open-space wetland restoration. To achieve these objectives, this document establishes action goals protective of wetland receptors (including sensitive species). The action goals for the Inboard Area sites are provided in Table 2.2-1. Numerical values for each action goal are set for the various contaminants found at the Inboard Area sites. However, action goals apply only to specific contaminants at each site, because the COCs differ at each site. Table 2.1-1 shows the specific contaminants of concern at each site and the corresponding action goal. The following paragraphs describe the process for selecting specific COCs at the Inboard Area sites and the sources for the action goals.

COCs for the Inboard Area sites were established by evaluating the results of the risk assessment during the FFS process and were further evaluated during the ROD/RAP. Two sites, Spoils Pile C and Spoils Pile L, screened out in the FFS were included for further action in the ROD/RAP. One site, the Northwest Runway Area, was included in the FFS for further evaluation, but was screened out during the ROD/RAP re-evaluation.

The results of the baseline risk assessment were further evaluated in the FFS to determine how the potential risk should be addressed by proposed remedial actions. The FFS refined the conceptual model used in the baseline risk assessment. Similar to the baseline risk assessment, the FFS conceptual model was based on potential exposure pathways and human and ecological receptors for a wetland end-use. However, the baseline risk assessment evaluated every receptor at each site, while the FFS conceptual model identified

and evaluated receptors based on the general habitat types (upland, estuarine, freshwater, or recreational) that are expected to be developed at each site. These general habitat types were established by the preferred wetland configuration (Jones & Stokes, 1998).

Although the wetland design has not been finalized, the general habitat types and receptors at a specific location are not expected to change significantly because of the physical constraints of the site. For example, a planned upland area is not likely to become a subtidal channel, and vice versa. The FFS conceptual model assumed estuarine and human recreational receptors at each Inboard Area site and additional freshwater receptors at the Building 82/87/92/94 Area; PDD Spoils Piles A, B and N; and the PDD Unlined Portion.

The FFS used hazard indices (HIs) developed in the baseline risk assessment to determine whether a site required remedial action. To require remedial action and evaluation in the FFS, a site had to have at least one receptor with an HI greater than 1. The receptors evaluated included those identified in the FFS conceptual model (as described above).

For each remaining site that required further evaluation, the FFS established site-specific FFS COPCs based on the receptors that were expected to be present during the development, maturation, and life of the wetland and the potential risk posed by residual contaminants. The site-specific FFS COPCs were determined as follows: the FFS reviewed the risk assessment COPCs at each site for the receptors identified by the FFS conceptual model. If the ecological hazard quotient (HQ) was greater than 1.0, or the human health HQ was greater than 1.0, or the incremental lifetime cancer risk (ILCR) was greater than $1x10^{-6}$, then the contaminant was considered a site-specific FFS COPC. The FFS COPCs determined in the FFS on a site-specific basis are listed in Table 1-2 of the FFS (USACE, 2001). The FFS then determined COCs by comparing FFS COPC concentrations to preliminary action goals (called comparator values in the FFS). The COCs determined in the FFS on a site-specific basis are listed in Table 1-5 of the FFS (USACE, 2001).

The process for determining the action goals and how those action goals would be compared to the sites was refined during development of the ROD/RAP. For each site, the ROD/RAP re-evaluated the COCs presented in the FFS by comparing each site-specific FFS COPC to the action goals established for the ROD/RAP (see below). The ROD/RAP compared the 95th UCL (or maximum if fewer than 5 samples were collected) concentrations for each FFS COPC to the action goals. If the 95th UCL (or maximum, if fewer than 5 samples were collected) concentration for a COPC was greater than the action goal, the contaminant was considered a COC. A site had to have at least one COC to be evaluated in the ROD/RAP.

For each site, the ROD/RAP identifies COCs as the contaminants that should be compared to the action goals. Detections of these COCs above the action goals are evaluated for remedial actions in this ROD/RAP. The action goals selected in this ROD/RAP for the Inboard Area are based on a number of sources (see Table 2.2-1). For metals, the primary sources are Inboard Area ambient concentrations or San Francisco Bay ambient concentrations, whichever is higher. For total PAHs, the reference is the ER-L. Petroleum hydrocarbon action goals are based on the Presidio of San Francisco Saltwater Ecological Protective Zone. DDT action goals are derived from RWQCB calculations. The DDT values were developed in the Coastal Salt Marsh Focused Feasibility Study (CH2M HILL, 2003).

TABLE 2.2-1
Action Goals—Inboard Area
Hamilton Main Airfield Parcel ROD/RAP

Contaminant	Action Goals (ppm)	Source[a]
Metals		
Arsenic	16.7	BRAC Soils Ambient
Barium	190	BRAC Soils Ambient
Beryllium	1.03	BRAC Soils Ambient
Boron	36.9	BRAC Soils Ambient
Cadmium	1.2	ER-L
Chromium	112	SF Bay Ambient
Cobalt	27.6	BRAC Soils Ambient
Copper	68.1	SF Bay Ambient
Lead	46.7	ER-L
Manganese	943	BRAC Soils Ambient
Mercury	0.43	SF Bay Ambient
Nickel	114	BRAC Soils Ambient
Silver	1	ER-L
Vanadium	118	BRAC Soils Ambient
Zinc	158	SF Bay Ambient
Semivolatile Organic Compounds (including PAHs)		
PAHs, total	4.022	ER-L
Petroleum Hydrocarbons		
TPH-dl/TPH-motor oil[b]	144	Presidio—Saltwater Ecological Protective Zone
TPH-g/JP-4	12	Presidio—Saltwater Ecological Protective Zone
Pesticides		
DDTs, total[c]	0.03	RART—California clapper rail

NOTE: This is a comprehensive list of action goals. All action goals do not apply at each site.

[a] The sources of the action goals are:

- **Metals:** Background concentrations for metals were primarily used as action goals unless the background concentrations were less than available risk-based numbers. Site-specific ambient levels from Appendix A - U.S. Army, 2001, *Final Human Health and Ecological Risk Assessment*; Effects Range-Lows (ER-Ls) from Long, E.R, D.D. MacDonald, S.L. Smith, and F.D. Calder, 1995, "Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments," *Environmental Management,* 19:81-97; *San Francisco Bay RWQCB Staff Report: Ambient Concentrations of Toxic Chemicals in San Francisco Bay Sediments*, May 1998.
- **Petroleum hydrocarbons:** *Report of Petroleum Hydrocarbon Bioassay and Point-of-Compliance Concentration Determinations; Saltwater Ecological Protection Zone; Presidio of San Francisco, California,* Dated December 1997. The numbers in this report were developed for a similar site with similar ecological receptors.
- **PAHs:** ER-Ls from Long, E.R, D.D. MacDonald, S.L. Smith, and F.D. Calder, 1995, "Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments," Environmental Management, 19:81-97. The ER-Ls were used as action goals because the ER-Ls are accepted as being protective of ecological receptors.
- **Pesticides:** The DDT values were developed in the Coastal Salt Marsh Focused Feasibility Study (CH2M HILL, 2003).

[b] The action goal for TPH diesel/TPH motor oil is also used as the action goal for UHE (unknown hydrocarbons extractable).

[c] The total DDT concentration in the Inboard Area shall not exceed 1.0 ppm. Areas with total DDT concentrations greater than 1.0 ppm shall be excavated and disposed of offsite.

SECTION 2.3

Remedial Action Objectives

Remedial Action Objectives (RAOs) describe the goals that proposed remedial actions are expected to accomplish, such as protecting human health and the environment by eliminating COCs above their action goals and/or eliminating exposures to human and ecological receptors. RAOs can differ with each specific site, depending on site conditions, exposure scenarios, and receptors. The FFS and ROD/RAP developed specific RAOs that were used to guide the development of alternatives for each Inboard Area site (discussed in Section 2.4).

This section describes the development of RAOs, identifies RAOs for the Inboard Area sites, and presents how the different agencies (DTSC, RWQCB, and Army) identify and implement their respective laws and standards for selection of remedies.

2.3.1 Definition of Remedial Action Objectives

RAOs were developed in this ROD/RAP to evaluate the ability of the remedial alternatives to comply with Applicable or Relevant, and Appropriate Requirements (ARARs), and to protect human health and the environment. RAOs are quantitative and qualitative expressions of goals for protecting human health and the environment. They are expressed in terms of contaminants and media of interest, possible receptors, and associated exposure pathways (CH2M HILL, 2001). Contaminants considered in establishing RAOs for the Inboard Area sites were based on COCs.

2.3.2 Identification of Remedial Action Objectives

Protection of human health and the environment in the future wetland can be accomplished by reducing the concentrations of residual COCs that are greater than their action goals or by controlling or eliminating the exposure of receptors to residual COCs that are greater than their action goals. The RAOs for the Army BRAC sites, Other Army BRAC Environmental Considerations, and HWRP issues are summarized in the following sections.

2.3.2.1 Army BRAC Sites

The RAOs for the Army BRAC sites are to prevent or mitigate the exposure of ecological and human receptors to soil and/or sediment containing concentrations of site specific COCs that are greater than their respective action goals at a given site. This can be accomplished by reducing the concentrations of residual COCs that are greater than their action goals or by controlling or eliminating the exposure of receptors to residual COCs that are greater than their action goals. Table 2.1-2 provides the action goals for the COCs at each of these sites.

2.3.2.2 Other Army BRAC Environmental Considerations

The RAOs for the other Army BRAC Environmental Consideration sites are to prevent or mitigate the exposure of ecological and human receptors to soil and/or sediment containing

concentrations of chemicals that are greater than the established action goals. This can be accomplished by reducing the concentrations of residual COCs that are greater than their action goals or by controlling or eliminating the exposure of receptors to residual COCs that are greater than their action goals.

2.3.2.3 Hamilton Wetland Restoration Project Issues

The RAOs for the issues that will be addressed by the HWRP (Inboard Area-Wide DDTs and PAHs near the runway) are to prevent or mitigate the exposure of ecological and human receptors to soil containing concentrations of COCs that are greater than their respective action goals for these issues. Table 2.1-2 provides the action goals for the COCs for these issues.

2.3.3 Remedy Selection Requirements and Process

State and federal agencies operate under different laws and regulations when selecting remedies for protection of human health and the environment. The State operates under the California Health and Safety Code, while the Army operates under CERCLA. This section describes how the different agencies identify and implement their respective laws and standards for selection of the remedies contained in this ROD/RAP.

2.3.3.1 State Remedy Selection Requirements and Process

The selection of the remedy by DTSC and the RWQCB is based on their authority to approve RAPs as set forth in Section 25356.1 of the California Health and Safety Code. The statutory requirements governing selection of the remedy are also contained in Health and Safety Code Section 25356.1.5. In summary, any remedy selected in a RAP must be based on, and be no less stringent than, requirements of the NCP (40 Code of Federal Regulations (CFR) Part 300), regulations and applicable requirements contained in Division 7 of the Water Code, regulations promulgated thereunder, resolutions issued by SWRCB and the San Francisco Bay Regional Water Quality Control Plan and applicable provisions of Chapter 6.8 of Division 20 of the Health and Safety Code.

DTSC and the RWQCB generally follow the model used by the NCP in developing information necessary for selecting a remedy. However, the decision selecting the final remedial goals and the remedy to be implemented ultimately constitutes an independent exercise of discretion by DTSC and the RWQCB, subject to applicable state laws. Approval of a RAP by DTSC and the RWQCB under Health and Safety Code Section 25356.1 must consider the following factors:

- Health and safety risks posed by conditions at the site, including scientific data and reports that may have a relationship to the site
- The effect of contamination or pollution levels upon present, future, and probable beneficial uses of contaminated, polluted, or threatened resources
- The effect of alternative remedial action measures on the reasonable availability of groundwater resources for present, future, and probable beneficial uses

- Site-specific characteristics, including the potential for offsite migration of hazardous substances, the surface or subsurface soil, and the hydrogeologic conditions, as well as preexisting background contamination levels
- Cost-effectiveness of alternative remedial action measures
- Potential environmental impacts of alternative remedial action measures

DTSC and the RWQCB have determined that the action goals selected in this ROD/RAP meet the applicable laws and requirements of the State. DTSC and the RWQCB have also determined that the remedies selected in this ROD/RAP are in compliance with the requirements of the California Health and Safety Code. In selecting the remedy, DTSC and the RWQCB have considered the available information for HAAF.

2.3.3.2. Army Remedy Selection Requirements and Process

Pursuant to Section 121(d)(1) of CERCLA, remedial actions must attain a degree of cleanup, which is protective of both human health and the environment, and they must comply with ARARs. Additionally, remedial actions that leave hazardous substances, pollutants, or contaminants onsite must meet standards, requirements, limitations, or criteria that are ARARs. Although HAAF is not on the NPL of CERCLA sites, the remedial investigations and remedial actions conducted at the site are required to be consistent with the NCP. As such, this ARARs analysis was developed in a manner consistent with guidance and policy of CERCLA, as amended by SARA. The intent of this ARARs analysis is to identify those federal and more-stringent state regulations that will be considered during the implementation of remedial actions.

Federal ARARs include requirements under any federal environmental law, while state ARARs include promulgated requirements under state environmental laws that are more stringent than federal ARARs. To be an ARAR, the requirement must meet either of the following requirements (EPA, 1988a):

- **Applicable** requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site.

Or:

- **Relevant and appropriate** requirements are those cleanup standards, standards of control, or other substantive environmental requirements, criteria, or limitations promulgated under federal or state law that, while not specifically "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the site so that their use is well-suited to the particular site. A requirement must be both relevant and appropriate to be designated an ARAR.

ARARs are identified on a site-specific basis from information about site-specific chemicals, specific actions that are being considered, and specific features of the site location. For the Army to consider a state requirement to be an ARAR under CERCLA, the requirement must be:

- Legally enforceable
- Generally applicable to all circumstances covered by the requirement, not just Superfund sites
- More stringent than the federal regulation

Substantive requirements pertain directly to actions or conditions in the environment. They include restrictions for exposure to certain types of hazardous substances (e.g. chemical-specific ARARs), technology-based requirements for actions (e.g., action-specific ARARs), and restrictions on activities in certain locations (e.g., location-specific ARARs). For any onsite remedial activity, the administrative portions of the environmental standards criteria, or limitations are not ARARs because CERCLA, Section 121(e) exempts these actions from permitting requirements. This permit exemption applies to all administrative requirements, whether or not they are styled as "permits." Administrative requirements include the approval of or consultation with administrative bodies, issuance of permits, documentation, reporting, recordkeeping, and enforcement.

The three categories of ARARs are described as:

- Chemical-specific ARARs are numerical values that represent a health-based or risk-based standard or the results of methodologies that, when applied to site-specific conditions, are used to establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment.
- Location-specific ARARs are restrictions on the conduct of activities solely because the site occurs in certain environmentally sensitive areas. Examples are wetlands, floodplains, endangered species habitat, or historically significant resources.
- Action-specific ARARs are technology-based or activity-based requirements or limitations on actions taken with respect to hazardous waste.

A requirement may not meet the definition of an ARAR as defined above, but still may be useful in determining whether to take action at a site or to what degree action is necessary. This can be particularly true when there are no ARARs for a site, action, or contaminant. Such requirements are called to-be-considered (TBC) criteria. TBC materials are nonpromulgated advisories or guidance issued by federal or state government that are not legally binding, but may provide useful information or recommended procedures for remedial action. Although TBCs do not have the status of ARARs, they are considered along with ARARs to establish the required level of cleanup for protection of health or the environment.

Section 121 (d)(4) of CERCLA provides six specific circumstances in which potential ARARs may be waived. These waivers apply only to meeting ARARs with respect to remedial actions onsite. Other statutory requirements, such as remedies being protective of human health and the environment, cannot be waived. Currently, it is not envisioned that any waivers will be requested for the Main Airfield Parcel sites; however, the circumstances under which potential ARARs could be waived are summarized below for sake of completeness:

- Interim Measures: The remedial action selected is only part of a total remedial action that will attain such a level or standard of control when completed [Section 121 (d)(4)(A)].
- Greater Risk to Human Health and the Environment: Compliance with such requirement at the facility will result in greater risk to human health and the environment than alternative options [Section 121 (d)(4)(B)].
- Technical Impracticability: Compliance with such a requirement is technically impractical from an engineering perspective [Section 121 (d)(4)(C)].
- Equivalent Standard of Performance: The remedial action selected will attain a standard of performance that is equivalent to that required under the otherwise applicable standard, requirement, criteria, or limitation, using another method or approach [Section 121 (d)(4)(D)].
- Inconsistent Application of State Requirements: With respect to a state standard, requirement, criterion, or limitation, the state has not consistently applied the standard, requirement, criterion, or limitation in similar circumstances at other remedial actions [Section 121 (d)(4)(E)].
- Fund Balancing: The Hazardous Substance Response Fund (Fund) waiver may apply when the selection of a remedial action that attains such level or standard of control will not provide a balance between the need for protection of public health and welfare and the environment at the facility under consideration and the availability of amounts from the Fund to respond to other sites that present or may present a threat to public health or welfare or the environment, considering the relative immediacy of such threats [Section 121 (d)(4)(F)]. The Fund Balancing waiver does not apply because funding for Hamilton is provided by the BRAC Environmental Restoration Account.

The ARARs for this ROD/RAP were developed using the following guidelines and documents:

- *CERCLA Compliance with Other Laws Manual, Part I: Interim Final* (EPA, 1988b)
- *CERCLA Compliance with Other Laws Manual, Part II: Clean Air Act and Other Environmental Statutes and State Requirements* (EPA, 1989)
- *California State Water Resources Control Board ARARs Under CERCLA* (SWRCB, 1992).

2.3.3.3 Chemical-Specific ARARs and TBCs

Chemical-specific ARARs include those requirements that regulate the release to, or presence in, the environment of materials possessing certain chemical or physical characteristics or containing specified chemical compounds. These requirements generally set health- or risk-based concentration limits or discharge limitations for specific chemicals. When a specific chemical is subject to more than one discharge or exposure limit, the more stringent of the requirements is used. Potential chemical-specific ARARs were evaluated on the basis of contaminants and the media affected. The potential requirements were reviewed and deemed not applicable, relevant, or appropriate to establishing cleanup goals. However, chemical-specific requirements may be applicable, relevant, or appropriate to actions to

be taken at the site. Therefore, a discussion of chemical-specific ARARs that apply only to specific actions that may be taken to clean up the site is provided under action-specific ARARs.

The chemical-specific ARARs and TBCs for the Inboard Area sites can be divided into two categories: (1) those that affect action goals, and (2) those that affect soil and sediment characterization and disposal. Table 2.3-1 lists the TBC criteria. Chemical-specific ARARs that affect soil and sediment characterization and disposal are described below, in the section on Action-Specific ARARS.

Because there are no promulgated chemical-specific ARARs that can be applied as soil or sediment action goals, a variety of TBC criteria have been considered. The sources for chemical-specific TBCs for the Inboard Area sites follow:

- ER-Ls from E. R. Long, D. D. MacDonald, S. L. Smith, and F. D. Calder, 1995, "Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments," *Environmental Management*, 19: 81-97.
- San Francisco Bay ambient levels from *San Francisco Bay RWQCB Staff Report: Ambient Concentrations of Toxic Chemicals in San Francisco Bay Sediments*. May 1998.
- *Report of Petroleum Hydrocarbon Bioassay and Point-of-Compliance Concentration Determinations; Saltwater Ecological Protection Zone; Presidio of San Francisco, California,* Dated December 1997.

2.3.3.4 Location-Specific ARARs

Location-specific ARARs are those requirements that relate to the geographical position or physical condition of the site. These requirements may limit the type of remedial action that can be implemented or may impose additional constraints on some remedial alternatives. The potential location-specific ARARs for the Inboard Area sites are summarized in Table 2.3-2.

Clean Water Act (Section 404)

Section 404 of the Clean Water Act (CWA), 33 U.S.C. §1344, requires a permit to discharge dredged or fill material into waters of the United States. Activities associated with investigation activities that might trigger Section 404 requirements include placement of fill into wetlands following excavation and confirmation sampling and construction of temporary roads in the wetland area. Runoff of excavated materials into the wetlands may also occur. The *Guidelines for Specification of Disposal of Sites for Dredged or Fill Material* [40 CFR Part 230, Section 404(b)(1)] define requirements that limit the discharge of dredged or fill material into the aquatic environment or aquatic ecosystems. These guidelines specify consideration of activities that have less adverse impacts. They prohibit discharges that would result in exceedance of surface water quality standards, exceedance of toxic effluent standards, and jeopardization of threatened or endangered species. Actions that can be taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem are specified in Subpart H of 40 CFR 230, and include:

- Confining the discharge's effects on aquatic biota
- Avoiding disruptions of periodic water inundation patterns
- Selection of disposal site and method of discharge
- Minimizing or preventing standing pools of water

In addition, under CWA Section 401, every applicant for a federal permit or license for any activity that may result in a discharge to a water body (e.g., Section 404 Permit) must obtain State Water Quality Certification (Certification) that the proposed activity will comply with state water quality standards.

2.3.3.5 Action-Specific ARARs

Hazardous Waste Characterization

The action-specific ARARs that affect soil and sediment characterization and disposal include the requirements for identification of hazardous waste found in Title 22 of the California Code of Regulations (CCR), Division 4.5, Chapter 11. A waste is a hazardous waste under both RCRA and California law if it exhibits any of the characteristics of ignitability, corrosivity, reactivity, or toxicity identified in 22 CCR 66261.21, 66261.22(a)(1), 66261.22(a)(2), 66261.23, and 66261.24(a)(1), or if it is listed as a hazardous waste in Article 4 of Chapter 11. In addition, under the California RCRA-authorized program, wastes can be classified as California-only hazardous wastes if they exceed the Soluble Threshold Limit Concentration (STLC) or the Total Threshold Limit Concentration (TTLC) values contained in 22 CCR 66261.24(a)(2).

The numerical values presented in 22 CCR 66261.24 (a)(1) and (a)(2) are not considered action goals but are compared to contaminant concentrations in excavated materials to determine how the material should be managed. In other words, the Toxicity Characteristic Leaching Procedure (TCLP), TTLC, and STLC criteria are not compared to in situ contaminant concentrations in soil or sediment, but rather are compared to the soil or sediment after it has been excavated (i.e., after the waste has been "generated"). If wastes generated at HAAF are characterized as hazardous waste, the regulations that govern the treatment, storage, and disposal of hazardous waste will be applicable. These requirements are found at Division 4.5 of Title 22 of the CCR.

If contaminant concentrations in excavated materials are less than the TCLP, TTLC, or STLC, but still contain contaminants that could cause degradation of surface or groundwater, these materials may be considered a designated waste. A designated waste is defined in Section 13173 of the California Water Code as a nonhazardous waste that consists of, or contains, pollutants that, under ambient environmental conditions at a waste management unit, could be released in concentrations exceeding applicable water quality objectives, or that could reasonably be expected to affect beneficial uses of the waters of the state, as contained in the appropriate state water quality control plan. The *Designated Level Methodology for Waste Classification and Cleanup Level Determination* (Central Valley RWQCB October 1986, Updated June 1989) provides a methodology for calculating levels for specific constituents of a waste that provides a site-specific indication of the water quality impairment potential of the waste. As a result, wastes that contain contaminants above these calculated levels would be characterized as designated wastes. Removal actions proposed at HAAF may include disposal of designated waste to an offsite landfill. Title 27 CCR 20210 requires that designated waste be discharged to Class I or Class II waste management units.

Table 2.3-3 summarizes the action-specific ARARs for the Inboard Area sites.

TABLE 2.3-1
Chemical-Specific To-Be-Considered Criteria for Developing Action Goals

Contaminants	Chemical-Specific TBCs Inboard Sites (ppm)
Metals	
Cadmium	1.2[a]
Chromium	112[b]
Copper	68.1[b]
Lead	46.7[a]
Total Mercury	0.43[b]
Silver	1[a]
Zinc	158[b]
Pesticides	
Total DDTs	0.03[c]
Petroleum Hydrocarbons	
TPH-d/TPH-motor	144[d]
TPH-g/JP-4	12[d]
Polynuclear Aromatic Hydrocarbons	
Total PAHs	4.022[a]

[a] E.R. Long, D.D. MacDonald, S.L. Smith, and F.D. Calder, 1995, "Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments," *Environmental Management*, 19:81-97.

[b] *San Francisco Bay RWQCB Staff Report: Ambient Concentrations of Toxic Chemicals in San Francisco Bay Sediments*. May 1998.

[c] The DDT values were developed in the *Coastal Salt Marsh Focused Feasibility Study* (CH2M HILL, 2003).

[d] *Report of Petroleum Hydrocarbon Bioassay of Point-of-Compliance Concentration Determinations; Saltwater Ecological Protection Zone; Presidio of San Francisco, California.* Dated December 1997.

TABLE 2.3-2
Location-Specific ARARs for Inboard Area Sites

Source	Citation	ARAR Status	Description of ARARs
California Toxics Rule	40 CFR 131.38	Relevant and Appropriate	Contains criteria for priority toxic pollutants in the State of California for inland surface waters and enclosed bays and estuaries, except those waters subject to objectives in San Francisco RWQCB's 1986 Basin Plan.
California Endangered Species Act	Title 14, CCR 670.1, 670.2, and 670.5	Applicable[a]	Contains standards for the identification and protection of listed or proposed threatened or endangered plants or animals.
California Fish and Game Code	Section 1900—California Native Plant Protection Act	Applicable[a]	Contains standards for the identification and protection of plants by the Act.
	Sections 3503.5, 3511, 4700, and 5050		Identifies and protects certain birds, mammals, reptiles, and amphibians.
Federal Endangered Species Act	50 CFR 402	Applicable[a]	Contains standards for the identification and protection of current or possible future-listed threatened or endangered plants or animals. Section 7 requires Federal agencies to consult the USFWS to ensure that actions do not jeopardize listed species or adversely modify their critical habitat. Section 9 prohibits taking of endangered species, while Section 10 permits incidental takes.
Federal Clean Water Act	40 CFR 230.3, Section 404—Definition of Wetlands	Applicable	Authorized the USACE to delineate wetlands.
	USACE, Public Notice 92-7: Interim Testing Procedures for Evaluating Dredged Material Disposed of in San Francisco Bay	Relevant and Appropriate	Reassures that all wetland creation, uplands disposal, or dredging projects complete certain notifications and listings.
	Section 401, 33 U.S.C. 1341	Applicable	State Water Quality Certification – wetlands destruction/alteration would require a 404 permit and this certification assures that the proposed activity will comply with state water quality standards
Coastal Zone Management Act	16 USC 1456	Relevant and Appropriate	Establishes the authority of the Bay Conservation and Development Commission (BCDC) to regulate construction and other activities within 100 feet inland from highest tidal action.

TABLE 2.3-2
Location-Specific ARARs for Inboard Area Sites

Source	Citation	ARAR Status	Description of ARARs
Rivers and Harbors Act	33 CFR 323.1, Parts 320, 325, and 328	Relevant and Appropriate	Gives the USACE permitting authority over the discharge of dredged materials into the waters of the United States. In addition, the USACE must permit any work within historically navigable waters, including behind levees.
Fish and Game Code	Section 5650 and 5652	Relevant and Appropriate	It is unlawful to deposit in, permit to pass into, or place where it can pass into the waters of the state any material listed in the Code.
Procedures for Implementing the Requirements of the Council on Environmental Quality on NEPA – Wetlands Protection	40 CFR 6.302(a)	Applicable	Executive Order 11990, Protection of Wetlands, requires federal agencies to avoid adverse impacts on wetlands. A floodplains/ wetlands assessment is also required.

[a] Applicable only if threatened or endangered species are identified on site.
USC = United States Code
NEPA = National Environmental Policy Act

TABLE 2.3-3
Action-Specific ARARs for Inboard Area Sites

Source	Standard, Requirement, Criterion, or Limitation	ARAR Status	Description of ARARs
Federal			
Federal Clean Water Act	40 CFR 122—EPA Administered Permit Programs: The National Pollution Discharge Elimination System; 40 CFR 122.26; 40 CFR 122.41(d); 40 CFR 122.41(e); 40 CFR 122.44(d)	Relevant and Appropriate	Requirements to ensure that stormwater discharges from remedial action activities do not contribute to a violation of surface water quality standards. All reasonable steps must be taken to minimize or prevent discharges that have a reasonable likelihood of causing adverse impacts on surface water quality [40 CFR 122.41(d)]. Discharges into surface water must achieve federal and state water quality standards [40 CFR 122.44(d)].
State of California Hazardous Waste			
California Hazardous Waste Control Law	Title 22, Division 4.5 (Environmental Health Standards for Management of Hazardous Waste), Chapter 11 (Identification and Listing of Hazardous Waste); 22 CCR 66261.1 through 22 CCR 66261.126	Relevant and Appropriate[a]	Defines hazardous waste and includes procedures for identifying hazardous waste.
California Hazardous Waste Control Law	Title 22, Division 4.5 (Environmental Health Standards for Management of Hazardous Waste), Chapter 12 (Standards Applicable to Generators of Hazardous Waste), Article 3 (Pre-Transport Requirements); 22 CCR 66262.30 through 66262.34	Relevant and Appropriate[a]	These standards establish requirements for generators of hazardous waste located in California. Before transportation, containers must be packaged, labeled, marked, and placarded in accordance with RCRA and Department of Transportation requirements. Accumulation of hazardous wastes onsite for longer than 90 days would be subject to RCRA requirements for storage facilities. These requirements are applicable to hazardous waste that is stored temporarily onsite before offsite disposal.
California Hazardous Waste Control Law	Title 22, Division 4.5 (Environmental Health Standards for Management of Hazardous Waste), Chapter 14 (Standards for Owners and Operators of Hazardous Waste Transfer, Treatment, Storage, and Disposal Facilities), Article 9 (Use and Management of Containers); 22 CCR 66264.171 through 22 CCR 66264.178	Relevant and Appropriate[a]	Soil will need to be managed as a hazardous waste only if it is classified as a hazardous waste. The treatment, storage, and disposal requirements for hazardous wastes include: using containers to store the recovered product that are compatible with this material (22 CCR 66264.172); using containers that are in good condition (22 CCR 66264.171); segregating the waste from incompatible wastes (22 CCR 66264.177); inspecting the containers (22 CCR 66264.176); providing adequate secondary containment for the water stored (22 CCR 66264.175); closing containers during transfer (22 CCR 66264.173); and removing all hazardous material at closure (22 CCR 66264.178).

TABLE 2.3-3
Action-Specific ARARs for Inboard Area Sites

Source	Standard, Requirement, Criterion, or Limitation	ARAR Status	Description of ARARs
California Hazardous Waste Control Law	Title 22, Division 4.5 (Environmental Health Standards for Management of Hazardous Waste), Chapter 14 (Standards for Owners and Operators of Hazardous Waste Transfer, Treatment, Storage, and Disposal Facilities), Article 12 (Waste Piles); 22 CCR 66264.250 through 22 CCR 66264.259	Relevant and Appropriate[a]	Delineates requirements for the management of waste piles for hazardous waste. This regulation is applicable to sites where excavated materials are classified as hazardous wastes and managed in waste piles. These regulations include 22 CCR 66264.251—Design and Operating Requirements; 22 CCR 66264.254—Monitoring and Inspection; 22 CCR 66264.256—Special Requirements for Ignitable or Reactive Waste; 22 CCR 66264.257—Special Requirements for Incompatible Wastes; 22 CCR 66264.258—Closure and Post-Closure Care; and 22 CCR 66264.259—Special Requirements for Hazardous Wastes F020, F021, F022, F023, F026, and F027. Hazardous waste will be managed in accordance with the standards stated in these sections of the regulation.
California Hazardous Waste Control Law	Title 22, Division 4.5 (Environmental Health Standards for Management of Hazardous Waste), Chapter 18 (Land Disposal Restrictions), Article 1 (General); 22 CCR 66268.1 through 22 CCR 66268.9	Relevant and Appropriate[a]	Provides the purpose, scope, and applicability of LDRs. The title of the sections of the regulations are: 22 CCR 66268.3—Dilution Prohibited as a Substitute for Treatment; 22 CCR 66268.7—Waste Analysis and Record Keeping; and 22 CCR 66268.9—Special Rules Regarding Wastes that Exhibit a Characteristic. If hazardous waste is land disposed within the meaning of the LDRs, the hazardous waste will be managed in accordance with the standards stated in applicable sections of the regulation. Only applicable if hazardous wastes are disposed of or treated in an area not designated as a CAMU or disposed of or treated beyond the area of contamination.
California Hazardous Waste Control Law	Title 22, Division 4.5 (Environmental Health Standards for Management of Hazardous Waste), Chapter 18 (Land Disposal Restrictions), Article 3 (Prohibitions on Land Disposal); 22 CCR 66268.30 through 22 CCR 66268.35	Relevant and Appropriate[a]	These standards are applicable to sites where excavated material is classified as hazardous waste and is disposed of or treated in an area not designated as a CAMU. If hazardous waste is land disposed within the meaning of the LDRs, the hazardous waste will be managed in accordance with the standards stated in these sections of the regulation.

TABLE 2.3-3
Action-Specific ARARs for Inboard Area Sites

Source	Standard, Requirement, Criterion, or Limitation	ARAR Status	Description of ARARs
California Hazardous Waste Control Law	Title 22, Division 4.5 (Environmental Health Standards for Management of Hazardous Waste), Chapter 18 (Land Disposal Restrictions), Article 5 (Prohibitions on Storage); 22 CCR 66268.50	Relevant and Appropriate[a]	This standard is applicable to sites where excavated material is classified as hazardous waste. The standard provides prohibitions on storage of restricted wastes. If hazardous waste is land disposed within the meaning of the LDRs, the hazardous waste will be managed in accordance with the standards stated in these sections of the regulation.
State of California Air			
California Clean Air Act	BAAQMD, Regulation 6 (Particulate Matter and Visible Emissions)	Applicable	This regulation limits visible emissions, particulate emissions by weight, and emissions from sulfuric acid plants and sulfur recovery units. This regulation is applicable to any remedial action activity, which may discharge air contaminants, as defined by the rule.
	BAAQMD, Regulation 7 (Odorous Substances)	Applicable	This regulation limits odorous emissions per complaints received from persons on properties where the emissions did not occur and places maximum concentration limits on certain organic emissions.
	BAAQMD, Regulation 8, Rule 40 (Aeration of Contaminated Soil and Removal of Underground Storage Tanks)	Applicable	This rule limits the emissions of organic compounds with organic chemicals or petroleum and provides procedures for controlling emissions during underground storage tank removal and soil stockpiling. Exemptions are provided for soil that contains nonvolatile hydrocarbons and for soil, which is in-situ.
	BAAQMD, Regulation 11 (Hazardous Pollutants, Rule 1 (Lead)	Relevant and Appropriate	This regulation limits the emission of lead to the atmosphere based on ground-level concentrations of lead in air.

TABLE 2.3-3
Action-Specific ARARs for Inboard Area Sites

Source	Standard, Requirement, Criterion, or Limitation	ARAR Status	Description of ARARs
State of California Surface Water, Groundwater, and Soil			
California Water Code	SWRCB Order 99-08-DWQ (General order for stormwater management at construction sites)	Applicable	Must identify the sources of sediment and other pollutants that affect the quality of stormwater discharges and implement practices to reduce these discharges. Stormwater discharges from construction sites must meet pollutant limits and standards. The narrative effluent standard includes the requirements to implement BMPs and/or appropriate pollution-prevention control practices. Inspections of the construction site before anticipated storm events and after actual storm events need to be conducted to identify areas contributing to stormwater discharge and evaluated for the effectiveness of BMPs and other control practices. Applies to construction sites 5 acres or greater in size. It also applies to smaller sites that are part of a larger common plan of development or sale. Administrative portions of this permit are not applicable in accordance with CERCLA.
Porter-Cologne Water Quality Control Act (California Water Code Sections 13240)	San Francisco Bay Basin (Region 2) Water Quality Control Plan	Applicable	Establishes water-quality objectives, including narrative and numerical standards that protect the beneficial uses of surface waters and groundwaters in the region. Establishes beneficial uses of affected water bodies.
Porter-Cologne Water Quality Control Act (California Water Code Sections 13000, 13140, 13240)	SWRCB Resolution 68-16	Applicable	The resolution establishes requirements for activities involving discharges of contamination directly into surface waters or groundwater. According to the RWQCB, this resolution requires that high-quality surface and groundwater be maintained to the maximum extent possible.

TABLE 2.3-3
Action-Specific ARARs for Inboard Area Sites

Source	Standard, Requirement, Criterion, or Limitation	ARAR Status	Description of ARARs
Porter-Cologne Water Quality Control Act (California Water Code Sections 13000, 13140, 13240)	SWRCB Resolution 88-63	Applicable	Specifies that, with certain exceptions, all ground and surface waters have the beneficial use of municipal or domestic water supply. Applies in determining beneficial uses for waters that may be affected by discharges of waste. SWRCB Resolution 88-63 applies to all sites that may be affected by discharges of waste to groundwater or surface water. The resolution specifies that, with certain exceptions, all groundwater and surface waters have beneficial use of municipal or domestic water supply. These exceptions include, among others, if: (1) the TDS exceed 3,000 mg/L or (2) the water source does not provide sufficient water to supply a single well capable of producing an average sustained yield of 200 gallons per day. In the case of HAAF, both these exceptions apply; therefore, groundwater below the site may not be considered suitable for municipal or domestic water supplies.
Porter-Cologne Water Quality Control Act (California Water Code Sections 13140, 13240, 13260, 13263, 13267, 13300, 13304, 13307)	SWRCB Resolution 92-49 (as amended April 12, 1994 and October 2, 1996) Subparagraph IIIG	Applicable	Section IIIG directs the water boards to ensure that dischargers clean up and abate the effects of discharges in a manner promoting attainment of either background water quality or the best reasonable water quality if background quality is not feasible. (Feasibility is determined by the factors listed in Section IIIG and 23 CCR, Chapter 15, Section 2550.4.) Minimum water standards must be protective of the beneficial use(s). Section IIIG directs the water boards to apply 23 CCR, Chapter 15, Section 2550.4 in approving any alternative cleanup levels less stringent than background quality. The requirement to obtain the water board's approval is not a substantive requirement (ARAR); however, the Army will consult with the water board in applying the State's criteria to establish alternative cleanup level(s).
Porter-Cologne Water Quality Control Act (California Water Code Sections 13140 - 13147, 13172, 13260, 13263, 13267, 13304)	Title 27 (Environmental Protection), Division 2 (Solid Waste), Chapter 1, Article 1 (General) 27 CCR 20090(d)	Applicable	Actions taken by or at the direction of public agencies to clean up from unauthorized releases are exempt from Title 27, except that wastes removed from the immediate place of release and discharged to land must be managed in accordance with classification (Title 27 CCR, Section 20200) and siting requirements of Title 27. Wastes contained or left in place must comply with Title 27 to the extent feasible.

TABLE 2.3-3
Action-Specific ARARs for Inboard Area Sites

Source	Standard, Requirement, Criterion, or Limitation	ARAR Status	Description of ARARs
Porter-Cologne Water Quality Control Act (California Water Code Sections 13140 - 13147, 13172, 13260, 13263, 13267, 13304)	Title 27 (Waters), Division 2 (Solid Waste), Chapter 3 (Criteria for waste Management Units), Article 2 (Waste Classification and Management) 27 CCR, 20200, 20210, 20220, and 20230	Applicable	Waste Classification: Wastes must be classified as: hazardous waste, designated waste, nonhazardous solid waste, or inert waste. A hazardous waste can only be discharged to a Class I facility (unless a variance is applicable under Title 22 regulations). A designated waste can be discharged to a Class I or Class II facility. A nonhazardous solid waste can be discharged to a Class I, II, or III facility. Inert wastes do not need to be sent to a classified facility.
Other State of California TBCs			
Resolution 92-145	Interim Final Sediment Screening Criteria and Testing Requirements for Wetland Creation and Upland Beneficial Reuse dated December 1992, Resolution No. 92-145 (referenced in the San Francisco Bay Region Water Quality Control Plan, approved in 1995).	TBC	In this Resolution, the RWQCB established screening criteria guidelines to be used to evaluate the appropriateness of using dredged material for beneficial purposes.
	Draft Staff Report titled Beneficial Reuse of Dredged Materials: Sediment Screening and Testing Guidelines dated May 2000.	TBC	This document is an update of the December 1992 document described previously. These guidelines fall into the category of TBC.

[a] The Army interprets these as relevant and appropriate; DTSC interprets them as applicable.

BAAQMD = Bay Area Air Quality Management District
BMP = best management practice
CAMU = corrective action management unit
CCR = California Code of Regulations
cm/sec = centimeter per second
DWQ = Department of Water Quality
LDR = land disposal restriction
RCRA = Resource Conservation and Recovery Act

SECTION 2.4

Summary and Evaluation of Alternatives

This section summarizes the evaluation of remedial alternatives for each of the Inboard Area sites recommended for further action. As described in Section 2.1.2, the Inboard Area sites are divided into three groups: Army BRAC sites, other Army BRAC Environmental Considerations, and HWRP Issues. The process used in this ROD/RAP to evaluate alternatives for each of these groups is summarized below.

Alternatives for the Inboard Army BRAC sites were first developed and evaluated in the Inboard Area Sites FFS (USACE, 2001). The alternatives for Inboard Area sites are redefined and re-evaluated in this ROD/RAP. The three alternatives evaluated in this ROD/RAP for the Army BRAC Inboard Area sites are listed below:

- Alternative 1, No Further Action
- Alternative 2, Excavation and Offsite Disposal
- Alternative 3, Manage In-Situ, with Monitoring and Maintenance, for Army BRAC sites

The Army BRAC sites evaluated for remedial action are listed in Table 1-1.

Section 2.1 presents alternatives for the Army BRAC Environmental Considerations (Archive Search Report Sties and GSA/BRAC Stockpiled Soil). Further evaluation of the selected alternatives is not required in this ROD/RAP.

Alternatives for the HWRP issues of Inboard Area-Wide DDTs and PAHs near the runway were first developed and discussed in the Inboard Area Sites (USACE, 2001). The alternatives are redefined and re-evaluated in this ROD/RAP. The two alternatives evaluated in this ROD/RAP for the Inboard Area-Wide DDTs and PAHs near the runway are listed below:

- Alternative 1, No Further Action
- Alternative 4, Manage Onsite, with Monitoring and Maintenance, for Army Civil Works Issues

A single alternative for addressing lead-based paint through the HWRP was presented in Section 2.1. Further evaluation of the selected alternative for lead-based paint is not required in this ROD/RAP.

All of the remedial alternatives were developed by assembling remedial technologies, compatible with a wetland end-use scenario, into treatment options that met RAOs. In some cases, specific aspects of the HWRP were also considered in identifying, evaluating, and selecting remedial alternatives.

Remedial alternatives were not developed or evaluated for Army BRAC sites that do not require remedial action. Army BRAC sites that do not require remedial action include sites for which the FFS determined no action is required or those where no COCs are identified in the ROD/RAP process. The Army BRAC sites that do not require further action are listed below:

- **Building 20:** FFS determined no remedial action required
- **Building 84/90:** FFS determined no remedial action required
- **PDD Spoil Pile E:** no COCs identified in ROD/RAP process
- **PDD Spoil Pile H:** FFS determined no remedial action required
- **East Levee Generator Pad:** FFS determined no remedial action required
- **Northwest Runway Area:** risk management evaluation determined no remedial action required
- **Tarmac East of Outparcel A-5:** FFS determined no remedial action required
- **Revetments, 5, 8, 9, 10, 15, 17, 20, 24, 27, and 28:** FFS determined no remedial action required
- **Revetment 18/Building 15:** FFS determined no remedial action required

The sections below provide a description of Alternatives 1 through 4, and select the remedial alternative for the Army BRAC Program sites that require remedial action and the HWRP Inboard Area-Wide DDTs and PAHs near the runway. A summary of the rationale for adopting the selected alternatives is also provided.

2.4.1 Remedial Alternatives

The four remedial alternatives developed for use and evaluation in this ROD/RAP are described in the following text.

2.4.1.1 Alternative 1, No Further Action

In accordance with the NCP (40 CFR 300), CERCLA guidance (EPA, 1988a), and under Chapter 6.8 of Division 20 of the California Health and Safety Code, a No Further Action alternative was developed for evaluation at each site. Under this alternative, no further action would be taken and there would be no restrictions placed on the use of the site.

The No Further Action Alternative reflects leaving a site in its current condition. In the analysis presented below, it is intended that this option be included only as a comparison to other alternatives. This alternative will not be selected for any of the sites requiring remedial action because it would not meet RAOs.

2.4.1.2 Alternative 2, Excavation and Offsite Disposal

Under this alternative, contaminated soils above action goals will be excavated and disposed of at an appropriate offsite landfill facility. Table 2.1-2 lists the action goals for sites that have been determined to require excavation. For the Inboard Area sites, excavation will continue until the action goals have been achieved. Excavated sites that are shown to meet the action goals shall be considered fully remediated and there would be no institutional controls placed on the use of the site. Excavation activities within the Inboard Area will need to be completed before levee breach.

Remedial Goals

Alternative 2 serves three purposes:

- To prevent human or ecological contact with contaminated soil/sediment
- To prevent migration of contamination
- To minimize long-term impact to habitat

Primary Action

Implementation of this alternative would consist of excavation and offsite disposal of site soils, as well as sampling to confirm removal of contaminated soils from the affected site. The following sections describe the primary activities and general design considerations for Alternative 2:

- **Equipment mobilization and establishment of staging areas and access to the sites targeted for remedial action.** Staging areas would be established on the airfield inboard property for heavy equipment, decontamination, and, as necessary, soil transfer from off-road trucks to highway transport trucks, as necessary.
- **Preconstruction biological surveying.** No sensitive species are known or suspected to be present at the Inboard Area sites so preconstruction biological surveying is not required.
- **Excavation of site material.** Contaminated material would be excavated using standard construction equipment. Excavation would continue until RAOs are achieved to ensure protection of human health and the environment. Confirmation samples would be collected to verify that RAOs are met (see below).
- **Disposal of site material.** Excavated materials would need to be classified and disposed of in a suitable offsite location. Waste profiling would be required to determine classification of the waste. Soil would then be disposed of in an approved landfill, based on waste classification.
- **Confirmation sampling.** Confirmation samples would be collected to verify that action goals are met. These samples could be collected as predesign investigation samples that would be collected before excavation to determine the extent of the excavation geometry. Alternatively, confirmation samples could be collected following excavation activities from the bottom and sidewalls of the excavation. Confirmation sampling will be conducted as necessary on a site-by-site basis. Once the confirmation sampling shows that all remaining contaminant concentrations have been reduced to below action goals, the site may be backfilled.
- **Backfill Operations.** Sites will be backfilled only as necessary to eliminate unsafe conditions using clean onsite soil or re-handled dredged material.

2.4.1.3 Alternative 3, Manage In-Situ, with Monitoring and Maintenance, for Army BRAC Sites

Under this alternative, a performance criteria of 3 feet of stable cover is established for a site where residual concentrations exceed the action goals identified in Table 2.1-2. The purpose

of the performance criteria for this alternative is to eliminate or significantly reduce any potential risk associated with residual concentrations of contaminants by preventing exposure of future wetland receptors to contaminated site soils. Alternative 3 is the final remedy for sites where residual concentrations of contaminants are greater than the action goals listed in Table 2.1-2 and the performance criteria can be met.

Alternative 3 is only considered for sites being addressed by the Army BRAC program. This alternative was not considered for Inboard Area-Wide DDTs or PAHs near the runway. For sites where this alternative is selected, the remedy will be implemented by ensuring that 3 feet of stable cover, or equivalent, are provided. This performance criteria of 3 feet of stable cover, or its equivalent, shall be achieved as of the date of the breach of the outboard levee and restoration of tidal action to the site. The HWRP design and geomorphic and scour analyses will be used to determine whether performance criteria can be achieved. If affected soils remain in areas of the wetland restoration project that are subject to tidal scour so that the performance criteria cannot be achieved, then such affected soils shall be excavated and disposed of offsite in accordance with Alternative 2.

The Army shall ensure that the HWRP, including implementation of its plan for monitoring and adaptive management, will achieve and maintain the 3 feet of stable cover, or equivalent, at each site where Alternative 3 is selected. The duration of the HWRP obligation shall extend to a date 13 years following the date of levee breach and reintroduction of tidal influence to the Inboard Area. This duration is the limit of the authorized implementation period of the HWRP and after, in accordance with federal law. Throughout the period of implementation of the HWRP and after, the Army and the property owner shall ensure that the remedy for these sites is maintained to the extent necessary to protect human health and the environment.

For sites where this alternative is selected, institutional controls in the form of land use restrictions, and monitoring, will be required where contamination remains at levels above the action goals.

Institutional controls in the form of land use restrictions will be required where contamination remains above the action goals. The institutional controls include:

- Grading, excavation, and intrusive activities must be conducted pursuant to a plan approved by the State.
- The property shall not be used for residences, schools, daycare facilities, hospitals, hospices, or other similar sensitive uses.

State and federal agencies must have access to the property. The property owner shall provide access, on an as-needed basis, minimizing any interference with the implementation, operation, or maintenance of the ecosystem restoration project. Appropriate federal and state agencies, and their officers, agents, employees, contractors, and subcontractors will have the right, upon reasonable notice, to enter the property where it is necessary to carry out response actions or other activities consistent with the purposes of this ROD/RAP Appropriate federal and state agencies and their officers, agents, employees, contractors, and subcontractors will also have the right, upon reasonable notice, to enter adjoining property where it is necessary to carry out response actions or other activities consistent with the purposes of this ROD/RAP.

2.4.1.4 Alternative 4, Manage Onsite, with Monitoring and Maintenance, for Army Civil Works Issues

Under this alternative, a performance criteria of 3 feet of stable cover, or equivalent measures, as agreed to by the Army and the State, is established for the areas specified below. The primary purpose of the performance criteria for this alternative is to eliminate or significantly reduce any potential risks associated with residual concentrations of Inboard Area-Wide DDTs and PAHs in soils adjacent to the runway by preventing exposure of future wetland receptors to site soils contaminated with these compounds. This alternative applies only to sites being addressed by the Army Civil Works Program; it was not considered for BRAC sites listed in Table 1-1.

Sampling indicates that all surface soils in the Inboard Area are affected by DDTs and that soils adjacent to the southern end of the runway are affected by PAHs. The HWRP design and geomorphic and scour analyses will be used to determine whether the performance criteria can be achieved for those portions of the Inboard Area where residual DDTs and PAHs in site soils adjacent to the runway exceed the action goals for DDTs and/or PAHs identified in Table 2.1-2. Where residual contamination of site soils exceed the action goals for DDTs and/or PAHs, and the performance criteria cannot be met, the HWRP will, with the concurrence of the State, excavate some or all of the impacted soils and manage them onsite. Following any such excavation, the HWRP shall address the residual contamination of site soils exceeding the action goals for DDTs and/or PAHs (Table 2.1-2), including both those soils that have been excavated for onsite management and those soils left in place, by implementing 3 feet of stable cover or equivalent measures. The performance criteria shall consist of placement of 3 feet of stable cover of dredged material, or an appropriate alternative action providing a level of protection equivalent to 3 feet of stable cover, as agreed to between the Army and the RWQCB. This performance criteria of 3 feet of stable cover, or its equivalent, shall be achieved as of the date of the breach of the outboard levee and restoration of tidal action to the site, and shall be maintained throughout the life of the wetland.

The Army Civil Works Program shall ensure, through both construction and implementation of its plan for monitoring and adaptive management, that the HWRP will achieve and maintain the performance criteria of 3 feet of stable cover or its equivalent. The duration of this HWRP obligation shall extend to a date 13 years following the date of levee breach and reintroduction of tidal influence to the Inboard Area. This duration is the limit of the authorized implementation period of the HWRP, in accordance with federal law. Thereafter, the property owner shall ensure that the performance criteria for the Inboard Area-Wide DDTs and PAHs in soils adjacent to the runway are maintained to the extent necessary to protect human health and the environment. The Army and the State have determined that the HWRP is likely to be an appropriate and effective mechanism for implementing this alternative.

Institutional controls in the form of land-use restrictions and monitoring will be required where contaminant concentrations of Inboard Area-Wide DDTs and/or PAHs in soils adjacent to the runway remain at levels above the action goals in Table 2.1-2. The institutional controls include:

- Grading, excavation, and intrusive activities must be conducted pursuant to a State-approved plan.
- The property shall not be used for residences, schools, daycare facilities, hospitals, hospices, or other similar sensitive uses.

State and federal agencies must have access to the property. The property owner shall provide access, on an as-needed basis, minimizing any interference with the implementation, operation, or maintenance of the ecosystem restoration project. Appropriate federal and state agencies and their officers, agents, employees, contractors, and subcontractors will have the right, upon reasonable notice, to enter the property where it is necessary to carry out response actions or other activities consistent with the purposes of this ROD/RAP. Appropriate federal and state agencies and their officers, agents, employees, contractors, and subcontractors will also have the right, upon reasonable notice, to enter adjoining property where it is necessary to carry out response actions or other activities consistent with the purposes of this ROD/RAP.

2.4.2 Evaluation of Alternatives

The remedial alternatives were evaluated based on the nine criteria set forth in the NCP. These evaluation criteria served as the basis for conducting the detailed analysis during the FFS, revising the analysis during the ROD/RAP and, subsequently, selecting remedial actions appropriate for the future wetland-use scenario.

The first two criteria, overall protection of human health and the environment and compliance with ARARs, are threshold criteria. Alternatives that do not meet the threshold criteria are eliminated from further evaluation. The remedy selection is based primarily on the next five criteria:

- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, and volume
- Short-term effectiveness
- Implementability
- Cost

The remaining criteria, state (support agency) acceptance and community acceptance, will be evaluated following receipt of comments on this ROD/RAP.

The list below analyzes the alternatives against the nine criteria. Alternative 1 is carried forward only as a comparison to other alternatives. This alternative will not be selected for any of the sites requiring remedial action because it would not meet RAOs.

1. Overall Protection of Human Health and the Environment

Army BRAC Sites (Alternatives 1, 2, and 3)

Where remedial actions are necessary, Alternative 1 does not meet this criterion because it has no remedial activity to protect human health or the environment from levels of contamination above action goals. Alternatives 2 and 3 protect human health and the environment by removing the contamination above action goals at each site, or by preventing exposure of human and ecological receptors to contamination above action goals.

HWRP Issues (Alternatives 1 and 4)

Where remedial actions are necessary, Alternative 1 does not meet this criterion because it has no remedial activity to protect human health or the environment from levels of contamination above action goals. Alternative 4 protects human health and the environment by preventing exposure of human and ecological receptors to contamination above action goals.

2. Compliance with Applicable Requirements

Army BRAC Sites (Alternatives 1, 2, and 3)

Alternatives 2 and 3 are expected to satisfy this criterion because they will meet their location- and action-specific ARARs. While there are no chemical-specific ARARs for residual contamination at HAAF, chemical-specific TBC criteria are proposed for the site. Alternative 2 will meet the criteria by removing contamination above action goals. The performance criteria specified for Alternative 3 will meet chemical-specific TBC criteria when 3 feet of stable cover material are provided. Where remedial actions are necessary, Alternative 1 does not meet this criterion.

HWRP Issues (Alternatives 1 and 4)

Alternative 4 is expected to satisfy this criterion because it will meet the location- and action-specific ARARs. While there are no chemical-specific ARARs for residual contamination at HAAF, chemical-specific TBC criteria are proposed for the site. The performance criteria specified for Alternative 4 will meet chemical-specific TBC criteria when 3 feet of stable cover material are provided. Where remedial actions are necessary, Alternative 1 does not meet this criterion.

3. Long-Term Effectiveness and Permanence

Army BRAC Sites (Alternatives 1, 2 and 3)

Alternatives 2 and 3 are effective in the long-term. Alternative 2 provides a high degree of permanence because the residual contamination will be removed. Contaminated materials will remain at HAAF if Alternative 3 is used, but the monitoring and management of Alternative 3 will verify that restrictions and recommendations implemented during the design and construction protect the wetland as it develops and matures. Where remedial actions are necessary, Alternative 1 is not effective in the long term.

HWRP Issues (Alternatives 1 and 4)

Alternative 4 is effective in the long term and will provide permanence. Although contaminated materials will remain at HAAF if Alternative 4 is implemented, the monitoring and management of Alternative 4 will verify that restrictions and recommendations implemented during the design and construction protect the wetland as it develops and matures. Where remedial actions are necessary, Alternative 1 is not effective in the long term.

4. Reduction of Toxicity, Mobility, and Volume Through Treatment

None of the alternatives involve treatment to reduce toxicity, mobility, or volume of contaminants. Soils at HAAF have a high clay content, and treatment options for contaminated soil with a high clay content are not practical.

5. Short-Term Effectiveness

Army BRAC Sites (Alternatives 1, 2 and 3)

No short-term impacts are expected from Alternative 1. Alternative 2 potentially may have short-term impacts on the community, workers, and environment because it involves excavation, stockpiling, and transporting soil to an offsite disposal facility. Fugitive dusts can be created during this process, but will be controlled using water, as necessary. Risk of worker exposure can be mitigated by following safety protocols during excavation activities. Alternative 3 does not have any short-term impacts because the action proposed in this alternative is the establishment of performance criteria, not the actual placement of cover.

HWRP Issues (Alternatives 1 and 4)

No short-term impacts are expected from Alternative 1. Alternative 4 may have the potential for short-term impacts on the community, workers, and environment because it may involve excavation, grading, stockpiling, and transporting soil elsewhere onsite. Fugitive dusts can be created during this process, but will be controlled using water, as necessary. Risk of worker exposure can be mitigated by following safety protocols during construction activities.

6. Implementability

Army BRAC Sites (Alternatives 1, 2, and 3)

There are no obstacles associated with implementing Alternative 1. Alternative 2 includes a few obstacles because this alternative uses excavation to reduce contamination. Excavation is a well-established remedial action and activities can be completed safely. Both Alternatives 2 and 3 will need to be coordinated with the HWRP.

HWRP Issues (Alternatives 1 and 4)

There are no obstacles associated with implementing Alternative 1. Alternative 4 will require coordination with the Army BRAC program.

7. Cost

Army BRAC Sites (Alternatives 1, 2, and 3)

There are no costs for Alternative 1. Estimated project costs for Alternatives 2 and 3 are listed in Table 2.4-1 (which follows the text of this section). The cost analysis includes estimated expenditures required to complete the remediation in terms of both capital costs and annual operations and maintenance. Cost estimates are based on estimated excavation volumes in the ROD/RAP and are expressed in terms of 2003 dollars. The costs associated with Alternative 3 are estimated for anticipated long-term monitoring requirements.

HWRP Issues (Alternatives 1 and 4)

There are no costs for Alternative 1. Estimated project costs for Alternative 4 will accrue to the HWRP.

8. Regulatory Acceptance

RWQCB and DTSC hereby determine, based on the substantial evidence in the administrative record, that this ROD/RAP has been properly noticed, circulated for public review and comment, and approved in accordance with the requirements of Sections 25356.1 and 25356.1.5 of the Health and Safety Code Chapter 6.8 of Division 20, the Porter-Cologne Water Quality Control Act, and all other applicable State laws.

9. Community Acceptance

Community acceptance refers to the public's general response to the alternatives described in the draft ROD/RAP. The community will have the opportunity to comment in writing on the ROD/RAP during a 45-day comment period. There will also be an opportunity for the public to ask questions and make comments at a public meeting to be held during the 45-day comment period.

2.4.3 Comparative Analysis for Selected Alternatives

This section summarizes the basis for the selected alternative for each Inboard Area site requiring remedial action. A comparative analysis summary of the alternatives is provided in Table 2.4-1.

For each site, the selected alternative satisfies the statutory requirements of CERCLA Sections 121 and 120(a)(4), as amended by SARA, and California Health and Safety Code Section 25356.1.5, which requires response actions approved by the RWQCB and/or DTSC under Chapter 6.8 of Division 20 of the California Health and Safety Code, in that the following mandates are attained:

- The selected remedy protects human health and the environment.
- The selected remedy complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action.
- The selected remedy is cost-effective.

Alternatives selected below for the Inboard Area sites include Alternative 2, Excavation and Offsite Disposal; and Alternative 3, Manage In-Situ, with Monitoring and Maintenance, for Army BRAC sites. Section 2.4.4 presents the total volume of soil to be excavated or covered under Alternatives 2 and 3.

2.4.3.1 Former Sewage Treatment Plant

Alternative 3, Manage In-Situ, with Monitoring and Maintenance, for Army BRAC Sites, is the preferred alternative for the FSTP. This alternative is effective and implementable. It establishes performance criteria requiring 3 feet of cover. This alternative would meet RAOs by preventing exposure of future wetland receptors to existing site soils. Implementation of

monitoring and adaptive management plans will achieve and maintain the 3 feet of stable cover. The FSTP is located in an area where it is currently expected that cover can be achieved and there is no expected scour or channel cut in the future wetland. The preferred alternative may change to Alternative 2 in the future if the final HWRP design and geomorphic and scour analysis determine that the performance criteria cannot be achieved and maintained.

The area recommended for this alternative is shown in Figure 2.4-1. The area over which the performance criteria would be achieved and maintained was established to address the estimated extent of soil containing DDTs at concentrations above action goals. A summary of the minimum, maximum, and average values for DDTs remaining at the FSTP are shown below. This information was considered in the process of selecting Alternative 3 and establishing cover boundaries for the FSTP.

Minimum, Maximum, and Average Values for DDTs — Former Sewage Treatment Plant

Contaminant	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
DDTs, total	65	0.00390	0.500	0.0113	0.03

Units are in ppm.

Alternative 1 was not selected because it would not meet RAOs and would not protect human health and the environment. Alternative 2 would be an effective and implementable alternative. Alternative 3 was selected over Alternative 2 because this site is in an area where no scour or channel cuts are currently expected in the future wetland and Alternative 3 is more cost-effective.

2.4.3.2 Building 26

Alternative 3, Manage In-Situ, with Monitoring and Maintenance, for Army BRAC Sites, is the preferred alternative for Building 26. This alternative is effective and implementable. This alternative establishes performance criteria requiring 3 feet of cover. This alternative would meet RAOs by preventing exposure of future wetland receptors to existing site soils. Implementation of monitoring and adaptive management plans will achieve and maintain the 3 feet of stable cover. Building 26 is located in an area where it is currently expected that cover can be achieved and there is no expected scour or channel cut in the future wetland. The preferred alternative may change in the future to Alternative 2 should the final HWRP design and geomorphic and scour analysis determine that the performance criteria cannot be achieved and maintained.

The area recommended for this alternative is shown in Figure 2.4-1. The area over which the performance criteria would be achieved and maintained was established to address the estimated extent of soil containing COCs at concentrations above action goals. A summary of the minimum, maximum, and average values for COCs remaining at Building 26 are shown below. This information was considered in the process of selecting Alternative 3 and establishing cover boundaries for Building 26.

Minimum, Maximum, and Average Values for COCs — Building 26

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
TPH-diesel	11	25	770	122	144

Units are in ppm

Alternative 1 was not selected because it would not meet RAOs and would not protect human health and the environment. Alternative 2 would be an effective and implementable alternative. Alternative 3 was selected over Alternative 2 because this site is in an area where no scour or channel cuts are currently expected in the future wetland and Alternative 3 is more cost-effective.

2.4.3.3 Building 35/39

Alternative 2, Excavation and Offsite Disposal, is the preferred alternative for the area at Building 35/39 where DDT was detected above 1 ppm near the outfall pipeline. This alternative is preferred because of the level of DDT detected. The Excavation and Offsite Disposal alternative would remove soil containing DDTs at concentrations above the 1 ppm action goal. After excavation, Alternative 3 would be implemented for any soils containing DDTs greater than the 0.03 ppm action goal. The excavated area would be backfilled as necessary for safety.

Alternative 3, Manage In-Situ, with Monitoring and Maintenance, for Army BRAC Sites, is the preferred alternative for Building 35/39 for the area where DDT concentrations are below 1 ppm, but are above the action goal of 0.03 ppm. This alternative is effective and implementable. This alternative establishes performance criteria requiring 3 feet of cover.

This alternative selection would meet RAOs by removing contamination or preventing exposure of future wetland receptors to existing site soils. Implementation of monitoring and adaptive management plans will achieve and maintain the 3 feet of stable cover. Building 35/39 is located in an area where it is expected that cover can be achieved and there is currently no expected scour or channel cut in the future wetland. The preferred alternative may change in the future to Alternative 2 should the final HWRP design and geomorphic and scour analysis determine that the performance criteria cannot be achieved and maintained.

The area recommended for this alternative is shown in Figure 2.4-1. Excavation and cover boundaries were established to address soil containing COCs at concentrations above action goals. A summary of the minimum, maximum, and average values for COCs remaining at Building 35/39 are shown below. This information was considered in the process of selecting Alternative 2 and 3, and establishing excavation and cover boundaries for Building 35/39.

Minimum, Maximum, and Average Values for COCs — Building 35/39 Area

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
DDTs, total	21	0.0017	3.93	0.188	0.03/1.0

Units are in ppm

Alternative 1 was not selected because it would not meet RAOs and would not protect human health and the environment.

2.4.3.4 Building 41

Alternative 2, Excavation and Offsite Disposal, is the preferred alternative for Building 41. Alternative 2 is effective and implementable. This alternative is preferred because Building 41 is located in an area where there is expected scour or channel cut in the future wetland. The Excavation and Offsite Disposal alternative would remove soil containing COCs at concentrations above action goals. The excavated area would be backfilled with clean onsite soil as necessary for safety. The alternative would meet RAOs by removing COCs above action goals.

The area recommended for this alternative is shown in Figure 2.4-2. Excavation boundaries were established to address soil containing COCs at concentrations above action goals. A summary of the minimum, maximum, and average values for COCs remaining at Building 41 are shown below. This information was considered in the process of selecting Alternative 2 and establishing excavation boundaries for Building 41.

Minimum, Maximum, and Average Values for COCs — Building 41 Area

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
PAHs, total	29	0.0600	101	3.63	4.022
TPH-diesel	38	20.0	3,100	242	144

Units are in ppm.

In February 2002, during remediation activities at Building 41, contaminated soil was removed and disposed of offsite. The analytical results of the soil-removal activities are provided in the *Final Construction Report Building 41 Demolition and Soil Removal, Spoils Pile F Removal, and Revetments 6 and 7 Removal* (IT, 2003). After reviewing the analytical data from that event, it was agreed that some additional samples are needed to determine whether the actions are complete. For this reason, Alternative 2 is chosen in this document as though the remediation activities have not yet taken place.

Alternative 1 was not selected because it would not meet RAOs and would not protect human health and the environment. Alternative 2 was selected over Alternative 3 because this site is in an area where scour or channel cuts are currently expected in the future wetland. The effectiveness of cover and monitoring in Alternative 3 is a potential concern in scour or channel cut areas.

2.4.3.5 Building 82/87/92/94 Area and Building 86 (Including Storm Drains)

Alternative 3, Manage In-Situ, with Monitoring and Maintenance, for Army BRAC Sites, is the preferred alternative for Building 82/87/92/94 and Building 86 (including storm drains). This alternative is effective and implementable. This alternative establishes performance criteria requiring 3 feet of cover. This alternative would meet RAOs by preventing exposure of future wetland receptors to existing site soils. Implementation of monitoring and adaptive management plans will achieve and maintain the 3 feet of stable cover. These buildings and associated storm drains are located in an area where it is

currently expected that cover can be achieved and there is no expected scour or channel cut in the future wetland. The preferred alternative may change in the future to Alternative 2 if the final HWRP design and geomorphic and scour analysis determine that the performance criteria cannot be achieved and maintained.

The area recommended for this alternative is shown in Figure 2.1-1. The area over which the performance criteria would be achieved and maintained was established to address the estimated extent of soil containing COCs at concentrations above action goals. The minimum, maximum, and average values for COCs remaining at Building 82/87/92/94 and Building 86 are summarized below. This information was considered in the process of selecting Alternative 3 and establishing cover boundaries for Building 82/87/92/94 and Building 86 and associated storm drains.

Minimum, Maximum, and Average Values for COCs — Building 82/87/92/94

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Barium	24	45.5	814	188	190
Beryllium	24	0.652	3.02	1.13	1.03

Units are in ppm.

Minimum, Maximum, and Average Values for COCs — Building 86

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Beryllium	48	0.74	6.44	0.837	1.03
Cadmium	48	0.99	68.0	23.5	1.2
Chromium	45	11.2	710	88.6	112
PAHs, total	79	0.058	414	5.26	4.022

Units are in ppm.

Alternative 1 was not selected because it would not meet RAOs and would not protect human health and the environment. Alternative 2 would also be an effective and implementable alternative. Alternative 3 was selected over Alternative 2 because this site is in an area where no scour or channel cuts are currently expected in the future wetland and Alternative 3 is more cost-effective.

2.4.3.6 Perimeter Drainage Ditch

Alternative 2, Excavation and Offsite Disposal, is the preferred alternative for the northern portion of the PDD (the unlined PDD) where DDT has been detected above 1 ppm. This alternative is preferred because of the level of DDT detected in this area. The Excavation and Offsite Disposal alternative would remove soil containing DDTs at concentrations above the 1 ppm action goal. After excavation, Alternative 3 would be implemented for any soils containing DDTs greater than the 0.03 action goal. The excavated area would be backfilled as necessary for safety.

Alternative 3, Manage In-Situ, with Monitoring and Maintenance, for Army BRAC Sites, is the preferred alternative for the southern portion of the PDD (the lined PDD). This alternative is effective and implementable. This alternative establishes performance criteria requiring 3 feet of cover. This alternative would meet RAOs by preventing exposure of future wetland receptors to existing site soils. Implementation of monitoring and adaptive management plans will achieve and maintain the 3 feet of stable cover. This portion of the PDD is located in an area where it is currently expected that cover can be achieved and there is no expected scour or channel cut in the future wetland. The preferred alternative may change in the future to Alternative 2 should the final HWRP design and geomorphic and scour analysis determine that the performance criteria cannot be achieved and maintained.

The areas recommended for this alternative are shown in Figure 2.1-1. The area over which the performance criteria would be achieved and maintained was established to address the estimated extent of soil containing COCs at concentrations above action goals. A summary of the minimum, maximum, and average values for COCs remaining at the PDD are shown below. This information was considered in the process of selecting Alternative 3 and establishing cover and excavation boundaries for the PDD.

Minimum, Maximum, and Average Values for COCs — Perimeter Drainage Ditch

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Beryllium	43	0.68	3.50	1.41	1.03
DDTs, total	49	0.0038	9.5	0.47	0.03

Units are in ppm.

Alternative 1 was not selected because it would not meet RAOs and would not protect human health and the environment.

2.4.3.7 PDD Spoils Piles

PDD Spoils Piles A, B, C, D, G, I, J, K, L, M, and N (Alternative 3)

Alternative 3, Manage In-Situ, with Monitoring and Maintenance, for Army BRAC Sites, is the preferred alternative for the former locations of PDD Spoils Piles A, B, C, D, G, I, J, K, L, M, and N. This alternative is effective and implementable. This alternative establishes performance criteria requiring 3 feet of cover. This alternative would meet RAOs by preventing exposure of future wetland receptors to existing site soils. Implementation of monitoring and adaptive management plans will achieve and maintain the 3 feet of stable cover. These piles are located in areas where it is currently expected that cover can be achieved and there is no expected scour or channel cut in the future wetland. The preferred alternative may change in the future to Alternative 2 if the final HWRP design and geomorphic and scour analysis determine that the performance criteria cannot be achieved and maintained.

The area recommended for this alternative is shown in Figure 2.4-1. The area over which the performance criteria would be achieved and maintained was established to address soil containing COCs at concentrations above action goals. A summary of the minimum, maximum, and average values for COCs remaining at PDD Spoils Piles A, B, C, D, G, I, J, K, L, M, and N are shown below. This information was considered in the process of selecting Alternative 3 and establishing cover boundaries for Spoils Piles A, B, C, D, G, I, J, K, L, M, and N.

Minimum, Maximum, and Average Values for COCs — Perimeter Drainage Ditch Spoils Pile A

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Beryllium	1	1.90	1.90	1.90	1.03
Zinc	1	164	164	164	158
DDTs, total	1	0.283	0.283	0.283	0.03

Units are in ppm.

Minimum, Maximum, and Average Values for COCs — Perimeter Drainage Ditch Spoils Pile B

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Cadmium	5	1.30	5.20	2.18	1.2
Copper	5	26.7	185	71.9	68.1
Mercury	5	0.100	1.70	0.446	0.43
Silver	5	1.03	1.07	0.650	1.0
Zinc	5	103	368	251	158

Units are in ppm.

Minimum, Maximum, and Average Values for COCs — Perimeter Drainage Ditch Spoils Pile C

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
DDTs, total	1	0.0390	0.0390	0.0390	0.03

Units are in ppm.

Minimum, Maximum, and Average Values for COCs — Preliminary Drainage Ditch Spoils Pile D

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
DDTs, total	1	0.129	0.129	0.129	0.03

Units are in ppm.

Minimum, Maximum, and Average Values for COCs — Preliminary Drainage Ditch Spoils Pile G

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
DDTs, total	1	0.211	0.211	0.211	0.03

Units are in ppm.

Minimum, Maximum, and Average Values for COCs — Perimeter Drainage Ditch Spoils Pile I

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Beryllium	2	0.710	1.10	0.910	1.03
DDTs, total	1	0.053	0.053	0.053	0.03

Units are in ppm.

Minimum, Maximum, and Average Values for COCs — Perimeter Drainage Ditch Soils Pile J

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
DDTs, total	1	0.117	0.117	0.117	0.03

Units are in ppm.

Minimum, Maximum, and Average Values for COCs — Perimeter Drainage Ditch Soils Pile K

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
DDTs, total	1	0.178	0.178	0.178	0.03

Units are in ppm.

Minimum, Maximum, and Average Values for COCs — Perimeter Drainage Ditch Soils Pile L

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Barium	1	222	222	222	190
Cobalt	1	56.6	56.6	56.6	27.6
Lead	1	77.4	77.4	77.4	46.7
Zinc	1	164	164	164	158

Units are in ppm.

Minimum, Maximum, and Average Values for COCs — Perimeter Drainage Ditch Spoils Pile M

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
DDTs, total	2	0.0219	0.0380	0.03	0.03

Units are in ppm.

Minimum, Maximum, and Average Values for COCs — Perimeter Drainage Ditch Spoils Pile N

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Lead	3	16.5	57.5	34.1	46.7
DDTs, total	3	0.0357	0.0880	0.0702	0.03

Units are in ppm.

Alternative 1 was not selected because it would not meet RAOs and would not protect human health and the environment. Alternative 2 would also be an effective and implementable alternative. Alternative 3 was selected over Alternative 2 because these sites are located in areas where no scour or channel cuts are currently expected in the future wetland and Alternative 3 is more cost-effective.

PDD Spoils Pile F (Alternative 2)

Alternative 2, Excavation and Offsite Disposal, is the preferred alternative for the former location of PDD Spoils Pile F. This alternative is preferred because PDD Spoils Pile F is located in an area where there is expected scour or channel cut in the future wetland. The Excavation and Offsite Disposal alternative would remove soil containing COCs at concentrations above action goals. The excavated area would be backfilled as necessary for safety. The alternative would meet RAOs by removing COCs above action goals.

The area recommended for this alternative is shown in Figure 2.4-1. Excavation boundaries were established to address soil containing COCs at concentrations above action goals. A summary of the minimum, maximum, and average values for COCs remaining at PDD Spoils Pile F are shown below. This information was considered in the process of selecting Alternative 2 and establishing excavation boundaries.

Minimum, Maximum, and Average Values for COCs — PDD Spoils Pile F

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Arsenic	3	3.70	29.6	15.8	16.7
Beryllium	3	0.590	4.80	2.20	1.03
Cobalt	3	6.50	61.1	27.8	27.6
Lead	3	16.5	109	75.8	46.7
Manganese	3	564	1,870	1,070	943
Nickel	3	23.9	198	102	114
Zinc	3	43.9	224	122	158
PAHs, total	2	7.32	41.15	24.2	4.022
DDTs, total	3	0.0211	0.641	0.349	0.03

Units are in ppm.

In February 2002, during remediation activities at Spoils Pile F, contaminated soil was removed and disposed of offsite. The analytical results of the soil removal activities are provided in the *Final Construction Report Building 41 Demolition and Soil Removal, Spoils Pile F*

Removal, and Revetments 6 and 7 Removal (IT, 2003). After reviewing the analytical data from that event, it was agreed that some additional samples are needed to determine if the actions are complete. For this reason, Alternative 2 is chosen in this document as though the remediation activities have not yet taken place.

Alternative 1 was not selected because it would not meet RAOs and would not protect human health and the environment. Alternative 2 was selected over Alternative 3 because this site is in an area where scour or channel cuts are expected in the future wetland. The effectiveness of cover and monitoring in Alternative 3 is a potential concern in scour or channel-cut areas.

2.4.3.8 Onshore Fuel Line

Alternative 3, Manage In-Situ, with Monitoring and Maintenance, for Army BRAC Sites, is the preferred alternative for the ONSFL. This alternative is effective and implementable. This alternative establishes performance criteria requiring 3 feet of cover. This alternative would meet RAOs by preventing exposure of future wetland receptors to existing site soils. Implementation of monitoring and adaptive management plans will achieve and maintain the 3 feet of stable cover. The ONSFL is located in an area where it is currently expected that cover can be achieved and there is no expected scour or channel cut in the future wetland. The preferred alternative may change in the future to Alternative 2 if the final HWRP design and geomorphic and scour analysis determine that the performance criteria cannot be achieved and maintained.

The areas recommended for this alternative are shown in Figures 2.4-3 through 2.4-5. The area over which the performance criteria would be achieved and maintained was established to address the estimated extent of soil containing COCs at concentrations above action goals. A summary of the minimum, maximum, and average values for COCs remaining at the ONSFL segments are shown below. This information was considered in the process of selecting Alternative 3 and establishing cover boundaries for the ONSFL.

Onshore Fuel Line, 54-Inch

Minimum, Maximum, and Average Values for COCs — ONSFL, 54-inch

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
TPH-gasoline	39	43.0	220	29.5	12

Units are in ppm.

Onshore Fuel Line, Hangar Segment

Minimum, Maximum, and Average Values for COCs — ONSFL, Hangar Segment

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
TPH-gasoline	286	1.80	3,700	56.7	12
TPH-JP-4	301	25.0	1,100	19.9	12
PAHs, total	444	0.037	742	2.16	4.022

Units are in ppm.

Onshore Fuel Line, Northern Segment

Minimum, Maximum, and Average Values for COCs — ONSFL, Northern Segment

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
TPH-diesel	159	7.10	870	15.0	144
TPH-motor oil	74	94.0	910	66.8	144
TPH-gasoline	159	0.52	470	12.1	12

Units are in ppm.

Alternative 1 was not selected because it would not meet RAOs and would not protect human health and the environment. Alternative 2 would also be an effective and implementable alternative. Alternative 3 was selected over Alternative 2 because this site is in an area where no scour or channel cuts are currently expected in the future wetland and Alternative 3 is more cost-effective.

2.4.3.9 Revetment Areas

Revetment Areas 6 and 7 (Alternative 2)

Alternative 2, Excavation and Offsite Disposal, is the preferred alternative for Revetment Areas 6 and 7. This alternative is preferred because the revetments are located in an area where there is expected scour or channel cut in the future wetland. The Excavation and Offsite Disposal alternative would remove soil containing COCs at concentrations above action goals. The excavated area would be backfilled as necessary for safety. The alternative would meet RAOs by removing COCs above action goals.

The area recommended for excavation is shown on Figure 2.4-1. Excavation boundaries were established to address soil containing COCs at concentrations above action goals. A summary of the minimum, maximum, and average values for COCs remaining at Revetments 6 and 7 are shown below. This information was considered in the process of selecting Alternative 2 and establishing excavation boundaries for Revetments 6 and 7.

Minimum, Maximum, and Average Values for COCs — Revetment 6

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
TPH-gasoline	7	920	920	920	12

Units are in ppm.

Minimum, Maximum, and Average Values for COCs — Revetment 7

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Lead	4	12.5	55.6	38.8	46.7
PAHs, total	3	3.061	7.87	5.41	4.022

Units are in ppm.

In February 2002, during remediation activities at Revetment 6, concrete and contaminated soil were removed and disposed of offsite. The analytical results of the Revetment 6 concrete pad and soil removal activities are provided in the *Final Construction Report Building 41 Demolition and Soil Removal, Spoils Pile F Removal, and Revetments 6 and 7 Removal* (IT, 2003). After reviewing the analytical data from that event, it was agreed that some additional samples are needed to determine if the actions are complete. For this reason, Alternative 2 is chosen in this document as though the remediation activities have not yet taken place.

Alternative 1 was not selected because it would not meet RAOs and would not protect human health and the environment. Alternative 2 was selected over Alternative 3 because this site is in an area where scour or channel cuts are expected in the future wetland. The effectiveness of cover and monitoring in Alternative 3 is a potential concern in scour or channel-cut areas.

Revetment Areas 1, 2, 3, 4, 11, 12, 13, 14, 16, 19, 21, 22, 23, 25, and 26, Historic Revetments, and Storm Drains (Alternative 3)

Alternative 3, Manage In-Situ, with Monitoring and Maintenance, for Army BRAC Sites, is the preferred alternative for revetments 1, 2, 3, 4, 11, 12, 13, 14, 16, 19, 21, 22, 23, 25, and 26, historic revetments, and the storm drains in this area. This alternative is effective and implementable. This alternative establishes performance criteria requiring 3 feet of cover. This alternative would meet RAOs by preventing exposure of future wetland receptors to existing site soils. Implementation of monitoring and adaptive management plans will achieve and maintain the 3 feet of stable cover. These revetments are located in an area where it is currently expected that cover can be achieved and there is no expected scour or channel cut in the future wetland. The preferred alternative may change in the future to Alternative 2 should the final HWRP design and geomorphic and scour analysis determine that the performance criteria cannot be achieved and maintained.

The area recommended for this alternative is shown in Figure 2.4-1. The area over which the performance criteria would be achieved and maintained was established to address the estimated extent of soil containing COCs at concentrations above action goals. A summary of the minimum, maximum, and average values for COCs remaining at these revetments are shown below. This information was considered in the process of selecting Alternative 3 and establishing cover boundaries for these revetments.

Minimum, Maximum, and Average Values for COCs — Revetment 1

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Barium	4	94.7	233	139	190
Cadmium	4	0.0400	1.80	1.00	1.2
Lead	4	9.7	70.2	45.6	46.7
PAHs, total	3	0.483	5.86	1.79	4.022

Units are in ppm.

Minimum, Maximum, and Average Values for COCs — Revetment 2

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Cadmium	4	0.430	3.10	1.66	1.2
Lead	4	16.6	176	81.6	46.7

Units are in ppm.

Minimum, Maximum, and Average Values for COCs — Revetment 3

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Barium	1	479	479	479	190
Copper	1	88.4	88.4	88.4	68.1
Manganese	1	1,850	1,850	1,850	943

Units are in ppm.

Minimum, Maximum, and Average Values for COCs — Revetment 4

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Cadmium	4	0.350	2.90	1.34	1.2
Lead	4	12.8	79.7	32.8	46.7

Units are in ppm.

Minimum, Maximum, and Average Values for COCs — Revetment 11

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Copper	17	28.6	126	60.5	68.1

Units are in ppm.

Minimum, Maximum, and Average Values for COCs — Revetment 12

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Copper	16	21.5	218	65.9	68.1

Units are in ppm.

Minimum, Maximum, and Average Values for COCs — Revetment 13

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Cadmium	4	0.110	4.20	1.57	1.2
Lead	4	15.3	109	45.8	46.7
PAHs, total	3	0.178	6.74	3.26	4.022

Units are in ppm.

Minimum, Maximum, and Average Values for COCs — Revetment 14

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
TPH-diesel	1	160	160	160	144

Units are in ppm.

Minimum, Maximum, and Average Values for COCs — Revetment 16

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Barium	1	406	406	406	190

Units are in ppm.

Minimum, Maximum, and Average Values for COCs — Revetment 19

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Barium	4	53.6	403	143	190
Cadmium	4	0.440	1.70	1.15	1.2
Copper	4	33.9	82.4	46.7	68.1
Lead	4	10.0	84.5	41.8	46.7
PAHs, total	4	0.110	12.5	2.77	4.022
TPH-diesel	4	270	270	270	144
TPH-gasoline	4	580	580	580	12

Units are in ppm.

Minimum, Maximum, and Average Values for COCs — Revetment 21

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Copper	1	70.3	70.3	70.3	68.1
Vanadium	1	131	131	131	118
TPH-diesel	1	310	310	310	144
TPH-gasoline	1	230	230	230	12

Units are in ppm.

Minimum, Maximum, and Average Values for COCs — Revetment 22

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
TPH-diesel	1	880	880	880	144
TPH-gasoline	1	200	200	200	12

Units are in ppm.

Minimum, Maximum, and Average Values for COCs — Revetment 23

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Copper	15	20.0	141	57.2	68.1

Units are in ppm.

Minimum, Maximum, and Average Values for COCs — Revetment 25

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Barium	1	238	238	238	190
TPH-diesel	1	330	330	330	144

Units are in ppm.

Minimum, Maximum, and Average Values for COCs — Revetment 26

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Barium	1	379	379	379	190
Boron	1	58.3	58.3	58.3	36.9
Manganese	1	1,130	1,130	1,130	943
TPH-diesel	1	290	290	290	144
TPH-gasoline	1	60.0	60.0	60.0	12

Units are in ppm.

No analytical data are available for the historic revetments.

Alternative 1 was not selected because it would not meet RAOs and would not protect human health and the environment. Alternative 2 would be an effective and implementable alternative. Alternative 3 was selected over Alternative 2 because these sites are located in areas where no scour or channel cuts are currently expected in the future wetland and Alternative 3 is more cost-effective.

2.4.3.10 Inboard Area-Wide DDTs and PAHs Near the Runway

Alternative 4, Manage Onsite, with Monitoring and Maintenance, for Army Civil Works Issues, is the preferred alternative for Inboard Area-Wide DDTs and PAHs near the runway. This alternative establishes performance criteria requiring 3 feet of cover over all site soils containing residual DDTs and/or PAHs in excess of the action goals. The Army Civil Works Program shall ensure, through both construction and implementation of its plan for monitoring and adaptive management, that the HWRP will achieve and maintain the performance criteria of 3 feet of stable cover or its equivalent. This alternative would meet RAOs by preventing exposure of future wetland receptors to existing site soils. Implementation of monitoring and adaptive management plans will achieve and maintain the 3 feet of stable cover.

The area recommended for cover is shown on Figure 2.4-6. Cover boundaries were established to address soil containing COCs at concentrations above action goals. A summary of the minimum, maximum, and average values for COCs remaining at these areas are shown below. This information was considered in the process of selecting Alternative 4 and establishing cover boundaries for these areas.

Minimum, Maximum, and Average Values for Inboard Area-Wide DDTs and PAHs Near the Runway

COC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Total DDTs	23	0.0181	0.935	0.163	0.03
Total PAHs	15	0.036	54.9	7.59	4.02

Units are in ppm.

Alternative 1 was not selected because it would not meet RAOs and would not protect human health and the environment. No other alternatives were considered.

2.4.4 Estimated Total Excavation Volume

As previously discussed, actions to be taken under Alternatives 2 and 4 include excavating soil. This section summarizes the estimated total volume of soil that will be excavated for sites where Alternatives 2 and 4 were selected.

Alternative 2, Excavation and Offsite Disposal, was selected for a number of Inboard Area sites as shown in Table 2.4-1. The total estimated volume of soil that will be excavated under this alternative is 13,800 cubic yards. The final footprint of excavation activities will be determined as part of the remedial design and/or by confirmation sampling conducted during remedial activities.

Alternative 4, Manage Onsite, with Monitoring and Maintenance, for Army Civil Works Issues, was selected for the Inboard Area-Wide DDTs and PAHs near the runway. The estimated maximum volume of soil to be excavated, moved, or managed elsewhere onsite under Alternative 4 is 871,000 cubic yards.

TABLE 2.4-1
Comparative Analysis Summary

		Evaluation Criteria Rankings								
Site	**Alternative**	**Overall Protection of Human Health and the Environment**	**Compliance with State and Federal Requirements**	**Long-Term Effectiveness and Permanence**	**Reduction of TMV Through Treatment**	**Cost**	**Short-Term Effectiveness**	**Implementability**	**Regulatory Agency Acceptance**	**Community Acceptance**
FSTP	**1**	NA	NA	NA	NA	NA	High	High	Low	TBD
	2	High	High	High	NA	$61,217	Medium	Medium	Medium	TBD
	3	High	Low	Medium	NA	$10,000	High	High	High	TBD
Building 26	**1**	NA	NA	NA	NA	NA	High	High	Low	TBD
	2	High	High	High	NA	$23,610	Medium	Medium	Medium	TBD
	3	High	Low	Medium	NA	$10,000	High	High	High	TBD
Building 35/39 Area	**1**	NA	NA	NA	NA	NA	High	High	Low	TBD
	2[a]	High	High	High	NA	$17,384	Medium	Medium	High	TBD
	3[b]	High	Low	Medium	NA	$10,000	High	High	High	TBD
Building 41 Area	**1**	NA	NA	NA	NA	NA	High	High	Low	TBD
	2	High	High	High	NA	$297,018	Medium	Medium	High	TBD
	3	High	Low	Medium	NA	$10,000	High	High	Medium	TBD
Building 82/87/92/94 Area and Building 86	**1**	NA	NA	NA	NA	NA	High	High	Low	TBD
	2	High	High	High	NA	$1,298,674	Medium	Medium	Medium	TBD
	3	High	Low	Medium	NA	$10,000	High	High	High	TBD
Perimeter Drainage Ditch	**1**	NA	NA	NA	NA	NA	High	High	Low	TBD
	2[c]	High	High	High	NA	$4,502,006	Medium	Medium	High	TBD
	3[d]	High	Low	Medium	NA	$10,000	High	High	High	TBD
Perimeter Drainage Ditch Spoils Piles	**1**	NA	NA	NA	NA	NA	High	High	Low	TBD
	2[e]	High	High	High	NA	Spoils Pile A—$ 55,892 Spoils Pile B—$123,374 Spoils Pile C—$97,974 Spoils Pile D—$60,244 Spoils Pile F—$182,305 Spoils Pile G—$68,213 Spoils Pile I—$41,202 Spoils Pile J—$16,915 Spoils Pile K—$32,852 Spoils Pile L—$9,811 Spoils Pile M—$126,722 Spoils Pile N—$72,078	Medium	Medium	High	TBD
	3[f]	High	Low	Medium	NA	$10,000 (per site)	High	High	High	TBD
Onshore Fuel Line	**1**	NA	NA	NA	NA	NA	High	High	Low	TBD
	2	High	High	High	NA	54-inch Line–$625,306 Hangar Segment–$701,748 Northern Segment–$571,294	Medium	Medium	Medium	TBD
	3	High	Low	Medium	NA	$10,000	High	High	High	TBD
Northwest Runway Area	**1**	NA	NA	NA	NA	NA	High	High	High	TBD
	2	High	High	High	NA	$76,566	Medium	High	Medium	TBD

TABLE 2.4-1
Comparative Analysis Summary

Site	Alternative	Evaluation Criteria Rankings: Overall Protection of Human Health and the Environment	Compliance with State and Federal Requirements	Long-Term Effectiveness and Permanence	Reduction of TMV Through Treatment	Cost	Short-Term Effectiveness	Implementability	Regulatory Agency Acceptance	Community Acceptance
	3	High	Low	Medium	NA	$10,000	High	High	Medium	TBD
Revetment Areas	**1**	NA	NA	NA	NA	NA	High	High	Low	TBD
	2[g]	High	High	High	NA	Revetment 1—$211,033 Revetment 2—$142,096 Revetment 3—$160,424 Revetment 4—$227,718 Revetment 6—$112,184 Revetment 7—$55,992 Revetment 11—$21,516 Revetment 12—$14,006 Revetment 13—$142,596 Revetment 14—$164,622 Revetment 15—$94,973 Revetment 16—$162,415 Revetment 19—$242,280 Revetment 20 —$170,446 Revetment 21—$167,867 Revetment 22—$156,872 Revetment 23—$226,934 Revetment 25—$164,373 Revetment 26—$156,810 Historic Revetments—$575,000	Medium	Medium	High	TBD
	3[h]	High	Low	Medium	NA	$10,000 per revetment	High	High	High	TBD
Inboard Area-Wide DDTs and PAHs Near Runway	**1**	NA	NA	NA	NA	NA	High	High	Low	TBD
	4	High	Low	Medium	NA	$5,880,000	Medium	High	High	TBD

[a] Alternative 2 seclected for Building 35/39 Area where DDTs are >1 ppm.
[b] Alternative 3 selected for Building 35/39 Area other than area where DDTs are >1 ppm.
[c] Alternative 2 selected for PDD unlined where DDTs are >1 ppm and PDD lined within proposed HWRP channel cut.
[d] Alternative 3 selected for PDD lined portion outside the proposed HWRP channel cut.
[e] Alternative 2 selected for PDD Spoils Pile F only.
[f] Alternative 3 selected for PDD Spoils Piles A, B, C, D, G, I, J, K, L, M, and N.
[g] Alternative 2 selected for Revetments 6 and 7.
[h] Alternative 3 selected for Revetments 1-4, 11-14, 16, 19, and 21-23, and historic revetments.
NA = not applicable
TMV = toxicity, mobility, and volume
TBD = to be determined
Shaded cells indicate the preferred alternative.
Alternative 1—No Further Action
Alternative 2—Excavation and Offsite Disposal
Alternative 3—Manage In-Situ, with Monitoring And Maintenance, for Army BRAC Sites
Alternative 4—Manage Onsite, with Monitoring and Maintenance, for Army Civil Works Issues

GRAPHIC SCALE

500 0 500 1000

(IN FEET)
1 inch = 500 ft.

NORTHWEST RUNWAY AREA, (ALT 3)

RADIOLOGICAL WASTE DISPOSAL CYLINDERS, (ALT 1)

PDD–UNLINED PORTION, (ALT 2)

NORTHWEST ALLEDGED DISPOSAL AREA (ASR SITE #8)

PDD SPOILS PILE A, (ALT 3)

NORTH LEVEE PERIMETER ROAD

PDD–UNLINED PORTION, (ALT 3)

ONSFL–54" DRAIN LINE SEGMENT, (ALT 3) SEE FIGURE 2.4–3

PDD SPOILS PILE B, (ALT 3)

BUILDING 20, (ALT 1)

BUILDING 26, (ALT 3)

PDD–LINED PORTION OUTSIDE HWRP CHANNEL CUT (ALT 3)

ONSFL–NORTHERN SEGMENT, (ALT 3) SEE FIGURE 2.4–4

PDD SPOILS PILE C, (ALT 3)

REVETMENT 16, (ALT 3)
REVETMENT 15, (ALT 1)
REVETMENT 14, (ALT 3)
REVETMENT 12, (ALT 3)
REVETMENT 28, (ALT 1)
REVETMENT 11, (ALT 3)
REVETMENT 10, BURN PIT (ALT 1)
REVETMENT 26, (ALT 3)
PDD SPOILS PILE D, (ALT 3)
REVETMENT 9, (ALT 1)
REVETMENT 8, (ALT 1)
REVETMENT 7, (ALT 2)

REVETMENT 18/BUILDING 15, (ALT 1)

ONSFL–HANGAR SEGMENT, (ALT 3) SEE FIGURE 2.4–5

REVETMENT 19, (ALT 3)
REVETMENT 17, (ALT 1)
REVETMENT 20 (ALT 1)
REVETMENT 21, (ALT 3)
REVETMENT 22, (ALT 3)
REVETMENT 23, (ALT 3)
REVETMENT 24, (ALT 1)
REVETMENT 13, (ALT 3)
REVETMENT 27, (ALT 1)
REVETMENT 25, (ALT 3)
REVETMENT 3, (ALT 3)
REVETMENT 1, (ALT 3)

PDD SPOILS PILE E, (ALT 1)
BUILDINGS 35/39, (ALT 2 AND 3)
REVETMENT 6, (ALT 2)
PDD SPOILS PILE F, (ALT 2)
PDD–LINED WITHIN HWRP CHANNEL CUT (ALT 2)
BUILDING 41 AREA (ALT 2) (SEE FIGURE 2.4–2)
FORMER SEWAGE TREATMENT PLANT (including sanitary and industrial waste lines), (ALT 3)
REVETMENT 5, (ALT 1)
REVETMENT 4, (ALT 3)
REVETMENT 2, (ALT 3)
PDD SPOILS PILE G, (ALT 3)
EAST LEVEE GENERATOR PAD (ALT 1)
HISTORIC REVETMENTS (ALT 3)
PDD SPOILS PILE I, (ALT 1)
PDD LINED OUTSIDE HWRP CHANNEL CUT (ALT 3)

TARMAC EAST OF OUTPARCEL A–5, (ALT 1)

HISTORIC REVETMENTS (ALT 3)

BUILDINGS 82/87/92/94 (including storm drains), (ALT 3)

PDD SPOILS PILE H, (ALT 1)

BUILDINGS 84/90 (ALT 1)

BUILDING 86 (including storm drains), (ALT 3)

PDD SOILS PILE N (ALT 3)

PDD SPOILS PILE J, (ALT 3)

PDD SPOILS PILE K, (ALT 3)

PDD SPOILS PILE M, (ALT 3)

HISTORIC REVETMENTS (ALT 3)

PDD SPOILS PILE L (ALT 3)

LANDFILL 26

HOL HILL

GSA PHASE II SALE PARCEL

HOSPITAL HILL

U.S. COAST GUARD

TESTING RANGE, (ASR SITE #4)

FIRING–IN BUTT, (ASR SITE #19)

SKEET RANGE (ASR SITE #18)

AGRICULTURAL LAND

LEGEND

(ALT 1)	REMEDIAL ALTERNATIVE 1 - SELECTED FOR SITE
(ALT 2)	REMEDIAL ALTERNATIVE 2 - SELECTED FOR SITE
(ALT 3)	REMEDIAL ALTERNATIVE 3 - SELECTED FOR SITE
———	MAIN AIRFIELD PARCEL BOUNDARY
- - - - - -	AREAS ENLARGED IN FIGURE 2.4-2 THROUGH FIGURE 2.4-5
–o–o–	STORMWATER DRAINAGE SYSTEM
— · —	SEWER SYSTEM LINES

SELECTED ALTERNATIVES LEGEND

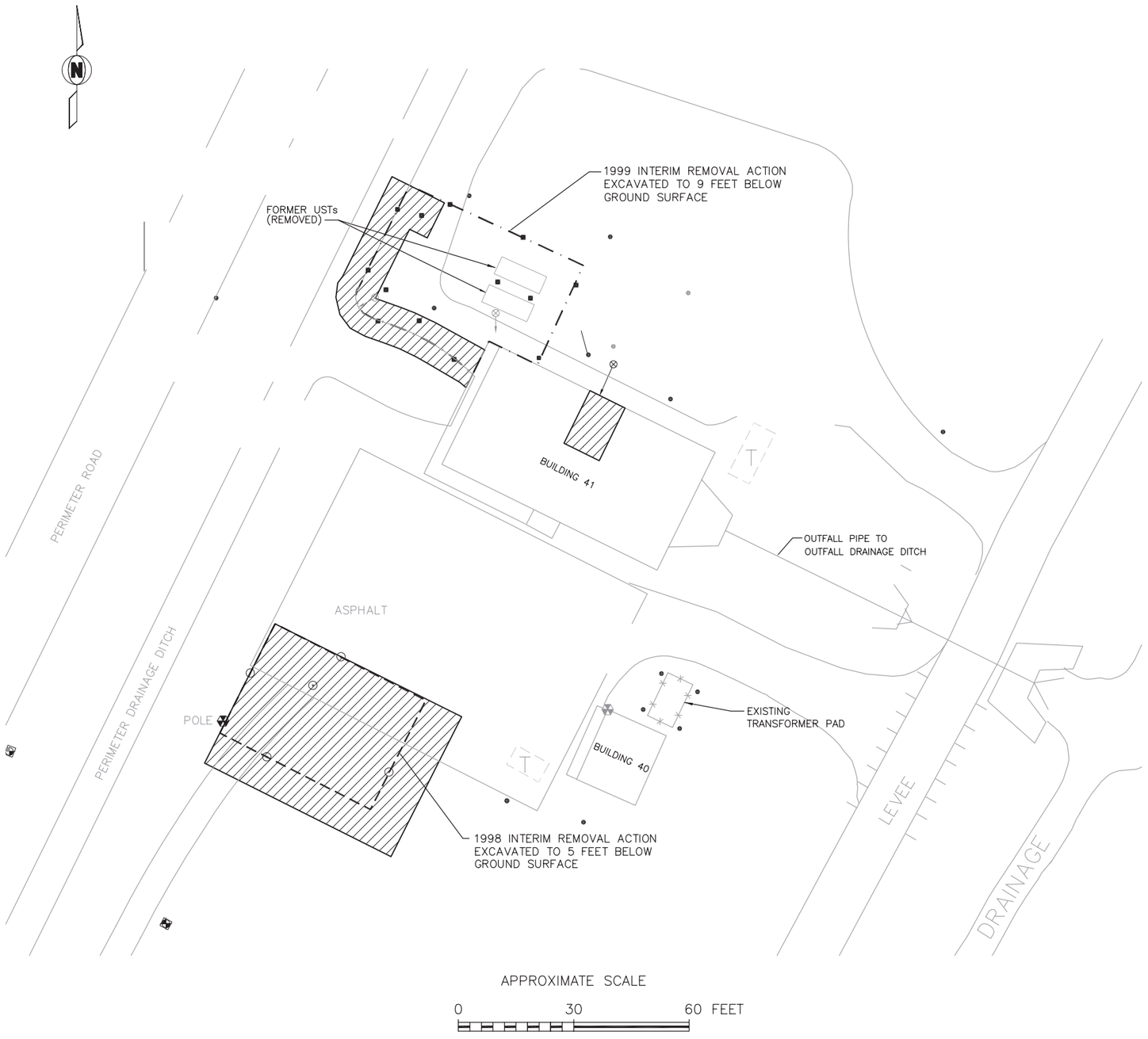
	ALTERNATIVE 1 - NO FURTHER ACTION
	ATERNATIVE 2 - EXCAVATION AND OFFSITE DISPOSAL
	ALTERNATIVE 3 - MANAGE IN-SITU WITH MONITORING AND MAINTENANCE, FOR ARMY BRAC SITES

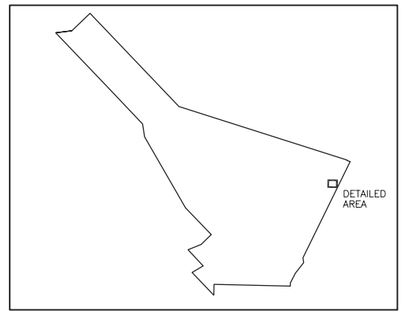
FIGURE 2.4-1
INBOARD AREA SITE LOCATIONS AND REMEDIAL ACTION AREAS
HAMILTON ARMY AIRFIELD

ROD/RAP

CH2MHILL

E042003005SAC_HAAF Fig2.4-1.ai 8/11/03 dash





KEY MAP

LEGEND:

- PROPOSED REMEDIAL ACTION AREA (ALTERNATIVE 2 - EXCAVATION AND OFFSITE DISPOSAL)
- ANGLED SOIL BORING SHOWING DIRECTION OF SLANT
- REMEDIAL INVESTIGATION SAMPLE (IT, 1999a)
- 1998 INTERIM REMOVAL ACTION SAMPLE
- 1999 INTERIM REMOVAL ACTION SAMPLE
- ABOVE GROUND STORAGE TANK (AST)
- SURVEY HUB
- MONITORING WELL LOCATION
- 1998 INTERIM REMOVAL ACTION EXCAVATION BOUNDARY
- 1999 INTERIM REMOVAL ACTION EXCAVATION BOUNDARY

FIGURE 2.4–2

BUILDING 41 AREA
PROPOSED
REMEDIAL ACTION AREAS
INBOARD AREA SITES
MAIN AIRFIELD PARCEL
HAMILTON ARMY AIRFIELD

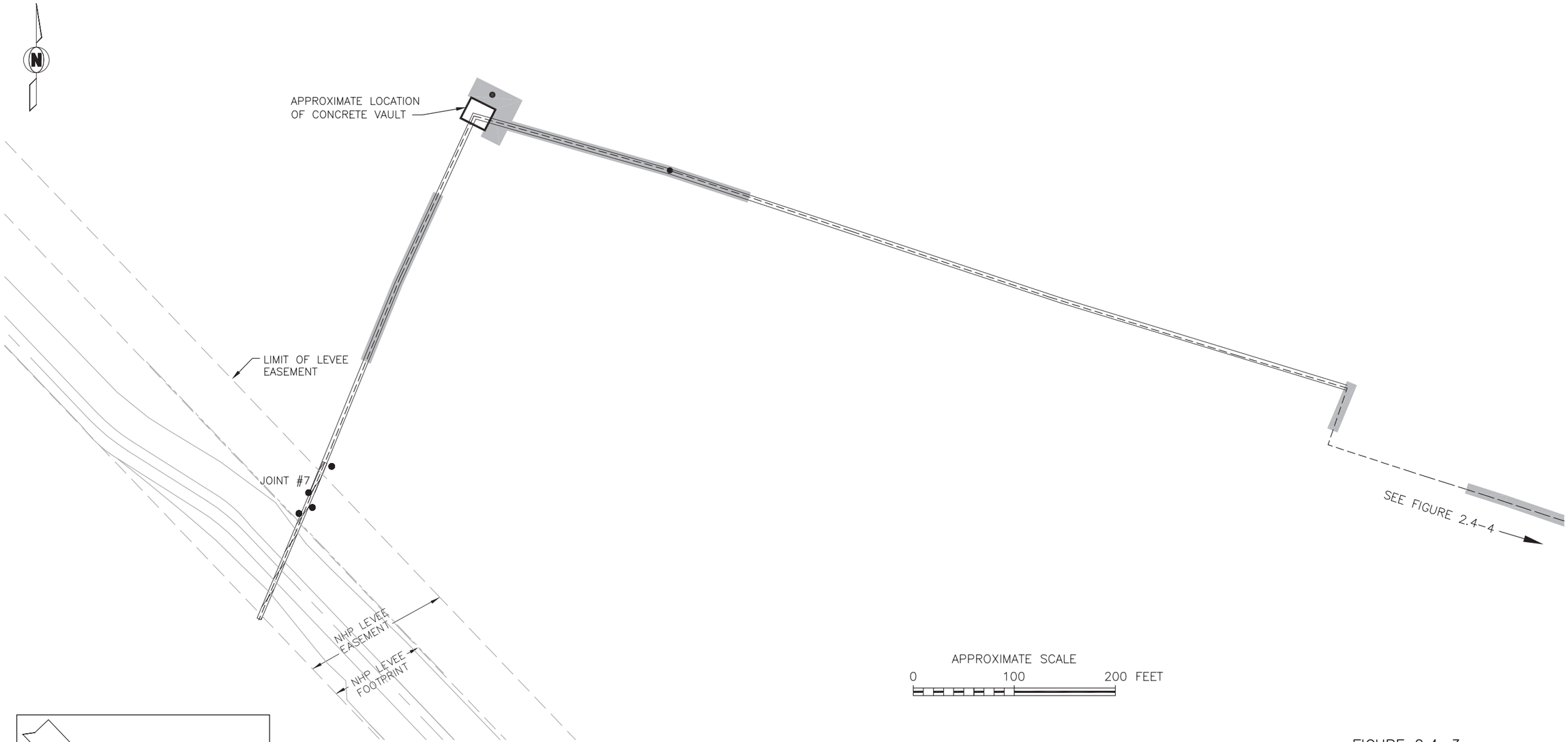
PREPARED FOR

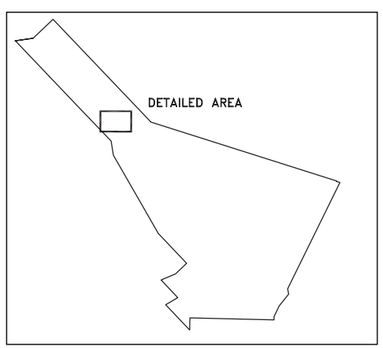
USACE SACRAMENTO

ROD / RAP
REFERENCE: IT CORPORATION (IT), FIGURE 2–5, BUILDING 41 AREA SAMPLE LOCATIONS AND PROPOSED EXCAVATION BOUNDARIES. (DWG. NO. 762538–R692.DWG)

CH2MHILL

E042003005SAC_HAAF Fig2.4-2.ai 8/7/03 esm





KEY MAP

LEGEND:

PROPOSED REMEDIAL ACTION AREA
(ALTERNATIVE 3 - MANAGE IN-SITU WITH MONITORING AND MAINTENANCE FOR ARMY BRAC SITES)

SOIL SAMPLE LOCATION

FORMER ONSHORE FUEL LINE

FIGURE 2.4–3

ONSHORE FUEL LINE
54–INCH DRAIN LINE SEGMENT
PROPOSED REMEDIAL ACTION AREAS
INBOARD AREA SITES
MAIN AIRFIELD PARCEL
HAMILTON ARMY AIRFIELD

PREPARED FOR

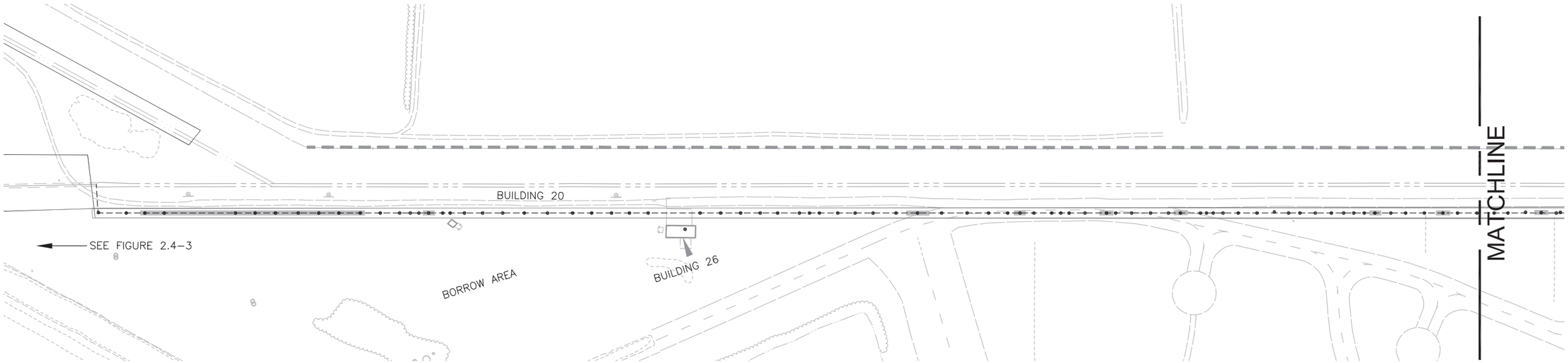
USACE SACRAMENTO

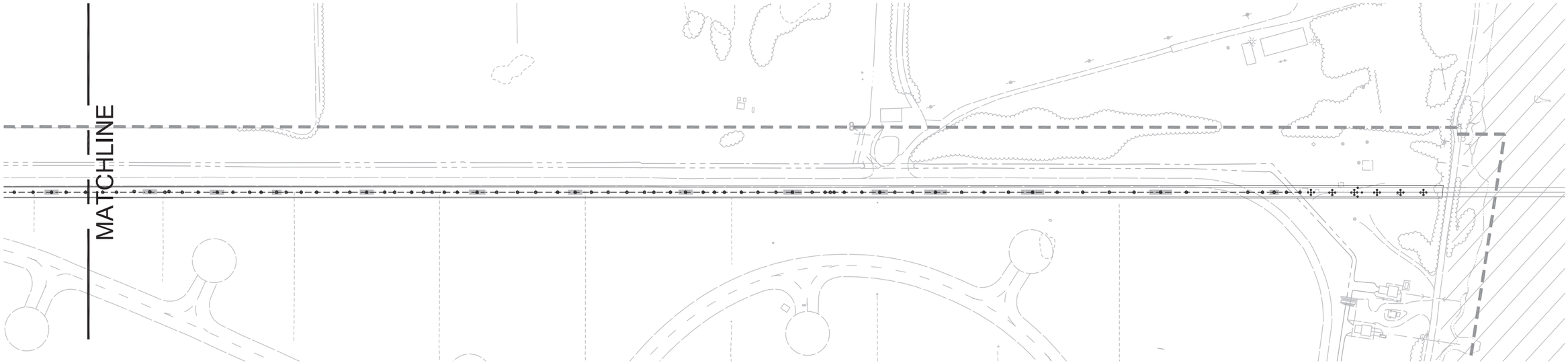
ROD / RAP

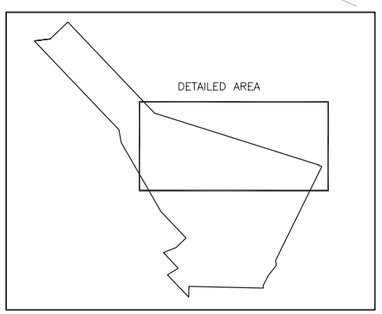
REFERENCE: IT CORPORATION (IT), FIGURE 2–2, ONSHORE FUEL LINE 54–INCH DRAIN LINE SEGMENT SAMPLE LOCATIONS AND PROPOSED EXCAVATION BOUNDARIES. (DWG. NO. 762538–R697.DWG)

CH2MHILL

E042003005SAC_HAAF Fig2.4-3.ai 8/7/03 esm







KEY MAP

LEGEND:

PROPOSED REMEDIAL ACTION AREA
(ALTERNATIVE 3 - MANAGE IN-SITU WITH MONITORING AND MAINTENANCE FOR ARMY BRAC SITES)

MAIN AIRFIELD BOUNDARY

PERIMETER DRAINAGE DITCH (CONCRETE LINED)

SAMPLE LOCATION (IT 1999a)

FORMER LOCATION OF FUEL LINE

APPROXIMATE SCALE
0 100 200 FEET

FIGURE 2.4–4

ONSHORE FUEL LINE
NORTHERN SECTION
PROPOSED REMEDIAL ACTION AREAS
INBOARD AREA SITES
MAIN AIRFIELD PARCEL
HAMILTON ARMY AIRFIELD

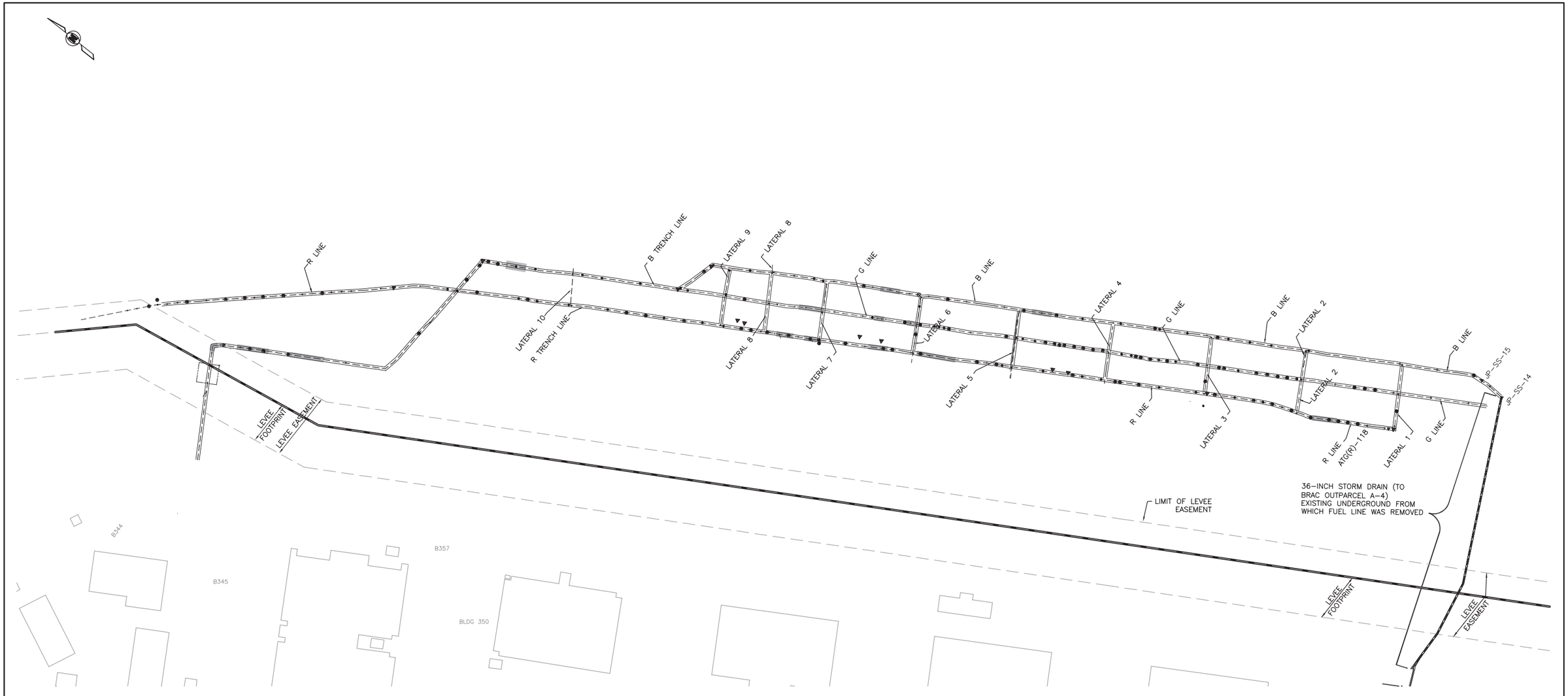
PREPARED FOR

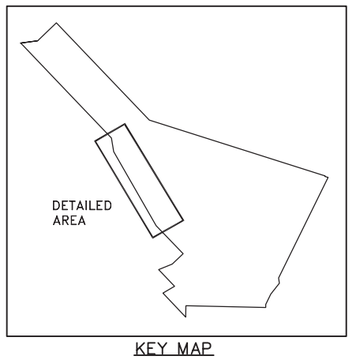
USACE SACRAMENTO

ROD /RAP
REFERENCE: IT CORPORATION (IT), FIGURE 2–3, ONSHORE FUEL LINE NORTHERN SECTION SAMPLE LOCATIONS AND PROPOSED EXCAVASTION BOUNDARIES (DWG NO. 762538 – R108.DWG)

CH2MHILL

E042003005SAC_HAAF Fig2.4-4.ai 8/7/03 esm





KEY MAP

LEGEND:

PROPOSED REMEDIAL ACTION AREA (ALTERNATIVE 3 - MANAGE IN-SITU WITH MONITORING AND MAINTENANCE FOR ARMY BRAC SITES)

SAMPLE LOCATIONS CONFIRMATION SAMPLE (IT, 1999a)

FORMER ONSHORE FUEL LINE SAMPLE

BOUNDARY BETWEEN LEVEE FOOTPRINT AND EASEMENT

LEVEE EASEMENT

FORMER ONSHORE FUEL LINE

APPROXIMATE SCALE

0 100 200 FEET

FIGURE 2.4-5

ONSHORE FUEL LINE HANGAR AREA
PROPOSED
REMEDIAL ACTION AREAS
INBOARD AREA SITES
MAIN AIRFIELD PARCEL
HAMILTON ARMY AIRFIELD

PREPARED FOR

USACE SACRAMENTO

ROD / RAP

REFERENCE: IT CORPORATION (IT), FIGURE 2-4, ONSHORE FUEL LINE HANGAR AREA SAMPLE LOCATIONS AND PROPOSED EXCAVATION BOUNDARIES. (DWG. NO. 762538-R109.DWG)

CH2MHILL

E042003005SAC_HAAF Fig2.4-5.ai 8/7/03 esm

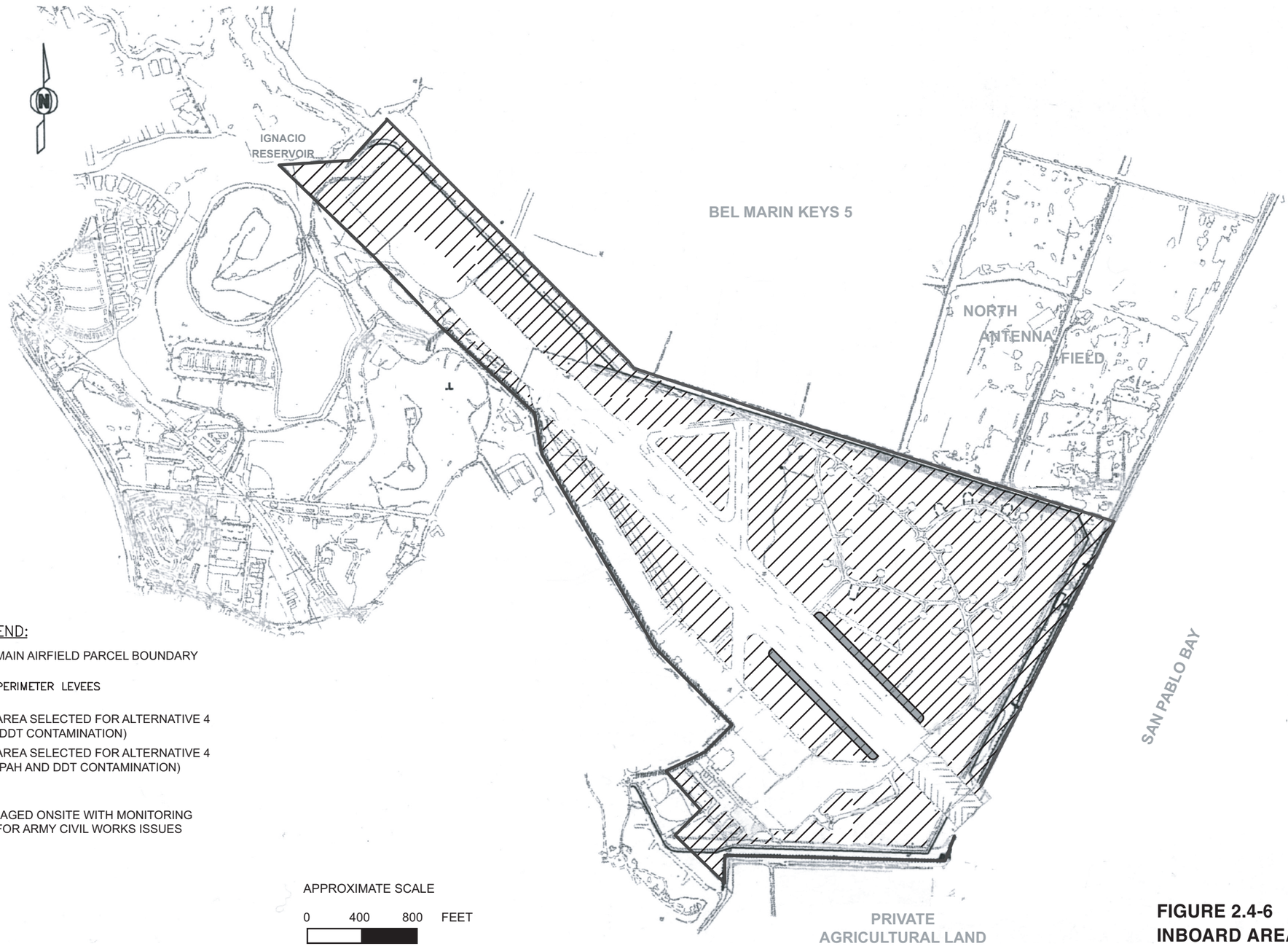


FIGURE 2.4-6
INBOARD AREA-WIDE DDTs
AND PAHs NEAR THE RUNWAY
PROPOSED REMEDIAL ACTION AREAS
HAMILTON ARMY AIRFIELD
PREPARED FOR USACE SACRAMENTO

ROD/RAP Reference: IT Corporation Figure 1-3 Inboard Sites (DWG No. 762538-B660)

CH2MHILL

SECTION 3.0

Coastal Salt Marsh Area Sites

Section 3.0 contains all of the information related to the Coastal Salt Marsh Area sites. This section is organized as follows:

3.1: Site Background and Extent of Contamination provides background information and discusses the nature of contamination for the sites in the Coastal Salt Marsh Area currently owned by the Army and also the sites in the adjacent coastal salt marsh habitat on property currently owned by the SLC. It provides a brief summary of the historical investigations and describes, in general terms, the nature of contamination found at the coastal salt marsh sites. In addition, it provides a background discussion for each site and identifies the nature of contamination.

3.2: Overview of Risk Assessment and Action Goals provides an overview of the risk assessment and the process used to establish action goals for the coastal salt marsh sites. It presents details of the process used to determine contaminants of potential concern (COPCs) and to establish action goals.

3.3: Remedial Action Objectives (RAOs) describes the goals that proposed remedial actions are expected to accomplish and the development of RAOs for the coastal salt marsh sites, and presents how the different agencies (DTSC, RWQCB, and Army) identify and implement their respective laws and standards for selection of remedies.

3.4: Summary and Evaluation of Alternatives summarizes the evaluation and selection of remedial alternatives presented for each coastal salt marsh site. It provides a description of the remedial alternatives, and the process for selecting alternatives for each site. The rationale for adopting the selected alternative is also provided.

Information for the Inboard Area sites is presented in Section 2.0.

SECTION 3.1

Site Background and Nature of Contamination

This section addresses the sites in the coastal salt marsh, currently owned by the Army, and the sites in the adjacent coastal salt marsh habitat, currently owned by the SLC. For ease of terminology, this section will use the term "coastal salt marsh" to refer to all areas outboard of the perimeter levee.

This section provides background information and discusses the nature of contamination for each site in the coastal salt marsh. Subsection 3.1.1 briefly summarizes the historical investigations and describes, in general terms, the nature of contamination found at the coastal salt marsh sites. Subsection 3.1.2 identifies the sites in the coastal salt marsh that are addressed in this ROD/RAP. Subsection 3.1.3 provides background information for each site and identifies the nature of contamination and COPCs.

3.1.1 Historical Investigations and Nature of Contamination

Numerous activities were conducted in the coastal salt marsh between 1987 and 2002. Historical activities included a confirmation study for hazardous waste, remedial investigations, biological testing data studies, and a HHERA. The following documents summarize the findings of these activities:

- *Coastal Salt Marsh December 2001/January 2002 Sampling Report* (USACE, 2002b): The Army collected additional soil samples at the coastal salt marsh sites to further characterize and investigate the extent of chemicals detected in the previous investigations, with the exception of the High Marsh Proposed Channel Cut and the Boat Dock Nonchannel Area.
- *Draft Channel Cut Sampling Report, Coastal Salt Marsh* (USACE, 2002a): The Army conducted this specific investigation to evaluate the soil in the High Marsh Proposed Channel Cut.
- *Human Health and Ecological Risk Assessment* (USACE, 2001): An HHERA was completed for the coastal salt marsh sites.
- *Remedial Design Investigation Report* (FW, 2000): A design data report was completed following the RI for the Antenna Debris Disposal Area and Boat Dock.
- *Comprehensive Remedial Investigation* (IT, 1999a): C*oastal* salt marsh sites were investigated during the RI, which consisted of collecting and analyzing soil, sediment, and water samples to determine whether the sites were affected by past activities. The RI activities ranged from review and evaluation of previous investigation data to the collection of soil, sediment, and groundwater samples for analysis. During the RI, additional background data were collected for metals. These data were combined with background data collected in previous investigations and were used to determine baseline (or background) concentrations for metals and PAHs in sediment and soil.

- *Biological Testing Data Report* (IT, 1999b).
- *1998 Interim Removal Action Report* (IT, 1999b): An interim removal action was conducted at the transformer pad in the Boat Dock Nonchannel Area.

A list of documents included in the Administrative Record for HAAF is attached as Appendix A. Portions of the coastal salt marsh were used to support U.S. Army and U.S. Army Reserve operations at HAAF. Activities in the coastal salt marsh included emergency rescue operations in San Pablo Bay, disposal of construction debris, destruction of waste discharge of surface water, and discharge of treated sewage water. Transformers and transformer pads, a winch at the Boat Dock, and a burn pit at the ELCDDA supported these activities.

Additional features of the coastal salt marsh include the ODD, which receives stormwater runoff and drainage from the Main Airfield, and the FSTP Outfall, which received Main Airfield sanitary wastes from the FSTP. Based on historical investigations, the types of contaminants detected at various sites in the coastal salt marsh include:

- TPH-d, TPH-g, and TPH-motor
- Metals
- Dioxins
- VOCs
- SVOCs, including PAHs
- PCBs
- Pesticides

3.1.2 Sites Evaluated in this ROD/RAP

The following sites located in the coastal salt marsh are evaluated in the remainder of this ROD/RAP:

- Antenna Debris Disposal Area
- East Levee Construction Debris Disposal Area
- High Marsh Area
- Historic ODD
- ODD
- Boat Dock
- Area 14
- FSTP Outfall

3.1.3 Background and Nature of Contamination

The following sections provide a description of each coastal salt marsh site and a summary of the types of contaminants (metals, pesticides, TPH, etc.) detected at each site. Remedial actions are presented and evaluated in this ROD/RAP for residual COPCs (FFS COPCs) that were detected above actions goals. More information regarding action goals and FFS COPCs is provided in Subsection 3.2.2. Specific information regarding sample locations and

individual sample results is available in the primary reports cited for each coastal salt marsh site. The location of each site is shown in Figure 3.1-1.

3.1.3.1 Antenna Debris Disposal Area

The Antenna Debris Disposal Area is located along the northern portion of the ODD, north of the Building 35 pump station outfall basin. Apparent debris disposal occurred in two areas, one east of the ODD and one west of the ODD (see Figure 3.1-1). (Figures follow the tables at the end of this section.) Visual inspection of the areas indicates that they contain discarded materials from the former antenna facilities and building materials. The December 2001/January 2002 investigation conducted by USACE found debris to a depth of 8.5 feet bgs in the western area and to a depth of 3 feet bgs in the eastern area. Both areas are currently covered with a growth of native grasses, interspersed with some pickleweed, which is common to the rest of the marsh. This site was identified in the Archive Search Report (USACE, 2003) as ASR Site #15.

The western Antenna Debris Disposal Area was investigated by the Army in 1995 (WCFS, 1996), 1999 (FW, 2000), and in December 2001 and January 2002 (USACE, 2002b). During the 1995 and 1999 investigations, eight soil samples were collected in and near the western area. One of the samples was collected at 2 to 3 feet bgs beneath the western area. The results of these investigations indicate that lead and pesticides are common throughout the western area. Only one of the samples was analyzed for PCBs; they were detected in the sample. No samples were collected from the eastern Antenna Debris Disposal Area during the 1995 or 1999 investigations.

In December 2001 and January 2002, the Army collected soil samples from the eastern area and additional samples from the western area. The objective of the sampling was to investigate the extent of chemicals detected in the previous investigations at the western area and to characterize the eastern area sufficiently to determine the appropriate remedy. Sampling at the eastern and western areas resulted in detections of metals, pesticides, TPH, and PCBs.

Table 3.1-1 lists the FFS COPCs for the Antenna Debris Disposal Area. (The table follows the text of this section.) Concentrations of FFS COPCs detected at this site exceed action goals.

3.1.3.2 East Levee Construction Debris Disposal Area

The ELCDDA is located on the eastern margin of the Main Airfield Parcel in the coastal salt marsh and outboard of the east levee. It is bisected by the eastern boundary of the Main Airfield Parcel and lies primarily in land owned by the SLC (see Figure 3.1-1). The ELCDDA was used, from approximately 1961 onward, primarily for disposal of construction debris. A dirt road runs through the central portion of the ELCDDA. Pickleweed grows up to the edges of the road.

The ELCDDA includes a burn pit, located at the eastern end, which extends out into San Pablo Bay and has a slightly higher elevation than most of the ELCDDA and the coastal salt marsh. The nature and quantity of any wastes burned at the site are unknown, and no waste materials were evident at the surface or in soil samples collected at the site. This site was identified in the Archive Search Report (USACE, 2003) as ASR Site #13.

The ELCDDA was investigated by the Army in 1986 (WCC, 1987); 1990 (ESI, 1993); 1994 (USACE, 1994 and WC, 1994); 1995 (WCFS, 1996); 1997 (IT, 1999a); and December 2001 and January 2002 (USACE, 2002b). During the 1986, 1990, 1994, 1995, and 1997 investigations, trench sampling and soil samples were collected and analyzed. TPH-d, TPH-g, SVOCs, VOCs, PCBs, pesticides, dioxins, and metals have been detected in one or more soil samples from the site.

In December 2001 and January 2002, the Army collected additional soil and sediment samples in the burn pit area and in portions of the ELCDDA adjacent to the Main Airfield Parcel. The objectives of the sampling were: (1) to investigate the extent of known chemicals detected in previous investigations at the burn pit; and (2) to characterize the extent of contamination at an isolated location in the ELCDDA sufficiently to determine the appropriate remedy. Sampling at the ELCDDA indicated the presence of metals.

The FFS COPCs for the ELCDDA are listed in Table 3.1-1.

3.1.3.3 High Marsh Area

As described in Subsection 1.4.5, three primary habitat zones are present in the coastal salt marsh (Low Marsh, Middle Marsh, and High Marsh). The Army has investigated several areas in the Middle Marsh habitat as potential areas of concern. Although the areas are located in the Middle Marsh habitat, these areas are collectively known as (and are referred to in many of the coastal salt marsh investigation and planning documents) the High Marsh Area. To remain consistent with previous documents, the term "High Marsh" or "High Marsh Area" will be used to refer to areas located outboard of the perimeter levee that are not part of another identified site. The majority of the High Marsh Area is on land owned by the SLC. The High Marsh Area is on the portion of the coastal salt marsh plain that is dominated by pickleweed. The area extends from the northern to southern Main Airfield Parcel boundaries and to the east from the levee, nearly to the shoreline of San Pablo Bay. A portion of the High Marsh Area is located in the Main Airfield Parcel (see Figure 3.1-1).

For the purposes of this draft ROD/RAP and the development and evaluation of alternatives, the High Marsh Area has been divided into two subgroups: the area where the wetland restoration project proposes to cut a channel to breach the levee, and the remainder of the High Marsh Area. Samples from the Historic ODD and ODD are not included in the High Marsh Area. They are discussed and evaluated in Subsections 3.1.3.4 and 3.1.3.5, respectively. The FFS COPCs for the High Marsh Area are listed in Table 3.1-1.

Nonchannel Cut Area

The High Marsh Area was investigated by the Army in 1991 and 1992 (ESI, 1993); 1994 (USACE, 1994); 1995 (WCFS, 1996); 1997 (IT, 1999a); 1998 (IT, 1999c); and December 2001 and January 2002 (USACE, 2002b). During the 1991, 1992, 1994, 1995, 1997, and 1998 investigations, sediment samples were collected and analyzed for various constituents in the Nonchannel Cut Area. Various contaminants, including metals and pesticides, have been detected in samples collected in the Nonchannel Cut Area. The area near the pump station outfalls to the bay was identified in the Archive Search Report (USACE, 2003) as ASR Site #16.

In December 2001 and January 2002, the Army collected soil and sediment samples from portions of the Nonchannel Cut Area. The objective of the sampling was to characterize:

- Copper and manganese contamination at a location on the northern end of the High Marsh Area
- Extent of metals contamination (particularly lead) at a cluster of locations on the northern end of the High Marsh Area
- Extent of manganese contamination in the central portion of the High Marsh Area sufficiently to determine the appropriate remedy

Sampling at the High Marsh Nonchannel Cut Area resulted in detections of metals and pesticides.

The FFS COPCs for the Nonchannel Cut Area are listed in Table 3.1-1.

Proposed Channel Cut Area

The High Marsh Area was investigated by the Army in 1991 and 1992 (ESI, 1993); 1994 (USACE, 1994); 1995 (WCFS, 1996); 1997 (IT, 1999a); 1998 (IT, 1999c); and September 2001 (USACE, 2002b). During the 1991, 1992, 1994, 1995, 1997, and 1998 investigations, sediment samples were collected and analyzed for various constituents in the Proposed Channel Cut Area. In 1993, metals were detected above baseline concentration (the cumulative concentration of an analyte present in soil from both natural occurrence and anthropogenic activities that are unrelated to activities conducted at a site). Additionally, PAHs were detected above baseline concentrations at three locations in the Proposed Channel Cut Area. In 1995, metals were detected at all sampled locations in the Proposed Channel Cut Area of the High Marsh. PAHs were detected at one location, and two pesticides (chlordane and DDT) were detected above baseline concentrations at one location in the Proposed Channel Cut Area.

In September 2001, the Army conducted a specific investigation to evaluate the soil in the Proposed Channel Cut Area. Samples were collected at 12 locations and 3 depths (1, 2, and 4 feet bgs). The samples were collected in a grid from the ODD toward the bay where the planned channel cut is anticipated. TPH, metals, PAHs, and SVOCs were detected in samples collected from the Proposed Channel Cut Area.

The FFS COPCs for the Channel Cut Area are listed in Table 3.1-1.

3.1.3.4 Historic Outfall Drainage Ditch

The portion of the ODD now known as the Historic ODD runs from the southern edge of the ELCDDA southward to the northern edge of the runway overrun (see Figure 3.1-1). Concrete building materials are visible along portions of the Historic ODD and were apparently used as riprap. Much of the Historic ODD has filled with sediments throughout the years, although the channel is still visible.

The Army collected two sediment samples in the Historic ODD during the 1995 investigation. Metals, including cadmium, cobalt, lead, and manganese, were present in the samples. The Army investigated the Historic ODD in December 2001. During the investigation, the Army collected soil and sediment samples at 250-foot intervals along the

Historic ODD, in order to characterize the extent of contamination. Some metals and pesticides were detected.

The FFS COPCs for the Historic ODD are listed in Table 3.1-1.

3.1.3.5 Outfall Drainage Ditch

The ODD is located on the coastal salt marsh side of, and parallel to, the east perimeter levee (See Figure 3.1-1). The ditch receives stormwater runoff and drainage from the Inboard Area sites and PDD. Historically, the ODD ran from the northernmost portion of the Main Airfield Parcel south to the Historic ODD, which emptied into the Boat Dock channel. The ODD receives water from the airfield stormwater collection system. The water is discharged to the ODD from the pump house area. When the south runway extension was constructed in 1953, the northern portion of the ditch was rerouted to San Pablo Bay at a point near the northern edge of the ELCDDA. Currently, the ODD runs from the northernmost portion of the Main Airfield Parcel to the northern edge of the ELCDDA. From this point, the ditch makes a 90-degree turn and runs to its discharge point in San Pablo Bay. The ODD is 3 to 4 feet deep and 6 to 10 feet wide.

The ODD was investigated by the Army in 1990 and 1991 (ESI, 1993); 1994 (USACE, 1994); 1995 (WCFS, 1996); 1997 (IT, 1999a); 1998 and 1999 (IT, 1999b); and January 2002 (USACE, 2001b). During the 1990, 1991, 1994, 1995, 1997, 1998, and 1999 investigations, sediment samples were collected and analyzed for various constituents in the ODD. TPH, metals, PCBs, and pesticides were detected in sediment samples collected from the ODD. Specifically, in 1994, metals, total recoverable petroleum hydrocarbon (TRPH), and TPH-d were detected above baseline concentrations in the Building 41 pump station outfall area.

In January 2002, the Army collected sediment samples from the ODD. The objectives of the sampling were: (1) to investigate the extent of chemicals detected in the previous investigations at the outfalls; (2) to address the downstream extent of contamination from the outfalls; and (3) to characterize the portion of the ODD upstream of the outfalls sufficiently to determine the appropriate remedy. Sampling at the ODD resulted in detections of metals, TPH, and pesticides.

The FFS COPCs for the ODD are listed in Table 3.1-1.

3.1.3.6 Boat Dock

For purposes of this draft ROD/RAP, the Boat Dock was divided into two areas, the Nonchannel Area and the Channel Area.

Nonchannel Area

The Boat Dock is located at the southeast corner of the HAAF Main Airfield Parcel in the coastal salt marsh (see Figure 3.1-1). Before 1965, when the base was active, the launch was maintained at the dock for rescue in the event of an emergency in San Pablo Bay. The Boat Dock had electrical power supplied by two transformers and one or more small, enclosed structures. A gasoline-powered winch was used to lower the launch down a steel track into a dredged channel and turning basin. The facility has since been abandoned and only piers and the main platforms remain.

The Nonchannel Area was investigated by the Army in 1997 (IT, 1999a), 1998 (IT, 1999c), and 1999 (FW, 2000). During these investigations, soil samples were collected and analyzed for various constituents in the Nonchannel Area. PCBs were detected in soil samples collected at the transformer pad area. Metals and pesticides were present in soil samples collected around and beneath the deck structures. PAHs were also detected, but are likely attributable to the creosote in pier pilings.

Investigations during the Comprehensive RI (IT, 1999a) and the remedial design investigation (FW, 2000) characterized the contamination present at the Nonchannel Area. An interim removal action was conducted in 1998 at the transformer pad in the Nonchannel Area, where one or more soil samples contained PCBs at concentrations at or above guidance levels (IT, 1997c). The interim removal action involved the removal of approximately 24 cubic yards of affected soil at the transformer pad, with offsite disposal of the excavated soil and the removal of the transformer pad (IT, 1999c). After excavation, five confirmation soil samples were collected to ensure the achievement of interim removal action guidance levels (concentrations of specific contaminants used to establish excavation limits during interim removal actions). PCBs were not detected in the confirmation samples. After completion of confirmation sampling, soil from a borrow area in the Main Airfield was used to backfill the excavation. Table C1-1.1 of the Comprehensive RI (IT, 1999a) presented the analytical results for the borrow area soil. All chemical concentrations reported for the borrow material are less than the action goals for the coastal salt marsh.

The FFS COPCs for the Boat Dock Nonchannel Area are listed in Table 3.1-1.

Channel Area

The Channel Area extends west from San Pablo Bay to the launch ramp at the Boat Dock, where it bends and continues to extend south to adjacent agricultural land. This portion of the Channel Area received agricultural runoff and stormwater from the Airfield. Aerial photographs suggest that maintenance of the channel and turnaround areas for the dock was discontinued during the 1960s. Because maintenance has stopped, the original contours of the channel leading from the dock to the bay have changed dramatically, as a result of the deposits of silt from San Pablo Bay. Historical photos indicate that the original channel was more than 100 feet wide. The historical depth of the channel is unknown. The turnaround area could accommodate boats up to 40 feet long. Currently, the existing channel is approximately 15 feet wide. The turnaround area is virtually nonexistent and is covered with a dense growth of pickleweed. The channel in this area receives some runoff from the Las Gallinas Valley Sanitary District gray water spraying operation.

The Channel Area was investigated by the Army in 1999 (FW, 2000) and December 2001 (USACE, 2002b). A single sediment sample was collected from the Boat Dock channel surface. The sample contained pesticides, herbicides, PAHs, TPH, VOCs, and metals. In December 2001, the Army collected additional sediment samples from the Channel Area. The objective of the sampling was to ascertain the extent of contamination found at the Boat Dock sufficiently to determine the appropriate remedy. Sampling at the Channel Area indicated the presence of metals.

The FFS COPCs for the Boat Dock Channel Area are listed in Table 3.1-1.

3.1.3.7 Area 14

Area 14 was a barren (or possibly inundated) area identified in a 1941 aerial photograph. The area is located north of the Boat Dock, just east of the east levee (see Figure 3.1-1). This site was identified in the Archive Search Report (USACE, 2003) as ASR Site #14.

The Army investigated area 14 in December 2001 and January 2002. During the investigation, the Army collected soil and sediment samples from Area 14 on a 100-foot grid. The objective of the sampling was to characterize the portions of Area 14 that were not covered with the construction of the runway overrun. Sampling at Area 14 resulted in detections of metals, pesticides, TPH, and PAHs. No debris or rubble, other than the rock and gravel used to support the runway extension and the road, was encountered.

The FFS COPCs for Area 14 are listed in Table 3.1-1.

3.1.3.8 Former Sewage Treatment Plant Outfall

The discharge point of the FSTP is located southeast of the Pump Station Area in the coastal salt marsh. Until 1986, treated effluent water was discharged into San Pablo Bay via the FSTP Outfall Pipe. Now abandoned, this outfall pipe extends approximately 450 feet eastward from the levee into the coastal salt marsh (see Figure 3.1-1). The terminus of the outfall pipeline is near the edge of the vegetated portion of the coastal salt marsh. There is a small outfall basin, and a narrow channel that conveyed the discharge from the pipe across the remainder of the marsh and the unvegetated intertidal mudflats to the open water of San Pablo Bay.

The FSTP Outfall was investigated by the Army in 1991 (ESI, 1993); 1995 (WCFS, 1996); and December 2001 and January 2002 (USACE, 2002b). A sediment sample was collected in the 1991 investigation 50 feet beyond the terminus of the outfall pipe in the channel to assess the contamination of sediments in San Pablo Bay. The sediment sample results showed no elevated concentrations of metals when compared with local background sediment concentrations estimated by ESI. However, elevated levels of mercury were detected at the surface. A sediment sample was collected during the 1995 investigation from the outfall basin. The sediment sample contained metals (including mercury), SVOCs, and PAHs.

In December 2001 and January 2002, the Army collected additional soil and sediment samples from the FSTP Outfall. The objective of the sampling was to investigate the extent of mercury detected in a previous investigation sufficiently to determine the appropriate remedy.

The FFS COPCs for the FSTP Outfall are listed in Table 3.1-1.

TABLE 3.1-1
Coastal Salt Marsh Site Specific COPCs

Contaminants	Action Goals	Antenna Debris Disposal Area	East Levee Construction Debris Disposal Area	High Marsh Nonchannel Cut	High Marsh Proposed Channel Cut	Historic Outfall Drainage Ditch	Outfall Drainage Ditch	Boat Dock Nonchannel Area	Boat Dock Channel	Area 14	FSTP Outfall
Metals											
Arsenic	23										
Barium	188	X							X		
Beryllium	1.68	X		X	X		X				
Boron	71.6										
Cadmium	1.8	X			X	X	X				
Chromium	149										
Cobalt	26.7	X		X	X	X	X			X	
Copper	88.7	X		X					X		X
Lead	46.7	X	X	X	X	X	X	X	X		X
Manganese	1260	X		X		X	X				
Mercury	0.58										X
Nickel	132	X		X	X	X	X				
Silver	1	X		X			X				X
Vanadium	136										
Zinc	169	X	X	X		X	X	X	X		X
Semivolatile Organic Compounds (including PAHs)											
PAHs, total	4.022							X		X	
Pentachlorophenol	0.017						X	X			
Phenol	0.13						X				
Petroleum Hydrocarbons											
TPH-diesel	144	X	X		X		X				
TPH-gasoline/TPH-JP-4	12									X	

TABLE 3.1-1
Coastal Salt Marsh Site Specific COPCs

Contaminants	Action Goals	Antenna Debris Disposal Area	East Levee Construction Debris Disposal Area	High Marsh Nonchannel Cut	High Marsh Proposed Channel Cut	Historic Outfall Drainage Ditch	Outfall Drainage Ditch	Boat Dock Nonchannel Area	Boat Dock Channel	Area 14	FSTP Outfall
Pesticides/PCBs/Dioxins											
BHCs, total	0.0048	X						X			
Chlordanes, total	0.00479	X		X	X		X	X			X
DDTs, total (2)	0.03	X	X	X	X		X	X		X	X
Dichlorprop	0.14					X					
Endrin aldehyde	0.0064	X		X	X		X				
Heptachlor	0.0088	X									
Heptachlor epoxide	0.0088	X						X			
MCPA	7.9	X									
MCPP	3.0	X									
Methoxychlor	0.09							X			
PCBs, total	0.09	X	X	X			X				
Total TCDD TEQ	0.000021		X								

FSTP = Former Sewage Treatment Plant

X = Contaminant identified as COC at site.

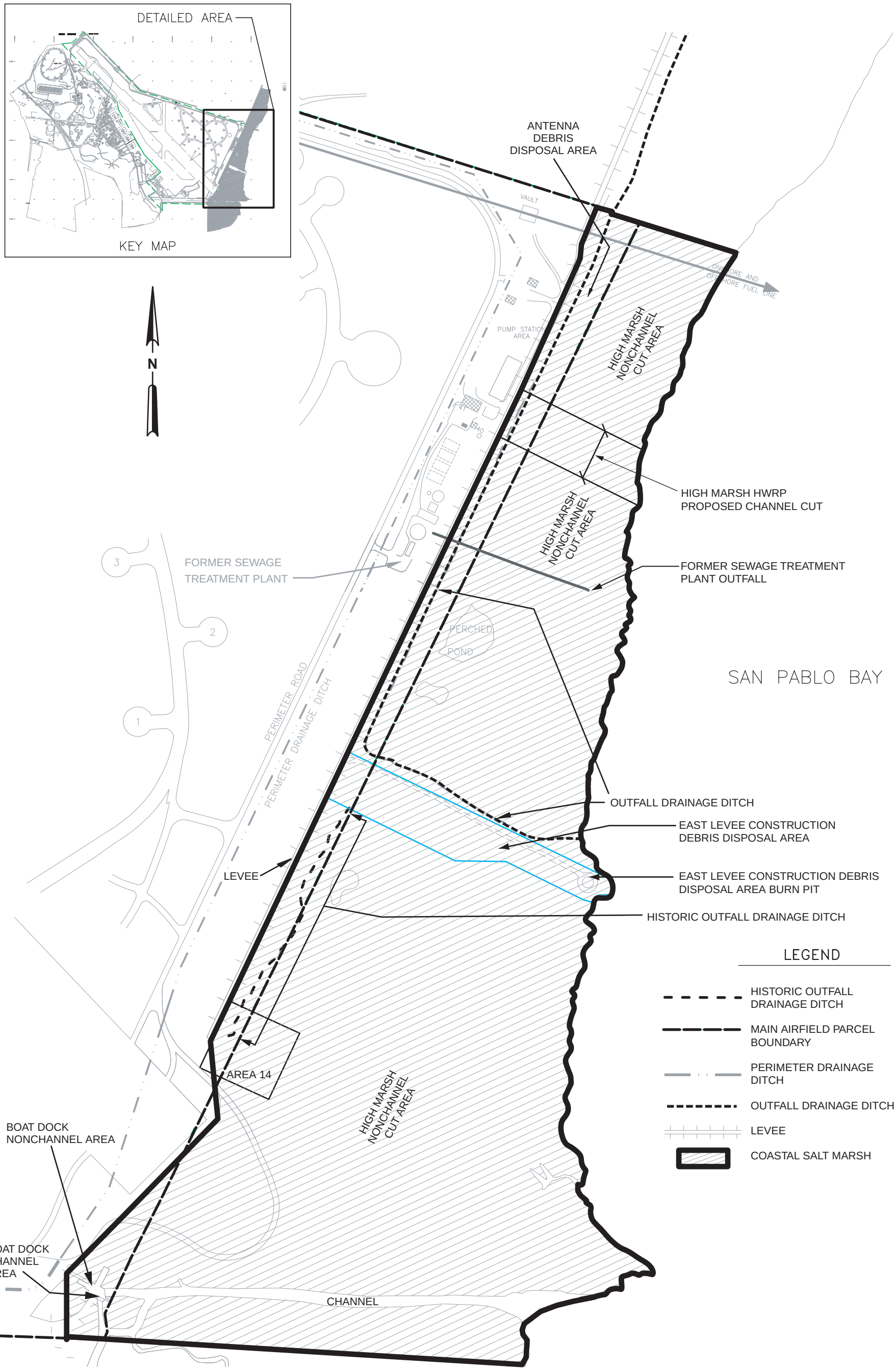


FIGURE 3.1-1
SITE LOCATION MAP
COASTAL SALT MARSH
HAMILTON ARMY AIRFIELD

ROD/RAP

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SECTION 3.2

Overview of Risk Assessment and Action Goals

This section provides an overview of the risk assessment and the process used to establish action goals for the coastal salt marsh sites. Contamination at most of the sites was first evaluated in the risk assessment to make an initial determination of the COPCs, and the levels that pose a risk. The sites were further evaluated in the FFS based on action goals and additional data that had been collected after completion of the risk assessment. The FFS determined which sites would require further action. The following text describes the process used to arrive at these decisions.

3.2.1 Risk Assessment Overview

The Army prepared a baseline risk assessment for coastal salt marsh sites, including the High Marsh, ELCDDA, Boat Dock, ODD, and Antenna Debris Disposal Area (USACE, 2001). Samples collected from the Historic ODD and FSTP Outfall were included in the evaluation of the High Marsh. The overall objective of the risk assessment was to assess the potential for adverse impacts to human health and the environment resulting from the exposure of receptors to contaminants in soil and sediment associated with historical activities in the coastal salt marsh (USACE, 2001).

Current and future land use scenarios were used to assess potential human health risks associated with the coastal salt marsh sites. Recreational use of the coastal salt marsh (or estuary) was the only exposure scenario considered for current and future land at the sites because no significant change in the habitat is anticipated. During the HHERA, the receptors considered for each coastal salt marsh site included marsh recreational users and consumers of recreationally caught fish and shellfish. Given the high certainty associated with future habitat at the coastal salt marsh sites, the ecological risk assessment considered only estuarine biota to characterize risk at these sites.

The HHERA evaluated numerous human health and ecological COPCs and identified COCs. COPCs are chemicals that are identified and evaluated during the risk assessment process because they are specifically related to activities conducted at the site and have the potential to adversely affect human health and/or the environment. COCs are COPCs that were evaluated during the risk assessment and determined to pose unacceptable risk to human health and/or the environment. The COCs identified during the HHERA are presented in Appendix B of the FFS (CH2M HILL, 2003).

3.2.2 Action Goals

The objective of this ROD/RAP is to remove contaminated soils to the maximum extent practical to protect public health and to maintain its wetland function. If any contaminants remaining above action goals are still a concern within the excavated areas, the site will be backfilled to prevent direct exposure to these contaminants. To achieve this objective, action

goals protective of wetland receptors (including sensitive species) are established in this document. The action goals for the coastal salt marsh sites are provided in Table 3.2-1. Numerical values for each action goal are set for various contaminants found at the coastal salt marsh sites. However, action goals apply only to specific contaminants at each site, because the COPCs differ between sites. Table 3.2-1 shows the specific COPCs at each site and the corresponding action goal. The following text describes the process for selecting specific COPCs at the coastal salt marsh sites and the sources for the action goals.

Action goals for the coastal salt marsh sites were established by evaluating the results of the risk assessment along with data collected at the sites following completion of the risk assessment. This process was completed during the FFS and is summarized below.

COPCs for each site were established during the FFS (CH2M HILL, 2003). The FFS considered data evaluated in the risk assessment in addition to data that the Army collected in 2001/2002 following the completion of the risk assessment. The FFS used a statistical approach to calculate the 95th UCL for each contaminant detected at a site. If the 95th UCL for a contaminant at a site was greater than the action goal, then the contaminant was determined to be a FFS COPC. The maximum detections at a site were used for comparison if fewer than 5 samples were collected at a site. This process differs somewhat from the process used for the Inboard Area sites. For the coastal salt marsh sites, each contaminant detected was compared to the action goals without first determining whether the contaminant posed a risk to human health or the environment. The approach is described in more detail in the FFS (CH2M HILL, 2003) and was applied only to sites in the coastal salt marsh where additional sampling had been conducted following the completion of the risk assessment. This approach was used because the risk assessment could not consider data that had been collected following its completion.

Using the approach described, the FFS identified FFS COPCs as contaminants that should be compared to action goals at each coastal salt marsh site (see Table 3.1-1). Detections of these FFS COPCs above action goals are evaluated for remedial actions in this ROD/RAP.

The action goals selected in this ROD/RAP are based on a number of references (see Table 3.2-1). For metals, the primary references are published site-specific ambient concentrations. For SVOCs, including PAHs, the references are the ER-L and values from the risk assessment. Petroleum hydrocarbon action goals are based on the Presidio of San Francisco Saltwater Ecological Protective Zone. Action goals for PCBs and dioxins are derived from the risk assessment. The DDT values were developed in the FFS (CH2M HILL, 2003).

TABLE 3.2-1
Action Goals – Coastal Salt Marsh Sites
Hamilton Main Airfield Parcel ROD/RAP

Contaminant	Action Goals (ppm)[a]	Source[b]
Metals		
Arsenic	23	Site-Specific Sediment Ambient
Barium	188	Site-Specific Sediment Ambient
Beryllium	1.68	Site-Specific Sediment Ambient
Boron	71.6	Site-Specific Sediment Ambient
Cadmium	1.8	Site-Specific Sediment Ambient
Chromium	149	Site-Specific Sediment Ambient
Cobalt	26.7	Site-Specific Sediment Ambient
Copper	88.7	Site-Specific Sediment Ambient
Lead	46.7	ER-L
Manganese	1260	Site-Specific Sediment Ambient
Mercury	0.58	Site-Specific Sediment Ambient
Nickel	132	Site-Specific Sediment Ambient
Silver	1	ER-L
Vanadium	136	Site-Specific Sediment Ambient
Zinc	169	Site-Specific Sediment Ambient
Semivolatile Organic Compounds (including PAHs)		
PAHs, total	4.022	ER-L
Pentachlorophenol	0.017	HHERA—Marine Invertebrate
Phenol	0.13	HHERA—Marine Invertebrate
Petroleum Hydrocarbons		
TPH-dl/TPH-motor oil[c]	144	Presidio—Saltwater Ecological Protective Zone
TPH-g/JP-4	12	Presidio—Saltwater Ecological Protective Zone
Pesticides/Herbicides/PCBs/Dioxins		
BHCs, total	0.0048	Lindane AET (polychaete)
Chlordanes, total	0.00479	PEL
DDTs, total[d]	0.03	RART—California clapper rail
Dichlorprop	0.14	HHERA—California clapper rail
Endrin Aldehyde	0.0064[e]	HHERA—Marine Invertebrate
Heptachlor	0.0088[f]	HHERA—Marine Invertebrate
Heptachlor epoxide	0.0088	HHERA—Marine Invertebrate
MCPA	7.9[g]	HHERA—Marine Invertebrate
MCPP	3.0	PQL

TABLE 3.2-1
Action Goals – Coastal Salt Marsh Sites
Hamilton Main Airfield Parcel ROD/RAP

Contaminant	Action Goals (ppm)[a]	Source[b]
Methoxychlor	0.09	HHERA—Marine Invertebrate
PCBs, total	0.09	HHERA—California clapper rail
Dioxins (Total TCDD TEQ)[h]	0.000021	EPA

NOTE: This is a comprehensive list of action goals. All action goals do not apply at each site.

TCDD = tetrachlorodibenzo-p-dioxin
TEQ = toxicity equivalence

[a] If contamination above the action goals is found in the coastal salt marsh beyond those areas already identified as requiring remediation, the Army and State will determine whether additional or continued excavation is warranted by considering the potential risk to public health and the environment from the residual contaminants and the resulting habitat destruction.

[b] The sources of the action goals are:

- **Metals:** Background concentrations for metals were primarily used as action goals unless the background concentrations were less than available risk-based numbers. Site-specific ambient levels from Appendix A - U.S. Army, 2001, *Final Human Health and Ecological Risk Assessment*; Effects Range-Lows (ER-Ls) from Long, E.R, D.D. MacDonald, S.L. Smith, and F.D Calder, 1995, "Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments," *Environmental Management,* 19:81-97; *San Francisco Bay RWQCB Staff Report: Ambient Concentrations of Toxic Chemicals in San Francisco Bay Sediments*, May 1998.
- **Petroleum hydrocarbons:** *Report of Petroleum Hydrocarbon Bioassay and Point-of-Compliance Concentration Determinations; Saltwater Ecological Protection Zone; Presidio of San Francisco, California,* Dated December 1997. The numbers in this report were developed for a similar site with similar ecological receptors.
- **PAHs:** ER-Ls from Long, E.R, D.D. MacDonald, S.L. Smith, and F.D. Calder, 1995, "Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments," Environmental Management, 19:81-97. The ER-Ls were used as action goals because the ER-Ls are accepted as being protective of ecological receptors.
- **SVOCs:** US Army, 2001, *Final Human Health and Ecological Risk Assessment.*
- **Pesticides, Herbicides, PCBs, and Dioxins:** Table 5-1 from the US Army, 2001, *Final Human Health and Ecological Risk Assessment* (marine invertebrate–amphipod and California clapper rail); practical quantitation limits (PQLs) from previous sampling events were used when no other ecologically-based numbers were available with achievable detection limits; U.S. EPA, 1993a, *Interim Report on Data and Methods for Assessment of 2,3,7,8-Tetrachlorodibenzo-p-dioxin Risks to Aquatic Life and Associated Wildlife*. (EPA/600/R-93/-055); for lindane and total chlordanes, Screening Quick Reference Tables (SQuiRTs), NOAA, updated September 1999 were used as the best available ecological number when no other references were available. The DDT values were developed in the Coastal Salt Marsh Focused Feasibility Study (CH2M HILL, 2003).

[c] The action goal for TPH diesel/TPH motor oil is also used as the action goal for UHE (unknown hydrocarbons extractable).

[d] The total DDT concentration in the Coastal Salt Marsh Area or Inboard Area shall not exceed 1.0 ppm. Areas with total DDT concentrations greater than 1.0 ppm shall be excavated and disposed of offsite.

[e] The goal for Endrin Ketone is used as a surrogate for Endrin Aldehyde.

[f] The goal for Heptachlor Epoxide is used as a surrogate for Heptachlor.

[g] The goal for 2,4,D is used as a surrogate for MCPA.

[h] Dioxin is only considered a COC at the ELCDDA Burn Pit.

SECTION 3.3

Remedial Action Objectives

RAOs describe the goals that proposed remedial actions are expected to accomplish, such as protecting human health and the environment by eliminating COPCs above action goals and/or eliminating exposures to human and ecological receptors. RAOs, can differ with each specific site, depending on site conditions, exposure scenarios, and receptors. The FFS developed specific RAOs, which are used in the ROD/RAP to guide the development of alternatives for each coastal salt marsh site.

This section describes the development of RAOs, identifies RAOs for the coastal salt marsh sites, and presents how the different agencies (DTSC, RWQCB, and Army) identify and implement their respective laws and standards for selection of remedies.

3.3.1 Definition of Remedial Action Objectives

RAOs were developed in the FFS to provide a basis for evaluating the ability of the remedial alternatives to comply with ARARs, and to protect human health and the environment in the coastal salt marsh. The RAOs are quantitative and qualitative expressions of goals for protecting human health and the environment. They are expressed in terms of contaminants and media of interest, possible receptors, and associated exposure pathways.

Contaminants considered in establishing RAOs for the coastal salt marsh sites were developed based on the FFS COPCs (CH2M HILL, 2003b). The conceptual model used in the FFS to establish RAOs is the same as the model used in the *Human Health and Ecological Risk Assessment* (USACE, 2001) for the coastal salt marsh (see Section 2.1.1). Current and future land use scenarios for the coastal salt marsh include recreational use (e.g., recreational fishing and shellfish collection). Because of the high certainty of the future ecological habitat of the marsh, the only ecological receptors expected to be present in the future are estuarine receptors.

3.3.2 Identification of Remedial Action Objectives

Protection of human health and the environment in the coastal salt marsh can be accomplished by reducing concentrations of FFS COPCs that are greater than action goals or by controlling or eliminating exposure of receptors to FFS COPCs that are greater than remediation goals.

The RAOs for the coastal salt marsh sites are to prevent or mitigate the exposure of ecological and human receptors to soil/sediment containing concentrations of FFS COPCs that are greater than their respective action goals. Table 3.1-1 provides the action goals established for the coastal salt marsh sites.

3.3.3 Remedy Selection Requirements and Process

State and federal agencies operate under different laws and regulations when selecting remedies for protection of human health and the environment. The State operates under the California Health and Safety Code, while the Army operates under CERCLA. This section describes how the different agencies identify and implement their respective laws and standards for selection of the remedies contained in this ROD/RAP.

3.3.3.1 State Remedy Selection Requirements and Process

The selection of the remedy by DTSC and the RWQCB is based on their authority to approve RAPs as set forth in Section 25356.1 of the California Health and Safety Code. The statutory requirements governing selection of the remedy are also contained in Health and Safety Code, Section 25356.1.5. In summary, any remedy selected in a RAP must be based on, and be no less stringent than, requirements of the NCP, regulations and applicable requirements contained in Division 7 of the Water Code, regulations promulgated thereunder, resolutions issued by SWRCB and the San Francisco Bay Regional Water Quality Control Plan, and applicable provisions of Chapter 6.8 of Division 20 of the Health and Safety Code.

DTSC and the RWQCB generally follow the model used by the NCP in developing information necessary for selecting a remedy. However, the decision selecting the final remedial goals and the remedy to be implemented ultimately constitute an independent exercise of discretion by DTSC and the RWQCB, subject to applicable state laws. Approval of a RAP by DTSC and the RWQCB under Health and Safety Code, Section 25356.1, must consider the following factors:

- Health and safety risks posed by conditions at the site, including scientific data and reports that may have a relationship to the site
- Effect of contamination or pollution levels on present, future, and probable beneficial uses of contaminated, polluted, or threatened resources
- Effect of alternative remedial action measures on the reasonable availability of groundwater resources for present, future, and probable beneficial uses
- Site-specific characteristics, including the potential for offsite migration of hazardous substances, the surface or subsurface soil, and the hydrogeologic conditions, as well as pre-existing background contamination levels
- Cost-effectiveness of alternative remedial action measures
- Potential environmental impacts of alternative remedial action measures

DTSC and the RWQCB have determined that the action goals selected in this ROD/RAP meet the applicable laws and requirements of the State. DTSC and the RWQCB have also determined that the remedies selected in this ROD/RAP are in compliance with the requirements of the California Health and Safety Code. In selecting the remedy, DTSC and the RWQCB have considered the available information for HAAF.

3.3.3.2. Army Remedy Selection Requirements and Process

Pursuant to Section 121(d)(1) of CERCLA, remedial actions must attain a degree of cleanup that protects both human health and the environment, and they must comply with ARARs. Additionally, remedial actions that leave hazardous substances, pollutants, or contaminants onsite must meet standards, requirements, limitations, or criteria that are applicable or relevant and appropriate. Although HAAF is not on the NPL of CERCLA sites, the remedial investigations and remedial actions conducted at the site are required to be consistent with the NCP. As such, this ARARs analysis was developed in a manner consistent with guidance and policy of CERCLA, as amended by SARA. The intent of this ARARs analysis is to identify those federal and more-stringent state regulations that must be considered when evaluating a remedial alternative.

Federal ARARs include requirements under any federal environmental law, while state ARARs include promulgated requirements under state environmental laws that are more stringent than federal ARARs. To be an ARAR, the requirement must meet either of these following requirements (EPA, 1988a):

- **Applicable** requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site.

Or:

- **Relevant and appropriate** requirements are those cleanup standards, standards of control, or other substantive environmental requirements, criteria, or limitations promulgated under federal or state law that, while not specifically "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the site that their use is well-suited to the particular site. A requirement must be both relevant and appropriate to be designated an ARAR.

ARARs are identified on a site-specific basis from information about site-specific chemicals, specific actions that are being considered, and specific features of the site location. For the Army to consider a state requirement to be an ARAR under CERCLA and the NCP, the requirement must be:

- Legally enforceable
- Generally applicable to all circumstances covered by the requirement, not just Superfund sites
- More stringent than the federal regulation

Substantive requirements pertain directly to actions or conditions in the environment. They include restrictions for exposure to certain types of hazardous substances (e.g., chemical-specific ARARs), restrictions on activities in certain locations (e.g., location specific ARARs), and technology-based requirements for actions (e.g., action specific ARARs). For any onsite remedial activity, the administrative portions of the environmental standards criteria or limitations are not ARARs because CERCLA Section

121(e) exempts these actions from permitting requirements. This permit exemption applies to all administrative requirements, whether or not they are styled as permits. Administrative requirements include the approval of or consultation with administrative bodies, issuance of permits, documentation, reporting, recordkeeping, and enforcement.

The three categories of ARARs are described as:

- Chemical-specific ARARs are numerical values that represent a health-based or risk-based standard, or the results of methodologies which, when applied to site-specific conditions, are used to establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment.
- Location-specific ARARs are restrictions on the conduct of activities solely because the site occurs in certain environmentally sensitive areas. Examples include wetlands, floodplains, endangered species habitat, or historically significant resources.
- Action-specific ARARs are technology-based or activity-based requirements or limitations on actions taken with respect to hazardous wastes.

A requirement may not meet the definition of an ARAR as defined above, but still may be useful in determining whether to take action at a site or to what degree action is necessary. This can be particularly true when there are no ARARs for a site, action, or contaminant. Such requirements are called TBC criteria. TBC criteria are nonpromulgated advisories or guidance issued by federal or state government that are not legally binding, but may provide useful information or recommended procedures for remedial action. Although TBCs do not have the status of ARARs, they are considered along with ARARs to establish the required level of cleanup for protection of human health or the environment.

Section 121 (d)(4) of CERCLA provides six specific circumstances in which potential ARARs may be waived. These waivers apply only to meeting ARARs with respect to remedial actions onsite. Other statutory requirements, such as remedies protective of human health and the environment, cannot be waived. Currently, it is not envisioned that any waivers will be requested for the coastal salt marsh sites; however, the circumstances in which potential ARARs could be waived are summarized below for the sake of completeness:

- Interim Measures: The remedial action selected is only part of a total remedial action that will attain such a level or standard of control when completed [Section 121 (d)(4)(A)].
- Greater Risk to Human Health and the Environment: Compliance with such a requirement at the facility will result in greater risk to human health and the environment than alternative options [Section 121 (d)(4)(B)].
- Technical Impracticability: Compliance with such a requirement is technically impractical from an engineering perspective [Section 121 (d)(4)(C)].
- Equivalent Standard of Performance: The remedial action selected will attain a standard of performance that is equivalent to that required under the otherwise applicable standard, requirement, criteria, or limitation, through use of another method or approach [Section 121 (d)(4)(D)].

- Inconsistent Application of State Requirements: With respect to a state standard, requirement, criterion, or limitation, the state has not consistently applied the standard, requirement, criterion, or limitation in similar circumstances at other remedial actions [Section 121 (d)(4)(E)].
- Fund Balancing: The Hazardous Substance Response Fund (Fund) waiver may apply when the selection of a remedial action that attains such level or standard of control will not provide a balance between the need for protection of public health and welfare and the environment at the facility under consideration and the availability of amounts from the Fund to respond to other sites that present or may present a threat to public health or welfare or the environment, considering the relative immediacy of such threats [Section 121 (d)(4)(F)]. The Fund Balancing waiver does not apply because funding for Hamilton is provided by the BRAC Environmental Restoration Account.

The ARARs for this ROD/RAP were developed using the following guidelines and documents:

- *CERCLA Compliance with Other Laws Manual, Part I: Interim Final* (EPA, 1988b)
- *CERCLA Compliance with Other Laws Manual, Part II: Clean Air Act and Other Environmental Statutes and State Requirements* (EPA, 1989)
- *California State Water Resources Control Board ARARs Under CERCLA* (SWRCB, 1992)
- *Considering Wetlands at CERCLA Sites* (EPA, 1994)

3.3.3.3 Chemical-Specific ARARs and TBCs

Chemical-specific ARARs include those requirements that regulate the release to, or presence in, the environment of materials possessing certain chemical or physical characteristics or containing specified chemical compounds. These requirements generally set health- or risk-based concentration limits or discharge limitations for specific chemicals. When a specific chemical is subject to more than one discharge or exposure limit, the more stringent of the requirements is used. Potential chemical-specific ARARs were evaluated on the basis of contaminants and the media impacted. The potential requirements were reviewed and deemed not applicable, relevant, or appropriate to establishing cleanup goals. However, chemical-specific requirements may be applicable, relevant, or appropriate to actions to be taken at the site. Therefore, a discussion of chemical-specific ARARs that apply only to specific actions that may be taken to clean up the site is provided under action-specific ARARs.

Because there are no promulgated chemical-specific ARARs that can be applied as soil or sediment action goals, a variety of TBC criteria have been considered. The chemical-specific TBCs for the coastal salt marsh sites are presented in Table 3.3-1. The sources for the TBCs follow:

- ER-Ls from E. R. Long, D. D. MacDonald, S. L. Smith, and F. D. Calder, 1995, "Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments," *Environmental Management*, 19: 81-97.
- Report of Petroleum Hydrocarbon Bioassay and Point-of-Compliance Concentration Determinations; Saltwater Ecological Protection Zone; Presidio of San Francisco, California, December 1997.

3.3.3.4 Location-Specific ARARs

Location-specific ARARs are those requirements that relate to the geographical position or physical condition of the site. These requirements may limit the type of remedial action that can be implemented or may impose additional constraints on some remedial alternatives. Potential location-specific ARARs for the site are summarized in Table 3.3-2. The major location-specific ARARs that could affect remedial actions in the coastal salt marsh are discussed in more detail below.

Clean Water Act (Section 404)

Section 404 of the CWA, 33 U.S.C. §1344, requires a permit for the discharge of dredged or fill material into waters of the United States. Activities associated with investigation activities that might trigger Section 404 requirements include placement of fill into wetlands following excavation and confirmation sampling and construction of temporary roads in the wetland area. Runoff of excavated materials into the wetlands may also occur. The *Guidelines for Specification of Disposal of Sites for Dredged or Fill Material* [40 CFR Part 230, Section 404(b)(1)] define requirements that limit the discharge of dredged or fill material into the aquatic environment or aquatic ecosystems. These guidelines specify consideration of activities that have less adverse impacts. They prohibit discharges that would result in exceedance of surface water quality standards, exceedance of toxic effluent standards, and jeopardization of threatened or endangered species. Actions that can be taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem are specified in Subpart H of 40 CFR 230, and include:

- Confining the discharge's effects on aquatic biota
- Avoiding disruptions of periodic water inundation patterns
- Selection of disposal site and method of discharge
- Minimizing or preventing standing pools of water

In addition, under CWA, Section 401, every applicant for a federal permit or license for any activity that may result in a discharge to a water body, e.g., Section 404 Permit, must obtain State Water Quality Certification (Certification) that the proposed activity will comply with state water quality standards.

Executive Order on Protection of Wetlands

The Executive Order on Protection of Wetlands, Executive Order No. 11990, requires that federal agencies avoid, to the extent possible, adverse impacts associated with the destruction or loss of wetlands, and avoid support of new construction in wetlands if a practicable alternative exists. EPA's regulations to implement this Executive Order are set forth in 40 CFR §6.302(a). In addition, EPA has developed guidance entitled *Policy on Floodplains and Wetlands Assessments for CERCLA Actions* (EPA, 1985). Wetlands will be encountered and affected during field activities, and these requirements are applicable.

San Francisco Bay Water Quality Control Plan Basin Plan

Chapter 2 (page 2-6) of the Basin Plan provides a discussion of wetlands in San Francisco Bay and their beneficial uses. Waters of the State of California, as defined by the Porter-Cologne Act, are "any water, surface or underground, including saline waters, within the boundaries of the State." Wetlands water quality control is, therefore, clearly within the jurisdiction of the State and Regional Boards.

Chapter 4 (page 4-49) of the Basin Plan addresses wetlands protection and management and incorporates several state directives to protect wetlands. These directives include (1) the Governor's Executive Order W-59-93, which has a goal of ensuring "no overall net loss of wetlands," achieving a "long-term net gain in the quantity, quality and permanence of wetlands acreage and values;" (2) Senate Concurrent Resolution No. 28, which expresses the intent of the State legislature to preserve, restore, and enhance California's wetlands; and (3) California Water Code, Section 13142.5, which states that "Highest priority shall be given to improving or eliminating discharges that adversely affect…wetland, estuaries and other biologically sensitive sites." These directives are applicable because the remediation proposed in the coastal salt marsh will directly affect resources the State is responsible for protecting; and thus, temporal and potentially permanent impacts must be considered in the selection of the remedy and addressed in its implementation.

3.3.3.5 Action-Specific ARARs

California Toxics Rule

Under Section 303(c)(2)(B) of the CWA, states must adopt numeric criteria for the priority toxic pollutants listed under Section 307(a) if those pollutants could be reasonably expected to interfere with the designated uses of State's waters. In April 1991, California adopted numeric criteria for priority toxic pollutants in the State's Inland Surface Water Plans and Enclosed Bays and Estuaries Plans. In 1994, a California State court ordered California to rescind these water quality control plans (the Basin Plans remained in effect). California remained subject to the National Toxics Rule promulgated in 1992 for certain waters and pollutants.

In May 2000, EPA promulgated the California Toxics Rule to replace the criteria that were rescinded by the State court. The National Toxics Rule also remains in effect in California for certain water bodies and pollutants. The water quality criteria promulgated under the California Toxics Rule are considered relevant and appropriate to water bodies.

San Francisco Bay Water Quality Control Plan

The State of California, as authorized by EPA, established water quality objectives for the protection of groundwater and surface water under the Porter-Cologne Water Quality Control Act. These water quality objectives were established by the California RWQCB for each basin and are based on the beneficial use(s) of the waters. The Water Quality Control Plan (also known as the Basin Plan) for the San Francisco Bay establishes beneficial uses for groundwater and surface water, as well as water quality objectives (the "criteria" under the CWA) designed to protect those beneficial uses. The Basin Plan describes implementation plans and other control measures designed to ensure compliance with statewide plans and policies and provides comprehensive water quality planning (RWQCB, 1995).

The coastal salt marsh is a wetland area within San Pablo Bay. Table 2-10 of the Basin Plan lists and specifies beneficial uses for 34 significant wetland areas within the region, including those wetlands located in San Pablo Bay (RWQCB, 1995). The beneficial uses listed for San Pablo Bay wetland areas are as follows:

- Estuarine habitat
- Fish migration and spawning
- Ocean, commercial, and sport fishing

- Preservation of rare and endangered species
- Water contact and noncontact recreation
- Wildlife habitat

The narrative and numerical water quality objectives contained in the Basin Plan are considered applicable in order to protect the beneficial uses of the coastal salt marsh and San Pablo Bay, and are directly enforceable by the State under the Porter-Cologne Water Quality Control Act.

Hazardous Waste Characterization

The action-specific ARARs that affect soil and sediment characterization and disposal include the requirements for identification of hazardous waste found in Title 22 of the CCR, Division 4.5, Chapter 11. A waste is a hazardous waste under both RCRA and California law if it exhibits any of the characteristics of ignitability, corrosivity, reactivity, or toxicity identified in 22 CCR 66261.21, 66261.22(a)(1), 66261.22(a)(2), 66261.23, and 66261.24(a)(1), or if it is listed as a hazardous waste in Article 4 of Chapter 11. In addition, under the California RCRA-authorized program, wastes can be classified as California-only hazardous wastes if they exceed the STLC or the TTLC values contained in 22 CCR 66261.24(a)(2).

The numerical values presented in 22 CCR 66261.24 (a)(1) and (a)(2) are not considered action goals but are compared to contaminant concentrations in excavated materials to determine how the material should be managed. In other words, the TCLP, TTLC, and STLC criteria are not compared to in situ contaminant concentrations in soil or sediment, but rather are compared to the soil or sediment after it has been excavated (i.e., after the waste has been "generated"). If wastes generated at HAAF are characterized as hazardous waste, the regulations that govern the treatment, storage, and disposal of hazardous waste will be applicable. These requirements are found at Division 4.5 of Title 22 of the CCR.

If contaminant concentrations in excavated materials are less than the TCLP, TTLC, or STLC, but still contain contaminants that could cause degradation of surface or groundwater, these materials may be considered a designated waste. A designated waste is defined in Section 13173 of the California Water Code as a nonhazardous waste that consists of, or contains, pollutants that, under ambient environmental conditions at a waste management unit, could be released in concentrations exceeding applicable water quality objectives, or that could reasonably be expected to affect beneficial uses of the waters of the state, as contained in the appropriate state water quality control plan. The *Designated Level Methodology for Waste Classification and Cleanup Level Determination* (Central Valley RWQCB October 1986, Updated June 1989) provides a methodology for calculating levels for specific constituents of a waste that provides a site-specific indication of the water quality impairment potential of the waste. As a result, wastes that contain contaminants above these calculated levels would be characterized as designated wastes. Removal actions proposed at HAAF may include disposal of designated waste to an offsite landfill. Title 27 CCR 20210 requires that designated waste be discharged to Class I or Class II waste management units.

The action-specific ARARs for the coastal salt marsh sites are summarized in Table 3.3-3.

TABLE 3.3-1
Chemical-Specific TBC Criteria for Developing Action Goals

Contaminants	TBC Value (ppm)[b]
Metals	
Lead	46.7[a]
Silver	1.0
Semivolatile Organic Compounds (including PAHs)	
PAHs, total	4.022
Petroleum Hydrocarbons	
TPH-d/TPH-motor	144
TPH-g/JP-4	12
Pesticides/Dioxins and Furans	
Chlordanes, total[d]	0.00479
DDTs, total[c]	0.03
Dioxins (total TCDD TEQ)[d]	0.000021

[a] Effects range-low

[b] The sources of the action goals are:

- **Metals:** Background concentrations for metals were primarily used as action goals unless the background concentrations were less than available risk-based numbers. Site-specific ambient levels from Appendix A - U.S. Army, 2001, *Final Human Health and Ecological Risk Assessment*; Effects Range-Lows (ER-Ls) from Long, E.R, D.D. MacDonald, S.L. Smith, and F.D. Calder, 1995, "Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments," *Environmental Management,* 19:81-97; *San Francisco Bay RWQCB Staff Report: Ambient Concentrations of Toxic Chemicals in San Francisco Bay Sediments*, May 1998.
- **Petroleum hydrocarbons:** *Report of Petroleum Hydrocarbon Bioassay and Point-of-Compliance Concentration Determinations; Saltwater Ecological Protection Zone; Presidio of San Francisco, California,* Dated December 1997. The numbers in this report were developed for a similar site with similar ecological receptors.
- **PAHs:** ER-Ls from Long, E.R, D.D. MacDonald, S.L. Smith, and F.D. Calder, 1995, "Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments," Environmental Management, 19:81-97. The ER-Ls were used as action goals because the ER-Ls are accepted as being protective of ecological receptors.
- **Pesticides:** The DDT values were developed in the Coastal Salt Marsh Focused Feasibility Study (CH2M HILL, 2003).

[c] The total DDT concentration in the Inboard Area shall not exceed 1.0 ppm. Areas with total DDT concentrations greater than 1.0 ppm shall be excavated and disposed of offsite.

[d] **Pesticides, Herbicides, PCBs, and Dioxins:** Table 5-1 from the US Army, 2001*, Final Human Health and Ecological Risk Assessmen*t (marine invertebrate—amphipod and California clapper rail); practical quantitation limits (PQLs) from previous sampling events were used when no other ecologically-based numbers were available with achievable detection limits; U.S. EPA, 1993a, *Interim Report on Data and Methods for Assessment of 2,3,7,8-Tetrachlorodibenzo-p-dioxin Risks to Aquatic Life and Associated Wildlife*. (EPA/600/R-93/-055); for lindane and total chlordane, Screening Quick Reference Tables (SquiRTs), NOAA, updated September 1999 were used as the best available ecological number when no other references were available.

RART = Regulatory Agencies and Resources Trustees

TCDD = tetrachlorodibenzo-p-dioxin

TEQ = toxicity equivalence

TABLE 3.3-2
Location-Specific ARARs for the Coastal Salt Marsh Sites

Source	Citation	ARAR Status	Description of ARARs
California Toxics Rule	40 CFR 131.38	Relevant and Appropriate	Contains criteria for priority toxic pollutants in the State of California for inland surface waters and enclosed bays and estuaries, except in those waters subject to objectives in SFRWQCB's 1986 Basin Plan.
California Endangered Species Act	Title 14, CCR 670.1, 670.2, and 670.5	Applicable	Contains standards for the identification and protection of listed or proposed threatened or endangered plants or animals.
Federal Endangered Species Act	50 CFR 402	Applicable	Contains standards for the identification and protection of current or possible future-listed threatened or endangered plants or animals. Section 7 requires federal agencies to consult the U.S. Fish and Wildlife Service to ensure that actions do not jeopardize listed species or adversely modify their critical habitat. Section 9 prohibits taking of endangered species, while Section 10 permits incidental takes.
Federal Clean Water Act	40 CFR 230.3, Section 404—Definition of Wetlands	Applicable	Authorized the USACE to delineate wetlands.
	40 CFR 230.10(a) to 230.10(c)	Applicable	Restrictions on Discharge: If there is a practicable alternative that would have a lesser impact on the wetlands, fill materials should not be discharged at the wetland. Any discharge that occurs should not cause a violation of a state water quality objective or a significant degradation of water quality.
	USACE, Public Notice 92-7: Interim Testing Procedures for Evaluating Dredged Material Disposed of in San Francisco Bay	Relevant and Appropriate	Reassures that all wetland creation, uplands disposal, or dredging projects complete certain notifications and listings.
	Section 401, 33 U.S.C. 1341	Applicable	State Water Quality Certification—wetland destruction, alteration would require a 404 permit and this certification assures that the proposed activity will comply with state water quality standards.
Coastal Zone Management Act	16 USC 1456	Relevant and Appropriate	Establishes the authority of the BCDC to regulate construction and other activities within 100 feet inland from highest tidal action.
Rivers and Harbors Act	33 CFR 323.1, Parts 320, 325, and 328	Relevant and Appropriate	Gives the USACE permitting authority over the discharge of dredged materials into the waters of the United States. In addition, the USACE must permit any work within historically navigable waters, including behind levees.

TABLE 3.3-2
Location-Specific ARARs for the Coastal Salt Marsh Sites

Source	Citation	ARAR Status	Description of ARARs
California Fish and Game Code	Section 1900—California Native Plant Protection Act Sections 3503.5, 3511, 4700, and 5050	Applicable	Contains standards for the identification and protection of plants by the act. Identifies and protects certain birds, mammals, reptiles, and amphibians.
California Fish and Game Code	Section 2080	Relevant and Appropriate	Action must be taken to conserve native plants. There can be no releases and/or actions that would have a deleterious effect on species or habitat. This section prohibits the taking, importation, or sale of any endangered or threatened species.
California Fish and Game Code	Section 2090 – 2096	TBC	These code sections comprise Article 4 of Chapter 1.5 of the California Endangered Species Act. These sections make provisions concerning Department coordination and consultation with the state and federal agencies and with project applicants.
California Fish and Game Code	Section 5650 and 5652	Relevant and Appropriate	It is unlawful to deposit in, permit to pass into, or place where it can pass into the waters of the state, any material listed in the code. Actions must be taken if toxic materials are placed where they can enter waters of the state. There can be no releases that would have a deleterious effect on species or habitat.
Fish and Game Code Addenda	Fish and Game Commission Wetlands Policy (adopted 1987)	TBC	Actions must be taken to ensure that “no net loss” of wetlands acreage or habitat value occurs. Actions must be taken to restore and enhance California’s wetland acreage and habitat value.

TABLE 3.3-3
Action-Specific ARARs for the Coastal Salt Marsh Sites

Source	Standard, Requirement, Criterion, or Limitation	ARAR Status	Description of ARARs
Federal			
Federal Clean Water Act	40 CFR 122—EPA Administered Permit Programs: The National Pollution Discharge Elimination System; 40 CFR 122.26; 40 CFR 122.41(d); 40 CFR 122.41(e); 40 CFR 122.44(d)	Relevant and Appropriate	Requirements to ensure storm water discharges from remedial action activities do not contribute to a violation of surface water quality standards. All reasonable steps must be taken to minimize or prevent discharges which have a reasonable likelihood of causing adverse impacts on surface water quality (40 CFR 122.41[d]). Discharges into surface water must achieve federal and state water quality standards (40 CFR 122.44[d]).
State of California Hazardous Waste			
California Hazardous Waste Control Law	Title 22, Division 4.5 (Environmental Health Standards for Management of Hazardous Waste), Chapter 11 (Identification and Listing of Hazardous Waste); 22 CCR 66261.1 through 22 CCR 66261.126	Relevant and Appropriate[a]	Defines hazardous waste and includes procedures for identifying hazardous waste.
California Hazardous Waste Control Law	Title 22, Division 4.5 (Environmental Health Standards for Management of Hazardous Waste), Chapter 12 (Standards Applicable to Generators of Hazardous Waste), Article 3 (Pre-Transport Requirements); 22 CCR 66262.30 through 66262.34	Relevant and Appropriate[a]	These standards establish requirements for generators of hazardous waste located in California. Prior to transportation, containers would be packaged, labeled, marked, and placarded in accordance with RCRA and Department of Transportation requirements. Accumulation of hazardous wastes onsite for longer than 90 days would be subject to RCRA requirements for storage facilities. These requirements are applicable to hazardous waste that is stored temporarily onsite prior to offsite disposal.
California Hazardous Waste Control Law	Title 22, Division 4.5 (Environmental Health Standards for Management of Hazardous Waste), Chapter 14 (Standards for Owners and Operators of Hazardous Waste Transfer, Treatment, Storage, and Disposal Facilities), Article 9 (Use and Management of Containers); 22 CCR 66264.171 through 22 CCR 66264.178	Relevant and Appropriate[a]	Soil will need to be managed as a hazardous waste only if it is classified as a hazardous waste. The treatment, storage, and disposal requirements for hazardous wastes include: using containers to store the recovered product that are compatible with this material (22 CCR 66264.172); using containers that are in good condition (22 CCR 66264.171); segregating the waste from incompatible wastes (22 CCR 66264.177); inspecting the containers (22 CCR 66264.176); providing adequate secondary containment for the water stored (22 CCR 66264.175); closing containers during transfer (22 CCR 66264.173); and removing all hazardous material at closure (22 CCR 66264.178).

TABLE 3.3-3
Action-Specific ARARs for the Coastal Salt Marsh Sites

Source	Standard, Requirement, Criterion, or Limitation	ARAR Status	Description of ARARs
California Hazardous Waste Control Law	Title 22, Division 4.5 (Environmental Health Standards for Management of Hazardous Waste), Chapter 14 (Standards for Owners and Operators of Hazardous Waste Transfer, Treatment, Storage, and Disposal Facilities), Article 12 (Waste Piles); 22 CCR 66264.250 through 22 CCR 66264.259	Relevant and Appropriate[a]	Delineates requirements for the management of waste piles for hazardous waste. This regulation is applicable to sites where excavated materials are classified as hazardous wastes and managed in waste piles. These regulations include 22 CCR 66264.251—Design and Operating Requirements; 22 CCR 66264.254—Monitoring and Inspection; 22 CCR 66264.256—Special Requirements for Ignitable or Reactive Waste; 22 CCR 66264.257—Special Requirements for Incompatible Wastes; 22 CCR 66264.258—Closure and Post-Closure Care; and 22 CCR 66264.259—Special Requirements for Hazardous Wastes F020, F021, F022, F023, F026, and F027. If hazardous waste will be managed in accordance with the standards stated in these sections of the regulation.
California Hazardous Waste Control Law	Title 22, Division 4.5 (Environmental Health Standards for Management of Hazardous Waste), Chapter 18 (Land Disposal Restrictions), Article 1 (General); 22 CCR 66268.1 through 22 CCR 66268.9	Relevant and Appropriate[a]	Provides the purpose, scope, and applicability of LDRs. The title of the sections of the regulations are: 22 CCR 66268.3—Dilution Prohibited as a Substitute for Treatment; 22 CCR 66268.7—Waste Analysis and Record Keeping; and 22 CCR 66268.9—Special Rules Regarding Wastes that Exhibit a Characteristic. If hazardous waste is land disposed within the meaning of the LDRs, the hazardous waste will be managed in accordance with the standards stated in applicable sections of the regulation. Only applicable if hazardous wastes are disposed of or treated in an area not designated as a CAMU or disposed of or treated beyond the area of contamination.
California Hazardous Waste Control Law	Title 22, Division 4.5 (Environmental Health Standards for Management of Hazardous Waste), Chapter 18 (Land Disposal Restrictions), Article 3 (Prohibitions on Land Disposal); 22 CCR 66268.30 through 22 CCR 66268.35	Relevant and Appropriate[a]	These standards are applicable to sites where excavated material is classified as hazardous waste and is disposed of or treated in an area not designated as a CAMU. If hazardous waste is land disposed within the meaning of the LDRs, the hazardous waste will be managed in accordance with the standards stated in these sections of the regulation.
California Hazardous Waste Control Law	Title 22, Division 4.5 (Environmental Health Standards for Management of Hazardous Waste), Chapter 18 (Land Disposal Restrictions), Article 5 (Prohibitions on Storage); 22 CCR 66268.50	Relevant and Appropriate[a]	This standard is applicable to sites where excavated material is classified as hazardous waste. The standard provides prohibitions on storage of restricted wastes. If hazardous waste is land disposed within the meaning of the LDRs, the hazardous waste will be managed in accordance with the standards stated in these sections of the regulation.

TABLE 3.3-3
Action-Specific ARARs for the Coastal Salt Marsh Sites

Source	Standard, Requirement, Criterion, or Limitation	ARAR Status	Description of ARARs
State of California Air			
California Clean Air Act	BAAQMD, Regulation 6 (Particulate Matter and Visible Emissions)	Applicable	This regulation limits visible emissions, particulate emissions by weight, and emissions from sulfuric acid plants and sulfur recovery units. This regulation is applicable to any remedial action activity which may discharge air contaminants as defined by the rule.
	BAAQMD, Regulation 7 (Odorous Substances)	Applicable	This regulation limits odorous emissions per complaints received from persons on properties where the emissions did not occur and places maximum concentration limits on certain organic emissions.
State of California Surface Water, Groundwater, and Soil			
California Water Code	SWRCB Order 99-08-DWQ (General order for stormwater management at construction sites)	Applicable	Must identify the sources of sediment and other pollutants that affect the quality of storm water discharges and implement practices to reduce these discharges. Storm water discharges from construction sites must meet pollutant limits and standards. The narrative effluent standard includes the requirements to implement BMPs and/or appropriate pollution prevention control practices. Inspections of the construction site prior to anticipated storm events and after actual storm events need to be conducted to identify areas contributing to storm water discharge and evaluated for the effectiveness of best management practices and other control practices. Applies to construction sites five acres or greater in size. It also applies to smaller sites that are part of a larger common plan of development or sale. Administrative portions of this permit are not applicable in accordance with CERCLA.
Porter-Cologne Water Quality Control Act (California Water Code Sections 13240)	San Francisco Bay Basin (Region 2) Water Quality Control Plan	Applicable	Establishes water quality objectives, including narrative and numerical standards that protect the beneficial uses of surface waters and groundwaters in the region. Establishes beneficial uses of affected water bodies.
Porter-Cologne Water Quality Control Act (California Water Code Sections 13000, 13140, 13240)	SWRCB Resolution 68-16	Applicable	The resolution establishes requirements for activities involving discharges of contamination directly into surface waters or groundwater. According to the RWQCB, this resolution requires that high-quality surface and groundwater be maintained to the maximum extent possible.

TABLE 3.3-3
Action-Specific ARARs for the Coastal Salt Marsh Sites

Source	Standard, Requirement, Criterion, or Limitation	ARAR Status	Description of ARARs
Porter-Cologne Water Quality Control Act (California Water Code Sections 13000, 13140, 13240)	SWRCB Resolution 68-16	Applicable	The resolution establishes requirements for activities involving discharges of contamination directly into surface waters or groundwater. According to the RWQCB, this resolution requires that high-quality surface and groundwater be maintained to the maximum extent possible.
Porter-Cologne Water Quality Control Act (California Water Code Sections 13000, 13140, 13240)	SWRCB Resolution 88-63	Applicable	Specifies that, with certain exceptions, all ground and surface waters have the beneficial use of municipal or domestic water supply. Applies in determining beneficial uses for waters that may be affected by discharges of waste. SWRCB Resolution 88-63 applies to all sites that may be affected by discharges of waste to groundwater or surface water. The resolution specifies that, with certain exceptions, all groundwater and surface waters have beneficial use of municipal or domestic water supply. These exceptions include, among others, if: (1) the TDS exceed 3,000 mg/L or (2) the water source does not provide sufficient water to supply a single well capable of producing an average sustained yield of 200 gallons per day. In the case of HAAF, both these exceptions apply; therefore, groundwater below the site may not be considered suitable for municipal or domestic water supplies.
Porter-Cologne Water Quality Control Act (California Water Code Sections 13140 - 13147, 13172, 13260, 13263, 13267, 13304)	Title 27 (Environmental Protection), Division 2 (Solid Waste), Chapter 1, Article 1 (General) 27 CCR 20090(d)	Applicable	Actions taken by or at the direction of public agencies to clean up from unauthorized releases are exempt from Title 27, except that wastes removed from the immediate place of release and discharged to land must be managed in accordance with classification (Title 27 CCR, Section 20200) and siting requirements of Title 27. Wastes contained or left in place must comply with Title 27 to the extent feasible.
Porter-Cologne Water Quality Control Act (California Water Code Sections 13140 - 13147, 13172, 13260, 13263, 13267, 13304)	Title 27 (Waters), Division 2 (Solid Waste), Chapter 3 (Criteria for waste Management Units), Article 2 (Waste Classification and Management) 27 CCR, 20200, 20210, 20220, and 20230	Applicable	Waste Classification: Wastes must be classified as: hazardous waste, designated waste, nonhazardous solid waste, or inert waste. A hazardous waste can only be discharged to a Class I facility (unless a variance is applicable under Title 22 regulations). A designated waste can be discharged to a Class I or Class II facility. A nonhazardous solid waste can be discharged to a Class I, II, or III facility. Inert wastes do not need to be sent to a classified facility.

TABLE 3.3-3
Action-Specific ARARs for the Coastal Salt Marsh Sites

Source	Standard, Requirement, Criterion, or Limitation	ARAR Status	Description of ARARs
Other State of California TBCs			
Resolution 92-145	Interim Final Sediment Screening Criteria and Testing Requirements for Wetland Creation and Upland Beneficial Reuse dated December 1992, Resolution No. 92-145 (referenced in the San Francisco Bay Region Water Quality Control Plan, approved in 1995).	TBC	In this Resolution, the RWQCB established screening criteria guidelines to be used to evaluate the appropriateness of using dredged material for beneficial purposes.
	Draft Staff Report titled Beneficial Reuse of Dredged Materials: Sediment Screening and Testing Guidelines dated May 2000.	TBC	This document is an update of the December 1992 document described above. These guidelines fall into the category of TBC.

[a] The Army interprets these as relevant and appropriate; DTSC interprets them as applicable.

SECTION 3.4

Evaluation and Selection of Alternatives

This section summarizes the evaluation and selection of remedial alternatives presented in the FFS (CH2M HILL, 2003a) for each coastal salt marsh site. The following remedial alternatives were developed in the FFS by assembling remedial technologies compatible with wetland functions into treatment options that meet RAOs:

- Alternative 1, No Further Action
- Alternative 2, Excavation and Offsite Disposal

Some alternatives, such as capping and in situ soil stabilization/solidification were considered but then eliminated from further evaluation because they are not compatible with wetlands functions. Excavation with onsite disposal was also considered, but is not compatible with wetlands functions.

The sections below describe the remedial alternatives, and their selection for each site. The rationale for adopting the selected alternative is also provided.

3.4.1 Remedial Alternatives

The two remedial alternatives evaluated in detail in the FFS were No Further Action, and Excavation and Offsite Disposal. These alternatives are described below.

3.4.1.1 Alternative 1, No Further Action

In accordance with the NCP (40 CFR 300), CERCLA guidance (EPA, 1988a), and under Chapter 6.8 of Division 20 of the California Health and Safety Code, a No Further Action alternative was developed for evaluation at each site. Under this alternative, no further action would be taken and there would be no restrictions placed on the use of the site.

The No Further Action alternative reflects leaving a site in its current condition. In the analysis presented below, it is intended that this option be included only as a comparison to other alternatives. This alternative will not be selected for any of the sites requiring remedial action, because it would not meet RAOs.

3.4.1.2 Alternative 2, Excavation and Offsite Disposal

Under this alternative, contaminated soils above action goals will be excavated and disposed of at an appropriate offsite landfill facility. Table 3.2-1 (at the end of Section 3.2) lists the action goals for sites that have been determined to require excavation. Excavation at the coastal salt marsh sites will continue until the action goals have been achieved, or until it is determined by joint agreement of the State and Army that further excavation is impractical, or until the point at which the State and the Army agree that the remaining contamination is shown not to pose an unacceptable risk to human health and the environment.

Activities in the coastal salt marsh will be conducted in a manner that is sensitive to impacts on plants and animals. Except in the area proposed as a channel cut by the HWRP, the

excavated areas in the coastal salt marsh will be backfilled with clean onsite soil or re-handled dredged material of similar physical characteristics.

Institutional controls in the form of land use restrictions will be required where contamination remains above action goals. These institutional controls include:

- Grading, excavation, and intrusive activities must be conducted pursuant to a plan approved by the State.
- The property shall not be used for residences, schools, daycare facilities, hospitals, hospices, or other similar sensitive uses.

State and federal agencies must have access to the property. The property owner shall provide access, on an as-needed basis, minimizing any interference with the implementation, operation, or maintenance of the ecosystem restoration project. Appropriate federal and state agencies and their officers, agents, employees, contractors, and subcontractors will have the right, upon reasonable notice, to enter the property where it is necessary to carry out response actions or other activities consistent with the purposes of this ROD/RAP. Appropriate federal and state agencies and their officers, agents, employees, contractors, and subcontractors will also have the right, upon reasonable notice, to enter adjoining property where it is necessary to carry out response actions or other activities consistent with the purposes of this ROD/RAP.

Remedial Goals

Alternative 2 serves three purposes:

- To prevent human or ecological contact with contaminated soil/sediment
- To prevent migration of contamination
- To minimize long-term impact to habitat

Primary Action

Implementation of this alternative would consist of excavation and offsite disposal of site soils, as well as sampling to confirm removal of contaminated soils from the affected site. Sites that are not channel areas would be backfilled to grade with clean soil. The following paragraphs describe the primary activities and general design considerations for Alternative 2.

Equipment mobilization and establishment of staging areas and access to the sites targeted for remedial action. Staging areas would be established on the airfield inboard property for heavy equipment, decontamination, and soil transfer from offroad trucks to highway transport trucks. Some sites can be reached on existing roadways in the coastal salt marsh or directly from the levee. For areas that are not accessible by existing roadways, temporary roads will be constructed. Low-impact methods will be used when practicable. The temporary roadway material will be removed as equipment is demobilized from each site.

Preconstruction biological surveying. Preconstruction surveying and trapping may be necessary to ensure that no sensitive species are present on the excavation sites. Sensitive species are discussed in Section 1.4.5. Noise, vibration, visual-related, and proximity-related disturbances associated with project construction could adversely affect sensitive species. Mitigation measures may include erecting barrier exclusion fencing to impede salt marsh harvest mice from entering the construction area, avoiding construction during the breeding

period for the clapper rail (February 1 through August 31), and placing fish barriers at waterways that are connected to excavation sites. Additional mitigation measures may be identified during remedial design.

Excavation of site material. Contaminated material would be excavated using standard construction equipment. Equipment will be chosen that exhibits low impact to habitat and high efficiency. Where possible, excavation activities will be conducted within the excavation areas to avoid temporary construction of access roads. Excavation will continue until the action goals are achieved, or until it is determined by joint agreement of the State and Army that further excavation is impractical, or until the point at which the State and the Army agree that the remaining contamination is shown to not pose an unacceptable risk to human health and the environment. Excavation in saturated conditions may result in the production of excess water in the excavation site through seepage of groundwater. This water would be disposed of properly.

Storage and disposal of site material. Excavated materials would need to be classified, stored onsite, and disposed of in a suitable offsite location. Waste profiling would be required to determine classification of the waste. Soil blending may be required to reduce moisture content of the excavated materials. Soil would be classified for disposal before blending. Soil would then be disposed of in an approved landfill, based on waste classification.

Confirmation sampling. Confirmation samples would be collected to verify that action goals are met. These samples could be collected as predesign investigation samples that would be collected before excavation to determine the extent of the excavation geometry. Alternatively, confirmation samples could be collected following excavation activities. Once the confirmation sampling shows that all remaining contaminant concentrations have been reduced below action goals, the site can be backfilled.

Backfill operations. Except in the area proposed as a channel cut by the HWRP, the excavated areas in the coastal salt marsh will be backfilled with clean onsite soil or re-handled dredge material of similar physical characteristics. For sites in the high marsh environment, backfilled excavations will be contoured to eliminate topographic depressions and promote the reestablishment of native vegetation. The site is expected to revegetate naturally, and seeding or planting is not anticipated.

Postconstruction monitoring. Postconstruction observations will include physical observations to check for reestablishment of the vegetation on the site, if applicable. Monitoring to address contaminants will be required where appropriate.

3.4.2 Evaluation of Alternatives

The remedial alternatives were evaluated based on the nine criteria set forth in the NCP. These evaluation criteria served as the basis for conducting the detailed analysis during the FFS and for selecting via this ROD/RAP a remedial action appropriate for the coastal salt marsh. Refer to Section 4.0 of the FFS (CH2M HILL, 2003a) for an in-depth review of all criteria.

The first two criteria, overall protection of human health and the environment and compliance with ARARs, are threshold criteria. Alternatives that do not meet the threshold criteria are eliminated from further evaluation. The remedy selection is based primarily on the next five criteria:

- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, and volume
- Short-term effectiveness
- Implementability
- Cost

The remaining criteria, State (support agency) acceptance and community acceptance, will be evaluated following receipt of comments on this ROD/RAP.

The list below analyzes the alternatives against the nine criteria. Alternative 1 is carried forward only as a comparison to other alternatives. This alternative will not be selected for any of the sites requiring remedial action because it would not meet RAOs.

1. **Overall Protection of Human Health and the Environment**
   Alternative 1, which involves no additional remedial activity to protect human health or the environment, does not meet this objective. Alternative 2 protects human health and the environment by removing the contamination at each site until the action goals are achieved, or until it is determined by joint agreement of the State and Army that further excavation is impractical, or until the point at which the State and the Army agree that the remaining contamination is shown not to pose an unacceptable risk to human health and the environment.

2. **Compliance with Applicable Requirements**
   Alternative 2 is expected to satisfy these criteria because it will meet the location and action-specific ARARs. A description of how Alternative 2 meets the ARARs is contained in the FFS. While there are no chemical-specific ARARs for residual contamination at HAAF, chemical-specific TBC criteria are proposed for the site. Alternative 2 will meet the criteria by removing contamination above action goals. Alternative 1 does not meet these criteria.

3. **Long-Term Effectiveness and Permanence**
   Alternative 2 provides a high degree of long-term effectiveness because the contamination will be removed from the site, or if contamination is left in place, exposure of receptors to remaining contaminants will be prevented. Alternative 1 is not effective in the long term.

4. **Reduction of Toxicity, Mobility, and Volume through Treatment**
   None of the alternatives involve treatment to reduce toxicity, mobility, or volume of contaminants. Soils at HAAF have a high clay content, and treatment options for contaminated soil with a high clay content are not practical.

5. **Short-Term Effectiveness**
   Alternative 2 has the potential for short-term impacts on the community, workers, and environment because it involves excavation in a sensitive habitat, stockpiling, blending of soils to reduce water content, if necessary, and transportation to an offsite disposal facility. Fugitive dusts can be created during this process, but will be controlled using

water, as necessary. Risk of worker exposure can be mitigated by following safety protocols during excavation activities. No short-term impacts are expected from Alternative 1.

6. **Implementability**
   There are no obstacles associated with implementing Alternative 1. Alternative 2 includes a few obstacles because this alternative uses excavation to reduce contamination. Excavation activities can be difficult because the stability of excavation areas and impact to habitat for access must be considered. However, excavation is a well-established remedial action and activities can be completed safely.

7. **Cost**
   Estimated project costs for Alternative 2 are listed in Table 3.4-1 (included at the end of this section). There are no costs for Alternative 1. The cost analysis includes estimated expenditures required to complete the remediation in terms of both capital costs and annual operations and maintenance. Cost estimates are based on estimated excavation volumes and monitoring and are expressed in terms of 2003 dollars.

8. **State (Support Agency) Acceptance**
   RWQCB and DTSC hereby determine, based on the substantial evidence in the administrative record, that this ROD/RAP has been properly noticed, circulated for public review and comment, and approved in accordance with the requirements of Sections 25356.1 and 25356.1.5 of the Health and Safety Code Chapter 6.8 of Division 20, the Porter Cologne Water Quality Control Act, and all other applicable State laws.

9. **Community Acceptance**
   Community acceptance refers to the public's general response to the alternatives described in the draft ROD/RAP. The community will have the opportunity to comment in writing on the ROD/RAP during a 45-day comment period. There will also be an opportunity for the public to ask questions and make comments at a meeting to be held during the 45-day comment period.

3.4.3 Comparative Analysis of Selected Alternatives

This section summarizes the basis for the selected alternative for each coastal salt marsh site. For each site, the selected alternative satisfies the statutory requirements of CERCLA Sections 121 and 120(a)(4), as amended by SARA, and California Health and Safety Code Section 25356.1.5, which requires response actions approved by RWQCB and/or DTSC under Chapter 6.8 of Division 20 of the California Health and Safety Code, in that the following mandates are attained:

- The selected remedy is protective of human health and environment.
- The selected remedy complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action.
- The selected remedy is cost-effective.

A number of the coastal salt marsh sites are adjacent to each other, or are in proximity (see Figure 3.4-1, included following the tables at the end of this section). Given the proximity of

sites, there is overlap in some of the excavation boundaries proposed in the alternatives selected below. The total volume of soil to be excavated at the coastal salt marsh sites, along with the total area of excavations, is presented in Section 3.4.5. In addition, Section 3.4.5 provides an estimate of the total area of pickleweed habitat that may be affected as a result of carrying out the selected alternatives for the coastal salt marsh sites.

3.4.3.1 Antenna Debris Disposal Area

Alternative 2, Excavation and Offsite Disposal, is the preferred alternative for the Antenna Debris Disposal Area. The Excavation and Offsite Disposal alternative would remove soil containing FFS COPCs at concentrations above action goals. The excavated area would be backfilled with clean soil or re-handled dredged material with physical characteristics similar to the soil removed from the coastal salt marsh. The alternative would meet RAOs by removing FFS COPCs above action goals.

Excavation boundaries were established to address soil containing FFS COPCs at concentrations above action goals. A summary of the minimum, maximum, and average values for FFS COPCs remaining at the Antenna Debris Disposal Area are shown below. This information was considered in the process of selecting Alternative 2 and establishing excavation boundaries for the Antenna Debris Disposal Area.

Minimum, Maximum, and Average Values for FFS COPCs — Antenna Debris Disposal Area

COPC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Barium	28	28.7	1,370	176	188
Beryllium	28	0.4	4.3	2.2	1.68
Cadmium	25	0.34	6.9	2.30	1.8
Cobalt	28	7	322	58	26.7
Copper	28	28.3	726	130	88.7
Lead	29	14.1	2,100	330	46.7
Manganese	29	227	7,440	1,931	1,260
Nickel	29	43.5	396	182	132
Silver	29	0.047	2.2	0.82	1
Zinc	29	70.4	2,930	169	169
Diesel Range Hydrocarbons	29	370	370	370	144
Endrin aldehyde	20	0.0015	0.02	0.0076	0.0064
Heptachlor	20	0.062	0.062	0.062	0.0088
Heptachlor epoxide	20	0.1	0.1	0.100	0.0088
MCPA	7	71	71	71	7.9
MCPP	6	27	27	27	3.0
Motor Oil	2	2,900	2,900	2,900	144
PCBs Total	21	0.00007868	2.19	0.38	0.09

Minimum, Maximum, and Average Values for FFS COPCs — Antenna Debris Disposal Area

COPC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
DDTs Total	28	0.0019	6.39	0.92	0.03
BHCs Total	27	0.003	0.61	0.166	0.0048
Chlordanes Total	27	0.0026	1	0.17	0.00479

Units are in ppm.
MCPA = methyl chlorophenoxy acetic acid
MCPP = mecoprop

Alternative 1, No Further Action, was not selected because it would not meet RAOs.

3.4.3.2 East Levee Construction Debris Disposal Area

Alternative 2, Excavation and Offsite Disposal, is the preferred alternative for the ELCDDA. The Excavation and Offsite Disposal alternative would remove soil containing FFS COPCs at concentrations above action goals. The excavated area would be backfilled with clean onsite soil or re-handled dredged material with physical characteristics similar to the soil removed from the coastal salt marsh. The alternative would meet RAOs by removing FFS COPCs above action goals.

The area recommended for excavation is shown on Figure 3.4-1. Excavation boundaries were established to address soil containing FFS COPCs at concentrations above action goals. A summary of the minimum, maximum, and average values for FFS COPCs remaining at the ELCDDA are shown below. This information was considered in the process of selecting Alternative 2 and establishing excavation boundaries for the ELCDDA.

Minimum, Maximum, and Average Values for FFS COPCs — East Levee Construction Debris Disposal Area

COPC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Lead	57	5	1,280	79	46.7
Zinc	52	18.8	855	154	169
Diesel Range Hydrocarbons	19	149	723	390	144
Total Dioxin Equivalents	4	0.087E-05	0.015E-05	0.006E-05	2.1E-05
PCBs Total	19	0.048	0.35	0.16	0.09
DDTs Total	9	0.0057	0.094	0.036	0.03

Units are in ppm.

Alternative 1, No Further Action, was not selected because the alternative would not meet RAOs.

3.4.3.3 High Marsh Area

Nonchannel Cut Area

Alternative 2, Excavation and Offsite Disposal, is the preferred alternative for the Nonchannel Cut Area. The Excavation and Offsite Disposal alternative would remove soil containing FFS COPCs at concentrations above action goals. The excavated area would be backfilled with clean onsite soil or re-handled dredged material with physical characteristics similar to the soil removed from the coastal salt marsh. The alternative would meet RAOs by removing FFS COPCs above action goals.

The area recommended for excavation is shown on Figure 3.4-1. Excavation boundaries were established to address soil containing FFS COPCs at concentrations above action goals. A summary of the minimum, maximum, and average values for FFS COPCs remaining at the Nonchannel Cut Area are shown below. This information was considered in the process of selecting Alternative 2 and establishing excavation boundaries for the Nonchannel Cut Area.

Minimum, Maximum, and Average Values for FFS COPCs — High Marsh Nonchannel Cut

COPC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Beryllium	93	0.37	8.6	2.43	1.68
Cobalt	95	5.3	162	43	26.7
Copper	95	21.5	1,600	118	88.7
Lead	95	12.9	1,540	169	46.7
Manganese	93	152	12,200	1,616	1,260
Nickel	95	18	800	181	132
Silver	95	0.03	6.61	1.20	1
Zinc	95	57.3	1,160	205	169
Endrin aldehyde	7	0.0034	0.016	0.010	0.0064
PCBs Total	10	0.008768	0.507021	0.10	0.09
DDTs Total	29	0.0024	5.64	1.38	0.03
Chlordanes Total	22	0.0042	1.3	0.24	0.00479

Units are in ppm.

Alternative 1, No Further Action, was not selected because it would not meet RAOs.

Proposed Channel Cut

Alternative 2, Excavation and Offsite Disposal, is the preferred alternative for the Proposed Channel Cut. The Excavation and Offsite Disposal alternative would remove soil containing FFS COPCs at concentrations above action goals. The alternative would meet RAOs by removing FFS COPCs above action goals.

The area recommended for excavation is shown on Figure 3.4-1. Excavation boundaries were established to address soil containing FFS COPCs at concentrations above action goals. A summary of the minimum, maximum, and average values for FFS COPCs remaining at the

Proposed Channel Cut are shown below. This information was considered in the process of selecting Alternative 2 and establishing excavation boundaries for the Proposed Channel Cut.

Minimum, Maximum, and Average Values for FFS COPCs – High Marsh Channel Cut

COPC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Beryllium	49	0.9	7	2.11	1.68
Cadmium	49	1	3.8	2.04	1.8
Cobalt	49	16.1	115	37	26.7
Lead	49	7	796	160	46.7
Nickel	49	77.2	376	133	132
Endrin aldehyde	39	0.0028	0.097	0.053	0.0064
Motor Oil	39	11	1100	89	144
DDTs Total	39	0.0022	9.9	0.77	0.03
Chlordanes Total	39	0.0022	0.41	0.149	0.00479

Units are in ppm.

Alternative 1, No Further Action, was not selected because it would not meet RAOs.

3.4.3.4 Historic Outfall Drainage Ditch

Alternative 2, Excavation and Offsite Disposal, is the preferred alternative for the Historic ODD. The Excavation and Offsite Disposal alternative would remove soil containing FFS COPCs at concentrations above action goals. The alternative would meet RAOs by removing FFS COPCs above action goals.

The area recommended for excavation is shown on Figure 3.4-1. Excavation boundaries were established to address soil containing FFS COPCs at concentrations above action goals. A summary of the minimum, maximum, and average values for FFS COPCs remaining at the Historic ODD are shown below. This information was considered in the process of selecting Alternative 2 and establishing excavation boundaries for the Historic ODD.

Minimum, Maximum, and Average Values for FFS COPCs — Historic ODD

COPC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Cadmium	19	3.3	11.5	7.23	1.8
Cobalt	19	11.5	136	31	26.7
Lead	19	16.2	229	45	46.7
Manganese	19	534	18,200	2,034	1,260
Nickel	19	68.7	546	133	132
Zinc	19	76.5	647	156	169
Dichlorprop	3	1.7	1.7	1.70	0.14

Units are in ppm.

Alternative 1, No Further Action, was not selected because it would not meet RAOs.

3.4.3.5 Outfall Drainage Ditch

Alternative 2, Excavation and Offsite Disposal, is the preferred alternative for the ODD. The Excavation and Offsite Disposal alternative would remove soil containing FFS COPCs at concentrations above action goals. The alternative would meet RAOs by removing FFS COPCs above action goals.

The area recommended for excavation is shown on Figure 3.4-1. Excavation boundaries were established to address soil containing FFS COPCs at concentrations above action goals. A summary of the minimum, maximum, and average values for FFS COPCs remaining at the ODD are shown below. This information was considered in the process of selecting Alternative 2 and establishing excavation boundaries for the ODD.

Minimum, Maximum, and Average Values for FFS COPCs — Outfall Drainage Ditch

COPC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Beryllium	39	0.53	6.8	2.14	1.68
Cadmium	43	1.1	18.6	5.52	1.8
Cobalt	43	13.8	199	41	26.7
Lead	43	9.7	752	133	46.7
Manganese	39	280	5,170	1,171	1,260
Nickel	43	66.1	637	155	132
Silver	30	0.087	8.3	1.54	1
Zinc	43	60	454	163	169
Diesel Range Hydrocarbons	26	19	4,600	1,367	144
Endrin aldehyde	13	0.0051	0.041	0.024	0.0064
Motor Oil	12	21	15,000	4,018	144
Pentachlorophenol	19	1.79	2.76	2.28	0.017
Phenol	19	2.34	3.06	2.70	0.13
PCBs, Total	8	0.0159	1.6941	0.25	0.09
DDTs, Total	45	0.003	11.01	1.22	0.03
Chlordanes, Total	15	0.003	0.25	0.081	0.00479

Units are in ppm.

Alternative 1, No Further Action, was not selected because it would not meet RAOs.

3.4.3.6 Boat Dock

Nonchannel Area

Alternative 2, Excavation and Offsite Disposal, is the preferred alternative for the Nonchannel Area. The Excavation and Offsite Disposal alternative would remove soil

containing FFS COPCs at concentrations above action goals. The excavated area would be backfilled with clean onsite soil or re-handled dredged material with physical characteristics similar to the soil removed from the coastal salt marsh. The alternative would meet RAOs by removing FFS COPCs above action goals.

The area recommended for excavation is shown on Figure 3.4-1. Excavation boundaries were established to address soil containing FFS COPCs at concentrations above action goals. A summary of the minimum, maximum, and average values for FFS COPCs remaining at the Nonchannel Area of the Boat Dock are shown below. The following information was considered in the process of selecting Alternative 2 and establishing excavation boundaries for the Nonchannel Area of the Boat Dock.

Minimum, Maximum, and Average Values for FFS COPCs — Boat Dock Nonchannel Area

COPC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Lead	9	22.8	349	93	46.7
Zinc	9	53.9	872	257	161
Heptachlor epoxide	7	0.011	0.017	0.014	0.0088
Methoxychlor	9	0.023	0.62	0.32	0.09
PAHs Total	10	0.115	23.092	6.7	4.022
DDTs Total	10	0.0337	0.46	0.15	0.03
BHCs Total	9	0.34	0.34	0.34	0.0048
Chlordanes Total	7	0.0018	0.0195	0.009	0.00479

Units are in ppm

Alternative 1, No Further Action, was not selected because it would not meet RAOs.

Channel Area

Alternative 2, Excavation and Offsite Disposal, is the preferred alternative for the Channel Area. The Excavation and Offsite Disposal alternative would remove soil containing FFS COPCs at concentrations above action goals. The alternative would meet RAOs by removing FFS COPCs above action goals.

The area recommended for excavation is shown on Figure 3.4-1. Excavation boundaries were established to address soil containing FFS COPCs at concentrations above action goals. A summary of the minimum, maximum, and average values for FFS COPCs remaining at the Channel Area of the Boat Dock are shown below. This information was considered in the process of selecting Alternative 2 and establishing excavation boundaries for the Channel Area of the Boat Dock.

Minimum, Maximum, and Average Values for FFS COPCs — Boat Dock Channel Area

COPC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Barium	11	60.3	1,060	158	188
Copper	11	74.3	348	105	88.7
Lead	11	26	1,980	206	46.7
Zinc	11	129	1,740	284	169

Units are in ppm.

Alternative 1, No Further Action, was not selected because it would not meet RAOs.

3.4.3.7 Area 14

Alternative 2, Excavation and Offsite Disposal, is the preferred alternative for Area 14. The Excavation and Offsite Disposal alternative would remove soil containing FFS COPCs at concentrations above action goals. The excavated area would be backfilled with clean onsite soil or re-handled dredged material with physical characteristics similar to the soil removed from the coastal salt marsh. The alternative would meet RAOs by removing FFS COPCs above action goals.

The area recommended for excavation is shown on Figure 3.4-1. Excavation boundaries were established to address soil containing FFS COPCs at concentrations above action goals. A summary of the minimum, maximum, and average values for FFS COPCs remaining at Area 14 are shown below. This information was considered in the process of selecting Alternative 2 and establishing excavation boundaries for Area 14.

Minimum, Maximum, and Average Values for FFS COPCs — Area 14

COPC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Cobalt	14	3.7	93.3	21	26.7
Motor Oil	16	26	660	134	144
PAHs Total	14	0.004	35.207	3.18	4.022
DDTs Total	14	0.0049	0.35	0.10	0.03

Units are in ppm.

Alternative 1, No Further Action, was not selected because this alternative would not meet RAOs.

3.4.3.8 Former Sewage Treatment Plant Outfall and Pipe

Alternative 2, Excavation and Offsite Disposal, is the preferred alternative for the FSTP Outfall and Pipe. Alternative 2 would remove soil containing FFS COPCs at concentrations above action goals. The excavated area would be backfilled with clean onsite soil or re-handled dredged material with physical characteristics similar to the soil removed from the coastal salt marsh. The alternative would meet RAOs by removing FFS COPCs above action goals.

The FSTP pipeline may contain residual COCs, so it is being removed as part of this action. The wooden pipeline support structure will not be removed. The pipeline will be disposed of at an appropriate facility.

The area recommended for excavation is shown on Figure 3.4-1. Excavation boundaries were established to address soil containing FFS COPCs at concentrations above action goals. A summary of the minimum, maximum, and average values for FFS COPCs remaining at the FSTP Outfall and Pipe are shown below. This information was considered in the process to select Alternative 2 and establish excavation boundaries for the FSTP Outfall and Pipe.

Minimum, Maximum, and Average Values for FFS COPCs — Former Sewage Treatment Plant Outfall

COPC	Number of Samples	Minimum Value	Maximum Value	Average Value	Action Goal
Copper	12	41.2	159	84	88.7
Lead	12	10.4	171	46	46.7
Mercury	12	0.25	8.4	1.68	0.58
Silver	12	0.2	23.2	6.8	1
Zinc	12	61.7	255	145	169
DDTs Total	4	0.063	0.063	0.063	0.03
Chlordanes Total	4	0.0055	0.0055	0.006	0.00479

Units are in ppm.

Alternative 1, No Further Action, was not selected because it would not meet RAOs.

3.4.4 Estimated Excavation Volume/Area and Impact on Coastal Salt Marsh Habitat

Alternative 2, Excavation and Offsite Disposal, was selected for all of the coastal salt marsh sites. Implementation of this alternative is expected to result in excavation of a total of 30,165 cubic yards of soil/sediment. The total short-term impact to the salt marsh habitat from excavation activities and equipment access is estimated to be 5.81 acres. Significant short-term impacts, including damage and destruction of habitat, will occur as a result of remediation activities at each coastal salt marsh site. It is expected that the habitat will fully reestablish itself naturally within 2 years. Specific monitoring procedures for habitat recovery will be developed in conjunction with the appropriate state and federal agencies during the remedial design process. Alternative 2 is not expected to have a long-term impact on the habitat in the coastal salt marsh, except at the Historic ODD and ODD, where the margins of the ditches may be excavated and removed. The long-term impact at these sites is expected to affect 0.26 acres.

A total of approximately 6.07 acres of coastal salt marsh habitat is expected to be temporarily or permanently affected by remediation activities. The actual number of acres impacted at a specific site may vary when field activities are conducted. The final footprint of excavation activities will be determined as part of the remedial design and/or confirmation sampling conducted during remedial activities.

TABLE 3.4-1
Comparative Analysis Summary

Site	Alternative	Evaluation Criteria Rankings				Cost	Short-Term Effectiveness	Implementability	Regulatory Agency Acceptance	Community Acceptance
		Overall Protection of Human Health and the Environment	Compliance with State and Federal Requirements	Long-Term Effectiveness and Permanence	Reduction of TMV Through Treatment					
Antenna Debris Disposal Area	1	NA	NA	NA	NA	NA	High	High	Low	TBD
	2	High	High	High	High	$248,500	Medium	Medium	High	TBD
East Levee Construction Debris Disposal Area	1	NA	NA	NA	NA	NA	High	High	Low	TBD
	2	High	High	High	High	$942,000	Medium	Medium	High	TBD
High Marsh Area Proposed HWRP Channel Cut	1	NA	NA	NA	NA	NA	High	High	Low	TBD
	2	High	High	High	High	$520,700	High	High	High	TBD
High Marsh Area Non Channel Cut	1	NA	NA	NA	NA	NA	High	High	Low	TBD
	2	High	High	High	High	$1,334,000	High	High	High	TBD
Historic Outfall Drainage Ditch	1	NA	NA	NA	NA	NA	High	High	Low	TBD
	2	High	High	High	High	$138,000	Medium	Medium	High	TBD
Outfall Drainage Ditch	1	NA	NA	NA	NA	NA	High	High	Low	TBD
	2	High	High	High	High	$266,000	Medium	Medium	High	TBD
Boat Dock	1	NA	NA	NA	NA	NA	High	High	Low	TBD
	2	High	High	High	High	$73,200	Medium	Medium	High	TBD
Area 14	1	NA	NA	NA	NA	NA	High	High	Low	TBD
	2	High	High	High	High	$225,000	Medium	Medium	High	TBD
FSTP Outfall and Pipe	1	NA	NA	NA	NA	NA	High	High	Low	TBD
	2	High	High	High	High	$217,300	Medium	Medium	High	TBD

NA = not applicable
TBD = to be determined

Alternative 1—No Further Action
Alternative 2—Excavation and Offsite Disposal

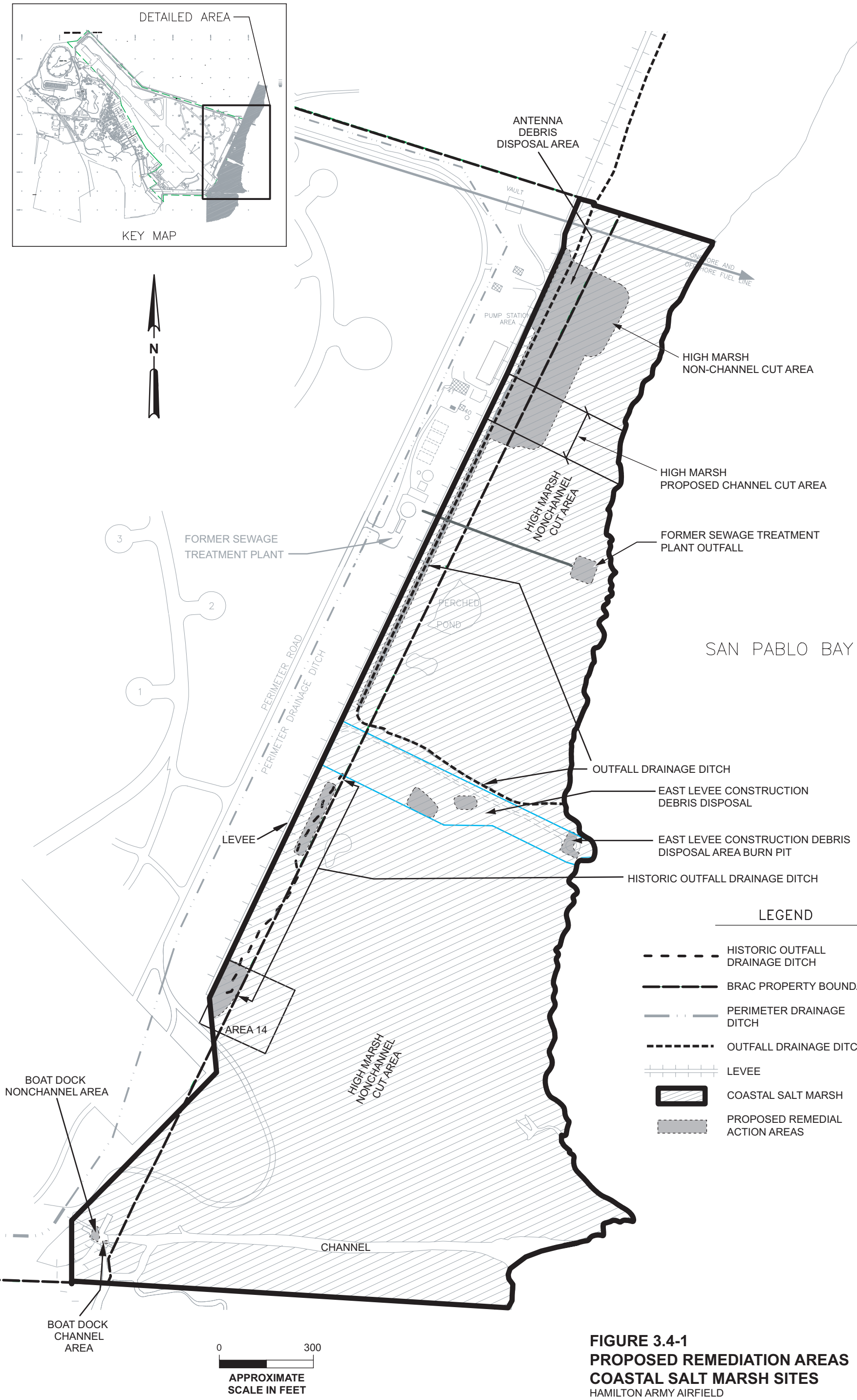

FIGURE 3.4-1
PROPOSED REMEDIATION AREAS
COASTAL SALT MARSH SITES
HAMILTON ARMY AIRFIELD

ROD/RAP

CH2MHILL

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SECTION 4.0

Summary and Proposed Actions

This section summarizes the purpose of the ROD/RAP and presents the remedial action alternatives selected for the Inboard Area sites, coastal salt marsh sites, and other environmental concerns in the HAAF Main Airfield Parcel. This section also presents a schedule of cleanup activities that will be conducted to implement the remedial actions described in this ROD/RAP.

This ROD/RAP was conducted for the HAAF Main Airfield Parcel to present the selected remedial actions for Inboard Area and coastal salt marsh sites. The objective of this ROD/RAP is to remove and/or cover contamination in the Inboard Area, rendering it suitable for open-space wetland restoration. For the coastal salt marsh, the alternative is to remove contaminated soils to the maximum extent practical to protect public health and to maintain its wetland function. For the coastal salt marsh, if any contaminants remaining above action goals area still a concern within the excavated areas, the site will be backfilled to prevent direct exposure to these contaminants.

The ROD/RAP selects remedial alternatives for each of the Inboard Area and coastal salt marsh sites that will protect human health and the environment by either reducing concentrations of residual COCs or FFS COPCs to levels below action goals, or by controlling or eliminating exposures of receptors to these chemicals. The ROD/RAP developed four remedial action alternatives:

- Alternative 1, No Further Action
- Alternative 2, Excavation and Offsite Disposal
- Alternative 3, Manage In-Situ, with Monitoring and Maintenance, for Army BRAC Sites
- Alternative 4, Manage Onsite, with Monitoring and Maintenance, for Army Civil Works Issues

Three of the alternatives were evaluated for the Inboard Area sites (Alternatives 1, 2, and 3). Two alternatives were evaluated for the coastal salt marsh sites (Alternatives 1 and 2). Two alternatives were also evaluated for the Inboard Area-Wide DDTs and PAHs near the runway, which are issues to be addressed by the HWRP (Alternatives 1 and 4, for Army Civil Works Issues). This ROD/RAP compares each alternative, as appropriate, and selects the remedial actions listed in Table 4-1 for each site.

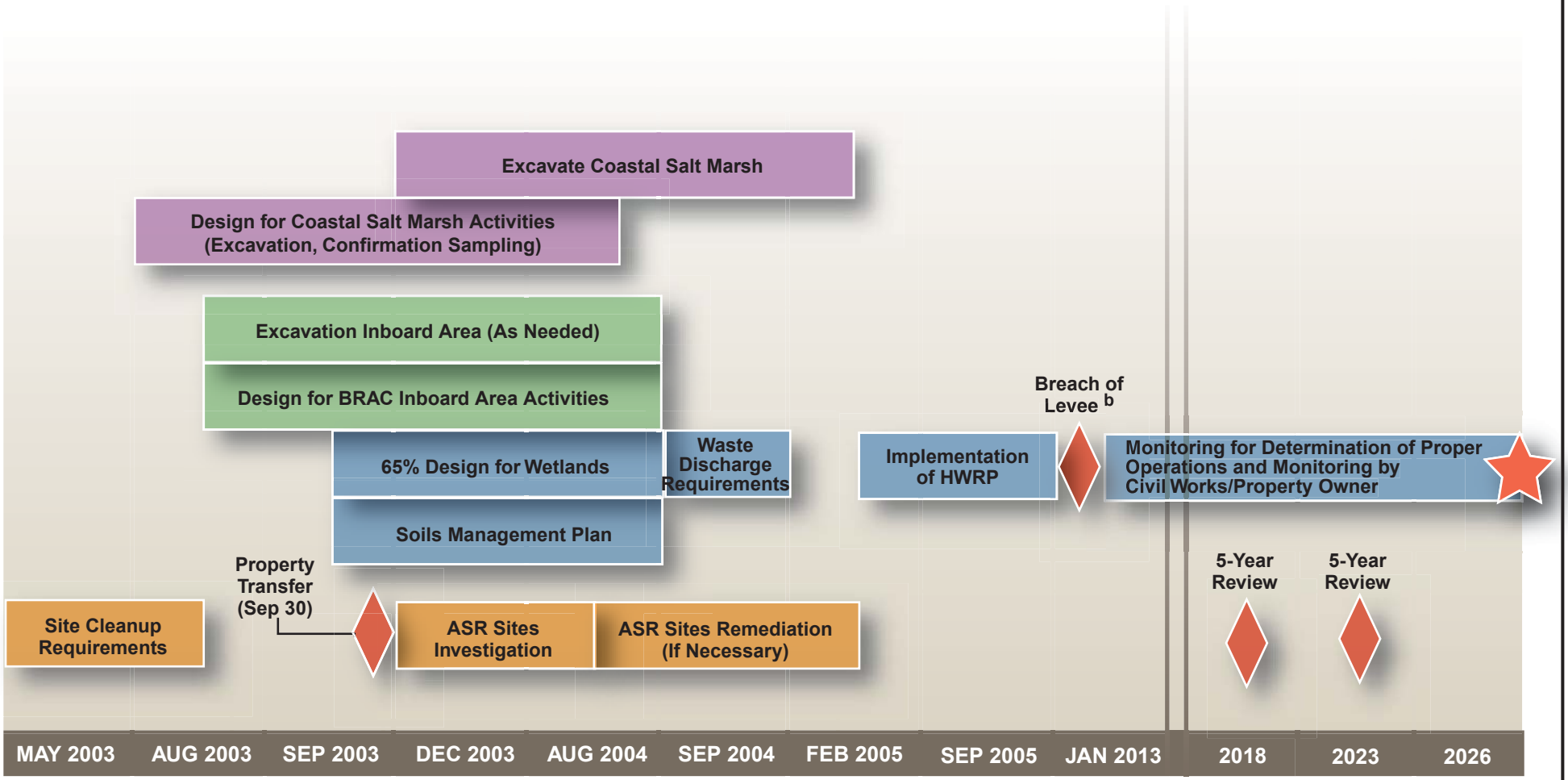
In a separate process, the ROD/RAP also selects alternatives for other environmental issues in the Main Airfield Parcel. The other environmental issues that will be addressed by the Army BRAC Program include sites identified by the Archive Search Report and the GSA/BRAC stockpiled soil on the runway. The other environmental issue that will be addressed by the HWRP is lead-based paint. The alternatives selected for these issues are summarized below:

- **Archive Search Report Sites:** Because information and data available for these sites are still being reviewed, decisions regarding the need for remedial action and the evaluation of alternatives for these sites are not included in this ROD/RAP. However, the Army and the State have agreed to complete the study/investigation activities listed in this ROD/RAP for the Archive Search Report sites. Should remedial action be required at the Archive Search Report sites, the action goals included in Table 1-2 will apply. If additional COCs are identified, action goals will be developed.
- **GSA/BRAC Stockpiled Soil:** The RWQCB will determine what additional actions (if any) may be required with respect to the GSA/BRAC stockpiled soil currently on the runway (see Subsection 2.1.4.2). The Army will be responsible for conducting any additional actions required by the RWQCB.
- **Lead-Based Paint:** Where lead contamination from lead-based paint may be a concern at current and previously demolished building locations, the HWRP will provide 3 feet of stable cover over the footprint of the building and 6 feet beyond the building footprint. If cover cannot be achieved, the footprint of the building plus 6 feet beyond the building perimeter will be scraped to a depth of 6 inches and managed elsewhere on site beneath 3 feet of stable cover.

Table 4-1 summarizes preferred alternatives for Inboard Area Sites and coastal salt marsh sites. Figure 4-1 provides a schedule of activities that will be conducted by the Army BRAC Program and Army Civil Works Program to implement the actions described in this ROD/RAP. Significant milestones for the HWRP are also included in the schedule.

TABLE 4-1
Summary of Preferred Alternatives

Alternative	Sites
1 – No Further Action	Revetment 18/Building 15 Building 20 Building 84/90 Perimeter Drainage Ditch (PDD) Spoils Piles E and H East Levee Generator Pad Tarmac East of Outparcel A-5 Northwest Runway Area Revetments 5, 8 through 10, 15, 17, 20, 24, 27, and 28 Radiological Waste Disposal Cylinders
2 – Excavation and Offsite Disposal	East Levee Construction Debris Disposal Area (including burn pit) High Marsh Area – proposed channel cut – nonchannel cut Historic Outfall Drainage Ditch Outfall Drainage Ditch Boat Dock – nonchannel area – channel area Area 14 Former Sewage Treatment Plant Outfall Antenna Debris Disposal Area Building 35/39 Area PDD Unlined (Addressing DDTs > 1 ppm) Building 41 Area PDD Spoils Pile F Revetments 6 and 7 PDD, lined portion within proposed wetland channel
3 – Manage In-Situ, with Monitoring, Maintenance, for Army BRAC Sites	Former Sewage Treatment Plant (including sanitary and industrial waste lines) Building 26 Building 35/39 Area Building 82/87/92/94/Area (including storm drains) Building 86 (including storm drains) PDD (lined portion outside proposed wetland channel) PDD (unlined) PDD Spoil Piles A, B, C, D, G, I, J, K, L, M, and N Onshore Fuel Line -54-inch-diameter Storm Drain Segment -Northern Segment -Hangar Segment Revetments 1 through 4, 11 through 14, 16, 19, 21 through 23, 25, and 26 (including storm drains) and Historic Revetments
4 - Manage Onsite, with Monitoring and Maintenance, for Army Civil Works Issues	Inboard Area-Wide DDTs and PAHs in soils adjacent to the runway



[a] *These dates are anticipated to be based on the current project understanding and are presented for planning purposes. The dates do not constitute obligations or deadlines and will be further refined through the adoption of the Site Cleanup Requirements.*

[b] *Completion of ROD/RAP requirements, except monitoring. Levee breach is currently expected to occur eight years after commencement of the HWRP implementation as along as the requirements of the ROD/RAP are met.*

FIGURE 4-1
APPROXIMATE SCHEDULE OF CLEANUP ACTIVITIES [a]
MAIN AIRFIELD PARCEL
HAMILTON ARMY AIRFIELD

SECTION 5.0

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APPENDIX A

HAAF Administrative Record List

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APPENDIX B

Groundwater

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Groundwater

Introduction

This appendix discusses groundwater investigations conducted at the Inboard Area and the coastal salt marsh at the former Hamilton Army Airfield (HAAF). An assessment of the condition of groundwater is provided. Additional specific details regarding the hydrogeologic and groundwater investigations can be obtained from the reports listed at the end of this appendix.

Seven environmental investigations of groundwater at HAAF, dating back to 1985 (Woodward-Clyde Federal Services [WCFS], 1985) through groundwater sampling in 2002 (Cerrudo Services, 2002), were conducted at the Inboard Area and coastal salt marsh. The referenced reports present the groundwater data, associated soil data, and the geologic and hydrogeologic conditions at the property.

Summary of Hydrogeology

As discussed in Section 1.4, the Inboard Area and the coastal salt marsh have similar compositions of Bay Mud but somewhat different hydrogeology, primarily as the result of differences in elevation and levels of saturation. Most of the Inboard Area lies below sea level and is inundated only seasonally with rainfall and stormwater surface runoff. During drier weather, this water either evaporates from the property or slowly percolates to the perimeter ditch and eventually is pumped to San Pablo Bay. In contrast, the coastal salt marsh is inundated regularly with saltwater from the higher tides of San Pablo Bay as well as receiving normal stormwater and stormwater discharges from the Inboard Area runoff via the pump stations.

Groundwater at HAAF is uniformly distributed throughout the saturated clay formation in the Inboard Area and coastal salt marsh. Groundwater levels at the Inboard Area vary according to seasonal rainfall (and the associated stormwater pumping) and evapotranspiration rates. The levels are influenced, to a lesser degree, by irrigation water discharged onto the property from upland areas. Groundwater levels and saturation of the coastal salt marsh vary with the diurnal fluctuations of tide elevations and inundation during storm events.

Where the Inboard Area is composed of Bay Mud (saturated or desiccated) and from zero to approximately two meters of overlying fill, groundwater moves slowly along the path of least resistance to the lowest area of the property percolating through the consolidated fill and over the saturated clay, tens of meters thick. The clay retards the vertical movement of any contaminants, and the consolidated fill retards horizontal movement. The sediment composition of the coastal salt marsh is predominantly soft Bay Mud, made up of very dense, relatively homogeneous clay. Groundwater does not move through this type of solid, highly porous, but weakly permeable formation without a significant applied hydraulic

pressure difference. The continuous saturated clay and the lack of movement of groundwater within the clay limit movement of contaminants within the marsh.

Investigations

Inboard Area

In 1985, the Army installed three investigation trenches, four test pits, and four wells at the west end of the airfield (northwest runway area—suspected Landfill 23) during the initial investigation within that area of the property. The groundwater sample reports for the October 1985 event indicated trace levels of metals, just above the method detection limits, in three down-gradient wells, trace detections of three priority pollutant organic compounds in two of the wells, and trace alpha and beta particles in one well—the only well sampled for these constituents.

Groundwater was sampled monthly between December 1985 and March 1986, and from June 1986 through September 1986. Very low concentrations of five volatile organic compounds (VOCs), lindane, and 12 semi-volatile organic compounds (SVOCs) were detected sporadically in the groundwater samples. No contaminant plumes were identified during the investigations. Four additional temporary wells were installed in the area of the levee to the southwest of the earlier wells, during a follow-on investigation by IT Corporation. Associated groundwater sampling, in April 1997, showed no evidence of impacts on groundwater from organic chemicals, and metals were detected within the range of observed values from background wells.

The investigations by Engineering Science, Inc. (ESI), conducted between 1990 and 1993, defined the distribution, type, and concentrations of contaminants at HAAF and assessed the risk associated with the chemicals (ESI, 1993). The investigation included installation of and sample collection from 18 groundwater monitoring wells at six sites: the revetment area, Revetment 10 firefighter training area (Burn Pit), aircraft maintenance and storage facility (AMSF), pump station area (PSA), former sewage treatment plant (FSTP) area, and at the coastal salt marsh-east levee construction debris disposal area (ELCDDA). The ELCDDA is discussed in the coastal salt marsh investigation subsection of this appendix. Groundwater samples from the ESI investigation were analyzed for VOCs; SVOCs; benzene, toluene, ethylbenzene, and total xylenes (BTEX); total recoverable petroleum hydrocarbons (TRPH); total metals (unfiltered); pesticides/polychlorinated biphenyl (PCBs); and general chemistry parameters. Metals were detected in all the groundwater samples. With the exception of the groundwater sample results at the FSTP, the detections of organic chemicals in groundwater were at trace concentrations. Methyl ethyl ketone (MEK), a common laboratory glassware cleaning solvent, was reported at trace concentrations ranging from 25.3 to 32.2 micrograms per liter (µg/L) in the groundwater samples collected from several wells across the facility.

Three wells were installed at Revetments 6, 20, and 26 in 1991, and sampled in 1991 and 1992. The well at Revetment 26 never accumulated sufficient water to sample. No TRPH, VOCs, SVOCs, BTEX, pesticides, or PCBs were detected in two rounds of sampling at the other two wells. Cyanide and five other metals were detected in a groundwater sample collected from the monitoring well (RV-MW-101) installed adjacent to Revetment 6

(IT, 1999). In 1993, one boring was also completed as a temporary monitoring well; no analytes were detected in the groundwater sample (IT, 1999).

At the Burn Pit (Revetment 10), TRPH was reported at just above the reporting limit of 100 µg/L in two of the four wells. MEK also was detected in the groundwater samples. The wells were removed during interim removal actions conducted at Revetment 10 in 1998 to remove contaminated soil.

Four wells were installed at the aircraft maintenance area. Wells AM-MW-101, 102, and 103 were located near former Building 86. TRPH and SVOCs were not detected. Benzene and 1,2-dichloroethene were reported at low concentrations (1.16 and 5.4 µg/L, respectively) in Well 101. In subsequent sampling events, chloromethane was reported at 8.3 µg/L in Well 103 and tentatively identified compounds (TICs) were reported as VOCs at 10 µg/L in Well 102. Napthalene was reported in a primary sample and a duplicate in Well 103 at 1.31 and 1.41 µg/L, respectively. TICs as SVOCs also were reported in Well 102 at 36 µg/L and in Well 103 at 20 and 40 µg/L in the primary and duplicate samples, respectively. In a second sampling event, napthalene was detected at 1.98 µg/L in Well 103 and TICs reported at 210 µg/L. Only metals were detected in groundwater samples collected from Monitoring Well AM-MW-104 located near Building 87.

One well was installed at the PSA adjacent to an aboveground storage tank (AST) north of Building 35. Soil samples, collected from three depths within the boring, indicated the presence of toluene at concentrations of 0.16, 0.15, and 0.57 mg/kg. However, no organics, including toluene, were reported in the groundwater sample after construction of the well. The well was closed in 1998, in anticipation of the removal of the AST and the excavation and disposal of diesel contaminated soil underneath the AST that was completed in 1999.

One well was installed at the south end of the sludge drying beds and within the footprint of the FSTP, which had been demolished in the mid-1980s. Concentrations of VOCs ranging from 1.24 to 198 µg/L, and SVOCs ranging from 3.19 to 232 µg/L, were reported. During the 1998 and 1999 interim removal actions at the FSTP, the well and surrounding soil containing VOC and SVOC chemicals were removed and disposed of offsite.

The U.S. Army Corps of Engineers (USACE) installed temporary wells and conducted groundwater sampling in 1994 to investigate (1) the potential for contamination from underground and aboveground fuel storage tanks at the pump station buildings, and (2) potential contamination from the sludge drying beds and a brackish water "seep" in the levee at the FSTP. Samples at both sites were analyzed for VOCs, SVOCs, TRPH, TPH-diesel, cyanide, and lead. No contaminants were identified in the groundwater at the pump stations and none identified in the temporary wells installed at the FSTP.

An investigation conducted by WCFS in 1995 and 1996 provided additional environmental groundwater data for the main airfield parcel. The Additional Environmental Investigation Report described the investigation for several areas of the main airfield parcel and summarized information from previous investigations (WCFS, 1996). Seventeen groundwater wells were constructed at five sites—revetment area (near Revetment 5), jet (onshore) fuel lines, pump station area (near Building 41), AMSF (Buildings 82/87/92/94 and 86 near the perimeter ditch outfall from AMSF area storm drains)—and five background locations. The five background wells were installed away from known artificial

or natural drainage features to evaluate the background groundwater quality for comparison on the main airfield parcel. Groundwater samples were collected and analyzed for VOCs; SVOCs including polynuclear aromatic hydrocarbons (PAHs); TPH measured as gasoline, diesel, and jet propulsion fuel (JP-4); BTEX; metals; pesticides; herbicides; oil and grease; total organic carbon; and other physical water quality parameters. The only organic chemical detected was toluene at trace concentrations in PSA-MW3. This well was installed, south of former Building 41, adjacent to a known area of hydrocarbon contamination that has been remediated. The samples from all but one well (PSA-MW1) had detected metals concentrations on par with or, in most cases, below the corresponding values observed in the background wells.

In 1996, Monitoring Wells RVT-MW-1 through RVT-MW-3 were installed around a catch basin located next to Revetment 5 (IT, 1999). Ten metals were detected in the groundwater samples collected from these wells, but organics were not detected (IT, 1999).

Also in 1996, eight temporary monitoring wells, RVT-TW1 through RVT-TW8, were installed in soil borings at the unpaved Revetments 9, 11, 12, and 23. Groundwater samples were collected and analyzed for TPH-D, TPH-G, TPH-JP-4, BTEX, and PAHs. Xylene was detected in the groundwater at Revetment 9, and ethylbenzene was detected in the groundwater at Revetment 12 (IT, 1999).

One groundwater sample was also collected from groundwater Monitoring Well PSA-MW-3, located southeast of Building 41, in an area adjacent to a former aboveground fuel tank and fuel leak to the soil. Metals and unknown extractable hydrocarbons (UHE) were detected in the groundwater sample collected from the monitoring well. As noted above, this area was remediated in 1998 and 1999.

A remedial investigation conducted by International Technology Corporation (IT) in 1997 and 1998 evaluated conditions at specific sites within the main airfield parcel. Data from previous investigations were evaluated during the Remedial Investigation, and additional samples were collected at specific sites and analyzed to aid in characterizing and determining the chemical conditions of groundwater. Groundwater samples were collected from six sites—Buildings 15, 20, 84/90, and 86; the FSTP sludge drying beds; and the northwest runway area—during the Remedial Investigation. The samples were analyzed for TPH (measured as gasoline, diesel, and JP-4), VOCs, BTEX, PAHs, PCBs, pesticides, metals, and dissolved organic carbon. Both inorganic and organic chemicals were detected at low levels.

At Building 15, a fuel tank was removed during the Remedial Investigation, and soil was excavated. Potholes were dug to determine the lateral extent of fuel impacts around the former tank location. One groundwater sample collected from the step-out pothole east of the concrete pad was analyzed for hydrocarbons and lead. UHE was reported in the water sample at 72 µg/L (IT, 1999).

During the Remedial Investigation, an aboveground fuel tank and contaminated soil were removed from Building 20. UHE, unknown purgeable hydrocarbons (UHP), and lead were detected at 3,300 µg/L, 7,800 µg/L, and 23 µg/L, respectively, in a water sample collected from the excavation pit at Building 20; the concentrations detected in the pit water sample were not suspected to be representative of the groundwater outside of the underground storage tank excavation (IT, 1999).

For the Remedial Investigation conducted at Buildings 84/90, one groundwater sample was collected from one soil boring drilled west of Building 90, adjacent to the edge of the wash racks. Lead was detected at 13 µg/L in the groundwater sample. No other analytes were detected (IT, 1999).

At Building 86, one groundwater sample was collected from AM-MW-101 and analyzed for TPH-P, TPH-E, VOCs, BTEX, PAHs, pesticides, PCBs, and metals during the Remedial Investigation. Five metals, four of which had been detected in previous sampling, and UHE were detected in the groundwater sample (IT, 1999).

TPH-G, UHE, BTEX, VOCs, heptachlor, and 13 metals were detected in one groundwater sample collected from the former monitoring well at the FSTP (IT, 1999). Monitoring Well TP-MW-101 and surrounding soil and sludge were removed during the 1998 and 1999 interim removal actions.

In 1997 at the northwest runway area, four direct-push soil samples were collected and temporary Monitoring Wells TW-001 through TW-004 were installed in the boreholes (U.S. Army, 2001). Metals were detected in groundwater collected from the temporary monitoring wells.

In 1998 and 1999, interim removal actions were conducted at a transformer pad outside Building 82. In the 1999 action, fuel was chased along the backfill surrounding a sewer pipe. Potholes were dug along the sewer line, and piezometer wells were constructed within the potholes. TPH-E was detected in a groundwater sample collected from the pothole well closest to the removal action excavation. PCBs were not detected in groundwater samples collected from the potholes (IT, 2000).

During the 1999 interim removal actions, a temporary piezometer well had been constructed in each of the three potholes at Building 82. In 2002, USACE sampled the three piezometers. The samples had analyses for TPH-gasoline range; TPH-diesel range; and benzene, toluene, ethylbenzene, and total xylenes (BTEX). No gasoline-range TPH or BTEX volatile compounds were reported. The analyses did report TPH in the diesel range at 410, 730, and 330 µg/L, respectively, in the three piezometer wells (B82E-TW001, B82E-TW002, and B82E-TW003); however, the chromatograms showed peaks uncharacteristic of the diesel standard, suggesting the results reflected weathered diesel or perhaps heating oil. The Army was unsure of the source of the petroleum, as there was no evidence of a tank at Building 82. The Army speculated that (1) an aboveground or underground tank may have been used for heating oil storage and was formerly located in the vicinity of what is now the northwest corner of Building 82, given that a natural gas system for building heating currently is located here; or (2) fuel had been drained into the sewer line from the building, but had leaked at a piping joint, given that TPH had been found along the pipeline.

In 2001 and 2002, at the request of a representative of the Regional Water Quality Control Board, the Army (through the USACE, Sacramento District) conducted a final groundwater survey of 18 of the 42 monitoring wells at the Inboard Area, including three background wells and two wells at the coastal salt marsh. The goal of the sampling was to add to the limited data on filtered metals in groundwater; and the focus was wells located in the vicinity of the planned channels for the Hamilton Wetland Restoration Project. Water samples were collected and analyzed for specific chemicals of interest. All 18 wells were

analyzed for dissolved (filtered) metals; and selected wells were analyzed for extractable-range TPH, VOCs, SVOCs, pesticides, and PCBs. The results of the sampling indicated background levels of metals and organic chemicals in the groundwater.

Of the 18 samples collected, three metals—copper, nickel, and zinc—exceeded the Salt Water Aquatic Life Protection values. Of these results, only two copper results exceeded any background metals concentrations, both by less than 10 percent. All three background wells (BKG-MW-2, BKG-MW-4, BKG-MW-5) exceeded the Salt Water Aquatic Life Protection values for these three metals, suggesting that military activity did not cause the exceedances, and ambient groundwater concentrations may be higher than the Salt Water Aquatic Life Protection values. UHE was tentatively identified in the sample collected from Well JFL-MW-1 and reported at an estimated concentration of 320 µg/L (USACE, 2002).

In January 2002, Monitoring Wells MW-PVC-1, -2, -3, and –4 at the northwest runway area were sampled. Following completion of the sampling in 2002, Wells -1, -2, and -3 were removed (USACE, 2002); Monitoring Well 4 was retained for future groundwater monitoring related to Landfill 26 located off of the main airfield parcel approximately 1,000 feet to the west of the runway panhandle. Other wells on the property were closed following the sampling in December 2001, January 2002, and October 2002.

An additional soil and groundwater investigation was conducted around the piezometers at the northwest corner of Building 82 in September 2002. Eight direct-push soil borings were completed. Two were driven through cores in the concrete floor inside Building 82, and the other six were located around the former transformer excavation and the piezometers to encompass an area of about 40 feet wide by 110 feet long. Soil samples were obtained from all eight cores, and groundwater was found and sampled in six of the eight cores. The samples were analyzed for TPH-purgeable range, TPH-extractable range, and BTEX. Gasoline-range hydrocarbons were reported at 190 µg/L in one of the push boring groundwater samples. An unknown fuel hydrocarbon was reported at 740 µg/L in an adjacent boring water sample. Diesel-range hydrocarbons were detected in all six water samples at concentrations ranging from 0.52 to 1.9 mg/L. No VOCs (BTEX) were reported in any of the water samples. No TPH or BTEX was reported in any of the eight soil samples. These data did not exceed water quality objectives for TPH applied to groundwater.

Three wells on the runway were thought to have been destroyed or lost during remediation construction activities on the airfield and adjacent General Services Administration property in 1995 and 1996. Several attempts to locate them had failed. After the final well sampling had been completed, three different individuals relocated the three wells successively. The Army decided to obtain a sample before these three wells were closed. Only one of the wells provided sufficient water for sampling, which was conducted in August 2002.

Organic constituents that were reported in groundwater appear to be distributed randomly at relatively low concentrations (below Water Quality Goals, California Toxics Rule Criteria, Enclosed Bays and Estuaries and below the Presidio, Saltwater Ecological Protection Zone numbers for TPH and its constituents). It was determined that no further action would be required for groundwater at the Inboard Area.

All groundwater analytical data from the 2001/2002 sampling of the 18 wells are presented in the table Groundwater Analytical Data for Select Wells at Hamilton Army Airfield in the

Groundwater Data Report, Final Well Sampling, Hamilton Army Airfield, Novato, California, June 2002 and addendum, September 2002 (USACE, 2002).

Coastal Salt Marsh

In 1986, the Army investigated the ELCDDA within the coastal salt marsh as an area of potential concern because of reported former dumping of construction debris and open incineration of wood (WCFS, 1987). Pairs of soil samples were collected from a series of 15 trenches within the ELCDDA and analyzed for metals, TRPH, VOCs, SVOCs, pesticides, and PCB arochlors. The results of the trench investigation indicated no releases had occurred within the disposal area. No organic chemicals were detected, and metals were reported within background concentrations (WCFS, 1987). Groundwater was not sampled at the ELCDDA during the investigation.

In 1991, ESI conducted an investigation of soil and groundwater at the coastal salt marsh to evaluate the potential of contaminants from the ELCDDA. The investigation included installation of five wells (EL-MW-101, EL-MW-102, EL-MW-103, EL-MW-104, and EL-MW-105) placed at four perimeter locations and at the center of the ELCDDA; sample collection; and sample analyses. Groundwater samples at four consecutive quarterly sampling events—January, April, July, and October 1991—were analyzed for a comprehensive suite of organic compounds, including VOCs, SVOCs, PCBs, PAHs, pesticides, and herbicides, and inorganic compounds (metals) and general chemistry parameters.

There was only one trace detection of a VOC—MEK, at 27.6 µg/L—in one well and no other organic detections (ESI, 1993). MEK, a common laboratory contaminant, was interpreted to be an investigation-related contaminant rather than related to the in-situ groundwater condition. Varied detections of metals (unfiltered samples) were reported. Hydrocarbons were not suspected on the basis of previous soil sample results. As a consequence, groundwater samples were not analyzed for TPH at that time. All other VOCs and SVOCs, PAHs, pesticides, and PCBs were not detected in any groundwater samples analyzed.

Values for metals detected in the coastal salt marsh groundwater samples collected during the 1991 quarterly sampling events are listed in Table 4.23 of the ESI report. In general, the detections of metals are at low concentrations, sporadic, and not indicative of any contaminant release.

In December 2001 and January 2002, the U.S. Army sampled two of the ELCDDA wells: EL-MW-103, and EL-MW-104. The samples were analyzed for metals, including mercury, TPHs in the extractable range, pesticides, and PCBs. Metals (filtered samples) were detected in both wells, diesel-range hydrocarbons (TPH-d) were detected in well EL-MW-104 at 200 µg/L, and endrin initially was estimated at a trace concentration of 0.008 µg/L. The TPH-d detection was below the Presidio, Saltwater Ecological Protection Zone numbers for TPH. Upon more rigorous evaluation, the reported trace concentration of endrin was determined to be a false positive result; thus, the chemical was not detected. With the exception of the TPH-d result, essentially no organics and only varied detections of metals were reported in the groundwater.

All groundwater analytical data from the 2001/2002 sampling of the 18 wells are presented in the table Groundwater Analytical Data for Select Wells at Hamilton Army Airfield in the

Groundwater Data Report, Final Well Sampling, *Hamilton Army Airfield, Novato, California,* June 2002 and addendum, September 2002 (USACE, 2002).

Results indicated that groundwater does not appear to have been affected by former site activities. The one previous MEK result was just above the detection limit in one sample in only the first of four events from one well. The TPH-d result was at trace concentrations. It was determined that no further action would be required for groundwater at the coastal salt marsh.

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APPENDIX C

Responsiveness Summary