



**TRAVIS AFB
CALIFORNIA**

**ADMINISTRATIVE RECORD
COVER SHEET**

AR File Number 1277

INSTALLATION RESTORATION PROGRAM

West/Annexes/Basewide Operable Unit
Travis Air Force Base

SOIL RECORD OF DECISION FOR THE WABOU

FINAL



60TH CIVIL ENGINEER SQUADRON
Travis Air Force Base, California



DEPARTMENT OF THE AIR FORCE
60TH CIVIL ENGINEER SQUADRON (AMC)

December 11, 2002

MEMORANDUM FOR DISTRIBUTION

FROM: 60 CES/CEVR
580 Hickam Ave
Travis AFB CA 94535-2176

SUBJECT: Final West/Annexes/Basewide Operable Unit (WABOU)
Soil Record of Decision (ROD)

1. The attached document constitutes the final WABOU Soil ROD in support of the Travis AFB Environmental Restoration Program. This ROD presents the selected and accepted remedies for the WABOU soil sites. If you have any questions concerning the WABOU Soil ROD, please contact Mr. Glenn Anderson at (707) 424-4359.

A handwritten signature in black ink that reads "Allen L. Brickeen".

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Final WABOU Soil ROD
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Final

**West/Annexes/Basewide
Operable Unit
Soil Record of Decision for
Travis Air Force Base**

Prepared for
60 CES/CEVR
Travis Air Force Base, California

December 2002

CH2MHILL
2525 Airpark Drive
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Section Tab

Acronyms List

Acronyms List

AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
AMC	Air Mobility Command
AMW	Air Mobility Wing
Annex	Potrero Hills Annex
ARARs	Applicable or Relevant and Appropriate Requirements
BAF	bioaccumulation factor
Base	Air Force Base
bgs	below ground surface
BRAC	Base Realignment and Closure
CAL-EPA/DTSC	California Environmental Protection Agency/Department of Toxic Substances Control
CAMU	Corrective Action Management Unit
CCR	California Code of Regulations
CDFG	California Department of Fish and Game
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFGC	California Fish and Game Code
CFR	Code of Federal Regulations
COC	chemical of concern
COEC	chemical of ecological concern
COPC	chemical of potential concern
COPEC	chemical of potential ecological concern
CRP	Community Relations Plan
CSM	Conceptual Site Model
CTV	Critical Toxicity Value
DI WET	de-ionized waste extraction test

EE/CA	Engineering Evaluation/Cost Analysis
EIOU	East Industrial Operable Unit
EPC	Exposure Point Concentration
ERA	Ecological Risk Assessment
FFA	Federal Facility Agreement
FS	Feasibility Study
GMU	Grazing Management Unit
GP	General Plan
GSAP	Groundwater Sampling and Analysis Program
HHRA	Human Health Risk Assessment
HQ	Hazard Quotient
HWAA	Hazardous Waste Accumulation Area
HWCL	California Hazardous Waste Control Law
IRP	Installation Restoration Program
ISA	Initial Screening of Alternatives
LCRS	leachate collection and recovery system
LDR	land disposal restrictions
LUC	Land Use Control
MAP	Management Action Plan
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
msl	mean sea level
MTR	minimum technology requirements
NCP	National Contingency Plan
NEWIOU	North/East/West Industrial Operable Unit
NFA	No Further Action
NOAEL	no observed adverse effect level
NOEC	no observed effect concentration
NOU	North Operable Unit
NPDES	California National Pollutant Discharge Elimination System

NPL	National Priorities List
NRC	Nuclear Regulatory Commission
OEAA	OEA Aerospace
O&M	Operations and Maintenance
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
P2 MAP	Pollution Prevention Management Action Plan
PCB	polychlorinated biphenyl
PCWQCA	Porter-Cologne Water Quality Control Act
PHOU	Potrero Hills Operable Unit
POCOS	Petroleum-only Contaminated Sites
PP	Proposed Plan
ppm	parts per million
PRG	Preliminary Remediation Goal
RA	Remedial Action
RAB	Restoration Advisory Board
RACER	Remedial Action Cost Engineering and Requirements System
RAGS	Risk Assessment Guidance for Superfund
RAO	Remedial Action Objective
RAP	Remedial Action Plan
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RD/RA	Remedial Design/Remedial Action
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
RTV	Reference Toxicity Value
RWQCB	Regional Water Quality Control Board
SARA	Superfund Amendments and Reauthorization Act of 1986

SVOC	semivolatile organic compound
TBC	to be considered
TCE	trichloroethene
U.S. EPA	U.S. Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compound
WABOU	West/Annexes/Basewide Operable Unit
WIOU	West Industrial Operable Unit

Section Tab

Part 1 - Declaration

PART I

Declaration

Site Name and Location

Department of the Air Force
Travis Air Force Base
Fairfield, California 94535-5000

Statement of Basis and Purpose

This Record of Decision (ROD) presents the soil remedial actions for the West/Annexes/Basewide Operable Unit (WABOU) at the Travis Air Force Base (AFB or Base) Superfund Site in Solano County, California. The Air Force selected the soil remedial actions in accordance with 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 § 9601 *et seq.*, and with the National Oil and Hazardous Substances Pollution Contingency Plan, 40 Code of Federal Regulations (CFR) Part 300 (National Contingency Plan [NCP]). The Administrative Record contains the documents used in the selection of the soil remedial actions. The Administrative Record is available for review at Travis AFB.

The U.S. Environmental Protection Agency (U.S. EPA), Region IX, concurs with the selected soil remedies. The State of California, through the California Environmental Protection Agency's Department of Toxic Substances Control (Cal-EPA/DTSC) and the San Francisco Bay Regional Water Quality Control Board (RWQCB), concurs with the selected soil remedies.

Assessment of the Site

As a result of past industrial activities, releases of semivolatile organic compounds (SVOC), metals, polychlorinated biphenyls (PCB), and/or pesticides have contaminated the soil at 10 WABOU sites at Travis AFB. Actual or threatened releases of hazardous substances from these sites, if not addressed by implementing the response actions selected in this WABOU Soil ROD, may present a potential threat to public health, welfare, or the environment.

Forty-one sites with potential contamination resulting from past industrial activities were originally identified during the WABOU Remedial Investigation (RI). Table I-1 presents the current status of the sites that were evaluated during the WABOU RI. Table I-2 presents the average and maximum concentrations of the major contaminants at each site.

The WABOU RI identified the need for the evaluation of remedial alternatives at 10 soil sites. Four of these 10 sites (Building 755, Building 905, Building 916, and Landfill 3) require an action to address groundwater contamination and are included in the *Groundwater Interim Record of Decision for the West/Annexes/Basewide Operable Unit*. (Travis AFB, 1999).

TABLE I-1
 Listing and Summary of Current Status of Sites
 Evaluated during the WABOU Remedial Investigation
 WABOU Soil ROD
 Travis AFB, California

Site Name	Site Designation	Annex Designation	Status
Building Sites			
Building 755	DP039		Remedy Selected in WABOU Soil ROD
Building 905	SS041		Remedy Selected in WABOU Soil ROD
Building 916	SD043		Remedy Selected in WABOU Soil ROD
Building 929/931/940	SD042		Remedy Selected in WABOU Soil ROD
Building 938			NFA ^a
Building 942			NFA
GMUs, Landfills, Firing Ranges			
GMUs 7 and 8 ^b			NFA
Landfill 3	LF008		Remedy Selected in WABOU Soil ROD
Landfill X	LF044		Remedy Selected in WABOU Soil ROD
Skeet Range			Removed from the WABOU and receiving RWQCB oversight (see page I-4) ^{c,g}
Former Small Arms Range	SD045		Remedy Selected in WABOU Soil ROD
Second Former Small Arms Range			NFA
Railhead Munitions Staging Area	SS046		Remedy Selected in WABOU Soil ROD
Railroad Sites			
Former Northern Sacramento Railroad Right-of-Way			NFA
Active Northern Sacramento Railroad Right-of-Way			NFA
Northern Sacramento Railroad Right-of-Way		A-11	NFA
Storage Tank Sites			
UST 935 ^d			NFA
UST 943			NFA
UST 944			NFA
Reservoir Sites and Golf Course			
Reservoir Facilities 1510 & 1516		A-7	NFA
Reservoir Facilities 1512 & 1520		A-8	NFA
Reservoir Facilities 1514 & 1518		A-9	NFA determined during the finalization of the WABOU Soil ROD (see page I-5)
Cypress Lakes Golf Course	SS041	A-10	NFA – cleanup completed as removal action (see page I-7)
Navigation Aid Terminal Very-High Frequency Omni Range		A-2	NFA
Navigation Aid Middle Marker		A-3	NFA
Navigation Aid Outer Marker		A-4	NFA
Cement Hill Communications		A-5	NFA
Miscellaneous Sites			
Suisun Dock Annex		A-1	Annex determined not to be part of the National Priorities List (NPL) site ^e
Potrero Hills Annex		A-6	Transferred to new Potrero Hills OU. Under investigation via Water Board Order (see page I-5) ^{e,f}
New Base Hospital			NFA
East Side Runway			NFA

TABLE I-1

Listing and Summary of Current Status of Sites
 Evaluated during the WABOU Remedial Investigation
 WABOU Soil ROD
 Travis AFB, California

Site Name	Site Designation	Annex Designation	Status
Patriot Housing		NFA	
Base Housing		NFA	
Radiological Sites			
Radioactive Burial Site 1/UST		NFA	
Radioactive Burial Site 2/Dry Waste Landfill	RW013		Remedy Selected in WABOU Soil ROD
Building 903			Removed from IRP because WABOU RI detected no release (see page I-6)
Building 925		NFA	
Buildings 932-936		NFA	
Building 943		NFA	
B-29 Crash Site		NFA	

^a NFA = No Further Action determined at conclusion of WABOU Remedial Investigation

^b GMU = Grazing management unit.

^c This site was taken out of the WABOU to prevent a delay in starting soil remedial actions in the WABOU

^d UST = Underground storage tank.

^e The Air Force and U S EPA made this determination in 1995

^f An appropriate remedial alternative for the site has not been selected at this time, and additional site characterization will be conducted via the California Regional Water Quality Control Board Order No 99-072, Site Cleanup Requirements, OEA Aerospace, Inc. & Travis AFB, dated 22 Sep 1999.

^g RWQCB letter, Unauthorized Discharge of Pollutants into Travis AFB Skeet Range Vernal Pool, Travis AFB, California, dated 9 December 1999

TABLE I-2

Major Contaminants at WABOU Soil Sites
 WABOU Soil ROD
 Travis AFB, California

Site Name (Designation)	Major Contaminants	Average Concentration in parts per million (ppm)	Maximum Concentration (ppm)
Building 755 (DP039)	Lead	830	7040
Building 905 (SS041)	Alpha-Chlordane	0.49	6.50
	Gamma-Chlordane	0.54	7.20
	Heptachlor Epoxide	0.02	0.27
	Toxaphene	3.26	25.00
Building 916 (SD043)	PCB-1254	0.58	2.0
Building 929/931/940 (SD042)	Benzo(a)pyrene	0.09	1.20
	Bibenz(a,h)anthracene	0.04	0.59
	Cadmium	4.38	24.60
	Zinc	206.69	1040.00
Landfill 3 (LF008)	Alpha-Chlordane	5.49	68.00
	Gamma-Chlordane	4.47	50.00
	Heptachlor	1.13	12.00
Landfill X (LF044)	Benzo(a)pyrene	5.59	69.00
	Cadmium	0.69	2.00
	Lead	16.94	107.00
	Silver	1.16	17.8

TABLE I-2
Major Contaminants at WABOU Soil Sites
WABOU Soil ROD
Travis AFB, California

Site Name (Designation)	Major Contaminants	Average Concentration in parts per million (ppm)	Maximum Concentration (ppm)
Former Small Arms Range (SD045)	Lead	574.08	7370
Railhead Munitions Staging Area (SS046)	Benzo(a)pyrene	0.05	0.61
	Benzo(b)fluoranthene	0.15	2.30
	Cadmium	1.88	18.70
Cypress Lakes Golf Course (SS041)	DDE	0.32	5.60
	Dieldrin	0.05	0.44
	Endosulfan	0.006	0.049
Radioactive Burial Site 2/Dry Waste Landfill (RW013)	Uranium-234	1425 pCi/g	11160 pCi/g
	Uranium-235	72.5 pCi/g	595.50 pCi/g

The WABOU RI concluded that there is no contaminated surface water in the WABOU. If the WABOU Remedial Design discovers surface water contamination, then any surface water remedial actions would be documented in an amendment to the WABOU Groundwater IROD, if necessary.

Even though there is a basewide component to the WABOU, it is one of three operable units currently on Travis AFB. The North/East/West Industrial Operable Unit (NEWIOU) contains most of the soil and groundwater sites on Travis AFB, and the Potrero Hills Operable Unit (PHOU) will address the Potrero Hills Annex. Section 2.2.2 (Operable Units) provides a more detailed description of the operable units on Travis AFB. The NEWIOU Soil ROD will document the selection of remedies for the soil sites in the NEWIOU. The Travis AFB Groundwater ROD will document the final selection of remedies for all groundwater sites on Travis AFB.

As shown in Table I-1, there are four sites that have been removed from the WABOU. A description of each site follows:

A.) Skeet Range

The Skeet Range is an active recreational skeet and trap facility that was temporarily closed in the early 1990s. The WABOU RI detected lead residue in the soil from past skeet range activities above the acceptable risk range. The Air Force considers this site to be no longer a part of the Travis AFB Installation Restoration Program (IRP), because it is an active skeet range and will remain active for the foreseeable future. The RWQCB is providing regulatory oversight of the range as a result of the presence of vernal pools in the area. Travis AFB Compliance Branch will assume responsibility for ensuring that current recreational activities comply with all federal and state regulations.

If Travis AFB decides to close the range, then all skeet and trap activities will cease and the Air Force will remove the lead shot and any residual lead residue in the soil to an acceptable risk level. The Air Force will notify the U.S. EPA prior to initiating closure of the range and will perform the site closure in accordance with applicable Federal and State of California laws and regulations. Travis AFB will use its Base digging permit procedures to prevent the

removal of soil with lead shot and lead residue from the skeet range. Also, no construction or maintenance project on Travis AFB will use soil from the skeet range. Travis AFB will evaluate the need for additional actions, if any, based on the results of the lead removal activities. Travis AFB will periodically report to U.S. EPA and to the State of California on the current status of the range and any plans for lead mitigation or site closure.

U.S. EPA considers the lead in the soil at the skeet range to be a release under CERCLA. Therefore, until appropriate response actions at the site have been documented under CERCLA, U.S. EPA will not be able to concur with the project closeout report (see Federal Facilities Agreement Sec. 30), nor will U.S. EPA be able to remove Travis AFB from the National Priorities List. U.S. EPA agrees to remove this site from the WABOU so as not to delay completion of this ROD, and agrees to continue discussions with the Air Force and State on how best to address the contamination at this Site.

B.) Reservoir Facilities 1514 and 1518

Reservoir Facilities 1514 and 1518 comprise one of three sets of water storage facilities that provide drinking water to Travis AFB. The WABOU RI detected fluoride contamination in the soil from a leaking aboveground hydrofluosilicic acid storage tank. The tank was removed from its concrete foundation in 1992. The WABOU RI included this fenced annex and identified fluoride in the groundwater and soil. The screening human health risk assessment estimated the hazard index for potential future residential exposure to the soil at or below the non-cancer risk level of 1. The risk assessment also determined that fluoride is not a carcinogen and does not pose a cancer risk to people. The ecological risk assessment concluded that the fluoride does not pose a significant risk to potential ecological receptors. The Air Force and the regulatory agencies have agreed that the potential ecological impacts are within an acceptable risk range, and no further remedial action is required for soil contamination at the Reservoir Facilities site. However, land use controls are in place at the site to provide protection associated with groundwater contamination. The Air Force will include the final groundwater remedial alternative for the Reservoir Facilities site in the subsequent Final Basewide Groundwater ROD for Travis AFB. The Air Force will amend the WABOU Feasibility Study (FS) with a focused FS to assist in the selection of the final groundwater remedial alternative.

C.) Potrero Hills Annex

The Potrero Hills Annex has been transferred to a new operable unit to manage its future remedial activities and will be addressed in a subsequent ROD.

The Potrero Hills Annex (Annex) is a 25-acre parcel that was originally part of a former NIKE missile battery. The WABOU RI detected PCB-1254 adjacent to an electrical transformer pad and metals and explosives in the vicinity of currently active explosive test facilities.

On 22 September 1999, the California Regional Water Quality Control Board issued a Site Cleanup Requirements Order to OEA Aerospace (OEAA) and Travis AFB. The Order tasks both parties with the environmental investigation of the Annex and the adjacent 525-acre OEAA property and the selection and implementation of appropriate remedial actions on both properties.

To allow Travis AFB to comply with this Order, the Air Force and regulatory agencies agreed to pull the Annex out of the WABOU and postpone the application of CERCLA to the Annex while OEAA and Travis AFB take action under the Water Board order. At the time of the signing of this Record of Decision, the investigation under the Water Board Order is ongoing. Once the investigation is complete, and any appropriate remedial action is in place, the agencies will review the results of the Water Board Order and determine whether any other CERCLA-related activities are required for both properties.

D.) Building 903

Building 903 is a former nuclear weapons maintenance facility. The WABOU RI detected radioactive residue inside a concrete vault that served as a neutron source storage area. This site has been removed from the Travis AFB IRP, because the WABOU RI concluded that no release occurred, and all radioactive residue remains inside the vault as anticipated by design. The Travis AFB Compliance Branch assumed the responsibility for the removal and proper disposal of the radioactive residue in the vault prior to the future demolition of the building. Travis AFB will perform all handling and disposal of the radioactive residue in the vault in accordance with the Nuclear Regulatory Commission (NRC) and other applicable regulations.

Description of the Selected Soil Remedies

The Air Force evaluated seven potential remedial alternatives to address contaminated soil in the WABOU. Table I-3 presents the potential soil remedial alternatives.

TABLE I-3
Potential Soil Remedial Alternatives
WABOU Soil ROD
Travis AFB, California

Cleanup Alternative	Description
S1 – No Action	Federal regulations require the use of this alternative as a starting point for comparing the other alternatives. No soil treatment takes place
S2 – Land Use and Access Restrictions	Land use restrictions are used to prohibit the excavation or disturbance of contaminated soil. They ensure that sites with residual contaminant concentrations that exceed residential cleanup levels, even after cleanup, will not be used for residential development or similar use (e.g., daycare facilities). Fences and signs are posted to prevent access.
S3 – Containment Capping	A multilayer cap is placed over contaminated soil to prevent access to the soil. A cap is an impermeable covering made of layers of compacted clay and/or synthetic material. Land use and access restrictions are included to protect the cap.
S4 – Excavation/Treatment/Onbase Consolidation	Contaminated soil is excavated, treated using a chemical stabilization process, and placed in an onbase Corrective Action Management Unit (CAMU). Land use and access restrictions may be included, depending on the soil cleanup level that is attained.
S5 – Excavation/Offbase Disposal	Contaminated soil is excavated and transported by truck to an offbase landfill. Land use and access restrictions may be included, depending on the soil cleanup level that is attained.
S6 – Excavation/Onbase Consolidation	Contaminated soil is excavated and placed in an onbase CAMU. Land use and access restrictions may be included, depending on the soil cleanup level that is attained.
S7 – In Situ Treatment/Capping	Contaminated soil is treated using a chemical stabilization process. The resulting soil/slurry mix is covered with an asphalt cap, surrounded by a fence, and protected with land use restrictions.

Subsequent to the evaluation of alternatives, the Air Force selected a remedy for the nine WABOU sites addressed in this WABOU Soil ROD. Table I-4 presents the selected soil remedies. The Air Force chose these remedies as the most appropriate strategies for addressing contaminated soil in the WABOU. These remedies address the potential human health and environmental risks that could result from exposure by human (e.g., workers and residents) and ecological (e.g., terrestrial) receptors or migration of contaminants to groundwater.

TABLE I-4
Selected Soil Remedial Alternatives
WABOU Soil ROD
Travis AFB, California

Site Name	Site Designation	Selected Alternative
Building 755	DP039	S2—Land Use and Access Restrictions
Building 905	SS041	S6—Excavation/Onbase Consolidation (Contingency: S5—Excavation/Offbase Disposal and S4- Excavation/Treatment/Onbase Consolidation) S2—Land Use and Access Restrictions
Building 916	SD043	S2—Land Use and Access Restrictions
Buildings 929/931/940	SD042	S6—Excavation/Onbase Consolidation (Contingency S5—Excavation/Offbase Disposal and S4- Excavation/Treatment/Onbase Consolidation) S2—Land Use and Access Restrictions
Landfill 3	LF008	S5—Excavation/Offbase Disposal S6—Excavation/Onbase Consolidation S2—Land Use and Access Restrictions
Landfill X	LF044	S2—Land Use and Access Restrictions
Former Small Arms Range	SD045	S6—Excavation/Onbase Consolidation (Contingency S5—Excavation/Offbase Disposal and S4- Excavation/Treatment/Onbase Consolidation) S2—Land Use and Access Restrictions
Railhead Munitions Staging Area	SS046	S2—Land Use and Access Restrictions
Cypress Lakes Golf Course Annex	SS041	No Further Action – cleanup completed as removal action (see page I-7)
Radioactive Bural Site 2/ Dry Waste Landfill	RW013	S5—Excavation/Offbase Disposal S2—Land Use and Access Restrictions

The Air Force completed the Cypress Lakes Golf Course Annex removal action in January 2001. The removal action met the residential cleanup levels of the selected remedial action; therefore, the remedial action for this site is complete, and Alternative S2 (Land Use and Access Restrictions) is not required at the site. This site is clear for unrestricted land use. Section 2.2.3 (Removal Actions) provides a more detailed description of the Cypress Lakes Golf Course Annex removal action.

Differences between Proposed Plan and Soil ROD

Table I-4 includes two major changes to the proposed remedies that were described in the WABOU Proposed Plan at two sites. The remedial action for Building 916 changed from Alternative S6 (Excavation/Onbase Consolidation) to Alternative S2 (Land Use and Access Restrictions), based on the results of a subsequent groundwater investigation. Section 5.8.1 provides the rationale for the change to the Building 916 remedy. Also, the remedial action

for the Railhead Munitions Staging Area changed from Alternatives S2 and S6 to Alternative S2, based on a revision to the risk management approach used at the site. Section 5.8.2 provides the rationale for the change to the Railhead Munitions Staging Area remedy.

Table I-4 also includes several additional selected and contingency remedies. Alternative S2 (Land Use and Access Restrictions) is now a selected remedy for each site (except for the Cypress Lakes Golf Course Annex), and Alternative S4 (Excavation/Treatment/Onbase Consolidation) is a contingency remedy for those sites that have Alternative S6 (Excavation/Onbase Consolidation) as its selected remedy.

Onbase Consolidation

Alternative S6 is the selected alternative for three of the WABOU soil sites (SS041, SD042, and SD045). Alternative S6 consists of excavation and placement of contaminated soil in a corrective action management unit (CAMU). The Air Force will build a CAMU within the boundaries of LF007, which is an inactive landfill within the NEWIOU that will require closure. The Air Force will build the CAMU in two general phases. This WABOU Soil ROD addresses the first phase, which involves the construction of a foundation layer for the CAMU and the placement of contaminated soil from the WABOU onto the foundation. A protective landfill cap will be built over this contaminated soil. The subsequent NEWIOU Soil, Sediment, and Surface Water ROD will address the second phase, which involves the placement of contaminated soil from NEWIOU soil sites into the CAMU and the extension of the cap over all of the contaminated soil. The NEWIOU Soil, Sediment, and Surface Water ROD will also address the closure requirements for LF007.

The Air Force and regulatory agencies have established CAMU soil acceptance levels to determine the contaminant types and soil concentrations that can be placed in the CAMU. These requirements are presented in Table II-5-9 (CAMU Soil Acceptance Levels). If the contaminant levels within excavated soil exceed CAMU acceptance requirements, the Air Force will implement Alternative S5 (Excavation/Offbase Disposal) as a contingency action. Although the WABOU Soil Proposed Plan did not identify Alternative S4 (Excavation/Treatment/Onbase Consolidation) as a contingency action, the Air Force agreed with a request from the regulatory agencies to evaluate Alternative S4 to determine whether it is more appropriate than offbase disposal. Section 4.2 describes the CAMU, and Section 5.1.4 provides more details concerning the construction of the CAMU at Travis AFB and the development of the CAMU soil acceptance levels.

Remedial Design/Remedial Action Documents

The Air Force will implement soil remedial actions as described in this WABOU Soil ROD. Several primary documents under the Travis AFB Federal Facility Agreement (FFA) will support the implementation of these actions. The Air Force has prepared the final *Basewide Soil Remedial Design/Remedial Action (RD/RA) Plan* (URS, 2002) that covers the general approach to implementing the soil remedies at all Travis AFB soil sites. The RD/RA Plan includes a description of primary documents that require regulatory approval under the Travis AFB FFA. The Air Force has also prepared the final *LF007 Soil Remedial Action Design Report and Post-Construction Maintenance Plan* (CH2M HILL, 2002) that addresses the CAMU

construction. It describes the CAMU location and approximate dimensions, waste characterization procedures, CAMU acceptance requirements, waste treatment alternatives, estimated volume of contaminated soil from all Travis AFB soil sites, procedures for contaminated soil segregation, liner and cover design, operation and maintenance procedures, monitoring requirements, and closure procedures.

In addition, the Air Force will prepare site-specific RD/RA work plans for each WABOU soil site that will provide a detailed approach for the selected remedy at the appropriate site. The regulatory agencies will review each of these documents. The Air Force and regulatory agencies will review the analytical and performance data from these actions to verify their effectiveness at meeting remedial action objectives.

Soil Cleanup Levels

The soil cleanup levels presented in Section 5.3 are based on the protection of human health, protection of ecological receptors, and groundwater and surface water beneficial uses. The Air Force used industrial soil cleanup values, based on a 10^{-6} risk exposure for a typical industrial worker, in the derivation of cleanup levels. As a result, all sites that achieve industrial cleanup levels but not residential cleanup goals will require land use controls. Sections 5.2.3 and 5.2.4 discuss how the human health risk assessment from the WABOU RI was used to derive inputs to the soil cleanup levels for carcinogenic and non-carcinogenic compounds, respectively. Section 5.2.5 discusses how the ecological risk assessment from the WABOU RI was used to derive inputs to the soil cleanup levels that are protective of ecological receptors. Section 5.2.6 discusses the rationale for determining soil cleanup levels that will be protective of groundwater beneficial uses.

Land Use Controls

Alternative S2 (Land Use and Access Restrictions) is a selected remedial alternative for the nine WABOU soil sites that require remedial action. The Air Force identifies herein the essential Land Use Controls (LUCs) applicable to the WABOU units that the Air Force deems necessary for future protection of human health and environment. Alternative S2 includes administrative and physical measures to restrict future land use and ensure the effectiveness of the remedy at all nine sites. As part of these measures, the Air Force will include in the Base General Plan any specific controls required at each site, that controls are required because of the presence of pollutants or contaminants, the current land users and uses of the site, the geographic control boundaries, and the objectives of the controls. Unless a site is cleaned up to levels appropriate for unrestricted use, the General Plan will reflect the applicable use restrictions, with all sites restricted from use for residential development, play areas, or day care facilities. Upon completion of a remedial action at a site, the Base will update the Base General Plan to include the site-specific use restrictions if needed. The General Plan will also contain a map indicating all areas where contaminated soil and groundwater are located, and what land use controls are in effect for each of those areas. It is understood and agreed upon by the Air Force, EPA, and the State of California that the remedies implemented by this decision document are of a permanent nature unless the sites in question become suitable for unrestricted use. If the Air Force determines that it cannot meet specific LUC requirements, it is further understood that the remedy may be

reconsidered and that additional measures may be required to ensure the protection of human health and the environment. Section 5.4 provides a more detailed description of the LUCs.

WABOU ROD Data Certification Checklist

The following information is included in the Part II – Decision Summary section of this Record of Decision. Additional information on these sites can be found in the Travis AFB Administrative Record.

1. Chemicals of concern and their respective concentrations [Table II-3-2 (Chemicals of Concern, Chemicals of Ecological Concern, and Potential Risks at WABOU Soil Sites) – page II-3-10]
2. Baseline risk represented by the chemicals of concern [Table II-3-2 (Chemicals of Concern, Chemicals of Ecological Concern, and Potential Risks at WABOU Soil Sites) – page II-3-10]
3. Cleanup levels established for chemicals of concern and the basis for these levels [Tables II-5-1 through II-5-8 – pages II-5-14 through II-5-33 and Section 5.2 (Criteria Used to Determine Soil Cleanup Levels) – page II-5-5]
4. How source materials constituting principal threats are addressed [Section 5.3 (Site-Specific Remedial Actions) – page II-5-13]
5. Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD [Section 5.2.1 (Residential/Industrial Exposure Scenarios) – page II-5-5, Section 1.4.3 (Groundwater Use) – page II-1-10, and Section 5.2.6 (Groundwater Protection) – page II-5-10]
6. Potential land use that will be available at the sites as a result of the Selected Remedies [Section 5.4.2 (Residential Cleanup Levels) – page II-5-36]
7. Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected [Section 4.4.7 (Cost) – page II-4-14]
8. Key factor(s) that led to selecting the remedies [Section 5.3 (Site-Specific Remedial Actions) – page II-5-13]

Declaration

These soil remedial actions are protective of human health and the environment, are compliant with federal and state ARARs directly associated with these actions, and are cost-effective. These actions utilize permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable. The Air Force and the regulatory agencies have addressed the statutory preference for remedies that reduce toxicity, mobility, or volume as a principle element in this WABOU Soil ROD. This ROD implements the substantive requirements of Federal and State of California CAMU laws and regulations for

the purpose of authorizing the construction of a CAMU as part of the CERCLA remedial actions on Travis AFB.

Lead and Support Agency Acceptance
of the Soil Record of Decision for
the WABOU, Travis Air Force Base, California

This signature sheet documents agreement between the United States Air Force and the United States Environmental Protection Agency, and the State of California, by the California Environmental Protection Agency, Department of Toxic Substances Control, and the San Francisco Bay Regional Water Quality Control Board on the Soil Record of Decision for the WABOU at Travis Air Force Base. The respective parties may sign this sheet in counterparts.

Deborah Jordan
Chief
Federal Facilities Cleanup Branch
U.S. Environmental Protection Agency, Region IX

Date

The State of California, Department of Toxic Substances Control (DTSC) had an opportunity to review and comment on this Record of Decision, and our concerns were addressed.

Anthony J. Landis, P.E.
California Environmental Protection Agency
Department of Toxic Substances Control
Chief of Operations
Office of Military Facilities

Date

Loretta K. Barsamian
California Regional Water Quality Control Board
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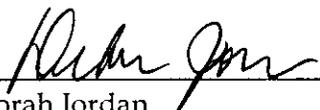
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12-3-02

Date

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12-11-02

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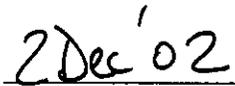
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Section Tab

Part II
Decision Summary

PART II

Decision Summary

Introduction

This Decision Summary includes the findings, evaluations, decisionmaking process, and selected remedial actions for the West/Annexes/Basewide Operable Unit Soil Record of Decision (WABOU Soil ROD). This Summary consists of the following sections:

- **Section 1.0**— Describes the physical and ecological setting of Travis Air Force Base (AFB or Base)
- **Section 2.0**— Provides an overview of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and non-CERCLA environmental programs at Travis AFB
- **Section 3.0**— Summarizes the nature and extent of soil contamination as presented in the WABOU Remedial Investigation (RI) report (CH2M HILL, 1997).
- **Section 4.0**— Presents the remedial alternatives that were considered and the comparison of the alternatives to the criteria set forth in the National Contingency Plan (NCP) as presented in the WABOU Feasibility Study (FS) (CH2M HILL, 1998).
- **Section 5.0**— Identifies the selected soil cleanup levels and remedies and the rationale for their selection
- **Section 6.0**— Presents the applicable or relevant and appropriate requirements (ARARs) and performance standards for the actions.
- **Section 7.0**— Is the list of references.

Section Tab

Section 1.0

1.0 Travis AFB Description

Travis AFB is located midway between San Francisco and Sacramento, California, about 3 miles east of downtown Fairfield in Solano County. The Base occupies about 6,383 acres. In addition, the Base maintains ownership of or administrative control over 11 annexes at off-base locations. Approximately 17,000 military and civilian personnel are present daily on the Base (Weston, 1993). Figure II-1-1 presents maps of the regional location of Travis AFB and its annexes

Travis AFB is currently part of the Air Mobility Command (AMC) and is host to the 60th Air Mobility Wing (AMW). The AMW operates C-5 Galaxy cargo aircraft and KC-10 Extender refueling aircraft. The primary missions of Travis AFB since its establishment have been strategic reconnaissance and airlift of freight and troops.

1.1 Physical Description

Travis AFB has a gently sloping to nearly flat topography with variations in topographic relief of up to 50 feet. Elevations at Travis AFB range from over 100 feet above mean sea level (msl) near the northern boundary to less than 20 feet above msl near the South Gate. The ground surface generally slopes to the south or southeast at about 30 feet per mile. Areas surrounding Travis AFB have a varied topography.

Within the WABOU, the ground surface elevation ranges from more than 100 feet above msl in the northwest to less than 30 feet above msl in the southern area.

The Travis AFB area has a Mediterranean climate, with wet winters and dry summers. The Base is located near the Carquinez Straits, which is the major break in the Coast Range. Travis AFB usually experiences mild temperatures because of its proximity to the Carquinez Straits and the coast. The mean annual temperature is 60° F. The lowest temperatures occur in January, with a mean of 46° F. The highest temperatures occur in July and August, with a mean of 72° F. Monthly mean relative humidity typically ranges from a low of 50 percent in June to a high of 77 percent in January. The mean annual relative humidity is 60.5 percent.

Travis AFB averages 17.5 inches of rain annually. Approximately 84 percent of the annual precipitation falls during the winter season of November through March. January is the wettest month, averaging 3.7 inches of precipitation; July is the driest month averaging 0.02 inch of precipitation.

Evapotranspiration ranges from about 50 to 75 inches per year. However, because most precipitation occurs in the winter, and most evaporation takes place in the summer, this apparent "net annual negative precipitation" has little impact on water infiltration through the soil column or on groundwater recharge.

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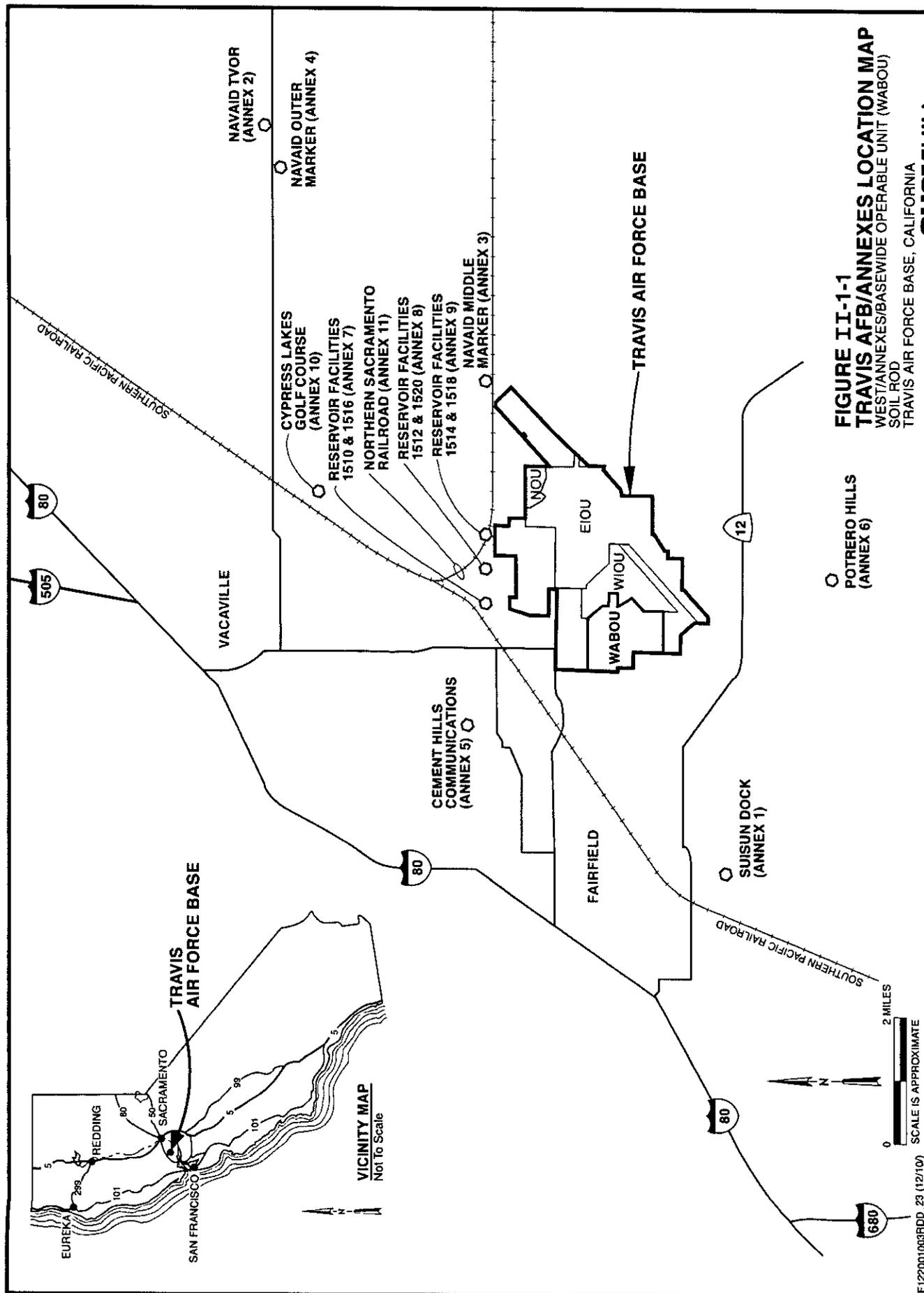


FIGURE II-1-1-1
TRAVIS AFB/ANNEXES LOCATION MAP
 WEST/ANNEXES/BASEWIDE OPERABLE UNIT (WABOU)
 SOIL ROD
 TRAVIS AIR FORCE BASE, CALIFORNIA

CH2MHILL

Travis AFB experiences sea breezes during the summer because of its proximity to the Carquinez Straits. The average annual wind speed is 8 knots, with a winter average of 5 to 6 knots and a summer average of 12 knots. The predominant wind directions are from the southwest and west-southwest.

1.2 Land Use

Travis AFB occupies about 6,383 acres of land near the center of Solano County, California, and is located approximately 3 miles east of downtown Fairfield and 8 miles south of downtown Vacaville (see Figure II-1-1). Solano County's population in 1990 was 340,421 (U.S. Department of Commerce/U.S. Bureau of the Census; 1990). This population was estimated to have grown to 373,923 by 1994 (State of California, Department of Finance, 1994). During the 1980s, the population of Solano County increased nearly 45 percent (U.S. Department of Commerce/U.S. Bureau of the Census, 1990). However, the rate of growth has declined since 1990. The projected population growth between 1990 and 2000 is 47.4 percent for the City of Fairfield and 33.6 percent for Solano County overall (Association of Bay Area Governments, 1990).

According to the Travis AFB Office of Public Affairs, Travis AFB currently employs about 7,750 active military personnel and 3,323 reservists. Approximately 5,613 people live in 3,466 on-base housing units. There are 3,006 civilians employed at Travis AFB. Approximately 17,000 people are on-base on a daily basis.

The land use areas of Travis AFB are grouped into eight functional categories:

- **Mission**—Uses are closely associated with the airfield and include facilities such as maintenance hangars and docks, avionics facilities, and other maintenance facilities. Aircraft operations facilities include control towers, Base operations, flight simulators, and other instructional facilities.
- **Administrative**—Uses include personnel, headquarters, legal, and other support functions.
- **Community**—Uses include both commercial and service activities. Examples of commercial uses include the Base Exchange, dining halls, service station, and clubs; service uses include the schools, chapel, library, and the family support center.
- **Housing**—Uses include both accompanied housing for families and unaccompanied housing for singles, temporary personnel, and visitors.
- **Base Support/Industrial**—Uses are for the storage of supplies and maintenance of Base facilities and utility systems.
- **Medical**—Uses include facilities for medical support, including the David Grant Medical Center.
- **Outdoor Recreation**—Uses include ball fields, golf course, equestrian center, swimming pools, and other recreational activities.

- **Open Space**—Used as buffers between Base facilities and to preserve environmentally sensitive areas.

The lands surrounding Travis AFB on the northeast and east are primarily used for ranching and grazing. Areas to the south are a combination of agricultural and marshland. A few commercial/light industrial areas are present to the north of the Base. The area west of Travis AFB is predominantly residential.

Land use within the WABOU consists of open grasslands, light industrial support areas, administrative areas, personnel training areas, ammunition storage, and service/storage areas. Land use at and surrounding the annexes component of the WABOU varies.

1.3 Ecology

Travis AFB has a variety of terrestrial and aquatic/wetland habitats and wildlife that are typical of the region. The information used in identifying biological resources was taken from field studies and reports produced by Biosystems (1993a, b; 1994), CH2M HILL (1995; 1996), Jacobs Engineering Group (1994a, b), Radian (1994), and Weston (1995a, b).

1.3.1 Terrestrial Habitats

The terrestrial habitats at Travis AFB and adjacent areas consist of herbaceous-dominated habitats (annual grassland, pasture, and early ruderal habitat) and urban habitat (industrial areas, lawns, and ornamental plants) according to the California Department of Fish and Game (CDFG) classification system (Mayer and Laudenslayer, 1988). Aquatic/wetland habitats at Travis AFB include riverine (Union Creek) and riparian habitat, lacustrine (Duck Pond), and herbaceous-dominated wetlands marshes, and vernal pools.

In general, annual grassland habitat is dominated by non-native plant species such as slender wild oat (*Avena fatua*), fescues (*Festuca*), soft chess (*Bromus hordeaceus*), field bindweed (*Convolvulus arvensis*), and yellow star-thistle (*Centaurea solstitialis*). Some native plants, such as bunchgrass (*F. viridula*) and johnny-tuck (*Triphysaria eriantha*) may also be found, usually associated with undisturbed areas.

Mowed/disc'd grassland is generally composed of soft chess, Italian ryegrass (*Lolium multiflorum*), and wild oats. Pasture grassland can contain varying frequencies of filaree (*Erodium* sp.), ripgut brome (*Bromus diandrus*), soft chess, Italian ryegrass, and yellow star-thistle. Ruderal grasslands, on the other hand, contain higher numbers of perennial species and, in some areas, woody species such as coyote brush (*Baccharis pilularis*), eucalyptus (*Eucalyptus* sp.), Peruvian pepper-tree (*Schinus molle*), and black locust (*Robinia pseudoacacia*).

The urban habitat on-base contains maintained lawns as well as trees and shrubs such as eucalyptus, Fremont cottonwood (*Populus fremontii*), arroyo willow (*Salix lasiolepis*), and coyote brush. Most isolated stands of shrubs or trees are located within or near urban areas, permanent water sources, or near artificial surface mounds (for example, rail lines, blast protection, and building/road foundations).

1.3.2 Aquatic/Wetland Habitats

Herbaceous wetland vegetation is found along the permanent (natural or artificial) drainages on-base and can also occur seasonally within vernal pools, swales, and ditches. Native species include salt grass (*Distichlis spicata*); non-native species include meadow fescue (*Festuca elatior*), sickle grass (*Parapholis incurva*), and cattails (*Typha* sp.). Vernally inundated areas support seasonal vegetation such as non-native Mediterranean barley (*Hordeum murinum* ssp. *leporinum*) and brass buttons (*Cotula coronopifolia*) and native plants such as downingia (*Downingia* sp.) and toad rush (*Juncus bufonius*).

Vernal pools are shallow depressions or small, shallow pools that fill with water during the winter rainy season, then dry out during the spring and become completely dry during the summer. The vernal pools at Travis AFB contain indicator species such as goldfields (*Lasthenia fremontii*), coyote thistle (*Eryngium vaseyi*), dwarf woolly-heads (*Psilocarphus brevissimum*), water pygmy-weed (*Crassula aquatica*); and one or more species of downingia and popcornflower (*Plagiobothrys* sp.).

Although a few willows and coyote brush can be found along Union Creek, the dominant plant species found in the riparian zone of Union Creek are mainly herbaceous and consist of beardless wild rye (*Leymus triticoides*), broad-leaved pepperwort (*Lepidium latifolium*), Harding grass (*Phalaris aquatica*), and saltgrass. Hydrophytes such as cattails and rushes are also common.

1.3.3 Wildlife

Terrestrial vertebrates associated with non-native annual grasslands are commonly found on-base. Typical avian species include ring-necked pheasant (*Phasianus colchicus*), American kestrel (*Falco sparverius*), American robin (*Turdus migratorius*), and the western meadowlark (*Sturnella neglecta*). Reptiles observed, or potentially occurring, at the Base include the western fence lizard (*Sceloporus occidentalis*), gopher snake (*Pituophis melanoleucus*), and California red-sided garter snake (*Thamnophis sirtalis* ssp. *infernalis*). Common mammals identified include deer mouse (*Peromyscus maniculatus*), California ground squirrel (*Spermophilus beecheyi*), Botta's pocket gopher (*Thomomys bottae*), black-tailed hare (*Lepus californicus*), and red fox (*Vulpes vulpes*).

Permanent wetlands and seasonally wet areas support aquatic invertebrates, fish, amphibians, reptiles, birds, and mammals. Some aquatic invertebrate species observed in herbaceous wetlands and vernal pools at Travis AFB include vernal pool fairy shrimp (*Branchinecta lynchi*), damselflies, crayfish, and aquatic snails. Amphibian species identified include bullfrog (*Rana catesbeiana*), Pacific tree frog (*Hyla regilla*), and California tiger salamander (*Ambystoma californiense tigrinum*). Aquatic birds observed on or near the Base include mallard (*Anas platyrhynchos*), great egret (*Casmerodius albus*), and great blue heron (*Ardea herodias*).

Because wildlife use riverine and riparian habitat somewhat similarly, these habitats are discussed together. Many aquatic invertebrates and amphibians are the same as those discussed above in herbaceous wetlands and vernal pools. These include damselflies, crayfish, aquatic snail, bullfrog, Pacific tree frog, and California tiger salamander. Fish species include mosquitofish (*Gambusia affinis*), fathead minnow (*Pimephales promelas*), threespine stickleback (*Gasterosteus aculeatus*), and bluegill (*Lepomis macrochirus*).

Riverine/riparian habitats are also used extensively by birds and terrestrial mammals for forage, shelter, and as a source of water. These include red-winged blackbird (*Agelaius phoeniceus*), raccoon (*Procyon lotor*), muskrat (*Ondatra zibethicus*), and beaver (*Castor canadensis*).

Habitats that support special-status species are considered sensitive habitats. Sensitive aquatic/ wetland areas include vernal pools, swales, and ditches that can support special-status plants and animals. Urban environments, scattered throughout the Base, can also support special-status species. For example, burrowing owls (*Speotyto cunicularia*) may use man-made culverts, perches, and bare earth areas that contain burrows provided by ground squirrels. Loggerhead shrikes (*Lanius ludovicianus*) may nest on antenna wires and forage in grasslands. Both owls and shrikes are typical species of the grassland habitats on-base. Also, vernal pool fairy shrimp have been found in artificially created depressions that seasonally fill with water.

1.4 Geology and Hydrogeology

This section provides a discussion of the regional geologic setting near Travis AFB, as well as specific geologic conditions in the WABOU.

1.4.1 Geology

Travis AFB is located on the western edge of the Sacramento Valley segment of the Great Valley Geomorphic Province. This province is a sediment-filled synclinal basin with a northwest-to-southeast-oriented axis. The Coast Range Geomorphic Province, which consists of folded and uplifted bedrock mountains, lies just to the west of Travis AFB (Thomasson et al., 1960; Olmsted and Davis, 1961).

The WABOU is located on the western flank of the truncated anticline that traverses Travis AFB in a northwesterly to southeasterly direction. The axis of the anticline runs through the East Industrial Operable Unit (EIOU) near Facility 363, about 2 miles east of the WABOU boundary. Early Eocene Epoch Domengine Sandstone, which is the oldest sedimentary unit exposed at the Base, is exposed along the axis of the anticline.

Bedrock units that outcrop in the vicinity of Travis AFB include (from oldest to youngest) the Domengine Sandstone, the Nortonville Shale, the Markley Sandstone, the Neroly Sandstone, and the Tehama Formation, as shown on Figure II-1-2. Bedrock at the North/East/West Industrial Operable Unit (NEWIOU) has been defined as consisting of consolidated to semi-consolidated sedimentary rock. It has been distinguished from the overlying unconsolidated sediment by such criteria as fissility, cementation, bedding, blow counts, color, texture, and gradation into competent rock (Weston, 1995a). Because of its lower permeability relative to the unconsolidated alluvium that overlies it, the bedrock may form a boundary for groundwater flow and therefore influence the migration of contaminants in groundwater. Table II-1-1 is a stratigraphic column that summarizes the lithology and age of the geologic units in the area.

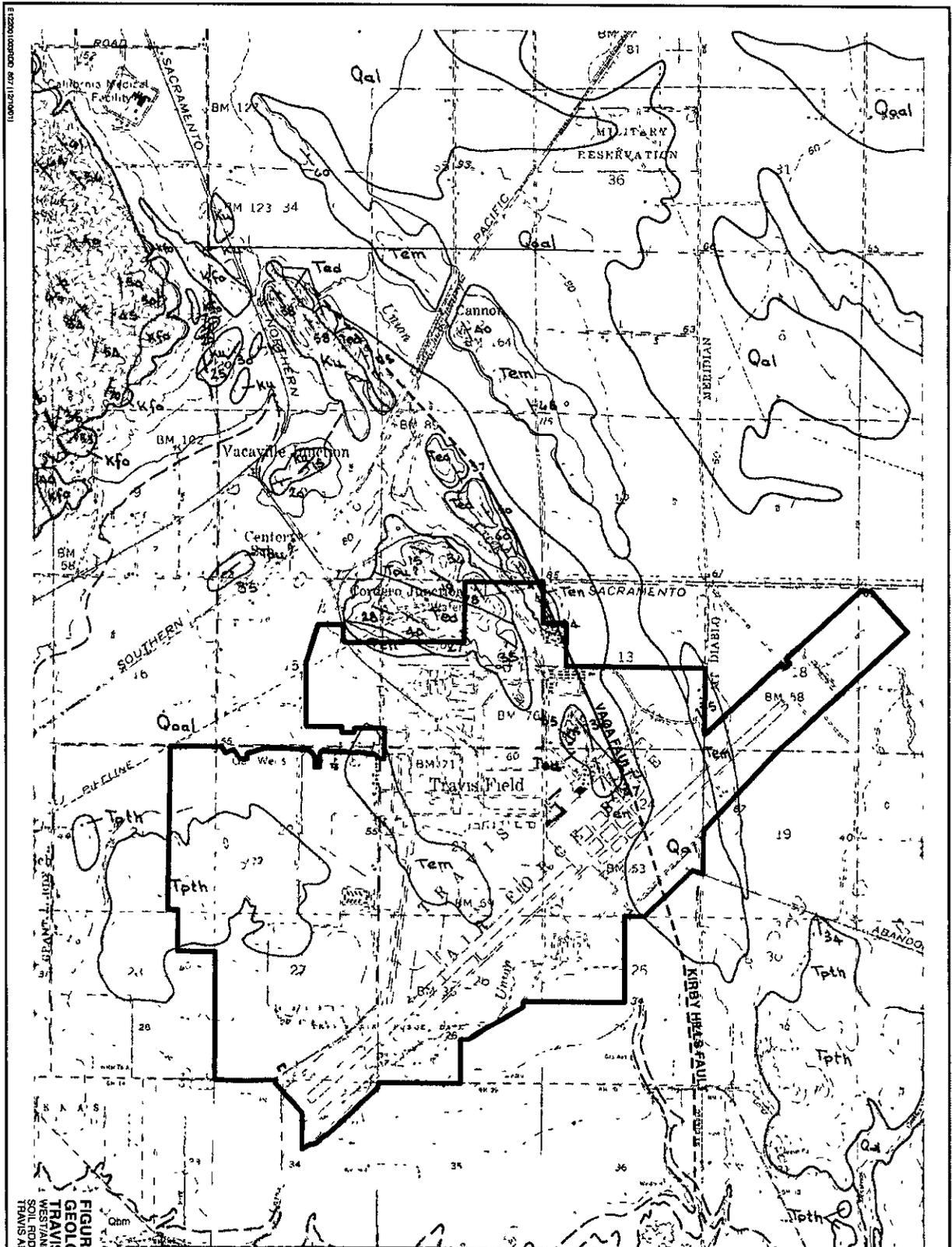


FIGURE II-1-12
 GEOLOGIC MAP OF
 TRAVIS AFB AND VICINITY
 WEST/TANNEKES/BASEWIDE OPERABLE UNIT (WABOU)
 SOIL FOD
 TRAVIS AIR FORCE BASE CALIFORNIA
CH2MHILL

LEGEND

- | | |
|-----------------------|-------------------------|
| Qal-YOUNGER ALLUVIUM | Ten NORTONVILLE SHALE |
| Qbm BAY MUD | Ted DOMENGINE SANDSTONE |
| Qoal-OLDER ALLUVIUM | Tpu-UNNAMED FORMATION |
| Tpth-TEHAMA FORMATION | Kfo-FORBES FORMATION |
| Tem MARKLEY SANDSTONE | Kg-GUINDA FORMATION |

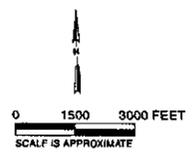


TABLE II-1-1
 Stratigraphic Column of Geologic Units at Travis AFB
 WABOU Soil ROD
 Travis AFB, California

Million Years Ago	Era	Period	Epoch	Geologic Unit	Lithologic Description	Possible Range of Thickness
1.8	Cenozoic	Quaternary	Pleistocene and Recent	Younger Alluvium	Interbedded clays, silts, sands and gravels, continental	0-70 feet
				Older Alluvium	Interbedded clays, silts, sands, and gravel, continental	0-100 feet
				Bay Mud	Interbedded clays, silts, sands and gravel, continental	
5			Pliocene	Tehama Formation	Interbedded gravels, sands, silts and clays, partially consolidated, occasional volcanoclastic sediments; continental	
				Unconformity		
27.5		Tertiary	Miocene	Neroly Sandstone (San Pablo Group)	Interbedded sandstone, siltstone, and shale, distinctive bluish color; manne	0-60 feet
				Unconformity		
38			Oligocene			
55			Eocene	Markley Sandstone	Massive micaceous, arkosic sandstone, interbeds of siltstone and shale, manne	0-60 feet
				Nortonville Shale	Predominantly dark gray marine shale and siltstone, minor sandstone, coal and glauconitic sandstone unit	80 feet
				Domengine Sandstone	Coarse-grained sandstone, minor siltstone and shale interbeds, gray to brown, manne (in outcrop only as mapped by Sims et al., 1973)	50 feet
			Paleocene	Unnamed Formation (?)	Interbedded shale, siltstone, and thinly laminated friable sandstone, manne (as mapped by Sims et al., 1973)	

Source: Sims et al., 1973.

The Tehama Formation consists of poorly sorted deposits of clay, silt, clayey silt, sandy silt and clay, and silty sand, containing generally thin lenses of gravel and sand. In areas of outcrop, it consists chiefly of siltstone, sandstone, and conglomerate. The Tehama Formation is widespread in the northern, northwestern, and western Sacramento Valley, and averages about 2,000 feet in thickness (Page, 1986). However, the thickness of the formation beneath the WABOU is unknown. Travis AFB is located on the northeastern margin of the Fairfield-Suisun Basin astride the Vaca Fault. The Vaca Fault is aligned northwest-southwest and is mapped as a fault with late Quaternary (during the past 700,000 years) activity (Jennings, 1994). No historic activity has occurred on this fault. Travis AFB lies on alluvial fans that extend from the Vaca Mountains to the Suisun Marsh. These fans were deposited by the

Ulatis, Union, Alamo, Laurel, and Suisun Creeks. Most of the alluvial material was deposited prior to the last period of glaciation during the Pleistocene Epoch, and is referred to as Older Alluvium. The parent rocks for the alluvium at Travis AFB include metasediments, serpentinites, ultramafic rocks, and the Sonoma Volcanics (Olmsted and Davis, 1961; Wagner, 1982). The drainages cut through the alluvial fans during the last glaciation, in response to the global lowering of the sea level. As the sea level has risen during the last 15,000 years, the drainages have filled again with alluvium. This material is referred to as Younger Alluvium. At Travis AFB, the overall thickness of the alluvium ranges from 0 to approximately 70 feet, but is generally less than 50 feet. West of Travis AFB, the thickness of the alluvium increases to over 200 feet (Thomasson et al., 1960). Some topographic relief in the form of very low ridges is provided by outcrops of sedimentary rocks characterized as bedrock in the Travis AFB area.

The younger and older deposits are distinguished at the surface by the difference in maturity of their soil profiles. The portion of the alluvium near the ground surface has been altered, or weathered over time by physical, chemical, and biological actions. The Younger Alluvium generally has an immature soil profile; the Older Alluvium generally has a well-developed, mature soil profile. Most of the sediment encountered at Travis AFB consists of Older Alluvium. The Younger Alluvium overlies the Older Alluvium and is found only in the northeastern portion of the Base.

Soil develops within geologic material exposed at the Earth's surface as the material is altered through physical, chemical, and biological processes. The nature of a soil is in part a function of climate, surface slope, time of exposure at the surface, and the type of original (parent) material. Soils in the vicinity of Travis AFB are classified as alfisols, which are primarily silt and clay loams that exhibit low permeabilities and poor drainage characteristics.

The majority of the Base, including the WABOU, is covered with soils derived from Pleistocene Epoch Older Alluvium designated as the Antioch-San Ysidro Complex. This complex comprises about 45 to 50 percent Antioch soil series and 35 to 45 percent San Ysidro soil series, with the remaining percentage composed of the Solano soil series and Pescadero soil series. The soils are old and are characterized by a well-developed soil profile.

1.4.2 Hydrogeology

Travis AFB is located along the eastern edge of the Fairfield-Suisun Hydrogeologic Basin. The Fairfield-Suisun Basin is a hydrogeologically distinct structural depression adjacent to the Sacramento Valley segment of the Central Valley Province. The basin is bordered to the north by the Vaca Mountains and to the east by the ridge that runs along the eastern portion of the North Operable Unit (NOU) and EIOU. The basin slopes south toward the Suisun Marsh; consequently, groundwater and surface water at Travis AFB tend to flow south to Suisun Marsh (California Department of Water Resources, 1994).

The primary water-bearing deposits in the region surrounding Travis AFB are the coarse-grained sediments (sand and gravel) within the Older Alluvium and Younger Alluvium. The bedrock units generally do not yield groundwater of usable quantity or quality in the Fairfield-Suisun Basin (Thomasson et al., 1960).

1.4.3 Groundwater Use

Intensive extraction of groundwater generally occurs only to the west of Travis AFB and Fairfield where the alluvium is thicker and contains a greater abundance of coarse-grained sediment. Groundwater wells in the area of Travis AFB are limited to domestic, stock-watering, and irrigation wells with typical screened depths of within 100 feet of ground surface (Weston, 1995b). Domestic wells, several of which are downgradient from Travis AFB, are used typically for households and gardens (Weston, 1993). Solano County does not supply water to the residences surrounding Travis AFB. The two nearest domestic wells are within 1700 feet of the south boundary of Travis AFB.

No on-base wells are used for potable water production. However, several wells located 4 miles north of Travis AFB, at the Cypress Lakes Golf Course (Annex 10), produce 400 to 500 million gallons of water per year. This well water is mixed with surface water purchased from the City of Vallejo to supply potable water to Travis AFB. The Fairfield public water supply field is located approximately 3 miles west of Travis AFB. The large production wells at the golf course and in Fairfield tend to be deeper than the nearby domestic wells, ranging up to 1,000 feet in depth.

1.5 Surface Water

Travis AFB is located in the northeastern portion of the Fairfield-Suisun Hydrologic Basin. Within the basin, water generally flows south to southeast toward Suisun Marsh, an 85,000-acre tidal marsh that is the largest contiguous estuarine marsh as well as the largest wetland in the continental United States. Suisun Marsh drains into Grizzly and Suisun Bays. Water from these bays flows through the Carquinez Straits to San Pablo Bay and San Francisco Bay, and ultimately discharges into the Pacific Ocean near the City of San Francisco.

Union Creek is the primary surface water pathway for runoff at Travis AFB. The headwaters of Union Creek are located approximately 1 mile north of the Base, near the Vaca Mountains, where the creek is an intermittent stream. Union Creek splits into two branches north of the Base, with the main (eastern) branch being impounded into a recreational pond designated as the Duck Pond. At the exit from the Duck Pond, the creek is routed through a storm sewer to the southeastern Base boundary, where it empties into open creek channel.

The West Branch of Union Creek flows south and enters the northwestern border of Travis AFB east of the David Grant Medical Center in an excavated channel. This channel flows south to the northeast corner of the WABOU. The channel forms the boundary between the WIOU and the WABOU and parallels Ragsdale Street for about 4,000 feet. Flow in the channel is then directed to a culvert under the runway and discharges to the main channel of Union Creek at Outfall II. From Outfall II, Union Creek flows southwest, and discharges into Hill Slough, a wetland located 1.6 miles from the Base boundary. Surface water from Hill Slough flows into Suisun Marsh.

Local drainage patterns have been substantially altered within the Base by the rerouting of Union Creek, the construction of the aircraft runway and apron, the installation of storm sewers and ditches, and general development (e.g., the Base Exchange, industrial shops, maintenance yards, roads, housing, and other facilities). Surface water is collected in a

network of underground pipes, culverts, and open drainage ditches. The surface water collection system divides the Base into eight independent drainage areas. The eastern portion of the Base is served by one of the drainage systems that collects runoff from along the runway and the inactive sewage treatment plant area and directs it to Denverton Creek and Denverton Slough. Denverton Creek is an intermittent stream in the vicinity of the Base. The northwestern portion of the WABOU drains to the west toward the McCoy Creek drainage area. McCoy Creek is also an intermittent stream in the vicinity of the Base. With the exception of these drainages, the remaining six drainage areas at the Base empty into Union Creek.

Travis AFB has limited topographic relief and the clayey soils prevent rapid drainage. This swale topography leads to the formation of vernal pools. The annual cycle of vernal pools includes standing water during the winter and spring, and desiccation during the summer and fall. During the time that the vernal pools contain water, biotic communities develop over relatively restricted areas. In the larger areas, grasslands form; in more confined, deeper areas, wetlands form. The vernal wetlands are concentrated along the western, southern, and southeastern boundaries of the Base. All of the surface water bodies on and in the vicinity of the Base empty into the Suisun Marsh. No springs have been recorded within the confines of Travis AFB.

Surface water pathways as defined in this WABOU Soil ROD include Union Creek, drainage channels, the storm and sanitary sewer system and the backfill material surrounding underground sewer lines. Surface water samples were collected at all surface water pathways adjacent to the nine WABOU soil sites. No surface water contamination was detected.

Section Tab

Section 2.0

2.0 Overview of Travis AFB Environmental Programs

The Travis AFB Environmental Management Office is divided into three branches: Compliance, Restoration, and Pollution Prevention. This section describes each branch and the programs that are designed to comply with current federal and state environmental regulations.

2.1 Compliance Branch

Travis AFB maintains several active environmental compliance programs, which are described below.

2.1.1 Air Force Regulations

The Air Force has developed a parallel set of environmental regulations to the federal environmental regulations. These Air Force regulations are designed to ensure that federal requirements are implemented in an appropriate manner at Air Force installations. Air Force Regulation AFI 32-7005 sets up an Environmental Protection Committee to oversee management of all environmental programs at each installation.

The Air Force environmental compliance regulations that parallel the federal environmental regulations are divided into the following subject areas:

- Air Quality Compliance
- Water Quality Compliance
- Solid and Hazardous Waste Compliance
- Storage Tank Compliance
- Environmental Impact Analysis Process
- Integrated Natural Resource Management
- Cultural Resource Management

2.1.2 Management Action Plan and Base General Plan

The Travis AFB Management Action Plan (MAP) summarizes the current status of the Travis AFB environmental compliance, restoration, and pollution prevention programs, and presents a comprehensive strategy for implementing response actions necessary to protect human health and the environment. Travis AFB produced the most recent version of the MAP in January 1997. Travis AFB environmental staff and Air Force headquarters use the MAP to direct and monitor environmental response actions and to schedule activities needed to resolve technical, administrative, and operational issues.

The Travis AFB Base General Plan, known as the Base Comprehensive Plan, a companion document to the MAP, provides an organized, systematic, and comprehensive approach to current and future planning and development. The Base General Plan is a tool that addresses a multitude of installation requirements and assists in the long-range growth of the Base, including natural resources, environmental protection, land use, airfield operation, utilities, transportation, and architectural compatibility. Of particular importance is its role in environmental protection. The Base General Plan addresses proper hazardous waste

management and recognizes CERCLA-related activities through proper land use at Travis AFB. The Travis AFB Community Planner maintains the Base General Plan. Section 5.4 (Land Use Controls) addresses the incorporation of land use restrictions into the Base General Plan based on CERCLA-related activities.

2.1.3 Resource Conservation and Recovery Act and Hazardous Waste Management Program

Travis AFB operates as a generator and facility for hazardous waste management under the Resource Conservation and Recovery Act (RCRA) and State of California hazardous waste management programs. Travis AFB received a Part B hazardous waste facility storage permit from Cal-EPA/DTSC and U.S. EPA on 5 March 1993.

2.1.4 Petroleum-only Contaminated Sites Program

The Travis AFB Petroleum-only Contaminated Sites (POCOS) program is designed to manage on-base petroleum-related contamination sites. Travis AFB and the regulatory agencies agreed to remove the POCOS from the Travis AFB IRP, because CERCLA excludes petroleum as a CERCLA contaminant. The Air Force will address petroleum contamination under CERCLA if it is commingled with CERCLA contaminants.

POCOS are typically associated with surface and subsurface releases from fuel spills, piping leaks, oil-water separators, or underground storage tanks (UST). The POCOS program includes the removal of leaking USTs and the remediation of petroleum-only contaminated soil and groundwater. An example of a POCOS that was removed from the CERCLA program by the regulatory agencies and the Air Force is the North/South Gas Station site. The San Francisco Bay RWQCB is the lead oversight agency for this program.

2.1.5 Stormwater Discharge Permit

Travis AFB monitors stormwater outfalls in compliance with its California National Pollutant Discharge Elimination System (NPDES) permit. The ongoing monitoring program was developed in 1992 and modified in 1999. The Air Force conducts surface water sampling and reporting according to the permit requirements. The San Francisco Bay RWQCB is the lead oversight agency for stormwater discharges.

2.2 Restoration Branch

The Restoration Branch manages the Travis AFB IRP that was initiated in 1983 to investigate the nature and extent of reported hazardous waste releases to the surrounding environment (Engineering-Science, 1983). On the basis of the evaluation of IRP data by the U.S. EPA, Travis AFB was placed on the NPL on November 21, 1989 (54 Federal Register 48187).

The Air Force, U.S. EPA, DTSC, and San Francisco Bay RWQCB negotiated and signed an FFA in September 1990. The FFA is a legally binding document that establishes the framework and schedules for the environmental cleanup at Travis AFB. This document also requires Air Force compliance with the NCP, CERCLA, RCRA guidance and policy, and state laws and regulations.

2.2.1 CERCLA Process

CERCLA was passed in 1980 and amended by SARA in 1986. This law established a program to remediate sites contaminated with hazardous constituents to protect public health and the environment. CERCLA established a series of steps to investigate site contamination and design and implement appropriate remedial actions at these sites. The major steps of the CERCLA process are described below.

Remedial Investigation (RI) – The RI is used to collect data to characterize site conditions, to determine the nature of the waste, and to assess risk to human health and the environment. The WABOU RI used a phased and sequenced approach to minimize collection of unnecessary data and maximize data quality. Initial data collection efforts provided a basic understanding of site characteristics. As this basic understanding was achieved, subsequent data collection efforts focused on filling identified data gaps in the conceptual site model and gathering the information necessary to support evaluations of remedial alternatives. The results and conclusions of this investigation were published in the WABOU RI report (CH2M HILL, 1997).

Feasibility Study (FS) – The FS is divided into three general phases: development of alternatives, screening of alternatives, and detailed analysis of alternatives. In the first phase the technology types and process options available to implement the general response actions for contaminated soil and groundwater were defined. A technology implementability screening was conducted that provided the basis for the selection of representative process options for soil and groundwater remediation. In the second phase the remedial alternatives were assembled using the representative process options and the site-specific conditions in the WABOU. In the last phase the alternatives were evaluated against seven of the nine CERCLA criteria. The WABOU FS provided a comparative analysis of alternatives to identify the advantages and disadvantages of each alternative to assist the decisionmaking process. The results of this study were published in the WABOU FS (CH2M HILL, 1998).

Proposed Plan (PP) – The PP presents to the public the preferred alternative for each site and the rationale for the preferences. The WABOU Soil PP (Travis AFB, 1998b) gave the public an opportunity to comment on the preferred soil alternatives during a 30-day public comment period (July 8, 1998 to August 8, 1998). All community members on the Travis AFB Community Relations list received a copy of the PP just prior to the start of the public comment period. The Air Force formally presented the preferred soil alternatives to the public at the July 23, 1998 public meeting. The Air Force also published a fact sheet in February 2000 to describe major changes to two of the soil remedial actions. The WABOU fact sheet gave the public an opportunity to comment on these changes during a 30-day public comment period (February 23, 2000 to March 24, 2000). All community members on the Travis AFB Community Relations list received a copy of the fact sheet just prior to the start of the public comment period. The Air Force formally presented the changes to the public at the March 15, 2000 public meeting.

The Air Force has also published a WABOU Groundwater PP (Travis AFB, 1998a) that presented the preferred alternatives for the WABOU groundwater sites. A separate 30-day public comment period (April 8, 1998 to May 8, 1998) and public meeting (April 23, 1998) was held to promote public participation in the decisionmaking process.

Record of Decision (ROD) – The ROD presents the selected alternative and final cleanup levels at each soil site. It summarizes all CERCLA activities at each soil site and documents that the Air Force and the regulatory agencies are in agreement as to how the cleanup is to take place. The *Groundwater Interim Record of Decision for the WABOU* (Travis AFB, June 1999) describes the remedial actions for the groundwater sites

Remedial Design (RD) – The RD specifies the engineering design used to implement the selected alternative at each soil site.

Remedial Action (RA) – The RA is the construction and operation of the selected alternatives specified in the ROD and designed in the RD. The Air Force will submit a schedule for the Remedial Design/Remedial Action (RD/RA) activities to the regulatory agencies 21 days after the WABOU Soil ROD is signed.

2.2.2 Operable Units

Initially, Travis AFB was treated as a single entity with one associated comprehensive cleanup schedule. In May 1993, the FFA was amended and the Base was divided into the four Operable Units (OU) listed below to facilitate the overall cleanup program:

- East Industrial Operable Unit (EIOU)
- West Industrial Operable Unit (WIOU)
- North Operable Unit (NOU)
- West/Annexes/Basewide Operable Unit (WABOU)

The WABOU has three main components:

- The western portion of the installation. Eight of the soil sites are located within the western portion of the Base.
- The annexes or noncontiguous parcels of property that are under the jurisdiction of the Travis installation commander. The boundaries of each annex are defined in the official records of the Travis AFB Real Property Office. Cypress Lakes Golf Course (SS041) is an annex. As described in Part I (Declaration), the Potrero Hills Annex has been removed from the WABOU and will be addressed in a Potrero Hills Operable Unit (PHOU).
- Other sites within the installation not being addressed by the other three OUs. These sites were included to ensure that all portions of the Base had been addressed. This is the "Basewide" component of the WABOU.

Operable unit boundaries are shown in Figure II-1-1. In October 1995, the EIOU, WIOU, and NOU were combined into the North/East/West Industrial Operable Unit (NEWIOU). Currently, the three operable units on Travis AFB are the NEWIOU, the WABOU and the PHOU. Any additional sites that are identified after the finalization of the WABOU Soil ROD will be addressed in the PHOU.

2.2.3 Removal Actions

There have been two removal actions within the WABOU. In April 1993, a RCRA corrective action was conducted to close the acid neutralization sump at Building 755. This sump was identified in the WABOU RI report as the most probable source of the trichloroethene (TCE)

contamination migrating from the site. The cobblestones were decontaminated prior to disposal, and the residual liquids and solids at the bottom of the sump were sampled and analyzed for hazardous characteristics. All hazardous waste was contained, transported, and disposed of in accordance with federal, state and local environmental regulations. The concrete sump and associated piping were demolished and removed from the site. Soil samples were analyzed for hazardous constituents. A plastic liner was placed into the excavation. The excavation was lined with a plastic membrane and backfilled with clean soil. This RCRA corrective action did not meet residential cleanup standards for soil, so the Air Force selected an appropriate remedial action for this site, as described in section 5.3.1 [Building 755(DP039)].

In October 2000, a soil removal action began at the Cypress Lakes Golf Course Annex to excavate pesticide-contaminated soil from its maintenance yard. This removal action was in response to a request from the Travis AFB Restoration Advisory Board to look for ways to expedite the cleanup of soil sites. Travis AFB and the regulatory agencies agreed to conduct the remedy at this annex as a removal action. They also agreed to forego an Engineering Evaluation/Cost Analysis (EE/CA), since the WABOU RI, WABOU FS and WABOU Proposed Plan (with its public comment period) were equivalent to an EE/CA. The *Action Memorandum for the Removal Action at the Cypress Lakes Golf Course Annex* (Radian, 1999) documents the decision to conduct the removal action at the annex. The *Work Plan for the Removal Action at the Cypress Lakes Golf Course Annex* (ECC, 2000) describes the tasks needed to successfully conduct the removal action. The excavation and transport of the pesticide-contaminated soil to an approved off-base landfill was completed in January 2001. The *Cypress Lakes Golf Course Annex Removal Action Report* (ECC, 2001) describes the successful excavation, transportation and disposal of pesticide-contaminated soil from the Annex. Since this removal action met all residential cleanup standards for soil, this Annex is considered to be a No-Further-Action site, as described in section 5.3.9 [Cypress Lakes Golf Course (SS041)].

The *Travis Air Force Base Groundwater Interim Record of Decision for the NEWIOU* (Radian, 1997) describes several groundwater removal actions that had been conducted in the NEWIOU.

2.2.4 Risk Assessment

The WABOU RI included a human health risk assessment and an ecological risk assessment. Section 3.2.1 (Human Health Risk Assessment) provides a detailed description of the human health risk assessment, and section 3.2.2 (Ecological Risk Assessment) provides a detailed description of the ecological risk assessment. In addition, the potential ecological risks to plants and animals were quantified from a basewide perspective and were presented in the *Final Comprehensive Basewide Ecological Risk Assessment - Tier 2: Screening Assessment* (CH2M HILL, 1996).

2.2.5 Community Participation

Travis AFB has had a community relations program since 1990. The purpose of this program is to inform the public and involve the community in the environmental decision-making process.

The highlights of the community relations activities taken by Travis AFB are presented below:

- **Federal Facilities Agreement (FFA).** The Air Force, U.S. EPA, Cal-EPA/DTSC, and San Francisco Bay RWQCB have negotiated an interagency agreement that includes requirements for community relations activities based on provisions in federal (and where applicable, state) statutes, regulations, and guidelines.
- **Restoration Advisory Board (RAB).** In 1994, Travis AFB established a RAB comprising representatives of the community and the regulatory agencies. Through its quarterly meetings and its focus groups, the RAB has provided valuable input about community concerns regarding the Restoration Program. The Technical Document Review focus group has reviewed and commented on the draft version of every major report. The Relative Risk focus group has provided input on the project prioritization, and the Community Relations focus group is working to reach out to all community members. The RAB replaced the Technical Review Committee, which met periodically to review program progress.
- **Administrative Record/Information Repository.** The Air Force established an Administrative Record to support Air Force decisions related to the Travis AFB IRP. In addition, the Air Force established a public information repository for the relevant portion of the Administrative Record at the Vacaville Public Library. Copies of RI reports, FS reports, Proposed Plans, and decision documents for both OUs are available for public review.
- **Community Relations Plan (CRP).** The Air Force implemented the first Travis AFB CRP in 1991. The Air Force revised the CRP in 1998. The Travis AFB Remedial Project Manager (RPM) is currently implementing the CRP.
- **Mailing List.** A mailing list of all interested parties in the community is maintained by Travis AFB and updated regularly. The mailing list currently totals more than 1,300 names.
- **Fact Sheets and Newsletters.** The Air Force has been publishing fact sheets describing activities and milestones in the restoration program occasionally since 1993. Since 1995 the Air Force has published and mailed quarterly newsletters to everyone on the mailing list. The newsletters contain information about public participation, issues of potential concern to the public, and program updates. The RAB co-chairs also write columns in each newsletter.
- **Proposed Plans.** The Air Force has mailed copies of NEWIOU and WABOU Soils Proposed Plans and the WABOU fact sheet to all parties on the Travis AFB mailing list, government officials, representatives of interested community groups, and members of the media. Copies are available at three Solano County libraries for public review.
- **Public Meetings.** The Air Force held a 30-day public comment period for the WABOU Soil Proposed Plan (July 8, 1998 to August 8, 1998). The Air Force held a public meeting on the evening of July 23, 1998 to present the proposed remedial alternatives for WABOU soil sites. The Air Force also held a 30-day public comment period for the WABOU fact sheet (February 23, 2000 to March 24, 2000). The Air Force held a public

meeting on the evening of March 15, 2000 to present major changes to two of the proposed remedial alternatives. At both meetings, representatives from the Air Force, Cal-EPA/DTSC, San Francisco Bay RWQCB, and U.S. EPA were present to answer questions about the soil contamination. Questions and comments from the public and responses are included in Part III, the Responsiveness Summary.

2.2.6 Remedial Design/Remedial Action

The RD/RA will include the design and implementation of all actions specified in this WABOU Soil ROD. The regulatory agencies will be involved in the approval and oversight of the design and construction of the remedial actions.

The Air Force will submit the RD/RA schedule for implementing the ROD 21 days after signing the ROD in accordance with the FFA. The regulatory agencies will review and approve the RD/RA schedule, as well as all reports and actions specified in the RD/RA schedule. The Air Force has prepared a *Basewide Soil RD/RA Plan* that covers the general approach for implementing the remedies at all Travis AFB soil sites. The Soil RD/RA Plan will include a copy of the RD/RA schedule. In addition, the Air Force will also prepare an attachment to the Soil RD/RA Plan for each Travis AFB soil site and for the CAMU that will provide the detailed approach for the selected remedy at each site.

2.3 Pollution Prevention Branch

Travis AFB has an active Pollution Prevention Program that strives to reduce the generation of wastes through a hierarchy of actions. The actions range from the most preferred choice of source reduction, to recycling, treatment, and finally disposal as a last resort. The Pollution Prevention Management Action Plan (P2 MAP) defines the framework to accomplish these actions. The P2 MAP analyzes all processes that generate hazardous waste streams and performs opportunity assessments of potential pollution prevention options to reduce the volume and/or toxicity of generated wastes. This program includes minimizing wastes generated by sampling activities in the IRP.

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Section Tab

Section 3.0

3.0 WABOU Remedial Investigation Summary

The primary objectives of the WABOU RI were to evaluate the nature and extent of contamination in the WABOU and assess the potential risks to human health and the environment posed by the contamination. Following the RI field activities and data evaluation, each site received a human health and ecological risk assessment. A quantitative human health risk assessment (HHRA) resulted in the identification of chemicals of concern (COC) for each site and the calculation of site-related excess lifetime cancer risks, as well as Hazard Indexes (for non-cancer-causing chemicals) for each COC. Similarly, the ecological risk assessment (ERA) resulted in the identification of chemicals of ecological concern (COEC) for each site and the calculation of Hazard Quotients (HQ) for various ecological receptors (selected indicator species of plants and animals) for each COEC.

3.1 Nature and Extent of Contamination

Nine of the 41 WABOU sites require a soil remedial action. Originally Buildings 929/931 and Building 940 were separate sites but now have the same site designation, because the contamination from both sites migrated into the same drainage ditch. Building 905 and Cypress Lakes Golf Course also share a site designation (SS041) but are presented separately. The Cypress Lakes Golf Course does not require a remedial action, as is described in section 5.3.9 [Cypress Lakes Golf Course (SS041)]. Table II-3-1 presents a brief description of each WABOU soil site. Section 3.3 presents a detailed description of each site. Figure II-3-1 shows the locations of the nine WABOU soil sites and the extent of contamination. Figures in Section 5 show each site in more detail.

There were three types of soil sampling used in the WABOU RI. Surface soil sampling using a hand trowel or shovel supported the assessment of contamination at or near the ground surface and applied to a depth of 0 to 3 inches. Shallow soil boring using a hand auger consisted of surface (0 to 3 inches) and subsurface (3 inches to 4 feet) soil sample pairs. Soil boring sampling using a hollow-stem auger reached depths greater than 10 feet.

Surface soil samples (0 to 3 inches) and shallow soil borings (0 to 4 feet) provided data for the HHRA and the ERA. Soil boring samples between 4 and 10 feet provided data for the HHRA. Soil boring samples from greater than 10 feet below ground surface provided data to assess the vertical extent of soil contamination and the migration of contaminants to the water table.

3.2 Risks Assessments

As part of the RI, each site received an HHRA and an ERA.

TABLE II-3-1
WABOU Soil Site Descriptions
WABOU Soil ROD
Travis AFB, California

Site Name	Site Designation	Site Description
Building 755	DP039	Building 755 is the Battery and Electric Shop. A former battery neutralization sump was used to dispose of lead-acid solutions. This practice was discontinued in 1978, and the sump was removed in 1993. Lead in the surface soil around the edges of the former sump area does not present an unacceptable risk to local workers or the environment.
Building 905	SS041	Building 905 is the Entomology Shop used to mix and store pesticides and herbicides. An outdoor concrete wash facility was used to wash pesticide residue off pesticide applicator vehicles. The topsoil surrounding the wash facility contains a variety of chlorinated pesticides. These pesticides may be a source of potential human health risk.
Building 916	SD043	Building 916 is an emergency electric power facility. At least one electrical transformer on a concrete pad adjacent to the building leaked cooling oil containing a Polychlorinated Biphenyl (PCB) into the surface soil. The concentration of PCBs does not present an unacceptable risk to either local workers or the environment.
Buildings 929/931/940	SD042	Building 929 is a storage shed near a former Hazardous Waste Accumulation Area. Building 931 is a maintenance facility for portable electrical generators. Both facilities drain into an adjacent drainage ditch. Sediment within the ditch is contaminated with Semivolatile Organic Compounds (SVOCs) and metals. These compounds may be a source of potential human health and ecological risk. Building 940 is a former paint-drying facility located within the former Fairfield Air Force Station, an Atomic Energy Commission facility that stored and maintained nuclear weapons. No elevated radioactive residue was found. A sediment sump near the building and a connecting ditch are contaminated with various metals associated with the painting operations. These metals may be a source of potential ecological risk.
Landfill 3	LF008	Landfill 3 consists of a series of small, unlined trenches that were used to dispose of expired pesticide containers. Several chlorinated pesticides are present in the waste material and soil surrounding the trenches. These pesticides may be a source of potential human health and ecological risk.
Landfill X	LF044	Landfill X is not a landfill but is actually an equipment training area and a stockpiling area for construction debris that contained metals and SVOCs. These compounds may be a source of potential human health and ecological risk.
Former Small Arms Range	SD045	The former small arms range is an open field near the south gate historically used for small arms training. Lead was detected in the soil and may be a source of potential human health and ecological risk.
Railhead Munitions Staging Area	SS046	Railroad operations deposited metals and SVOCs into the surface soil. These compounds do not present an unacceptable risk to either local workers or the environment.
Cypress Lakes Golf Course	SS041	A portion of the golf course maintenance yard had historically been used for the mixing of chlorinated pesticides. Section 2.2.3 describes the removal action that Travis AFB used to remove these pesticides from the maintenance yard.
Radioactive Bural Site 2/ Dry Waste Landfill	RW013	This dry waste landfill is a fenced backfilled trench that was part of the former Fairfield Air Force Station, an Atomic Energy Commission facility that stored and maintained nuclear weapons. Low-level radioactive waste from the maintenance of the nuclear components was buried in the trench and may be a source of potential human health risk.

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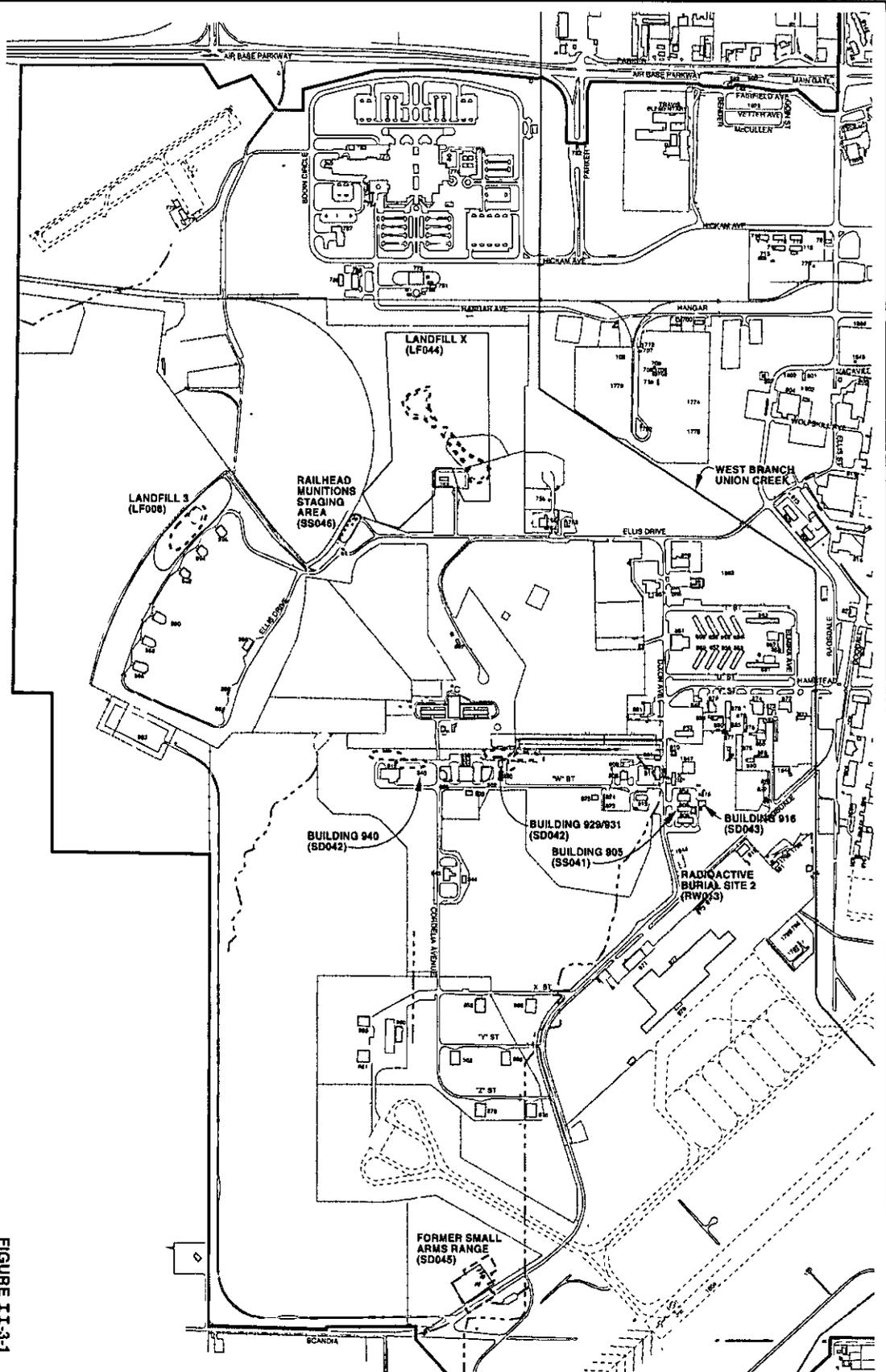
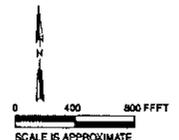


FIGURE 11-3-1
EXTENT OF SOIL
CONTAMINATION IN THE WABOU
 WEST HANNEKESBASEWIDE OPERABLE UNIT (WABOU)
 TRAVIS AIR FORCE BASE, CALIFORNIA

CH2M HILL

- LEGEND**
- - - - - OC PESTICIDE CONTOUR
 - - - - - PCB CONTOUR
 - - - - - METAL CONTOUR
 - - - - - SVOC CONTOUR
 - - - - - RADIONUCLIDE CONTOUR
 - x - FENCE
 - ROADS
 - SURFACE WATER
 - INTERMITTENT SURFACE WATER
 - TRAVIS AIR FORCE BASE BOUNDARY
 - RAILROADS
 - BUILDING YARDS
 - WATER TANKS
 - TAXIWAYS
 - BUILDINGS
 - PONDS



3.2.1 Human Health Risk Assessment

An HHRA is a baseline assessment that evaluates potential threats to human health in the absence of any remedial action. The HHRA begins by evaluating the chemicals of potential concern (COPC) and concludes with identification of the COCs. Section 3.7 of the WABOU RI report presents a detailed discussion of the HHRA at WABOU sites.

The following steps summarize the evaluation process:

Identification of Chemicals of Potential Concern (COPC) – Identifies the chemicals evaluated in the HHRAs.

Exposure Assessment – Identifies potential pathways by which exposure could occur; characterizes the potentially exposed populations; and estimates the magnitude, frequency, and duration of exposure.

Toxicity Assessment – Summarizes the toxicity of the COPC and the relationship between magnitude of exposure and adverse health effects.

Risk Characterization – Integrates the toxicity and exposure assessments to estimate the potential risks to human health from exposure to site chemicals. Chemicals that exceed risk factors in surface soil/dry sediment, subsurface soil or groundwater are identified as COCs. The potential risk posed by a carcinogenic compound is expressed as a probability value (i.e., 1×10^{-6}). The potential risk posed by a non-carcinogenic compound is expressed as a ratio, known as a Hazard Index, of the estimated intake of a chemical divided by its reference dose. The hazard index takes into account multiple routes of exposure (i.e., inhalation, ingestion, etc.).

Highlights of the HHRA within the WABOU RI report are as follows:

- Section 3.7.2 (Screening HHRA) describes the first step of the HHRA that involved the identification of No Further Action sites based on chemical exposure under residential conditions.
- Section 3.7.3 (Quantitative HHRA) describes the evaluation of site-specific exposure scenarios. The commercial/industrial worker exposure scenario applies to most sites, based on the current and anticipated future site use.

3.2.2 Ecological Risk Assessment

The overall purpose of an ERA is to provide a qualitative and quantitative evaluation of the actual or potential effects of contaminants on plants and animals (other than humans and domesticated species). The WABOU ERA (CH2M HILL, 1997) evaluated potential threats to the environment in the absence of any remedial action. The ERA identifies and characterizes the toxicity of the chemicals of potential ecological concern (COPEC), possible exposure pathways, potential ecological receptors, assessment and measurement endpoints, and the upper boundary of possible risks under the conditions defined for the various WABOU sites. One result of the ERA is the identification of COECs for each site.

The ERA used a tiered approach to support the investigation of, and the remedial action decisions for, the WABOU soil sites. The Tier 1 assessment was qualitative in nature and

identified the chemicals, habitats and potential ecological receptors at each soil site. The Tier 2 assessment was a screening process that quantified potential risks to ecological receptors by comparing Exposure Point Concentrations (EPC) to Critical Toxicity Values (CTV) for each target species. The EPC is a chemical concentration to which a target species may be exposed at a site. The calculation of the EPC takes into account the number and chemical concentration of samples collected at the site. The CTV is a chemical- and receptor-specific value that is derived from a selected exposure medium and pathway. It is based on Reference Toxicity Values (RTVs) for plants and animals reported in toxicological databases, wildlife toxicological reviews, or scientific literature, as well as results of site-specific bioassays. CTVs are expressed as a chemical concentration in soil. CTVs are derived from the target species RTVs, bioaccumulation factors, species-specific exposure factors, and dietary compositions of target species. The CTVs are conservative values, because they assume animals will be resident within the area of each soil site, although the sites often are smaller than the home range (which is especially true for birds). The Tier 3 assessment validated the results of the Tier 2 assessment, using bioassays, to better define the potential risks and reduce uncertainties. Section 3.8 of the WABOU RI report (CH2M HILL, 1997) presents a detailed description of the tiered approach used for the ERA and the results of the Tier 3 ERA at WABOU sites; relevant portions for soil sites are summarized below.

Travis AFB has two primary terrestrial habitats that are typical of the region and are described as herbaceous-dominated habitats (annual grassland, pasture, and early succession ruderal habitat) and urban habitats (industrial areas, lawns, and ornamental plants). Terrestrial vertebrates associated with non-native annual grasslands are commonly found on base. Typical avian species include ring-necked pheasant (*Phasianus colchicus*), American kestrel (*Falco sparverius*), American robin (*Turdus migratorius*), and the western meadowlark (*Sturnella neglecta*). Reptiles observed, or potentially occurring, at the Base include the western fence lizard (*Sceloporus occidentalis*), gopher snake (*Pituophis melanoleucus*), and California red-sided garter snake (*Thamnophis sirtalis infernalis*). Common mammals identified include deer mouse (*Peromyscus maniculatus*), California ground squirrel (*Spermophilus beecheyi*), Botta's pocket gopher (*Thomomys bottae*), black-tailed hare (*Lepus californicus*), and red fox (*Vulpes vulpes*). Tables 2-6 through 2-10 in the WABOU RI (CH2M HILL, 1997) list the individual plant, invertebrate, amphibian, bird, and mammal species associated with the habitats found on Travis AFB. Table 2-11 (CH2M HILL, 1997) lists several special-status species observed on base, including the burrowing owl (*Athene cunicularia*).

One of the key components of the ERA was the identification of ecological resources that were valued (termed "assessment endpoints"); the goal of the ERA was to evaluate potential risks of contaminant exposures to these endpoints. The following assessment endpoints were used for sites in terrestrial habitats:

- Plants - maintain grassland productivity or plant species composition
- Animals - maintain the prey species (e.g., invertebrates and herbivorous mammals and birds) available to secondary consumers; maintain the population of avian and mammalian consumers; and protect individual special-status bird species likely to nest or forage in grassland habitat.

Selection of Assessment and Measurement Endpoints is described more fully in Section 3.8.2.5 of the WABOU RI report (CH2M HILL, 1997).

Another crucial component of the ERA is to develop a Conceptual Site Model (CSM) that describes the different pathways by which ecological receptors may be exposed to contaminant sources. The CSM also denotes which types of receptors are likely to have a potential risk of exposure for each pathway. This model is described in detail in Section 3.8.2.6 of the WABOU RI report (CH2M HILL, 1997). Briefly, contaminants at Travis AFB may be released from their primary sources via two mechanisms: (1) surface dispersion to surface soils, and (2) infiltration/percolation to subsurface soils and groundwater. Surface soil contaminants may be subsequently transported via stormwater runoff to surface water, sediments, or other surface soils. These contaminants may also be released and transported by air as either volatile emissions or dust. Subsurface contaminated soil represents a direct pathway of exposure to plants and to animal receptors that live or burrow in the soil. Groundwater in the WABOU is more than 5 feet bgs; therefore, discharge to surface water and completion of this exposure pathway is not likely. Potential exposure routes include root or foliar uptake (plants only), direct ingestion, dermal contact, and inhalation or secondary ingestion through consumption of contaminated forage or prey.

The number of different habitats and species present at any site makes it impractical to evaluate the potential ecological risks to each individual species. Therefore, a subset of potential receptors, called target species, was selected for evaluation in the ERA. Selection of target species is important because it allows for extrapolation of effects from a small subset of species to those in a larger group and potentially to the community as a whole. To effectively make such extrapolations, target species were selected that fulfill as many of the following criteria as possible:

- Species that are known to occur or are likely to occur at the site
- Species that relate to the assessment endpoints selected
- Species that are likely to be maximally exposed to COPECs or are especially sensitive to them
- Sedentary species or species with a small home range
- Species that are known to play an integral role in the ecological community structure at the site
- Species that are known or likely to be especially sensitive to contaminants, and therefore are an indicator of ecological change
- Species that are representative of the foraging guild or that serve as food items for higher trophic levels.

To conduct the ERA, a special-status bird species (the burrowing owl), several common bird (American robin and western meadowlark) and mammal (deer mouse and ornate shrew) species that are representative of animals found at the sites, along with plants and terrestrial invertebrates, were selected for evaluation. Section 3.8.3.1 of the WABOU RI report (CH2M HILL, 1997) presents full descriptions of each of these species.

Ecological receptors may be exposed to chemicals in soil, sediment, or surface water via direct or secondary exposure pathways. Complete exposure pathways evaluated for the soil sites include root uptake (plants only), direct ingestion by terrestrial invertebrates, dermal

contact by terrestrial invertebrates, incidental ingestion by terrestrial vertebrates, inhalation of volatiles by birds (burrowing owl only), and food-chain transfer via ingestion of contaminated plants or wildlife (secondary exposure). More detail on selected exposure pathways is available in Section 3.8.3.2 of the WABOU RI report (CH2M HILL, 1997).

Contaminant exposure may cause a variety of effects in receptor species. Potential effects on plants include toxicity to target (or acceptable surrogate) species represented by adverse changes in growth rate, biomass, and reproduction (e.g., seed germination) and bioaccumulation in tissues determined by tissue residue analysis. Target prey species may exhibit toxicity through decreases in reproduction and survival, and may bioaccumulate chemicals (determined by tissue residue analysis) which can be transferred to avian and mammalian consumers. As a result of this secondary exposure, consumer species may suffer reductions in reproduction and survival. Additionally, decreases in the abundance of prey species due to toxic effects of contaminant exposure may cause adverse effects on reproduction and survival of consumer species. Effects and measurement endpoints are further discussed in Section 3.8.2.5 and Table 3-17 of the WABOU RI report (CH2M HILL, 1997).

The ecological effects assessment establishes a relationship between concentrations of COPECs and adverse effects in ecological receptors. CTVs are obtained or derived from toxicological literature, toxicity bioassays, and evaluation of bioaccumulation potential. Site-specific information and toxicological data for the identified target species were used in preference to literature sources. When toxicological information for the target species was not available, information for similar species was used and was extrapolated to the target species (mammals and birds only). In addition, toxicity information resulting from chronic studies was used in preference to acute information, unless site-specific conditions dictated use of acute information. Two upland terrestrial areas (pastural and pastural/mowed grassland habitat) were identified as reference locations, and were sampled to provide additional background information for "natural stressors" (i.e., non-contaminant factors causing unfavorable conditions) in surface soil.

The purpose of the risk characterization is to evaluate the evidence linking site contaminants with potential adverse ecological effects. This link is established by combining the exposure assessment, ecological effects assessment, toxicological data, and site chemical data through quantitative and qualitative evaluations. In the WABOU ERA, quantification of the potential ecological risk posed by a contaminant to a target species was conducted using an HQ approach. The formula for the HQ is:

$$HQ = EPC/CTV$$

The magnitude of the HQ provides a broad determination of the potential ecological toxicity/risk for a chemical. Because of the uncertainties associated with the CTV calculation process, the WABOU ERA expresses potential risk as measured by the HQ in general terms: less than 1 - no or low risk, 1 to 10 - low to medium risk, 10-100 - medium to high risk, and greater than 100 very high risk.

The results of the toxicity bioassays were used to calculate no observed effect concentrations (NOECs) for plants, terrestrial invertebrates, and aquatic organisms and bioaccumulation factors (BAFs) for plants and terrestrial invertebrates. These site-specific NOECs and BAFs were used in the derivation of the CTVs that were used in the HQ calculations. In addition,

the results of the toxicity bioassays were used to evaluate the toxicity at the locations where the samples were collected. For birds and mammals, all HQs were based on CTVs that represent no observed adverse effect levels (NOAELs) of exposure.

Qualitative evaluations focused on the reasonable potential for exposure of target species to contaminants at each site. This potential for exposure was evaluated through assessment of the magnitude of the HQ, habitat quality of the site, home range size of target species in comparison to size of site/contaminated area, frequency of detection, and use of maximum values or 95 percent upper confidence levels of the mean as EPCs. Results of these evaluations were used in conjunction with the results of the quantitative evaluations to determine if COPECs would be retained as COECs, and those COECs will be used as the basis for recommendations for evaluation of the site during the FS. (Derivation and justification of cleanup goals based on the results of the ERA are discussed below in Section 5.2.5 of this document.)

In summary, the magnitude of the HQs was used as an indication of the magnitude of potential risk, but it is not an exact estimation of risk. If a COPEC had a high HQ, but the other qualitative evaluations (i.e., habitat quality, home range, frequency of detection, and EPC) indicated that the potential for exposure to the COPEC was low, then the COPEC may not have been retained as a COEC.

Finally, uncertainties and limitations are inherent in all aspects of an ERA and include those related to problem formulation, exposure assessment, ecological effects assessment, and risk characterization. The major uncertainties and limitations associated with soil sites are presented in Section 3.8.6 of the WABOU RI report (CH2M HILL, 1997) and are summarized below:

- Problem Formulation
 - The use of duplicate samples as unique samples may under- or over-estimate potential risks because the actual sample concentrations may lie somewhere between the original sample value and the duplicate sample value.
 - The background dataset used to evaluate inorganics and organochlorine pesticides may result in an under- or over-estimation of potential risks because the inorganic dataset was limited and the organochlorine pesticide evaluation was based on historical legal applications (exact concentrations are unknown).
- Exposure Assessment
 - Plant uptake, inhalation of volatiles or particulates, and dermal contact were not quantified due to the limited toxicological information for these pathways. This may under-estimate the potential risks; however, the contribution of these pathways was expected to be minor.
 - Many species were identified as potential receptors, but habitat or other conditions may preclude these species from using the site regardless of the presence of COPECs. This may over-estimate the potential risks.

- Assumptions regarding the exposure route (e.g., media intake, population characteristics, and exposure patterns) may not characterize exposures resulting in under- or over-estimation of potential risks.
- Calculation of risks based on target species may under- or over-estimate potential risk because other species may have different exposure or intake than that modeled for target species.
- Species commonly used in bioassays (e.g., earthworms, lettuce, daphnia, and amphipods) may be more or less sensitive than species found onsite resulting in over- or under-estimation, respectively, of potential risks.
- Ecological Effects Assessment
 - RTVs are subject to change, as new evidence becomes available. This may under- or over-estimate the potential risks.
 - No mathematical correlation exists to extrapolate LD50s to NOAELs; therefore, RTVs derived from LD50s or LC50s may under- or over-estimate potential risks.
 - RTVs and CTVs were derived from laboratory animal studies. Extrapolation between species from different families and classes may induce error because of differences in pharmacokinetics, target organs, and population variability. This may under- or over-estimate potential risk.
 - Toxicity values were not available for all chemicals at the site; thus, these chemicals were not addressed quantitatively. This may under-estimate the potential risks.
- Risk Characterization
 - Hazard quotients can be used as indicators of potential risk, but due to uncertainties in the derivation of CTVs, they cannot be used as an exact measurement of potential risk. This may under- or over-estimate risk
 - Use of risk estimates for target species to characterize risks to plants and wildlife throughout the site may under- or over-estimate the potential risks because target species may be more or less sensitive to COPECs than other species.
 - Toxicity and risk were evaluated for individual chemicals. This may underestimate risks associated with exposure to multiple chemicals.

3.3 Site Descriptions

This section provides a description and history for each WABOU soil site. It identifies the COCs and COECs for surface and subsurface soil and references the appropriate sections of the WABOU RI report that pertain to the human health and ecological risk assessments.

Table II-3-2 presents the soil COCs and COECs at each site, the maximum concentrations detected, and the maximum human health risk values and ecological HQs associated with each contaminant. When reading this table, it is important to realize that the maximum contaminant concentration at a soil site does not necessarily result in the maximum

TABLE II-3-2
 Chemicals of Concern, Chemicals of Ecological Concern, and Potential Risks at WABOU Soil Sites
 WABOU Soil ROD
 Travis AFB, California

Site Name (Designation)	Soil COC/COEC	Maximum Concentration (mg/kg) ^a	Maximum Residential Human Health Risk Value ^b	Maximum Ecological Risk Value (HQ) ^c
Building 755 (DP039)				
Building 905 (SS041)	Chlordane	13.7	3×10^{-5}	NA ^e
	Toxaphene	25	6×10^{-5}	NA
Building 916 (SD043)				
Buildings 929/931/940 (SD042)	Benzo(a)pyrene	1.2	2×10^{-5}	400
	Dibenzo(a,h)anthracene	0.59	1×10^{-5}	130
	Indeno(1,2,3-cd)pyrene	1.0	2×10^{-6}	1.5
	Barium	2,020	0.2	12
	Chromium	5,240	0.89	28
	Nickel	85	1×10^{-6}	1.7
Landfill 3 (LF008)	Chlordane	118	3×10^{-4}	95
	Endosulfan	0.0072	0.0021	54
	Heptachlor epoxide	0.35	7×10^{-6}	3.7
Landfill X (LF044)	Cadmium	2	9×10^{-8}	14
	Silver	17.8	0.001	3.6
	Anthracene	9.1	0.03	1.9
	Benzo(a)pyrene	69	5×10^{-5}	22,000
	Benzo(g,h,i)perylene	38	NA	11
	Bis(2-ethylhexyl)phthalate	1,400	7×10^{-8}	16,000
Landfill X (LF044) (continued)	Dibenz(a,h)anthracene	18	6×10^{-6}	830
	Indeno(1,2,3-cd)pyrene	40	2×10^{-6}	27

TABLE II-3-2
 Chemicals of Concern, Chemicals of Ecological Concern, and Potential Risks at WABOU Soil Sites
 WABOU Soil ROD
 Travis AFB, California

Site Name (Designation)	Soil COC/COEC	Maximum Concentration (mg/kg) ^a	Maximum Residential Human Health Risk Value ^b	Maximum Ecological Risk Value (HQ) ^c
Former Small Arms Range (SD045)	Pyrene	90	0.005	30
	Copper	4,930	2	49
	Benzo(a)pyrene	0.61	1 x 10⁻⁵	200
	Benzo(a)anthracene	2	3 x 10⁻⁶	1.3
Railhead Munitions Staging Area (SS046)	Fluoranthene	12	0.005	3.7
	Phenanthrene	73	NA	1.6
	Cadmium	18.7	2 x 10⁻⁶	250
	Chlordane	0.54	9 x 10⁻⁷	15.0
Cypress Lakes Golf Course (SS041)	DDT	34	2 x 10⁻⁶	4.2
	Endosulfan	0.053	0.02	770
	Uranium-235	172.1±1.70 pCi/g	8.2 x 10⁻⁵	NA

^a Maximum Concentration detected in either surface or subsurface soil. The maximum concentration is not necessarily the concentration associated with the Human Health or Ecological Risk Values presented in their respective columns, as described in section 3.3.

^b A risk value in exponential notation represents an estimate of potential excess lifetime cancer risk posed by a contaminant under residential conditions. A risk value in decimal notation represents an estimate of potential non-cancer risk posed by a contaminant under residential conditions. The potential non-cancer risk values are shown in **bold** text. These values do not represent the potential risk values under current (industrial) conditions at Travis AFB. The term "NA" indicates that the contaminant does not pose a cancer or non-cancer risk to human receptors.

^c The ecological risk value represents an estimate of potential risk posed by a contaminant to the most sensitive target species evaluated in the WABOU Ecological Risk Assessment. Section 3.2.2 describes the Hazard Quotient (HQ). The term "NA" indicates that there is no exposure pathway between the contaminant and the target ecological receptors.

^d This chemical does not pose an unacceptable risk to current or future site workers. Therefore, it is not considered a chemical of concern.

^e NA = Not Applicable

^f pCi/g = picoCurie per gram

potential risk posed by the contaminant. For example, a high concentration of a contaminant at the bottom of a former six-foot trench would not result in a high ecological risk, because most of the ecological receptors live in the top four feet of topsoil. Using the same example, a surface soil contaminant may pose the highest potential human health risk, due to a higher probability for exposure, even though the highest contaminant concentration is found in the subsurface soil.

3.3.1 Building 755 (DP039)

Building 755 is the Travis AFB Battery and Electric Shop. The site consists of Building 755 and a former battery neutralization sump. Past operations have included the recharging and dismantling of lead-acid and nickel-cadmium batteries. Before 1978, lead acid solutions were discharged into a sink inside Building 755. The pipeline from the sink led to a rock-filled sump approximately 65 feet northwest of the building. This practice was discontinued in 1978 when the pipeline was dismantled and reconnected to the sanitary sewer system. The sump was removed in 1993.

Surface soil around the edges of the former sump area contains lead residue. Since the lead-acid solution entered the former sump through a subsurface pipe, the presence of lead in the surface soil is attributed to the deposition of small amounts of lead-contaminated subsurface soil during the 1993 sump removal action. The Building 755 HHRA and ERA concluded that the lead residue does not pose an unacceptable risk to local workers or ecological receptors. Sections 4.1.7 and 4.1.8 of the WABOU RI report present more detailed descriptions of the HHRA and ERA for Building 755, respectively

3.3.2 Building 905 (SS041)

Building 905 is the Travis AFB Entomology Shop used to prepare pesticide and herbicide mixtures from 1983 to 1992. A 3,000-square-foot fenced enclosure outside on the east side of the building contains a washrack and a storage area. The purpose of the washrack was to wash down tractors used for towing bowsers filled with pesticides and herbicides. The washrack consisted of a concrete pad with a perimeter berm (i.e., curb) and a drain that discharged to an UST. The surface soil appears to have received pesticide residue from spray generated during the washing of pesticide applicator vehicles under windy conditions or spillage during transfer of liquids from the UST to drums.

The pesticide contaminants in the surface soil at this site include the following COCs: alpha-chlordane, gamma-chlordane, heptachlor epoxide, and toxaphene. Section 4.2.7 of the WABOU RI report presents a more detailed description of the HHRA for Building 905. No COCs or COECs are present in subsurface soil. The Building 905 ERA concluded that the presence of chemicals will not adversely affect terrestrial plants or wildlife under current conditions. Section 4.2.8 of the WABOU RI report presents a more detailed description of the ERA for this site.

3.3.3 Building 916 (SD043)

Building 916 is an emergency electrical power facility. The diesel-powered generators inside the building sit above a cellar, or sump area, that also houses sump pumps. Prior to 1991, spilled diesel fuel from the generators and wash water were pumped out of the building through one of four pipes. The pipes discharged onto small concrete spillways constructed

for erosion control on the side slope of the trapezoidal drainage channel that lies east of the building. From the spillways, wastewater flowed down the side-slope and into the drainage channel. This method of sump water disposal was discontinued in 1991.

There had been a fenced and graveled electrical transformer area on the southwest corner of the building. This area contained three liquid-filled transformers on top of a concrete pad. In 1992, one of the transformers developed a leak onto the concrete pad and ground surface. The base removed the transformers and pad in 1993.

PCB-1254 was detected in soil at concentrations that do not pose an unacceptable risk to local workers or ecological receptors. Sections 4.3.7 and 4.3.8 of the WABOU RI report present detailed descriptions of the HHRA and ERA for Building 916, respectively.

PCB-1254 was detected in a groundwater sample immediately below the transformer area, and there was a possibility that PCB-1254 in subsurface soil is a source of ongoing groundwater contamination. Additional groundwater sampling in June 1999 demonstrated that there is no PCB-contaminated groundwater migrating from the site. The *Reevaluation of Soil and Groundwater Contamination at Building 916 (SD043)* Technical Memorandum (CH2M HILL, 2000) presents a detailed discussion on the groundwater sampling effort.

3.3.4 Building 929/931/940 (SD042)

Building 929 is a small storage shed, 12 feet by 12 feet, completely enclosed with a concrete floor, currently used to store paint. Building 931, a maintenance facility for portable electrical generators, is located approximately 100 feet southeast of Building 929. A former drum storage area, or Hazardous Waste Accumulation Area (HWAA), is located immediately to the west of Building 929. The HWAA stored waste materials generated at Building 931. Both buildings drain to the adjacent channel. Semivolatile organic chemicals (SVOCs) and metals have accumulated in the channel sediment.

Building 940, located approximately 400 feet southeast of Building 929, was formerly used as a painting and paint-drying area for large equipment, and possibly components of nuclear weapons from 1953 to 1962. No radiological contamination was detected in soil or sediment samples, but SVOCs and metals resulting from painting operations were detected.

COCs detected in soil and sediment samples collected from the drainage channel near Buildings 929 and 931 include benzo(a)pyrene, dibenz(a,h)anthracene, and benzo(b)fluoranthene. Sections 4.4.7 and 4.25.7 of the WABOU RI report present a detailed description of the HHRA for Buildings 929/931/940. COECs detected include cadmium, chromium, lead, nickel, zinc, benzo(a)pyrene, dibenz(a,h)anthracene, fluoranthene, indeno(1,2,3-c,d)pyrene, and bis(2-ethylhexyl)phalate. Sections 4.4.8 and 4.25.8 of the WABOU RI report present a detailed description of the ERA for Buildings 929/931/940.

3.3.5 Landfill 3 (LF008)

Landfill 3 consists of trenches used in the 1970s for the disposal of pesticide containers. Landfill 3 is located within the Weapons Storage Area (Bunker A) in the western portion of the WABOU. Bunker A is a secured area and is surrounded by fences. This landfill comprises about 1 acre of land, as indicated by the trenches excavated during the WABOU RI. The trenches are currently covered with fill material.

Approximately 30 cubic yards of materials were reportedly buried in trenches of varying dimensions. The WABOU RI used geophysical surveys to locate these trenches, and six out of nine exploration trenches encountered buried debris. The depth of waste observed was from 5 to 8 feet, and no lining was visible beneath the waste. The excavated material included 1- and 5-gallon metal containers, plastic and paper bags, other paper and plastic debris, 1-gallon glass bottles, and two 55-gallon drums. Labels found on some of the containers indicated that the containers originally held pesticides and herbicides. There was no evidence that other contaminants were placed into these trenches.

COCs detected in surface soil include alpha-chlordane and gamma-chlordane. These contaminants are also COECs together with dieldrin, endosulfan, endosulfan II, endosulfan sulfate, heptachlor epoxide, and methoxychlor.

COCs detected in subsurface soil include alpha-chlordane, gamma-chlordane, heptachlor, and heptachlor epoxide. There were no COECs detected in subsurface soil. Sections 4.7.7 and 4.7.8 of the WABOU RI report present a detailed description of the HHRA and ERA for Landfill 3, respectively.

3.3.6 Landfill X (LF044)

Landfill X comprises approximately 25 acres of undeveloped land located within Grazing Management Unit (GMU)-2, a 126-acre parcel of land used to graze horses. Limited information regarding past activities at Landfill X is available. It was reportedly used for disposal of used aircraft tires in the early 1960s. The tires have since been removed. Construction debris is mixed with soil in one portion of the site. In 1985, horses that were grazing became ill and were moved. The horses recovered and the area has not been used for grazing since.

The site is located within an actively used field that meets important worker safety training and construction needs on Travis AFB. The soil contaminants are attributed to the asphalt and other construction debris that is stockpiled onsite and do not impact the local groundwater.

COCs detected in surface soils include benzo(a)anthracene, benzo(a)pyrene, and dibenz(a,h)anthracene. These contaminants are also COECs together with to benzo(k)fluoranthene, fluoranthene, and pyrene.

COCs detected in subsurface soils include benzo(a)anthracene, benzo(a)pyrene, and dibenz(a,h)anthracene, benzo(k)fluoranthene. These contaminants are also subsurface COECs together with anthracene, acenaphthene, benzo(b)fluoranthene, benzo (g,h,i)perylene, chrysene, fluoranthene, indeno(1,2,3-c,d)pyrene, phenanthrene, bis(2-ethylhexyl)phthalate, cadmium, lead, and silver. Sections 4.8.7 and 4.8.8 of the WABOU RI report present a detailed description of the HHRA and ERA for Landfill X, respectively.

3.3.7 Former Small Arms Range (SD045)

The Former Small Arms Range comprises 2.8 acres of flat, grassy terrain; no traces of previous firing range activities are visible. Periodically the site is disked. The location of the site was determined from historical photographs.

Lead is the COC and a COEC at this site, both in surface and subsurface soil. Other COECs in surface soil are antimony and copper. Sections 4.10.7 and 4.10.8 of the WABOU RI report present a detailed description of the HHRA and ERA for the Former Small Arms Range, respectively.

3.3.8 Railhead Munitions Staging Area (SS046)

The Railhead Munitions Staging Area site consists of a railroad track and concrete pad that formerly served as a railhead at the south terminus of a spur off the Northern Sacramento Railroad. This site served as a weapons-handling facility from 1953 to 1962.

COCs detected in surface soil include benzo(a)pyrene, benzo(b)fluoranthene, benzo(a)anthracene, and benzo(k)fluoranthene. COCs detected in subsurface soil include cadmium, lead, benzo(a)pyrene, benzo(k)fluoranthene, fluoranthene, phenanthrene, pyrene, and pentachlorophenol. All of the COCs were detected in the vicinity of the railroad tracks. Section 4.12.7 of the WABOU RI report presents a detailed description of the HHRA for the Railhead Munitions Staging Area.

COECs were detected in isolated areas surrounding the concrete pad. The COECs include benzo(a)pyrene, benzo(k)fluoranthene, fluoranthene, pentachlorophenol, phenanthrene, pyrene, cadmium, and lead. Section 4.12.8 of the WABOU RI report presents a detailed description of the ERA for this site.

3.3.9 Cypress Lakes Golf Course (Annex 10) (SS041)

Annex 10 is an active facility consisting of an 18-hole golf course with an associated maintenance yard, and the Travis AFB water supply wellfield. The maintenance yard was constructed in 1974 and includes several buildings, garages, and storage areas. It also has several concrete pads used for cleaning and servicing vehicles and mixing herbicides and pesticides.

COCs detected in surface soil samples include dieldrin and DDE. These contaminants are also considered COECs together with DDT, alpha-chlordane, gamma-chlordane, endosulfan, and endosulfan sulfate. Sections 4.18.7 and 4.18.8 of the WABOU RI report present a detailed description of the HHRA and ERA for the Cypress Lakes Golf Course, respectively. Section 2.2.3 (Removal Actions) describes the removal action that removed the above chemicals from the maintenance yard.

3.3.10 Radioactive Burial Site 2/Dry Waste Landfill (RW013)

This site consists of a fenced backfilled trench, approximately 50 feet by 100 feet. This area was formerly used to bury low-level radioactive wastes generated during maintenance activities for nuclear weapons.

The COC for this site is enriched uranium (U-234 and U-235), detected in subsurface soil. No COECs were detected. Sections 4.21.7 and 4.21.8 of the WABOU RI report present a detailed description of the HHRA and ERA for the Radioactive Burial Site 2/Dry Waste Landfill, respectively.

Section Tab

Section 4.0

4.0 WABOU Feasibility Study Summary

Travis AFB conducted an FS in the WABOU to assist in selecting remedial actions for the contaminated WABOU soil sites. The primary objectives of this study were to:

1. Identify potential response actions, technologies, and process options to address the potential risks in the WABOU
2. Screen the technologies and process options
3. Assemble feasible and appropriate remedial alternatives
4. Provide detailed evaluations of the remedial alternatives
5. Perform a comparative analysis of the alternatives

The FS can be divided into three main phases:

1. The Initial Screening of Alternatives
2. The Detailed Analysis of Alternatives
3. The Comparative Analysis of Alternatives

4.1 Initial Screening of Alternatives

The purpose of the Initial Screening of Alternatives (ISA) is to develop an appropriate range of remedial alternatives that would protect human health and the environment at the nine soil sites identified in the WABOU RI.

This is necessary because of the large number of remedial technologies available to handle a wide variety of contaminants under various site conditions.

With all of the combinations of remedial options available, the evaluation process could easily become too complicated and cumbersome. To prevent this, the ISA screened out those technologies that were not appropriate for the contaminants and site conditions found in the WABOU. Then it used the remaining technologies to develop the most promising remedial alternatives.

The alternatives screening process consists of the following seven steps:

Step 1: Establish Remedial Action Objectives. Remedial Action Objectives (RAO) specify the extent of cleanup required to protect human health and the environment. The RAO for a site takes into account the contaminant that poses the potential risk, the exposure routes and receptors, and an acceptable contaminant level or range of levels for each exposure route.

Step 2: Develop General Response Actions. General response actions describe the broad range of actions that will satisfy the RAOs.

Step 3: Identify Potential Remedial Technologies and Process Options. Many potentially applicable technology types are available to remediate all categories of contaminants under various site conditions. Some technologies have a proven record of performance; others are promising but have not been tested under all field conditions. General technology types that

can be used to implement a general response action are referred to as remedial technologies. Specific technology types within a remedial technology are called process options. An example of a remedial technology for an administrative action is access restrictions; an example of a process option within this remedial technology is fencing. Information on remedial technologies and process options is acquired through database searches and technical journal reviews. This review of all potentially applicable technologies ensures that the best technologies are not overlooked early in the FS process.

Step 4: Screen Process Options for Technical Implementability. In this step the list of technology and process options is reduced by evaluating the technical implementability of the options. Technical implementability refers to the ability of the remedial technology or process option to meet an RAO. The result of this step is a list of technologies and process options that are capable of addressing contaminant types found in the WABOU under existing site conditions.

Step 5: Technology Evaluation and Selection of Representative Process Options. The process options that survived the Step 4 screening are evaluated for administrative implementability, effectiveness, and cost. Examples of administrative implementability are the ability to obtain the necessary permits and the availability of necessary equipment and workers to implement the process option. This evaluation further reduces the list of process options to those that can be implemented, that are effective in treating the contaminants in the WABOU, and that are not cost-prohibitive.

Even after the above evaluations are completed, a number of process options could be implemented to meet the RAOs. From the list of remaining process options within each remedial technology, a representative process option is selected. The representative process option is used to develop the alternatives, but the other equally promising process options are retained.

Step 6: Assemble Remedial Alternatives. The representative process options are used to assemble remedial alternatives that represent a range of general response actions specifically for the WABOU sites.

Step 7: Screen Remedial Alternatives. In this final step of the ISA the remedial alternatives are again screened to ensure they meet three criteria: protectiveness of human health and the environment, implementability, and cost-effectiveness.

The WABOU ISA resulted in the development of seven potential soil remedial alternatives. Table II-4-1 provides a brief description of these potential soil remedial alternatives.

TABLE II-4-1
 Potential Soil Remedial Alternatives
 WABOU Soil ROD
 Travis AFB, California

Cleanup Alternative	Description
S1 - No Action	Federal regulations require the use of this alternative as a starting point for comparing the other alternatives. No soil treatment takes place.
S2 - Land Use and Access Restrictions	Land use restrictions are used to prohibit the excavation or disturbance of contaminated soil and prevent residential use where residential cleanup levels are exceeded. Fences and signs are posted to prevent access
S3 - Containment: Capping	A multilayer cap is placed over contaminated soil to prevent access to the soil. A cap is an impermeable covering that is made of layers of compacted clay and/or synthetic material. Land use and access restrictions are included to protect the cap
S4 - Excavation/Treatment/On-base Consolidation	Contaminated soil is excavated, treated using a chemical stabilization process, and placed in an on-base Corrective Action Management Unit (CAMU). The excavation is filled with uncontaminated soil or imported fill. Land use and access restrictions may be included, depending on the soil cleanup level that is attained.
S5 - Excavation/Off-base Disposal	Contaminated soil is excavated and transported by truck to an off-base landfill. The excavation is filled with uncontaminated soil or imported fill. Land use and access restrictions may be included, depending on the soil cleanup level that is attained.
S6 - Excavation/On-base Consolidation	Contaminated soil is excavated and placed in an on-base CAMU. The excavation is filled with uncontaminated soil or imported fill. Land use and access restrictions may be included, depending on the soil cleanup level that is attained.
S7 - In Situ Treatment/Capping	Contaminated soil is treated using a chemical stabilization process. The resulting soil/slurry mix is covered with an asphalt cap, surrounded by a fence, and protected with land use restrictions.

4.2 Corrective Action Management Unit

The WABOU ISA describes the Corrective Action Management Unit (CAMU), an important strategy at Travis AFB for the on-base consolidation of contaminated soil. A CAMU is a designated area within a facility that is designed to carry out a corrective action, such as the management of contaminated soil. The state and federal CAMU regulations were written to give regulatory agencies greater flexibility in selection and implementing the most effective and appropriate waste management strategy for the cleanup of large complex facilities, such as Travis AFB.

The final CAMU rules were published in the Federal Register on February 16, 1993 (EPA, 1993 - Federal Register "40 Code of Federal Regulations [CFR] 260, et al., Corrective Action Management Units and Temporary Units; Corrective Action Provisions; Final Rule." Volume 58, No. 29, February 16, 1993) and are found in 40 CFR 264.552. These regulations have been adopted under the California RCRA program and are found in Title 22, California Code of Regulations (CCR), Section 66264.552. In addition, EPA has adopted a new CAMU regulation (67 Fed. Reg. 2961, Jan. 22, 2002) that allows a facility to use the previous CAMU regulation if a substantially complete CAMU proposal was submitted prior to November 20, 2000. The regulatory agencies have concurred that Travis AFB has met the substantive portion of this requirement prior to the deadline.

The CAMU allows for more flexibility when managing remediation wastes and leads to expeditious implementation of protective and cost-effective remedies at CERCLA sites. For instance, consolidation or placement of remediation wastes into the CAMU would not constitute creation of a waste management unit subject to minimum technology requirements (MTR). In addition, remediation wastes managed within the CAMU, which were generated as part of a corrective action at the facility, would not be subject to RCRA permitting requirements. The waste may be placed within the CAMU without pre-treatment to the technology-based levels established under the RCRA land disposal restrictions (LDR) programs. However, the CAMU must be protective of human health and the environment and will require monitoring in accordance with Title 27 CCR. The CAMU cover will also be designed to meet Title 27 CCR substantive cover requirements.

There are several advantages of the CAMU approach:

- The consolidation of contaminated soil would provide needed material for the construction of the LF007 cap. This would reduce the amount of clean soil that would need to be purchased.
- A large quantity of contaminated soil would never have to leave Travis AFB, avoiding the transport of this soil by truck on major roads and highways. This would reduce air emissions, noise, and the risk of vehicle accidents associated with the cleanup actions.
- The amount of soil that would have to go to commercial off-base landfills would be reduced. This would extend the functional life of these landfills.
- The amount of paperwork generated to track the contaminated soil would be significantly reduced, resulting in a project management cost reduction.
- The use of a CAMU would significantly reduce the cost of cleaning up the other IRP soil sites by reducing or eliminating off-base landfill disposal fees.

Landfill 2 (LF007) is a soil site in the NEWIOU that has been selected as a favorable location for the CAMU. This landfill was used from the 1950s through the 1970s as a Base municipal landfill. As part of the closure plan for the landfill, a large quantity of soil must be used to fill in depressions in the soil cover over the existing waste to provide a foundation for a cap. The CAMU design calls for a four-foot evapotranspiration cap that will prevent people, animals, and plants from coming in contact with the waste. The cap also limits infiltration of rainwater, thereby reducing leaching of contaminants and protecting groundwater. In order for Travis AFB to place contaminated soil within the CAMU as part of the foundation for the cap over part of LF007, the contaminated soil must meet acceptance criteria that are protective of groundwater beneficial use objectives. The consolidation requirements are used to ensure compatibility between contaminated soil from different sites as well as compatibility with existing landfill waste and cap materials.

In evaluating whether the use of a CAMU for onsite consolidation of remediation wastes is a viable option, the following seven criteria must be considered and met:

1. The CAMU must facilitate the implementation of reliable, protective, and cost-effective corrective action measures.

2. Waste management activities associated with the CAMU shall not create unacceptable risks to humans or the environment.
3. The CAMU shall incorporate uncontaminated areas only if the inclusion of such areas allows better protection.
4. Areas within the CAMU, where wastes remain in place after closure of the CAMU, shall be managed and contained to minimize the potential for future releases.
5. The CAMU shall expedite the implementation of corrective measures.
6. The CAMU shall enable the use of treatment technologies to enhance long-term effectiveness of corrective actions by reducing the toxicity, mobility, or volume of wastes
7. To the extent practicable, the CAMU shall minimize the land areas where wastes will remain in place after closure of the CAMU.

To demonstrate that the contaminated soil to be placed in the CAMU will not impact the underlying groundwater in excess of beneficial use objectives (MCLs), the Air Force conducted a leachability assessment using the California Waste Extraction Test modified to use deionized water as the extractant. A site-specific dissociation constant was calculated by dividing the leachate concentration by the total soil concentration. The CAMU acceptance levels were calculated using the product of the water quality objective, the dissociation constant, and a dilution/attenuation factor as modeled in consideration of the landfill cover and the CAMU cap design. The *Corrective Action Management Unit Soil Acceptance Criteria* (Radian, 2000) provides a more detailed description of the leachate assessment.

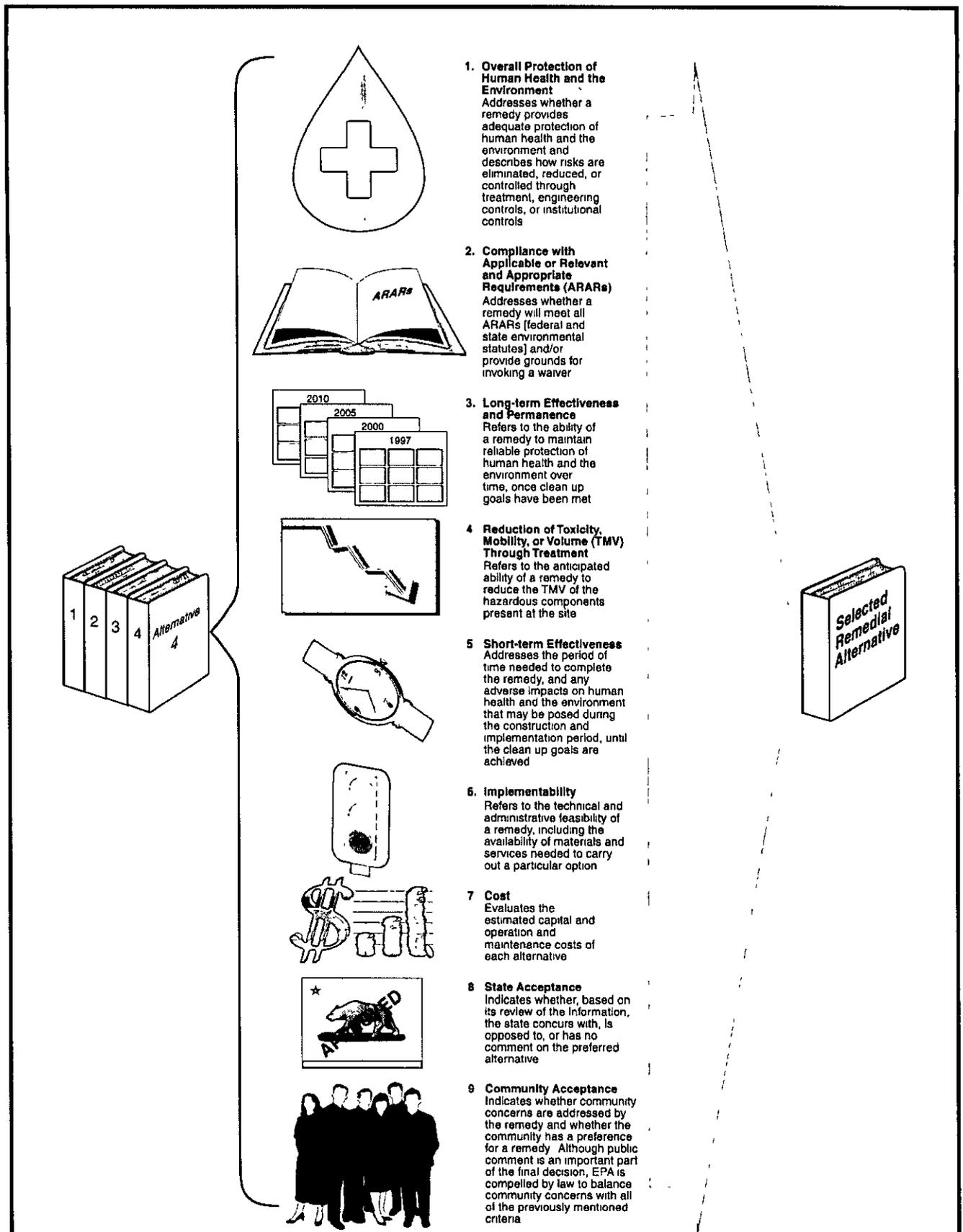
4.3 Detailed Analysis of Alternatives

The purpose of the Detailed Analysis of Alternatives is to analyze the alternatives identified in the ISA and present the relevant information needed to select the appropriate remedies. This is accomplished by evaluating each alternative against the nine criteria provided under CERCLA. Figure II-4-1 identifies and defines the nine evaluation criteria. The *Community Acceptance* and *State Acceptance* criteria are addressed in this WABOU Soil ROD on the basis of acceptance of the WABOU Soil Proposed Plan and the evaluation of comments received during the July 8, 1998 to August 8, 1998 public comment period.

4.4 Comparative Analysis of Alternatives

In the final phase of the FS, the soil remediation alternatives are evaluated in accordance with the requirements of each CERCLA criterion. This evaluation identifies the relative strengths and weaknesses of each alternative to determine the preferred alternatives at each site. The following subsections provide a ranking of how alternatives meet CERCLA criteria; discussions are organized with the most favorable alternatives first. Section 9.0 of the WABOU FS (CH2M HILL, 1998) presents the comparative analysis of soil alternatives in greater detail. Tables II-4-2 through II-4-7 provide summary qualitative evaluations of the performance of each soil alternative on a site-by-site basis, using five of the CERCLA criteria. A remedial alternative must meet the Overall Protection of Human Health and the

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1. Overall Protection of Human Health and the Environment

Addresses whether a remedy provides adequate protection of human health and the environment and describes how risks are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Addresses whether a remedy will meet all ARARs (federal and state environmental statutes) and/or provide grounds for invoking a waiver

3. Long-term Effectiveness and Permanence

Refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean up goals have been met

4. Reduction of Toxicity, Mobility, or Volume (TMV) Through Treatment

Refers to the anticipated ability of a remedy to reduce the TMV of the hazardous components present at the site

5. Short-term Effectiveness

Addresses the period of time needed to complete the remedy, and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until the clean up goals are achieved

6. Implementability

Refers to the technical and administrative feasibility of a remedy, including the availability of materials and services needed to carry out a particular option

7. Cost

Evaluates the estimated capital and operation and maintenance costs of each alternative

8. State Acceptance

Indicates whether, based on its review of the information, the state concurs with, is opposed to, or has no comment on the preferred alternative

9. Community Acceptance

Indicates whether community concerns are addressed by the remedy and whether the community has a preference for a remedy. Although public comment is an important part of the final decision, EPA is compelled by law to balance community concerns with all of the previously mentioned criteria

NOTE

The nine criteria are from the *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (EPA, 1988) and provide support for the selected Remedial Alternative

FIGURE II-4-1

NINE EVALUATION CRITERIA

WEST/ANNEXES/BASEWIDE OPERABLE UNIT (WABOU)
SOIL ROD
TRAVIS AIR FORCE BASE, CALIFORNIA

CH2MHILL

TABLE II-4-2
 Summary of Comparative Analysis of Soil Alternatives — by Criterion
 Long-term Effectiveness and Permanence
 WABOU Soil ROD
 Travis AFB, California

Site	Soil Alternative						
	S1	S2	S3	S4	S5	S6	S7
B905	o	o	-	-	•	•	•
B916	o	-	-	•	•	•	⊗
B929/931 & 940	o	-	-	-	-	-	-
LF03	o	o	⊗	•	•	•	⊗
LF0X	o	o	o	o	o	o	o
SAR1	o	⊗	⊗	•	•	•	-
RMSA	o	o	o	o	o	o	o
AX10	o	⊗	⊗	•	•	•	-
RW13	o	o	o	o	o	o	o

Legend. Relative performance of the alternative at each site.

- Better satisfies criterion
 - ⊗ Moderately satisfies criterion
 - o Poorly satisfies criterion
 - Alternative not applicable at this site
- B905 = Building 905 (SS041)
 B916 = Building 916 (SD043)
 B929/931
 & 940 = Buildings 929/931 and 940 (SD042)
 LF03 = Landfill 3 (LF008)
 LF0X = Landfill X (LF044)
 SAR1 = Former Small Arms Range (SD045)
 RMSA = Railhead Munitions Staging Area (SS046)
 AX10 = Cypress Lakes Golf Course (Annex 10, SS041)
 RW13 = Radioactive Burial Site 2/Dry Waste Landfill (RW013)

Alternative S1 — No-Action
 Alternative S2 — Land Use and Access Restrictions
 Alternative S3 — Containment Capping
 Alternative S4 — Excavation/Treatment/On-base Consolidation
 Alternative S5 — Excavation/Off-base Disposal
 Alternative S6 — Excavation/On-base Consolidation
 Alternative S7 — In situ Treatment/Capping

TABLE II-4-3
 Summary of Comparative Analysis of Soil Alternatives — by Criterion
 Reduction of Toxicity, Mobility, or Volume through Treatment
 WABOU Soil ROD
 Travis AFB, California

Site	Soil Alternative						
	S1	S2	S3	S4	S5	S6	S7
B905	o	o	o	o	o	o	o
B916	o	-	-	•	•	•	⊗
B929/931 & 940	o	o	o	o	o	o	o
LF03	o	o	⊗	•	•	•	⊗
LF0X	o	o	o	o	o	o	o
SAR1	o	o	⊗	•	•	•	-
RMSA	o	o	o	o	o	o	o
AX10	o	o	⊗	•	•	•	-
RW13	o	o	o	o	o	o	o

Legend: Relative performance of the alternative at each site.

- Better satisfies criterion
 - ⊗ Moderately satisfies criterion
 - o Poorly satisfies criterion
 - Alternative not applicable at this site
- B905 = Building 905 (SS041)
 B916 = Building 916 (SD043)
 B929/931 & 940 = Buildings 929/931 and 940 (SD042)
 LF03 = Landfill 3 (LF008)
 LF0X = Landfill X (LF044)
 SAR1 = Former Small Arms Range (SD045)
 RMSA = Railhead Munitions Staging Area (SS046)
 AX10 = Cypress Lakes Golf Course (Annex 10, SS041)
 RW13 = Radioactive Burial Site 2/Dry Waste Landfill (RW013)

Alternative S1 — No-Action
 Alternative S2 — Land Use and Access Restrictions
 Alternative S3 — Containment, Capping
 Alternative S4 — Excavation/Treatment/On-base Consolidation
 Alternative S5 — Excavation/Off-base Disposal
 Alternative S6 — Excavation/On-base Consolidation
 Alternative S7 — In situ Treatment/Capping

TABLE II-4-4
 Summary of Comparative Analysis of Soil Alternatives — by Criterion
 Short-term Effectiveness
 WABOU Soil ROD
 Travis AFB, California

Site	Soil Alternative						
	S1	S2	S3	S4	S5	S6	S7
B905							
B916	o	-	-	⊗	⊗	⊗	•
B929/931 & 940							
LF03	o	•	•	⊗	⊗	⊗	•
LF0X							
SAR1	o	•	•	⊗	⊗	⊗	-
RMSA							
AX10	o	•	•	⊗	⊗	⊗	-
RW13							

Legend Relative performance of the alternative at each site

- Better satisfies criterion
 - ⊗ Moderately satisfies criterion
 - o Poorly satisfies criterion
 - Alternative not applicable at this site
- B905 = Building 905 (SS041)
 B916 = Building 916 (SD043)
 B929/931 & 940 = Buildings 929/931 and 940 (SD042)
 LF03 = Landfill 3 (LF008)
 LF0X = Landfill X (LF044)
 SAR1 = Former Small Arms Range (SD045)
 RMSA = Railhead Munitions Staging Area (SS046)
 AX10 = Cypress Lakes Golf Course (Annex 10, SS041)
 RW13 = Radioactive Bural Site 2/Dry Waste Landfill (RW013)

Alternative S1 — No-Action
 Alternative S2 — Land Use and Access Restrictions
 Alternative S3 — Containment Capping
 Alternative S4 — Excavation/Treatment/On-base Consolidation
 Alternative S5 — Excavation/Off-base Disposal
 Alternative S6 — Excavation/On-base Consolidation
 Alternative S7 — In situ Treatment/Capping

TABLE II-4-5
 Summary of Comparative Analysis of Soil Alternatives — by Criterion
 Implementability
 WABOU Soil ROD
 Travis AFB, California

Site	Soil Alternative						
	S1	S2	S3	S4	S5	S6	S7
B905	o	o	o	o	o	o	o
B916	o	-	-	⊗	•	⊗	⊗
B929/931 & 940	o	o	o	o	o	o	o
LF03	o	⊗	⊗	⊗	•	⊗	⊗
LF0X	o	o	o	o	o	o	o
SAR1	o	⊗	⊗	⊗	•	⊗	-
RMSA	o	o	o	o	o	o	o
AX10	o	o	⊗	⊗	•	⊗	-
RW13	o	o	o	o	o	o	o

Legend. Relative performance of the alternative at each site.

- Better satisfies criterion
 - ⊗ Moderately satisfies criterion
 - o Poorly satisfies criterion
 - Alternative not applicable at this site
- B905 = Building 905 (SS041)
 B916 = Building 916 (SD043)
 B929/931 & 940 = Buildings 929/931 and 940 (SD042)
 LF03 = Landfill 3 (LF008)
 LF0X = Landfill X (LF044)
 SAR1 = Former Small Arms Range (SD045)
 RMSA = Railhead Munitions Staging Area (SS046)
 AX10 = Cypress Lakes Golf Course (Annex 10, SS041)
 RW13 = Radioactive Burial Site 2/Dry Waste Landfill (RW013)

Alternative S1 — No-Action
 Alternative S2 — Land Use and Access Restrictions
 Alternative S3 — Containment: Capping
 Alternative S4 — Excavation/Treatment/On-base Consolidation
 Alternative S5 — Excavation/Off-base Disposal
 Alternative S6 — Excavation/On-base Consolidation
 Alternative S7 — In situ Treatment/Capping

TABLE II-4-6
 Summary of Comparative Analysis of Soil Alternatives
 Relative Performance of Soil Alternatives - by Cost
 WABOU Soil ROD
 Travis AFB, California

Site	Total Present Worth (\$ x 1,000)						
	S1	S2	S3	S4	S5	S6	S7
B905	-	-	55.0	90.0	56.7	31.8	-
B916	-	-	-	77.0	43.0	31.7	436.2
B929/931 & 940	-	63.0	-	197.0	175.7	86.0	-
LF03	-	-	451.0	1,641.0	4,162.0	336.0	3,045.0
LF0X	-	-	1,110.0	1,025.0	2,520.0	84.0	10,540.0
SAR1	-	48.3	1,639.0	833.0	2,255.0	186.3	-
RMSA	-	17.0	-	17.0	26.0	51.2	-
AX10	-	17.8	154.0	155.6	130.0	47.7	-
RW13	-	-	-	-	31.5	-	495.0

Legend: Relative performance of the alternative at each site.

- Alternative not applicable at this site

B905 = Building 905 (SS041)

B916 = Building 916 (SD043)

B929/931 & 940 = Buildings 929/931 and 940 (SD042)

LF03 = Landfill 3 (LF008)

LF0X = Landfill X (LF044)

SAR1 = Former Small Arms Range (SD045)

RMSA = Railhead Munitions Staging Area (SS046)

AX10 = Cypress Lakes Golf Course (Annex 10, SS041)

RW13 = Radioactive Burial Site 2/Dry Waste Landfill (RW013)

Alternative S1 — No-Action

Alternative S2 — Land Use and Access Restrictions

Alternative S3 — Containment: Capping

Alternative S4 — Excavation/Treatment/On-base Consolidation

Alternative S5 — Excavation/Off-base Disposal

Alternative S6 — Excavation/On-base Consolidation

Alternative S7 — In situ Treatment/Capping

Note: Present worth values are cost estimates that take into account the direct (i.e., construction and O&M) and indirect (i.e., project management and overhead) costs as well as the inflation rate

TABLE II-4-7
 Summary of Comparative Analysis of Soil Alternatives
 Relative Performance of Soil Alternatives
 WABOU Soil ROD
 Travis AFB, California

Site	Overall Performance of Soil Alternative						
	S1	S2	S3	S4	S5	S6	S7
B905	o	o	o	o	o	o	o
B916	o	-	-	⊗	⊗	•	⊗
B929/931 & 940	o	o	o	o	o	o	o
LF03	o	o	⊗	⊗	⊗	•	⊗
LF0X	o	o	o	o	o	o	o
SAR1	o	o	⊗	⊗	⊗	•	-
RMSA	o	o	o	o	o	o	o
AX10	o	o	⊗	⊗	⊗	•	-
RW13	o	o	o	o	o	o	o

Legend: Relative performance of the alternative at each site.

- Better satisfies criterion
 - ⊗ Moderately satisfies criterion
 - o Poorly satisfies criterion
 - Alternative not applicable at this site
- B905 = Building 905 (SS041)
 B916 = Building 916 (SD043)
 B929/931 & 940 = Buildings 929/931 and 940 (SD042)
 LF03 = Landfill 3 (LF008)
 LF0X = Landfill X (LF044)
 SAR1 = Former Small Arms Range (SD045)
 RMSA = Railhead Munitions Staging Area (SS046)
 AX10 = Cypress Lakes Golf Course (Annex 10, SS041)
 RW13 = Radioactive Burial Site 2/Dry Waste Landfill (RW013)

Alternative S1 — No-Action
 Alternative S2 — Land Use and Access Restrictions
 Alternative S3 — Containment/Capping
 Alternative S4 — Excavation/Treatment/On-base Consolidation
 Alternative S5 — Excavation/Off-base Disposal
 Alternative S6 — Excavation/On-base Consolidation
 Alternative S7 — In situ Treatment/Capping

Environment as well as the Compliance with ARARs criteria to be selected as a remedy. Section 5.5.5 (State and Community Acceptance) addresses the way that the remedies in this soil ROD meet the State Acceptance and Community Acceptance criteria.

4.4.1 Overall Protection of Human Health and the Environment

The *Overall Protection of Human Health and the Environment* criterion serves as a threshold determination that must be met by any alternative for it to be selected as a remedy. Each of the soil alternatives, except for Alternative S1 (No Action), are protective of human health and the environment.

4.4.2 Compliance with ARARs

The *Compliance with ARARs* criterion also serves as a threshold determination that must be met by any alternative for it to be selected as a remedy. Each of the soil alternatives, except for Alternative S1 (No Action), will comply with ARARs.

4.4.3 Long-Term Effectiveness and Permanence

The *Long-term Effectiveness and Permanence* criterion is a measure of two principal factors: (1) the magnitude of residual risk; and (2) the adequacy and reliability of controls used to manage treatment residuals. Each of the soil alternatives, except for Alternative S1 (No Action), achieves some measure of long-term effectiveness and permanence. Table II-4-2 provides a summary qualitative evaluation of the performance of each of the soil alternatives against this criterion on a site-by-site basis.

4.4.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Each of the soil treatment alternatives, including Alternative S1 (No Action), will achieve varying degrees of *Reduction in Contaminant Toxicity, Mobility, or Volume*. However, Alternative S1 will not achieve reduction through treatment. Table II-4-3 provides a summary qualitative evaluation of the performance of each of the soil alternatives against this criterion on a site-by-site basis.

4.4.5 Short-Term Effectiveness

The *Short-term Effectiveness* criterion is a measure of the protection afforded by each alternative during the construction and implementation process. As such, the time until the remedial action objectives are achieved is an important component of the criterion. Each of the soil alternatives, except for Alternative S1 (No Action), is effective in the short term to some degree. Table II-4-4 provides a summary qualitative evaluation of the soil alternatives against this criterion on a site-by-site basis.

4.4.6 Implementability

The *Implementability* criterion evaluates the technical and administrative difficulties associated with implementing each alternative. An important component of technical implementability is consideration of the reliability of the technology. Each of the soil alternatives is technically implementable. For Alternative S6, the most important issue related to administrative implementability is when Travis AFB will obtain a CAMU

designation. Table II-4-5 provides a summary qualitative evaluation of the soil alternatives against this criterion on a site-by-site basis.

4.4.7 Cost

Table II-4-6 presents the total project cost estimates for each soil alternative at each site. These *Cost* criterion estimates are a total of the site-specific capital and annual Operations and Maintenance (O&M) cost estimates for implementing the alternative.

Detailed cost summary tables are provided in Appendix A of the WABOU FS (CH2M HILL, 1998). These summary tables were developed using the Remedial Action Cost Engineering and Requirements System (RACER Version 3.2). RACER is a PC-based environmental cost estimating system developed by the U.S. Air Force. Section A.4 of the WABOU FS presents the assumptions on which the cost estimates are based.

4.4.8 Conclusions

The Comparative Analysis did not recommend the implementation of a specific alternative for each WABOU site. It described the overall performance and cost of each soil alternative at each site. The paragraphs below summarize the findings of this analysis. The relative performance of each soil alternative at each applicable WABOU site is summarized in Table II-4-7.

Alternative S6 - Excavation/On-base Consolidation has the highest degree of overall performance among the soil alternatives for 9 of the 10 WABOU soil sites. This alternative provides a high degree of protection to human health and the environment. Additionally, except for Alternative S2 - Land Use and Access Restrictions, it is the least costly of the soil alternatives. However, Alternative S6 requires the designation of a CAMU at Travis AFB. Without this designation, the alternative cannot be implemented. Travis AFB is actively pursuing a CAMU designation for Landfill 2 (LF007) in the NEWIOU. If successful, this CAMU designation will be promulgated in the NEWIOU Soil, Sediment, and Surface Water Record of Decision.

Alternative S5 - Excavation/Off-base Disposal and **Alternative S4** - Excavation/Treatment/On-base Consolidation have similar levels of overall performance at applicable WABOU soil sites. Alternative S5 has a slightly higher degree of overall performance, because it is not subject to potential implementation problems associated with obtaining a CAMU designation. However, these two alternatives have relatively high costs compared to Alternative S6. Offsite landfill disposal costs are high under Alternative S5, and soil treatment costs are high under Alternative S4.

Alternative S3 - Containment: Capping and **Alternative S7** - In situ Treatment/Capping have similar levels of overall performance. Both alternatives provide adequate protection of human health and the environment. However, both alternatives are less implementable than Alternatives S4, S5, or S6 because of future land use considerations. At several WABOU soil sites these alternatives may be incompatible with future land use at Travis AFB. Also, these alternatives do not provide final solutions, because contaminated soil is left in place. Both capping and in situ treatment would likely require long-term monitoring to ensure continued protectiveness.

Alternative S2 - Land Use and Access Restrictions provides a low level of overall performance compared to the alternatives mentioned above. This alternative allows contaminated soil to remain in place. Land use and access restrictions reduce exposures to humans but provide relatively little protection of ecological receptors. The cost of implementing Alternative S2 is lower than the alternatives mentioned above.

By definition, **Alternative S1** - No Action provides the lowest level of overall performance of any of the alternatives. There is no cost to implement this alternative.

Section Tab

Section 5.0

5.0 Selected Soil Remedial Actions

The Air Force evaluated and selected soil remedial actions for the 10 WABOU soil sites. Each of the selected remedies will be protective of human health and the environment and will comply with ARARs. They are effective at reducing contaminant exposure, are implementable and cost-effective, and are acceptable to the public and the State of California. The Air Force based the selection of these remedial actions on environmental and land use considerations and the nature and extent of contamination found at each site. U.S. EPA guidance and criteria evaluations and available technology were additional factors used in the selection process.

The Air Force is responsible for implementing, maintaining, and monitoring the remedial actions identified herein for the duration of the remedies selected in this Record of Decision. It will exercise this responsibility in accordance with CERCLA and the National Contingency Plan (NCP).

Meeting remedial action objectives shall be the primary and fundamental indicator of performance, the ultimate aim of which is protecting human health and the environment. Performance measures for Land Use Controls are defined herein as the remedial action objectives plus the required actions to achieve the defined objectives. It is anticipated that successful implementation, operation, maintenance, and completion of these measures will achieve protective and legally compliant remedies.

The following subsections present the selected action at each site and the soil cleanup levels for the sites that require active remedial actions and the rationale for the selection. Figures showing conceptual designs for the selected soil remedial actions are located at the end of the section.

5.1 Description of Selected Remedial Alternatives

5.1.1 Alternative S2—Land Use and Access Restrictions

Alternative S2 involves the application of additional physical and/or administrative land use restrictions to a site to ensure that human health and the environment is protected from potential exposure to chemicals that are present at the site. This remedial alternative is the selected remedial action for four soil sites (DP039, SD043, LF044, and SS046). It will also be applied to those soil sites where the residual soil concentration of each contaminant after the completion of excavation exceeds the 10^{-6} residential risk value. Table II-4-1 provides a description of this alternative, and Section 5.4 (Land Use Controls) describes the rationale for applying this alternative to excavated sites that exceed residential risk values.

5.1.2 Alternative S4—Excavation/Treatment/On-base Consolidation

Alternative S4 involves the excavation and treatment of contaminated soil prior to its placement in a CAMU. Section 4.2 (Corrective Action Management Unit) provides a detailed description of the CAMU. This alternative is appropriate for those sites that meet the following conditions:

- The chemical concentrations of contaminants in a significant amount of soil from the site exceed the CAMU acceptance levels. The calculations for the acceptance levels are based on the results of the field sampling and analysis using the California Waste Extraction Test with deionized water. The *Travis AFB Leachate Assessment Report* (Radian, 2000) presents a more detailed description of the leachate assessment and its results.
- There is a physical or chemical stabilization process that would prevent the leaching of contaminants from the soil and would allow the placement of soil with higher contaminant concentrations in the CAMU. The most likely treatment option for most of the soil contaminants is soil stabilization using Portland cement. Prior to using this stabilization process, the Air Force would have to demonstrate through a treatability study that the process successfully prevents the leaching of contaminants from the local soil.
- The cost of the soil stabilization process would not exceed the cost of transporting and disposing the soil in an appropriate off-base landfill. The amount of soil that requires treatment is an important consideration of determining the cost effectiveness of the stabilization process.

Since it is not possible to select this remedial alternative until the above conditions are met, the decision to use a soil stabilization process would occur after the excavation at the WABOU soil sites is complete and the amount of soil to be treated is known. The stabilization and placement of this soil would take place prior to the construction of the protective cap over the contaminated soil.

5.1.3 Alternative S5—Excavation/Off-base Disposal

Alternative S5 involves the excavation of contaminated soil and its disposal in an appropriate off-base landfill. This is the selected alternative for sites with contaminated soil that cannot be placed in the CAMU, including low-level radioactive waste and contaminated soil from an off-base annex. This is also the selected contingency alternative for the contaminated soil that exceeds the CAMU acceptance limits. The off-base disposal facilities that are available to receive contaminated soil and waste include Class I and Class II hazardous waste landfills and low-level radioactive waste repositories.

5.1.4 Alternative S6—Excavation/On-base Consolidation

Alternative S6 is the remedial alternative that involves the excavation of contaminated soil and its placement in a CAMU. This is the selected alternative for sites with contaminated soil that meets the CAMU acceptance criteria. Section 4.2 provides a detailed description of the CAMU. Sections 5.1.2 and 5.1.3 present the remedial alternatives for contaminated soil that exceed the CAMU acceptance criteria.

The Air Force will build the CAMU within a former landfill (LF007) to consolidate contaminated soil from Travis AFB IRP sites. LF007 is a closed landfill within the NEWIOU. The contaminated soil will be covered with an engineered cap.

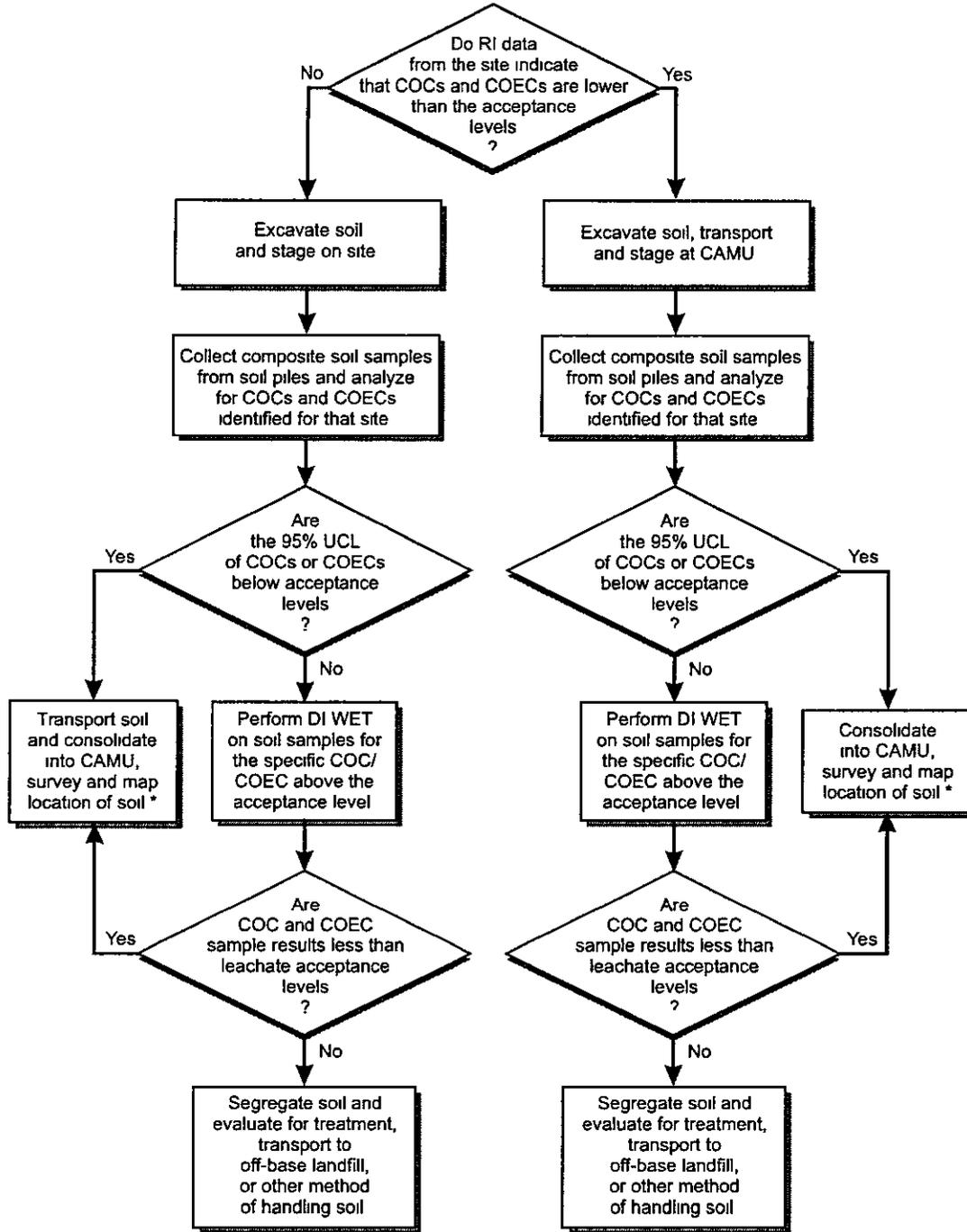
The Air Force will build the CAMU in phases. Initially, a relatively flat compacted soil pad for the CAMU will be constructed at a portion of LF007 using grading and compacted fill. Subsequently, a module will be built for each year that the excavation and consolidation of suitable soil from Travis AFB soil sites is scheduled. By the end of the construction season

(normally May through October), the module of consolidated soil will be covered with a final cap. Each module will have an intermediate cover on the side where future modules will be attached. The phased approach is necessary, because the selection of remedial alternatives for the Travis AFB soil sites will take place in the WABOU and NEWIOU Soil RODs, which are on two different schedules. Also, the soil remedial actions on Travis AFB are funded over several years so that they fit within the projected IRP budget.

The Air Force will design the CAMU to be protective of human health and the environment and to comply with all ARARs. One of the design objectives for the landfill cover and CAMU cap is to prevent the CAMU waste from coming into contact with groundwater and to ensure that potential leachate from the CAMU will not cause groundwater underlying the waste to exceed beneficial use objectives. The Air Force, with guidance from the San Francisco Bay Regional Water Quality Control Board, has developed the soil acceptance requirements shown in Table II-5-9 to determine the contaminant types and soil concentrations that can be safely placed in the CAMU. The SESOIL modeling, the initial review of the RI data, the de-ionized waste extraction test (DI WET) results and the proposed CAMU design support the establishment of soil acceptance levels. Soil acceptance levels represent chemical concentrations in the soil that may result in leachate concentrations greater than the maximum contaminant level (MCL) by a factor of 100 but are predicted to attenuate by a factor of 100 as the leachate migrates to the water table below the CAMU. Soil samples from representative soil sites at Travis AFB were collected and analyzed using the DI WET to provide site-specific data on the potential leaching of contaminants from soils. The conclusion of this sample analysis is that the leachate acceptance levels that exceed the MCL by a factor of 100 are protective of groundwater beneficial use objectives for a CAMU without a liner or leachate collection and recovery system (LCRS). The *Corrective Action Management Unit Soil Acceptance Criteria* (Radian, 2001) provides a more detailed description of the development and protectiveness of the CAMU acceptance levels.

Acceptance of contaminated soil to the CAMU will be based on a comparison of the soil acceptance level of a COC to the site-specific soil concentration data. Excavated soil that has soil concentrations below the soil acceptance level for each contaminant at the site will be placed into the CAMU. For excavated soil whose soil concentrations exceed the soil acceptance levels, placement into the CAMU is allowable if the leachate results from soil samples that are collected from the excavated site and analyzed using the DI WET method do not exceed the leachate acceptance levels presented in Table II-5-9. The CAMU will receive post-closure inspections and maintenance to ensure the cap continues to perform as designed. The *LF007 Soil Remedial Action Design Report and Post-Closure Maintenance Plan* (CH2M HILL, 2002) describes the CAMU design, postclosure inspections, and maintenance.

Figure II-5-1 (figures located at the back of this section) presents the acceptance level sampling process that supports the placement of soil in the CAMU. Section 5.6 (RD/RA Implementation and Schedule) describes the RD/RA activities related to the CAMU. Section 6 (List of Applicable or Relevant and Appropriate Requirements and Performance Standards) presents the CAMU ARARs.



TransSoil-RI-RA-WPvt-ra-accept-levels.caf - VMD 103000 SAC

* Soil that is acceptable for consolidation to the CAMU may still be transported for off-base disposal

Figure II-5-1. Acceptance Level Sampling Process

5.2 Criteria Used to Determine Soil Cleanup Levels

The selected soil cleanup levels for COCs at each site represent the residual site-specific contaminant concentrations that can remain after completion of a remedial action and are protective of human health and the environment. Since no chemical-specific ARARs that establish soil cleanup levels exist, the following subsections present the criteria that provide the basis for the cleanup levels at the WABOU soil sites.

5.2.1 Residential/Industrial Exposure Scenarios

When reviewing text or tables that address cleanup concentrations and associated risk values, it is important to consider the criteria used in the calculation of the risk values. At Travis AFB, the residential and the industrial exposure scenarios provided the two sets of criteria used in risk calculations.

The residential exposure scenario, the more conservative of the two, assumes that the site is available for any possible use. For example, the property could be in the middle of a residential housing area or adjacent to a day care center. In this scenario, the risk assessor makes assumptions about the amount of potential chemical exposure that a resident (such as a gardener or a barefoot child) may receive. Since the assumptions for this scenario represent the maximum potential exposure, the residential risk calculations usually result in high values.

The industrial exposure scenario assumes that the site is available for industrial use only. In this scenario, the risk assessor makes assumptions about the amount of potential chemical exposure that a site worker may receive. The assumptions for this scenario are appropriate for a healthy adult at the site during normal working hours in minimal protective clothing and represent a lower potential exposure. The industrial risk calculations usually result in lower values.

The Air Force reviewed the U.S. EPA Office of Solid Waste and Emergency Response (OSWER) Directive 9355.0-30 (page 5) to select the appropriate exposure scenario for Travis AFB:

"The preamble to the NCP states that U.S. EPA will consider future land use as residential in many cases. In general, residential areas should be assumed to remain residential; and undeveloped areas can be assumed to be residential in the future unless sites are in areas where residential land use is unreasonable. Often the exposure scenarios based on potential future residential land use provide the greatest risk estimates (e.g., reasonable maximum exposure scenario) and are important considerations in deciding whether to take action (55 Fed. Reg. at 8710).

However, the NCP also states that 'the assumption of future residential land use may not be justifiable if the probability that the site will support residential use in the future is small.' Sites that are adjacent to operating industrial facilities can be assumed to remain as industrial areas unless there is an indication that this is not appropriate. Other land uses, such as recreational or agricultural, may be used, if appropriate. When exposures based on reasonable future land use are used to estimate risk, the NCP preamble states that

the ROD 'should include a qualitative assessment of the likelihood that the assumed future land use will occur' (55 Fed. Reg. at 8710)."

Travis AFB is host to the largest airlift organization in the Air Force, with a versatile fleet of C-5 Galaxy cargo aircraft and KC-10 Extender refueling aircraft to support its strategic airlift mission. This Base is also the west coast terminus for aeromedical aircraft returning sick or incapacitated military personnel from the Pacific and is a west coast port of embarkation for military personnel. Travis AFB is in the middle of an extensive construction program that is replacing aging inefficient buildings with new facilities as well as upgrading existing structures to better conform to their function. The recent acquisition of land to the north of the Base supports the construction of additional family housing units needed for the additional personnel to be assigned to Travis AFB under the Base Realignment and Closure (BRAC) Act.

There is a large geographical separation between the northern residential housing areas and the southern industrial areas on Travis AFB. All of the WABOU soil sites are located within or adjacent to industrial facilities. Also, there are currently no Base closure initiatives scheduled for the next few years, and there is no indication that Congress will enact legislation to change the status of open Bases.

In summary, the physical size, the number of personnel and units, and the assigned mission responsibilities at Travis AFB are growing. The present land use near all WABOU sites is industrial in nature, and there are no indications that this condition will change in the near future. Therefore, the use of industrial criteria in deriving cleanup levels is appropriate for the WABOU soil sites. Also, residential criteria are the basis for deriving more stringent cleanup goals for these sites.

Since the Air Force is selecting industrial cleanup levels at all WABOU soil sites, existing and additional land use controls will be implemented, monitored, maintained, and enforced as described in section 5.4 (Land Use Controls).

5.2.2 Risk Management

Risk management is the process of making decisions concerning a site, taking into account the potential risk posed by contaminants, the cost of cleaning up the contaminants, the present and future use of the land, and other site conditions. The following subsections describe risk management decisions that were applied to the WABOU soil sites.

5.2.2.1 Risk Management Range

The Air Force has selected soil cleanup levels that equate to an acceptable exposure level. The rationale for deciding on an acceptable exposure level at a site is based on 40 CFR 300.430(e)(2)(i)(A)(2) of the NCP:

"For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 10^{-4} and 10^{-6} using information on the relationship between dose and response."

Consistent with this language, the Air Force will ensure that any residual soil contaminants after completion of a remedial action will fall within or below the 10^{-4} to 10^{-6} risk range. For

each site, the specific cleanup level within that range must be determined based upon site-specific factors. The NCP at 40 CFR 300.430(e)(2)(i)(A)(2) further states that:

"The 10^{-6} risk level shall be used as the point of departure for determining remediation goals for alternatives when ARARs are not available or are not sufficiently protective because of the presence of multiple contaminants at a site or multiple pathways of exposure."

Therefore, the 10^{-6} risk level and the industrial exposure scenario are the basis for cleanup concentrations at WABOU soil sites. These concentrations provide a margin of safety for workers, since Travis AFB is an industrial facility as described in Section 5.2.1 (Residential/Industrial Exposure Scenarios), and conservative exposure assumptions were used in the risk calculations.

5.2.2.2 Point of Departure

As a military facility, Travis AFB uses a number of self-imposed land use restrictions to maintain security and ensure safety for site workers. These restrictions also serve as potential mitigating factors to depart from the 10^{-6} risk level at sites within certain portions of the Base. After a review of these factors and their locations in relation to the WABOU soil sites, only Landfill 3 (LF008) was found to warrant a departure from the 10^{-6} risk level. Table II-5-3C presents the existing land use restrictions in the vicinity of LF008 and the rationale for their use in deciding upon an appropriate risk level. Section 5.3.5 [Landfill 3 (LF008)] discusses the use of these factors in the selection of cleanup levels in more detail.

5.2.2.3 Depth Considerations

Contaminants located at different depths pose different amounts of potential risk to receptors. For example, a site worker has a greater chance of being exposed to chemicals in surface soil [0 to 0.25 feet below ground surface (bgs)] than chemicals in soil that is 10 feet bgs. Also, the soil horizon for ecological receptors is considered to be 0 to 4 feet bgs, so chemicals below 4 feet bgs are not considered to pose a potential risk to ecological receptors.

As a conservative measure, the concentrations that equate to a 10^{-6} risk level under industrial conditions will apply to the top six inches of surface soil at each site, unless there is a human health or ecological cleanup value that is lower. The rationale for using a depth of six inches involves the existing land use controls on Travis AFB. To conduct a soil excavation in excess of six inches, the excavator must obtain a signed digging permit from the Base. The Base environmental office reviews all digging permits to ensure that site workers are not exposed to contaminants or that appropriate personal protection is required as a condition of proceeding with the excavation. It is conservative, because the WABOU human health risk assessment applied conservative surface soil assumptions to calculate potential risk for the top three inches of soil. Section 5.4 (Land Use Controls) describes the land use controls on Travis AFB.

The concentrations that are protective of ecological receptors and the local groundwater will apply to soil beneath the top six inches at each site as long as they are within or below the 10^{-4} to 10^{-6} risk range. The assumptions used to calculate potential risk for the soil below 3 inches are less conservative, since they apply to trench workers. As a result, this approach protects site workers by preventing potential chemical exposure at a site.

As a result of this consideration, several sites have multiple soil cleanup tables, each one applying to a different range of soil depths.

5.2.2.4 Consideration of Site Conditions

Initially, the Air Force used an initial screening approach that used only numerical risk values to determine whether a soil site required a cleanup action. However, in working with the regulatory agencies to resolve legal and technical issues, the Air Force elected to apply a risk management strategy described in OSWER Directive 9355.0-30, the *Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions* (U.S. EPA, 1991) to several WABOU soil sites. This strategy uses the risk assessment and site conditions to develop cleanup alternatives and to support risk management decisions. This strategy allows the Air Force to focus its cleanup efforts on high-risk soil sites and monitor the low-risk soil sites.

As a result, the Air Force found that Alternative S2 (Land Use and Access Restrictions) provided an adequate measure of protection for site workers at low-risk soil sites, negating the need for an active remedial action. Section 5.8.2 [Railhead Munitions Staging Area (SS046)] presents an example of the application of this strategy at the Railhead Munitions Staging Area (SS046).

5.2.3 Human Health Exposure for Carcinogens

The WABOU Human Health Risk Assessment evaluated potential threats to human health from chemicals found at WABOU soil sites in the absence of any remedial action. This information was used to determine the need for remedial action at each site. Section 3.2.1 (Human Health Risk Assessment) presents a brief summary of the WABOU Human Health Risk Assessment.

The Air Force accepted the regulatory agency recommendation to use the 1 October 2002 U.S. EPA Preliminary Remediation Goals (PRG) as the soil cleanup levels for carcinogenic chemicals that equate to a fixed level of risk (1×10^{-6}). U.S. EPA estimated the PRG using current U.S. EPA toxicity values with "standard" exposure factors to ensure that the resulting concentrations are protective of humans, including sensitive groups, over a lifetime.

The 1 October 2002 U.S. EPA Region IX PRG Table contains concentrations for both residential and industrial use. Since Travis AFB is an industrial facility as described in Section 5.2.1 (Residential/Industrial Exposure Scenarios), the soil cleanup levels for each site are based on the industrial PRG. The soil cleanup table for each site contains a column of the current residential PRGs and a column of the current industrial PRGs that equate to a potential 10^{-6} cancer risk.

5.2.4 Human Health Exposure for Non-carcinogens

The WABOU Human Health Risk Assessment evaluated potential lead exposures by calculating the blood-lead level associated with lead in soil, using the lead spreadsheet model developed by the CAL-EPA. A lead concentration in the soil that results in a blood-lead level greater than 10 $\mu\text{g}/\text{dL}$ warrants a cleanup action at a lead-contaminated site.

The Air Force accepted the regulatory agency recommendation to use the 1 October 2002 U.S. EPA PRGs as the soil cleanup levels for non-carcinogenic chemicals that equate to a fixed level of risk (Hazard Index of 1) The Hazard Index is a ratio of a chemical concen-

tration compared to the chemical's corresponding U.S. EPA PRG. U.S. EPA estimated the PRG using current U.S. EPA toxicity values with "standard" exposure factors to ensure that the resulting concentrations are protective of humans, including sensitive groups, over a lifetime. As described in Section 5.2.3 (Human Health Exposure for Carcinogens), the soil cleanup levels for each site are based on the industrial PRG. The soil cleanup table for each site contains a column of the current residential PRGs for a residential hazard index of 1 and a column of the current industrial PRGs for an industrial hazard index of 1.

5.2.5 Ecological Exposure

During the WABOU RI, an ERA was conducted for the WABOU soil sites (CH2M HILL, 1997b). The ERA was conducted in accordance with the protocol for conducting risk assessments at Travis AFB (JEG, 1994a) as well as applicable state and federal guidance documents available at that time (e.g., U.S. EPA, 1989a; U.S. EPA, 1989b; U.S. EPA, 1992; DTSC, 1996), and is described in Section 3.2.2 (Ecological Risk Assessment). Although additional guidance documents have been published subsequently (e.g., U.S. EPA, 1997; U.S. EPA, 1998), they do not contain substantive changes in the approach toward conducting ERAs at sites such as Travis AFB.

One of the key components of the ERA was the identification of ecological resources that were valued (termed "assessment endpoints"); the goal of the ERA was to evaluate potential risks of contaminant exposures to these endpoints. The following assessment endpoints were used for sites in terrestrial habitats:

- Plants - maintain grassland productivity or plant species composition
- Animals - maintain the prey species (e.g., invertebrates and herbivorous mammals and birds) available to secondary consumers; maintain the population of avian and mammalian consumers; and protect individual special-status bird species likely to nest or forage in grassland habitat.

To conduct the ERA, a special-status bird species (the burrowing owl, *Athene cunicularia*), several common bird and mammal species that are representative of animals found at the sites, along with plants and terrestrial invertebrates, were selected for evaluation.

Risk characterizations were based on HQs in which exposure levels were compared to potential effect levels. The HQs in the ERA generally were based on comparisons of exposure point concentrations to NOECs or NOAELs, or to similar values (rather than comparing to the lowest observed effect concentrations [LOECs] or LOAELs).

The LOECs and LOAELs are typically about ten times the NOECs and NOAELs, and an uncertainty factor of 10 was used in the ERA to estimate the NOEC or NOAEL when the referenced study reported only the lowest effect levels. Thus, concentrations up to ten times the NOECs or NOAELs that were used (consistent with conservative ERA assumptions and practice) could represent acceptable levels of contamination for chemicals at the various sites, especially for population-level endpoints and common species. Using both the NOEC/NOAEL and the LOEC/LOAEL provides a range of values that can be considered in risk management decisionmaking.

Site use factors (i.e., proportion of time receptors are likely to spend on-site) were conservatively assumed to be one for the ERA, even though most of the birds and mammals selected as target receptors have foraging ranges that are larger than the affected areas at the terrestrial sites. This is particularly true for the burrowing owl, which typically has a foraging range of about 300 acres (Gervais, 2000). This foraging range was identified in a recent study conducted at Lemoore Air Field, which is an ecological setting similar to that at Travis AFB.

The risk management decision for the terrestrial sites focused primarily on protection of special-status species individuals (i.e., the burrowing owl, which was the special-status species selected for the ERA because it is known to occur on some of the sites and can be expected to forage on any of the sites). Setting the cleanup levels to be protective of the burrowing owl (and basing the cleanup levels on NOAELs for this species) will result in reduction of risk to other ecological receptors at the terrestrial sites.

When the combined consideration of LOECs or LOAELs for the common species, potentially limited use of on-site habitats by those receptors (as well as the burrowing owl), and the goal of protecting populations (rather than individuals) of the common species were taken into account, it was concluded that there will be no potential unacceptable ecological risk remaining at the soil sites. This is particularly true because the soil sites are small in relation to the amount of available similar habitat on-base and in the surrounding region, and any residual (post-remediation) contamination will not adversely impact populations of these species.

The Evaluation of Ecological Protection for Remedial Actions in the WABOU Soil ROD (CH2M HILL, 2001b) presents the risk evaluations that led to the ecological input to the soil cleanup levels. Section 5.3 (Site-Specific Remedial Actions) summarizes the results of the ERA for each site from the WABOU RI Report (CH2M HILL, 1997) and presents the rationale for the selected cleanup levels.

5.2.6 Groundwater Protection

It is important that the residual soil contamination at each site does not serve as a continuing source of groundwater contamination. There are two groups of WABOU soil sites based on this criterion: those without contaminated groundwater and those with contaminated groundwater.

5.2.6.1 Sites without Groundwater Contamination

The WABOU RI investigated contamination in the soil and groundwater at each WABOU site. At several sites, the WABOU RI concluded that there was no groundwater contamination present, using either the significant reduction of soil contaminant concentrations in the vadose zone with depth or the results of groundwater sample analysis. The WABOU RI report review also evaluated site histories to determine the approximate date of the initial release and to determine if sufficient time had elapsed for a groundwater impact to be observed in the closest down-gradient monitoring location. For those sites where the release took place more than 10 years ago, it was determined that current groundwater data would serve as a suitable indicator of whether a groundwater impact was likely to occur now or in the future. For those sites where groundwater has not yet been impacted by the release, it

was decided that the cleanup level based on human health and ecological protection would also provide sufficient protection of the groundwater resource.

The WABOU RI did not evaluate the groundwater conditions at several soil sites due to considerations of the insoluble nature of the contaminants. At these sites the Base collected groundwater samples at locations immediately downgradient of the highest contaminant concentrations. The purpose of this sampling effort was to collect the empirical evidence needed to prove that the soil contaminants are not leaching into the groundwater. The results of the sample analyses demonstrated that there is no leachate generation at these sites. The *Evaluation of Groundwater Protection for Remedial Actions in the WABOU Soil ROD* (CH2M HILL, 2001a) presents the results of these analyses.

5.2.6.2 Sites with Groundwater Contamination

At several WABOU sites, groundwater contamination is present and is undergoing treatment in a separate groundwater remedial action. For those sites where groundwater has already been impacted, it was necessary to determine whether residual contaminant concentrations less than the selected cleanup level could potentially serve as a continuing source of groundwater pollution. To demonstrate that the cleanup levels at a soil site with groundwater contamination are protective of groundwater beneficial use objectives, the Base collected soil samples in the most highly contaminated portions of the site and analyzed them, using the landfill assessment approach for determining the CAMU acceptance levels. The *Corrective Action Management Unit Soil Acceptance Criteria* (Radian, 2001) provides a more detailed description of the approach for developing the CAMU acceptance levels. This approach takes into account the low permeability of the underlying soil strata and the distance between the contaminant source area and the water table. This approach takes the concentration of the contaminants and compares them to the amount of contaminant that leached from the sample when subjected to a modified California Waste Extraction Test modified to use deionized water as an extractant. A site-specific dissociation constant was then calculated by dividing the leachate concentration by the total soil concentration. The analyses resulted in the identification of chemical concentrations that are protective of groundwater beneficial use objectives. The *Evaluation of Groundwater Protection for Remedial Actions in the WABOU Soil ROD* (CH2M HILL, 2001a) presents the rationale for the application of this methodology to the evaluation of groundwater protection and the results of these analyses.

5.2.7 Former Small Arms Range Remedial Action Plan

The former small arms range (SD045) was the subject of an Air Force Center for Environmental Excellence (AFCEE)-funded demonstration project that is part of a nationwide Air Force initiative to develop a standardized approach for the streamlined assessment of remedial requirements at Air Force small arms ranges. The purpose of the initiative is to establish a technically sound, unified approach to firing range site investigation, risk evaluation, and remediation that is cost effective. AFCEE plans to use the information acquired during the application of the risk-based approach to prepare a technical protocol document for use by remedial project managers and their subcontractors to cost-effectively mitigate potential environmental hazards associated with Air Force firing ranges. The Air Force published the risk-based approach in the *Work Plan for the Demonstration of a Risk-Based*

Approach To Determine Remedial Requirements at the Former Small Arms Firing Range (SAR1), Travis AFB, California (Parsons, 1998).

The risk-based approach consists of four major tasks:

1. Estimate of Lead Absorption by the Human Body - This estimate was made using the following measurements:
 - Particle Size - Soil samples were sieved and analyzed chemically to determine the particle size of the metal contaminants.
 - Chemistry - An electron microprobe was used to determine the forms of lead (oxides, sulfates, etc.) that are present in the soil. This information is important, because different lead compounds are absorbed into people, plants and animals at different rates.
 - Lead Absorption Analysis - The study used the U.S. EPA Technical Review Workgroup Adult Blood Lead Model to evaluate potential risks to on-base industrial workers from site contaminants.
2. Evaluation of Ecological Risk - The study evaluated the potential risks of site contaminants on terrestrial plants and invertebrates, the burrowing owl, the western meadowlark, and the deer mouse. It took into consideration the disruption of cattle grazing and firebreak disking on the ecological habitat. Once the potential risks were characterized, risk-based remediation goals were calculated.
3. Treatability Testing - Three treatment technologies (gravity separation, acid leaching, and stabilization with Portland cement) were tested to determine their effectiveness under existing site conditions.
4. Feasibility Study - A focused feasibility study was performed to evaluate remedial alternatives to reduce risks associated with antimony, copper, and lead concentrations in soil at the site. The five remedial alternatives were land use restrictions, a soil cap, excavation and on-site treatment (acid leaching), excavation and placement in an on-base CAMU, and excavation and off-base disposal.

After the completion of the field activities that were described in the above work plan, the Air Force published the *Remedial Action Plan for the Former Small Arms Range (SAR1), Travis AFB, California (RAP) (Parsons, 2000)*. The RAP summarizes the findings of the risk-based investigation of SD045, recommends a preferred remedial alternative to address the metals contamination in the soil, and presents soil remediation goals that are protective of current and future workers, plants and animals. The Air Force used the RAP to select cleanup levels for this site.

5.2.8 WABOU Reference Concentrations

The WABOU RI evaluated the inorganic chemicals found at WABOU sites to determine whether inorganic constituents detected in samples are naturally occurring or are the result of contamination from past activities. The end product of this evaluation was a table of WABOU maximum reference concentrations for all media. Section 3.5 (Inorganic Constituent Evaluation) of the WABOU RI report summarizes the approach used to evaluate the

WABOU inorganic data set. Appendix H1 of the WABOU RI report provides a more detailed discussion of the WABOU inorganic constituent evaluation.

Barium at SD042 is the only chemical that required the application of WABOU maximum reference concentrations in the selection of soil cleanup levels.

5.3 Site-Specific Remedial Actions

The following subsections present a brief description of the 10 WABOU soil sites; the selected remedial action for each site; and descriptions of the protectiveness of the remedial action to human health, the ecological receptors, and groundwater beneficial use objectives.

Tables II-5-1 through II-5-8 present the soil cleanup levels for the sites that require active remedial action in accordance with the NCP. The shaded cells in the risk columns of these tables indicate the concentration (cancer, non-cancer, ecological, or groundwater protection) that led to the soil cleanup level.

The following subsections also provide the rationale for the selection of cleanup levels for each site. These soil cleanup levels take into account the site-specific conditions, comply with CERCLA, and are protective of human health and the environment.

For clarification purposes, the WABOU RI report used the term "hazard index" to refer to a measure of non-carcinogenic risk to humans and the term "hazard quotient" to refer to a measure of ecological risk. This ROD describes the hazard index in section 3.2.1 (Human Health Risk Assessment) and the hazard quotient in section 3.2.2 (Ecological Risk Assessment).

The WABOU RI report (CH2M HILL, 1997) is the source of the risk values listed below.

5.3.1 Building 755 (DP039)

Site Description – Building 755 is the Base battery and electric shop. The past practice for disposing of used battery acid was to pour it into a battery neutralization sump. The Base dismantled the sump in 1993. The area immediately surrounding the former sump area contains lead, possibly left behind from the sump removal action.

Selected Remedial Alternative(s) – Alternative S2 (Land Use and Access Restrictions) is the selected remedial action for this site. The Air Force will restrict the use of this small area to industrial activities only. Administrative controls will be sufficient to enforce the restriction, so no physical barriers (i.e., fences) will be necessary. The Travis AFB General Plan will document the presence of lead in the surface soil and enforce the land use restriction, particularly on the use of the contaminated area for playground or other play activities.

The objective of this remedial action is to document the location of the contaminants and apply land use controls to prevent the site from being used for residential purposes. This is the most cost-effective remedy available, since it avoids the cost of an active remedial action, such as excavation and disposal. Also, the selection of an active remedial action would still not allow the site to be used for residential purposes, primarily due to its location within an existing explosive safety clear zone associated with a nearby ammunition handling facility.

Protection of Human Health – Lead is the soil COC at this site. There is no estimated excess lifetime cancer risk; however, lead is regulated based on developmental toxicity. The lead concentrations at the former sump area range from 56.5 mg/kg to 7,040 mg/kg (830 mg/kg average), which equates to a potential non-cancer residential hazard index of 11. The average value reflects 'hot spot' concentrations only (biased high); the estimated industrial hazard index is less than 1, and the calculated blood-lead level for the site (6 µg/dL) is lower than the threshold level of 10 µg/dL. The site does not pose an unacceptable potential risk to site workers, and the selected remedy is protective of human health by preventing the residential use of the property, including day care center activities. Section 4.1.7 of the WABOU RI presents the results of the human health risk assessment for this site.

Protection of Ecological Receptors – The small area of lead contamination results in a low exposure potential for ecological receptors, so lead is not a chemical of ecological concern at this site. Section 4.1.8 of the WABOU RI report presents the results of the ecological risk assessment for this site.

Protection of Groundwater – The WABOU RI detected lead in the local groundwater at concentrations below the U.S. EPA MCL. Lead is not a groundwater chemical of concern at this site, so the selected remedial alternative is protective of groundwater beneficial use objectives. The *Evaluation of Groundwater Protection for Remedial Actions in the WABOU Soil ROD* (CH2M HILL, 2000a) technical memorandum presents a more detailed discussion on the groundwater evaluation of this site.

5.3.2 Building 905 (SS041)

Site Description – Building 905 is the Base entomology shop. The surface soil within this fenced facility contains various pesticides from the past washing of pesticide-applicator vehicles on a concrete washrack.

Selected Remedial Alternative(s) – Alternative S6 (Excavation/On-base Consolidation) is the selected remedial action for this site. Table II-5-1 presents the soil cleanup levels for the chemicals of concern at the site. Alternative S5 (Excavation/Off-base Disposal) is the selected contingency remedial action for soil that exceeds the CAMU acceptance levels.

TABLE II-5-1
Cleanup Levels for Soil COCs at Building 905 (SS041)
WABOU Soil ROD
Travis AFB, California

Chemical of Concern	Soil Cleanup Level (mg/kg)	Residential (mg/kg)		Industrial (mg/kg)		HQ=1 (mg/kg)	Potential for Groundwater Impact?
		10 ⁻⁶ Cancer Risk	Chronic HI=1	10 ⁻⁶ Cancer Risk	Chronic HI=1		
chlordane	6.5	1.6	35	8.5	670	NA ^a	No
heptachlor epoxide	0.19	0.053	0.79	1.9	11	NA	Yes ^b
toxaphene	1.6	0.44	NA	5	NA	NA	No

^a NA = Not Applicable

^b The *Evaluation of Groundwater Protection for Remedial Actions in the WABOU Soil ROD* (CH2M HILL, 2001a) technical memorandum describes the confirmatory analyses for verification that the cleanup level for this compound is protective of groundwater beneficial use objectives.

If some of the excavated soil does not meet the CAMU acceptance criteria, the Air Force will determine whether the soil needs to be sent to an off-base landfill or whether a soil treatment can stabilize the contaminants sufficiently for placement in the CAMU. Alternative S4 (Excavation/ Treatment/On-base Consolidation) is the selected contingency remedial action if it proves to be a cost-effective improvement over Alternative S5.

Alternative S2 (Land Use and Access Restrictions) is also a selected remedial action for the site. However, it will not be implemented if Alternative S6 achieves the residential cleanup values as presented in Table II-5-1. Administrative controls will be sufficient to enforce future restrictions at this site, because a fence is already in place around the site. The Travis AFB General Plan will document the presence of pesticides in the soil and enforce the land use restrictions, including the prohibition on day care center activities.

The basis for selecting an active remedial action at this site is the protection of groundwater beneficial use objectives. The Air Force will excavate the pesticide-contaminated soil surrounding the concrete washrack and transport it to the CAMU. The estimated volume of excavated soil is approximately 100 cubic yards. The excavation will be backfilled with clean soil. This approach has minimal impact on entomology shop operations. The estimated cost for Alternative S6 is \$32,000; the estimated cost for Alternative S5 is \$57,000, and the estimated cost for Alternative S4 is \$90,600. This is the most cost-effective remedy that meets the remedial action objective of removing as much of the soil contaminants as needed to improve the effectiveness of the existing groundwater extraction and treatment remedy at this site. Figure II-5-2 shows the areal extent of contamination and the approximate limits of excavation.

Protection of Human Health – Chlordane, heptachlor epoxide, and toxaphene are the chemicals of concern at this site. The estimated excess lifetime cancer risk for potential future worker exposure is 4×10^{-5} for surface soil, based on existing contaminant concentrations. The estimated hazard index for potential industrial exposure is 0.4 for surface soil. For subsurface soil the estimated excess lifetime cancer risk for all personnel is below 1×10^{-6} , and the estimated hazard index for residential exposure is below 1. Even though the basis of the selected remedial action is protection of groundwater beneficial use objectives, the cleanup levels will reduce the estimated excess lifetime cancer risk for potential future worker exposure to 1×10^{-6} for each contaminant.

Protection of Ecological Receptors – There is no ecological habitat, and therefore no chemicals of ecological concern, at the site. Section 4.2.8 of the WABOU RI report presents the results of the ecological risk assessment for this site.

Protection of Groundwater – The local groundwater also contains heptachlor epoxide, and a separate groundwater remedial action (groundwater extraction and treatment) is removing this contaminant from the groundwater. Although this pesticide does not readily dissolve in groundwater, the soil remedial action will remove the source of groundwater contamination. The other two soil COCs (chlordane and toxaphene) are not groundwater COCs, so their concentrations prior to an active soil remedial action are already protective of the groundwater beneficial use objectives. However, the selected remedial action will reduce the potential of the soil COCs to leach into the local groundwater.

The *Evaluation of Groundwater Protection for Remedial Actions in the WABOU Soil ROD* (CH2M HILL, 2000a) technical memorandum describes the field analysis that was used to calculate contaminant concentrations in the soil that are protective of groundwater beneficial use objectives. Groundwater monitoring associated with the groundwater remedial action will verify the effectiveness of the soil and groundwater remedial actions at the site.

5.3.3 Building 916 (SD043)

Site Description – This site is an electric power facility. At least one electrical transformer on a concrete pad adjacent to the building leaked PCB-laden oil into the surface soil.

Selected Remedial Alternative(s) – Alternative S2 (Land Use and Access Restrictions) is the selected remedial action for this site. The Air Force will restrict the use of this small area to industrial activities only. Administrative controls will be sufficient to enforce the restriction, so no physical barriers (i.e., fences) will be necessary. The Travis AFB General Plan will document the presence of this compound and enforce the land use restriction.

Section 5.8.1 [Building 916 (SD043)] describes the change made to the proposed remedial alternative. The residential cleanup value for PCB-1254 is 0.22mg/kg.

Protection of Human Health – PCB-1254 is the chemical of concern at this site. The remaining PCB-1254 concentrations at the former transformer area range from 0.051 mg/kg to 2.0 mg/kg (0.58 mg/kg average), which equates to a potential residential cancer risk of 2.6×10^{-6} . The estimated excess lifetime cancer risk for potential future worker exposure is below 1×10^{-6} for surface soil (based on the screening human health risk assessment) and is 6×10^{-8} for subsurface soil. The estimated non-cancer risk value for potential industrial exposure is below 0.1 for surface soil (based on the screening human health risk assessment) and is 0.1 for subsurface soil. The site does not pose an unacceptable potential risk to site workers, and the selected remedy is protective of human health by maintaining the industrial use of the property. Section 4.3.7 of the WABOU RI report presents the results of the human health risk assessment for this site.

Protection of Ecological Receptors – There are no chemicals of ecological concern associated with this site. Section 4.3.8 of the WABOU RI report presents the results of the ecological risk assessment for this site.

Protection of Groundwater – The WABOU RI detected PCB-1254 in an unfiltered groundwater sample taken directly under the leak area. Additional groundwater samples taken from sampling points approximately 15 feet and 30 feet from the leak area contained no PCBs. Since the leak occurred over eight years ago, this sampling effort demonstrates that the low PCBs concentrations in the soil are not contaminating the local groundwater. The *Reevaluation of Soil and Groundwater Contamination at Building 916 (SD043)* Technical Memorandum (CH2M HILL, 2000) presents a detailed discussion on this groundwater sampling effort.

Even though the additional fieldwork described above demonstrated that the PCBs are not migrating from the source area, the Air Force will collect and analyze a set of groundwater samples from the three groundwater monitoring points located downgradient of the PCB leak area. This field effort will take place within the Travis AFB Groundwater Sampling and Analysis Program (GSAP) after all WABOU soil actions are complete and will provide addi-

tional verification that PCBs are not migrating from the source area. If the GSAP demonstrates that PCBs are consistently present in the groundwater at concentrations greater than MCLs, then the Air Force will evaluate the available remediation technologies and implement an appropriate contingency remedial action.

5.3.4 Building 929/931/940 (SD042)

Site Description – Building 929 is a storage shed, building 931 is maintenance facility for portable electrical generators, and building 940 was a former paint-drying facility. The ditch adjacent to these buildings received metals and SVOC contaminants from past industrial activities.

Selected Remedial Alternative(s) – Alternative S6 (Excavation/On-base Consolidation) is the selected remedial action for this site. Tables II-5-2A and II-5-2B present the soil cleanup levels for the chemicals of concern at the site. Alternative S5 (Excavation/Off-base Disposal) is the selected contingency remedial action for soil that exceeds the CAMU acceptance levels.

TABLE II-5-2A

Cleanup Levels for Surface Soil COCs and COECs at Buildings 929/931/940 (SD042)

WABOU Soil ROD

Travis AFB, California

Chemical of Concern	Soil Cleanup Level (mg/kg) ^a	Residential (mg/kg)		Industrial (mg/kg)		HQ=1 (mg/kg)	Potential for Groundwater Impact?
		10 ⁻⁶ Cancer Risk	Chronic HI=1	10 ⁻⁶ Cancer Risk	Chronic HI=1		
Benzo(a) pyrene	0.21	0.062	NA ^b	0.21	NA	59	No
Dibenz(a,h) anthracene	0.0092	0.062	NA	0.21	NA	0.0092	No
Benzo(b) fluoranthene	2.1	0.62	NA	2.1	NA	61	No
Indeno(1,2,3-c,d) pyrene	2.1	0.62	NA	2.1	NA	110	No
Fluoranthene	850	NA	2,300	NA	22,000	850	No
Barium	860 ^c	NA	5,400	NA	67,000	91	No
Cadmium	47	1,400	37	3,000	450	47	No
Total Chromium	450	210	NA	450	NA	2,900	No
Lead	380	NA	400	NA	750	380	No
Nickel	520	NA	1,600	NA	20,000	520	No
Zinc	6,900	NA	23,000	NA	100,000	6,900	No

a These cleanup levels apply to soil within a depth of 6 inches below ground surface (bgs) at Buildings 929/931/940.

b NA = Not Applicable

c The cleanup level for Barium is based on the WABOU maximum reference concentration Section 5.2.8 (WABOU Reference Concentrations) addresses the derivation of this value.

If some of the excavated soil does not meet the CAMU acceptance criteria, the Air Force will determine whether the soil needs to be sent to an off-base landfill or whether a soil treatment can stabilize the contaminants sufficiently for placement in the CAMU. Alternative S4 (Excavation/Treatment/On-base Consolidation) is the selected contingency remedial action if it proves to be a cost-effective improvement over Alternative S5.

TABLE II-5-2B
 Cleanup Levels for Subsurface Soil COCs and COECs at Buildings 929/931/940 (SD042)
 WABOU Soil ROD
 Travis AFB, California

Chemical of Concern	Soil Cleanup Level (mg/kg) ^d	Residential (mg/kg)		Industrial (mg/kg)		HQ=1 (mg/kg)	Potential for Groundwater Impact?
		10 ⁻⁶ Cancer Risk	Chronic HI=1	10 ⁻⁶ Cancer Risk	Chronic HI=1		
Benzo(a) pyrene	59	0.062	NA ^b	0.21	NA	59	No
Dibenz(a,h) anthracene	0.0092	0.062	NA	0.21	NA	0.0092	No
Benzo(b) fluoranthene	61	0.62	NA	2.1	NA	61	No
Indeno(1,2,3-c,d) pyrene	110	0.62	NA	2.1	NA	110	No
Fluoranthene	850	NA	2,300	NA	22,000	850	No
Barium	860 ^c	NA	5,400	NA	67,000	91	No
Cadmium	47	1,400	37	3,000	450	47	No
Total Chromium	2,900	210	NA	450	NA	2,900	No
Lead	380	NA	400	NA	750	380	No
Nickel	520	NA	1,600	NA	20,000	520	No
Zinc	6,900	NA	23,000	NA	100,000	6,900	No

^d These cleanup levels apply to soil greater than a depth of 6 inches below ground surface (bgs) at Buildings 929/931/940

The basis for the selected alternative is the protection of ecological receptors. The Air Force will excavate soil contaminated with metals and SVOCs from the drainage ditch adjacent to Buildings 929/931/940 and transport it to the CAMU. The estimated volume of contaminated soil is approximately 295 cubic yards. The excavation may be backfilled with clean soil, depending on the volume of soil that is removed from the ditch. The estimated cost for Alternative S6 is \$86,000; the estimated cost for Alternative S5 is \$176,000, and the estimated cost for Alternative S4 is \$197,600. This is the most cost-effective remedy that meets the remedial action objective of cleaning up the site to levels that are protective of individual burrowing owls and populations of other ecological receptors. Figure II-5-3 shows the areal extent of contamination and the approximate limits of excavation.

Alternative S2 (Land Use and Access Restrictions) is also a selected remedial action for the site. However, it will not be implemented if Alternative S6 achieves the residential cleanup values as presented in Tables II-5-2A and II-5-2B. Administrative controls will be sufficient to enforce this action, so no physical barriers (i.e., fences) will be necessary. The Travis AFB General Plan will document the presence of metals and SVOCs in the surface soil and enforce the restriction on residential land use, including day care center activities.

Protection of Human Health – Benzo(a)pyrene, benzo(b)fluoranthene, cadmium, and dibenz(a,h)anthracene are the chemicals of concern for this site. The estimated excess lifetime cancer risk for potential future worker exposure is 1×10^{-5} for surface soil, based on existing contaminant concentrations. The estimated hazard index for potential industrial

exposure is 0.4 for surface soil. Even though the basis of the selected remedial action is protection of ecological receptors, the cleanup levels will reduce the estimated excess lifetime cancer risk for potential future worker exposure. As described in section 5.2.2 (Risk Management), the soil cleanup levels for the top six inches of soil equate to a 10^{-6} risk level under industrial conditions. The subsurface soil contained no chemicals of concern, so the soil cleanup levels below six inches below ground surface equate to a hazard quotient of one for the burrowing owl, since this is the basis for conducting a remedial action at this site. Section 4.4.7 of the WABOU RI report presents the results of the human health risk assessment for this site.

Protection of Ecological Receptors – Barium, cadmium, chromium, lead, nickel, zinc, benzo(a)pyrene, dibenz(a,h)anthracene, fluoranthene, and indeno(1,2,3-c,d)pyrene are the chemicals of ecological concern for this site. Ecological risks were evaluated for plants, terrestrial invertebrates, deer mice (*Peromyscus maniculatus*), ornate shrews (*Sorex ornatus*), western meadowlarks (*Sturnella neglecta*), and burrowing owls at this site. Sensitivity of the various receptors differed among the COECs identified at the site, with deer mice and shrews generally being most sensitive, especially to cadmium and benzo(a)pyrene exposure

Cleanup levels were selected to protect individual burrowing owls and populations of the other ecological receptors. They took into account the assumption that an owl would feed consistently at the contaminated portion (less than 0.5 acres) of the site, even though it represents only about 0.2 percent of the typical foraging range for an owl. The evaluations conducted for other ecological receptors indicate that remediation of soil to the degree necessary for protection of the burrowing owl will be reasonably protective for plants, invertebrates, and common species of birds and mammals at the site. This is particularly true because the site represents a very small fraction of the similar habitat on-base and in the surrounding area, and the goal for other receptors is to protect populations rather than individuals of those receptors. When the combined consideration of LOECs or LOAELs for the common species, potentially limited use of on-site habitats by those receptors (as well as the burrowing owl), and the goal of protecting populations (rather than individuals) of the common species were taken into account, it was concluded that there will be no potential unacceptable ecological risk remaining at this site. The *Evaluation of Ecological Protection for Remedial Actions in the WABOU Soil ROD* (CH2M HILL, 2001b) presents a more detailed description of this ecological evaluation.

Protection of Groundwater – The WABOU RI did not evaluate the presence of contaminants in the local groundwater, because the soil contaminant concentrations decreased significantly with depth. However, the Base collected and analyzed groundwater samples immediately downgradient of the highest surface soil concentrations to determine whether the chemicals of concern were present in the groundwater. The results of the groundwater analysis demonstrate that the current concentrations of the chemicals of concern in the soil do not have an adverse impact on the local groundwater. Therefore, the soil cleanup levels are also protective of groundwater beneficial use objectives. The *Evaluation of Groundwater Protection for Remedial Actions in the WABOU Soil ROD* (CH2M HILL, 2001a) technical memorandum presents a more detailed description of this field investigation.

5.3.5 Landfill 3 (LF008)

Site Description – Landfill 3 consists of trenches used for the past disposal of pesticide containers.

Selected Remedial Alternative(s) – Alternative S5 (Excavation/Off-base Disposal) is the selected remedial action for this site. Tables II-5-3A and II-5-3B present the soil cleanup levels for the chemicals of concern at the site. Alternative S6 (Excavation/On-base Consolidation) is the selected contingency remedial action for soil that does not exceed the CAMU acceptance levels. Alternative S2 (Land Use and Access Restrictions) is also a selected remedial action for the site. However, it will not be implemented if Alternative S5 achieves the residential cleanup values as presented in Tables II-5-3A and II-5-3B. The Travis AFB General Plan will document the presence of pesticides in the soil and enforce the land use restrictions, including the prohibition on day care center activities.

TABLE II-5-3A
Cleanup Levels for Surface Soil COCs and COECs at Landfill 3 (LF008)
WABOU Soil ROD
Travis AFB, California

Chemical of Concern	Soil Cleanup Level (mg/kg) ^a	Residential (mg/kg)		Industrial (mg/kg)		HQ=1 (mg/kg)	Potential for Groundwater Impact?
		10 ⁻⁶ Cancer Risk	Chronic HI=1	10 ⁻⁶ Cancer Risk	Chronic HI=1		
chlordane	0.9	1.6	35	6.5	670	0.9	No
dieldrin	0.11	0.03	3.1	0.11	44	0.29	No
endosulfan	7.5	NA	370	NA	3,700	7.5	No
heptachlor	0.38	0.11	31	0.38	440	0.97	No
heptachlor epoxide	0.037	0.053	0.79	0.19	11	0.037	No
methoxychlor	3,100	NA	310	NA	3,100	5,300	No

^a These cleanup levels apply to soil within a depth of 4 feet below ground surface (bgs) at Landfill 3.

TABLE II-5-3B
Cleanup Levels for Subsurface Soil COCs and COECs at Landfill 3 (LF008)
WABOU Soil ROD
Travis AFB, California

Chemical of Concern	Soil Cleanup Level (mg/kg) ^b	Residential (mg/kg)		Industrial (mg/kg)		HQ=1 (mg/kg)	Potential for Groundwater Impact?
		10 ⁻⁶ Cancer Risk	Chronic HI=1	10 ⁻⁵ Cancer Risk	Chronic HI=1		
chlordane	65	1.6	35	65	670	NA	Yes ^c
dieldrin	1.1	0.03	3.1	1.1	44	NA	Yes
endosulfan	3,700	NA	370	NA	3,700	NA	No
heptachlor	3.8	0.11	31	3.8	440	NA	Yes
heptachlor epoxide	1.9	0.053	0.79	1.9	11	NA	Yes
methoxychlor	3,100	NA	310	NA	3,100	NA	No

^b These cleanup levels apply to soil greater than a depth of 4 feet bgs at Landfill 3.

^c The *Evaluation of Groundwater Protection for Remedial Actions in the WABOU Soil ROD* (CH2M HILL, 2001a) technical memorandum describes the confirmatory analyses for verification that the cleanup level for this compound is protective of groundwater beneficial use objectives

NA = Not Applicable

The rationale for this selection is that there may be intact containers of liquid pesticides in the trenches at Landfill 3. If these containers were to break during excavation and transport to the CAMU, the contents would potentially be incompatible with other CAMU waste. The liquid pesticides could also percolate through the soil and have an impact on groundwater beneath the CAMU. The containers and contaminated soil present a potential risk to human health but does not present a risk to ecological receptors, based on the depth at which the contamination is found

The Air Force will begin the remedial action by excavating the soil above the trenches. Any contaminated portion of this soil will be placed into the CAMU only if it meets the established CAMU acceptance levels. Then the Air Force will remove the containers and highly pesticide-contaminated soil and transport them to an appropriate offsite disposal facility. The excavation and transport of contaminated soil to either the CAMU or to the offsite facility (depending on the ability of the soil to meet CAMU acceptance levels) will continue until the cleanup levels are achieved or a maximum depth of 15 feet is reached. This is the depth that a typical excavator can reach. At this point, the excavation will stop, and the pit will be backfilled with clean soil. Since this soil remedial action will remove most of the source of the groundwater contamination from the subsurface, the Air Force will then rely on the existing groundwater extraction and treatment system to contain and remove the residual contaminants from the site.

The total estimated volume of contaminated soil is 11,110 cubic yards. The estimated cost of this action is \$4,162,000, based on the off-base disposal of the entire estimated soil volume. The placement of soil into the CAMU as described above will reduce the overall cost of this remedial action and still allow Travis AFB to meet the remedial action objective of removing as much of the soil contaminants as needed to improve the effectiveness of the existing groundwater extraction and treatment remedy at this site. Figure II-5-4 shows the areal extent of contamination and the approximate limits of excavation.

Table II-5-3A presents the LF008 cleanup levels for the soil within a depth of 4 feet below ground surface (bgs). The 0 to 4 foot depth is the reasonable limit of potential exposure to contaminants by burrowing animals and most plant roots, so the cleanup levels in Table II-5-3A take into account the protection of ecological receptors. Table II-5-3B presents the LF008 cleanup levels for the soil greater than 4 feet bgs. Since there is a negligible exposure pathway between ecological receptors and contaminants from soil that exceeds the 4-foot depth, the cleanup levels in Table II-5-3B do not use the ecological protection values in their calculations.

Specific site conditions provide the basis for any departure from the 10^{-6} cancer risk value. A review of these risk-reducing site conditions was part of the determination of whether a site warrants a departure from the starting point. When applying these factors to a specific site, the qualitative and quantitative value of the factors present justifies and supports departure from the 10^{-6} limit toward the protective and authorized 10^{-4} limit. Table II-5-3C presents the mitigating factors that are present at LF008. An excess lifetime cancer risk level for future industrial exposure of 1×10^{-5} is justified, because the presence of these mitigating factors greatly diminishes the time an industrial worker spends on-site and the resulting potential industrial exposure to the contaminated soil beneath buried waste. This time-spent-on-site is far below the assumed exposure time used to calculate industrial risk. Present and future exposure is minimal due to site conditions and the low level of industrial activity at the site.

TABLE II-5-3C
 Specific Factors Justifying Departure from 10^{-6} Risk Level for Landfill 3 (LF008)
 WABOU Soil ROD
 Travis AFB, California

No.	Description	Rationale
1	Installation Boundary Fence	A boundary fence surrounds Travis AFB. This fence limits Base access to personnel who reside, work or conduct business at Travis AFB. Personnel can only enter the installation through four manned gates.
2	Site Fence	Landfill 3 has an additional fence to allow site access to authorized personnel only. The activities at this site are sensitive in nature and require a greater level of control over property use. LF008 is enclosed in the fence that protects A bunker, an ammunition storage facility.
3	Clear Zones	Landfill 3 is located in restricted explosive safety, quantity-distance clear zones due to its proximity to ammunition storage and handling facilities. The Wing Safety Office closely monitors the land use within a safety clear zone and restricts its use to activities that involve a maximum of 25 persons at one time. For example, office building construction does not take place inside clear zones. In essence, the explosive safety clear zone is a restricted area for industrial and construction activities. Permitted activities within the zone, such as landscape maintenance, are not routine and of short duration.
4	Noise Level Restrictions	The area surrounding the runways at Travis AFB is called the Air Installation Compatible Use Zone (AICUZ). The dimensions of the noise contours within the zone are based on the level of noise that is generated by aircraft operations. High noise levels can have an adverse effect on personnel, so the Base discourages development in areas within this zone both on- and off-base.
5	Security Forces	Security forces regularly patrol Travis AFB for unauthorized activities. This monitoring enforces the land use restrictions that are in place.
6	Escort Requirements	Certain portions of the installation are official restricted areas and require a qualified Base escort to obtain site access. Taxiways and ammunition storage and handling areas are examples of restricted areas. Site access is limited to individuals with a specific need to enter. This consideration applies to LF008, which is located in an ammunition storage facility. A Base representative trained in ammunition safety must escort personnel who enter this facility. This factor decreases worker time on-site compared to the standard assumption for time on-site and the resulting potential exposure.
7	Segregation of Residential/Industrial Areas	Residential housing areas at Travis AFB are physically separate and geographically remote from all WABOU sites. The closest site, LF008, is approximately 2/3 mile from a residential complex.
8	Transient Work Force	The majority of workers at Travis AFB are transient military members, thereby limiting their period of potential exposure. All Travis AFB residents are military members and their dependents. Due to the frequency of transfers, the average length of assignment to Travis AFB is approximately three years, which limits their potential lifetime exposure.

Protection of Human Health—Chlordane, dieldrin, heptachlor, and heptachlor epoxide are the chemicals of concern for this site. The estimated excess lifetime cancer risk for potential future industrial exposure to surface soil is 5×10^{-6} and to subsurface soil is 2×10^{-4} , based on existing contaminant concentrations. The estimated hazard index for potential industrial exposure is 3 for subsurface soil.

Protection of Ecological Receptors—Chlordane, dieldrin, endosulfan, heptachlor epoxide, and methoxychlor are the chemicals of ecological concern at this site. Ecological risks were evaluated for plants, terrestrial invertebrates, deer mice, ornate shrews, western meadowlarks, and burrowing owls at this site. Sensitivity of the various receptors differed

among the pesticides identified at the site, with birds generally being more sensitive than the mammals.

Cleanup levels were selected to protect individual burrowing owls and populations of the other ecological receptors. They took into account the assumption that an owl would feed consistently at the contaminated portion (about 0.7 acre) of this site, even though it represents about 0.2 percent of the typical foraging range for an owl. The evaluations conducted for other ecological receptors indicate that remediation of soil to the degree necessary for protection of the burrowing owl will be reasonably protective for plants, invertebrates, and common species of birds and mammals at the site. This is particularly true because the site represents a very small fraction of the similar habitat on-base and in the surrounding area, and the goal for other receptors is to protect populations rather than individuals of those receptors. When the combined consideration of LOECs or LOAELs for the common species, potentially limited use of on-site habitats by those receptors (as well as burrowing owls), and the goal of protecting populations (rather than individuals) of the common species were taken into account, it was concluded that populations of those species would not be affected by any potential impacts attributable to COECs remaining at this site. The *Evaluation of Ecological Protection for Remedial Actions in the WABOU Soil ROD* (CH2M HILL, 2001b) presents a more detailed description of this ecological evaluation.

Protection of Groundwater— The local groundwater contains chlordane, heptachlor and heptachlor epoxide; a separate groundwater remedial action will treat this contaminated groundwater in accordance with the *Groundwater Interim Record of Decision for the WABOU* (Travis AFB, 1999). Although the pesticides do not readily dissolve in groundwater, the buried waste may be acting as a potential source of groundwater contamination.

Two of the soil COCs, methoxychlor and endosulfan, are not groundwater COCs, so the current concentrations of these compounds are protective of groundwater beneficial use objectives.

The *Evaluation of Groundwater Protection for Remedial Actions in the WABOU Soil ROD* (CH2M HILL, 2001a) technical memorandum describes the field analysis that was used to calculate contaminant concentrations in the soil that are protective of groundwater beneficial use objectives. Groundwater monitoring associated with the groundwater remedial action will verify the effectiveness of the soil and groundwater remedial actions at the site.

5.3.6 Landfill X (LF044)

Site Description— Landfill X is located in an area used as a stockpile for construction debris, such as concrete and asphalt, and a heavy equipment training area.

Selected Remedial Alternative(s)— Alternative S2 (Land Use and Access Restrictions) is the selected remedial alternative for this site. Landfill X is not actually a landfill, but rather it is in an area used by the Base to train heavy equipment operators and to stockpile construction materials, such as asphalt and concrete. The metals and SVOCs found in the soil are constituents of these construction materials. The Air Force will install a fence around the contaminated area and the training and stockpile area. It is protective of human health, in that it will restrict personnel access to the site but will still allow the area to meet worker safety training and construction needs. Workers involved with safety training use adequate

noise and breathing protection equipment, when needed, in accordance with Occupational Safety and Health Administration (OSHA) regulations. Protective berms constructed within the fenced area will provide environmental protection by preventing soil contaminants from flowing during rain events into nearby vernal pools. The estimated cost of this action is \$139,000. Figure II-5-5 shows the areal extent of contamination and the proposed fence location. Table II-5-4 presents a comparison of the chemical concentrations in the soil with potential risk criteria.

TABLE II-5-4
Comparison of Soil COCs and COECs at Landfill X (LF044) to Potential Risk Criteria
WABOU Soil ROD
Travis AFB, California

Chemical of Concern	Average Concentration (mg/kg) ^a	Residential (mg/kg)		Industrial (mg/kg)		HQ=1 ^b (mg/kg)	Potential for Groundwater Impact?
		10 ⁻⁶ Cancer Risk	Chronic HI=1	10 ⁻⁶ Cancer Risk	Chronic HI=1		
Cadmium	0.704	1,400	37	3,000	450	47	No
Lead	16.94	NA	400	NA	750	380	No
Silver	0.686	NA	390	NA	5,100	230	No
Acenaphthene	0.205	NA	3,700	NA	29,000	1,200	No
Anthracene	0.494	NA	22,000	NA	100,000	5,100	No
Benzo(a) anthracene	2.09	0.62	NA	2.1	NA	3.1	No
Benzo(a) pyrene	2.67	0.062	NA	0.21	NA	59	No
Benzo(b) fluoranthene	2.16	0.62	NA	2.1	NA	61	No
Benzo(g,h,i) perylene	1.35	NA	56	NA	190	NA	No
Benzo(k) fluoranthene	2.39	6.2	NA	21	NA	110	No
Bis(2-ethylhexyl) phthalate	42.48	35	1,200	180	18,000	15,000	No
Chrysene	2.60	62	NA	210	NA	150	No
Dibenz(a,h) anthracene	0.652	0.062	NA	0.21	NA	0.0092	No
Fluoranthene	4.44	NA	2,300	NA	22,000	850	No
Indeno(1,2,3-cd) pyrene	1.47	0.62	NA	2.1	NA	110	No
Phenanthrene	1.79	NA	56	NA	190	510	No
Pyrene	3.84	NA	2,300	NA	29,000	850	No

^a mg/kg = milligrams per kilogram

^b Based on the protection of the burrowing owl

^c NA = Not Applicable

The objective of this remedial action is to document the location of the contaminants and apply land use controls to prevent the site from being used for residential purposes. This is the most cost-effective remedy available, as shown in Table II-4-6 (Relative Performance of Soil Alternatives - by Cost). Also, the selection of an active remedial action would still not

allow the site to be used for residential purposes, primarily due to its location within an existing explosive safety clear zone associated with a nearby ammunition handling facility.

The Travis AFB General Plan will describe all land use controls associated with the site, which will include compliance with any applicable personnel notification or other OSHA regulations that pertain to personnel access to the site.

If the Air Force decides to close the site in the future, a follow-on remedial action will be selected, based on the nature of the revised future land use. Until that time, the Travis AFB General Plan will restrict use of this site to industrial use with protective clothing.

Protection of Human Health – Benzo(a)pyrene, benzo(a)anthracene, dibenz(a,h)anthracene, and benzo(k)fluoranthene are the chemicals of concern at this site. The estimated excess lifetime cancer risk for potential future worker exposure is 2×10^{-5} for both surface and subsurface soil, based on existing contaminant concentrations, which is within the risk management range for carcinogens. The estimated hazard index for potential industrial exposure is 0.007 for subsurface soil. The chemicals are attributed to the asphalt and concrete that is stockpiled in the area. This is an active industrial facility, and all site workers wear appropriate personal protection equipment in accordance with OSHA regulations. Also, the area investigated during the WABOU RI is located in a little-used portion of the facility, so the potential exposure of chemicals to the site workers is low. Therefore, the selected remedial alternative is protective of the site workers.

Protection of Ecological Receptors – Benzo(a)pyrene, benzo(a)anthracene, dibenz(a,h)anthracene, fluoranthene, benzo(k)fluoranthene, pyrene, benzo(g,h,i)perylene, benzo(b)fluoranthene, bis(2-ethylhexyl)phthalate, chrysene, indeno(1,2,3-c,d)pyrene, phenanthrene, cadmium, lead, silver, acenaphthene, and anthracene are the chemicals of ecological concern at this site. Ecological risks were evaluated for plants, terrestrial invertebrates, deer mice, ornate shrews, western meadowlarks, and burrowing owls at this site. Sensitivity of the various receptors differed among the three metals, a phthalate, and 13 polycyclic aromatic hydrocarbons (PAH) identified at the site, with birds and mammals generally being about equally sensitive. Exceptions were mainly cadmium and benzo(a)pyrene, to which the mammals were more sensitive. Plants and terrestrial invertebrates are considered most sensitive to bis(2-ethylhexyl)phthalate, which was found in the subsurface soil at the site.

Concentrations of COECs in surface soils are substantially lower than those in subsurface soils (which are less likely than surface soils to be an exposure source for most species). The only HQ that was very high for the burrowing owl was for dibenz(a,h)anthracene. There is considerable uncertainty associated with that HQ, because it was based on results of a study with mammals that were extrapolated to birds. Based on the results of a feeding study with mallards (*Anas platyrhynchos*) reported by Patton and Dieter (1980), the NOAEL-based acceptable level (i.e., the CTV) for dibenz(a,h)anthracene in the soil is 877 mg/kg. This indicates that this COEC realistically should pose minimal risk to the burrowing owl at this site.

This site is actively used by the Air Force as a heavy equipment training area. Ongoing site activities frequently alter the terrain as mounds of excavated soil and concrete rubble are moved during the training activities. The frequent site activities would routinely displace wildlife and make it unlikely that they would be able to permanently establish a residence.

This disturbance causes much of the site to provide sub-optimal habitat for wildlife. Birds and mammals are more likely to only occasionally use the site, preferring to use the less disturbed surrounding areas that provide higher-quality habitat.

The contaminated portion of this site is less than 7 acres, which represents less than 2 percent of the typical foraging range for a burrowing owl. When the combined consideration of LOECs or LOAELs for the common species, potentially limited use of on-site habitats by those receptors (as well as burrowing owls) due to the nature of site activities and the small size of the site compared to typical home ranges, and the goal of protecting populations (rather than individuals) of the common species were taken into account, it was concluded that populations of those species would not be affected by any potential impacts attributable to COECs at this site. This is particularly true because the site represents a very small fraction of the similar habitat on-base and in the surrounding area, and the goal for other receptors is to protect populations rather than individuals of those receptors. The *Evaluation of Ecological Protection for Remedial Actions in the WABOU Soil ROD* (CH2M HILL, 2001b) presents a more detailed description of this ecological evaluation.

Protection of Groundwater – The WABOU RI concluded that there are no groundwater COCs at this site. Therefore, the current concentrations of chemicals found in the soil are protective of groundwater beneficial use objectives. The *Evaluation of Groundwater Protection for Remedial Actions in the WABOU Soil ROD* (CH2M HILL, 2001a) technical memorandum presents a more detailed discussion of the groundwater investigation conducted during the WABOU RI.

5.3.7 Former Small Arms Range (SD045)

Site Description – This site was a former small arms training facility. Reduction of potential adverse human health and ecological impacts is the basis for establishing cleanup levels.

Selected Remedial Alternative(s) – Alternative S6 (Excavation/On-base Consolidation) is the selected remedial action for this site. Table II-5-5 presents the soil cleanup levels for the chemicals of concern at the site. Alternative S5 (Excavation/Off-base Disposal) is the selected contingency remedial action for soil that exceeds the CAMU acceptance levels.

If a portion of the excavated soil does not meet the CAMU acceptance criteria, the Air Force will determine whether the soil needs to be sent to an off-base landfill or whether a soil treatment can stabilize the contaminants sufficiently for placement in the CAMU.

Alternative S4 (Excavation/ Treatment/On-base Consolidation) is the selected contingency remedial action if it proves to be a cost-effective improvement over Alternative S5.

Alternative S2 (Land Use and Access Restrictions) is also a selected remedial action for the site. However, it will not be implemented if Alternative S6 achieves the residential cleanup values as presented in Table II-5-5. Administrative controls will be sufficient to enforce the restriction, so no physical barriers (i.e., fences) will be necessary. The Travis AFB General Plan will document the presence of lead in the soil and enforce the restriction on residential land use, including day care center activities and for playground and other play activities.

TABLE II-5-5

Cleanup Levels for Soil COCs and COECs at the Former Small Arms Range (SD045)
 WABOU Soil ROD
 Travis AFB, California

Chemical of Concern	Soil Cleanup Level (mg/kg) ^a	Residential (mg/kg)		Industrial (mg/kg)		HQ=1 (mg/kg)	Potential for Groundwater Impact?
		10 ⁻⁶ Cancer Risk	Chronic HI=1	10 ⁻⁶ Cancer Risk	Chronic HI=1		
Antimony	6	NA	31	NA	410	0.54	No
Copper	250	NA	3,100	NA	41,000	1,400	No
Lead	1,000	NA	400	NA	750	380	No

NA = Not Applicable

^a The rationale for the selection of soil cleanup levels for this site is presented in the Remedial Action Plan for the Former Small Arms Range SAR1 (Parsons ES, 2000) Section 5.2.7 (Former Small Arms Range Remedial Action Plan) presents a summary of the Remedial Action Plan.

Surface soil within a former small arms range contains lead residue from past small arms training activities. The estimated volume of contaminated soil is approximately 5,755 cubic yards. The Air Force will excavate lead-contaminated soil and transport it to the CAMU. The excavation will be backfilled with clean soil. The estimated cost for Alternative S6 is \$186,000; the estimated cost for Alternative S5 is \$2,255,000, and the estimated cost for Alternative S4 is \$833,000. This is the most cost-effective remedy that meets the remedial action objective of cleaning up the site to levels that allow for industrial use and are protective of individual burrowing owls and populations of other ecological receptors that can live within a grazing management unit. Figure II-5-6 shows the areal extent of contamination and the approximate limits of excavation.

Protection of Human Health – Lead is the chemical of concern at this site. There is no estimated excess lifetime cancer risk; however, lead is regulated based on developmental toxicity. The estimated hazard index for industrial exposure to surface soil is 0.2, and the estimated blood lead level for lead exposure in surface soil is 19 µg/dL and in subsurface soil is 52 µg/dL, based on existing contaminant concentrations. Both values exceed the threshold value of 10 µg/dL. The remedial action will reduce the lead concentrations in the soil to a protective level. The *Remedial Action Plan for the Former Small Arms Range (SAR1), Travis AFB, California* (Parsons, 2000) presents the risk calculations that demonstrate the protectiveness of the cleanup levels under site-specific conditions to human health.

Protection of Ecological Receptors – Antimony, copper, and lead are the chemicals of ecological concern at this site. Ecological risks were evaluated for plants, terrestrial invertebrates, deer mice, ornate shrews, western meadowlarks, and burrowing owls at this site. Birds and mammals were identified as the most sensitive receptors for antimony and lead, based on NOECs/NOAELs. Plants were the most sensitive receptors for copper.

Cattle graze on the site under the Base's lease program and, in addition, portions are disked as part of the Base's fire control program. The combined effects of grazing and disking make the site suboptimal habitat for most avian and mammalian wildlife.

Two other factors influenced the derivation of cleanup levels for lead. The first factor was the small size of the site (3.8 acres) compared to the foraging range for a burrowing owl. The original ERA (CH2M HILL, 1997) assumed that an owl (as well as other avian and mammalian receptors) would forage consistently on-site, but the site represents only about 1 percent of the expected foraging range for a burrowing owl. The second factor was the relative bioavailability of lead at this site (Parsons, 2000). Further study (Parsons, 2000) was conducted at the site toward development of risk-based remediation goals for the COECs identified in the ERA. In this study, the previously developed preliminary cleanup goals for the site were revised based on additional ecological and contaminant characterization data. Relative in-vitro bioavailability of lead in soil from the site ranged from 75 to 96 percent, with an average of 85.2 percent. This bioavailability fraction and an assumed absorbable fraction of 50 percent were used to derive a lower site-specific BAF of 43 percent for lead, in contrast to the assumed 100 percent during the ERA. Due to a lack of site-specific information on the bioavailability of antimony and copper, the default value of 100-percent bioavailability was retained for those metals. The ecological input to the cleanup levels reflect the results of the studies conducted at this site. They provide a substantial margin of safety for exposures of the burrowing owl to metals at the site. The *Remedial Action Plan for the Former Small Arms Range (SAR1), Travis AFB, California* (Parsons, 2000) presents the rationale for demonstrating the protectiveness of the soil cleanup levels under site-specific conditions to ecological receptors. Section 5.2.7 (Former Small Arms Range Remedial Action Plan) describes the subsequent Parsons study in more detail.

Excavation of soil to the degree necessary for protection of the burrowing owl will be reasonably protective for populations of other ecological receptors at the site. When the combined consideration of LOECs or LOAELs for the common species, potentially limited use of on-site habitats by those receptors (as well as the burrowing owl), and the goal of protecting populations (rather than individuals) of the common species were taken into account, it was concluded that there will be no potential unacceptable ecological risk remaining at this site. This is particularly true because the site is small in relation to the amount of available similar habitat on-base and in the surrounding region, and any residual contamination will not adversely impact populations of these species. The *Evaluation of Ecological Protection for Remedial Actions in the WABOU Soil ROD* (CH2M HILL, 2001b) presents a more detailed description of this ecological evaluation.

Protection of Groundwater— The WABOU RI did not evaluate the presence of contaminants in the local groundwater, because the soil contaminant concentrations decreased significantly with depth. However, the Base collected and analyzed groundwater samples immediately downgradient of the highest surface soil concentrations to determine whether the chemicals of concern were present in the groundwater. The results of the groundwater analysis demonstrate that the current concentrations of the chemicals of concern in the soil do not have an adverse impact on the local groundwater. Therefore, the soil cleanup levels are also protective of groundwater beneficial use objectives. The *Evaluation of Groundwater Protection for Remedial Actions in the WABOU Soil ROD* (CH2M HILL, 2001a) technical memorandum presents a more detailed description of this field investigation.

5.3.8 Railhead Munitions Staging Area (SS046)

Site Description – This site consists of a railroad track and concrete pad that formerly served as a railhead for a spur off the Northern Sacramento Railroad line

Selected Remedial Alternative(s) – Alternative S2 (Land Use and Access Restrictions) is the selected remedial action for this site. The objective of this remedial action is to document the location of the contaminants and apply land use controls to prevent the site from being used for residential purposes. This is the most cost effective remedy available, as shown in Table II-4-6 (Relative Performance of Soil Alternatives - by Cost). Administrative controls will be sufficient to enforce the restriction, because the site is located within the explosive safety clear zones that surround an adjacent ammunition storage facility (A Bunker) and Building 759 (Ammunition Maintenance). The clear zones already restrict property use and new construction at SS046. Therefore, physical barriers (i.e., fences) would provide no additional protection and will not be necessary. The Travis AFB General Plan will document the presence of chemicals and enforce the land use restriction at this site.

Section 5.8.2 [Railhead Munitions Staging Area (SS046)] describes the change that was made to the original selected remedial action for this site. Table II-5-6 presents a comparison of the chemical concentrations in the soil with potential risk criteria.

TABLE II-5-6

Comparison of Soil COCs and COECs at the Railhead Munitions Staging Area (SS046) to Potential Risk Criteria
WABOU Soil ROD
Travis AFB, California

Chemical of Concern	Average Concentration (mg/kg) ^a	Residential (mg/kg)		Industrial (mg/kg)		HQ=1 ^b (mg/kg)	Potential for Groundwater Impact?
		10 ⁻⁶ Cancer Risk	Chronic HI=1	10 ⁻⁶ Cancer Risk	Chronic HI=1		
Benzo(a) pyrene	0.126	0.062	NA	0.21	NA	59	No
Benzo(b) fluoranthene	0.431	0.62	NA	2.1	NA	61	No
Benzo(a) anthracene	0.404	0.62	NA	2.1	NA	3.1	No
Benzo(k) fluoranthene	0.429	6.2	NA	21	NA	110	No
Fluoranthene	2.24	NA	2,300	NA	22,000	850	No
Pentachlorophenol	0.664	3.0	1,400	9	14,000	1.2	No
Phenanthrene	1.20	NA	56	NA	190	510	No
Pyrene	1.69	NA	2,300	NA	29,000	850	No
Cadmium	4.23	1,400	37	3,000	450	47	No
Lead	112.41	NA	400	NA	750	380	No

^a mg/kg = milligrams per kilogram

^b Based on the protection of the burrowing owl

^c NA = Not Applicable

Protection of Human Health – Benzo(a)pyrene, benzo(B)fluoranthene, benzo(a)anthracene, and benzo(k)fluoranthene are the chemicals of concern at this site. The estimated excess lifetime cancer risk for potential future worker exposure is 1×10^{-5} for surface soil, based on existing contaminant concentrations, which is within the risk management range for

carcinogens. The estimated hazard index for potential industrial exposure is 0.03 for surface soil. Since the chemicals are located beneath the railroad tracks adjacent to the concrete pad, there is a low probability of exposure to future workers. Therefore, the selected remedial alternative is protective of human health.

Protection of Ecological Receptors – Cadmium, lead, benzo(a)pyrene, benzo(k)fluoranthene, fluoranthene, pentachlorophenol phenanthrene, and pyrene are the chemicals of ecological concern for this site. Ecological risks were evaluated for plants, terrestrial invertebrates, deer mice, ornate shrews, western meadowlarks, and burrowing owls at this site. HQs for birds were less than ten for all chemicals, but those for cadmium and benzo(a)pyrene in mammals were higher. Plants were considered the most sensitive receptors for pentachlorophenol.

The contaminated portion of the site is about 0.07 acre, which represents less than 0.02 percent of the typical foraging range for a burrowing owl. When the combined consideration of LOECs or LOAELs for the common species, potentially limited use of on-site habitats by those receptors (as well as the burrowing owl), and the goal of protecting populations (rather than individuals) of the common species were taken into account, it was concluded that there is no potential unacceptable ecological risk at this site. This is particularly true, because the site is small in relation to the amount of available similar habitat on-base and in the surrounding region, and the COECs will not adversely affect populations of these species. The *Evaluation of Ecological Protection for Remedial Actions in the WABOU Soil ROD* (CH2M HILL, 2001b) presents a more detailed description of this ecological evaluation.

Protection of Groundwater – The WABOU RI concluded that there are no groundwater COCs at this site. Therefore, the current concentrations of chemicals found in the soil are protective of groundwater beneficial use objectives. The *Evaluation of Groundwater Protection for Remedial Actions in the WABOU Soil ROD* (CH2M HILL, 2001a) technical memorandum presents a more detailed discussion of the groundwater investigation conducted during the WABOU RI.

5.3.9 Cypress Lakes Golf Course (SS041)

Site Description – The maintenance yard of the Cypress Lakes Golf Course contains an administrative building, garages, and storage areas. The equipment in the maintenance yard is used for pesticide application and landscaping activities at the golf course.

Selected Remedial Alternative(s) – No further action is required at the Cypress Lakes Golf Course, because Alternative S5 (Excavation/Off-base Disposal) was completed in January 2001 as a removal action. Table II-5-7 presents the soil cleanup levels that the removal action had to achieve at the site. Environmental Chemical Corporation (ECC) excavated approximately 160 cubic yards of pesticide-contaminated soil and transported it to Kettleman Hills landfill for disposal. Section 2.2.3 (Removal Actions) provides a description of the removal action in the maintenance yard. The *Cypress Lakes Golf Course Annex Removal Action Report* (ECC, 2001) describes the successful implementation of Alternative S5. This report concluded that the removal action achieved the targeted cleanup levels as presented in the *Work Plan for the Removal Action at the Cypress Lakes Golf Course Annex* (ECC, 2000). Since the targeted cleanup levels are identical to the soil cleanup levels in Table II-5-7, the

removal action meets the requirements of the Alternative S5 remedial action. The DI WET analyses that were performed during the removal action demonstrated that the residual pesticide concentrations are protective of groundwater beneficial use objectives.

Figure II-5-7 shows the extent of the actual excavated area.

TABLE II-5-7

Cleanup Levels for Soil COCs and COECs at the Cypress Lakes Golf Course (SS041)
WABOU Soil ROD
Travis AFB, California

Chemical of Concern	Soil Cleanup Level (mg/kg)	Residential (mg/kg)		Industrial (mg/kg)		HQ=1 (mg/kg)	Potential for Groundwater Impact?
		10 ⁻⁶ Cancer Risk	Chronic HI=1	10 ⁻⁶ Cancer Risk	Chronic HI=1		
chlordane	1.45	1.6	35	6.5	670	1.45	No
DDE	7.0	1.7	NA	7.0	NA	7.8	No
DDT	3.4	1.7	36	7.0	730	3.4	No
dieldrin	0.11 ^a	0.03	3.1	0.11	44	0.29	Yes ^b
endosulfan	7.5	NA ^c	370	NA	3,700	7.5	No

^a This cleanup level for dieldrin applies to soil within a depth of 6 inches below ground surface (bgs) at the Cypress Lakes Golf Course. A cleanup level of 0.29 mg/kg for dieldrin (associated with a hazard quotient of 1) applies to soil in excess of a depth of 6 inches bgs at this site.

^b The *Evaluation of Groundwater Protection for Remedial Actions in the WABOU Soil ROD* (CH2M HILL, 2001a) technical memorandum describes the confirmatory analyses for verification that the cleanup level for this compound is protective of groundwater beneficial use objectives.

^c NA = Not Applicable

The report also concluded that the removal action achieved the residential cleanup levels that are presented in Table II-5-7. As a result, the Cypress Lakes Golf Course Annex is clear for unrestricted land use, and the Air Force does not need to select Alternative S2 (Land Use and Access Restrictions) for this site. This annex requires no further action and is considered a closed site.

Protection of Human Health – Dieldrin and DDE were the chemicals of concern at this site prior to the removal action. The estimated excess lifetime cancer risk for potential future worker exposure to surface soil was 6×10^{-6} . The estimated hazard index for potential industrial exposure was 0.03 for surface soil. The selected remedial action reduced the potential risk posed by these chemicals to a protective level.

Protection of Ecological Receptors – Chlordane, DDE, DDT, dieldrin, and endosulfan were the chemicals of ecological concern at this site prior to the removal action. Ecological risks were evaluated for plants, terrestrial invertebrates, deer mice, ornate shrews, American robins (*Turdus migratorius*), western meadowlarks, and burrowing owls at this site. All of the pesticide HQs for birds and mammals were less than five. HQs for plants and invertebrates were higher, especially for invertebrate exposure to endosulfan.

Excavation of soil to the degree necessary for protection of the burrowing owl is reasonably protective for populations of other ecological receptors at the site. When the combined consideration of LOECs or LOAELs for the common species, potentially limited use of on-site habitats by those receptors (as well as the burrowing owl), and the goal of protecting populations (rather than individuals) of the common species were taken into account, it was

concluded that there is no unacceptable risk remaining at this site. This is particularly true because the site is small in relation to the amount of available similar habitat on-base and in the surrounding region, and any residual (post-remediation) contamination will not adversely impact populations of these species.

Cleanup levels were selected to protect individual burrowing owls and populations of other ecological receptors. They took into account the assumption that an owl would feed consistently at the contaminated portion (about 0.1 acres) of the site, even though it represents less than 0.03 percent of the typical foraging range for an owl. The evaluations conducted for other ecological receptors indicated that remediation of soil to the degree necessary for protection of the burrowing owl would be reasonably protective for plants, invertebrates, and common species of birds and mammals at the site. This is particularly true because the site represents a very small fraction of the similar habitat on-base and in the surrounding area, and the goal for other receptors is to protect populations rather than individuals of those receptors. When the combined consideration of LOECs or LOAELs for the common species, potentially limited use of on-site habitats by those receptors (as well as burrowing owls), and the goal of protecting populations (rather than individuals) of the common species were taken into account, it was concluded that populations of those species would not be affected by any potential impacts attributable to COECs remaining at this site. The *Evaluation of Ecological Protection for Remedial Actions in the WABOU Soil ROD (CH2M HILL, 2001b)* presents a more detailed description of this ecological evaluation.

Protection of Groundwater— The WABOU RI detected dieldrin in one unfiltered hydropunch sample that was attributed to an artifact associated with sediment carry-over introduced during sampling. A subsequent filtered sample immediately downgradient of the highest dieldrin concentration detected in the soil had a lower detection. An evaluation of this data concluded that the soil cleanup levels are protective of groundwater beneficial use objectives. The *Evaluation of Groundwater Protection for Remedial Actions in the WABOU Soil ROD (CH2M HILL, 2001a)* technical memorandum presents a more detailed description of this field investigation.

5.3.10 Radioactive Burial Site 2/Dry Waste Landfill (RW013)

Site Description— This fenced burial site is a single trench that contains low-level radioactive waste from former nuclear weapons maintenance.

Selected Remedial Alternative(s)— Alternative S5 (Excavation/Off-base Disposal) is the selected remedy for this site. Table II-5-8 presents the soil cleanup levels for the chemicals of concern at the site. The Air Force will excavate the waste and soil and transport them in specially designed containers to an off-base low-level radioactive waste repository. The total estimated volume of excavated material is 60 cubic yards. The excavation will be backfilled with clean soil. The estimated cost of this action is \$131,000. As shown in Table II-4-6 (Relative Performance of Soil Alternatives - by Cost), this is the most cost-effective remedy that meets the remedial action objective of cleaning up the site to levels that allow for

TABLE II-5-8
 Cleanup Levels for Subsurface Soil COCs at Radioactive Burial Site 2 (RW013)
 WABOU Soil ROD
 Travis AFB, California

Chemical of Concern	Soil Cleanup Level (pCi/g) ^a	Residential (pCi/g)		Industrial (pCi/g)		HQ=1 (pCi/g)	Potential for Groundwater Impact?
		10 ⁻⁵ Cancer Risk	Chronic HI=1	10 ⁻⁵ Cancer Risk	Chronic HI=1		
Uranium-234	690	180	NA	690	NA	NA	No
Uranium-235	8	2	NA	8	NA	NA	No

NA = Not Applicable

^a The soil cleanup levels for U-234 and U-235 represent a 10⁻⁵ industrial cancer risk rather than the more conservative 10⁻⁶ industrial cancer risk values at other sites. Concentrations at the 10⁻⁶ level are below the practical quantitation limits for these compounds, using standard laboratory test equipment, which justifies the departure from the 10⁻⁶ level, as described in the Travis AFB e-mail, sent 21 December 2001 at 8:37 PM, titled "Resolution of the Soil Cleanup Levels Selection for RW013". Travis AFB and the regulatory agencies agree that the selected cleanup levels are protective, because they are within the 10⁻⁴ to 10⁻⁶ risk range as described in the National Contingency Plan. Also, there is no complete exposure pathway, because residual contaminants remaining at the bottom of the excavation will be buried below at least 6 feet of clean soil backfill. Land use controls will be implemented at the site if the residential cleanup levels are not achieved.

industrial use. Figure II-5-8 shows the areal extent of contamination and the approximate limits of excavation.

Alternative S2 (Land Use and Access Restrictions) is the selected remedial action for the site if Alternative S5 does not achieve the residential cleanup values as presented in Table II-5-8. The Travis AFB General Plan will document the presence of uranium in the subsurface soil and enforce the restriction on residential land use, including prohibiting day care center activities.

Protection of Human Health— Uranium-234 and Uranium-235 are the chemicals of concern at this site. The estimated excess lifetime cancer risk for potential future worker exposure to subsurface soil is 3×10^{-5} , based on existing contaminant concentrations. The buried waste does not pose a potential non-cancer risk. The remedial action will reduce the potential risk to future workers to a protective level.

Protection of Ecological Receptors— There are no chemicals of ecological concern at this site due to the burial depth (6 feet) of the waste materials. Therefore, the soil cleanup levels are protective of ecological receptors.

Protection of Groundwater— The WABOU RI detected no evidence of radiological or chemical contamination in the local groundwater, so the soil cleanup levels are protective of groundwater beneficial use objectives. The *Evaluation of Groundwater Protection for Remedial Actions in the WABOU Soil ROD* (CH2M HILL, 2001a) technical memorandum presents a more detailed discussion of the WABOU RI groundwater investigation.

5.4 Land Use Controls

Alternative S2 (Land Use and Access Restrictions) is included as all or part of the selected remedy at nine WABOU soil sites as described in Table I-1-4 and Section 5.1.1 (Alternative S2 - Land Use and Access Restrictions). Alternative S2 is required at the nine WABOU sites, because the selected remedial actions will clean up soil contamination to industrial cleanup levels but will allow for residual contamination to be left in place, which is greater than residential cleanup levels and therefore requires land use and access restrictions. If it is economically feasible, the Air Force may decide to clean up soil to the more conservative residential cleanup levels. If the Air Force does achieve residential cleanup levels at a site, then land use and access restrictions would not be necessary as discussed in Section 5.4.2 (Residential Cleanup Levels).

The soil remedial actions at five WABOU sites (LF008, RW013, SS041, SD042, and SD045) are required to meet industrial cleanup levels. At these five sites, Alternative S2 will also be implemented to address residual contamination above residential cleanup levels. At four sites (DP039, SD043, LF044, and SS046), no active remedial action is needed, because the contamination levels do not exceed industrial cleanup levels. However, Alternative S2 is required, because the contamination levels exceed residential cleanup levels. At one site (Cypress Lakes Golf Course Annex), the soil excavation that was performed as a removal action achieved residential cleanup levels, so Alternative S2 will not be applied there.

The remedial action objective of Alternative S2 for all nine sites is to restrict site access to prohibit residential use of the property, including use for day care, at sites where residential cleanup values are not attained. For sites where contaminated soil is not being excavated and backfilled with clean soil, an additional objective is to prevent surface-disturbing activities that could create a risk of human exposure inconsistent with the assumptions described herein. Separate controls are in place and enforced by the Air Force to prevent inappropriate soil and groundwater exposure at all Travis AFB IRP sites. The Air Force currently requires digging permits and other types of controls to restrict site access during the interim period before remedial actions are implemented.

Alternative S2 includes administrative and physical measures selected by the Air Force to restrict access and limit exposure to residual hazardous substances after remediation. These measures restrict future land use and ensure the effectiveness of the remedy at all nine sites. The Air Force will implement as performance measures at all sites with Land Use Controls the following:

- Include in the Base General Plan any specific controls required at each site, that controls are required because of the presence of pollutants or contaminants, the current land users and uses of the site, the geographic control boundaries, and the objectives of the controls. Unless a site is cleaned up to levels appropriate for unrestricted use, the General Plan will reflect the applicable use restrictions, with all sites restricted from use for residential development, play areas, or day care facilities. Upon completion of a remedial action at a site, the Base will update the Base General Plan to include the site-specific use restrictions if needed. The section describing the specific controls will also refer the reader to the Base Environmental Office if more information is needed. The General Plan will contain a map indicating all areas where contaminated soil and groundwater are located, and what land use controls are in effect for each of those areas.

- Notify the regulatory agencies of any Base proposals for a major land use change at a site inconsistent with the use restrictions and assumptions described herein, any anticipated action that may disrupt the effectiveness of the land use controls, any action that might alter or negate the need for the land use controls, or any anticipated transfer of the property subject to the land use controls.
- Maintain existing administrative controls (e.g. dig permits as described in Section 5.4.1) while Land Use Controls are in place.
- Conduct periodic monitoring (at least annually) and take prompt action to restore, repair or correct any Land Use Control deficiencies or failures identified. A different monitoring schedule may be agreed upon according to the schedule provisions of the FFA, if all parties agree and if the change reasonably reflects the risk presented by the site.

The Air Force is responsible for implementing (to the degree controls are not already in place), monitoring, maintaining, and enforcing the identified controls. If the Air Force determines that it cannot meet specific Land Use Control requirements, it is understood that the remedy may be reconsidered and that additional measures may be required to ensure the protection of human health and the environment.

In addition to the Land Use Controls described above for all sites, the following measures will be taken at some sites:

- As mutually agreed among the RPMs for specific sites, display appropriate signs to warn site visitors of potential hazards associated with surface soil contamination.
- At the five sites where the selected remedy involves soil excavation, the Air Force will backfill the excavation with clean soil, removing the potential exposure to surface soil contamination. These sites may have residual contamination at depth, so the digging permit process is designed to ensure that future industrial activities or construction projects either do not disturb the contaminated subsurface soil or that the Base takes other appropriate safety measures.
- For Landfill X,
 - Install a fence around the Landfill X area and the adjacent equipment training area.
 - Build protective berms to prevent soil contamination from flowing during rain to nearby vernal pools.
 - Comply with applicable OSHA regulations, including relevant worker notification, training, and protective measures.

In addition, to assure the regulatory agencies and the public that the Air Force will fully comply with and be accountable for the performance measures identified herein, it will timely submit to EPA and California an annual monitoring report on the status of LUCs and/or other remedial actions, including the operation and maintenance, and monitoring thereof, and how any LUC deficiencies or inconsistent uses have been addressed. The report will also be filed in the Information Repository (IR). The report would not be subject to approval and/or revision by EPA and the State.

5.4.1 Components of the Travis AFB General Plan and Existing Administrative Procedures

The first step in restricting specific types of development at a site is to revise the Travis AFB General Plan (GP) to place constraints ensuring that these sites are never used for specific types of land use such as residential development or day care facilities. The GP implements "zone-like" requirements at Travis AFB Air Force installations require this comprehensive planning document for the establishment and maintenance of the institutional and engineering controls. The GP resides in the office of the Base community planner.

Travis AFB will revise several sections of the GP to establish the constraints against residential development of IRP sites. Section 5.2.2.4 (Installation Restoration Program Sites) and Section 5.4.1 (On Base Land Use) of the GP will receive the appropriate revisions needed to prohibit specific development of an IRP site. Figure 5-2B (Aboveground Storage Tanks, Underground Storage Tanks, IRP Areas, Test Wells, Air Emission Sources: Boilers, Air Emission Sources: Bulk Storage Tanks) will show the IRP sites at which specific development is prohibited. Travis AFB will enforce these constraints on specific development through administrative review procedures that are already in place.

One procedure is the Air Force Form 332 (AF332) (Base Civil Engineer Work Request). This form must be filed and approved before the start of any building project at Travis AFB. Appendix A includes a copy of this form. The approval of the AF332 involves the comparison of the building site with the constraints in the GP. The AF332 serves as the document for communicating any construction constraints to the appropriate offices. Any constraints at the site result in the disapproval of the form unless the requester makes appropriate modifications to the building plans. The Civil Engineer Squadron Chief of Operations is responsible for the final approval of building projects through the AF332 review process.

In addition to restricting specific development at IRP sites, the GP will restrict soil disturbances such as digging trenches for underground lines and excavating soil for building foundations. Travis will use 60 Air Mobility Wing Form 55 (Excavation Permit) to enforce these constraints against residential development. Appendix A includes a copy of this form. This form is also called the Base digging permit. The requester submits the permit to the Civil Engineer Squadron for any project that involves soil excavation of greater than three inches. The permit lists the environmental management and other support offices that review the excavation plans for approval. If constraints involving soil disturbance or worker safety exist at the excavation area, the permit describes the appropriate procedures that will prevent unknowing exposure to soil contamination as well as measures the workers must implement before the start of excavation. The Civil Engineer Squadron Chief of Operations is responsible for the final approval of excavation projects through the permit review process.

5.4.2 Residential Cleanup Levels

Residential cleanup levels are not legally enforceable cleanup standards under this WABOU Soil ROD but are goals that the Air Force will try to meet in order to avoid the implementation of land use controls at a site. As stated in Section 5.3, the selected soil cleanup levels take into account the site-specific conditions, comply with CERCLA, and are protective of human health and the environment. These levels are also protective of the sensitive ecologi-

cal receptors that live near the WABOU soil sites. However, these levels do not clear the sites for unrestricted (residential) use. Alternative S2 is a selected remedial alternative for all excavation sites, because the selected cleanup levels may not be protective of human health and the environment if these sites were to be reclassified in the future as recreational or residential areas. Section 5.1 describes the industrial nature of the land surrounding the WABOU soil sites. Tables II-5-1 through II-5-8 present the soil cleanup levels and the residential cleanup levels for the WABOU soil sites that require excavation.

If a soil excavation achieves the residential cleanup levels at a site, then the site is available for unrestricted access and there would be no need to establish, maintain, monitor or enforce LUCs. The regulatory agencies agree to delete requirements pursuant to Alternative S2 (Land Use and Access Restrictions) as a selected remedial alternative for a site in the event that the soil excavation achieves the residential cleanup levels for all chemicals of concern at the site.

It is impossible to calculate the concentrations of residual contamination at a soil site before the excavation of the estimated volume of soil is complete. There are three possibilities:

1. The excavation does not achieve results that meet the minimum specified cleanup standards, in which case the excavation will continue until the standards are met.
2. The excavation achieves results that meet the minimum specified cleanup standards, but the site will be protective for industrial uses only. Land use controls will be necessary.
3. The excavation achieves soil cleanup levels such that the site is protective for both industrial and residential use. Land use controls will not be necessary.

If the initial soil excavation at a site achieves the selected cleanup levels but not the residential cleanup levels (possibility 2), the Air Force will consider a number of factors in making the decision to continue the excavation in an attempt to reach the residential cleanup goals, including the:

- Amount of soil excavation completed,
- Concentrations of residual contaminants (and the residual risk remaining),
- Best estimate available for the additional amount of soil to be excavated to achieve protection for residential activities,
- Amount of time that an excavation crew can remain mobilized at the site,
- Remaining budget for the continuation of excavation activities,
- Remaining budget for the disposal of the additional volume of contaminated soil,
- Impact of adverse weather conditions on the project,
- Continued impact of the project on Base activities.

The decision-making process is qualitative in nature and takes into account the progress made at all excavation sites. For example, the selected cleanup levels are achieved at both Site A and Site B. There is a small amount of funding remaining for these two projects, and the best estimate indicates that a smaller amount of additional excavation would be needed

to reach residential cleanup levels at site A. Assuming that there are no other considerations, the decision might be made to continue the excavation activities to attempt to reach residential cleanup levels at site A and finalize the remedial action at site B with land use controls. If the review results in the decision to finalize the cleanup action before achieving the cleanup levels at a soil site, Travis AFB will notify the regulatory agencies and start the application of Alternative S2 to the site.

5.5 Statutory Determinations

This section discusses the applicability and compliance of the following statutory determinations:

- Protectiveness
- ARARs
- Cost-Effectiveness
- Use of Permanent Solutions, Alternative Treatment, or Resource Recovery Technologies
- State and Community Acceptance

5.5.1 Protectiveness

These selected remedies are protective of human health and the environment. They achieve protection by removing or isolating source areas of contamination that pose a potential risk to human health or the environment.

5.5.2 Applicable or Relevant and Appropriate Requirements

The selected remedies comply with State of California and federal ARARs. Section 6.0 presents the soil ARARs.

5.5.3 Cost-Effectiveness

The selected remedies for implementing the soil remedial actions at each site include the most cost-effective technologies that can meet the WABOU RAOs. Section 6.0 of the WABOU FS (CH2M HILL AFB, 1998) presents the details of the technology selection.

5.5.4 Use of Permanent Solutions, Alternative Treatment, or Resource Recovery Technologies

The selected remedies utilize, to the maximum extent practicable, permanent solutions to the potential threats posed by soil contamination at each site. For the WABOU soil sites, innovative technologies, such as solidification and stabilization, were considered. However, difficulties associated with implementability or excessive cost rendered less innovative technology, such as excavation and disposal, more favorable.

5.5.5 State and Community Acceptance

The State of California (DTSC and San Francisco Bay RWQCB) concurs with the Air Force and the U.S. EPA in the selection of the actions described in this section for the WABOU soil sites.

The comments received during the July 8, 1998 to August 8, 1998 public comment period and lack of comments from the February 23, 2000 to March 24, 2000 public comment period indicate that the public has no preference of alternatives. Part III (Responsiveness Summary) provides the public comments received and the Air Force responses

5.6 RD/RA Implementation and Schedule

The Air Force will implement the RD/RA for the nine WABOU soil sites in accordance with this WABOU Soil ROD. In accordance with the Travis AFB FFA, the Air Force will present the WABOU RD/RA schedule for completing and submitting the site-specific RD planning and design documents to the regulatory agencies within 21 days of signing the WABOU Soil ROD.

The WABOU RD/RA schedule is a product of the Travis AFB IRP Priority Model and the Travis AFB Strategic Plan. The priority model and the strategic plan are planning tools used by Travis AFB to prioritize funding and schedule remedial actions for IRP sites. They take into account factors such as human health risk, off-base migration, CAMU coordination issues, ecological risk, public interest, capital cost, project execution, and projected funding levels.

The Air Force has prepared the final *Basewide Soil Remedial Design/Remedial Action Plan* (Soil RD/RA Plan) (URS, 2002) that addresses the implementation of soil remedial actions for all Travis AFB soil sites. It provides the procedures for conducting a soil excavation, transportation, and either placement in the CAMU or disposal in an off-base landfill. It addresses the following issues:

- The identification and filling of potential site characterization data gaps.
- The analytical methods and Quality Assurance/Quality Control procedures that will be used to characterize soil contaminants and confirm the attainment of cleanup levels during excavation.
- The procedures for conducting soil excavations. This includes procedures for sample collection and selection of sampling methods. This also includes the consideration of factors needed to make the site-specific decisions for continuing an excavation to attempt to reach residential cleanup goals.
- The sampling rationale for waste characterization prior to disposal. This includes the number of samples collected at each site and the methodology used for their collection. This also includes the procedures to be used to segregate heavily contaminated soil that needs to be transported off-base for disposal and the less contaminated soil that can be placed in the CAMU.
- A detailed description of the CAMU, to include the procedures for segregating soil by contaminant type, decontamination procedures, sampling protocols, and inspection and maintenance requirements.

The Soil RD/RA Plan also provides the procedures needed for those remedial actions that do not involve excavation, such as the construction of fences and berms needed for land use controls.

The Air Force will also prepare an attachment to the Soil RD/RA Plan for each Travis AFB soil site. Each attachment will present excavation requirements, precautions needed to protect nearby sensitive habitats, truck routes to enter and exit the site, and all other site-specific information needed to complete the soil remedial action. The regulatory agencies will review each site-specific attachment to the Soil RD/RA Plan for acceptance. The *LF007 Soil Remedial Action Design Report and Post-Construction Maintenance Plan* (CH2M HILL, 2002) presents the CAMU design, including the configuration and procedures for the phased placement of consolidated soil. The Air Force will provide an opportunity for public participation during the Remedial Design phase.

The attachment for the Radioactive Burial Site 2/Dry Waste Landfill (RW013) identifies the low-level radiological waste disposal facility that will receive the Radioactive Burial Site 2 waste and contaminated soil. It describes any special packaging, labeling, transportation, and Air Force coordination requirements that need to be met for radiological waste disposal.

The RD/RA phases will use the soil cleanup levels listed in Tables II-5-1 through II-5-8 to:

- Estimate the target volumes that require remediation, an important input for the remedial design.
- Verify that the analysis of the confirmation samples collected during remedial action can achieve the quantitation limits required by the appropriate Travis AFB Quality Assurance Project Plan.
- Measure the progress of the remedial action through comparison with the field analytical data and determine when the remedial action is complete.

The Air Force will monitor the progress of each soil remedial action until the soil cleanup levels are achieved. Then, the Air Force will review the results of the confirmation sample analysis and other site-specific conditions as described in Section 5.4.2 and decide whether the remedial action should continue in order to attempt to reach residential cleanup goals and avoid the need to implement land use controls. The Air Force will keep the regulatory agencies informed of these decisions.

5.7 Site Closure

Within 60 days of the final inspection of the constructed remedy, the Air Force will submit a remedial action report to the regulatory agencies for acceptance. This report will describe the remedial action and document the amount of excavated soil removed from the site, the disposition of the excavated soil (placement in the on-base CAMU or disposal in an off-base landfill), and the analytical results of the confirmation sampling. Table II-5-9 lists the soil and leachate acceptance levels for the CAMU at LF007. For soils that have been placed in the CAMU, the report will document the results of acceptance level sampling and analysis and will contain a map of the CAMU that shows the placement area for soil from a particular site. Figures will show the areal, and if necessary vertical, extent of the excavation area. For those sites that did not require excavation, the remedial action report will document the installation of fences, berms and signs and the implementation of land use controls. It will also describe the maintenance of permanent structures that are part of the remedial action.

TABLE II-5-9
CAMU Soil Acceptance Levels
WABOU Soil ROD
Travis AFB, California

Chemical of Concern	CAMU - Soil Acceptance Level (mg/kg)	CAMU - Leachable Acceptance Level (DI-WET results µg/L)	Adsorption Coefficient - K_d (L/KG)	MCL (µg/L)	Tap Water PRG or Other Water Quality Goal (µg/L)
Aluminum	35,500	100,000	355	1000	
Antimony*	74	600	124	6	
Arsenic*	1,000	5,000	200	50	
Barium	1,096	100,000	10.96	1000	
Cadmium	7.50	500	15	5	
Chromium	840	5,000	168	50	
Copper	5,174	130,000	39.8	1300	
Lead*	854	1,500	569	15	
Mercury	64	200	322	2	
Molybdenum	360	18,000	20	NE	180
Nickel	122	10,000	12.2	100	
Selenium*	550	5,000	110	50	
Silver*	24,360	10,000	2,436	100	
Vanadium	26,000	26,000	1,000	NE	260
Zinc	6,350	500,000	12.7	5000	
Acenaphthene	1,776	37,000	48	NE	370
Alpha Chlordane* ^	38 6	10	3,856	0.1	
Anthracene	27,200	180,000	151	NE	1800
Aroclor-1254	184	50	3,674	0 5	
Aroclor-1260*	75	50	1,500	0.5	
Benzo(a)anthracene	25	10	2,484	0 1	
Benzo(a)pyrene	164	20	8,190	0.2	
Benzo(b)fluoranthene	65	9 2	7,079	NE	0.092
Benzo(k)fluoranthene	184	92	2,000	NE	0.92
Bis(2-ethylhexyl)phthalate	1,893	400	4,733	4	
Carbon Disulfide	0 52	1,000	0.52	NE	1,000
Chrysene	542	920	589	NE	9.2
4,4'-DDD*	25	28	910	NE	0.28
4,4'-DDE*	4	20	200	NE	0 2
Dibenz(a,h)anthracene	11	0 92	11,620	NE	0 0092
Dieldnn	0.030	0.420	71	NE	0.0042
Di-N-butyl phthalate	87,700	370,000	237	NE	3700
Dioxin as 2,3,7,8-TCDD*	0.034	0.0030	11,346	0.00003	
Endosulfan	0.31	220	1 4	NE	220
Endosulfan sulfate**	NE	NE	NE	NE	110
Fluoranthene	43,785	150,000	291.9	NE	1500
Fluorene	1,272	24,000	53	NE	240
Gamma Chlordane* ^	17 39	10	1,739	0.1	
Heptachlor*	2 6	1.00	2,600	0.01	
Heptachlor epoxide	0.052	1.00	51 89	0 01	
Indeno(1,2,3-cd)pyrene	15	9.20	1,600	NE	0.092
Methoxychlor	2,173	4,000	543.37	40	
Methoxone**	NE	NE	NE	NE	18

TABLE II-5-9
 CAMU Soil Acceptance Levels
 WABOU Soil ROD
 Travis AFB, California

Chemical of Concern	CAMU - Soil Acceptance Level (mg/kg)	CAMU - Leachable Acceptance Level (DI-WET results µg/L)	Adsorption Coefficient - K_d (L/KG)	MCL (µg/L)	Tap Water PRG or Other Water Quality Goal (µg/L)
Phenanthrene	112	630	178	NE	6.3
Pyrene	4,788	18,000	266	NE	180
Toxaphene	3.17	300	10.57	3	

NE - Not Established

* K_d calculated from Travis AFB site-specific DI WET results

** Surtable K_d values have not been located or established for these compounds

Note The chlordane MCL was used for Alpha & Gamma Chlordane

Once all remedial actions at a site are complete, the Air Force will submit a site closure report to the regulatory agencies for acceptance. This report will document the attainment of cleanup levels, the performance of the constructed remedy, the assurance that the remedial actions are protective of human health and the environment, verification that all required land use controls is in place and are being enforced, and the description of required O&M tasks.

The Air Force and the regulatory agencies will hold a formal program review after the soil remedial actions are complete. One purpose of the program review is to confirm the implementation of land use controls on Travis AFB, where needed.

5.8 Documentation of Significant Changes

There have been two significant changes to the selected remedies since the Air Force submitted the WABOU Soil Proposed Plan for public comment on July 8, 1998.

5.8.1 Building 916 (SD043)

The first significant change involves Building 916, an emergency electric power facility on the western side of the Base. In 1995, the Base conducted a remedial investigation of this site and discovered PCB-1254 in the soil. The source of the PCB contamination was a former transformer pad next to the building that once held transformers containing PCB-laden oil. Leaks from these transformers resulted in the deposition of this chemical into the soil. The pad and transformers have been removed, but the PCB residue remains in the soil. The risk assessment for this site concluded that the PCB residue in the soil did not pose an unacceptable potential risk to site workers or the environment.

In June 1999 Travis AFB conducted a follow-on groundwater investigation at the site. The purpose of the investigation was to determine whether the PCB-1254 in the subsurface soil next to the building was acting as a source of ongoing groundwater contamination. This information was important, because the original Air Force proposal to dig up and haul away the PCB-contaminated soil was based on the possibility that the PCB residue could have an adverse impact on the local groundwater.

PCB-1254 does not readily dissolve in water, and Travis AFB wanted to confirm whether a soil cleanup action at this site was needed. So, in June 1999, the Base installed several monitoring points downgradient of the former transformer area and collected groundwater samples from them. The analysis of these samples demonstrated that the PCB-1254 in the subsurface soil was not leaching into the local groundwater.

As a result, the Air Force revises its proposed action for this site from excavation to land use controls. The objective of these controls is to document the location of the contaminants and apply land use controls to prevent the site from being used for residential purposes. Since an active remedy would still not allow the site to be used for residential purposes, due to its proximity to industrial activities and an active runway, this is the most cost-effective remedy available.

5.8.2 Railhead Munitions Staging Area (SS046)

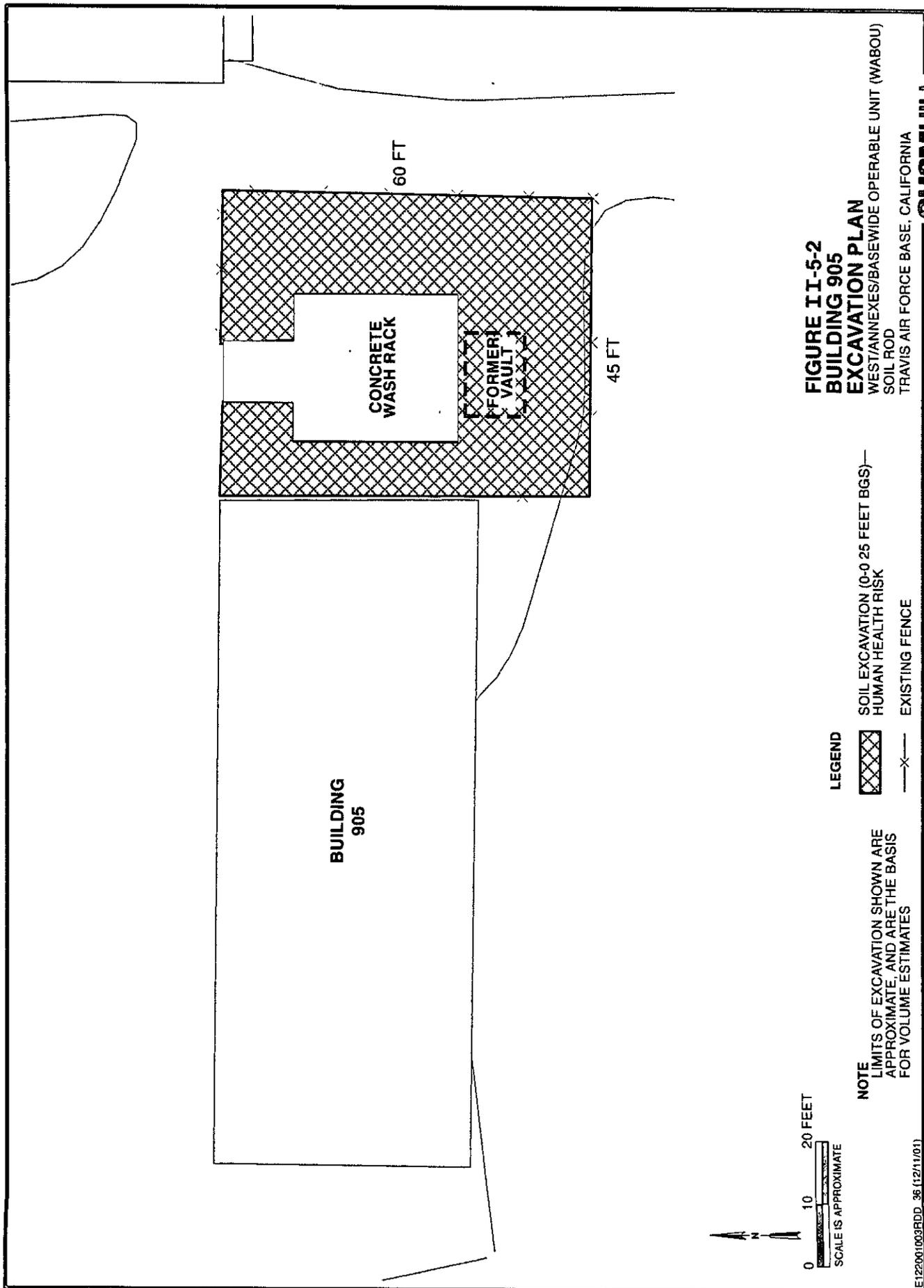
The second significant change involves the Railhead Munitions Staging Area, a concrete pad next to a set of railroad tracks on the western side of the Base. This site was part of the 1995 remedial investigation because of the possibility that cancer-causing solvents had been used on the pad during equipment-handling operations. However, the only contaminants found were metals and oil-based chemicals, related to railroad operations, in the surface soil. The original Air Force cleanup proposal for this site as presented in the *Proposed Plan for Soil Cleanup* (Travis AFB, 1998b) was to build a fence around it, dig up and haul away small quantities of surface soil around it, and administratively restrict its use to industrial purposes only.

The Air Force described changes to the original proposal in a Proposed Plan fact sheet, dated February 2000. The public reviewed this fact sheet during the February 23 to March 24 public comment period. The Air Force also presented the information in this fact sheet during the March 15, 2000 public meeting. The public did not submit comments on these significant changes. Part III (Responsiveness Summary) presents the comments received on the soil remedial actions.

The Air Force revises its proposed action for this site from fence construction and excavation to administrative land use controls. The Air Force applied the risk management strategy described in Section 5.2.2.2 (Consideration of Site Conditions) to SS046 and found that land use controls would adequately protect site workers. Land use controls would also record the presence of the contaminants until the Base changes the land use of the site and removes the railroad tracks.

This risk management decision took into account several considerations. First, the contaminants that pose a potential risk to human receptors are found beneath the railroad tracks, a location that is inaccessible to site workers. Also, the contaminants that posed a potential risk to ecological receptors are found in three isolated areas around the concrete pad adjacent to the railroad tracks. The concentrations are low and the areas are small in size, so the contaminants do not pose an unacceptable risk to the populations of plants and animals at the site. Section 5.3.8 (Railhead Munitions Staging Area) describes the protection of human and ecological receptors in more detail.

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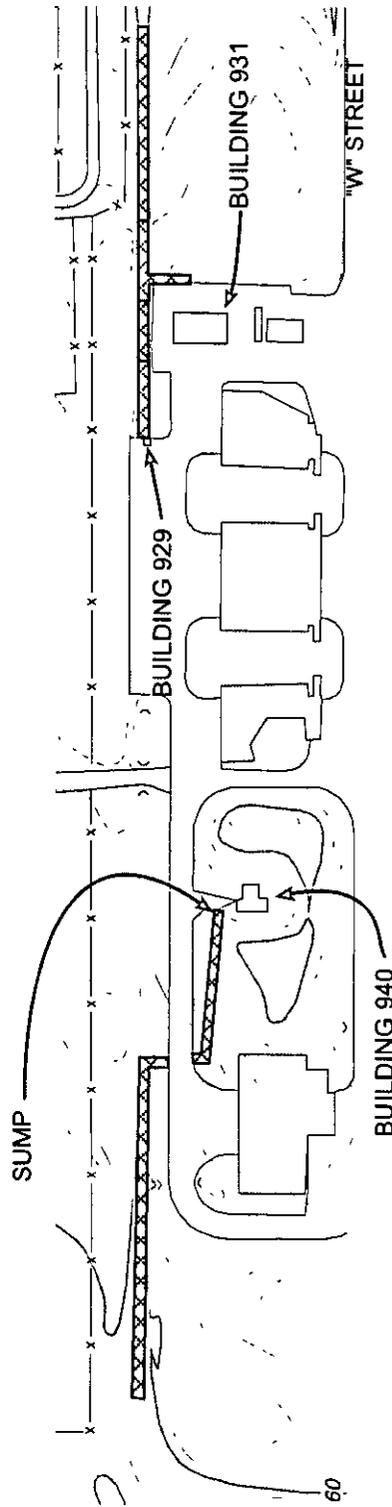


FIGURE II-5-3
BUILDINGS 929/931 AND 940
EXCAVATION PLAN
 WEST/ANNEXES/BASEWIDE OPERABLE UNIT (WABOU)
 SOIL ROD
 TRAVIS AIR FORCE BASE, CALIFORNIA

CH2MHILL

- LEGEND**
-  SOIL EXCAVATION AREA (0-0.25 FEET BGS)—HUMAN HEALTH RISK
 -  SOIL EXCAVATION AREA (0-0.25 FEET BGS)—ECOLOGICAL RISK
 - x- EXISTING FENCE LINES
 - ROADS

NOTE
 LIMITS OF EXCAVATION SHOWN ARE
 APPROXIMATE, AND ARE THE BASIS
 FOR VOLUME ESTIMATES

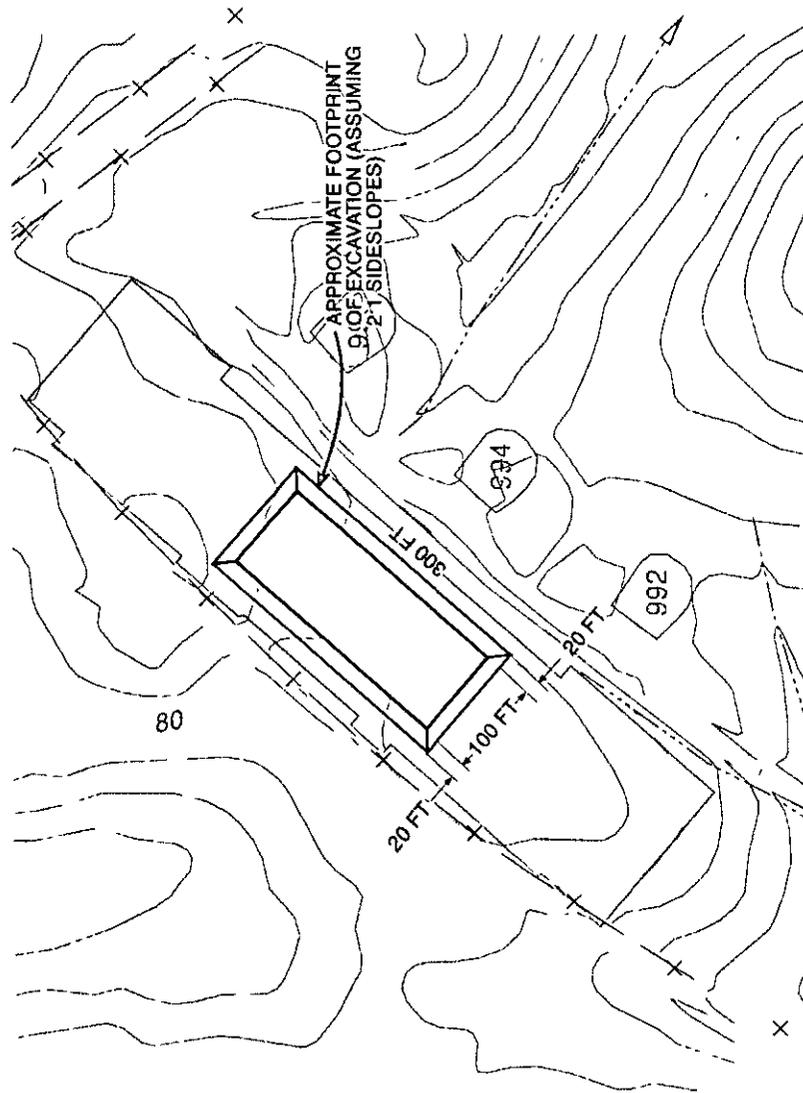


FIGURE II-5-4
LANDFILL 3
EXCAVATION PLAN
 WEST/ANNEXES/BASEWIDE OPERABLE UNIT (WABOU)
 SOIL ROD
 TRAVIS AIR FORCE BASE, CALIFORNIA

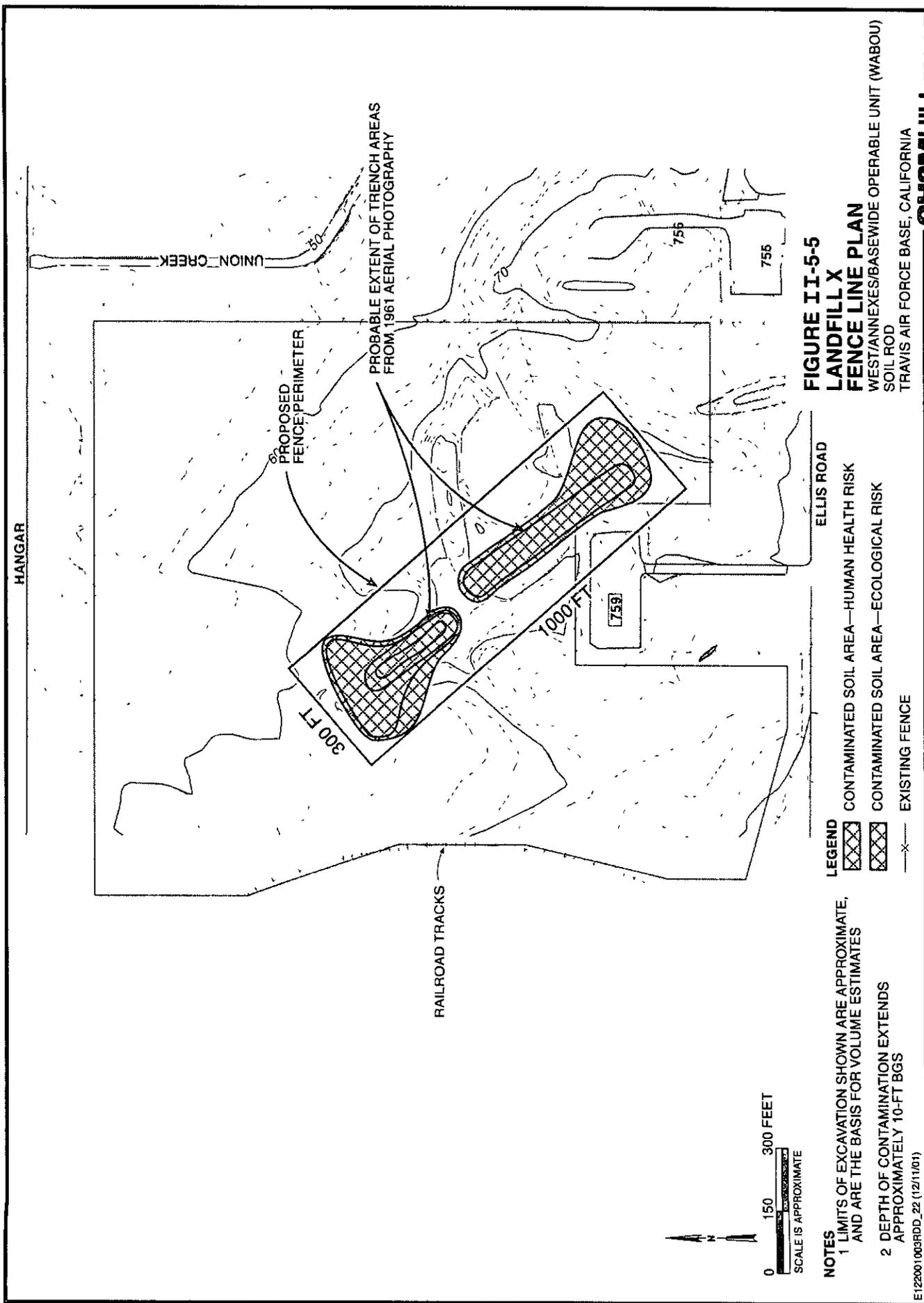
LEGEND

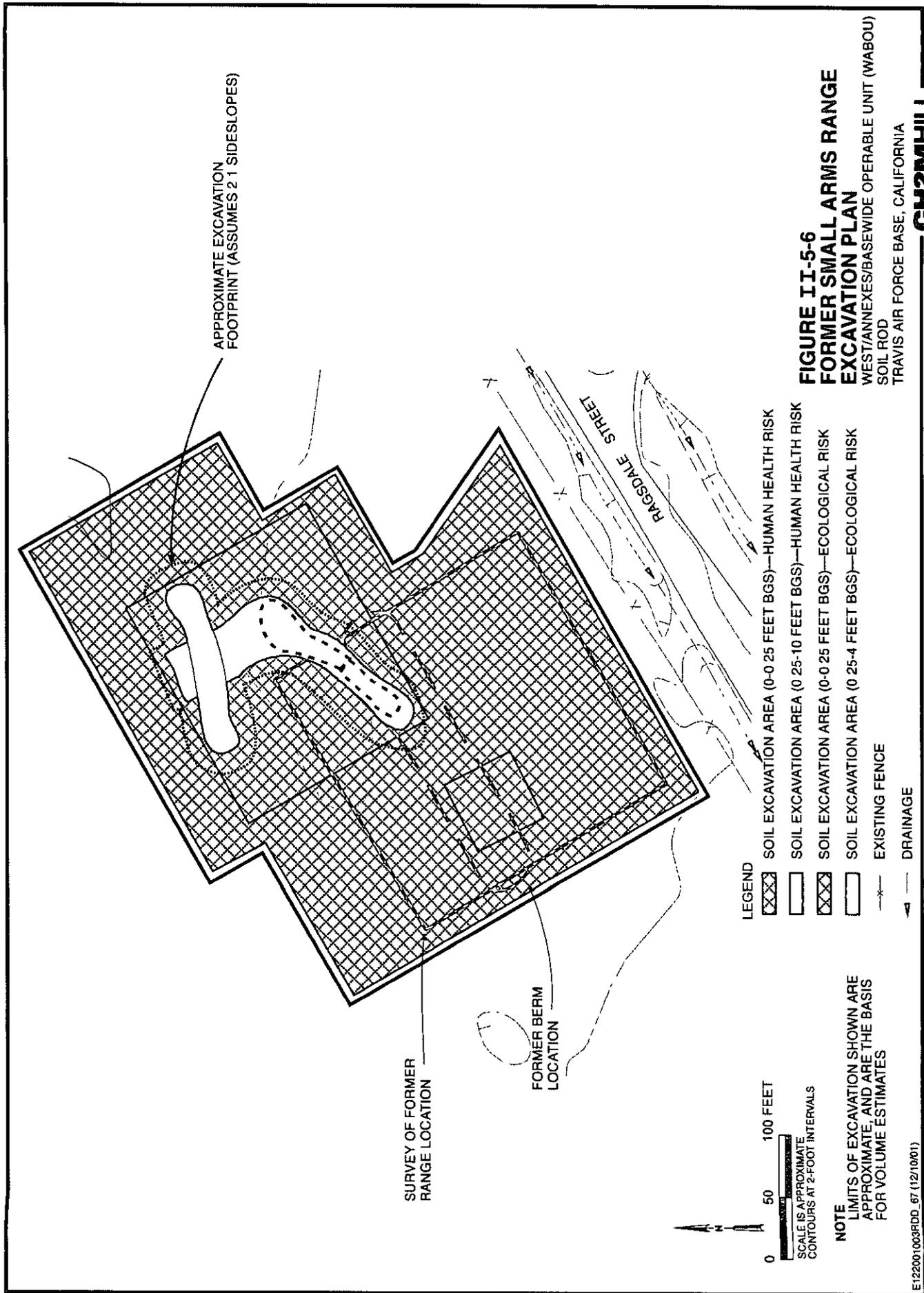
- SOIL EXCAVATION—HUMAN HEALTH AND ECOLOGICAL RISK
- EXISTING FENCE

0 150 300 FEET
 SCALE IS APPROXIMATE

NOTES

- 1 LIMITS OF EXCAVATION SHOWN ARE APPROXIMATE, AND ARE THE BASIS FOR VOLUME ESTIMATES
- 2 DEPTH OF SOIL CONTAMINATION EXTENDS APPROXIMATELY 10-FT BGS





APPROXIMATE EXCAVATION FOOTPRINT (ASSUMES 2:1 SIDESLOPES)

SURVEY OF FORMER RANGE LOCATION

FORMER BERM LOCATION

RAGDALE STREET

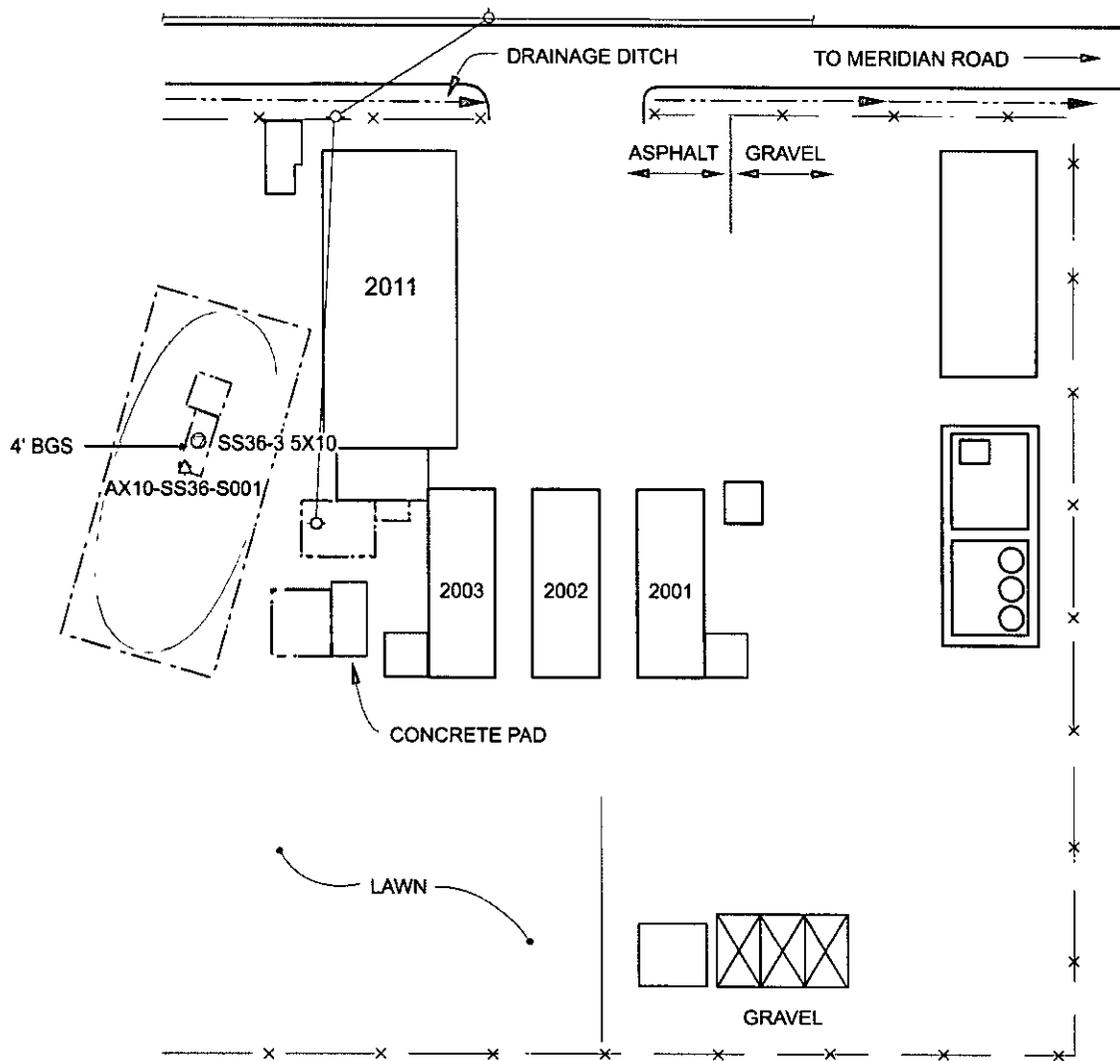
LEGEND

- [Cross-hatch pattern] SOIL EXCAVATION AREA (0-0 25 FEET BGS)—HUMAN HEALTH RISK
- [Horizontal lines pattern] SOIL EXCAVATION AREA (0 25-10 FEET BGS)—HUMAN HEALTH RISK
- [Vertical lines pattern] SOIL EXCAVATION AREA (0-0 25 FEET BGS)—ECOLOGICAL RISK
- [Diagonal lines pattern] SOIL EXCAVATION AREA (0 25-4 FEET BGS)—ECOLOGICAL RISK
- [Dashed line] EXISTING FENCE
- [Arrow] DRAINAGE

0 50 100 FEET
 SCALE IS APPROXIMATE
 CONTOURS AT 2-FOOT INTERVALS

NOTE
 LIMITS OF EXCAVATION SHOWN ARE
 APPROXIMATE, AND ARE THE BASIS
 FOR VOLUME ESTIMATES

FIGURE I I-5-6
FORMER SMALL ARMS RANGE
EXCAVATION PLAN
 WEST/ANNEXES/BASEWIDE OPERABLE UNIT (WABOU)
 SOIL ROD
 TRAVIS AIR FORCE BASE, CALIFORNIA



LEGEND

- x— Fence
- - -> Drainage
- Powerline
- - - Extent of Excavation
- - - Approximate Area of Surface Soil Contamination
- △ Post-Excavation Sample
- ⊙ Groundwater Protection Sample

Source
 Travis\Cypress Lakes\ra-final-excavation-samples cdr - VMG 07/13/01 SAC

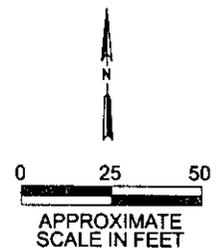
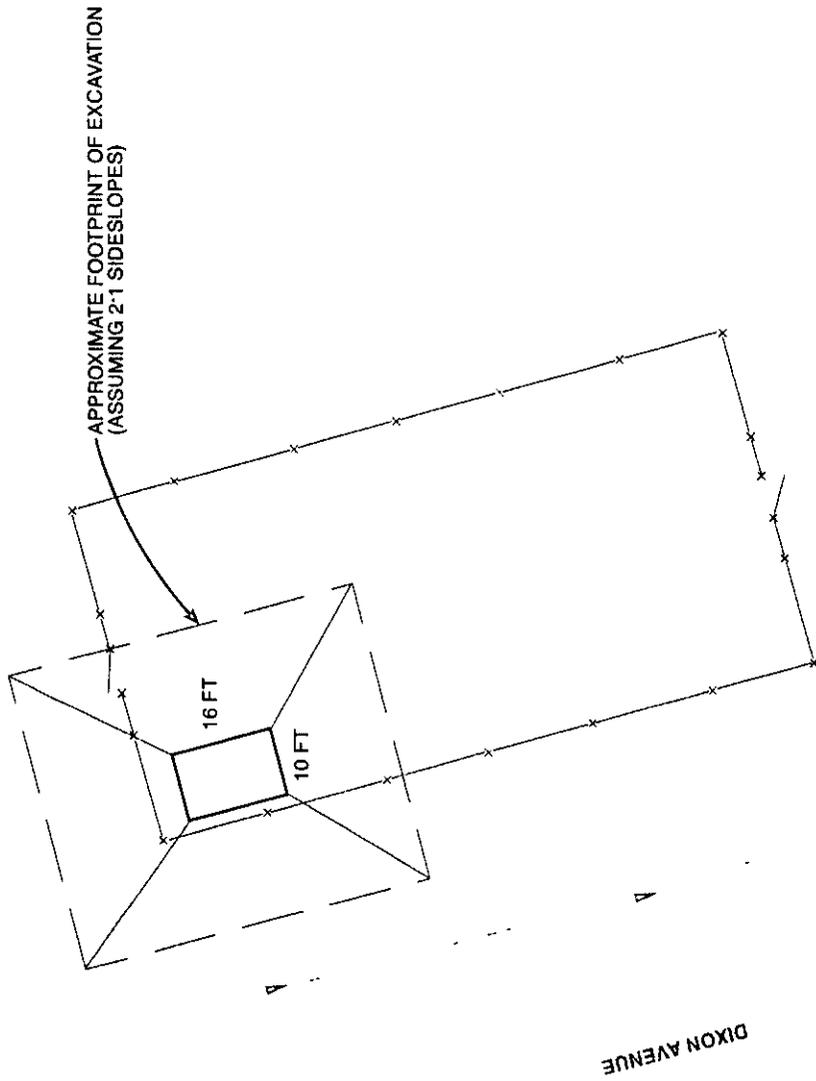


FIGURE II-5-7
CYPRESS LAKES GOLF COURSE
MAINTENANCE YARD
FINAL EXTENT OF EXCAVATION
 WEST/ANNEXES/BASEWIDE OPERABLE UNIT (WABOU)
 SOIL ROD
 TRAVIS AIR FORCE BASE, CALIFORNIA



**FIGURE II-5-8
RADIOACTIVE BURIAL SITE 2 (RW13)
EXCAVATION PLAN**
WEST/ANNEXES/BASEWIDE OPERABLE UNIT (WABOU)
SOIL ROD
TRAVIS AIR FORCE BASE, CALIFORNIA

LEGEND

- SOIL EXCAVATION—HUMAN HEALTH RISK
- EXISTING FENCE
- DRAINAGE

0 15 30 FEET
SCALE IS APPROXIMATE

NOTE
1 LIMITS OF EXCAVATION SHOWN ARE APPROXIMATE,
AND ARE THE BASIS FOR VOLUME ESTIMATES
2 DEPTH OF SOIL CONTAMINATION EXTENDS
APPROXIMATELY 10-FT BGS

Section Tab

Section 6.0

6.0 List of Applicable or Relevant and Appropriate Requirements and Performance Standards

6.1 Overview

Under CERCLA, remedial actions designed to clean up or abate contaminants in the groundwater or in soils must be designed, constructed, and operated to comply with all federal and more stringent State ARARs. ARARs include both federal requirements under any federal environmental law and State requirements under state environmental or facility siting laws that are more stringent than federal requirements and that have been identified by the State of California in a timely manner.

Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. Relevant and appropriate requirements include those that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, nevertheless address problems or situations sufficiently similar to those encountered at the CERCLA site to indicate their use is well suited to the particular site. If a given requirement is both relevant and appropriate to a particular site, it constitutes a valid legal requirement for that site. A requirement must either be applicable or both relevant and appropriate to be an ARAR. If no ARAR addresses a particular situation, or if an ARAR is insufficient to protect human health or the environment, then non-promulgated standards, criteria, guidance, and to be considered (TBC) advisories are identified as additional performance standards in an ROD.

In general, onsite actions need to comply with only the substantive aspects of these requirements, not with corresponding administrative requirements (such as, but not limited to, permits, recordkeeping, and reporting).

All laws and statutes identified as ARARs for a particular site or action must be considered and applied during the design, construction, and operation of any remedial action at the particular site. ARARs are identified on a site-specific basis from data and information concerning that site. Data and information concerning the objectives of site remediation, specific actions that are being considered as remedies at that site, the hazardous substances located upon the site, the physical and geological characteristics of the site, and the potential human and ecological receptors at or near the site must be analyzed and considered to properly identify ARARs at a particular site. All federal and more stringent state requirements that address or impact any of these conditions must be included as site ARARs.

There are three categories of ARARs that are described below:

- Chemical-specific ARARs establish numerical values or provide methodologies which, when applied to site-specific conditions, result in the establishment of numerical values. These ARARs are developed by identifying the contaminants at a site that pose a threat to human health or the environment and that must be remediated. Chemical-specific ARARs determine acceptable concentrations of specific hazardous substances,

pollutants, and contaminants in the environment and establish the levels to which the soil or groundwater at the affected site must be cleaned or restored to protect human health and the environment. Chemical-specific ARARs also establish the levels at which certain actions must be taken while transporting, treating, or storing hazardous wastes recovered during remediation.

- Location-specific ARARs are designed to protect the unique characteristics of the site or other areas potentially affected by site activities during the design, construction, or operation of remedial activities. Location-specific ARARs place restrictions on the concentration of hazardous substances or the conduct of activities solely because the site occurs in, or may affect, a special location. Some examples include the protection of wetlands and vernal pools; protection of endangered or threatened species and their habitats; and the protection of fish and game from unauthorized taking.
- Action-specific ARARs are technologically or activity-based requirements or limitations on the particular remedial actions at the site. Some examples include prohibitions or restrictions against the discharge of chemicals or contaminants to the air, water, or soil and the proper transfer, treatment, or storage of chemicals and contaminants.

6.2 ARARs Identification, Development, and Evaluation

6.2.1 Methodology

As lead agency, the Department of the Air Force has performed each of the following actions consistent with CERCLA and the NCP:

- Identified federal ARARs for each remedial action alternative addressed in the WABOU FS, taking into account site-specific conditions found in the WABOU.
- Reviewed potential state ARARs identified by the State to determine whether each potential ARAR satisfied CERCLA and NCP criteria that must be met to qualify as State ARARs.
- Evaluated and compared federal ARARs and their state counterparts to determine which State ARARs are more stringent or are in addition to the federal ARARs.
- Reached a conclusion as to which federal and State requirements were the most stringent ARARs for each selected alternative.

6.2.2 Solicitation, Identification, and Evaluation of State ARARs

The Department of the Air Force followed the procedures of the process set forth in 40 CFR, Section 300.515 and the Travis AFB FFA for remedial actions in seeking state assistance in identification of State ARARs.

The CERCLA, NCP, and FFA requirements for remedial actions provide that the lead federal agency request that the State identify chemical-specific and location-specific State ARARs. The lead agency requested chemical-, location-, and action-specific ARARs from DTSC on 20 February 1997. The request letter included as an attachment the ARARs tables developed during the NEWIOU FS. These tables were developed using responses from:

- California Integrated Waste Management Board
- Department of Toxic Substances Control Board
- State Water Resources Control Board
- California Regional Water Resources Control Board
- Bay Area Air Quality Management District
- California Department of Fish and Game

With few exceptions, the site conditions at both operable units are similar, so this approach was used to simplify the WABOU ARARs selection process for both the state and lead agency. The tables were made available so that the state could identify additional requirements, if any, to be included as ARARs, or identify those requirements that were not applicable to the WABOU. The state did identify additional requirements that address radiological remediation sites and actions.

During the review and analysis of ARARs identified by the state, and following considerable discussion with the representatives from the various state agencies, many of the requirements identified by the state as potential ARARs were determined to be valid ARARs by the lead agency. These ARARs are included in this section of this document.

6.3 Determination of ARARs

6.3.1 Methodology

The list included in this section identifies those requirements applicable or relevant and appropriate to soil remediation while those that had no relevancy were excluded from consideration. Specifically excluded were:

1. Location-specific requirements addressing conditions not present at WABOU remediation sites.
2. Chemical-specific requirements for COCs not present at WABOU remediation sites.
3. Action-specific requirements for remedial alternatives not utilized at WABOU remediation sites.

The list of ARARs for WABOU soil sites and remedial actions is provided in Tables II-6-1 through II-6-8 (all tables come at the end of this section).

6.4 Action-Specific ARARs

These ARARs place restrictions on remedial activities that may negatively impact the surrounding environment. The potential WABOU soil remedial alternatives were analyzed to identify potential impacts to the environment. Those considered are discussed in the following sections.

6.4.1 Solid Waste Management Requirements

The California Integrated Waste Management Act of 1989 is intended to reduce, recycle, and reuse solid waste generated in the state to the maximum extent feasible in an efficient and

cost-effective manner to conserve water, energy, and other natural resources, to protect the environment, and to improve the regulations for solid waste management. Table II-6-1 contains potential ARARs for sites containing solid waste and a brief description of the substantive requirements and applicability to the sites, remedial action, or technology used to clean up the site and contaminated material.

6.4.2 Hazardous Waste Treatment, Storage, and Disposal Requirements

These requirements are technology- or activity-based requirements that place limitations on actions taken with respect to the hazardous waste. Regulations promulgated under the applicable provisions of the state authorized federal RCRA and more stringent provisions of the California Hazardous Waste Control Law (HWCL) are relevant and appropriate to RCRA-permitted storage facilities and proper characterization of hazardous waste, and storage and disposal of such waste. If any hazardous wastes are identified that will be transported offsite, they will be disposed of and handled under applicable provisions of the state authorized federal RCRA program.

Many of the HWCL provisions are either applicable or relevant and appropriate because they describe requirements for the safe handling of contaminated materials and precautions for preventing further contamination. These requirements are identified in Table II-6-2.

6.4.3 Water Resources Requirements

Several California statutes and regulations that protect the waters of the State have been identified and incorporated as ARARs. These ARARs establish the remedial objectives and requirements for COCs present at WABOU soil remediation sites. For example, Title 27 details the requirements for a minimum five foot separation between waste in the CAMU and groundwater, design of the final engineered cover, along with closure and post-closure maintenance and monitoring.

The Porter-Cologne Water Quality Control Act (PCWQCA) is one of the statutory bases for regulation of discharges of waste to land that could impair either surface water or groundwater quality in California. It establishes the authority of the State through its regional water quality control boards to protect the quality of surface water and groundwater. Under the authority of the PCWQCA, the Regional Water Quality Control Board (RWQCB) developed the San Francisco Bay Basin Plan, which in conjunction with regulations promulgated pursuant to the PCWQCA is identified in Table II-6-3. The EPA does not acknowledge the status of the San Francisco Bay Basin Plan in this soil ROD as a soil ARAR. The Air Force will take a cautious approach to this issue and will retain this groundwater requirement as a soil ARAR until such time that EPA and RWQCB agree to an acceptable resolution. If the regulatory agencies decide that this requirement is not a soil ARAR, this ROD will be amended accordingly.

6.4.4 Air Resources Requirements

Legislation divides the State into local air pollution control districts and allows each district to enforce the requirements of the California Clean Air Act within its jurisdictional boundaries. Travis AFB is located in the Bay Area Air Quality Management District (BAAQMD). The applicable air regulations are presented in Table II-6-4. In addition, most of the rules in the State Implementation Plan (SIP), adopted pursuant to the Federal Clean Air

Act, are federal ARARs. Table II-6-4 contains a brief description of the substantive requirements and their applicability to either the site, remedial action, or technology used to clean up the site.

6.5 Location-Specific ARARs

These ARARs place restrictions on remedial activities that may be conducted onsite because of the presence of unique site features. The location of the WABOU soil and groundwater sites and surrounding areas were analyzed for unique site features to identify ARARs. The unique site features considered are discussed below.

6.5.1 Habitats of Rare, Threatened, Endangered, and Special-Status Species

Vernal pools that may contain an endangered species, including the Vernal Pool Tadpole Shrimp and the Vernal Pool Fairy Shrimp, have been identified. Other endangered species, including the Black-Shouldered Kite, Boggs Lake Dodder, Burrowing Owl, Coopers Hawk, California Gull, Golden Eagle, Loggerhead Shrike, Northern Harrier, Red Fox, Tri-colored Blackbird, Contra Costa Goldfields, Northwestern Pond Turtle, and San Francisco Forktail Damselfly have been observed at least once at Travis AFB and have the potential to be found at WABOU sites.

Several more stringent State ARARs protective of site ecology have also been identified. The California Fish and Game Code (CFGC) and regulations promulgated under this Code protect rare, endangered, or threatened species or habitats, and require alternative actions at sites where impacts have the potential to occur. In addition to these State counterparts to the Endangered Species Act, the CFGC also establishes several requirements to protect site wildlife by prohibiting or restricting the unauthorized taking of other wildlife. The CFGC also regulates to protect aquatic life in the waters of the State. All remedial activities that have the potential to cause a discharge to any stream, lake, or other body of water must comply with the requirements of the CFGC. Table II-6-5 presents the CFGC ARARs.

Several federal ARARs were identified which impact site ecology. The Endangered Species Act and implementing regulations set forth in Table II-6-6 apply to those remedial actions at WABOU sites where impact to endangered wildlife could occur. To ensure that regulatory requirements are followed and impacts are avoided or mitigated, all sites will be surveyed in consultation with the U.S. Fish and Wildlife Service for the presence of these resources immediately prior to the commencement of remedial activities. This consultation will begin after all necessary site-specific data concerning the execution of soil media actions become available.

6.5.2 Historically or Culturally Significant Properties

Some buildings on Travis AFB have recently been identified as Cold War Era buildings and historically significant. However, none of these buildings is affected by WABOU remedial activities.

6.5.3 Wilderness Areas, Wild and Scenic Rivers, and Coastal Zones

No wilderness areas, wild and scenic rivers, or coastal zones exist within the boundaries of Travis AFB. Therefore, requirements related to these areas are not applicable or relevant to WABOU sites and actions.

6.5.4 Earthquake Faults

Although the Vaca-Winters and the Vaca-Kirby faults are located in the Travis AFB area, WABOU sites are not located on these faults.

6.6 Chemical-Specific ARARs

6.6.1 Remediation of Soil Sites

The soil sites in the WABOU are contaminated primarily with SVOCs, pesticides, PCBs, and metals. The only site with potential vadose zone issues is Building 755 at which volatile organic chemicals (VOC) are present in the subsurface soil. The burial of construction debris and pesticide containers took place at two WABOU sites. A third site was used for the burial of low-level radioactive waste from nuclear weapon maintenance.

The only chemical-specific federal requirement applicable to soils remediation is the Toxic Substance Control Act implemented through 40 CFR, Part 761 that applies to sites where soil contains more than 50 ppm of PCBs and the PCB spill occurred after May 4, 1987. There are no WABOU soil sites with PCB concentrations greater than 2.0 mg/kg. Therefore, this federal requirement is not an ARAR at any WABOU site. There are no state chemical-specific ARARs for COCs found in WABOU soil sites.

To ensure protection of human health and the environment, chemical-specific requirements were developed using the 1 October 1999 PRGs developed by U.S. EPA Region IX and the Human Health screening process. This screening process evaluated chemicals detected in soil/dry sediment and compared them to chemical-specific PRGs developed by U.S. EPA Region IX, dated 1995. These soil PRGs were developed using default exposure factors for a residential scenario and U.S. EPA or Cal-EPA toxicity values (whichever are more stringent) to estimate concentrations that are protective of humans, including sensitive groups, over a lifetime. This is a very conservative screening assessment because no current or future residential land use is planned for sites within the WABOU. Radiological data were evaluated by comparing the detected concentrations in soil with PRGs for radioactive constituents that were developed following the 1991 EPA Risk Assessment Guidance for Superfund (RAGS), Volume 1.

6.6.2 Low-level Radiological Contaminant Remediation

In addition to the hazardous waste, transfer, treatment, and storage requirements for radioactive constituents identified above, the State of California has also identified statutes, regulations, and guidance that pertain to military bases in California. Those requirements identified as potential ARARs are identified in Table II-6-7. The State identified a non-promulgated guidance document title, "Guidance for Cleanup of Radioactivity on Closing Military Bases for Unrestricted Use of Property." However, because Travis Air Force Base is not on the military installation closure list, and the Travis AFB property will not be designated for unrestricted public use or access, it was determined by the lead agency that this document is neither applicable nor relevant to cleanup of radiological sites at Travis AFB.

**Table II-6-1
Travis AFB - WABOU Soil Sites
State ARARs
California Integrated Waste Management Requirements**

Source	Requirement, Standard, of Criterion	Type	Description	Remarks	Sites and Alternatives
Title 27 CCR Chap 3, Subchapter 4, Art 1	20510	Applicable	Establishes requirement that the weight or volume of waste accepted must be determined to an accuracy of + or - 10 percent. Applies to sites defined by PRC 40122. Requires that records be maintained to document excavations which may affect the safe and proper operation of the site or cause damage to adjoining properties.	Applicable to non-hazardous waste removed from WABOU landfill sites which will be consolidated at the base-wide CAMU. Wastes generated will include landfill wastes, disposal pit wastes, and contaminated soil wastes. Permitting requirements set forth in these sections are not ARARs. The 27 CCR requirements reflect the consolidation and renumbering of Chapter 14 and Chapter 23 solid waste requirements by the State of California. Requirements identified in Title 27 may vary from those in the WABOU FS ARAR tables as a result of this consolidation.	008, 041, 042, 044, 045 S4, S6
	20530	Applicable	Requires that the site be designed to discourage unauthorized access using perimeter or topographic constraints, or fenced to provide adequate security.		
	20540	Applicable	Requires landfill roads be designed to minimize dust or tracking of materials onto public roads.		
	20630	Applicable	Requires that unloading of solid waste be confined to as small an area as possible to minimize health and safety hazards.		
	20640	Applicable	Requires spreading/compacting of refuse in layers		
	20650	Applicable	Requires covered surfaces of the disposal area be graded to promote run-off and prevent ponding, accounting for future settlement.		
	20660	Applicable	Requires stockpiled cover material and unacceptable native material be placed not to cause problems or interference with site operations.		

**Table II-6-1
Travis AFB - WABOU Soil Sites
State ARARs
California Integrated Waste Management Requirements
(continued)**

Source	Requirement, Standard, of Criterion	Type	Description	Remarks	Sites and Alternatives
Title 27 CCR Chap 3, Subchapter 4, Art 3	20700	Applicable	Requires compacted material at least 12 inches thick on fill where no additional refuse will be deposited within 180 days.	Applicable to activities where non-hazardous wastes will be uncovered and moved.	008, 041, 042, 044, 045
	20710	Applicable	Establishes prohibition on scavenging at disposal sites. Salvaging is permitted in a planned and controlled manner. Requires salvage material to be safely isolated for storage, and the storage time for salvage material be limited to a safe duration		S4, S5, S6
	20720	Applicable	Establishes that items capable of impairing public health not be salvaged without prior approval by enforcement/local health agencies.		
	20730	Applicable	Authorizes volume reduction and energy recovery in a planned and controlled manner. Requires processing to be confined to the smallest area possible.		
Title 27 CCR Chap 3, Subchapter 4, Art 4	20760	Applicable	Requires that each disposal site be operated and maintained so as to not create a nuisance.	Applicable to activities where nonhazardous wastes will be uncovered or moved Section 20790 is applicable as applied consistent with 22 CCR 66264.301	008, 041, 042, 044, 045
	20790	Applicable	The operator shall take adequate steps to monitor, collect, treat, and effectively dispose of leachate. Requires that no solid waste be deposited in contact with surface or ground water.		S4, S5, S6
	20800	Applicable	Requires operators take measures to minimize dust and prevent safety hazards due to obscured visibility.		

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**Tabl II-6-1
Travis AFB - WABOU Soil Sit s
State ARARs
California Integrated Waste Management Requirements
(continued)**

Source	Requirement, Standard, of Criterion	Type	Description	Remarks	Sites and Alternatives
Title 27 CCR Chapter 3, Subchapter 4 Article 4 (continued)	20810	Applicable	Requires the operator control or prevent the propagation, harborage, or attraction of flies, rodents, or other vectors, and to minimize bird problems.	Applicable to activities where non-hazardous wastes will be uncovered or moved.	008, 041, 042, 044, 045
	20820	Applicable	Requires adequate drainage to be provided to ensure integrity of systems, prevent safety hazards, and prevent exposure of waste.		
	20830	Applicable	Requires litter/loose materials to be routinely collected and disposed.		
	20860	Applicable	Requires minimization of traffic flow into, on and out of the site.		

Title 27 CCR Chapter 3, Subchapter 4, Article 6	20919	Applicable	Establishes requirements for landfill gas control based on monitoring.	Applicable to activities where nonhazardous wastes will be uncovered or moved	008, 041, 042, 044, 045
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Title 27 CCR Chapter 3, Subchapter 5, Article 2	21130	Applicable	Establishes a requirement to maintain a written emergency response plan.	Applicable to landfill sites where nonhazardous wastes will be uncovered or moved. Section 21135, paragraphs (c) to (f) are relevant requirements. Paragraph (a) is not applicable per paragraph (b). Enforcement Agency requirements identified in these sections are non substantive and therefore not ARARs	007, 008, 044
	21135	Relevant and Appropriate	Establishes site security requirements and closure procedure for open landfills.		

**Table II-6-1
Travis AFB - WABOU Soil Sites
State ARARs
California Integrated Waste Management Requirements
(continued)**

Source	Requirement, Standard, of Criterion	Type	Description	Remarks	Sites and Alternatives
Title 27 CCR Chapter 3, Subchapter 5 Article 2 (continued)	21140	Relevant and Appropriate	Establishes requirements for the final cover of the waste management unit.	Pertains to the management unit in which wastes from the remediation sites will be placed.	007
	21142	Relevant and Appropriate	Establishes requirements for the design and maintenance of the final grading of the cap for the waste management unit.		S4, S6
	21145	Relevant and Appropriate	Establishes requirements for the design of the slopes of the cap on the waste management unit to ensure stability.		
	21150	Relevant and Appropriate	Establishes requirements for the design and maintenance of the drainage and erosion control system for the waste management unit.		
	21160	Relevant and Appropriate	Establishes requirement for landfill gas control and leachate collection within the waste management unit.		
	21180	Relevant and Appropriate	Establishes requirements for postclosure maintenance of the waste management unit.		
	21190	Relevant and Appropriate	Establishes parameters for postclosure land use of the waste management unit.		
Title 27 CCR Chapter 4, Subchapter 3, Article 2	21600	Relevant and Appropriate	Requires the development of plans to ensure solid waste is handled and disposed in a manner that protects public health, safety, and the environment.	Pertains to sites where consolidation activities will occur. Relevant and appropriate to establish format for contents of the remedial action documents.	008, 044 S4, S5, S6

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**Table II-6-2
Travis AFB - WABOU Soil Sites
Federal ARARs*
Waste Transfer, Treatment, and Storage and Disposal Requirements
* (California Statutes and Regulations Comprising Federal Authorized RCRA Program)**

Requirement,
Standard, or
Criterion

Source	Requirement, Standard, or Criterion	Type	Description	Remarks	Sites and Alternatives
Title 22 CCR Chap 12, Art 1	66262.11	Applicable	Requires a facility to make a determination as to whether waste is hazardous	Applicable to wastes excavated or resulting from treatment processes.	008, 013, 041, 042, 045 S4, S5, S6
Title 22 CCR Chap 14, Art 9 (Standards for Owners and Operators of Hazardous Waste Transfer, Treatment, Storage, and Disposal Facilities - Use and Management of Containers)	66264.171	Relevant and Appropriate	Sets standards for containers holding hazardous waste for chemicals recovered from sediments, surface soils, or groundwater.	Sections in this article are relevant and appropriate to sites or actions where waste containers are used. Containers will be used to transfer and store wastes generated from construction activities or the operation of remedial actions. Examples would include spent carbon from treatment plants, drill cuttings from well installation, free product removed from a plume, etc.	008, 013, 041, 042, 045 S4, S5, S6
	66264.172	Relevant and Appropriate	Requires use of containers that are compatible with the recovered material for the storage of that material.		
	66264.173	Relevant and Appropriate	Requires containers used to transport material to be closed during transport and that waste be handled to minimize damage to containers.		
	66264.174	Relevant and Appropriate	Establishes requirements for inspecting containers weekly.		
	66264.175	Relevant and Appropriate	Establishes requirement for adequate secondary containment for stored waste.		
	66264.176	Relevant and Appropriate	Requires isolating waste from sources of ignition if waste is ignitable.		
	66264.177	Relevant and Appropriate	Requires segregation of waste from incompatible waste.		
	66264.178	Relevant and Appropriate	Establishes the requirement to remove all hazardous waste and waste residue at closure.		

**Tabl II-6-2
Travis AFB - WABOU Soil Sites
Federal ARARs***

**Waste Transfer, Treatment, and Storage and Disposal Requirements
* (California Statutes and Regulations Comprising Federal Authorized RCRA Program)
(continued)**

Source	Requirement, Standard, or Criterion	Type	Description	Remarks	Sites and Alternatives	
Title 22 CCR Chap 14, Art 10 Standards for Owners and Operators of Hazardous Waste Transfer, Treatment, Storage, and Disposal (Facilities - Use and Management of Tank Systems)	66264.192	Relevant and Appropriate	Establishes design/installation requirements for new tank systems and components.	Sections in this article are relevant and appropriate to alternatives which incorporate the use of tanks or tank systems as part of the remedial equipment. Tanks will be used at treatment plants to store contaminated water prior to treatment. Tanks will also be used for temporary storage of free product, if necessary.	008, 041, 042, 045	
	66264.193	Relevant and Appropriate	Delineates requirements for tank systems including containment and detection of releases.			
	66264.194	Relevant and Appropriate	Delineates requirements for tank systems including operating requirements.			
	66264.195	Relevant and Appropriate	Delineates requirements for tank systems including inspections.			
	66264.196	Relevant and Appropriate	Delineates requirements for tank systems including response to leaks or spills.			
	66264.197	Relevant and Appropriate	Delineates requirements for tank systems including closure and post-closure care.	Section 66264.197, paras (a), (c)(3) and (c)(4) are not relevant and appropriate with respect to cost estimates and financial responsibility requirements		
	66264.198	Relevant and Appropriate	Delineates requirements for tank systems including special care requirements for reactive wastes.			Section 66264.198 is relevant and appropriate to sites with ignitable wastes [i.e., free product] or reactive waste.
	66264.199	Relevant and Appropriate	Delineates requirements for tank systems including special requirements for incompatible wastes.			

**Tabl II-6-2
Travis AFB - WABOU Soil Sites
Federal ARARs*
Waste Transfer, Treatment, and Storage and Disposal Requirements
(California Statutes and Regulations Comprising Federal Authorized RCRA Program)
(continued)**

Source	Requirement, Standard, or Criterion	Type	Description	Remarks	Sites and Alternatives
Title 22 CCR Chap 14, Art 15 Corrective Action for Waste Management Units	66264.552(c)	Applicable	Establishes subjective criteria for the establishment of a Corrective Action Management Unit (CAMU): (1) to ensure reliable, effective, protective, and cost-effective corrective action measures (2) to eliminate unacceptable risks to human health or the environment resulting from exposure to hazardous wastes (3) which limit the use of uncontaminated areas of the site (4) to manage and contain wastes that remain in place after the CAMU is closed (5) to expedite timing of corrective action implementation (6) to utilize technologies that enhance the long-term effectiveness of the corrective actions; and (7) which minimize the land area of the site upon which wastes remain after CAMU closure.	These criteria are applicable to the creation of a CAMU at the LF007 landfill in the NEWIOU. Although there will be no CAMU established in the WABOU, these requirements are applicable to the wastes excavated from the WABOU sites that will be consolidated at the LF007 landfill.	008, 041, 042, 045
	66264.552(d)	Applicable	Establish requirement for lead agency to provide the State with information necessary for the establishment of a CAMU	Applicable to sites where solid wastes are excavated and transported to LF007 for final consolidation.	S4, S6
	66264.552(e)	Applicable	Requires DTSC to specify CAMU requirements to include: (1) areal configuration of the CAMU; (2) remediation waste management; (3) ground water monitoring; (4) and closure and post-closure.	The requirement for a permit or order set forth in Section 66264 552(e) is not applicable.	

**Table II-6-2
Travis AFB - WABOU Soil Sites
Federal ARARs***

**Waste Transfer, Treatment, and Storage and Disposal Requirements
* (California Statutes and Regulations Comprising Federal Authorized RCRA Program)
(continued)**

Source	Requirement, Standard, or Criterion	Type	Description	Remarks	Sites and Alternatives
Title 22 CCR Chap 15, Art 17 (Chemical, Physical, and Biological Treatment)	66265.401	Relevant and Appropriate	Establishes operating requirements for equipment used in chemical, physical, or biological treatment.	Relevant and appropriate for landfill sites where wastes will be chemically treated and left in place prior to capping.	S7
	66265.402	Relevant and Appropriate	Establishes requirements for conducting waste analysis and trial treatment tests.		
	66265.403	Relevant and Appropriate	Establishes facility inspection requirements.		
	66265.404	Relevant and Appropriate	Establishes requirements for treatment process closure.		
	66265.405	Relevant and Appropriate	Establishes special requirements for ignitable or reactive wastes.		
	66265.406	Relevant and Appropriate	Establishes special requirements for incompatible wastes.		
Title 22 CCR Chap 18, Art 1 (Land Disposal Restrictions - General)	66268.3	Applicable	Establishes land disposal restrictions, including a prohibition of using dilution as a substitute for treatment.	Applicable to hazardous wastes generated from site excavation activities. Restricts onsite disposal activities in unauthorized areas. Section 66268.7, paragraphs (a)(1), (b)(1)(2) and (3), and (c)(2) are substantive requirements. The remainder of the section is procedural and not ARARs.	008, 041, 042, 045
	66268.7	Applicable	Establishes land disposal restrictions, including requirements for waste analysis and record keeping.		
	66268.9	Applicable	Establishes land disposal restrictions and special rules for wastes exhibit a characteristic.		
Title 22 CCR Chap 18, Art 2	All Sections	Applicable	Establishes treatment technology for disposal of waste to land for RCRA and non-RCRA wastes identified in section 66268.106.	Applicable to sites where excavated material is classified as hazardous waste or state regulated waste. Wastes identified will be managed IAW these standards.	008, 041, 042, 045 S4, S5, S6, S7

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**Table II-6-2
Travis AFB - WABOU Soil Sit s
Federal ARARs*
Waste Transfer, Treatment, and Storage and Disposal Requirements
* (California Statutes and Regulations Comprising Federal Authorized RCRA Program)
(continued)**

Source	Requirement, Standard, or Criterion	Type	Description	Remarks	Sites and Alternatives
Title 22 CCR, Chap 18 Art 3	66268.30	Applicable	Establishes waste-specific LDRs	Applicable to sites where excavated media is classified hazardous waste and disposed of or treated on-site. Applicable to wastes excavated/removed from soil sites. Requires identification of waste through the proper characterization process.	08, 41, 42, 45 S4, S5, S6
	66268.31	Applicable	Establishes LDRs for waste containing dioxin.		
	66268.32	Applicable	Establishes LDRs for certain hazardous waste.		
	66268.33	Applicable	Establishes LDRs - First Third Wastes.		
	66268.34	Applicable	Establishes LDRs - Second Third Wastes.		
	66268.35	Applicable	Establishes LDRs - Third Third Wastes.		
	66268.36	Applicable	Prohibits land disposal of newly listed wastes.		
	66268.37	Applicable	Prohibits land disposal of ignitable or corrosive wastes whose treatment standards were vacated.		
	66268.38	Applicable	Identifies waste specific prohibitions on newly identified organic toxicity characteristic wastes and newly listed coke by-product and chlorotoluene waste		

Title 22 CCR, Chap 18, Art 4	All Sections	Applicable	Identifies treatment standards for halogenated organic compounds regulated by Sec. 66268.32	Applicable to sites where excavated material is classified as hazardous waste. Identified waste to be managed in accordance with these standards, if disposed of on land and not in a CAMU. Applicable at sites where wastes or contaminated soils are excavated or removed.	008, 041, 044 S4, S5, S6
	All Sections	Applicable	Establishes prohibitions on storage of hazardous wastes restricted under Article 3 of this chapter or RCRA Section 3004 (42 USC 6924).		
Title 22 CCR, Chap 18, Art 10	66268 100	Applicable	Establishes land disposal prohibitions for non-RCRA hazardous wastes.	Applicable to sites where unintentional spills may occur	008, 013, 041, 042, 045 S4, S5, S6
Title 22 CCR, Chap 18, Art 11	All Sections	Applicable	Establishes disposal restrictions, prohibitions, and treatment standards for certain identified hazardous wastes.		
Title 22 CCR, Chap 43 -Mgmt of Extremely Haz. Wastes)	67430.3	Applicable	Establishes requirements, for the removal of spilled or improperly deposited extremely hazardous wastes.		

**Table II-6-3
Travis AFB - WABOU Soil Sites
State ARARs
Water Board Requirements**

Source	Requirement, Standard, or Criterion	Type	Description	Remarks	Sites and Alternatives	
Federal Water Pollution Control Act Section 402, Porter Cologne Water Act; California Water Code, Division 7, Sections 13000, 13140, 13240, Water Quality Control Plan for the San Francisco Bay Basin	SWB Resolution 68-16	Applicable	Establishes policy that whenever the existing water quality is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it has been demonstrated that any change will be consistent with maximum benefit to the people of the State, won't unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than prescribed in the policies. Discharges or proposed discharges to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that a pollution or nuisance will not occur and the highest water quality consistent with maximum benefit to the people of the State will be maintained.	Applicable to sites where discharges of contaminants to the soil or soil actions have the potential to cause active discharges to surface water (i.e., contaminant solidification and stabilization and CAMU consolidation activities). The cleanup levels established in Tables II-5-2 through II-5-8 will satisfy this requirement.	007, 008, 041, 042, 044, 045	S4, S6, S7
Porter Cologne Water Act; CWC Sections 13000, 13140, 13240,	SWB Resolution 88-63	Applicable	Designates all ground and surface water of the state as potential drinking water with certain exceptions (TDS > 3000 ppm, well yield < 200 gpd, geothermic resources, waste water conveyance facility, or can't be reasonably treated for domestic use).	Applies to soils actions that will result in a discharge to groundwater or surface water (i.e. Union Creek). Beneficial uses of Union Creek include navigation, contact and non-contact recreation, fish spawning, and warm fresh-water and wildlife habitat. Groundwater beneficial uses include municipal and domestic water supply, industrial and industrial process water supply, and agriculture water supply.	007, 008, 041, 042, 044, 045	S4, S6, S7

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**Tabl II-6-3
Travis AFB - WABOU Soil Sit s
State ARARs
Water Board Requirements
(continued)**

Source	Requirement, Standard, or Criterion	Type	Description	Remarks	Sites and Alternatives
Porter Cologne Water Act; CWC Sections 13140, 13240, 13260, 13263, 13267, 13300, 13304, 13307	State Water Board Resolution 92-49	Relevant and Appropriate	Establishes a requirement for the regional boards to apply certain policies and procedures for the oversight of investigations and cleanup and abatement activities resulting from discharges of waste which affect or threaten water quality. Also requires the application of Title 27 CCR, Division 2 to cleanups.	Paragraphs IIIF and IIIG are relevant and appropriate to all WABOU sites where the discharges of wastes to soils threatens or may affect the quality of ground or surface water. The cleanup levels established in Tables II-5-2 through II-5-8 will satisfy this requirement.	007, 008, 041, 042, 044, 045 S4, S6, S7
Title 27 Division 2, Subdivision 1, Chapter 1, Article 1	20080 (b and c)	Relevant and Appropriate	Establishes the use and justification of engineered alternatives for construction of solid waste treatment, storage and disposal units that are consistent with Title 27 performance goals.	Permits to sites where consolidation activities will occur. Only substantive portions of this regulation pertain to the CAMU.	007 S4, S6
	20080 (d)	Relevant and Appropriate	Requires closure of existing waste management units IAW Title 27 CCR, Division 2, Chapter 3, Subchapter 2, Article 3. Applies to all areas where waste has been discharged to land on or before Nov 27, 1984, but were not closed, abandoned, or inactive prior to that date.	This section pertains to existing waste management units and only as invoked through section 20090(d).	008, 013, 044 S3, S7
	20090(d)	Relevant and Appropriate	Establishes exemption from provisions of this subsection for unintentional or unauthorized releases of waste or pollutants to the environment. Requires wastes, pollutants, or contaminated materials removed from the immediate place of release to be discharged according to Art 2, Subch. 2, Chap.3, Subdivision 1 (Sections 20200 et. seq.). Remedial actions to contain such wastes at the place of release shall implement applicable provisions of this subchapter to the extent feasible.	The 27 CCR requirements reflect the consolidation and renumbering of Chapter 14 and Chapter 23 solid waste requirements by the State of California. Requirements identified in Title 27 may vary from those in the WABOU FS ARAR tables as a result of this consolidation.	

**Table II-6-3
Travis AFB - WABOU Soil Sites
State ARARs
Water Board Requirements
(continued)**

Source	Requirement, Standard, or Criterion	Type	Description	Remarks	Sites and Alternatives
Title 27 Division 2, Subdivision 1, Chapter 3, Subchapter 2 Article 2	20210	Relevant and Appropriate	Requires that designated wastes be discharged to class I or II management units. Applies to designated waste (nonhazardous waste that could cause degradation of surface or ground water) to land for treatment, storage, or disposal.	Pertains to wastes being removed from landfills.	008, 013, 041, 044, 045
	20220	Applicable	Requires that non-hazardous solid waste be discharged to a classified waste management unit.		
Title 27 CCR Chapter 3, Subchapter 2, Article 3	20240	Relevant and Appropriate	Requires all new landfills, waste piles, and surface impoundments to be sited, designed, constructed, and operated to ensure that wastes will be a minimum of five feet (5 ft.) above the highest anticipated elevation of underlying ground water.	Pertains to sites where consolidation activities will occur. Relevant and appropriate for the design of the CAMU.	007
	(c)	Appropriate			
Title 27 Division 2, Subdivision 1, Chapter 3, Subchapter 3 Article 1	20380	Relevant and Appropriate	Establishes the ability to use an Allowable Engineered Alternative monitoring program	Pertains to areas in which waste has been discharged to land, specifically the CAMU. Only the substantive portions of this regulation pertain to the CAMU.	007
	20385	Relevant and Appropriate	Requires detection monitoring at a waste management unit to determine the threat to water quality.		
	20390	Relevant and Appropriate	Establishes a water quality protection standard for a waste management unit.		
	20395	Relevant and Appropriate	Establishes a list of chemicals of concern for a waste management unit.		
	20400	Relevant and Appropriate	Establishes concentration limits for chemicals of concern at a waste management unit.		
20405	20405	Relevant and Appropriate	Establishes monitoring points and the point of compliance at a waste management unit.	The Air Force has met these requirements through negotiation with the RWQCB. Requirements are satisfied in the CAMU Soil Acceptance Criteria technical memorandum and the draft LF007 Soil Remedial Design Report	
	20410	Relevant and Appropriate	Establishes a compliance monitoring period.		
	20410	Relevant and Appropriate			

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**Table II-6-3
Travis AFB - WABOU Soil Sites
State ARARs
Water Board Requirements
(continued)**

Source	Requirement, Standard, or Criterion	Type	Description	Remarks	Sites and Alternatives
Title 27 Division 2, Subdivision 1, Chapter 3, Subchapter 3, Article 1 (continued)	20420	Relevant and Appropriate	Requires the installation of a water quality monitoring system that is appropriate for detecting, at the earliest possible time, a release from the waste management unit, and that comply with substantive provisions of section 20415.	Pertains to sites where consolidation activities will occur	007 S4, S6
	20425	Relevant and Appropriate	Establishes the need to assess the nature and extent of a groundwater release, including a determination of the spatial distribution and concentration of each constituent.	Pertains to the CAMU only if the analytical results from the detection monitoring referenced in section 20385 show statistically "measurably significant" evidence of a release to groundwater. Only substantive portions of this regulation pertain to the CAMU	
	20430 (c, d, f, and g)	Relevant and Appropriate	Establishes procedures for the implementation and termination of corrective action measures and monitoring to ensure that cleanup levels are achieved throughout the zone affected by a release to groundwater.	Pertains to the CAMU only if the analytical results from the evaluation referenced in section 425 indicate the need to conduct a groundwater corrective action. Only substantive portions of these sections in the regulation pertain to the CAMU.	
Title 27 Division 2, Chap 3, Subchap 5 Art 1	20950	Relevant and Appropriate	Establishes closure and post-closure performance standards for a waste management unit.	Pertains to the management unit in which wastes from the remediation sites will be placed	007 S4, S6

**Table II-6-3
Travis AFB - WABOU Soil Sites
State ARARs
Water Board Requirements
(continued)**

Source	Requirement, Standard, or Criterion	Type	Description	Remarks	Sites and Alternatives	
Title 27 Division 2, Subdivision 1, Chap 3, Subchap 5 Art 2	21090	Relevant and Appropriate	For wastes contained or left in place following remedial action if potentially affecting water quality. Includes closure landfills and other areas where wastes have been discharged. Requires final cover be constructed IAW specific prescriptive standards	Pertains to remediation sites where waste has been left in place following remedial action.	007, 008, 013, 041, 044, 045	S3, S7
Title 27 Division 2, Subdivision 1, Chapter 3, Subchapter 5 Article 3	21400	Applicable	Requires surface impoundments to be closed by either removing all remaining contamination or closing the surface impoundment as a landfill.	Applies to areas where wastes containing free liquids were discharged.	008, 041	S3, S7
Title 27 Division 2, Subdivision 1, Chapter 4, Subchapter 3 Article 4	21750 (f, g, h)	Relevant and Appropriate	Establishes the need to consider the geology, hydrogeology and land and water use in the construction of a waste management unit.	The Air Force has met these requirements through negotiation with the RWQCB. Requirements are satisfied in the CAMU Soil Acceptance Criteria technical memorandum and the draft LF007 Soil Remedial Design Report.	008, 013, 041, 044, 045	S4, S6

**Table II-6-3
Travis AFB - WABOU Soil Sites
State ARARs
Water Board Requirements
(continued)**

Source	Requirement, Standard, or Criterion	Type	Description	Remarks	Sites and Alternatives
Regional Water Quality Control Board (San Francisco Bay Basin Water Quality Control Plan)	Chapter 2, Beneficial Uses.	Relevant and Appropriate	Establishes beneficial uses of surface and ground waters.	Pertains to soil sites where the selected remedy protects the beneficial uses of nearby surface water or underlying groundwater. Beneficial uses of Union Creek and downstream receiving waters include navigation, contact and non-contact recreation, fish spawning, warm fresh-water habitat, and wildlife habitat. Beneficial uses of groundwater include municipal and domestic water supply, industrial and agricultural process water supply, and agricultural water supply.	007, 008, 039, 041, 043
			Establishes both narrative and numerical water quality objectives for surface and ground waters. Narrative objectives describe the water quality to attain via pollution control and form the basis for the numerical values. Numerical objectives are designed to limit the adverse effects of pollutants.	Pertains to the beneficial uses that are being protected by the selected remedy at soil sites.	G3, G4, G5
State Water Resources Control Board Order 99-08-DWQ	A (Discharge Prohibitions), B (Receiving Water Limitations), Section A (Storm Water Pollution Prevention Plan - para. 1, 5 thru 11)	Relevant and Appropriate	Requires control of storm water runoff discharges at construction sites that are greater than five acres in size, including clearing, grading and excavation activities to be minimized using Best Available Technology Economically Achievable (BAT).	The substantive portions of these paragraphs are applicable to activities associated with the construction of the CAMU. The permitting requirement is not an ARAR.	007, 008, 013, 041, 045

**Table II-6-4
Travis AFB - WABOU Soil Sites
State ARARs
BAAQMD Air Remediation Requirements**

Source	Requirement, Standard, or Criterion	Type	Description	Remarks	Sites and Alternatives
Regulation 6	301	Applicable	Establishes limitations on visible emissions and opacity.	Applicable to sites where excavation or construction activities have the potential to release particulate matter into the air (i.e. dirt and dust), or at sites where portable soldering, brazing, welding equipment is used. Also applicable at sites where portable combustion engines of < 25 liters of displacement are used.	008, 013, 041, 042, 044, 045
	302	Applicable	Establishes limitations on opacity		
	303	Applicable	Establishes limitations on emission rates, concentration, visible emissions and opacity.		
	501	Applicable	Establishes requirements for sampling facilities and instruments.		

Regulation 8, Rule 40	110	Applicable	Establishes an exemption for calculation of aeration volumes for exposed surfaces.	Applicable to all soil sites where VOCs are present.	S4, S5, S6
	111	Applicable	Establishes an exemption for calculation of aeration volumes for exposed surfaces.		
	112	Applicable	Establishes exemption for calculation of aeration volume for soil used in sampling.		
	113	Applicable	Establishes an exemption for calculation of aeration volumes of chemicals with a boiling point >302 ° F.		
	311	Applicable	Establishes restrictions on vapor freeing a tank.		
	312	Applicable	Establishes restrictions on ventilating a tank.		
	602	Applicable	Establishes measurement of organic content requirements for organic compounds in soil.	Applicable to sites or activities where tanks are used as part of the remedial action.	
	603	Applicable	Establishes parameters for measuring emissions of organic compounds from soils.		

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Tabl II-6-5
Travis AFB - WABOU Soil Sites
Stat ARARs
Fish and Game Requirements

Source	Requirement, Standard, or Criterion	Type	Description	Remarks	Sites and Alternatives	
California Fish and Game Code	1908	Applicable	Prohibits the import, taking or possession of rare or endangered native plants.	Applicable to active remediation sites where rare or endangered native plants exist.	008, 042, 044, 045 S3, S4, S5, S6 S7	
	2080	Applicable	Prohibits the import, taking or sale of threatened or endangered native plants	Requires site surveys prior to action to determine presence of endangered/threatened plants at the site and consideration of potential impact Relevant and appropriate for federal agencies at all sites where endangered or threatened species are located. Requires coordination and, if appropriate, consideration of alternative actions at sites where impact to endangered or threatened species may occur. Will be considered at all sites where active remediation occurs.		
	2090	Relevant and Appropriate	Requires state lead agencies to consult with DF&G to ensure authorized actions will not jeopardized endangered or threatened species.			
	2091	Relevant and Appropriate	Requires state agencies to use alternative actions if impact to threatened or endangered species or habitat is found.			
	2092	Relevant and Appropriate	Requires state agencies to adopt reasonable alternative actions where project would result in the extinction of a species			
	3005	Applicable	Prohibits taking of birds or animals with net, pound, cage, trap, set line, wire, or poison.	Applicable at all remediation sites where birds, mammals, or other animals and wildlife identified by the applicable statutory provision exist.		
	3511	Applicable	Prohibits taking of birds identified as "fully protected."			
	3513	Applicable	Prohibits taking of mammals that are identified as fully protected.			
	4700	Applicable	Prohibits taking or possession of mammals identified as "fully protected "			
	5050	Applicable	Prohibits taking or possession of reptiles and amphibians identified as "fully protected."			
	5515	Applicable	Prohibits taking or possession of fish identified as "fully protected."			
	5650	Applicable	Prohibits deposit or placement of specified materials and substances into places where it can pass into the waters of the state.			
						Note: These sections are applicable to the extent that the state law is more strict than the Federal Endangered Species Act or Migratory Bird treaty Act. For example, in those cases where a species is listed as "fully protected" but not identified as a federally endangered or protected, than the state law is applicable.

**Table II-6-5
Travis AFB - WABOU Soil Sites
State ARARs
Fish and Game Requirements
(continued)**

Source	Requirement, Standard, of Criterion	Type	Description	Remarks	Sites and Alternatives
California Fish and Game Policies	Management and Utilization of Fish and Wildlife on Federal Lands Wetlands Resource Policy	Performance Standard	Establishes management policies and defines methodologies used in protecting all fish, wildlife, and threatened and endangered species.	These policies do contain substantive provisions that will be relied upon in the decision process, consistent with applicable federal laws and statutes. Will be followed at all sites where active remediation occurs. The Wetlands Resource Policy will be followed for actions at sites where wetland habitat occurs.	008, 042, 044, 045 S2, S3, S4, S5, S6, S7
		Performance Standard	Establishes management policies and defines methodologies to assure no net loss of wetland habitat value or acres.		
		Performance Standard	Establishes management policies and defines methodologies to assure no net loss of wetland habitat value or acres.		
		Performance Standard	Establishes management policies and defines methodologies to assure no net loss of wetland habitat value or acres.		
Title 14 CCR	40.00	Applicable	Prohibits the taking or possession of native reptiles and amphibians.	Applicable to all site and action alternatives where identified mammals, fish, reptiles or amphibians or plants exist. Will be considered at all sites where active remediation occurs. Requires site surveys prior to action to determine presence of endangered/threatened plants at the site. Section 640 will be considered to the extent feasible and consistent with CERCLA planning documents. Species found at Travis AFB which are covered by these sections include the Black-Shouldered Kite, Boggs Lake Dodder, Burrowing Owl, Coopers Hawk, California Gull, Golden Eagle, Loggerhead Shrike, Northern Harrier, Red Fox, Tri-colored Blackbird, Vernal Pool Fairy Shrimp, Contra Costa Goldfields, Northwestern Pond Turtle, San Francisco Forktail DamselFly, Vernal Pool Tadpole Shrimp.	008, 042, 044, 045 S2, S3, S4, S5, S6, S7
		Applicable	Prohibits the possession or taking of native reptiles and amphibians.		
		Applicable	Prohibits the taking of certain fur bearing mammals at any time.		
		Applicable	Establishes requirement for fish and wildlife planning to optimize fish and wildlife resources.		
		Applicable	Establishes species, subspecies, and varieties of native California plants as endangered, threatened, or rare.		
	640	Applicable	Establishes requirement for fish and wildlife planning to optimize fish and wildlife resources.		
	670.2	Applicable	Establishes species, subspecies, and varieties of native California plants as endangered, threatened, or rare.		
	670.5	Applicable	Establishes species, subspecies, and varieties of native California plants as endangered, threatened, or rare.		

Tabl II-6-6
Travis AFB - WABOU Soil Sites
Federal ARARs
Requirements under the US Code and Related Regulations

Source	Requirement, Standard, or Criterion	Type	Description	Remarks	Sites and Alternatives
Title 16 USC (Endangered Species Act)	1531(c)	Applicable	Requires action to conserve endangered species and critical habitats upon which endangered species depend. Includes consultation with the Department of Interior.	Activities at all remedial sites must be performed in such a manner as to identify the presence of and protect endangered or threatened plants and animals at the site. Species at Travis AFB include the Black-Shouldered Kite, Boggs Lake Dodder, Burrowing Owl, Coopers Hawk, California Gull, Golden Eagle, Loggerhead Shrike, Northern Harrier, Red Fox, Tri-colored Blackbird, Vernal Pool Fairy Shrimp, Contra Costa Goldfields, Vernal Pool Tadpole Shrimp, Northwestern Pond Turtle, San Francisco Forktail Damselfly	008, 013, 041, 042, 044, 045
	1536(a)	Applicable			S2, S3, S4, S5, S6, S7
Title 16 USC (Migratory Bird Treaty Act)	703	Applicable	Prohibits unlawful taking, possession, and sale of almost all species of native birds in the U.S.	Species at Travis AFB include Black-Shouldered Kite, Burrowing Owl, Coopers Hawk, California Gull, Golden Eagle, Loggerhead Shrike, Northern Harrier, Tri-colored Blackbird.	008, 013, 041, 042, 044, 045
Federal Clean Water Act, Section 404, Title 33 CFR Part 330, Appx A, Subpart B, Army Corps of Engineers Nationwide Permit Programs	Para 27	Applicable	Establishes requirements for activities in waters of the United States associated with the restoration of altered and degraded non-tidal wetlands and creation of wetlands on private lands	The substantive portions of these paragraphs are applicable to activities related to construction and installation of remedial equipment. The permitting requirements are not ARARs.	044
					S2, S3, S4, S5, S6, S7

**Table II-6-6
Travis AFB - WABOU Soil Sites
Federal ARARs**

**Requirements under the US Code and Related Regulations
(continued)**

Requirement, Standard, or Criterion	Type	Description	Remarks	Sites and Alternatives	
Federal Clean Water Act, Section 404, Title 33 CFR Part 330, Appx A, Subpart C Army Corps of Engineers Nationwide Permit Conditions (NWP)	Para 2	Requires any structure or fill authorized be properly maintained, including maintenance to ensure public safety.	The substantive portions of these paragraphs are relevant and appropriate. The notification requirements are not ARARs. Site activities related to construction and installation of remedial equipment give rise to these requirements.	008, 041, 042, 045	S3, S4, S5, S6 S7
	Para 4	Requires that no activity may substantially disrupt the movement of those species of aquatic life indigenous to the water body.			
40 CFR Part 230 (Clean Water Act - Disposal of Dredged or Fill Material)	Para 5	Requires heavy equipment working in wet-lands must be placed on mats or other measures be taken to minimize soil disturbance	Applicable to sites where wetlands and vernal pools are located. Permitting requirements are not applicable to CERCLA sites and are not ARARs	008, 044, 045	S3, S4, S5, S6 S7
	Para 11	No activity is authorized under any NWP if likely to jeopardize the continued existence of a threatened or endangered species or species proposed for such designation, as identified under the Endangered Species Act, or which is likely to adversely modify or destroy the habitat of such species.			
	230.10	Prohibits discharge of dredged or fill material into waters or wetlands without a permit. Establishes limits on discharges.			
	230.71	Places limitations/requirements on the disposal and treatment of the dredged or fill material discharged.			
	230.72	Establishes requirements and methods for the control of the effects of dredged or fill material after discharge, through use of levees, caps, lined containment areas, lining and placement.			
230.73	Establishes requirements for minimizing discharge effects by use of specific disbursement methods.				
230.74	Requires use of available technology, adapted to the particular site, to minimize adverse effects of dredge and fill discharges.				
230.75	Requires minimization of adverse effects on populations of plants and animals from the discharge of dredge/fill materials.				
230.76	Requires use of fill or dredge material discharge methods that minimize the adverse effects on human use potential.				

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**Table II-6-6
Travis AFB - WABOU Soil Sites
Federal ARARs
Requirements under the US Code and Related Regulations
(continued)**

Source	Requirement, Standard, or Criterion	Type	Description	Remarks	Sites and Alternatives
40 CFR Part 258	258.60 (a)	Relevant and Appropriate	Establishes the requirement to install a final cover system for the waste management unit.	Applicable to the management unit in which wastes from the remediation sites will be placed.	007 S4, S6
	258.60 (c)	Relevant and Appropriate	Establishes the requirements for and the elements of a closure plan for the waste management unit.	Applicable to the management unit in which wastes from the remediation sites will be placed.	007 S4, S6
Section 403 of Toxic Substance Control Act (TSCA), 40 CFR Part 745	Para III C4(b)(i)	Relevant and Appropriate	Establishes a hazard standard of 400 ppm in bare soil for children's play areas.	Applicable to sites where the residual lead concentration in the soil exceeds 400 ppm.	039, 042, 045 S2

**Table II-6-7
Travis AFB - WABOU Soil Sites
Radiological Remediation Requirements**

Source	Requirement Standard, or Criterion	Type	Description	Remarks	Sites and Alternatives
10 CFR Part 20 (Nuclear Regulatory Commission Regulations) (42 USC, 2073, 2093,, 2095, 2111, 2133, 2134 2201, 2232, 2236, 2297f, 5841, 5842, 5846)	20.1801	Relevant and Appropriate	The licensee shall secure from unauthorized removal or access licensed materials that are stored in controlled or unrestricted areas.	Although these regulations are designed to control the transfer and storage of licensed radioactive materials, substantive requirements are relevant and appropriate to WABOU sites containing low-level radioactive wastes.	013
	20.1802	Relevant and Appropriate	Establishes requirement for the control of material not in storage, requiring control and maintain constant surveillance of licensed material that is in a controlled or unrestricted area and that is not in storage.		
	20.1902	Relevant and Appropriate	Establishes requirements for the use of caution signs bearing radioactive symbol.		
	20.1904	Relevant and Appropriate	Establishes marking and labeling requirements for containers holding radioactive materials.		
	20.2005	Applicable	Establishes requirements/limitations for treatment or disposal of radioactive materials by incineration.		
	20.2006	Applicable	Establishes requirements/limitations for disposal of radioactive wastes to landfills.		
	20.2007	Applicable	Requires compliance with other applicable Federal, State, and local regulations governing any other toxic or hazardous properties of materials that may be disposed of under this subpart.		
	App C	Applicable	Establishes volume requirements/limitations for labeling		
	App F	Applicable	Requirements for low-level-waste transfer for disposal at land disposal facilities.		
	App G	Applicable	Requirements for transfers of low-level radioactive waste intended for disposal at licensed land disposal facilities.		

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**Table II-6-7
Travis AFB - WABOU Soil Sites
Radiological Remediation Requirements
(continued)**

Source	Requirement Standard, or Criterion	Type	Description	Remarks	Sites and Alternatives
California Health and Safety Code	25249.5	Applicable	Establishes prohibition on contaminating drinking water with chemicals known to cause cancer or reproductive toxicity except as provided in Section 25249.9	Applicable to remedial activities at WABOU sites containing low-level radioactive wastes.	013 S5
	25249.6.	Applicable	Requires warning before knowingly and intentionally exposing any individual to a chemical known to the state to cause cancer or reproductive toxicity without first giving clear and reasonable warning to such individual, except as provided in Section 25249.10.		
	25249.9	Applicable	Establishes exemptions from discharge prohibitions established in Section 25249.5		
	25249.10	Applicable	Establishes exemptions from warning requirements on Section 25249.6 shall not apply to include: (a) An exposure for which federal law governs warning in a manner that preempts state authority. (b) An exposure that takes place less than twelve months (c) An exposure for which the person responsible can show that the exposure poses no significant risk assuming lifetime exposure		
United States Environmental Protection Agency (EPA Guidance Documents)	OSWER 9200.4-18	Performance Standard	Establishes EPA guidance on establishment of cleanup levels for CERCLA sites contaminated with radionuclides.	Identifies potential performance standards for radiological contaminated soil.	013 S5

**Tabl II-6-8
Travis AFB - WABOU Soil Sites
DOD Requirements**

Source	Requirement Standard, or Criterion	Type	Description	Remarks	Sites and Alternatives	
40 CFR (Military Munitions Rule)	Parts 260-266, 270 (as amended by 62 FR 6622)	Applicable	Establishes parameters for determining when military munitions become RCRA hazardous waste and provides requirements for their safe transportation and storage.	Applicable to sites where spent munitions are present.	045	S6

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Section Tab

Section 7.0

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Appendix Tab

Appendix A

Appendix A
Travis AFB Work Coordination Forms

PART III

UNDERGROUND SERVICE ALERT (USA) NOTIFICATION

UNDERGROUND SERVICE ALERT (USA) HAS BEEN NOTIFIED BY THE DIGGER. (1-800-227-2600)

*Note to digger: USA must be notified every fourteen (14) calendar days as long as excavation continues.	24. Date USA Called	25. USA Expiration Date	26. USA#
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27. USA EXTENSIONS					
New Extension Date	New USA Number	New Extension Date	New USA Number	New Extension Date	New USA Number

PART IV

28. REMARKS (This section must describe specific precautionary measures to be taken before and during work accomplishment. Specific comments concerning the approved method of excavation, hand or powered equipment to be included.)

Approval Recommendation: Maintenance Engineering

29. Date	30. Typed or Printed Name and Grade of Recommending Official	31. Signature
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Approval Authorization

Approved
 Disapproved

Date Approved	33. Date Expires (90 days from approval)	34. Signature of Approving Officer (Chief/Deputy Chief of 60 CES Operations)
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Air Force Form 332
Base Civil Engineer Work Request

BASE CIVIL ENGINEER WORK REQUEST (See Reverse for Instructions)					Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average .2 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to the Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204 Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project 0704-0188, Washington DC 20503 Please DO NOT RETURN your form to either of these addresses. Send your completed form to HQ AFESC/DEMIG.						
SECTION I - TO BE COMPLETED BY REQUESTER						
1. FROM (Organization)		2. OFFICE SYMBOL	3. DATE OF REQUEST		4. WORK REQUEST NO. (For BCE Use)	
5. NAME AND PHONE NO. OF REQUESTER			6. REQUIRED COMPLETION DATE		7. BUILDING, FACILITY OR STREET ADDRESS WHERE WORK IS TO BE ACCOMPLISHED	
8. DESCRIPTION OF WORK TO BE ACCOMPLISHED (Include Sketch or Plan, when appropriate)						
9. BRIEF JUSTIFICATION FOR WORK TO BE ACCOMPLISHED (Not required for maintenance and repair)						
10. DONATED RESOURCES						
FUNDS	LABOR		MATERIAL		CONTRACT BY REQUESTER	NONE
11. NAME OF REQUESTER			12. GRADE OF REQUESTER		13. SIGNATURE OF REQUESTER (See Reverse of Form)	
14. COORDINATION						
SECTION II - FOR BASE CIVIL ENGINEER USE						
15. WORK ORDER (Place an "X" in the appropriate box.)						
IN-SERVICE		SELF-HELP		CONTRACT		SABER
16. DIRECT SCHEDULED WORK (Place an "X" in the appropriate box.)						
EMERGENCY		URGENT		ROUTINE		SELF-HELP
17. SELF-HELP (Place an "X" in the appropriate box.)						
BRIEFING REQUIRED			ADEQUATE COORDINATION			INSPECTION REQUIRED
SECTION III - COMPLETE ONLY IF WORK IS TO BE ACCOMPLISHED BY WORK ORDER						
18. WORK CLASS		19. PRIORITY		20. ESTIMATED HOURS		21. ESTIMATED FUNDED COST
						22. ESTIMATED TOTAL COST
23. THERE IS NO NEED FOR AN ENVIRONMENTAL ASSESSMENT (AFR 19-2)			24. A WRITTEN ASSESSMENT IS BEING/HAS BEEN PROCESSED		25. APPROVED	26. DISAPPROVED
27. REMARKS						
SECTION IV - APPROVING AUTHORITY						
28. NAME AND GRADE (Please Type or Print)				29. SIGNATURE		30. DATE

1277189

60 Air Mobility Wing Form 55
Excavation Permit

EXCAVATION PERMIT	1. TRACKING No.
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PART I

2. Excavation clearance at the following _____

Description of work to be done _____

on Work Order/Job _____, Contract _____

The excavation area involved was properly staked and/or clearly marked in white _____ (DATE) to indicate where the proposed - on _____

3. TYPE OF FACILITY/WORK INVOLVED

<input type="checkbox"/> A. Pavements	<input type="checkbox"/> B. Drainage Systems	<input type="checkbox"/> C. Fire Detection and Protective Systems	<input type="checkbox"/> D. Utility Overhead Underground	<input type="checkbox"/> E. Communications Overhead Underground
<input type="checkbox"/> F. Aircraft or Vehicular Traffic Flow	<input type="checkbox"/> G. Security	<input type="checkbox"/> H. Medical	<input type="checkbox"/> I. OTHER (Specify)	

INSTRUCTIONS: This excavation permit is required for any interior or exterior excavation deeper than six inches. This form is used to coordinate the required work with key base activities so all base utilities in the area of excavation may be marked, and to identify potentially hazardous work conditions. It is also used to notify the proper agencies of possible road closures so as to keep customer inconvenience to a minimum. This excavation permit will be processed after the excavation area has been properly staked or marked in white (IAW Underground Service Alert (USA) guidelines). This Excavation Permit is valid only if it is signed by the Approving Officer. If excavation delays are encountered and/or conditions at the excavation site change (due to weather, heavy traffic, or construction) which cause the utility markings to no longer be visible then this excavation permit will no longer be considered valid.

4. Organization/Company Name	5. Phone Number	6. Date
7. Name of Requester	8. Signature	
9. Date Submitted	10. Date Clearance Required	11. Date Clearance Terminated
12. Depth		
13. Areas to be Excavated <input type="checkbox"/> Main Base <input type="checkbox"/> MFH <input type="checkbox"/> Airfield <input type="checkbox"/> DGMC <input type="checkbox"/> Other (Please specify)		

PART II

EXCAVATION CLEARANCE REVIEW

ORGANIZATION	NO UTILITY IN AREA	UTILITY NEEDS TO BE MARKED	DATE UTILITY MARKED	PRINTED NAME	INITIALS	RENEWAL STOP REQUIRED	
						YES	NO
14. Base Civil Engineering	A. Water/Gas/Sewer Distribution						
	B. Electrical Distribution						
	C. Heat Distribution (Zone 3)						
	D. Drainage Systems						
	E. POL Distribution						
	F. Controls/Alarms						
	G. Engineering Technician						
	H. Fire Department (Only when traffic is affected)						
15. Environmental Management							
16. 60 CS Leased Comm/QS/GTE (Fiber/Metro Cable)							
17. Base Operations							
18. PAC Bell (Notified by USA)							
18. TCI/Cable TV							
20. Safety							
21. 60 Security Forces (Only when traffic is affected)							
22. 60 Medical Group Ambulance Service (Only when traffic is affected)							
23. Other (Specify)							

Section Tab

Part III

Responsiveness Summary

PART III

Responsiveness Summary

The Air Force used the North/East/West Industrial Operable Unit (NEWIOU) Soil, Sediment, and Surface Water Proposed Plan; the West/Annexes/Basewide/Operable Unit (WABOU) Soil Proposed Plan, and the 8 July - 8 August 1998 public comment period to promote public input on the basewide soil remediation approach. The public received these Proposed Plans just prior to the start of the public comment period. To encourage public comment, the Air Force listed the phone numbers and E-mail addresses of Air Force and Cal-EPA Department of Toxic Substances Control (DTSC) representatives in the Proposed Plans; mailed more than 1,300 copies of the Proposed Plans to interested community members; distributed copies of the Proposed Plans to local libraries; and held a public meeting on 23 July 1998 at the Fairfield Senior Center.

Several community members attended the public meeting, and the Air Force received oral comments from several people, including Mr. Jim Whalen, Mr. David Kanouff, and Mr. Jon Weiss, all of which were members of the Travis Air Force Base (AFB or Base) Restoration Advisory Board at the time of the public comment period. Mr. Rick Abbott submitted a comment on the basewide soil remediation approach to the Air Force during the public comment period. A written transcript of the public meeting contains the oral comments and is available for public review at the Travis AFB Information Repository, located at the Vacaville Public Library. The oral comments concerning the cleanup of contaminated soil at Travis AFB are presented below in a paraphrased form for greater clarity. The Air Force based the selection of soil remedial actions in the WABOU on the documents in the Travis AFB Administrative Record and on public comments.

Public Comment 1 from Mr. Jim Whalen: There was concern whether the CAMU proposal had accounted for the synergistic effect of multiple chemicals in the soil within the CAMU.

Air Force Response: The NEWIOU Soil, Sediment and Surface Water Record of Decision will present a detailed chemical analysis of the material proposed for placement in the CAMU. This analysis will show that the soil contaminants placed in the CAMU are compatible with the existing waste and with each other. This analysis is necessary in order to meet the criteria found in the federal and California CAMU regulations.

Public Comment 2 from Mr. David Kanouff: There was concern that the soil contaminants that do not readily decompose through natural attenuation, such as PCBs and pesticides, will contaminate the local groundwater beneath the CAMU.

Air Force Response: There are three considerations that alleviate this concern. First, the design of the CAMU will specify that there will be a five-foot separation between the contaminated soil from other soil sites and the water table. This will ensure that the consolidated soil sits above the water table and is not in physical contact with the groundwater. Second, the CAMU cap above the contaminated soil is a low-permeability barrier that significantly reduces the amount of rainwater that would flow through the soil and transport

contaminants to the local groundwater. Finally, contaminants such as PCBs, pesticides, and metals are relatively immobile. Most of the mobile contaminants have either volatilized into the atmosphere or dissolved into the local groundwater. The remaining contaminants are suitable for placement into the CAMU, because they are relatively immobile. To support this conclusion, the leachability assessment demonstrated that the consolidated soil would not adversely impact groundwater. The low-permeability cap constructed above this soil will increase this immobility, because there will be much less rainwater infiltration through the contaminated soil than that which occurs today.

Public Comment 3 from Mr. Jon Weiss: Has Travis AFB established target levels for the contaminated materials proposed for the CAMU that are acceptable to the regulatory agencies and to the Air Force?

Air Force Response: The regulatory agencies received and reviewed the proposed contaminant target (or acceptance) levels based on computer modeling and other supporting rationale in a document known as the CAMU Technical Memorandum. The Air Force and regulatory agencies will finalize these levels in the NEWIOU Soil, Sediment and Surface Water ROD. One source of supporting rationale is the leachability assessment, which demonstrated that the target levels for the consolidated soil do not pose a potentially adverse impact to ground water.

EPA Response: The State is the lead regulatory agency for landfill closures and for the CAMU. The CAMU proposal for Travis AFB will be going through a review process to demonstrate that the synergistic effects and persistence of chemicals will not create an environmental problem. Modeling and calculations that support this proposal will be presented to the public.

Public Comment 4 from Mr. Rick Abbott: Has Travis AFB considered the use of Supercritical Oxidation Steam, a treatment technology used by the Texas Heavy Oil Recovery Company, to break down the soil contaminants?

Air Force Response. The WABOU Feasibility Study (FS) evaluated a large number of potential soil treatment technologies for use at the WABOU soil sites. The FS considered a technology known as Steam Stripping/Metal Extraction to be an effective method of removing organic compounds and heavy metals from soil. However, this technology was rejected due to its extensive equipment, labor, and energy requirements and the associated high capital and maintenance costs. If this technology can be shown to remediate contaminated soil in a cost-effective manner, then the Air Force will consider it for future soil remediation projects. The Air Force Center for Environmental Excellence (AFCEE) supports the evaluations of innovative technologies and provides opportunities for small businesses to assist in remediation projects. Travis AFB gave Mr. Abbott information to assist him in contacting AFCEE.

Second Public Comment Period

In February 2000, Travis AFB printed a fact sheet that described significant changes to the soil remedial actions at two sites: Building 916 and the Railhead Munitions Staging Area. After mailing the fact sheet to approximately 1,300 local community members and providing copies to the three local libraries, the Base initiated a 23 February - 24 March

public comment period to obtain public input to the remedial action decisionmaking process. Additionally, the Base posted the fact sheet and accompanying news release on its Environmental Restoration web site (www.travis.af.mil/pages/enviro).

To further promote community acceptance of the remedial action changes, the environmental office held a public meeting on 15 March 2000 at 7:00 p.m. at the Fairfield-Suisun Chamber of Commerce, 1111 Webster Street, Fairfield, CA. At this meeting the Base described the two changes to the soil remedial actions and offered to recapitulate the other remedial actions that had not changed. The Base also offered to provide the status of the three sites that had been pulled out of the WABOU to prevent a delay in the signing of the (West/Annexes/Basewide Soil Record of Decision) WABOU Soil ROD.

Mr. David Kanouff was the only community member who attended the public meeting. He had no questions concerning the proposed changes and had no interest in hearing a summary of the other sites mentioned above.

FINAL PAGE

ADMINISTRATIVE RECORD

FINAL PAGE