DRAFT

Five-Year Review Report

Second Five-Year Review Report

for

Hill Air Force Base, Utah

June 2003

PREPARED FOR:

United States Department of Defense
Hill Air Force Base Environmental Management Directorate

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List of Acronyms

1E-6	$1x10^{-6}$ or 0.000001
ADR	Analytical Data Report
AFB	Air Force Base
amsl	above mean sea level
ARAR	Applicable, Relevant, and Appropriate Requirement
AS	Air Sparging
ASTP	Air Stripper Treatment Plant
bgs	below ground surface
BNAE	Base-Neutral-Acid Extractable
BSHW	Bureau of Solid and Hazardous Waste
BRA	Baseline Risk Assessment
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CDP	Chemical Disposal Pit
CERCLA	Comprehensive Environmental Response, Compensation, and Liabilities Act
COC	Contaminant of Concern
COPC	Contaminant of Potential Concern
CPT	Cone Penetration Testing
CSF	Cancer Slope Factor
CWSID	Central Weber Sewer Improvement District
CY	Calendar Year
DCA	Dichloroethane
DCE	Dichloroethene
DCE11	1,1-Dichloroethene
DCE12C	1,2-cis-Dichloroethene
DCE12T	1,2-trans-Dichloroethene
DERP	Defense Environment Restoration Program
DNAPL	Dense Non-Aqueous Phase Liquid
DRMO	Defense Reutilization and Marketing Office
EE/CA	Engineering Evaluation / Cost Analysis
EMR	Environmental Management and Restoration
EPA	Environmental Protection Agency
ERPIMS	Environmental Restoration Program Information Management System
FFA	Federal Facilities Agreement
FS	Feasibility Study
FT	Fire Training
FTA	Fire Training Area
FYR	Five-Year Review
GAC	Granular Activated Carbon
GIS	Geographic Information Services
GES	Groundwater Extraction System
gpm	gallons per minute
GW	Groundwater
HDUS	Horizontal Drain Upgrade System
IRA	Interim Remedial Action
IRP	Installation Restoration Program
ITP	Innovative Technology Program
IWTP	Industrial Wastewater Treatment Plant
L	Liter
LF	Landfill
LNAPL	Light Non-Aqueous Phase Petroleum Liquid
LTM	Long-Term Monitoring
LTO	Long-Term Operation
LUST	Leaking Underground Storage Tank
MAMS	Missile Assembly, Maintenance, and Storage

MAP	Management Action Plan
MCL	Maximum Contaminant Level
MDL	Minimum Detection Limit
MEK	Methyl Ethyl Ketone
MNA	Monitored Natural Attenuation
MTBE	Methyl Tert-Butyl Ether
MW	Montgomery Watson
MW	Monitoring Well
MWH	Montgomery Watson Harza
NA	Not Applicable
NCP	National Contingency Plan
NDCSD	North Davis County Sewer District
NFRAP	No Further Response Action Planned
NIT	North Interceptor Trench
NPDES	National Pollutant Discharge Elimination System
NPL	National Priority List
O&M	Operations and Maintenance
OO-ALC	Ogden Air Logistics Center
OU	Operable Unit
OWS	Oil/Water Separator
PA	Preliminary Assessment
PAH	Polyaromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCE	Perchloroethene
PESD	Proposed Explanation of Significant Differences
PITT	Partitioning Interwell Tracer Test
PM	Project Manager
POTW	Publicly Owned Treatment Works
ppb	parts per billion
ppbv	parts per billion by volume
PSVP	Performance Standard Verification Plan
PSVR	Performance Standard Verification Report
PTS	Pump-and-Treat System
RA	Remedial Action
RAO	Remedial Action Objective
RBC	Risk-Based Concentration
RBSL	Risk-Based Screening Level
RDS	Remote Data System
RAB	Restoration Advisory Board
RfD(i)	Reference Dose for Inhalation
RfD(o)	Reference Dose for Oral ingestion
RI	Remedial Investigation
ROD	Record of Decision
RVMF	Refueling Vehicle Maintenance Facility
RCRA	Resource Conservation and Recovery Act
SI	Site Inspection
SEAR	Surfactant-Enhanced Aquifer Remediation
SOP	Standard Operating Procedure
SRS	Source Recovery System
SVE	Soil Vapor Extraction
SVOC	Semi-Volatile Organic Compound
SW	Surface Water
TARS	Tooele Army Rail Shop
TCA	Trichloroethane
TCE	Trichloroethene
TDS	Total Dissolved Solids

TPH-DRO	Total Petroleum Hydrocarbons – Diesel Range Organics
TS	Treatability Study
TSCA	Toxic Substances Control Act
UCS	Upgradient Control System
UDEQ	Utah Department of Environmental Quality
UDERR	Utah Division of Environmental Response and Remediation
µg	Microgram (10^{-6} gram)
USGS	United States Geological Service
UST	Underground Storage Tank
VOC	Volatile Organic Compounds
WOST	Waste Oil Storage Tanks
WPOP	Waste Phenol Oil Pit
WWTP	Wastewater Treatment Plant

Forward to the June DRAFT

This DRAFT Five-Year Review Report was prepared following the process described in Section II. URS conducted an independent technical review of the remedial actions at Hill AFB for the purpose of determining the degree of protectiveness provided by the existing remedies. URS prepared this report based primarily on research and review of documents provided by Hill AFB and incorporation of comments provided through an independent review by Hill EMR staff regarding historical findings and issues that are not fully described in published documents.

The Report contains protectiveness statements, issues, and recommendations. Hill AFB reviewed the May DRAFT Five-Year Review Report and prepared an independent response regarding the recommendations and protectiveness statements prepared by URS for each operable unit. That response was considered during preparation of this June DRAFT. All comments from Hill AFB EMR on preliminary versions of sections of the FYR, as well as the URS actions based on EMR response to the May DRAFT, are provided in Appendix A. In addition, the May DRAFT was provided by Hill EMR to the Restoration Advisory Board (RAB). Their comments, EMR direction, and URS response are included in a comment resolution matrix in Appendix A. This June DRAFT is improved in presentation and content because of the contributions from EMR and the RAB. It reflects the results of an independent review.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name (*from WasteLAN*): Hill Air Force Base		
EPA ID (*from WasteLAN*): UT0571724350		
EPA Region: VIII	**State:** UT	**City/County:** Hill AFB / Davis
SITE STATUS		
NPL status: (Final) Deleted Other (specify) _____		
Remediation status (choose all that apply): (Under Construction) (Operating) (Complete)		
Multiple OUs?* (YES) NO	**Construction completion date:** N/A	
Has site been put into reuse? YES (NO)		
REVIEW STATUS		
Lead agency: Dept. of Defense (Air Force)		
Author name: Jeff Watkins		
Author title: EM Operations Program Manager	**Author affiliation:** HAFB / EMR	
Review period:** through 09/30/2002		
Date(s) of site inspection: January and February, 2003		
Type of review: (Post-SARA) Pre-SARA NPL-Removal Only Non-NPL Remedial Action Site NPL State/Tribe-lead Regional Discretion		
Review number: 1 (first) (2 (second)) 3 (third) Other (specify)		
Triggering action: Actual RA Onsite Construction at OU# Actual RA Start at OU# Construction Completion (Previous Five-Year Review Report) Other (specify)		
Triggering action date (*from WasteLAN*): 09/30/1998		
Due date (*five years after triggering action date*): 09/30/2003		
Next 5 year review date: 09/30/2008		

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

EXECUTIVE SUMMARY

In July 1987, the U.S. Environmental Protection Agency placed Hill AFB on the National Priorities List under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The U.S. Department of Defense is preparing this Five-Year Review Report pursuant to CERCLA and in accordance with the National Contingency Plan, which require a review of remedial actions no less often than every five years at all sites that do not allow unlimited use and unrestricted exposure.

The primary purpose of this Five-Year Review is to determine whether the remedies selected at Hill Air Force Base are protective of human health and the environment. The review was intended to: 1) evaluate whether the remedy is operating as designed; 2) evaluate whether the original action levels are achieving protection; 3) determine if additional protection at each site is still needed; and 4) evaluate if protectiveness has been achieved and if the site can be excluded from the next Five-Year Review.

A total of 42 Installation Restoration Program (IRP) sites in twelve Operable Units (OUs) at Hill AFB were evaluated as a part of this review. The evaluation of these sites consisted of a document review, interview, and inspection process focused on addressing three questions in the Five-Year Review Technical Assessment section. The three questions are:

A. Is the remedy functioning as intended by the decision document?
B. Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy still valid?
C. Has any other information been uncovered that could call into question the protectiveness of the remedy?

The protectiveness categories include: protective, protectiveness cannot be determined, protective in the short term, will be protective once remedy complete, not protective, and not applicable. A not applicable determination was given to sites that already had No Further Remedial Action Planned (NFRAP) status as well as sites where remedial investigations and feasibility studies were still being completed and a remedy was not installed. The summary of the protectiveness determinations is included in Table ES-1. Because some OUs at Hill AFB do not have remedies selected and constructed, a basewide protectiveness statement is not included in this review. Basewide, OU-specific, and site-specific issues and recommendations are included in this report. One OU, OU 12, is not protective. However, with current groundwater use restrictions and air treatment units in some homes, there is not apparent danger of exposure.

Table ES-1. Summary of Protectiveness Determinations for Hill AFB

Protectiveness Determination	Number of IRP Sites	Number of OUs
Protective	8	2
Protectiveness cannot be determined	6	4
Protective in the short term	2	2
Will be protective once remedy complete	1	1
Not protective	1	1
Not applicable	24	2

I INTRODUCTION

Purpose of Review

The primary purpose of a Five-Year Review (FYR) is to determine whether the remedies selected at Hill Air Force Base (AFB) are protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review reports. In addition, five-year review reports identify deficiencies in remedies and plans to meet remedial action objectives (RAOs) found during the review, if any, and describe recommendations or corrective action that may be taken to address them.

The U.S. Department of Defense is preparing this Five-Year Review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121 and in accordance with the National Contingency Plan (NCP). CERCLA §121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

This requirement is further interpreted in the NCP; 40 CFR §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after initiation of the selected remedial action.*

CERCLA and the NCP require a review of remedial actions (RAs) no less often than every five years at all sites that do not allow unlimited use and unrestricted exposure. The review is intended to: 1) evaluate whether the remedy is operating as designed; 2) evaluate whether the original action levels are achieving protection; 3) determine if additional protection at each site is still needed; and 4) evaluate if protectiveness has been achieved and if the site can be excluded from the next Five-Year Review. Evaluation of the remedy and the determination of protectiveness is based on and supported by data and observations.

Hill Air Force Base Environmental Management Directorate contracted URS Corporation to conduct a Five-Year Review of Hill AFB (NPL site ID: UT0571724350). This review was conducted from November 2002 through April 2003 and this report documents the results of the review. This is the second Five-Year Review for Hill Air Force Base. The triggering action for this statutory review is the signature date of the previous Five-Year Review Report dated September 1998. The Five-Year Review is required because hazardous substances, pollutants, or contaminants remain on the Base above levels that allow for unlimited use and unrestricted exposure.

This 2003 Five-Year Review goes beyond the statutory requirements in that it addresses all Installation Restoration Program (IRP) sites on the Base that had or may have CERCLA-associated

actions at any time, not just those sites where hazardous substances, pollutants, or contaminants remain. Protectiveness assessments are presented for each IRP site and for each Operable Unit (OU).

Background and Setting

Hill AFB is located in northern Utah, about 30 miles north of Salt Lake City and about five miles south of Ogden, Utah, just west of the Wasatch Front mountain range. The land use in the area around the Base includes urban, suburban, agricultural (both irrigated and dryland farming), and vacant ground. The land west of Hill AFB is entirely urban, whereas the north and southeast sides are mostly rural. Hill AFB is surrounded by the incorporated towns of South Weber, Washington Terrace, Riverdale, Roy, Sunset, Clearfield, and Layton (see **Figure 1**).

The Base is included in the Weber Delta Sub-district of the East Shore hydrologic region. The Sunset, 250 to 400 feet below the ground surface, and Delta, 500 to 700 feet below ground surface (bgs), are the principal aquifers of the East Shore area. Shallow groundwater (GW) also occurs in flood plain deposits and regionally in the valley lowlands within a few feet of the ground surface. Many seeps and springs exist at various locations within the communities surrounding the Base.

Hill AFB is part of the Air Force Materiel Command located in northern Utah. The Ogden Air Logistics Center (OO-ALC) is based out of Hill and is responsible for many operational and support missions such as engineering and logistics management for various aircraft as well as for intercontinental ballistic missiles. Since the origination of "Hill Field" in 1940, Hill AFB has been the site of maintenance and repair activities for a number of key aircraft during World War II, Korea, Vietnam, and Desert Storm.

The maintenance and repair activities at Hill AFB generate waste including chlorinated and non-chlorinated solvents and degreasers, fuels and other hydrocarbons, acids, bases, and metals. These chemicals and their associated waste products were historically disposed of at the Industrial Wastewater Treatment Plant (IWTP), in chemical disposal pits (CDPs) and landfills (LFs) on the Base, or at other Air Force facilities. Disposal in the chemical pits and landfills was discontinued in 1980. All wastes are currently treated at the IWTP, recycled on Base, or sent to off-Base treatment or disposal facilities.

In July 1987, the U.S. Environmental Protection Agency (EPA) placed Hill AFB on the National Priorities List (NPL) under CERCLA. In April 1991, Hill AFB entered a Federal Facility Agreement (FFA) with the Utah Department of Environmental Quality (UDEQ) and the EPA Region VIII in Denver to establish a procedural framework and schedule for implementing the appropriate response actions in accordance with existing regulations. At that time, the FFA defined seven geographic areas known as Operable Units. There are twelve OUs today. Many of them extend off base into the surrounding communities. Each OU encompasses one or more hazardous waste sites and facilitates administration of the CERCLA process. **Table 1** briefly describes each of the OUs at Hill AFB.

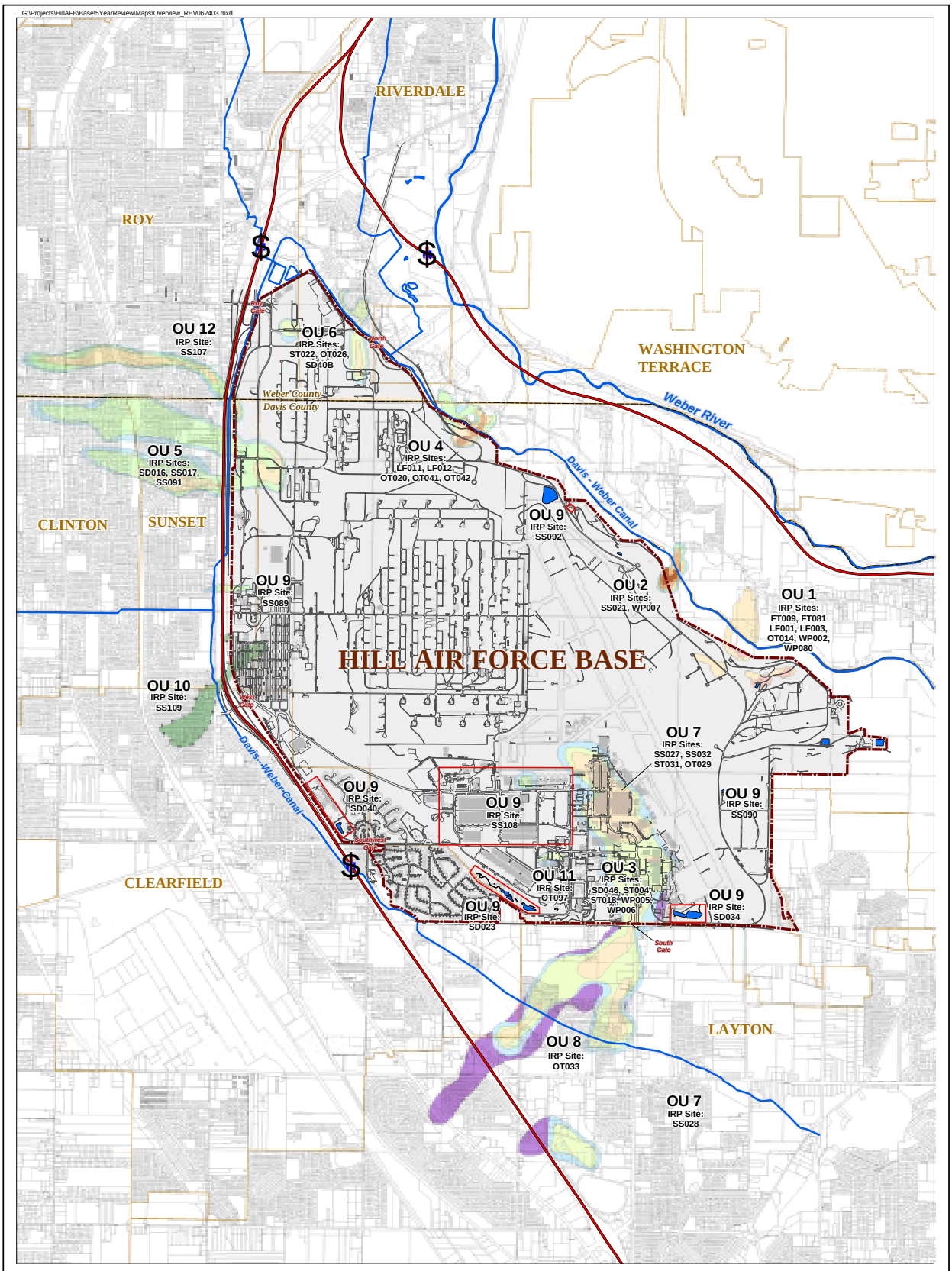

FIGURE 1:
Site Overview Map

Table 1. Operable Units at Hill AFB

OU	Description	Number of IRP Sites Reviewed
1	Areas between former Landfill No. 3 and Landfill No. 4 (inclusive) and associated groundwater plume	7
2	Chemical Pit 3 and associated groundwater plume	2
3	Area between Berman Pond and Building 514 (inclusive)	5
4	Areas southeast of North Gate, including Landfill No.1 and associated groundwater plume	5
5	1600 Area and two associated groundwater plumes extending west off-Base	3
6	1900 and 2000 Areas west of North Gate and associated groundwater plume	3
7	200 Area (soil only)	5
8	Layton TCE plume	1
9	Buildings in all areas of Base that have not been assigned to an OU; many are deferred sites or under RI	8
10	1200 Area and associated groundwater plume	1
11	Former Building 454 (Service Station)	1
12	Groundwater plume west of MAMS-2 Area, extending off-Base into Roy	1
	Total Number of IRP Sites	42

Table 2 lists major events at Hill AFB since it opened in 1920. In addition to important basewide events, the record of decision (ROD) documents for OUs 1 through 7 also are included. OUs 8 through 12 are still under investigation, with some interim actions, and do not have RODs. Hill AFB has more than 80 years of operational history and approximately 20 years over which remedial actions have been implemented.

Table 2. Chronology of CERCLA-related events for Hill AFB

Month	Year	Event	Comments	Reference
	1981	Phase I (records search) of the Air Force Installation Restoration Program starts at Hill AFB.	Part of nationwide IRP initiated by the Department of Defense in 1978.	Federal Facilities Agreement Under CERCLA Section 120
01	1982	Results of Phase I of IRP published.	Identified thirteen areas at Hill AFB where hazardous materials may have been used, stored, treated, or disposed. These areas are later grouped into Operable Units 1 – 7.	Federal Facilities Agreement Under CERCLA Section 120
09	1982	Phase II (preliminary assessments/site inspections) of IRP begins.	Designed to identify and quantify contaminants and to evaluate extent, direction, and rate of contaminant migration.	Federal Facilities Agreement Under CERCLA Section 120
07	1984	Cease and Desist Order issued by UDWQ.	Order issued for leachate discharge below Landfill 4 (now part of OU 1).	Record of Decision Operable Unit 1 IRP Sites LF01, WP02, LF03, FT09, FT81, and WP80
08	1984	Construction begins on groundwater treatment facility at OU 1.	This facility is the first remedial action conducted at Hill AFB.	Comprehensive Remedial Investigative Report for Operable Unit 1 (IRP Site LF01, LF03, WP02, FT09, OT14, FT81, and WP80) Volume 1
09	1984	Results of Phase II of IRP published.	Identified VOC and heavy metal contaminants at Hill AFB.	Federal Facilities Agreement Under CERCLA Section 120
10	1984	EPA proposes Hill AFB for the National Priority List.		Federal Facilities Agreement Under CERCLA Section 120
	1985	Additional remedies installed at OU 1.	Remedies include low-permeability caps over source areas and subsurface barrier.	Record of Decision Operable Unit 1 IRP Sites LF01, WP02, LF03, FT09, FT81, and WP80
07	1987	Hill AFB placed on NPL by EPA.		Federal Register Vol. 52, No. 140
04	1991	Hill enters into FFA with UDEQ and EPA.	Established a procedural framework and schedule for developing, implementing, and monitoring response actions at Hill AFB in accordance with existing regulations. Seven operable units were defined under the FFA.	Federal Facilities Agreement Under CERCLA Section 120
08	1991	Record of Decision for Interim Action at OU 2.	Pump-and-treat system for removal and destruction of free-phase DNAPLs from groundwater is selected as the remedy for interim action.	Record of Decision for Interim Action at Operable Unit 2, Final
09	1992	Record of Decision for Interim Action at Operable Unit 3 Site ST04.	Selected an asphalt cap as the interim remedial action at Site ST004.	Record of Decision for Interim Action at Operable Unit 3 Site ST04

Table 2. Chronology of CERCLA-related events for Hill AFB (Cont.)

Month	Year	Event	Comments	Reference
	1993	OU 8 created.	Contaminated groundwater, previously considered part of OU 3 and OU 7, redesignated as OU 8.	Remedial Investigation Report for Operable Unit 8
06	1994	Record of Decision for OU 4.	The selected remedy addresses contaminated groundwater, surface water, and landfill contents at OU 4, and air inside off-Base residences in plume area.	Record of Decision and Responsiveness Summary for Operable Unit 4 (IRP Sites LF11, LF12, OT20, OT41, OT42)
01	1995	Formation of Restoration Advisory Board	Created to advise Hill AFB on community concerns regarding environmental investigation and cleanup.	Minutes, First RAB Meeting, January 12, 1995
09	1995	Record of Decision for OU 3.	The selected remedy called for SVE at Site ST018, a cap at Site WP005, and cap maintenance at ST004.	Record of Decision for OU 3
09	1995	Record of Decision for OU 7.	Mandated groundwater monitoring upgradient, beneath, and downgradient of the area where contaminant concentrations in soils are above health-based risk levels.	Record of Decision for Operable Unit 7
09	1996	Record of Decision for OU 2.	The selected remedy addresses contaminated groundwater, soil, and surface water at OU 2.	Record of Decision and Responsiveness Summary for Operable Unit 2
05	1997	Interim Record of Decision for OU 8.	An Interim Remedial Action (hydraulic containment system at base boundary) was required.	Record of Decision for an Interim Remedial Action at Operable Unit 8
10	1997	Record of Decision for OU 6.	Contaminated groundwater required active treatment by extraction and air stripping.	Record of Decision Operable Unit 6 Sites ST022, OT026, SD40B
09	1998	First Five-Year Review of CERCLA Sites at Hill AFB	Focused on Operable Units, not on individual IRP sites.	Hill AFB Five-Year Review, September 1998
10	1998	Record of Decision for OU 1.	ROD established RAOs and remedial action goals for existing and planned actions at OU 1.	Record of Decision Operable Unit 1 IRP Sites LF01, WP02, LF03, FT09, FT81, and WP80
09	2000	OU 10 created	Redesignation of groundwater contamination plumes identified during OU 9 investigations. SS109, the 1200 Area, redesignated as OU 10.	OU10 Remedial Investigation/Feasibility Study Operable Unit 10 Analytical Data Report, May 1 2001 - January 31 2002
09	2000	OU 11 created	Zone 7 - Golf Course Area (Site SS090) and Former Building 454 (Site OT097), formerly part of OU 9, were redefined as OU 11.	Final Analytical Data Report (ADR) For Operable Unit 9 Investigation Areas 1 May Through 10 October 2000
10	2001	OU 12 created	The northern GW contamination plume within OU 5 is designated OU 12.	Final Operable Units 5 and 12 Historic Site and Source Area Review, March 2002
03	2002	Site Management Plan for OU 9 Deferred Sites	Provides mechanism to track and inventory deferred sites.	Operable Unit 9 Calendar Year 2001 Deferred Sites Inventory Report, Hill Air Force Base, Utah. Draft

II DESCRIPTION OF PROCESS

Review Approach

The Five-Year Review was conducted, in general, per the EPA guidance (EPA 2001). For each site, there was a thorough document review, inspections, and interviews as necessary to determine the protectiveness of remedies. For sites with no remedial actions to-date (e.g., undergoing Remedial Investigation [RI]) this review served as a baseline to establish that the planned approach will be able to achieve protection. For sites that have a "No Further Response Action Planned" (NFRAP) classification, this review served as a check to insure there were no issues with the site and is, in most cases, the final review required.

The document review, interviews, and inspections were focused to gather the information necessary to address the three questions in the Five-Year Review Technical Assessment (EPA 2001) and not to generate new data or significantly re-evaluate existing data sets to assess previous conclusions. Any issues that were identified in the review which suggested that additional information may be necessary to evaluate previous work are highlighted in the "Issues" portion of this report. Specifically, the evaluation team systematically reviewed documents and captured the findings for each site in a Site Summary. Each Site Summary and all of the back-up material used to generate conclusions about each site and each OU are stored in a Microsoft (MS) Access® database.

The review "unit" for this Five-Year Review was the IRP site and the review was conducted, where possible, on a site-by-site basis. However, historical management at Hill AFB has been structured around Operable Units and much of the information is reported by OU. Therefore, for many of the Hill AFB IRP sites, this review was necessarily conducted by evaluating OU-wide documentation.

Members of the Restoration Advisory Board (RAB), a group of local people representing the surrounding communities and interest groups, were notified of the initiation of the Five-Year Review on September 26, 2002. The review team was led by Jeff Watkins of Hill AFB, EM Operations Program Manager (PM), and included the Community Involvement Coordinator for Hill AFB, Charles Freeman, and the Evaluation Team staff from URS Corporation, lead by Barbara L. Hall. URS conducted the review in close coordination with Project Managers from Hill AFB, who provided clarification throughout the process on items not specifically addressed in documentation. Hill AFB EMR comments on the preliminary and DRAFT versions of the report are included as **Appendix A**.

Community Notification and Involvement

Community involvement is an important part of the success of Hill AFB environmental cleanup efforts. Professional staff, both within Hill AFB and under contract, assists in the daily management of community involvement issues. The 2003 Five-Year Review is special in the sense that it is a critical self-examination of the success of the cleanup program, and public participation in the examination is particularly important. To emphasize this importance, the community involvement contractor was tasked to manage Five-Year Review community involvement independent of the contractor hired to evaluate technical cleanup efforts.

Early in the project, Hill AFB published a notice in the Ogden Standard Examiner (local daily newspaper) and the Hilltop Times (Hill AFB weekly newspaper). This notice described the objectives of the Five-Year Review and established the public role in the process. Hill AFB has conducted interviews with both public and private members of the community (between March 10 and April 22, 2003),

specifically tailored to obtain public input about cleanup activities. Relevant comments are addressed in **Appendix B**.

The Restoration Advisory Board has been closely involved in the Five-Year Review process. A FYR Working Group within the RAB was formed to consult with Hill AFB regarding the Five-Year Review process and report format. A DRAFT of the Report was provided to the RAB and their comments are included in **Appendix A**. The Working Group reports to the RAB in a special effort to ensure effective public participation.

A news media release will announce the availability of the DRAFT Five-Year Review report and a request for public comment. Relevant public comments will be addressed in the final Five-Year Review Report. The final Five-Year Review Report will be placed in the Administration Record and will be available to the public. Community involvement will continue beyond the Five-Year Review as a necessary and vital part of the cleanup program.

Database Design

The data collection process included specific techniques to enter data derived from document reviews, inspections, and interviews into a searchable, relational database using MS Access®. Tables were built and relationships established so that all data can be downloaded and distinguished by OU number and/or site identification, as well as other key fields. This allows all review information for each OU to be queried and summarized where necessary. Moreover, detailed tables were generated from the database tables for scrutinizing review material and final reporting.

Document Review

The document review was conducted by first examining documentation directly resulting from the CERCLA cleanup process for a site or OU. These baseline documents typically include those listed in **Table 3**, which also indicates the types of information that are available in each document.

Table 3. Typical documents reviewed and contents

Document Title	Contents Pertinent to the FYR
Record of Decision	Background, nature and extent of contamination, cleanup alternatives, cleanup objectives, contaminants, remedial decision
Remedial Action Report	Construction activities
Action Memorandum	Background, nature and extend of contamination, cleanup alternatives, cleanup objectives, contaminants, remedial decision
Annual Report / O&M Reports / O&M Manual	System objectives, system performance, design parameters, trends
Long-term monitoring data	Monitoring data, trends, interpretation of monitoring data
Performance Standard Verification Plan (PSVP)	Sampling plan, performance metrics, closure pathways
Memo on Explanation of Significant Differences	Changes from original remedy
Management Action Plan 2001 (MAP)	Remedial status, background
Drinking Water Standards	Current state and federal standards
EPA Region III Risk-Based Concentration (RBC) Tables	Current risk factors

For many sites, review of this first set of documentation was not adequate to conduct the Technical Assessment and evaluate protectiveness. When this was the case, additional documentation was reviewed. **Table 4** lists those types of additional documentation and the information that was gathered from them.

Table 4. Additional documents reviewed as needed and contents

Document Title	Contents Pertinent to the FYR
Risk Assessment	Exposure assumption, risk calculations
Remedial Investigation	Background, nature and extent of contamination
Feasibility Study (FS)	Cleanup alternatives, cleanup objectives
Proposed Plan	Remedy
Engineering Evaluation/Cost Analysis (EE/CA)	Background, nature and extend of contamination, cleanup alternatives, cleanup objectives, contaminants, remedial decision
Construction report	Construction activities
Remedial Design	Remedy, design parameters, cleanup objectives

A list of all documents that were reviewed for this Five-Year Review is included in **Appendix C**.

A Preliminary Site Summary was developed first for each site to highlight data gaps that needed to be addressed either with a more in-depth document review or through site inspections and personnel interviews. Once inspections and interviews were complete, the Site Summary was updated. Following the completion of the review for all sites in an OU, the results were synthesized into a summary for the Operable Unit. Finally, lists of issues and recommendations from all OUs were considered to develop the conclusions presented in Section III.

Interviews and Inspections

As follow-on to the document review, a series of interviews and inspections were conducted in January, February, and March of 2003 to understand aspects of site status that were not clear from the document review. Also, questions and/or issues stemming from data evaluations completed at some sites were resolved during this interview process. Depending on the type of information required, the interviews included site operations and maintenance (O&M) managers and staff and Environmental Management and Restoration (EMR) project managers. The EMR project managers interviewed included:

- Current managers of the site,
- Construction oversight managers of the site remedy installation,
- Manager of post-ROD OUs, and
- Managers with historical knowledge.

The EMR project manager interviewed for each OU was based on the type of information required to complete a thorough review. A Site Interview Questionnaire was developed after the documentation review was completed and prior to each interview. The questionnaire was based on recommendations for interviews in the EPA guidance (EPA 2001, Appendix C) but was expanded for each interview to address specific data gaps and unresolved issues that had been identified for the site. **Appendix D** includes an example of a questionnaire used for the interview of EMR project managers for OU 7. The Hill AFB Community Involvement Coordinator interviewed community action groups and site neighbors and results of those interviews are presented in **Appendix B**.

Interviewers who were not involved with any aspect of remedial activities conducted one-on-one interviews either in person or on the phone. The completed Site Interview Questionnaires are part of the FYR Database. If the person completing the site review was not conducting the interviews, a meeting was held between the interviewer and the site reviewer to examine the site issues prior to the interview. The interviews with EMR project managers for OU 3, OU 4, and OU 7 were conducted differently. Initially, both Jeff Watkins, the post-ROD project manager, and Oscar Torres, the current project manager, were interviewed simultaneously regarding the current activities and status at these OUs. Later, Steve Hicken, the historical project manager, was also interviewed to resolve questions regarding the history of the sites. Thirty-seven interviews were conducted as a part of the Five-Year Review. The persons interviewed, their role, and the date and time of the interviews are listed in **Table 5**.

Twenty-four inspections were conducted as a part of the Five-Year Review during the months of January and February of 2003. A checklist was prepared for each inspection based on recommendations in the EPA guidance (EPA 2001, Appendix D). Inspectors were selected for each OU based on their knowledge of the OU and impartiality with respect to current operation. An example of a checklist used during the inspection of all sites is included in **Appendix D**. This checklist is comprehensive and lengthy. Only the applicable portions of each checklist were filled out during the inspection. The completed Site Inspection Checklists are included in the FYR Database.

Only one site with NFRAP status, SS092, was inspected, on 3 February 2003. Following this inspection, because no additional information was obtained during this inspection and no visible risks exist at the NFRAP sites, no more sites with NFRAP status were inspected for this review. All sites with a remedy in place or those sites in the pre-ROD phase were inspected and are listed in **Table 6**. Multiple inspections were completed at sites with several remedies (e.g., OU 6), as shown in the table.

The extensive site inspection that was conducted as part of this review indicates that the IRP sites, associated infrastructure, and treatment systems and facilities are generally clean and in good repair. Inspections identified no significant health and safety issues for employees and equipment is well maintained. The presence of on-site documentation and proper institutional controls were verified during the inspection process and any specific issues are captured in the appropriate Site summaries.

Table 5. Interviews conducted for the FYR

Operable Unit	Persons to Interview	Role	Date and Time of Interview
OU 1	Ray Spencer (EMR)	Current & Construction PM	2/6/03 9:00 AM
	Curt Himle (URS)	O&M Contractor (Tech)	2/17/03 1:15 PM
	Bruce McCormack (URS)	O&M Contractor (Tech)	2/6/03 10:00 AM
	Stacey Arens (URS)	O&M Contractor (Eng.)	2/6/03 10:30 AM
OU 2	Stacey Arens (URS)	O&M Contractor (Eng.)	2/6/03 3:00 PM
	Curt Himle (URS)	O&M Contractor (Tech)	2/5/03 1:00 PM
	Ray Spencer (EMR)	O&M and Construction PM	2/6/03 1:00 PM
OU 3*	Steve Knutson (URS)	O&M Contractor (Tech)	2/21/03 9:30 AM
	Holly Renn (URS)	O&M Contractor (PM)	2/24/03 2:00 PM
	Jeffrey Watkins (EMR)	Post-ROD PM	3/4/03 9:30 AM
	Oscar Torres (EMR)	Current PM	3/4/03 9:30 AM
OU 4*	Steve Knutson (URS)	O&M Contractor (Tech)	2/21/03 9:50 AM
	Sage Evans (URS)	O&M Contractor (Eng.)	2/20/03 2:00 PM
	Holly Renn (URS)	O&M Contractor (PM)	2/24/03 2:42 PM
	Jeffrey Watkins (EMR)	Post-ROD PM	3/4/03 10:00 AM
	Oscar Torres (EMR)	Current PM	3/4/03 10:00 AM
OU 5 (Phase I & Phase II)	Oscar Torres (EMR)	Current PM	2/6/03 9:00 AM
	Curt Himle (URS)	O&M Contractor (Tech)	2/12/03 1:00 PM
	Tyler Esplin (URS)	O&M Contractor (Eng.)	2/6/03 10:00 AM
	Mark Loucks (EMR)	Historical PM	2/6/03 10:30 AM
	Steve Knutson (URS)	O&M Contractor (Tech)	2/12/03 12:00 PM
OU 6 (Craigdale, Cooley's, and On-Base)	Oscar Torres (EMR)	Current PM	1/28/03 10:00 AM
	Curt Himle (URS)	O&M Contractor (Tech)	1/24/03 10:20 AM
	Sage Evans (URS)	O&M Contractor (Geologist)	1/27/03 2:00 PM
	Tyler Esplin (URS)	O&M Contractor (Eng.)	1/27/03 10:20 AM
OU 7*	Steve Knutson (URS)	O&M Contractor (Tech)	2/21/03 10:00 AM
	Holly Renn (URS)	O&M Contractor (PM)	2/24/03 3:20 PM
	Jeffrey Watkins (EMR)	Post-ROD PM	3/4/03 10:40 AM
	Oscar Torres (EMR)	Current PM	3/4/03 10:40 AM
OU 8	Steve Knutson (URS)	O&M Contractor (Tech)	1/28/03 9:52 AM
	Holly Renn (URS)	O&M Contractor (PM)	1/28/03 10:31 AM
	Rob Petrie (EMR)	Current PM	1/28/03 12:20 PM
OU 9	Shannon Smith (EMR)	Current PM	2/4/03 9:30 AM
OU 10	Shannon Smith (EMR)	Current PM	1/28/03 9:22 AM
OU 11	Sheri Rolfsness (EMR)	Current PM	1/16/03 10:00 AM
OU 12	Mark Loucks (EMR)	Historical PM	2/11/03 1:00 PM
	Dave Mills (EMR)	Current PM	2/11/03 9:00 AM

* Steve Hicken of EMR also was interviewed for OU 3, OU 4, and OU 7 for a historical perspective on several questions in a short afternoon session on 3/4/03 with Jeffrey Watkins and Oscar Torres.

Table 6. Inspections conducted for the FYR

Operable Unit	Description	Site ID	Date and Time of Site Inspection
OU 1	Landfill No. 4 Chemical Pits 1 and 2 Landfill No. 3 Fire Training Area 1 Waste Phenol Oil Pit	LF001, WP002, LF003, FT081, WP080	2/17/03 2:15 PM
OU 2	Chemical Pit 3	WP007	2/5/03 1:00 PM
OU 3	Sodium Hydroxide Spill	ST004	2/5/03 10:46 AM
	Berman Pond	WP005	2/5/03 10:28 AM
OU 4	Landfill No. 1	LF011	2/5/03 11:33 AM
	Horizontal Drain Upgrade System	LF011	2/5/03 1:09 PM
OU 5	US Army Tooele Rail Shop - Phase I	SS017	2/11/03 1:00 PM
	US Army Tooele Rail Shop - Phase II	SS017	2/11/03 1:30 PM
OU 6	Sump Leach Field	ST022	2/3/03 1:10 PM
	Asphalt Pad - on-Base Pump and Treat (PTS) System	OT026	2/3/03 12:26 PM
	Asphalt Pad - Cooley's Pond	OT026	2/3/03 2:54 PM
	Asphalt Pad - Craigdale	OT026	2/3/03 2:13 PM
OU 7	Building 225 Cr Spill	SS027	2/5/03 10:59 AM
OU 8	Layton TCE Plume	OT033	2/5/03 9:57 AM
OU 9	800/900 Warehouse Area	SS108	2/3/03 10:54 AM
	Pond 3	SD023	2/3/03 10:35 AM
	Pond 7	SD040	2/3/03 10:23 AM
	1100 Area	SS089	2/3/03 9:59 AM
	Building 786*	SS092	2/3/03 9:48 AM
	Zone 7 Golf Course Area	SS090	2/3/03 9:31 AM
	Pond 1	SD034	2/3/03 9:15 AM
OU 10	1200 Area	SS109	2/3/03 10:08 AM
OU 11	Gas Station (454)	OT097	1/24/03 11:00 AM
OU 12	Aspen Ave. Disposal Area	SS107	2/11/03 3:00 PM

* Building 786, SS092, was the only site with NFRAP status that was inspected.

Technical Assessment

A technical assessment was conducted for each site based on the information collected during document review, interviews, and inspections. Each technical assessment addressed the following three questions (EPA 2001):

A. Is the remedy functioning as intended by the decision documents?
B. Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy still valid?
C. Has any other information been uncovered that could call into question the protectiveness of the remedy?

Question A was answered primarily by comparing long-term monitoring (LTM) and operation and maintenance reports with RAOs. The intention of the review with respect to Question A was to determine whether in-place remedies are performing as anticipated. Data produced in LTM reports were used to determine if remedies were in compliance with specifications (e.g., groundwater contaminant concentrations, groundwater elevations, fencing around hazardous waste sites, etc.) provided primarily, but not exclusively, in the USEPA Record of Decision and augmented by the Hill AFB Performance

Standard Verification Plan (PSVP). The PSVPs are important in a protectiveness review because they are the document in which the translation of clean-up standards from the RODs into metrics for evaluating performance is presented. For future Five-Year Reviews, Hill AFB can address Question A in even greater detail when performance standard verification reports (PSVRs) are available for each OU. The PSVR will assess performance using statistical analysis, modeling, and other tools to quantify and update the progress in achieving RAOs. For this Five-Year Review, no additional statistical evaluations of monitoring data were performed beyond those available in published reports.

The O&M reports were reviewed to determine if the technology was functioning appropriately to meet cleanup levels. Optimization of the operations was not a focus of the Five-Year Review.

Question B was addressed primarily by comparing cleanup levels at the time of remedy selection with cleanup standards in place as of September 2002. Cases where standards have changed were identified; however, no human health risk assessment was conducted to evaluate the impact on cleanup levels due to recent changes in recommended toxicity or exposure levels. The intention of the review with respect to Question B was to determine whether exposure assumptions, toxicity data, and cleanup levels used at the time the ROD or an Action Memorandum was signed were still valid as of September 2002. It is possible that remedies could be compliant with RAOs established at the time of a ROD but no longer afford the same level of "protectiveness" based on more recent EPA toxicity evaluations of specific contaminants of concern. A risk assessment would need to be conducted using recently developed toxicity data and updated USEPA risk assessment procedures to determine if remedies activated in accordance with RODs where clean-up levels may need to be modified are still protective.

Question C was answered primarily by review of longer-term monitoring reports or other treatability studies published since remedial actions were initiated. Results of interviews and inspections also played an important role in addressing Question C. The intention of the review with respect to Question C was to determine if there are issues beyond system operation and clean-up standards that could impact the success of a remedy.

This Technical Assessment resulted in a set of yes/no answers that formed the basis for evaluating protectiveness for each IRP Site. In addition, the process of addressing each question resulted in a list of issues associated with each site. A set of recommendations was generated to address issues associated with the Technical Assessment.

Protectiveness Selection

Based on the results of the Technical Assessment, the protectiveness of each site was evaluated and categorized as one of the following:

- Protective
- Will be protective once the remedy is completed
- Protective in the short-term; however, in order for the remedy to be protective in the long-term, follow-up actions need to be taken
- Not protective, unless the following actions are taken in order to ensure protectiveness
- Protectiveness cannot be determined until further information is obtained
- Not Applicable

The "Not Applicable" categorization was used for those sites which were included in this review either for completeness (e.g., sites with previous NFRAP designation) or for which no remedial actions have been constructed at this time (e.g., sites currently under RI).

Following the data evaluation and protectiveness selection, a protectiveness statement was written in accordance with the EPA Guidance explaining the primary reason(s) for the categorization.

Report Preparation

Hill AFB is a complex facility and therefore this review was conducted for individual IRP sites rather than for the Base as a whole. This CERCLA Five-Year Review Report was developed by first looking at review results at each individual IRP site (Site Summaries), then considering the collective protectiveness at the OU level (OU Summaries, Section VII). Protectiveness statements were developed for each of the 42 sites reviewed and for each of the 12 OUs at Hill AFB.

As a result of the tiered review process (sites followed by OUs), much of the information in the Site Summaries duplicates that presented for the Operable Unit. The reader is encouraged to focus on the OU Summaries for understanding protectiveness and use the Site Summaries as a source of additional detail, particularly background and issues and recommendations specific to each IRP site.

III CONCLUSION & RECOMMENDATIONS

This 2003 CERCLA Five-Year Review for Hill AFB was completed following the process described in Section II during the period of October 2002 through April 2003. The document review included work conducted at Hill AFB that was published prior to 30 September 2002 and interviews and inspections that were conducted during January, February, and March of 2003. The Hill Administrative Record served as the source of much of the required documentation. In the event that information necessary to complete the review of a site was not available through the Administrative Record, Hill EMR project files were accessed for historical records. A list of all documents reviewed is included in **Appendix C**. Information gathered during the review is in the FYR Access® database along with the reference for each item. The conclusions of the review are the result of a reproducible, defensible process where data were evaluated to assess whether remedial actions conducted at IRP sites at Hill AFB are protective of human health and the environment.

Basewide Findings

The EMR department is managing the CERCLA-related remediation efforts at Hill AFB. This review highlighted several items that were apparent across the Base, not specific to a particular site, Operable Unit, or remedial action, which are important to EMR's ability to monitor and maintain protectiveness. These basewide findings are described here while details of the OU- and site-specific reviews are contained in Section VII.

Changes in Chemical-Specific Clean-up Levels

As part of the Technical Assessment, the cleanup level for each chemical of concern (COC) listed in the ROD and decision documents was examined. The standard-based cleanup levels for groundwater were compared to the current Utah drinking water standards (UT 2002). To assess the current relevancy of risk-based cleanup levels developed for OUs in the past, the toxicity factors used in the risk assessments were compared to the toxicity factors listed in the EPA Region III RBC Tables (EPA Region III 2002). Details of the study are included in **Appendix E**, and changes in standards or toxicity factors that could affect the cleanup levels for OUs at Hill AFB are summarized in **Table 7**. OUs 9 through 12 were not included in this analysis because there are no decision documents for these OUs and consequently no (by definition) contaminants of concern. It should be noted that the arsenic cleanup levels are currently still valid. However, the new arsenic standard of 10 µg/L has been promulgated and will take effect January 2006.

Also, Hill AFB EMR, EPA and Utah State established a new action level for TCE in indoor air at 0.43 parts per billion by volume (ppbv) in December 2002 (MWH 2002). This new action level may affect any OU with a groundwater contaminant plume that has extended off-Base under residential areas. Potential residential exposure to TCE vapor should be analyzed for residents within or near OU 1, OU 2, OU 4, OU 5, OU 6, and OU 8.

Based on the result of this portion of the technical assessment, the risk analyses for OU 1 through OU 8 should be re-evaluated due to new standards and more stringent toxicity factors. The chemicals of potential concern (COPCs) that were dismissed after the original risk assessments were not reassessed during this review. The standards and toxicity factors for the COPCs at OU 1 through OU 8 should be examined to determine if risk calculations should be updated and if new actions levels are warranted.

Table 7. Comparison of Cleanup Levels and Standards

COC listed in Decision Documents with changes to MCLs or risk factors	OU							
	1	2	3	4	5	6	7	8
1,1-Dichloroethene (1,1-DCE)						-		
Arsenic (effective 1/26/2006)	+		+	+				+
Barium	-							
Beta-BHC		+						
Boron				+				
Chromium (total or VI)							+	-
Fluoride	-							
Methylene chloride		+	+					
Naphthalene	+							
Polychlorinated Biphenyl (PCB)			-					
1,1,2,2-Tetrachloroethane			0					
Tetrachloroethene (Perchloroethene or PCE)		+						
Trichloroethene (TCE)		+		+	0			
Potential Risk to Indoor Air Quality	√	√		√	√	√		√
Answer to Tox/Standard portion of Question B*	N	N	N	N	Y	Y	N	Y

Cleanup levels stated in decision documents were compared to 2002 Maximum Contaminant Levels (MCLs) and toxicity factors:
(-) 2002 MCLs or risk factors are less stringent, (+) 2002 MCLs or risk factors are more stringent, (0) risk assessment required to understand impact, (shaded) not a COC, (√) risk should be evaluated, (Y/N) yes/no.
*Conclusion assumes exposure assumptions have not changed.

Site Management

Site management at Hill AFB focuses on providing protectiveness to human health and the environment. A site management plan, whether conceptual or as a published document, provides a framework for making decisions about an OU and generally contains guidelines for daily site management, tools for optimizing long-term monitoring and long-term operations (LTO), and a closure strategy that has regulatory and community approval. Site management objectives are to provide protectiveness by evaluating performance data, reducing LTM/LTO program costs, and reducing the time to closure. An important component of reducing LTO costs and time to closure is to implement the most efficient technology for an OU. Each OU at Hill AFB is managed by a Project Manager who is cognizant of issues associated with that OU and has authority to develop a site management plan and select contractors to implement phases of that plan.

Daily Site Management

Daily activities required to maintain protectiveness include primarily O&M tasks and long-term monitoring tasks. In general for the OUs at Hill AFB, separate contracts are in place for O&M tasks and for the long-term monitoring tasks. Based on document reviews, interviews, and inspections, the individual contractors appear to be aware of most of the protectiveness issues associated with the tasks they conduct. For example, O&M contractors are aware of issues associated with permit requirements and efficiency for a particular treatment system and LTM contractors have constructed and are using monitoring systems that allow sub-surface conditions to be tracked in accordance with the Basewide Monitoring Program. However, this Five-Year Review suggests that greater integration of these data sets could support efforts to ensure protectiveness by increasing treatment efficiency and reducing treatment times. Further, there is information that is collected by both LTM and LTO contractors that is not

analyzed and reviewed except as part of annual O&M reporting or the PSVP/PSVR process, which is conducted every five years. A less rigorous but more frequent review of LTO and LTM data could lead to regular changes in operations that modify treatment, ensure protectiveness, and reduce time to site closure.

In addition, this Five-Year Review for several of the OUs suggests that a review should be conducted by each Hill OU Project Manager to confirm responsibility for meeting PSVP data collection requirements. In cases where different contractors are performing O&M and LTM tasks, the assignment for monitoring and reporting data required in the PSVP must be explicit to ensure monitoring and reporting are comprehensive. A careful check should be conducted by the EMR Project Manager to ensure that each PSVP-based requirement is being fulfilled through one of the contracts.

Optimizing Long-Term Monitoring

The goal of a LTM program as part of site management is to collect the minimum data necessary to ensure protectiveness, demonstrate remedial progress, and achieve site closure. Minimizing data collection reduces costs. To support this goal, Hill AFB has implemented a basewide monitoring program. The Hill AFB monitoring program is designed and managed to locate contamination, evaluate risk of exposure, and determine and monitor treatment controls to protect human health and the environment. The program consists of monitoring for the presence of contamination in the air, soil, vegetation, and water in seeps, springs, surface water and groundwater at hundreds of sampling locations on and around Hill AFB, often extending into the surrounding communities. Groundwater elevation and slope stability data are also collected. Samples are analyzed for presence of contaminants, changes in elevation or flow patterns, and impact on slope stability in order to track risk of exposure and assess the impact of treatment. All data are maintained in the Hill AFB Environmental Restoration Program Information Management System (ERPIMS) for statistical analysis and used for daily management decisions and long-range planning. Hill AFB partners closely with the public in all aspects of the monitoring program, and the monitoring program is reviewed periodically to ensure it is adequate for evaluating protectiveness while remaining cost-effective.

The monitoring program has two independent but related functions. The first function entails sampling performed during remedial investigations to locate and characterize areas that may be contaminated. Data are collected during the investigations to define the extent of the plume, understand risk of exposure, and develop site conceptual models. Operable Units 9, 10, 11, and 12 are currently under investigation without any active treatment, and OUs 5 and 8 have active interim treatment systems while investigations continue toward preparation of a ROD. Once a ROD has been developed, monitoring will be managed under the second monitoring function.

The second monitoring function is designed and managed to track contamination, to measure the effect of treatment, and to measure compliance with applicable environmental laws at post-ROD OUs 1, 2, 3, 4, 6, and 7 where the selected remedies are in place. Monitoring is managed as defined in the PSVPs and sampling is generally conducted semi-annually by contractors with EMR oversight. The PSVP defines performance metrics based on clean-up standards in the ROD and specifies locations for monitoring progress toward achieving RAOs, typically, but not exclusively, groundwater monitoring locations. The PSVP specifically defines what parameters to monitor, the location of the monitoring points, and the frequency of monitoring. Sampling results are reviewed every 5 years and necessary adjustments to management and the subsequent PSVRs will be made in the PSVP. The first Hill AFB PSVP was prepared for OU 1 in April 2001, and for the other post-ROD OUs the following year. PSVPs for OUs 5 and 8 have been developed and others will be developed for the remaining OUs as investigations continue. The first PSVRs are scheduled for completion 2006.

The PSVP for each OU should include the metrics necessary to monitor performance and protectiveness of the remedial action or treatment remedy design. Based on this Five-Year Review, PSVPs may not address either or both of these functions adequately. Specifically, the PSVPs should carefully address the locations that are monitored and the frequency of that monitoring and data review. The PSVP/PSVR process should be capable of ensuring that the locations required to understand both the remedy performance and the remedy protectiveness are sampled.

Optimizing Long-Term Operations

The primary operational strategies of LTO to ensure protectiveness as part of site management are active remediation in the source area and plume containment. Focus remains on maximizing the effectiveness of the strategy while minimizing the costs for treatment and monitoring. Consequently, a responsive site management plan allows for future considerations for alternative technology insertion. To this end, Hill AFB has developed a basewide Innovative Technology Program (ITP) that serves as an EMR-wide tool to identify opportunities to achieve cleanup goals in a more cost effective manner. The program was established in the mid-1990s as a way to integrate and coordinate innovative technology demonstrations. Opportunities may include innovative modification of traditional technologies or application of new technologies. An innovative application may be cost-effective if it accelerates progress toward remediation goals or enables an existing application to function more efficiently.

EMR management reviews innovative technologies with three objectives in mind. Projects should be focused on 1) reducing clean-up times, 2) reducing life-cycle costs, or 3) meeting some other compelling requirement in the EMR program. Following review and acceptance of an application at an OU, the ITP Manager works directly with the OU Project Manager to coordinate the activities and communicate findings to other OU managers. By reducing costs associated with studies and remediation, this program helps with the redistribution of Defense Environment Restoration Program (DERP) funds across the Base to ensure that protectiveness is achieved as quickly and as cost-effectively as possible.

Funding for technology demonstration comes both from the Hill AFB budget and from external funding sources. Examples of external funding sources for previous technology demonstrations have included: Advanced Applied Technology Demonstration Facility (AATDF), Remediation Technology Development Forum (RTDF), the Strategic Environmental Research and Development Program (SERDP), the Environmental Security Technology Certification Program (ESTCP) and the Environmental Protection Agency (EPA, Ada Laboratory). In addition to external funds, Hill EMR supports the demonstrations and research with funds from DERP, administered by the Air Force Materiel Command.

Basewide Issues

This Five-Year Review, following the process described in Section II, culminating in a Technical Assessment of the protectiveness for each IRP site and for each OU, has identified issues that need to be addressed in order to gain or ensure continuing protectiveness for Hill AFB. Three issues exist at several OUs, though not necessarily at every OU reviewed, and are therefore presented generally in **Table 8**.

Table 8. Major basewide issues identified during 2003 CERCLA Five-Year Review

Issue	Potentially Affects Protectiveness? (Y/N)	
	Currently	Future
Evidence of ponding and damage on landfill caps	N	Y
Unlocked gates and inadequate signage	Y	Y
Insufficient evaluation of performance data conducted to date for most OUs	N	Y

Basewide Recommendations

The following recommendations are based on the general, basewide issues identified above. Each was developed based on the findings in this Five-Year Review and either has an impact on protectiveness or on the ability to determine protectiveness. All should be implemented prior to the next Five-Year Review in 2008.

- Determine the potential for exposure to TCE vapors for residents near OU 1, OU 2, OU 4, OU 5, OU 6, and OU 8.
- Re-evaluate the risk analyses for OU 1 through OU 8 in view of new standards and more stringent toxicity factors.
- Conduct periodic, integrated review of O&M and LTM data to support remedy performance and protectiveness tracking.
- Conduct a check of O&M and LTM contracts to ensure that all PSVP-based items are being completed under one or the other.
- Review each PSVP and update if necessary to ensure the PSVP includes the metrics necessary to monitor the performance and the protectiveness of the selected remedy.
- Assess the impact of ponding and damage on landfill caps and correct activities and repair accordingly.
- Ensure that all gates are locked and adequate, descriptive signage is present where required.

OU Specific Issues and Recommendations

This Five-Year Review also has identified issues that need to be addressed in order to gain or ensure continuing protectiveness for the individual OUs at Hill AFB. The specific issues identified for each OU are listed in the respective OU Summary in Section VII. **Table 9** highlights some of the more complex issues as well as recommendations to address each issue. Each OU Summary (Section VII) contains a comprehensive list of issues that was used to develop recommendations and assess protectiveness for each OU. The list of issues and recommendation in each Site Summary can be used to specifically address protectiveness at an individual IRP site. The list of recommendations in each Site Summary can be used to develop a list of action items that should be addressed as soon as possible and prior to the next Five-Year Review in 2008.

Table 9. Major issues and recommendations identified during 2003 CERCLA Five-Year Review

OU	IRP Site	Issue	Recommendation	Potentially Affects Protectiveness? (Y/N)	
				Currently	Future
1	LF001, WP002, LF003, FT081, WP080	Measurable hydrocarbon concentrations and LNAPL are present downgradient and to the west of the exterior trench. Therefore, monitored natural attenuation in that portion of the non-source area may not be adequate to remediate the contaminated groundwater.	Re-evaluate the non-source area monitored natural attenuation remedial action to determine if still applicable in all non-source areas.	Y	Y
2	WP007	A thorough review of the remedial actions now implemented is not scheduled until 2006, 13 years after the SRS began operation in 1993 and 10 years after the containment wall and the North Interceptor Trench were completed in 1996.	Complete a PSVR to comprehensively evaluate the system of remedies at OU 2, particularly the containment wall, the North Interceptor Trench, and the SRS.	N	Y
		The leading edge of the plume is near the boundary of NE ¼, Sect. 29, T5N R1W, which is not subject to water rights restrictions. Should the plume advance, it could impinge on this quarter section.	Monitor plume extent, particularly with respect to NE ¼, Sect. 29, T5N R1W, and apply water use restrictions as appropriate.	N	Y
3	WP005	The groundwater levels in the extraction sumps at Berman Pond have been above the PSVP-mandated GW elevation action level for the past four years. Pumps were removed after the cap was installed in 1997. Pumps have not been re-installed in the sumps because EMR believes that groundwater from OU 3 is captured in the OU 8 extraction system.	Revise the PSVP to reflect the change of remedial actions at the site.	Y	Y
4	LF011	Increasing contaminants trends in distal portions of the plume suggest migration while a recent report concludes the plume is "relatively static".	Thoroughly evaluate existing data and determine if additional data and/or modeling is required to develop a plume management plan that meets the RAOs.	N	Y
		The effectiveness of the landfill cap in limiting infiltration and reducing the contaminant leaching is questionable.	Complete an investigation into the increase of TCE concentrations in U4-047 and closely monitor future analytical results from this location for trends.	Y	Y
		Protectiveness of some seeps is based on low flow and not on access control.	Conduct a risk-based assessment for seep U4-308 and install institutional controls if risk-based action levels are exceeded.	N	Y
	OT041, LF012	An additional source of contamination is suspected near these two sites. Both sites have NFRAP status.	Continue to monitor wells in the plume area and if sustained increasing trends are observed, which result in an expansion of plume boundaries, an evaluation should be completed to determine if additional source characterization is warranted.	N	Y
5	SS017	Operational issues have reduced the effectiveness of the aeration curtain, which is allowing concentrations of TCE greater than 5 µg/L to pass through.	Evaluate the life expectancy of the aeration curtain system and, if appropriate, replace the blowers with air compressors. Clean the sparge lines and develop a preventive maintenance process to prevent unplanned system shutdowns.	N	N
		The Phase II groundwater extraction system does not appear to be affecting the plume and is predicted to only remove another 1% of contaminant mass over the next 30 years.	Plan the deactivation of Phase II groundwater extraction system.	N	N
6	OT026	Active treatment in the northern arm of the east contaminant plume needs to be evaluated, as required by the ROD, because the TCE concentrations have remained above 5 µg/L after 5 years [after 2002].	Evaluate the need for active treatment in the northern arm of the off-Base contamination plume.	N	Y
		The air stripper discharge pump is running at its maximum capacity and cannot handle additional flow, while flows from the well field should be increased to reach action levels.	Evaluate treatment system to determine why target groundwater levels at the extraction wells, which are an indicator of plume capture, have not been achieved.	Y	Y
		Fouling at the extraction wells has reduced the volume of groundwater that can be extracted.	Develop a long-term maintenance strategy to closely monitor the fouling problem at the extraction wells and to ensure that adequate treatment is implemented.	N	N
7	SS027	Hexavalent chromium concentrations in groundwater beneath Bldg. 225 have exceeded MCLs since 1996, and the downgradient concentrations are increasing, suggesting contaminant migration.	Identify the source of the elevated concentrations of hexavalent chromium in the groundwater underlying the SS027 site.	Y	Y
8	OT033	A potential exposure pathway with no institutional controls exists at U3-610.	Review analytical sampling results for U3-633 to quantify exposure risks at this location.	Y	Y

IV PROTECTIVENESS STATEMENTS

Protectiveness statements have been developed for each IRP site reviewed in this 2003 Five-Year Review as well as for each Operable Unit. The basis for these statements is provided in the OU Summaries included as Section VII of this report. **Table 10** provides a summary of the protectiveness determinations for Hill AFB. **Table 11** provides the protectiveness determination for the sites and OUs. A not applicable determination was given to sites that already had a No Further Remedial Action Planned (NFRAP) status as well as sites where remedial investigations and feasibility studies were still being completed and a remedy was not installed. Because some OUs at Hill AFB do not have remedies selected and constructed, a basewide protectiveness statement is not included in this review.

Table 10. Summary of Protectiveness Determinations for Hill AFB

Protectiveness Determination	Number of IRP Sites	Number of OUs
Protective	8	2
Protectiveness cannot be determined	6	4
Protective in the short term	2	2
Will be protective once remedy complete	1	1
Not protective	1	1
Not applicable	24	2

One OU, OU 12, is not protective because there are high levels of TCE in shallow groundwater, and although there are groundwater use restrictions in place, there are areas within the plume and beneath residences where groundwater is very shallow and indoor air quality is a concern. Currently, with groundwater use restrictions and air treatment units in homes with identified indoor air concerns, there is no apparent danger of exposure.

Table 11. Site Five-Year Review Status for Hill AFB

OU	Site ID	Site Name	Protectiveness	Management Stage *	Next FYR Review
1	LF001	LANDFILL NO 4	Protective	**LTO/LTM**	2008
1	WP002	CHEMICAL PITS 1 AND 2	Protectiveness cannot be determined until further information is obtained	LTO/LTM	2008
1	LF003	LANDFILL NO 3	Protective	LTO/LTM	2008
1	FT009	FIRE TRAINING AREA 1	Not applicable	NFRAP	None required
1	OT014	GOLF COURSE	Not applicable	NFRAP	None required
1	FT081	FIRE TRAINING AREA 2	Protectiveness cannot be determined until further information is obtained	LTO/LTM	2008
1	WP080	WASTE PHENOL OIL PIT	Protectiveness cannot be determined until further information is obtained	LTO/LTM	2008
1	OU 1	OPERABLE UNIT 1	Protectiveness cannot be determined until further information is obtained	LTO/LTM	2008
2	WP007	CHEMICAL PIT 3	Protectiveness cannot be determined until further information is obtained	LTO/LTM	2008
2	SS021	PERIMETER ROAD	Not applicable	NFRAP	None required
2	OU 2	OPERABLE UNIT 2	Protectiveness cannot be determined until further information is obtained	LTO/LTM	2008
3	ST004	SODIUM HYDROXIDE SPILL	Protective	LTO/LTM	2008
3	WP005	BERMAN POND	Protective	LTO/LTM	2008
3	WP006	IWTP SLUDGE DRYING BEDS	Not applicable	NFRAP	None required
3	ST018	BLDG 514	Protective	NFRAP	None required
3	SD046	POND 2	Not applicable	NFRAP	None required
3	OU 3	OPERABLE UNIT 3	Protective	LTO/LTM	2008
4	LF011	LANDFILL NO 1	Protective in the short term	LTO/LTM	2008
4	LF012	LANDFILL NO 2	Not applicable	NFRAP	2008
4	OT020	SPOIL PIT	Not applicable	NFRAP	None required
4	OT041	NORTH GATE DUMP OP UNIT 4	Not applicable	NFRAP	2008
4	OT042	MUNITIONS DUMP OP UNIT 4	Not applicable	NFRAP	None required
4	OU 4	OPERABLE UNIT 4	Protective in the short term	LTO/LTM	2008
5	SD016	BAMBERGER POND	Not applicable	NFRAP	None required
5	SS017	US ARMY TOOELE RAIL SHOP	Protective in the short term	RI/EARLY ACTION	2008
5	SS091	BLDG 1607 - EVAP. POND	Not applicable	RI	2008
5	OU 5	OPERABLE UNIT 5	Protective in the short term	RI/EARLY ACTION	2008
6	ST022	SUMP LEACH FIELD	Protective	LTO/LTM	2008

Table 11. Site Five-Year Review Status for Hill AFB (Cont.)

OU	Site ID	Site Name	Protectiveness	Management Stage *	Next FYR Review
6	OT026	ASPHALT PAD	Protectiveness cannot be determined until further information is obtained.	LTO/LTM	2008
6	SD40B	BLDG. 1946 EVAPORATION POND	Not applicable	NFRAP	None required
6	OU 6	OPERABLE UNIT 6	Protectiveness cannot be determined until further information is obtained.	LTO/LTM	2008
7	SS027	BLDG 225 CR SPILL	Protective	LTM	2008
7	ST031	B220 UNDERGROUND TANKS	Not applicable	NFRAP	None required
7	SS032	BLDG 225 PCB	Not applicable	NFRAP	None required
7	SS028	SILL PROPERTY, LAYTON	Not applicable	NFRAP	None required
7	OT029	B-204 BE	Not applicable	NFRAP	None required
7	OU 7	OPERABLE UNIT 7	Protective	LTM	2008
8	OT033	LAYTON TCE PLUME	Protectiveness cannot be determined until further information is obtained	IRA/PP	2008
8	OU 8	OPERABLE UNIT 8	Protectiveness cannot be determined until further information is obtained	IRA/PP	2008
9	SD023	POND 3	Not applicable	RI	2008
9	SD034	POND 1	Will be protective once remedy is completed	RA-C	2008
9	SS092	BLDG 786	Protective	NFRAP	None required
9	OT106	DEFERRED AREAS	Not applicable	LTM	2008
9	SD040	POND 7	Not applicable	RI	2008
9	SS089	1100 AREA	Not applicable	RI	2008
9	SS090	ZONE 7 GOLF COURSE	Not applicable	RI	2008
9	SS108	800/900 WAREHOUSE AREA	Not applicable	RI	2008
9	OU 9	OPERABLE UNIT 9	Will be protective once remedy is completed	RI	2008
10	SS109	1200 AREA	Not applicable	RI	2008
10	OU 10	OPERABLE UNIT 10	Not applicable	RI	2008
11	OT097	GAS STATION (454)	Not applicable	RI	2008
11	OU 11	OPERABLE UNIT 11	Not applicable	RI	2008
12	SS107	ASPEN AVE. DISPOSAL AREA	**Not protective**	RI/TS-C	2008
12	OU 12	OPERABLE UNIT 12	**Not protective**	RI/TS-C	2008

* Management Stages:

IRA = Interim Remedial Action, under Interim ROD
LTM = Long Term Monitoring
LTO = Long Term Operation
NFRAP = No Further Remedial Action Planned
PP = Proposed Plan
RA = Remedial Action in place, under ROD
RA = Remedial Action in place, under ROD
RA-C = Remedial Action under Construction, under ROD
RI = under Remedial Investigation
TS-C = Treatability Study under Construction

V TIMING FOR NEXT REVIEW FOR HILL AFB

The next Five-Year Review for Hill Air Force Base is required by September 2008, five years from the date of this review. **Table 10** illustrates that this 2003 Five-Year Review was the final review required for many of the IRP sites included. The 2008 Review will need to encompass all 12 OUs, but only 28 IRP sites from this reviewed set of 42.

VI REFERENCES FOR SECTIONS I THROUGH V

(EPA 2001) Comprehensive Five-Year Review Guidance, EPA 540-R-01-007, OSWER No. 9355.7-03B-P, Environmental Protection Agency, June 2001.

(EPA Region III 2002) Risk-Based Concentration Table, EPA Region III, October 9, 2002, EPA Region III, 9 October 2002.

(MWH 2002) Draft, Basewide Air Sampling and Analysis Plan Indoor Residential Air Sampling, Montgomery Watson Harza, Oct 2002.

(UT 2002) Utah Rule R309-200, Monitoring and Water Quality: Drinking Water Standards, State of Utah, July 2002.

VII FIVE-YEAR REVIEW OF OPERABLE UNITS

The FYR summary for each Operable Unit is included in this section. The information for each OU is contained after the tab with the corresponding number. At a minimum, each numbered tab includes the OU summary, a site figure, and an OU chronology. If the OU has more than one site, site chronologies and site summaries are also included.

Operable Unit 1

I Introduction

OU 1 is located near the eastern Base property boundary and includes two IRP sites with NFRAP status (FT009 and OT014) (see Table OU 1-1) and 5 open IRP sites with active remediation in place to address contaminated groundwater and soil (HAFB EMR 1998a). Past investigations have focused on the five open sites as a group and subsequently RAOs were written and remedial actions were selected for the region impacted by all sites collectively.

Table OU 1-1. OU 1 Site Identification

Site ID	Site Name
LF001	LANDFILL NO. 4
WP002	CHEMICAL PITS 1 AND 2
LF003	LANDFILL NO. 3
FT009	FIRE TRAINING AREA 1
OT014	GOLF COURSE
FT081	FIRE TRAINING AREA 2
WP080	WASTE PHENOL OIL PIT

II Site Chronology

See Table OU 1-2 for a history of events in this OU. The table is organized to describe events that impacted the OU as a whole, followed by events impacting specific IRP sites within the OU.

III Background

OU 1 is located near the eastern Base property boundary, and includes the former waste disposal areas: Landfills No. 3 and No. 4, Fire Training Areas (FTAs) 1 and 2, Chemical Disposal Pits 1 and 2, the Water Phenol/Oil Pit (WPOP), and the Waste Oil Storage Tank (WOST) site. The source area includes Landfills No. 3 and No. 4, CDPs 1 and 2, FTAs 1 and 2, the WPOP, the WOST (see Figures OU 1-1 and OU 1-2), and the light, non-aqueous phase liquid (LNAPL) emanating from the CDPs. The non-source area includes an on-Base groundwater plume west of the CDPs and the off-Base groundwater plume in the Weber River Valley. These groundwater plumes are depicted in Figures OU 1-1 and OU 1-2. Although these two figures illustrate TCE and cis-1,2-DCE, other COCs may be present within the boundaries of these plumes.

Historically, hazardous materials and wastes were dumped and/or burned at all of the source areas. These included scrap metal, construction debris, domestic refuse, industrial refuse, sludge drying bed and flocculation wastes from the Industrial Wastewater Treatment Plant, sulfuric acid, chromic acid, phenol, methyl ethyl ketone (MEK), waste oil, fuel, spent solvents including Stoddard solvent and paint thinner, paint sludges, paint booth scrubber sludge, plastics, and spent sandblast media (MW 1995).

The shallow groundwater under and downgradient of the five open sites was contaminated as a result of the historical disposal activities. Because of the proximity of the five sites, investigations have focused on them as a group; RAOs were written, and remedial actions were selected for the region impacted by all sites collectively. All of the sites, except Fire Training

Area 2 (FT081), were capped during construction activities at Landfills No. 3 and No. 4 and groundwater contamination at the site is being addressed through five remedial actions which are: 1) extraction trenches that collect contaminated shallow groundwater (dewater) and LNAPLs (source area), 2) landfill caps (source areas), 3) remediation of contaminated surface water and soil at downgradient springs (non-source area), 4) monitored natural attenuation for contaminated groundwater off-Base (non-source area), and 5) institutional controls.

IV Remedial Actions

Remedial actions have been implemented at OU 1 to address both on-Base and off-Base contamination. The remedial actions are discussed in detail in the Site Summaries (see Section XIII) for OU 1. In summary, the remedial actions are:

1. Source Area - Groundwater Extraction Trenches
   Installation of five groundwater extractions trenches located in the OU 1 source area to dewater the Provo Formation by extracting groundwater and LNAPLs. The extracted contaminated groundwater is passed through an oil water separator (OWS) before being conveyed to the IWTP for treatment. Treated water from the IWTP is discharged to the North Davis Sewer Improvement District for further treatment and final discharge.

2. Source Area - Landfill Cap
   The remedial action at Landfill No. 4 consisted of the low permeability soil cover constructed in 1985 and the repair of the areas of differential settlement in 2001. The remedial action at Landfill No. 3 included construction of a new portion of low-permeability cap over the CDP area and the repair of portions of the cap (installed in 1985) disturbed by the installation of the groundwater extraction trenches. The purpose of the repair of the landfill caps was to minimize the infiltration of surface water into the landfill contents and the leaching of contamination into the groundwater. The landfill caps cover all of the sites at OU 1 except for Fire Training Area 2 and the Waste Phenol Oil Pit.

3. Non-Source Area - Spring Remediation System
   The selected remedial action for the springs (U1-303, U1-304, U1-305, U1-307, and U1-318) is to treat the groundwater from the springs with contamination levels above MCLs. Due to reducing conditions in the groundwater at OU 1, elevated arsenic concentrations in the groundwater have been measured. To mitigate arsenic from mobilizing from the sediments to the groundwater, sediments from spring areas with arsenic contamination above 11 mg/kg will be identified and excavated after the springs have ceased to flow. The removal of the arsenic contaminated soils at the springs is anticipated two to three years after the springs cease to flow.

4. Non-Source Area - Monitored Natural Attenuation
   The selected remedial action for the non-source area groundwater plumes is monitored natural attenuation (MNA). This remedial action requires long-term monitoring of the groundwater plumes to determine if naturally occurring attenuation processes are meeting the remedial action objectives as stated in the ROD.

5. Common to Both Source Area and Non-Source Area - Institutional Engineering Controls
   Institutional and engineering controls include restriction of access to landfill cap areas using fencing and warning signs, enforcement of the Hill AFB Commander's office continuing order that limits development within OU 1 (HAFB 1998), distribution of the Hill Restricted

Use Access Map to the appropriate Hill AFB personnel to identify OU 1 as an area restricted to development, and restricting domestic usage of the shallow groundwater in the OU 1 area with drilling restrictions per the Utah Division of Water Rights.

The remedial actions at OU 1 were developed to achieve the RAOs set forth in the ROD. The individual site summaries include a description of each RAO for OU 1.

V Progress Since Last Five-Year Review

OU 1 interim remedies were reviewed in the 1998 Five-Year Review Report (HAFB EMR 1998b). Since the review in 1998, the ROD has been written and all of the remedial actions outlined in the ROD have been implemented except for removal of arsenic contaminated soils from the springs, which is not planned until after two to three years operation of the groundwater extraction system (GES).

VI Five-Year Review Process

Site review was conducted per the process described in this report for the overall 2003 FYR.

VII Technical Assessment

Results of the technical assessment for each site in OU 1 and for the operable unit are listed in Table OU 1-3. Details of the technical assessment for each site in OU 1 are provided in the respective site summary (see Section XIII).

Table OU 1-3. Technical Assessment Summary for OU 1

Site ID	Remedy	Technical Assessment*			Protectiveness	Next Five-Year Review
		Question A	Question B	Question C		
FT081, WP002, WP080	Groundwater Extraction Trenches, Spring Remediation, Landfill Cap, Monitored Natural Attenuation, Institutional Controls	Yes	No	Yes	Protectiveness cannot be determined until further information is obtained	2008
LF001, LF003	Landfill Cap, Institutional Controls	Yes	No	Yes	Protective	2008
FT009	NA	NA	NA	NA	NA	NA
OT014	NA	NA	NA	NA	NA	NA
OU 1	Groundwater Extraction Trenches, Spring Remediation, Landfill Cap, Monitored Natural Attenuation, Institutional Controls	Yes	No	Yes	Protectiveness cannot be determined until further information is obtained	2008

*Question A: Is the remedy functioning as intended by the decision documents?
Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objective (RAOs) used at the time of the remedy still valid?
Question C: Has any other information come to light that could call into question the protectiveness of the remedy?
NA = Not Applicable

Question A. Is the remedy functioning as intended by the decision documents?

Yes. The primary goal of the OU 1 remedies is to dewater the source area and prevent groundwater contamination of uncontaminated areas (non source areas). Since June 2001, the groundwater extraction system has extracted 28,216,379 gallons of groundwater and 6,301 gallons of LNAPL (as of 31 December 2002) (URS 2002a and 2002b). Water elevations in the sumps at OU 1 have not been maintained in several sumps below the trench pipe entry elevation (U1-217, U1-218, U1-219, and U1-224). However, additional groundwater extraction pumps were installed in U1-217 and U1-219 to increase extraction capacity. The flows at springs U1-303 and U1-304 have decreased to a yearly average of less than 0.1 gpm, and springs U1-305 and U1-318 have ceased to flow.

Question B. Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objective (RAOs) used at the time of the remedy still valid?

No. A new, lower arsenic standard of 10 ug/L (ppb) will be effective 01/26/2006. The barium cleanup level of 1000 ug/L is lower than the MCL of 2000 ug/L (overprotective). The fluoride cleanup level of 2400 ug/L is lower than the MCL of 4000 ug/L (overprotective). The naphthalene RfD(o) decreased from 0.04 to 0.02 mg/kg/day, and the RfD(i) is now available at 9.0×10^{-4} mg/kg/day (EPA Region III 2002). EMR, EPA and UDEQ have established a new action level for TCE in indoor air at 0.43 ppbv.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

Yes. The conclusions of the OU 1 Source Area Zone Delineation Progress Report (Intera 2002) indicate that hydrocarbon concentrations are measurable downgradient and to the west of the exterior trench (Trench D). This could be an indication that contaminated groundwater from the source area is not being captured by either the interior or exterior trenches or that there is an additional source of contamination off-site (see Figures OU 1-1 and OU 1-2 for location).

VIII Issues

Based on the information reviewed, issues that may affect protectiveness of the selected remedies at OU 1 are listed below:

1. Eighteen months of operational data are not sufficient to determine if the remedies at OU 1 are containing contaminated groundwater. As discussed in the PSVP (CH2M 2001b), five years of data with at least two sampling rounds per year should provide adequate samples across the site and over time to determine if plume mean concentrations are decreasing.

2. If measurable hydrocarbon concentrations and LNAPL are present downgradient and to the west of the exterior trench (Trench D), it is questionable whether monitored natural attenuation in that portion of the non-source area is adequate to remediate the contaminated groundwater to achieve RAOs.

3. Ponding on the landfill caps was identified during the site inspection portion of this review.

4. A preliminary check between the PSVP sampling requirements and data in ERPIMS showed that the analytical results from 14 out of 44 sampling locations were not available for review. This may be due to both the lag time between sampling activities and the uploading of the results into ERPIMS and the possibility that the sampling locations were/are dry. However, if the locations are dry, the results (i.e., "well is dry") should be included in ERPIMS.

5. Some of the indoor air sampling results, collected during the RI, exceed the new action level for TCE in indoor air (0.43 ppbv).

IX Recommendations and Follow-up Actions for OU 1

The recommendations and follow-up actions for OU 1 are:

1. Re-evaluate the non-source area monitored natural attenuation remedial action to determine if it is still applicable in all non-source areas (specifically in the area of measurable hydrocarbon concentrations outside Trench D).

2. Modify ERPIMS to indicate springs and seeps that are dry during a sampling event.

3. Review the long term monitoring sampling and analysis plan to ensure that locations where the hydrocarbon concentrations were located during the Source Zone Area Delineation project (Intera 2001) are sampled.

4. Proceed with the delineation and excavation of the arsenic contaminated soils at the springs.

5. Determine if the trenches are containing/capturing the contamination in the source area by evaluating the gradient around the trenches. Additional monitoring points may be necessary to confirm that the prescribed water levels in the sumps are adequate to maintain containment.

6. Re-evaluate the risk analysis for OU 1 to determine if revised contaminant action levels are warranted based on new standards and toxicity factors, as explained in the Technical Assessment above.

7. Re-evaluate the RI data on indoor air and determine if the new action level for TCE (0.43 ppbv) in indoor air warrants additional mitigation measures in off-Base residential areas.

8. Address drainage and ponding issues on Landfills No. 3 and No. 4 as soon as they are identified to ensure the landfill cap integrity.

9. Ensure that all gates and fences are locked in accordance with the ROD-specified institutional controls.

10. Determine if the plume mean concentrations are decreasing, using the described locations and monitoring frequency outlined in the PSVP and the results of the PSVR, scheduled for 2006.

11. Ensure that the method detection limits (MDLs) are low enough to detect a contaminant of concern (i.e., MDL equal to or less than the MCL or PRG).

12. Collect samples from all locations described in the PSVP and ensure that the results are entered in ERPIMS.

13. Continue to perform landfill cap inspections.

X Protectiveness

A protectiveness determination of the remedies associated with OU 1 cannot be made until further information is available. Within the time between the remedy selection and this Five-Year Review, USEPA has published changes to toxicity factors that affect chemical-specific clean-up levels at OU 1. Therefore, a re-evaluation of potential risk at OU 1 must be conducted before the protectiveness of the current remedies can be determined.

Additional items that need to be addressed are described in the previous issues and recommendations and include: the appropriateness of the monitored natural attenuation remedial action in the area of measurable hydrocarbon concentrations outside Trench D, and determining if the trenches are containing/capturing the contamination in the source area. A completed PSVR, due in 2006, will be useful for determining the protectiveness of the remedial actions at OU 1 during the next Five-Year Review (2008).

XI Next Review

The next FYR for OU 1 is required by 2008. No future review is required for the Fire Training Area 1 (FT009) or the Golf Course (OT014) sites because no further remedial actions are planned at these sites.

XII References for Operable Unit 1 Summary

(CH2M 1998) Feasibility Study Report for Operable Unit 1 (IRP Sites LF01, LF03, WP02, FT09, OT14, FT81, and WP80), CH2M Hill, January 1998.

(CH2M 2000) Remedial Design Report and Work Plan Operable Unit 1, CH2M Hill, February 2000.

(CH2M 2001a) Operable Unit 1 Fire Training Area 2 No Further Response Action Planned (NFRAP) Decision Document, IRP Site FT081, State of Utah, Department of Environmental Quality, Leaking Underground Storage Tank Site EIIK, Hill Air Force Base, Utah, August 2001, CH2M Hill, August 2001.

(CH2M 2001b) Performance Standard Verification Plan Operable Unit 1, CH2M Hill, April 2001.

(CH2M 2002) Final Operable Unit 1 Phase I Remedial Action Groundwater Extraction System Operation and Maintenance Plan, CH2M Hill, August 2002.

(EPA Region III 2002) Risk-Based Concentration Table, EPA Region III, October 9, 2002, EPA Region III, 9 October 2002.

(HAFB 1998) OO-ALC-HAFB Supplement I, AFI 32-7020, 29 April 1998, Hill AFB, 29 April 1998.

(HAFB EMR 1998b) CERCLA 1998 Five-Year Review Hill Air Force Base, Utah, Hill AFB EMR, September 1998.

(HAFB EMR 1998a) Record of Decision Operable Unit 1 IRP Sites LF01, WP02, LF03, FT09, FT81, and WP80, Hill AFB EMR, September 1998.

(Heyse, C. 1991) Final Decision Document for Site OT14 - Golf Course, Hill Air Force Base, Utah, Hill AFB EMR, May 1991.

(Intera 2002) OU 1 Source Zone Delineation Progress Report, Intera, 26 September 2002.

(MW 1995) Comprehensive Remedial Investigative Report for Operable Unit 1 (IRP Site LF01, LF03, WP02, FT09, OT14, FT81, and WP80) Volume 1, Montgomery Watson, December 1995.

(Radian Int'l 1998) Final Feasibility Study Report for Operable Unit 1 (IRP Sites LF01, LF03, WP02, FT09, OT14, FT81, and WP80), Hill Air Force Base, Utah, Radian International, January 1998.

(SAIC 1989) Final Decision Document for Fire Training Area 1, U.S. Air Force Installation Restoration Program, Hill Air Force Base, Utah, July 1989, Science Applications International Corporation, July 1989.

(URS 2002a) 2001 Cost & Performance Report, Operable Unit 1, Hill AFB, UT, URS, 11 February 2002.

(URS 2002b) Monthly OU 1 Operations Summary Reports (Jan - Dec), URS, January 2002.

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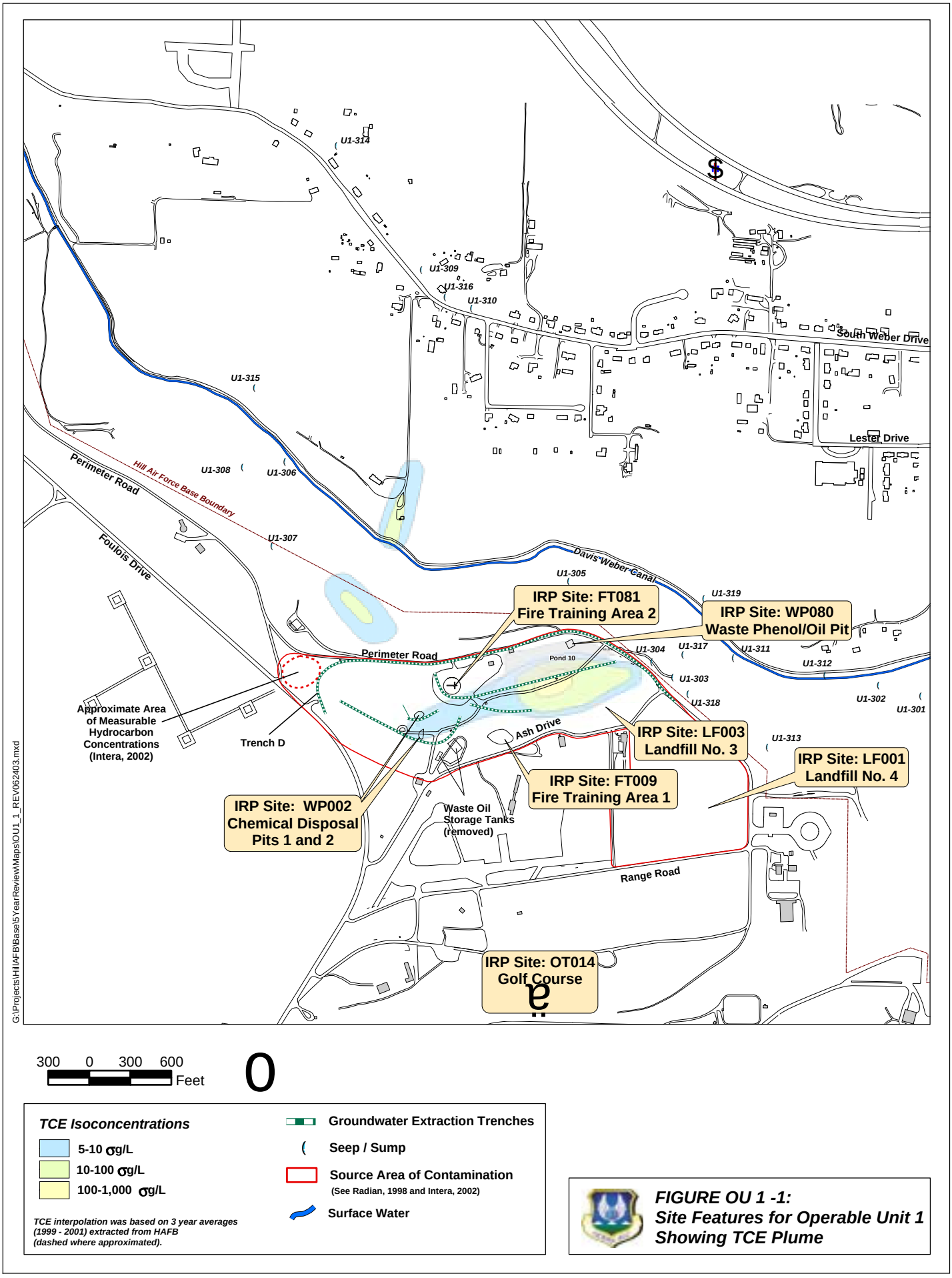
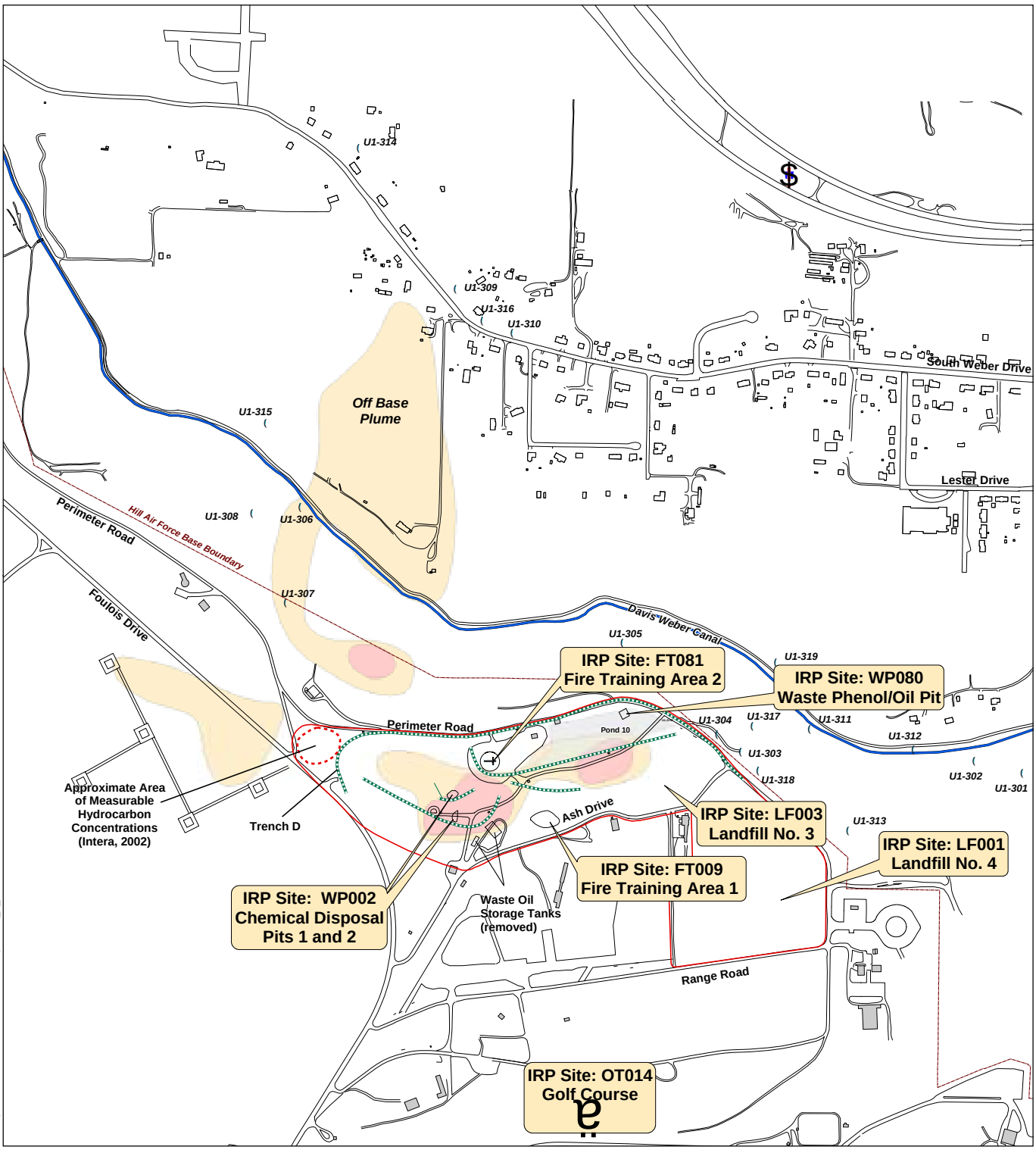


FIGURE OU 1 -1:
Site Features for Operable Unit 1
Showing TCE Plume



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300 0 300 600 Feet

cis-1,2 DCE Isoconcentrations

- 70-1,000 σg/L
- >1,000 σg/L

DCE interpolation was based on 3 year averages (1999 - 2001) extracted from HAFB (dashed where approximated).

- Groundwater Extraction Trenches
- Seep / Sump
- Source Area of Contamination (See Radian, 1998 and Intera, 2002)
- Surface Water

FIGURE OU 1 -2:
Site Features for Operable Unit 1 Showing DCE Plume

Table OU 1 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
OU 1	**OPERABLE UNIT 1**			
07	1984	Cease and Desist Order issued by UDWQ (07/23/1984)	Cease and Desist Order issued for leachate discharge below Landfill 4 observed at U1-303 and U1-304.	Record of Decision Operable Unit 1 IRP Sites LF01, WP02, LF03, FT09, FT81, and WP80
08	1984	Began construction of an on-site groundwater extraction and treatment facility.	Extraction wells U1-201 and U1-202 were completed near CDPs and U1-205 was completed north of LF4	Comprehensive Remedial Investigative Report for Operable Unit 1 (IRP Site LF01, LF03, WP02, FT09, OT14, FT81, and WP80) Volume 1
	1985	Installation of low-permeability caps over the source areas	Designed to reduce infiltration of precipitation.	Record of Decision Operable Unit 1 IRP Sites LF01, WP02, LF03, FT09, FT81, and WP80
	1985	Installation of subsurface physical barrier located upgradient of the source areas (Landfills 3 and 4)	Soil/bentonite slurry cut-off wall designed to reduce groundwater recharge to the source areas	Record of Decision Operable Unit 1 IRP Sites LF01, WP02, LF03, FT09, FT81, and WP80
12	1985	Treatment system operable	U1-206, U1-207, and U1-208 were installed east of LF4 and U1-209 was installed west of LF4. A 1,500 foot extraction trench with two sumps (U1-203 and U1-204) was completed south of FTA2 and a facility was constructed to treat extracted groundwater which included an aeration tank and a skid-mounted dual tank groundwater processor. Effluent discharged via underground pipeline to an airfield sprinkler system. Pumping systems U1-303 and U1-304 were installed at springs northeast of LF4.	Comprehensive Remedial Investigative Report for Operable Unit 1 (IRP Site LF01, LF03, WP02, FT09, OT14, FT81, and WP80) Volume 1

Table OU 1 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
	1986	Air Strippers Added	Treat all pumped groundwater from extraction wells.	Comprehensive Remedial Investigative Report for Operable Unit 1 (IRP Site LF01, LF03, WP02, FT09, OT14, FT81, and WP80) Volume 1
01	1988	Treatment system disassembled	3-mile waste water line installed to transport effluent to the IWTP.	Comprehensive Remedial Investigative Report for Operable Unit 1 (IRP Site LF01, LF03, WP02, FT09, OT14, FT81, and WP80) Volume 1
	1989	Pumping system at Pond 10 installed	The pumping system was installed to pump excess water out of the pond and send it to Pond 9. This was designed to keep a constant elevation head in the pond by removing water above a set elevation.	Final Remedial Action Report Pond 10 Pumping Facility Construction at OU 1
	1990	Groundwater and surface water monitoring implemented	Established baseline data for site groundwater and surface water.	Record of Decision Operable Unit 1 IRP Sites LF01, WP02, LF03, FT09, FT81, and WP80
04	1991	Entered Federal Facilities Agreement with UDEQ	Establish a framework and schedule for developing, implementing, and monitoring appropriate response actions at the site in accordance with existing regulations	Record of Decision Operable Unit 1 IRP Sites LF01, WP02, LF03, FT09, FT81, and WP80
09	1993	Pump transfer building constructed (BLDG 753)	Transfer effluent from OU 1 and OU 2 to a 250,000 gallon holding tank at the IWTP	Comprehensive Remedial Investigative Report for Operable Unit 1 (IRP Site LF01, LF03, WP02, FT09, OT14, FT81, and WP80) Volume 1

Table OU 1 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
01	1995	Pumping station installed at U1-307 on hillside north of the OU 1 Source Areas	On-site holding pond was removed and filled.	Comprehensive Remedial Investigative Report for Operable Unit 1 (IRP Site LF01, LF03, WP02, FT09, OT14, FT81, and WP80) Volume 1
12	1995	Comprehensive Remedial Investigation Report for Operable Unit 1 (MW 1995) published	Determined nature and extent of contamination. Free-phase LNAPL and LNAPL in residual saturation in the sand and gravel aquifer material act as the primary continuing sources of contaminants in the groundwater at OU 1. The risk to human health was low at the time of the RI, but could increase due to shallow water being used for domestic purposes or if housing is built over areas with free or residual phase LNAPL.	Comprehensive Remedial Investigative Report for Operable Unit 1 (IRP Site LF01, LF03, WP02, FT09, OT14, FT81, and WP80) Volume 1
01	1998	Feasibility Study (FS) for Operable Unit 1 (CH2M Hill 1998) published	Determined RAOs for soil, groundwater, surface water, LNAPL, and landfill caps and contents. Preliminary remediation goals were outlined for each RAO with technology evaluations and alternatives included as well. Treatability Study technologies were found not to be viable remediation options.	Final Feasibility Study Report for Operable Unit 1 (IRP Sites LF01, LF03, WP02, FT09, OT14, FT81, and WP80), Hill Air Force Base, Utah
10	1998	Record of Decision Operable Unit 1 (HAFB EM 1998) published	ROD established RAOs and remedial action goals for the OU1 site.	Record of Decision Operable Unit 1 IRP Sites LF01, WP02, LF03, FT09, FT81, and WP80
	1999	Remedial Design	Trench extraction system expansion	2001 Cost & Performance Report, Operable Unit 1, Hill AFB, UT

Table OU 1 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
	2000	Modification of the pumping system at Pond 10	The pumping system at Pond 10 was modified to drain the pond completely.	Final Remedial Action Report Pond 10 Pumping Facility Construction at OU 1
05	2000	Construction of trench extraction system expansion started	Extension of source area containment	2001 Cost & Performance Report, Operable Unit 1, Hill AFB, UT
06	2001	Construction of trench extraction system expansion completed	Four trenches installed with associated drains/sumps to capture contaminated groundwater from the Source Areas. Piezometers installed for monitoring. Water and LNAPL extraction pumps installed in sumps. Oil water separator constructed to remove LNAPL prior to pumping to IWTP. Landfill cap repair on LF4 and cap addition over CDPs.	2001 Cost & Performance Report, Operable Unit 1, Hill AFB, UT
06	2001	Operation of goundwater extraction system began	URS as O&M contractor and CH2M Hill as the long term monitoring contractor.	2001 Cost & Performance Report, Operable Unit 1, Hill AFB, UT
WP002	**CHEMICAL PITS 1 AND 2**			
	1995	Ethanol Flushing Treatabilty Study	To assess innovative technology effectiveness for the OU 1 site remediation.	Innovative Subsurface Remediation: Field Testing of Physical, Chemical, and Characterization Technologies. American Chemical Society Symposium Series 725

Table OU 1 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
	1996	Air Sparging/Soil Vapor Extraction Treatabilty Study	Contaminant removal rates by volatilization due to air sparging were higher than what could be achieved with a conventional pump and treat system. The addition of oxygen to the soils and groundwater appeared to enhance contaminant removal. The elevated carbon dioxide levels suggest that aerobic biodegradation was significant.	Innovative Subsurface Remediation: Field Testing of Physical, Chemical, and Characterization Technologies. American Chemical Society Symposium Series 725
	1996	Treatability Study	Steam Injection Treatability Study	Hill AFB Environmental Restoration Management Action Plan - 2001
	1996	Treatability Study	Surfactant Middle Phase Microemulsion Treatability Study	Hill AFB Environmental Restoration Management Action Plan - 2001
	1996	Surfactant Solubilization Treatability Study	The mobilization mechanism was more effective than the solubilization mechanism in terms of contaminant removal for approximately the same amount of contaminant mass. The results show that that there is significant potential for surfactant systems to expedite pump and treat remediation of residual oil and encourage the continued development and implementation of these systems.	Innovative Subsurface Remediation: Field Testing of Physical, Chemical, and Characterization Technologies. American Chemical Society Symposium Series 725
	1996	Complexing Sugar Flush Treatability Study	The technology was successful in enhancing remediation of the contaminated site. As an enhanced solubilization technology, it is not as aggressive as mobilization-based flushing technologies, but more efficient than water flushing.	Innovative Subsurface Remediation: Field Testing of Physical, Chemical, and Characterization Technologies. American Chemical Society Symposium Series 725

Table OU 1 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
	1996	Treatability Study	In-Well Aeration/Vertical Co-solvent Solubilization Treatability Study	Hill AFB Environmental Restoration Management Action Plan - 2001
	1996	Single Phase Microemulsion Treatabilty Study	Both flushing methods (single phase microemulsion study and co-solvent mobilization study) removed approximately 90% of the mass based on soil cores and constituent removal in extraction wells and approximately 80% based on partitioning tracers.	Innovative Subsurface Remediation: Field Testing of Physical, Chemical, and Characterization Technologies. American Chemical Society Symposium Series 725
	1996	Co-solvent Mobilization Treatabilty Study	Both flushing methods (single phase microemulsion study and co-solvent mobilization study) removed approximately 90% of the mass based on soil cores and constituent removal in extraction wells and approximately 80% based on partitioning tracers.	Innovative Subsurface Remediation: Field Testing of Physical, Chemical, and Characterization Technologies. American Chemical Society Symposium Series 725
FT009	**FIRE TRAINING AREA 1**			
07	1989	No Further Remedial Action Planned	Due to the lack of evidence of fire-training related contamination at FTA-1, coupled with the relative "sealing off" of surface water infiltration, it has been concluded that no further IRP action is necessary at FTA-1. During the sampling in the referenced decision document, there was no evidence of soil contamination at FTA-1. It is possible that any contaminated materials were removed during interim construction activities at LF3 and LF4. It was also covered by the LF clay cap and asphalt during construction activities. Groundwater contamination was found at MW-49 but is attributed to CDP1 and CDP2.	Final Decision Document for Fire Training Area 1, U.S. Air Force Installation Restoration Program, Hill Air Force Base, Utah, July 1989

Table OU 1 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
OT014	**GOLF COURSE**			
05	1991	No Further Remedial Action Planned	There is no record of the golf course use as a disposal site. It was only investigated to determine the influence of irrigation on groundwater flow at the known disposal sites at OU 1 and OU 3. Effects of recharge from all sources will be addressed in the RI/FS reports for each operable unit.	Final Decision Document for Site OT14 - Golf Course, Hill Air Force Base, Utah
FT081	**FIRE TRAINING AREA 2**			
04	1994	Bioventing Treatibilty Study	Bioventing study reduced TPH-DRO concentrations to below the Tier 1 Screening level of 5,000 mg/kg. The study lasted approximately one year.	Operable Unit 1 Fire Training Area 2 No Further Response Action Planned (NFRAP) Decision Document, IRP Site FT081, State of Utah, Department of Environmental Quality, Leaking Underground Storage Tank Site EIIK, Hill Air Force Base, Utah, August 2001
	2001	No Further Remedial Action Planned	FT081 was recommended and accepted for NFRAP	Operable Unit 1 Fire Training Area 2 No Further Response Action Planned (NFRAP) Decision Document, IRP Site FT081, State of Utah, Department of Environmental Quality, Leaking Underground Storage Tank Site EIIK, Hill Air Force Base, Utah, August 2001

XIII Five-Year Review of Sites in OU 1

Operable unit review results are summaries of findings for all of the sites in each operable unit. The following site summaries present a detailed review of each IRP site. Therefore, much of the information presented in the Site Summaries is a duplicate of what was presented in the OU Summary.

The reader is encouraged to use the Site Summary to obtain details on specific contaminants of concern and the technical assessment for each site.

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OU 1 LF001 LANDFILL NO 4

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

Landfill 4 (LF001) was a sanitary refuse landfill from 1967-1973. The landfill was capped with a low permeability soil cover in 1985 which was repaired in 2001 to prevent ponding and excess infiltration.

II. Site Chronology

See Table OU 1-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

Landfill 4 was a sanitary refuse landfill from 1967-1973 when it received solid wastes including scrap metal, construction debris, domestic refuse, industrial refuse, and small amounts of sludge from the IWTP drying beds, sulfuric acid, chromic acid, phenol, and methyl ethyl ketone. Landfill 4 is located southeast of Landfill 3 (LF003) and is bounded by Perimeter Road on the east and Range Road on the south (see Figures OU 1-1 and OU 1-2). Landfill 4 covers approximately 21 acres and is approximately 25 feet thick.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
GW	1,1,1-TRICHLOROETHANE	200 ug/L
SOIL	1,1,1-TRICHLOROETHANE	10 mg/kg
SW	1,1,1-TRICHLOROETHANE	200 ug/L
GW	1,1-DICHLOROETHANE	790 ug/L
SOIL	1,1-DICHLOROETHANE	13 mg/kg
SW	1,1-DICHLOROETHANE	790 ug/L
GW	1,1-DICHLOROETHENE	7 ug/L
SOIL	1,1-DICHLOROETHENE	0.03 mg/kg
SW	1,1-DICHLOROETHENE	7 ug/L
GW	1,2,4-TRICHLOROBENZENE	70 ug/L
SOIL	1,2,4-TRICHLOROBENZENE	17 mg/kg
SW	1,2,4-TRICHLOROBENZENE	70 ug/L
GW	1,2-DICHLOROBENZENE	600 ug/L
SOIL	1,2-DICHLOROBENZENE	60 mg/kg
SW	1,2-DICHLOROBENZENE	600 ug/L
SOIL	1,2-DICHLOROETHANE	0.10 mg/kg
GW	1,4-DICHLOROBENZENE	75 ug/L

SOIL	1,4-DICHLOROBENZENE	5.8 mg/kg
SW	1,4-DICHLOROBENZENE	75 ug/L
SOIL	2,3,7,8-TETRACHLORODIBENZOFURAN	0.004 mg/kg
GW	2,4-DIMETHYLPHENOL	600 ug/L
SOIL	2,4-DIMETHYLPHENOL	8 mg/kg
SW	2,4-DIMETHYLPHENOL	600 ug/L
GW	4-METHYLPHENOL (p-CRESOL)	750 ug/L
SOIL	4-METHYLPHENOL (p-CRESOL)	3.7 mg/kg
SW	4-METHYLPHENOL (p-CRESOL)	750 ug/L
GW	ARSENIC	50 ug/L
SW	ARSENIC	50 ug/L
GW	BARIUM	1000 ug/L
SW	BARIUM	1000 ug/L
GW	BENZENE	5 ug/L
SOIL	BENZENE	0.12 mg/kg
SW	BENZENE	5 ug/L
SOIL	BENZO(a)PYRENE	21 mg/kg
GW	CHLOROBENZENE	100 ug/L
SOIL	CHLOROBENZENE	2.4 mg/kg
SW	CHLOROBENZENE	100 ug/L
GW	cis-1,2-DICHLOROETHENE	70 ug/L
SOIL	cis-1,2-DICHLOROETHENE	1.1 mg/kg
SW	cis-1,2-DICHLOROETHENE	70 ug/L
SOIL	ETHYLBENZENE	11 mg/kg
GW	FLUORIDE	2400 ug/L
SW	FLUORIDE	2400 ug/L
GW	NAPHTHALENE	1200 ug/L

SOIL	NAPHTHALENE	22.5 mg/kg
SW	NAPHTHALENE	1200 ug/L
SOIL	PCB-1260 (AROCHLOR 1260)	10.1 mg/kg
SOIL	PENTACHLOROPHENOL	0.26 mg/kg
GW	TETRACHLOROETHENE(PCE)	5 ug/L
SOIL	TETRACHLOROETHENE(PCE)	0.52 mg/kg
SW	TETRACHLOROETHENE(PCE)	5 ug/L
GW	TOLUENE	1000 ug/L
SOIL	TOLUENE	43 mg/kg
SW	TOLUENE	1000 ug/L
GW	TRICHLOROETHENE (TCE)	5 ug/L
SOIL	TRICHLOROETHENE (TCE)	0.17 mg/kg
SW	TRICHLOROETHENE (TCE)	5 ug/L
GW	VINYL CHLORIDE	2 ug/L
SOIL	VINYL CHLORIDE	0.03 mg/kg
SW	VINYL CHLORIDE	2 ug/L
GW	XYLENES, TOTAL	10000 ug/L
SOIL	XYLENES, TOTAL	1000 mg/kg
SW	XYLENES, TOTAL	10000 ug/L

Remedial Action Objectives

* The remedial action objectives for the Source Area are to prevent contaminants in excess of MCLs from migrating away from the Source Area so that the Non-Source Area can be effectively remediated and to restore Source Area groundwater to MCLs.

* The remedial action objectives for groundwater are to prevent human exposure through contact, ingestion, or inhalation to contaminated groundwater and restore groundwater to beneficial use. Institutional and engineering controls will prevent use of the water and contain contaminants in the Source Area. Contaminated groundwater from the Source Area will be treated as part of the dewatering process. Monitored natural attenuation is expected to meet these goals in the Non-Source Area.

* The remedial action objectives for the landfill contents and landfill gas are to: prevent human exposure to the contents and the gas; minimize infiltration, thus reducing additional groundwater contamination; and prevent landfill gas concentrations form reaching dangerous (i.e., explosive) levels.

* The remedial action objective for surface water is to prevent human exposure through contact, ingestion, or inhalation to contaminated seep or spring water by the collection and treatment of the contaminated water.
* The remedial action objectives for soils are to prevent human exposure through contact, ingestion, or inhalation to contaminated soil that presents an unacceptable risk and to prevent migration of contaminants that cause an unacceptable risk in groundwater.
* The remedial action objectives for the LNAPL plume is [sic] to remove the LNAPL that can be practicably removed and to prevent contaminant migration from the Source Areas to groundwater at levels that impair water quality and/or represent a potential threat to human health and the environment.

IV. Remedial Actions

Source Area - Landfill Cap
The remedial action at Landfill 4 consists of the low permeability soil cover constructed in 1985 and the repair of the areas of differential settlement in 2001. The purpose of the repair of the landfill cap was to minimize the infiltration of surface water into the landfill contents and the leaching of contamination into the groundwater. The remedial action also includes maintenance and monitoring of a gas vent system to prevent landfill gas concentrations from reaching dangerous levels.

Common to Both Source Area and Non-Source Area - Institutional Engineering Controls
Institutional and engineering controls include restriction of access to landfill cap areas for unauthorized personnel using fencing and warning signs, enforcement of the Hill AFB Commander's office continuing order that limits development within OU 1 (HAFB 1998), distribution of the Hill Restricted Use Access Map to the appropriate Hill AFB personnel to identify OU 1 as restricted to development, and restricting domestic usage of the shallow groundwater in the OU 1 area with drilling restriction per the Utah Division of Water Rights.

V. Progress Since Last Review

LF001 was not specifically reviewed in the 1998 Five-Year Review Report (HAFB EMR 1998b). However, interim remedies that had been installed for OU 1 were reviewed in the 1998 Five-Year Review Report as a whole. Since the review in 1998, the ROD has been written and all of the remedial actions outlined in the ROD have been implemented except for removal of arsenic contaminated soils from the springs.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer)

Yes

Question A (Comment)

Source Area - Landfill Cap
The landfill cap remedial action has been successful in minimizing infiltration. Inspections by the on-site operators are ongoing and the cap is repaired as necessary. The cap at Landfill 4 will also be inspected via the Base wide landfill cap inspection process starting in calendar year (CY) 2003.

Common to Both Source Area and Non-Source Area - Institutional Engineering Controls

Institution controls at Landfill 4 have been effective in preventing trespassing and unauthorized construction.

Question B (Answer) No

Question B (Comment) The arsenic cleanup level is currently valid. However, it should be noted that the revised arsenic standard of 10 ug/L (ppb) will be effective in 01/26/2006. Currently, analytical results for arsenic range from 1 ppb to 600 ppb. The barium cleanup level of 1000 ug/L is lower than the MCL of 2000 ug/L (overprotective). The fluoride cleanup level of 2400 ug/L is lower than the MCL of 4000 ug/L (overprotective). The naphthalene reference dose for oral ingestion [RfD(o)] decreased from 0.04 to 0.02 mg/kg/day, and the reference dose for inhalation [RfD(i)] is now available at 0.00090 mg/kg/day (EPA Region III 2002).

The RAOs associated with Landfill 4 are still valid.

Question C (Answer) Yes

Question C (Comment) Ponding on several areas at the landfills were identified during inspections as part of this review. This may compromise the integrity of the cap and allow excess infiltration.

VIII. Issues *Ponding on the landfill caps was noticeable during the inspection conducted as part of this review.

IX. Recommendations *Address drainage and ponding issues on Landfill 4 as soon as they are identified to ensure the landfill cap integrity.
*Ensure that all gates and fences are locked in accordance with the ROD specified institutional controls.
*Continue to perform landfill cap inspections.

X. Protectiveness Protective

Protectiveness Statement The remedies associated with Landfill 4 (LF001) are protective of human health and the environment.

XI. Next Required FYR 2008

OU 1 WP002 CHEMICAL PITS 1 AND 2

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

WP002 includes Chemical Disposal Pits (CDPs) 1 and 2 which were operated as industrial liquid waste disposal sites from 1952-1973. Groundwater contamination emanating from the CDPs is currently being addressed through the OU 1 remedial actions which include groundwater extraction trenches, spring remediation, monitored natural attenuation, and institutional controls. There are no remaining soils issues at CDPs 1 and 2 since the sites have been capped by Landfill 3.

II. Site Chronology

See Table OU 1-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

CDP 1 covers approximately 2,600 square feet, with contamination extending from just below ground surface down to the water table. CDP 2 covers approximately 2,800 square feet extending from just below ground surface to the water table at about 25 feet bgs. Wastes disposed of at the CDPs included waste oil, fuel, IWTP flocculation wastes, and spent solvents including Stoddard solvent and paint thinner. The CDPs were covered with fill materials and portions were capped with a low permeability soil cover in the mid-1980s. The WP002 site also included the four above ground 20,000-25,000 gallons storage tanks known as the Waste Oil Storage Tanks (see Figures OU 1-1 and OU 1-2) that contained fuels, oils, and hydraulic fluids and were removed in 1981. Remedial actions regarding groundwater contamination resulting from the activities that historically took place at WP002 are currently being addressed through the OU 1-wide remedies.

Two additional IRP sites are addressed by the overall OU 1 remedies: the Waste Phenol Oil Pit (WP080) and the Fire Training Area 2 (FT081). All five IRP sites at OU 1 that have ongoing CERCLA actions were areas where industrial wastes, fuels, and other hazardous substances were dumped and/or burned. Subsequently, the shallow groundwater in the area and downgradient of the five sites was contaminated. Because of the proximity of the five sites, investigations, RAOs, and remedial actions have focused on them as a group. All of the sites except Fire Training Area 2 (FT081) and the Waste Phenol Oil Pit (WP080) were capped during construction activities at Landfill 3 and 4 and the groundwater contamination for the site and off-Base is being addressed through five remedial actions: extraction trenches that collect shallow groundwater and LNAPLs (source area), landfill cap (source area), remediation of contaminated surface water and soil at downgradient springs, monitored natural attenuation for contaminated groundwater off-Base, and institutional controls.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
GW	1,1,1-TRICHLOROETHANE	200 ug/L
SOIL	1,1,1-TRICHLOROETHANE	10 mg/kg
SW	1,1,1-TRICHLOROETHANE	200 ug/L
GW	1,1-DICHLOROETHANE	790 ug/L
SOIL	1,1-DICHLOROETHANE	13 mg/kg

SW	1,1-DICHLOROETHANE	790 ug/L
GW	1,1-DICHLOROETHENE	7 ug/L
SOIL	1,1-DICHLOROETHENE	0.03 mg/kg
SW	1,1-DICHLOROETHENE	7 ug/L
GW	1,2,4-TRICHLOROBENZENE	70 ug/L
SOIL	1,2,4-TRICHLOROBENZENE	17 mg/kg
SW	1,2,4-TRICHLOROBENZENE	70 ug/L
GW	1,2-DICHLOROBENZENE	600 ug/L
SOIL	1,2-DICHLOROBENZENE	60 mg/kg
SW	1,2-DICHLOROBENZENE	600 ug/L
SOIL	1,2-DICHLOROETHANE	0.10 mg/kg
GW	1,4-DICHLOROBENZENE	75 ug/L
SOIL	1,4-DICHLOROBENZENE	5.8 mg/kg
SW	1,4-DICHLOROBENZENE	75 ug/L
SOIL	2,3,7,8-TETRACHLORODIBENZOFURAN	0.004 mg/kg
GW	2,4-DIMETHYLPHENOL	600 ug/L
SOIL	2,4-DIMETHYLPHENOL	8 mg/kg
SW	2,4-DIMETHYLPHENOL	600 ug/L
GW	4-METHYLPHENOL (p-CRESOL)	750 ug/L
SOIL	4-METHYLPHENOL (p-CRESOL)	3.7 mg/kg
SW	4-METHYLPHENOL (p-CRESOL)	750 ug/L
GW	ARSENIC	50 ug/L
SW	ARSENIC	50 ug/L
GW	BARIUM	1000 ug/L
SW	BARIUM	1000 ug/L
GW	BENZENE	5 ug/L
SOIL	BENZENE	0.12 mg/kg

SW	BENZENE	5 ug/L
SOIL	BENZO(a)PYRENE	21 mg/kg
GW	CHLOROBENZENE	100 ug/L
SOIL	CHLOROBENZENE	2.4 mg/kg
SW	CHLOROBENZENE	100 ug/L
GW	cis-1,2-DICHLOROETHENE	70 ug/L
SOIL	cis-1,2-DICHLOROETHENE	1.1 mg/kg
SW	cis-1,2-DICHLOROETHENE	70 ug/L
SOIL	ETHYLBENZENE	11 mg/kg
GW	FLUORIDE	2400 ug/L
SW	FLUORIDE	2400 ug/L
GW	NAPHTHALENE	1200 ug/L
SOIL	NAPHTHALENE	22.5 mg/kg
SW	NAPHTHALENE	1200 ug/L
SOIL	PCB-1260 (AROCHLOR 1260)	10.1 mg/kg
SOIL	PENTACHLOROPHENOL	0.26 mg/kg
GW	TETRACHLOROETHENE(PCE)	5 ug/L
SOIL	TETRACHLOROETHENE(PCE)	0.52 mg/kg
SW	TETRACHLOROETHENE(PCE)	5 ug/L
GW	TOLUENE	1000 ug/L
SOIL	TOLUENE	43 mg/kg
SW	TOLUENE	1000 ug/L
GW	TRICHLOROETHENE (TCE)	5 ug/L
SOIL	TRICHLOROETHENE (TCE)	0.17 mg/kg
SW	TRICHLOROETHENE (TCE)	5 ug/L
GW	VINYL CHLORIDE	2 ug/L
SOIL	VINYL CHLORIDE	0.03 mg/kg

SW	VINYL CHLORIDE	2 ug/L
GW	XYLENES, TOTAL	10000 ug/L
SOIL	XYLENES, TOTAL	1000 mg/kg
SW	XYLENES, TOTAL	10000 ug/L

Remedial Action Objectives

* The remedial action objectives for the Source Area are to prevent contaminants in excess of MCLs from migrating away from the Source Area so that the Non-Source Area can be effectively remediated and to restore Source Area groundwater to MCLs.

* The remedial action objectives for soils are to prevent human exposure through contact, ingestion, or inhalation to contaminated soil that presents an unacceptable risk and to prevent migration of contaminants that cause an unacceptable risk in groundwater.

* The remedial action objectives for the LNAPL plume is [sic] to remove the LNAPL that can be practicably removed and to prevent contaminant migration from the Source Areas to groundwater at levels that impair water quality and/or represent a potential threat to human health and the environment.

* Because arsenic is found above background values (11 mg/kg) at off-Base Springs U1-301, U1-303, U1-304, U1-305, and U1-318, HAFB is including the sediment at these springs in the areas for remediation. The remedial action objective for these sediments is to prevent human exposure through contact, ingestion, or inhalation to sediment that exceeds 11 mg/kg of arsenic.

* The remedial action objective for surface water is to prevent human exposure through contact, ingestion, or inhalation to contaminated seep or spring water by the collection and treatment of the contaminated water.

* The remedial action objectives for groundwater are to prevent human exposure through contact, ingestion, or inhalation to contaminated groundwater and restore groundwater to beneficial use. Institutional and engineering controls will prevent use of the water and contain contaminants in the Source Area. Contaminated groundwater from the Source Area will be treated as part of the dewatering process. Monitored natural attenuation is expected to meet these goals in the Non-Source Area.

IV. Remedial Actions

Source Area - Groundwater Extraction Trenches

The remedial action for groundwater in the source area includes five trenches to collect groundwater and LNAPL. The location and function of the four trenches that were installed in May 2001 and of the pre-existing trench that was installed in 1984 are described in the PSVP (CH2M 2001b). The extracted contaminated groundwater is passed through an oil water separator before being treated at the IWTP and is discharged to the North Davis Sewer Improvement District. The groundwater is treated in accordance with the existing pretreatment permits for these facilities (CH2M 2000).

Source Area - Landfill Cap

The remedial action at Landfill 3 and 4 consists of minimizing the infiltration of surface water into the landfill contents and the leaching of contamination into the groundwater. The remedial action also includes maintenance and monitoring of a gas vent system to prevent landfill gas concentrations from reaching dangerous levels.

Non-Source Area - Spring Remediation System
The selected remedial action for the springs (U1-303, U1-304, U1-305, U1-307, and U1-318) is to treat the groundwater from springs with contamination levels above MCLs. Due to reducing conditions in the groundwater at OU 1, elevated arsenic concentrations in the groundwater have been measured. To mitigate arsenic from mobilizing from the sediment to the groundwater, sediments from spring areas with arsenic contamination above 11 mg/kg will be identified and excavated two to three years after the springs have ceased to flow.

Non-Source Area - Monitored Natural Attenuation
The selected remedial action for the non source area groundwater plumes is monitored natural attenuation. This remedial action requires long-term monitoring of the groundwater plumes to determine if naturally occurring attenuation processes are meeting the remedial action objectives as stated in the ROD.

Common to Both Source Area and Non-Source Area - Institutional Engineering Controls
Institutional and engineering controls include restriction of access to landfill cap areas using fencing and warning signs, enforcement of the Hill AFB Commander's office continuing order that limits development within OU 1 (HAFB 1998), distribution of the Hill Restricted Use Access Map to the appropriate Hill AFB personnel to identify OU 1 as an area restricted to development, and restricting domestic usage of the shallow groundwater in the OU 1 area with drilling restriction per the Utah Division of Water Rights.

V. Progress Since Last Review

WP002 was not specifically reviewed in the 1998 Five-Year Review Report (HAFB EMR 1998b). However, interim remedies that had been installed for OU 1 were reviewed in the 1998 Five-Year Review Report as a whole. Since the review in 1998, the ROD has been written and all of the remedial actions outlined in the ROD have been implemented except for removal of arsenic contaminated soils from the springs.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer)

Yes

Question A (Comment)

The primary goal of the OU 1 remedies is to dewater the source area and prevent groundwater contamination of uncontaminated areas (non source areas). Since June 2001, the groundwater extraction system has extracted 28,216,379 gallons of groundwater and 6,301 gallons of LNAPL (as of 31 December 2002) (URS 2002a and 2002b).

*Source Area - Groundwater Extraction Trenches
Water elevations in the sumps at OU 1 must be maintained at levels below the trench pipe entry level to ensure that groundwater and LNAPL are captured by the trenches (CH2M 2002). As of December 2001, water levels have not been maintained in several sumps below the trench pipe entry elevation (U1-217, U1-218, U1-219, and U1-224). However, additional groundwater extraction pumps were installed in U1-217and U1-219 to increase extraction capacity. The groundwater gradient around the trenches was not evaluated as

part of this review. Evaluation of the gradient would help determine if the trenches are containing the contaminated groundwater and LNAPL from migrating off-site.

*Non-Source Area - Spring Remediation System
The flows at springs U1-303 and U1-304 have decreased to a yearly average flow of less than 0.1 gpm, and springs U1-305 and U1-318 have ceased to flow. These springs have met the action levels that determine when the arsenic contaminated soils should be located and disposed. The groundwater extraction system is performing as designed by eliminating flow at these locations.

*Common to Both Source Area and Non-Source Area - Institutional Engineering Controls
Institution controls at OU 1 have been effective in preventing trespassing and unauthorized construction.

Question B (Answer)

No

Question B (Comment)

The arsenic cleanup level is currently valid. However it should be noted that a new, lower arsenic standard of 10 ug/L (ppb) will be effective 01/26/2006. Currently, analytical results for arsenic range from 1 ppb to 600 ppb. The barium cleanup level of 1000 ug/L is lower than the MCL of 2000 ug/L (overprotective). The fluoride cleanup level of 2400 ug/L is lower than the MCL of 4000 ug/L (overprotective). The naphthalene RfD(o) decreased from 0.04 to 0.02 mg/kg/day, and the RfD(i) is now available at 0.00090 mg/kg/day (EPA Region III 2002).

When the remedial investigation was originally conducted, air sampling was performed in a number of homes above the plume. TCE was detected in several residences, but at levels that were not considered to be a risk at that time. Due to recent emphasis on vapor intrusion, EMR has worked with the EPA and UDEQ to establish an action level for TCE in indoor air at 0.43 ppbv. Because several of the indoor air sampling results from the original RI were above the new action level, there are potential air quality issues that have not been addressed.

The RAOs associated with Chemical Disposal Pits 1 and 2 are still valid.

Question C (Answer)

Yes

Question C (Comment)

*Source Area - Groundwater Extraction Trenches
Although the system has extracted large amounts of contaminated groundwater and LNAPLs, it is not clear at this time that the system is preventing the migration of groundwater from the source area to the non-source area. The conclusions of the OU 1 Source Area Zone Delineation Progress Report (Intera 2002) indicate that hydrocarbon concentrations are measurable downgradient and to the west of the exterior trench (Trench D) (see Figure OU 1-1 for location). This could be an indication that contaminated groundwater from the source area is not being captured by either the interior or exterior

trenches or that there is an additional source of contamination.

During site inspections performed as part of this review, maintenance of some systems at the site was noted to be lacking. Specifically, replacement of the carbon unit on Oil/Water Separator off-gas, LNAPL disposal, and Oil/Water Separator cleanings should be performed on a regular basis.

A preliminary trend analysis of four monitoring locations indicate the following (the locations of the monitoring locations can be found in the OU 1 PSVP [CH2M 2001b]):
*The Method Detection Limits for all four of the contaminants reviewed (TCE, DCE11, DCE12T, and DCE12C) were too high to detect some of the analytes at several of the locations at their current concentrations.
*DCE12C (PRG = 70 ppb) concentrations at U1-067 decreased from approximately 8,600 ppb to 5,510 ppb over a five year period.
*DCE12T (MCL = 100 ppb) concentrations at U1-162 have decreased from approximately 70 ppb to 5 ppb over a five year period.
*The DCE12C concentrations at U1-667 decreased from approximately 4,300 ppb to 3,300 ppb over the past five years (still above the PRG of 70 ppb). The TCE (MCL = 5ppb) concentrations have decreased from 700 ppb to 240 ppb over a five year period. However, the DCE11 (PRG = 7 ppb) concentrations have increased from approximately 9 to 14 ppb.
*At U1-079 all of the analytes reviewed increased over a five year period. TCE increased from approximately 5 to 25 ppb, DCE12T increased from approximately 1 to 6 ppb, and DCE 12C increased from approximately 60 to 350 ppb.

From this preliminary review, it is not possible to conclude that there is a significant downward or upward trend in concentrations of contaminants of concern at OU 1. Further, the impact of the trenches (which have operated for only 1.5 years) is not evident because of this short duration of remedial actions at OU 1.

*Source Area - Landfill Cap
Ponding on several areas at the landfills have been identified during CY 2002. This may compromise the integrity of the cap and allow excess infiltration.

*Non-Source Area - Spring Remediation System
In the OU 1 Feasibility Study Report (CH2M 1998) and Comprehensive Remedial Investigation Report (MW 1995), several exposure pathways are listed for current and future use. Of these pathways, springs and seeps are the most problematic for current and future use of groundwater and surface water on Base and off Base.

Analytical results for benzene, cis-1,2 DCE, trans-1,2 DCE, PCE, TCE, vinyl chloride, and chromium at the 19 springs/seeps at OU 1 were reviewed over time. Of the 19 locations, intermittent analytical results from nine locations (U1-303, U1-304, U1-305, U1-306, U1-312, U1-313, U1-314, U1-317, and U1-318) were available in ERPIMS. These nine locations have been dry for the past several rounds of sampling. Springs U1-311 and U1-319 are not currently monitored. The only spring that currently exhibits groundwater contamination above PRGs is U1-307 (exceeds the PRG for cis-1,2 DCE). However, the water from this spring is collected via the groundwater extraction system at OU 1 and is discharged to the IWTP for treatment.

There are no analytical results for chromium in ERPIMS after 1995. A future potential exposure pathway has been identified as chromium in springs used for watering livestock (MW 1995 and CH2M 1998); therefore, chromium needs to be added to the sampling and analysis plan (SAP) at OU 1 again. All of the results in ERPIMS for total chromium were non detect except for U1-301 (15ug/g on 4/16/1990), U1-302 (18 ug/g on 4/16/1990), and U1-305 (15 ug/g on 4/17/1990). The MCL for total chromium is 100 ug/L.

VIII. Issues

*Eighteen months of operational data are not sufficient to determine if the remedies at OU 1 are containing contaminated groundwater. As discussed in the PSVP (CH2M 2001b), five years of data with at least two sampling rounds per year should provide adequate samples across the site and over time to determine if plume mean concentrations are decreasing. However, if there are measurable hydrocarbon concentrations in samples collected downgradient and to the west of the exterior trench (Trench D), monitored natural attenuation in that portion of the non-source area may not be adequate to remediate the contaminated groundwater.

*A preliminary check between the PSVP sampling requirements and data in ERPIMS showed that the analytical results from several locations were not available. This may be due to the lag time between sampling activities and the uploading of the results into ERPIMS, the possibility that the sampling locations were/are dry, or that the locations were not sampled.

*Some of the indoor air sampling results, collected during the RI, exceed the new action level for TCE in indoor air (0.43 ppbv).

IX. Recommendations

*Re-evaluate the non-source area monitored natural attenuation remedial action to determine if it is still applicable in all non-source areas (specifically in the area of measurable hydrocarbon concentrations outside Trench D).
*Modify ERPIMS to indicate springs and seeps that are dry during a sampling event.
*Review the long term monitoring sampling and analysis plan to ensure that locations where the hydrocarbon concentrations were located during the Source Zone Area Delineation project (Intera 2001) are monitored.
*Proceed with the delineation and excavation of the arsenic contaminated soils at the springs.
*Determine if the trenches are containing/capturing the contamination in the source area by evaluating the gradient around the trenches. Additional monitoring points may be necessary to confirm that the prescribed water levels in the sumps are adequate to maintain containment.
*Reevaluate the RI data on indoor air and determine if the new action level for TCE (0.43 ppbv) in indoor air warrants additional mitigation measures in off-Base residential areas.
*Reevaluate the risk analysis for OU 1 to determine if revised contaminant action levels are warranted based on new standards and toxicity factors, as explained in the Technical Assessment above.
*Ensure that all gates and fences are locked in accordance with the ROD-specified institutional controls.
*Implement maintenance activities in a timely manner.

*Determine if the plume mean concentrations are decreasing, using the described locations and monitoring frequency outlined in the PSVP and the results of the PSVR, scheduled for 2006.
*Ensure that the method detection limits (MDL) are low enough to detect a contaminant of concern (i.e., MDL equal to or less than the MCL or PRG).
*Add chromium to the sampling and analysis plan for springs at OU 1.
*Collect samples from all locations described in the PSVP.

X. Protectiveness

Protectiveness cannot be determined until further information is obtained

Protectiveness Statement

A protectiveness determination of the remedies associated with WP002 cannot be made until further information is available. Within the time between the remedy selection and this Five-Year Review, USEPA has published changes to toxicity factors that affect chemical-specific clean-up levels at OU 1. Therefore, a re-evaluation of potential risk at OU 1 must be conducted before the protectiveness of the current remedies can be determined.

Additional items that need to be addressed are described in the previous issues and recommendations and include: the appropriateness of the monitored natural attenuation remedial action in the area of measurable hydrocarbon concentrations outside Trench D, and determining if the trenches are containing/capturing the contamination in the source area. A completed PSVR, due in 2006, will be useful for determining the protectiveness of the remedial actions at OU 1 during the next Five-Year Review (2008).

XI. Next Required FYR

2008

OU 1 LF003 LANDFILL NO 3

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

Landfill 3 (LF003) was an industrial dump and burn pit and liquid and solid waste disposal site that was in operation from 1940-1967. Landfill 3 was capped in two stages with a low permeability soil cover in 1985 and again in 1986 to reduce surface water infiltration.

II. Site Chronology

See Table OU 1-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

Landfill 3 covers approximately 14 acres and is up to 25 feet thick (see Figures OU 1-1 and OU 1-2). During operations at Landfill 3, garbage trucks were backed up and liquid and solid refuse was dumped and burned on a daily basis. The IWTP disposed sludge into Landfill 3 containing heavy metals from 1956-1967. Other materials known to have been disposed of in Landfill 3 are sanitary and industrial refuse, construction debris, IWTP sludge drying bed and flocculation wastes, paint sludges, paint booth scrubber sludge, plastics, spent sandblast media, spent solvents, residues from spent solvent cleaning operations, and residues and filters from plating and cleaning operations.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
GW	1,1,1-TRICHLOROETHANE	200 ug/L
SOIL	1,1,1-TRICHLOROETHANE	10 mg/kg
SW	1,1,1-TRICHLOROETHANE	200 ug/L
GW	1,1-DICHLOROETHANE	790 ug/L
SOIL	1,1-DICHLOROETHANE	13 mg/kg
SW	1,1-DICHLOROETHANE	790 ug/L
GW	1,1-DICHLOROETHENE	7 ug/L
SOIL	1,1-DICHLOROETHENE	0.03 mg/kg
SW	1,1-DICHLOROETHENE	7 ug/L
GW	1,2,4-TRICHLOROBENZENE	70 ug/L
SOIL	1,2,4-TRICHLOROBENZENE	17 mg/kg
SW	1,2,4-TRICHLOROBENZENE	70 ug/L
GW	1,2-DICHLOROBENZENE	600 ug/L
SOIL	1,2-DICHLOROBENZENE	60 mg/kg
SW	1,2-DICHLOROBENZENE	600 ug/L
SOIL	1,2-DICHLOROETHANE	0.10 mg/kg

GW	1,4-DICHLOROBENZENE	75 ug/L
SOIL	1,4-DICHLOROBENZENE	5.8 mg/kg
SW	1,4-DICHLOROBENZENE	75 ug/L
SOIL	2,3,7,8-TETRACHLORODIBENZOFURAN	0.004 mg/kg
GW	2,4-DIMETHYLPHENOL	600 ug/L
SOIL	2,4-DIMETHYLPHENOL	8 mg/kg
SW	2,4-DIMETHYLPHENOL	600 ug/L
GW	4-METHYLPHENOL (p-CRESOL)	750 ug/L
SOIL	4-METHYLPHENOL (p-CRESOL)	3.7 mg/kg
SW	4-METHYLPHENOL (p-CRESOL)	750 ug/L
GW	ARSENIC	50 ug/L
SW	ARSENIC	50 ug/L
GW	BARIUM	1000 ug/L
SW	BARIUM	1000 ug/L
GW	BENZENE	5 ug/L
SOIL	BENZENE	0.12 mg/kg
SW	BENZENE	5 ug/L
SOIL	BENZO(a)PYRENE	21 mg/kg
GW	CHLOROBENZENE	100 ug/L
SOIL	CHLOROBENZENE	2.4 mg/kg
SW	CHLOROBENZENE	100 ug/L
GW	cis-1,2-DICHLOROETHENE	70 ug/L
SOIL	cis-1,2-DICHLOROETHENE	1.1 mg/kg
SW	cis-1,2-DICHLOROETHENE	70 ug/L
SOIL	ETHYLBENZENE	11 mg/kg
GW	FLUORIDE	2400 ug/L
SW	FLUORIDE	2400 ug/L

GW	NAPHTHALENE	1200 ug/L
SOIL	NAPHTHALENE	22.5 mg/kg
SW	NAPHTHALENE	1200 ug/L
SOIL	PCB-1260 (AROCHLOR 1260)	10.1 mg/kg
SOIL	PENTACHLOROPHENOL	0.26 mg/kg
GW	TETRACHLOROETHENE(PCE)	5 ug/L
SOIL	TETRACHLOROETHENE(PCE)	0.52 mg/kg
SW	TETRACHLOROETHENE(PCE)	5 ug/L
GW	TOLUENE	1000 ug/L
SOIL	TOLUENE	43 mg/kg
SW	TOLUENE	1000 ug/L
GW	TRICHLOROETHENE (TCE)	5 ug/L
SOIL	TRICHLOROETHENE (TCE)	0.17 mg/kg
SW	TRICHLOROETHENE (TCE)	5 ug/L
GW	VINYL CHLORIDE	2 ug/L
SOIL	VINYL CHLORIDE	0.03 mg/kg
SW	VINYL CHLORIDE	2 ug/L
GW	XYLENES, TOTAL	10000 ug/L
SOIL	XYLENES, TOTAL	1000 mg/kg
SW	XYLENES, TOTAL	10000 ug/L

Remedial Action Objectives

* The remedial action objectives for groundwater are to prevent human exposure through contact, ingestion, or inhalation to contaminated groundwater and restore groundwater to beneficial use. Institutional and engineering controls will prevent use of the water and contain contaminants in the Source Area. Contaminated groundwater from the Source Area will be treated as part of the dewatering process. Monitored natural attenuation is expected to meet these goals in the Non-Source Area.

* The remedial action objective for surface water is to prevent human exposure through contact, ingestion, or inhalation to contaminated seep or spring water by the collection and treatment of the contaminated water.

* The remedial action objectives for soils are to prevent human exposure through contact, ingestion, or inhalation to contaminated soil that presents an unacceptable risk and to prevent migration of contaminants that cause an unacceptable risk in groundwater.
* The remedial action objectives for the LNAPL plume is [sic] to remove the LNAPL that can be practicably removed and to prevent contaminant migration from the Source Areas to groundwater at levels that impair water quality and/or represent a potential threat to human health and the environment.
* The remedial action objectives for the landfill contents and landfill gas are to: prevent human exposure to the contents and the gas; minimize infiltration, thus reducing additional groundwater contamination; and prevent landfill gas concentrations form reaching dangerous (i.e., explosive) levels.
* The remedial action objectives for the Source Area are to prevent contaminants in excess of MCLs from migrating away from the Source Area so that the Non-Source Area can be effectively remediated and to restore Source Area groundwater to MCLs.

IV. Remedial Actions

Source Area - Landfill Cap
The remedial action at Landfill 3 included construction of a new portion of low-permeability cap over the CDP area and the repair of portions of the cap (installed in 1985) disturbed by the installation of the groundwater extraction trenches. The purpose of the repair of the landfill cap was to minimize the infiltration of surface water into the landfill contents and the possible leaching of contamination into the groundwater. The remedial action also includes maintenance and monitoring of a gas vent system to prevent landfill gas concentrations from reaching dangerous levels.

Common to Both Source Area and Non-Source Area - Institutional Engineering Controls
Institutional and engineering controls include restriction of access to landfill cap areas for unauthorized personnel using fencing and warning signs, enforcement of the Hill AFB Commander's office continuing order that limits development within OU 1 (HAFB 1998), distribution of the Hill Restricted Use Access Map to the appropriate Hill AFB personnel to identify OU 1 as restricted to development, and restricting domestic usage of the shallow groundwater in the OU 1 area with drilling restrictions per the Utah Division of Water Rights.

V. Progress Since Last Review

LF003 was not specifically reviewed in the 1998 Five-Year Review Report (HAFB EMR 1998b). However, interim remedies that had been installed for OU 1 were reviewed in the 1998 Five-Year Review Report as a whole. Since the review in 1998, the ROD has been written and all of the remedial actions outlined in the ROD have been implemented except for removal of arsenic contaminated soils from the springs.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer) Yes

OU 1 LF003 LANDFILL NO 3

Site Summary - Hill AFB 2003 Five Year Review

Question A (Comment)

Source Area - Landfill Cap
The landfill cap remedial action has been successful in minimizing infiltration. Inspections by the on-site operators are ongoing and repaired as necessary. The cap at Landfill 3 will also be inspected via the Base wide landfill cap inspection process starting in calendar year (CY) 2003.

Common to Both Source Area and Non-Source Area - Institutional Engineering Controls
Institution controls at Landfill 3 have been effective in preventing trespassing and unauthorized construction.

Question B (Answer)

No

Question B (Comment)

The arsenic cleanup level is currently valid. However it should be noted that the revised arsenic standard of 10 ug/L (ppb) will be effective in 01/26/2006. Currently, analytical results for arsenic range from 1 ppb to 600 ppb. The barium cleanup level of 1000 ug/L is lower than the MCL of 2000 ug/L (overprotective). The fluoride cleanup level of 2400 ug/L is lower than the MCL of 4000 ug/L (overprotective). The naphthalene RfD(o) decreased from 0.04 to 0.02 mg/kg/day, and the RfD(i) is now available at 0.00090 mg/kg/day (EPA Region III 2002).

The RAOs associated with Landfill 3 are still valid.

Question C (Answer)

Yes

Question C (Comment)

Ponding on several areas at the landfills were identified during inspections as part of this review. This may compromise the integrity of the cap and allow excess infiltration.

VIII. Issues

*Ponding on the landfill caps was noticeable during the inspection conducted as part of this review.

IX. Recommendations

*Address drainage and ponding issues on Landfill 3 as soon as they are identified to ensure the landfill cap integrity.
*Ensure that all gates and fences are locked in accordance with the ROD specified institutional controls.
*Continue to perform landfill cap inspections.

X. Protectiveness

Protective

Protectiveness Statement

The remedies associated with Landfill 3 (LF003) are protective of human health and the environment.

XI. Next Required FYR	2008

OU 1 FT009 FIRE TRAINING AREA 1

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

Fire Training Area 1 (FT009) was used by Hill AFB to extinguish simulated aircraft fires from 1958-1973. Large quantities of oil and combustible waste chemicals were poured into a dirt pit surrounded by an earthen dike and then ignited. However, Fire Training Area 1 was recommended for NFRAP status and accepted in July of 1989 when soil borings showed no evidence of shallow soil contamination and Base records indicated that Fire Training Area 1 was also covered by the Landfill 3 clay and asphalt cap during construction activities. This site is included in the 2003 Five-Year Review Report for completeness to document the site's history.

II. Site Chronology

See Table OU 1-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

Fire Training Area 1 (FTA-1) covers approximately one-third of an acre and is located within the Operable Unit 1 area in Landfill 3 (see Figure OU 1-1). This site was identified for IRP investigation during the Phase II Stage 2 Presurvey meeting in March 1985 where Base records and soil boring and monitoring well analytical results were reviewed. Due to the lack of evidence of shallow soil contamination at the site, and that if there had been any contamination it was removed during interim construction activities at Landfills 3 and 4 and capped, FTA-1 was recommended for NFRAP status and accepted in 1989 (SAIC 1989) due to the fact that surface water infiltration was mitigated by the Landfill 3 cap.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
NA	NA - Risk Assessment indicates no risk to human health and the environment.	NA

Remedial Action Objectives

* Not applicable. No COCs or RAOs for this site.

IV. Remedial Actions

Not applicable.

V. Progress Since Last Review

FT009 was not specifically reviewed in the 1998 Five-Year Review Report (HAFB EMR 1998b). However, interim remedies that had been installed for OU 1 were reviewed in the 1998 Five-Year Review report as a whole. Since the review in 1998, the ROD has been written and the remedial actions outlined in the ROD have been implemented except for removal of arsenic contaminated soils from the springs.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer)

Not Applicable

Question A (Comment)	Not applicable.
Question B (Answer)	Not Applicable
Question B (Comment)	Not applicable.
Question C (Answer)	Not Applicable
Question C (Comment)	Not applicable.
VIII. Issues	Not applicable.
IX. Recommendations	Not applicable.
X. Protectiveness	Not Applicable
Protectiveness Statement	FT009 was recommended for NFRAP status and accepted in 1989 because there was no evidence of shallow soil contamination and the area was covered by the Landfill 3 low permeability soil cap.
XI. Next Required FYR	None - Current FYR is Final

OU 1 OT014 GOLF COURSE

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

OT014 was developed in 1960 as the Base golf course located south of Landfill 4 and along the eastern boundary of Hill AFB (see Figure OU 1-1). OT014 was recommended for NFRAP status and accepted in 1991 because there was no history of hazardous wastes ever being disposed at the site (Heyse, C. 1991). This site is included in the 2003 Five-Year Review Report for completeness to document the site's history.

II. Site Chronology

See Table OU 1-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

The Golf Course (OT014) was recommended for NFRAP status and accepted in 1991 because there was no history of hazardous wastes ever having been disposed at the site. The effect of recharge by irrigation and the impact to groundwater under Landfills 3 and 4 were evaluated and it was estimated that approximately 12.5 inches per year of percolation could occur and flow to OU 1; however, with the construction of the slurry wall between the golf course and OU 1 in 1985, percolation was thought to have been mitigated (Heyes, C. 1991). This site is not included in the ROD for OU 1 (HAFB EMR 1998a); therefore, there are no RAOs associated with this site.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
NA	NA - No history of contamination at this site.	NA

Remedial Action Objectives

* Not applicable. No COCs or RAOs for this site.

IV. Remedial Actions

Not applicable.

V. Progress Since Last Review

OT014 was not specifically reviewed in the 1998 Five-Year Review Report (HAFB EMR 1998b). However, interim remedies that had been installed for OU 1 were reviewed in the 1998 Five-Year Review report as a whole. Since the review in 1998, the ROD has been written and all of the remedial actions outlined in the ROD have been implemented except for removal of arsenic contaminated soils from the springs.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer) Not Applicable

Question A (Comment) Not applicable.

Question B (Answer)	Not Applicable
Question B (Comment)	Not applicable.
Question C (Answer)	Not Applicable
Question C (Comment)	Not applicable.
VIII. Issues	Not applicable.
IX. Recommendations	Not applicable.
X. Protectiveness	Not Applicable
Protectiveness Statement	OT014 was recommended for NFRAP status and accepted in 1991 because there was no history of hazardous wastes ever having been disposed of at the site.
XI. Next Required FYR	None - Current FYR is Final

OU 1 FT081 FIRE TRAINING AREA 2

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

Fire Training Area 2 (FTA-2) was used by Hill AFB to extinguish simulated aircraft fires from 1973-1995 where jet fuel, propane, and explosives were used as fuel. Soil contamination of TPH-DRO (Total Petroleum Hydrocarbons - Diesel Range Organics) was remediated with a Bioventing Treatability Study conducted from April 1994 to July 1995, when it was recommended for no further remedial action status regarding soil contamination at the FTA-2 site. This recommendation was accepted in 2001 (CH2M 2001a). Groundwater contamination from the Fire Training Area 2 site is currently being addressed through the OU 1-wide remedial actions which include groundwater extraction trenches, spring remediation, monitored natural attenuation, and institutional controls.

II. Site Chronology

See Table OU 1-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

Fire Training Area 2 is located along Perimeter Road in the northern portion of Operable Unit 1 and covers approximately 2.5 acres (see Figures OU 1-1 and OU1-2). Mixed and on-specification jet fuel were stored in and dispensed from a 5,000 gallon UST which was removed in October of 1993 in accordance with UDEQ Division of Environmental Response and Remediation (DERR) (CH2M 2001a). After the UST was removed, soil contamination was found near the former UST. A Bioventing Treatability Study, from April 1994 to July 1995, reduced TPH-DRO concentrations ranging from 1,500 mg/kg to 22,000 mg/kg to below the Tier 1 Screening level of 5,000 mg/kg. No further remedial action regarding soils was recommended and accepted in 2001 (CH2M 2001a) following the study. Currently, a fire training tower is still in use at the site, where wood is used as fuel. FTA-2 is currently covered by an asphalt cap, there are no utilities or property boundaries within 30 feet of the former fuel area, and the closest occupied building is more than 2,000 feet from the site. Remedial actions regarding groundwater contamination resulting from the activities that historically took place at FT081 and other OU 1 sites are currently being addressed through the OU 1-wide remedies.

Two additional IRP sites are addressed by the overall OU 1 remedies: the Waste Phenol Oil Pit (WP080) and the Chemical Disposal Pits (WP002). All five IRP sites at OU 1 that have ongoing CERCLA actions were areas where industrial wastes, fuels, and other hazardous substances were dumped and/or burned. Subsequently, the shallow groundwater in the area and downgradient of the five sites was contaminated. Because of the proximity of the five sites, investigations, RAOs, and remedial actions have focused on them as a group. All of the sites except Fire Training Area 2 (FT081) and the Waste Phenol Oil Pit (WP080) were capped during construction activities at Landfill 3 and 4 and the groundwater contamination for the site and off-Base is being addressed through five remedial actions: extraction trenches that collect shallow groundwater and LNAPLs (source area), landfill cap (source area), remediation of contaminated surface water and soil at downgradient springs, monitored natural attenuation for contaminated groundwater off-Base, and institutional controls.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
GW	1,1,1-TRICHLOROETHANE	200 ug/L

SW	1,1,1-TRICHLOROETHANE	200 ug/L
GW	1,1-DICHLOROETHANE	790 ug/L
SW	1,1-DICHLOROETHANE	790 ug/L
GW	1,1-DICHLOROETHENE	7 ug/L
SW	1,1-DICHLOROETHENE	7 ug/L
GW	1,2,4-TRICHLOROBENZENE	70 ug/L
SW	1,2,4-TRICHLOROBENZENE	70 ug/L
GW	1,2-DICHLOROBENZENE	600 ug/L
SW	1,2-DICHLOROBENZENE	600 ug/L
GW	1,4-DICHLOROBENZENE	75 ug/L
SW	1,4-DICHLOROBENZENE	75 ug/L
GW	2,4-DIMETHYLPHENOL	600 ug/L
SW	2,4-DIMETHYLPHENOL	600 ug/L
GW	4-METHYLPHENOL (p-CRESOL)	750 ug/L
SW	4-METHYLPHENOL (p-CRESOL)	750 ug/L
GW	ARSENIC	50 ug/L
SW	ARSENIC	50 ug/L
GW	BARIUM	1000 ug/L
SW	BARIUM	1000 ug/L
GW	BENZENE	5 ug/L
SW	BENZENE	5 ug/L
GW	CHLOROBENZENE	100 ug/L
SW	CHLOROBENZENE	100 ug/L
GW	cis-1,2-DICHLOROETHENE	70 ug/L
SW	cis-1,2-DICHLOROETHENE	70 ug/L
GW	FLUORIDE	2400 ug/L
SW	FLUORIDE	2400 ug/L

GW	NAPHTHALENE	1200 ug/L
SW	NAPHTHALENE	1200 ug/L
GW	TETRACHLOROETHENE(PCE)	5 ug/L
SW	TETRACHLOROETHENE(PCE)	5 ug/L
GW	TOLUENE	1000 ug/L
SW	TOLUENE	1000 ug/L
GW	TRICHLOROETHENE (TCE)	5 ug/L
SW	TRICHLOROETHENE (TCE)	5 ug/L
GW	VINYL CHLORIDE	2 ug/L
SW	VINYL CHLORIDE	2 ug/L
GW	XYLENES, TOTAL	10000 ug/L
SW	XYLENES, TOTAL	10000 ug/L

Remedial Action Objectives

* The remedial action objectives for groundwater are to prevent human exposure through contact, ingestion, or inhalation to contaminated groundwater and restore groundwater to beneficial use. Institutional and engineering controls will prevent use of the water and contain contaminants in the Source Area. Contaminated groundwater from the Source Area will be treated as part of the dewatering process. Monitored natural attenuation is expected to meet these goals in the Non-Source Area.

* The remedial action objective for surface water is to prevent human exposure through contact, ingestion, or inhalation to contaminated seep or spring water by the collection and treatment of the contaminated water.

* The remedial action objectives for soils are to prevent human exposure through contact, ingestion, or inhalation to contaminated soil that presents an unacceptable risk and to prevent migration of contaminants that cause an unacceptable risk in groundwater.

* The remedial action objectives for the LNAPL plume is [sic] to remove the LNAPL that can be practicably removed and to prevent contaminant migration from the Source Areas to groundwater at levels that impair water quality and/or represent a potential threat to human health and the environment.

* Because arsenic is found above background values (11 mg/kg) at off-Base Springs U1-301, U1-303, U1-304, U1-305, and U1-318, HAFB is including the sediment at these springs in the areas for remediation. The remedial action objective for these sediments is to prevent human exposure through contact, ingestion, or inhalation to sediment that exceeds 11 mg/kg of arsenic.

* The remedial action objectives for the Source Area are to prevent contaminants in excess of MCLs from migrating away from the Source Area so that the Non-Source Area can be effectively remediated and to restore Source Area groundwater to MCLs.

IV. Remedial Actions

Source Area - Groundwater Extraction Trenches
The remedial action for groundwater in the source area includes five trenches to collect groundwater and LNAPL. The location and function of the four trenches that were installed in May 2001 and of the pre-existing trench that was installed in 1984 are described in the PSVP (CH2M 2001b). The extracted contaminated groundwater is passed through an oil water separator before being treated at the IWTP and is discharged to the North Davis Sewer Improvement District. The groundwater is treated in accordance with the existing pretreatment permits for these facilities (CH2M 2000).

Non-Source Area - Spring Remediation System
The selected remedial action for the springs (U1-303, U1-304, U1-305, U1-307, and U1-318) is to treat the groundwater from springs with contamination levels above MCLs. Due to reducing conditions in the groundwater at OU 1, elevated arsenic concentrations in the groundwater have been measured. To mitigate arsenic from mobilizing from the sediment to the groundwater, sediments from spring areas with arsenic contamination above 11 mg/kg will be identified and excavated two to three years after the springs have ceased to flow.

Non-Source Area - Monitored Natural Attenuation
The selected remedial action for the non source area groundwater plumes is monitored natural attenuation. This remedial action requires long-term monitoring of the groundwater plumes to determine if naturally occurring attenuation processes are meeting the remedial action objectives as stated in the ROD.

Common to Both Source Area and Non-Source Area - Institutional Engineering Controls
Institutional and engineering controls include restriction of access to landfill cap areas using fencing and warning signs, enforcement of the Hill AFB Commander's office continuing order that limits development within OU 1 (HAFB 1998), distribution of the Hill Restricted Use Access Map to the appropriate Hill AFB personnel to identify OU 1 as an area restricted to development, and restricting domestic usage of the shallow groundwater in the OU 1 area with drilling restriction per the Utah Division of Water Rights.

V. Progress Since Last Review

FT081 was not specifically reviewed in the 1998 Five-Year Review Report (HAFB EMR 1998b). However, interim remedies that had been installed for OU 1 were reviewed in the 1998 Five-Year Review Report as a whole. Since the review in 1998, the ROD has been written and all of the remedial actions outlined in the ROD have been implemented except for removal of arsenic contaminated soils from the springs.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer)

Yes

Question A (Comment)

The primary goal of the OU 1 remedies is to dewater the source area and prevent groundwater contamination of uncontaminated areas (non source areas). Since June 2001, the groundwater extraction system has extracted 28,216,379 gallons of groundwater and

6,301 gallons of LNAPL (as of 31 December 2002) (URS 2002a and 2002b).

*Source Area - Groundwater Extraction Trenches
Water elevations in the sumps at OU 1 must be maintained at levels below the trench pipe entry level to ensure that groundwater and LNAPL are captured by the trenches (CH2M 2002). As of December 2001, water levels have not been maintained in several sumps below the trench pipe entry elevation (U1-217, U1-218, U1-219, and U1-224). However, additional groundwater extraction pumps were installed in U1-217 and U1-219 to increase extraction capacity. The groundwater gradient around the trenches was not evaluated as part of this review. Evaluation of the gradient would help determine if the trenches are containing the contaminated groundwater and LNAPL from migrating off-site.

*Non-Source Area - Spring Remediation System
The flows at springs U1-303 and U1-304 have decreased to a yearly average flow of less than 0.1 gpm, and springs U1-305 and U1-318 have ceased to flow. These springs have met the action levels that determine when the arsenic contaminated soils should be located and disposed. The groundwater extraction system is performing as designed by eliminating flow at these locations.

*Common to Both Source Area and Non-Source Area - Institutional Engineering Controls
Institution controls at OU 1 have been effective in preventing trespassing and unauthorized construction.

Question B (Answer)

No

Question B (Comment)

The arsenic cleanup level is currently valid. However it should be noted that a new, lower arsenic standard of 10 ug/L (ppb) will be effective 01/26/2006. Currently, analytical results for arsenic range from 1 ppb to 600 ppb. The barium cleanup level of 1000 ug/L is lower than the MCL of 2000 ug/L (overprotective). The fluoride cleanup level of 2400 ug/L is lower than the MCL of 4000 ug/L (overprotective). The naphthalene RfD(o) decreased from 0.04 to 0.02 mg/kg/day, and the RfD(i) is now available at 0.00090 mg/kg/day (EPA Region III 2002).

When the remedial investigation was originally conducted, air sampling was performed in a number of homes above the plume. TCE was detected in several residences, but at levels that were not considered to be a risk at that time. Due to recent emphasis on vapor intrusion, EMR has worked with the EPA and UDEQ to establish an action level for TCE in indoor air at 0.43 ppbv. Because several of the indoor air sampling results from the original RI were above the new action level, there are potential air quality issues that have not been addressed.

The RAOs associated with Fire Training Area 2 are still valid.

Question C (Answer)

Yes

Question C (Comment)

*Source Area - Groundwater Extraction Trenches
Although the system has extracted large amounts of contaminated groundwater and LNAPLs, it is not clear at this time that the system is preventing the migration of groundwater from the source area to the non-source area. The conclusions of the OU 1 Source Area Zone Delineation Progress Report (Intera 2002) indicate that hydrocarbon concentrations are measurable downgradient and to the west of the exterior trench (Trench D) (see Figure OU 1-1 for location). This could be an indication that contaminated groundwater from the source area is not being captured by either the interior or exterior trenches or that there is an additional source of contamination.

During site inspections performed as part of this review, maintenance of some systems at the site was noted to be lacking. Specifically, replacement of the carbon unit on Oil/Water Separator off-gas, LNAPL disposal, and Oil/Water Separator cleanings should be performed on a regular basis.

A preliminary trend analysis of four monitoring locations indicate the following (the locations of the monitoring locations can be found in the OU 1 PSVP [CH2M 2001]):
*The Method Detection Limits for all four of the contaminants reviewed (TCE, DCE11, DCE12T, and DCE12C) were too high to detect some of the analytes at several of the locations at their current concentrations.
*DCE12C (PRG = 70 ppb) concentrations at U1-067 decreased from approximately 8,600 ppb to 5,510 ppb over a five year period.
*DCE12T (MCL = 100 ppb) concentrations at U1-162 have decreased from approximately 70 ppb to 5 ppb over a five year period.
*The DCE12C concentrations at U1-667 decreased from approximately 4,300 ppb to 3,300 ppb over the past five years (still above the PRG of 70 ppb). The TCE (MCL = 5ppb) concentrations have decreased from 700 ppb to 240 ppb over a five year period. However, the DCE11 (PRG = 7 ppb) concentrations have increased from approximately 9 to 14 ppb.
*At U1-079 all of the analytes reviewed increased over a five year period. TCE increased from approximately 5 to 25 ppb, DCE12T increased from approximately 1 to 6 ppb, and DCE 12C increased from approximately 60 to 350 ppb.

From this preliminary review, it is not possible to conclude that there is a significant downward or upward trend in concentrations of contaminants of concern at OU 1. Further, the impact of the trenches (which have operated for only 1.5 years) is not evident because of this short duration of remedial actions at OU 1.

*Source Area - Landfill Cap
Ponding on several areas at the landfills have been identified during CY 2002. This may compromise the integrity of the cap and allow excess infiltration.

*Non-Source Area - Spring Remediation System
In the OU 1 Feasibility Study Report (CH2M 1998) and Comprehensive Remedial Investigation Report (MW 1995), several exposure pathways are listed for current and future use. Of these pathways, springs and seeps are the most problematic for current and future use of groundwater and surface water on Base and off Base.

Analytical results for benzene, cis-1,2 DCE, trans-1,2 DCE, PCE, TCE, vinyl chloride, and

chromium at the 19 springs/seeps at OU 1 were reviewed over time. Of the 19 locations, intermittent analytical results from nine locations (U1-303, U1-304, U1-305, U1-306, U1-312, U1-313, U1-314, U1-317, and U1-318) were available in ERPIMS. These nine locations have been dry for the past several rounds of sampling. Springs U1-311 and U1-319 are not currently monitored. The only spring that currently exhibits groundwater contamination above PRGs is U1-307 (exceeds the PRG for cis-1,2 DCE). However, the water from this spring is collected via the groundwater extraction system at OU 1 and is discharged to the IWTP for treatment.

There are no analytical results for chromium in ERPIMS after 1995. A future potential exposure pathway has been identified as chromium in springs used for watering livestock (MW 1995 and CH2M 1998); therefore, chromium needs to be added to the sampling and analysis plan (SAP) at OU 1 again. All of the results in ERPIMS for total chromium were non detect except for U1-301 (15ug/g on 4/16/1990), U1-302 (18 ug/g on 4/16/1990), and U1-305 (15 ug/g on 4/17/1990). The MCL for total chromium is 100 ug/L.

VIII. Issues

*Eighteen months of operational data are not sufficient to determine if the remedies at OU 1 are containing contaminated groundwater. As discussed in the PSVP (CH2M 2001b), five years of data with at least two sampling rounds per year should provide adequate samples across the site and over time to determine if plume mean concentrations are decreasing. However, if there are measurable hydrocarbon concentrations in samples collected downgradient and to the west of the exterior trench (Trench D), monitored natural attenuation in that portion of the non-source area may not be adequate to remediate the contaminated groundwater.

*A preliminary check between the PSVP sampling requirements and data in ERPIMS showed that the analytical results from several locations were not available. This may be due to the lag time between sampling activities and the uploading of the results into ERPIMS, the possibility that the sampling locations were/are dry, or that the locations were not sampled.

*Some of the indoor air sampling results, collected during the RI, exceed the new action level for TCE in indoor air (0.43 ppbv).

IX. Recommendations

*Re-evaluate the non-source area monitored natural attenuation remedial action to determine if it is still applicable in all non-source areas (specifically in the area of measurable hydrocarbon concentrations outside Trench D).
*Modify ERPIMS to include a field for springs and seeps that exhibit dry conditions during a sampling event.
*Review the long term monitoring sampling and analysis plan to ensure that locations where the hydrocarbon concentrations were located during the Source Zone Area Delineation project (Intera 2001) are monitored.
*Proceed with the delineation and excavation of the arsenic contaminated soils at the springs.
*Determine if the trenches are containing/capturing the contamination in the source area by evaluating the gradient around the trenches. Additional monitoring points may be necessary to confirm that the prescribed water levels in the sumps are adequate to

maintain containment.
*Re-evaluate the risk analysis for OU 1 to determine if revised contaminant action levels are warranted based on new standards and toxicity factors, as explained in the Technical Assessment above.
*Re-evaluate the Remedial Investigation data on indoor air and determine if the new action level for TCE (0.43 ppbv) in indoor air warrants additional mitigation measures in off-Base residential areas.
*Ensure that all gates and fences are locked in accordance with the ROD specified institutional controls.
*Implement maintenance activities in a timely manner.
*Determine if the plume mean concentrations are decreasing, using the described locations and monitoring frequency outlined in the Performance Standard Verification Plan and the results of the Performance Standard Verification Report, scheduled for 2006.
*Ensure that the method detection limits (MDL) are low enough to detect a contaminant of concern (i.e., MDL equal to or less than the MCL or PRG).
*Add chromium to the sampling and analysis plan for spring at OU 1.
*Collect samples from all locations described in the PSVP.

X. Protectiveness

Protectiveness cannot be determined until further information is obtained

Protectiveness Statement

A protectiveness determination of the remedies associated with FT081 cannot be made until further information is available. Within the time between the remedy selection and this Five-Year Review, USEPA has published changes to toxicity factors that affect chemical-specific clean-up levels at OU 1. Therefore, a re-evaluation of potential risk at OU 1 must be conducted before the protectiveness of the current remedies can be determined.

Additional items that need to be addressed are described in the previous issues and recommendations and include: the appropriateness of the monitored natural attenuation remedial action in the area of measurable hydrocarbon concentrations outside Trench D, and determining if the trenches are containing/capturing the contamination in the source area. A completed PSVR, due in 2006, will be useful for determining the protectiveness of the remedial actions at OU 1 during the next Five-Year Review (2008).

XI. Next Required FYR

2008

OU 1 WP080 WASTE OIL PHENOL PIT

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

WP080, the Waste Phenol Oil Pit (WPOP), was a brick-lined pit used to dispose and burn waste oil and phenol from 1954 to 1965. The WPOP was located in the northeast area of OU 1 where surface water retention Pond 10 is now located. Groundwater contamination emanating from the WPOP is currently being addressed through the OU 1 remedial actions which include groundwater extraction trenches and institutional controls.

II. Site Chronology

See Table OU 1-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

The WPOP was constructed in 1954 for the burning of waste oil and phenols generated during industrial processes (see Figure OU 1-1 for location). During its first use, the brick burn pit broke apart due to high combustion temperatures, but the pit was used on a weekly basis until 1965. When the pit was excavated in 1965, the visibly stained soils were disposed of in Landfill 3. Remedial actions regarding groundwater contamination resulting from the activities that historically took place at WP080 are currently being addressed through the OU 1-wide remedies.

Two additional IRP sites are addressed by the overall OU 1 remedies: the Chemical Disposal Pits (WP002) and the Fire Training Area 2 (FT081). All five IRP sites at OU 1 that have ongoing CERCLA actions were areas where industrial wastes, fuels, and other hazardous substances were dumped and/or burned. Subsequently, the shallow groundwater in the area and downgradient of the five sites was contaminated. Because of the proximity of the five sites, investigations, RAOs, and remedial actions have focused on them as a group. All of the sites except Fire Training Area 2 (FT081) and the Waste Phenol Oil Pit (WP080) were capped during construction activities at Landfill 3 and 4 and the groundwater contamination for the site and off-Base is being addressed through five remedial actions: extraction trenches that collect shallow groundwater and LNAPLs (source area), landfill cap (source area), remediation of contaminated surface water and soil at downgradient springs, monitored natural attenuation for contaminated groundwater off-Base, and institutional controls.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
GW	1,1,1-TRICHLOROETHANE	200 ug/L
SOIL	1,1,1-TRICHLOROETHANE	10 mg/kg
SW	1,1,1-TRICHLOROETHANE	200 ug/L
GW	1,1-DICHLOROETHANE	790 ug/L
SOIL	1,1-DICHLOROETHANE	13 mg/kg
SW	1,1-DICHLOROETHANE	790 ug/L
GW	1,1-DICHLOROETHENE	7 ug/L

SOIL	1,1-DICHLOROETHENE	0.03 mg/kg
SW	1,1-DICHLOROETHENE	7 ug/L
GW	1,2,4-TRICHLOROBENZENE	70 ug/L
SOIL	1,2,4-TRICHLOROBENZENE	17 mg/kg
SW	1,2,4-TRICHLOROBENZENE	70 ug/L
GW	1,2-DICHLOROBENZENE	600 ug/L
SOIL	1,2-DICHLOROBENZENE	60 mg/kg
SW	1,2-DICHLOROBENZENE	600 ug/L
SOIL	1,2-DICHLOROETHANE	0.10 mg/kg
GW	1,4-DICHLOROBENZENE	75 ug/L
SOIL	1,4-DICHLOROBENZENE	5.8 mg/kg
SW	1,4-DICHLOROBENZENE	75 ug/L
SOIL	2,3,7,8-TETRACHLORODIBENZOFURAN	0.004 mg/kg
GW	2,4-DIMETHYLPHENOL	600 ug/L
SOIL	2,4-DIMETHYLPHENOL	8 mg/kg
SW	2,4-DIMETHYLPHENOL	600 ug/L
GW	4-METHYLPHENOL (p-CRESOL)	750 ug/L
SOIL	4-METHYLPHENOL (p-CRESOL)	3.7 mg/kg
SW	4-METHYLPHENOL (p-CRESOL)	750 ug/L
GW	ARSENIC	50 ug/L
SW	ARSENIC	50 ug/L
GW	BARIUM	1000 ug/L
SW	BARIUM	1000 ug/L
GW	BENZENE	5 ug/L
SOIL	BENZENE	0.12 mg/kg
SW	BENZENE	5 ug/L
SOIL	BENZO(a)PYRENE	21 mg/kg

GW	CHLOROBENZENE	100 ug/L
SOIL	CHLOROBENZENE	2.4 mg/kg
SW	CHLOROBENZENE	100 ug/L
GW	cis-1,2-DICHLOROETHENE	70 ug/L
SOIL	cis-1,2-DICHLOROETHENE	1.1 mg/kg
SW	cis-1,2-DICHLOROETHENE	70 ug/L
SOIL	ETHYLBENZENE	11 mg/kg
GW	FLUORIDE	2400 ug/L
SW	FLUORIDE	2400 ug/L
GW	NAPHTHALENE	1200 ug/L
SOIL	NAPHTHALENE	22.5 mg/kg
SW	NAPHTHALENE	1200 ug/L
SOIL	PCB-1260 (AROCHLOR 1260)	10.1 mg/kg
SOIL	PENTACHLOROPHENOL	0.26 mg/kg
GW	TETRACHLOROETHENE(PCE)	5 ug/L
SOIL	TETRACHLOROETHENE(PCE)	0.52 mg/kg
SW	TETRACHLOROETHENE(PCE)	5 ug/L
GW	TOLUENE	1000 ug/L
SOIL	TOLUENE	43 mg/kg
SW	TOLUENE	1000 ug/L
GW	TRICHLOROETHENE (TCE)	5 ug/L
SOIL	TRICHLOROETHENE (TCE)	0.17 mg/kg
SW	TRICHLOROETHENE (TCE)	5 ug/L
GW	VINYL CHLORIDE	2 ug/L
SOIL	VINYL CHLORIDE	0.03 mg/kg
SW	VINYL CHLORIDE	2 ug/L
GW	XYLENES, TOTAL	10000 ug/L

SOIL	XYLENES, TOTAL	1000 mg/kg
SW	XYLENES, TOTAL	10000 ug/L

Remedial Action Objectives

* The remedial action objectives for soils are to prevent human exposure through contact, ingestion, or inhalation to contaminated soil that presents an unacceptable risk and to prevent migration of contaminants that cause an unacceptable risk in groundwater.

* The remedial action objectives for the LNAPL plume is [sic] to remove the LNAPL that can be practicably removed and to prevent contaminant migration from the Source Areas to groundwater at levels that impair water quality and/or represent a potential threat to human health and the environment.

* The remedial action objective for surface water is to prevent human exposure through contact, ingestion, or inhalation to contaminated seep or spring water by the collection and treatment of the contaminated water.

* Because arsenic is found above background values (11 mg/kg) at off-Base Springs U1-301, U1-303, U1-304, U1-305, and U1-318, HAFB is including the sediment at these springs in the areas for remediation. The remedial action objective for these sediments is to prevent human exposure through contact, ingestion, or inhalation to sediment that exceeds 11 mg/kg of arsenic.

* The remedial action objectives for groundwater are to prevent human exposure through contact, ingestion, or inhalation to contaminated groundwater and restore groundwater to beneficial use. Institutional and engineering controls will prevent use of the water and contain contaminants in the Source Area. Contaminated groundwater from the Source Area will be treated as part of the dewatering process. Monitored natural attenuation is expected to meet these goals in the Non-Source Area.

* The remedial action objectives for the Source Area are to prevent contaminants in excess of MCLs from migrating away from the Source Area so that the Non-Source Area can be effectively remediated and to restore Source Area groundwater to MCLs.

IV. Remedial Actions

Source Area - Groundwater Extraction Trenches

The remedial action for groundwater in the source area includes five trenches to collect groundwater and LNAPL. The location and function of the four trenches that were installed in May 2001 and of the pre-existing trench that was installed in 1984 are described in the PSVP (CH2M 2001b). The extracted contaminated groundwater is passed through an oil water separator before being treated at the IWTP and is discharged to the North Davis Sewer Improvement District. The groundwater is treated in accordance with the existing pretreatment permits for these facilities (CH2M 2000).

Non-Source Area - Spring Remediation System

The selected remedial action for the springs (U1-303, U1-304, U1-305, U1-307, and U1-318) is to treat the groundwater from springs with contamination levels above MCLs. Due to reducing conditions in the groundwater at OU 1, elevated arsenic concentrations in the groundwater have been measured. To mitigate arsenic from mobilizing from the sediment to the groundwater, sediments from spring areas with arsenic contamination above 11 mg/kg will be identified and excavated two to three years after the springs have ceased to flow.

Non-Source Area - Monitored Natural Attenuation

The selected remedial action for the non source area groundwater plumes is monitored natural attenuation. This remedial action requires long-term monitoring of the groundwater plumes to determine if naturally occurring attenuation processes are meeting the remedial action objectives as stated in the ROD.

Common to Both Source Area and Non-Source Area - Institutional Engineering Controls
Institutional and engineering controls include restriction of access to landfill cap areas using fencing and warning signs, enforcement of the Hill AFB Commander's office continuing order that limits development within OU 1 (HAFB 1998), distribution of the Hill Restricted Use Access Map to the appropriate Hill AFB personnel to identify OU 1 as an area restricted to development, and restricting domestic usage of the shallow groundwater in the OU 1 area with drilling restriction per the Utah Division of Water Rights.

V. Progress Since Last Review

WP080 was not specifically reviewed in the 1998 Five-Year Review Report (HAFB EMR 1998b). However, interim remedies that had been installed for OU 1 were reviewed in the 1998 Five-Year Review Report as a whole. Since the review in 1998, the ROD has been written and the remedial actions outlined in the ROD have been implemented except for removal of arsenic contaminated soils from the springs.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer)

Yes

Question A (Comment)

The primary goal of the OU 1 remedies is to dewater the source area and prevent groundwater contamination of uncontaminated areas (non source areas). Since June 2001, the groundwater extraction system has extracted 28,216,379 gallons of groundwater and 6,301 gallons of LNAPL (as of 31 December 2002) (URS 2002a and 2002b).

*Source Area - Groundwater Extraction Trenches
Water elevations in the sumps at OU 1 must be maintained at levels below the trench pipe entry level to ensure that groundwater and LNAPL are captured by the trenches (CH2M 2002). As of December 2001, water levels have not been maintained in several sumps below the trench pipe entry elevation (U1-217, U1-218, U1-219, and U1-224). However, additional groundwater extraction pumps were installed in U1-217 and U1-219 to increase its extraction capacity. The groundwater gradient around the trenches was not evaluated as part of this review. Evaluation of the gradient would help determine if the trenches are containing the contaminated groundwater and LNAPL from migrating off-site.

*Non-Source Area - Spring Remediation System
The flows at springs U1-303 and U1-304 have decreased to a yearly average flow of less than 0.1 gpm, and springs U1-305 and U1-318 have ceased to flow. These springs have met the action levels that determine when the arsenic contaminated soils should be located and disposed. The groundwater extraction system is performing as designed by eliminating flow at these locations.

*Common to Both Source Area and Non-Source Area - Institutional Engineering Controls
Institution controls at OU 1 have been effective in preventing trespassing and unauthorized construction.

Question B (Answer)

No

Question B (Comment)

The arsenic cleanup level is currently valid. However it should be noted that a new, lower arsenic standard of 10 ug/L (ppb) will be effective 01/26/2006. Currently, analytical results for arsenic range from 1 ppb to 600 ppb. The barium cleanup level of 1000 ug/L is lower than the MCL of 2000 ug/L (overprotective). The fluoride cleanup level of 2400 ug/L is lower than the MCL of 4000 ug/L (overprotective). The naphthalene RfD(o) decreased from 0.04 to 0.02 mg/kg/day, and the RfD(i) is now available at 0.00090 mg/kg/day (EPA Region III 2002).

When the remedial investigation was originally conducted, air sampling was performed in a number of homes above the plume. TCE was detected in several residences, but at levels that were not considered to be a risk at that time. Due to recent emphasis on vapor intrusion, EMR has worked with the EPA and UDEQ to establish an action level for TCE in indoor air at 0.43 ppbv. Because several of the indoor air sampling results from the original RI were above the new action level, there are potential air quality issues that have not been addressed.

The RAOs associated with the Waste Phenol Oil Pit are still valid.

Question C (Answer)

Yes

Question C (Comment)

*Source Area - Groundwater Extraction Trenches
Although the system has extracted large amounts of contaminated groundwater and LNAPLs, it is not clear at this time that the system is preventing the migration of groundwater from the source area to the non-source area. The conclusions of the OU 1 Source Area Zone Delineation Progress Report (Intera 2002) indicate that hydrocarbon concentrations are measurable downgradient and to the west of the exterior trench (Trench D) (see Figure OU 1-1 for location). This could be an indication that contaminated groundwater from the source area is not being captured by either the interior or exterior trenches or that there is an additional source of contamination.

During site inspections performed as part of this review, maintenance of some systems at the site was noted to be lacking. Specifically, replacement of the carbon unit on Oil/Water Separator off-gas, LNAPL disposal, and Oil/Water Separator cleanings should be performed on a regular basis.

A preliminary trend analysis of four monitoring locations indicate the following (the locations of the monitoring locations can be found in the OU 1 PSVP [CH2M 2001]):

*The Method Detection Limits for all four of the contaminants reviewed (TCE, DCE11, DCE12T, and DCE12C) were too high to detect some of the analytes at several of the locations at their current concentrations.
*DCE12C (PRG = 70 ppb) concentrations at U1-067 decreased from approximately 8,600 ppb to 5,510 ppb over a five year period.
*DCE12T (MCL = 100 ppb) concentrations at U1-162 have decreased from approximately 70 ppb to 5 ppb over a five year period.
*The DCE12C concentrations at U1-667 decreased from approximately 4,300 ppb to 3,300 ppb over the past five years (still above the PRG of 70 ppb). The TCE (MCL = 5ppb) concentrations have decreased from 700 ppb to 240 ppb over a five year period. However, the DCE11 (PRG = 7 ppb) concentrations have increased from approximately 9 to 14 ppb.
*At U1-079 all of the analytes reviewed increased over a five year period. TCE increased from approximately 5 to 25 ppb, DCE12T increased from approximately 1 to 6 ppb, and DCE 12C increased from approximately 60 to 350 ppb.

From this preliminary review, it is not possible to conclude that there is a significant downward or upward trend in concentrations of contaminants of concern at OU 1. Further, the impact of the trenches (which have operated for only 1.5 years) is not evident because of this short duration of remedial actions at OU 1.

*Source Area - Landfill Cap
Ponding on several areas at the landfills have been identified during CY 2002. This may compromise the integrity of the cap and allow excess infiltration.

*Non-Source Area - Spring Remediation System
In the OU 1 Feasibility Study Report (CH2M 1998) and Comprehensive Remedial Investigation Report (MW 1995), several exposure pathways are listed for current and future use. Of these pathways, springs and seeps posses the most problematic for current and future use of groundwater and surface water on Base and off Base.

Analytical results for benzene, cis-1,2 DCE, trans-1,2 DCE, PCE, TCE, vinyl chloride, and chromium at the 19 springs/seeps at OU 1 were reviewed over time. Of the 19 locations, intermittent analytical results from nine locations (U1-303, U1-304, U1-305, U1-306, U1-312, U1-313, U1-314, U1-317, and U1-318) were available in ERPIMS. These nine locations have been dry for the past several rounds of sampling. Springs U1-311 and U1-319 are not currently monitored. The only spring that currently exhibits groundwater contamination above PRGs is U1-307 (exceeds the PRG for cis-1,2 DCE). However, the water from this spring is collected via the groundwater extraction system at OU 1 and is discharged to the IWTP for treatment.

There are no analytical results for chromium in ERPIMS after 1995. A future potential exposure pathway has been identified as chromium in springs used for watering livestock (MW 1995 and CH2M 1998); therefore, chromium needs to be added to the sampling and analysis plan (SAP) at OU 1 again. All of the results in ERPIMS for total chromium were non detect except for U1-301 (15ug/g on 4/16/1990), U1-302 (18 ug/g on 4/16/1990), and U1-305 (15 ug/g on 4/17/1990). The MCL for total chromium is 100 ug/L.

VIII. Issues

*Eighteen months of operational data are not sufficient to determine if the remedies at OU 1 are containing contaminated groundwater. As discussed in the PSVP (CH2M 2001b), five years of data with at least two sampling rounds per year should provide adequate samples across the site and over time to determine if plume mean concentrations are decreasing. However, if there are measurable hydrocarbon concentrations in samples collected downgradient and to the west of the exterior trench (Trench D), monitored natural attenuation in that portion of the non-source area may not be adequate to remediate the contaminated groundwater.

*A preliminary check between the PSVP sampling requirements and data in ERPIMS showed that the analytical results from several locations were not available. This may be due to the lag time between sampling activities and the uploading of the results into ERPIMS, the possibility that the sampling locations were/are dry, or that the locations were not sampled.

*Some of the indoor air sampling results, collected during the RI, exceed the new action level for TCE in indoor air (0.43 ppbv).

IX. Recommendations

*Re-evaluate the non-source area monitored natural attenuation remedial action to determine if it is still applicable in all non-source areas (specifically in the area of measurable hydrocarbon concentrations outside Trench D).
*Modify ERPIMS to include a field for springs and seeps that exhibit dry conditions during a sampling event.
*Review the long term monitoring sampling and analysis plan to ensure that locations where the hydrocarbon concentrations were located during the Source Zone Area Delineation project (Intera 2001) are monitored.
*Proceed with the delineation and excavation of the arsenic contaminated soils at the springs.
*Determine if the trenches are containing/capturing the contamination in the source area by evaluating the gradient around the trenches. Additional monitoring points may be necessary to confirm that the prescribed water levels in the sumps are adequate to maintain containment.
*Re-evaluate the risk analysis for OU 1 to determine if revised contaminant action levels are warranted based on new standards and toxicity factors, as explained in the Technical Assessment above.
*Re-evaluate the Remedial Investigation data on indoor air and determine if the new action level for TCE (0.43 ppbv) in indoor air warrants additional mitigation measures in off-Base residential areas.
*Ensure that all gates and fences are locked in accordance with the ROD specified institutional controls.
*Implement maintenance activities in a timely manner.
*Determine if the plume mean concentrations are decreasing, using the described locations and monitoring frequency outlined in the Performance Standard Verification Plan and the results of the Performance Standard Verification Report, scheduled for 2006.
*Ensure that the method detection limits (MDL) are low enough to detect a contaminant of concern (i.e., MDL equal to or less than the MCL or PRG).
*Add chromium to the sampling and analysis plan for springs at OU 1.
*Collect samples from all locations described in the PSVP.

X. Protectiveness	Protectiveness cannot be determined until further information is obtained
Protectiveness Statement	A protectiveness determination of the remedies associated with WP080 cannot be made until further information is available. Within the time between the remedy selection and this Five-Year Review, USEPA has published changes to toxicity factors that affect chemical-specific clean-up levels at OU 1. Therefore, a re-evaluation of potential risk at OU 1 must be conducted before the protectiveness of the current remedies can be determined. Additional items that need to be addressed are described in the previous issues and recommendations and include: the appropriateness of the monitored natural attenuation remedial action in the area of measurable hydrocarbon concentrations outside Trench D, and determining if the trenches are containing/capturing the contamination in the source area. A completed PSVR, due in 2006, will be useful for determining the protectiveness of the remedial actions at OU 1 during the next Five-Year Review (2008).
XI. Next Required FYR	2008

Operable Unit 2

I Introduction

Operable Unit 2 consists of two IRP sites, as shown below in Table OU 2-1. Site SS021 requires no further action (HAFB EMR 1991a; CH2M 1996) and has been included in the Five-Year Review for completeness and to document the site background. IRP site WP007, also known as Chemical Disposal Pit 3, consists of two unlined trenches which were used for the disposal of unknown quantities of trichloroethene bottoms from solvent recovery units, sludge from vapor degreasers, and plating tank bottoms. The waste solvents migrated downward through the vadose zone into the shallow aquifer and accumulated as a mobile, dense non-aqueous phase liquid (DNAPL), pooled in topographic lows of a clay aquitard underlying sandier surface soils. Contaminated soils and the pooled DNAPL are the source of shallow groundwater contamination extending approximately 1500 feet downgradient, and beyond the Hill AFB boundary.

Since the Record of Decision for Operable Unit 2 (CH2M 1996), OU 2 has become synonymous with WP007, although OU 2 includes both SS021 and WP007.

Table OU 2-1. OU 2 Site Identification

Site ID	Site Name
WP007	CHEMICAL PIT 3
SS021	PERIMETER ROAD

II Site Chronology

See Table OU 2-2 for a history of events in this OU. The table is organized to describe events that impacted the OU as a whole, followed by events impacting specific IRP sites within the OU.

III Background

SS021 (Perimeter Road) was reportedly the site of previously unidentified dumping of waste solvents prior to 1979, in addition to dumping known to have occurred at a number of sites now associated with other Operable Units. The Record of Decision for Operable Unit 2 (CH2M 1996) states that SS021 has been found to be free of contamination except in those areas being addressed as part of existing Operable Units, and that no further action at that site is needed.

IRP site WP007, Chemical Disposal Pit 3, is located approximately 100 feet west of Perimeter Road, near the northeast boundary of Hill AFB, as shown on Figure OU 2-1. Past disposal of chlorinated solvents at WP007 has contributed to on- and off-Base contamination of the natural environment (Radian 1992a). A steep, terraced, northeast-facing escarpment leading from the Base to the Weber River Valley below separates the on-Base portion of OU 2 from the off-Base portion. There is about 300 feet of relief between Hill AFB and the valley.

WP007 consists of two unlined trenches several feet wide and approximately 50 to 100 feet long (Radian 1992a). The exact size and depth of the trenches are unknown. The facilities of the Source Recovery System (SRS) and other structures supporting the removal, treatment, and investigation of DNAPL in the subsurface are constructed over and obscure the trenches. From 1967 to 1975 the trenches were used for the disposal of unknown quantities of trichloroethene bottoms from solvent recovery units and sludge from vapor degreasers (CH2M 1996). An

unknown volume of plating tank bottoms was disposed at this site in the early 1940s (CH2M 1996). The estimated volume of waste solvents disposed in the trenches exceeds 10,000 gallons, and may exceed 100,000 gallons (HAFB EMR 1991c; CH2M 1996). The waste solvents migrated downward through the vadose zone into the shallow aquifer and accumulated as a mobile phase DNAPL, pooled in topographic lows of the Alpine Formation, a clay aquitard underlying the sandier soils of the Provo Formation (HAFB EMR 1991b; Radian 1992a). The DNAPL is approximately 70% TCE (URS 1999).

Contaminated soils near the trenches and the pooled DNAPL are the source of shallow, dissolved phase groundwater contamination extending approximately 1500 feet downgradient, and beyond the Hill AFB boundary (HAFB EMR 1991b; Radian 1992a; CH2M 1996; URS 2002a). Downgradient seeps and springs have also exhibited contamination. Concentrations of TCE in groundwater exceeding 10,000 µg/L occur both on- and off-Base. Groundwater contamination appears limited to the shallow, unconfined aquifer of the Provo Formation, above the Alpine Formation aquitard.

The Record of Decision for Operable Unit 2, issued in 1996, specifies both source and non-source remedies to address contamination due to WP007 (CH2M 1996). The source area corresponds approximately to the on-Base regions of contamination, the non-source areas to the off-Base regions. One of the remedies specified by the ROD is a low permeability containment wall encircling the source area to reduce the potential for further contamination of groundwater. After the wall was built, however, an additional accumulation of free-phase DNAPL was identified outside of the wall (URS 1999). This accumulation is informally known as either the "Griffith Pool" or the "G-Pool."

IV Remedial Actions

The remedial actions at OU 2 are described in detail in Section IV of the WP007 (Chemical Pit 3) Site Summary.

Source Area - Containment Wall

The containment wall is a vertical, low permeability, soil/bentonite slurry wall encircling the OU 2 source area, isolating the source area from the shallow aquifer (CH2M 1997). The containment wall acts as a barrier to contaminant migration and, in conjunction with extraction of groundwater from the source area, is intended to produce an inward hydraulic gradient along the western portion of the wall. The upgradient control system (UCS) is a gravel trench upgradient from the containment wall designed to eliminate groundwater mounding, which could lead to slope instability and failure (CH2M 1997). Associated sumps, pumps and piping convey intercepted groundwater to either the Source Recovery System process plant or the Air Stripper Treatment Plant (ASTP) for treatment and disposal.

Source Area – Source Recovery System

The SRS consists of a free-product and contaminated groundwater recovery well field and a process treatment facility. In conjunction with the containment wall, the SRS extraction well field provides hydraulic control in the source area by lowering the elevation of shallow groundwater within the wall (CH2M 1997). The SRS process plant also receives contaminated groundwater from the G-Pool.

DNAPL from other wells within the containment wall is removed using a portable DNAPL pump assembly. Since its initial operation in 1993 through 2001, approximately 43,500 gallons of DNAPL have been recovered from the source area and shipped off-Base (URS 2002b). Current piping configurations allow the treated groundwater to be discharged either to the ASTP or to the Hill Air Force Base Industrial Wastewater Treatment Plant for further treatment.

Source Area – Treatability Studies
Several pilot-scale treatability studies involving innovative technologies have been conducted in the source area. Approximately 6,000 gallons of DNAPL have been removed from the source area as the combined result of treatability studies and subsequent full-scale innovative treatments.

Source Area – Soil Vapor Extraction (SVE)
The source area SVE system specified in the ROD to remove VOCs from subsurface soils has not been implemented, and no timetable is specified in the ROD for implementation. The schedule will be established pending the completion of treatability studies. In 2002, a pilot-scale soil vapor extraction study was recommended to Hill AFB and is currently under review.

Source Area – Surface Cap
A surface cap over the source area, designed to prevent infiltration of surface water and further degradation of groundwater, has not been built. The ROD indicates the cap is to be delayed until source area treatment by either conventional or innovative technologies is completed and their effectiveness evaluated.

Source and Non-Source Area – Air Stripper Treatment Plant (ASTP)
The ASTP is designed to treat extracted groundwater containing relatively low concentrations of VOCs from both the source and non-source areas (CH2M 1997). It can treat flows from the UCS, the SRS (after initial treatment in the steam stripper), and the North Interceptor Trench (NIT, discussed below). In addition, it can treat groundwater extracted from OU 1. Treated water flows by gravity to a sanitary sewer connection leading to the Central Weber Sewer Improvement District (CWSID) treatment facility. During 2001, VOC concentrations in ASTP effluent were consistently below detection limits (URS 2001).

Non-Source Area – Interceptor Trenches
The NIT is a gravel trench drain located near the leading edge of the off-Base plume, designed to intercept contaminated groundwater to prevent further downgradient migration (CH2M 1997). A sump located at the lowest pipe entry elevation of the NIT receives groundwater intercepted by the trench, and also receives water intercepted by similar trenches at springs U2-304 and U2-326. The groundwater collected from the NIT sump is sent to the ASTP for treatment. The NIT has been upgraded to pump untreated NIT flows directly to CWSID.

Institutional Controls
A Continuing Order (AFI 32-7020) has been issued to restrict disturbance of contaminated soil and groundwater and to restrict installation of water wells on-Base at OU 2 (HAFB 1998). The Utah Division of Water Rights has also restricted water well drilling and the use of shallow groundwater at off-Base areas near OU 2. On-Base remediation facilities are not fenced, but are locked when unoccupied. Off-Base remediation facilities are fenced and/or posted with signs.

Environmental Monitoring

The ROD requires a program of long-term monitoring for contaminants and treatment system performance. A Performance Standard Verification Plan (CH2M 2001) was completed in 2001, describing the data needed to assess whether the remedial actions specified in the ROD are operating properly and successfully, and establishing a program to collect the data. The PSVP specifies annual reporting of operations and maintenance activities for the treatment systems, the annual cost of O&M, and an annual groundwater sampling report. The annual groundwater sampling report is a summary of the groundwater sampling conducted during the previous year, and includes data reporting and charting; it does not, however, include data interpretation. Thorough interpretation and evaluation of the data is deferred until 2006, when a Performance Standard Verification Report is scheduled. All environmental monitoring data, derived from either the O&M or groundwater sampling reporting, are submitted to ERPIMS.

V Progress Since Last Five-Year Review

The 1998 Five-Year Review contained no specific recommendations regarding the remedies at OU 2. The estimate of initial free-phase DNAPL accumulation in the G-Pool, outside of the containment wall, has been refined from 5,000-10,000 gallons (1998) to 2,800 gallons (currently). Approximately 2,500 gallons have been recovered from the G-Pool.

Many incremental improvements have been achieved in the operation of the remedies.

VI Five-Year Review Process

Site review was conducted per the process described in this report for the overall 2003 FYR.

VII Technical Assessment

Results of the technical assessment of the remedies at OU 2 are presented in Table OU 2-3. Additional details are provided in Section VII of the WP007 Site Summary.

Table OU 2-3. Technical Assessment Summary for OU 2

Site ID	Remedy	Technical Assessment*			Protectiveness	Next Five-Year Review
		Question A	Question B	Question C		
WP007	Source removal, containment, and institutional controls	No	No	Yes	Cannot be determined until further information is obtained	2008
SS021	Not required, NFRAP site	NA	NA	NA	NA	Not required
OU 2	Source removal, containment, and institutional controls	No	No	Yes	Cannot be determined until further information is obtained	2008

* Question A: Is the remedy functioning as intended by the decision documents?
Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objective (RAOs) used at the time of the remedy still valid?
Question C: Has any other information come to light that could call into question the protectiveness of the remedy?
NA = Not applicable

Question A. Is the remedy functioning as intended by the decision documents?
No. Some portions of the remedy appear to be functioning as intended, while others do not.

The SRS process plant, treatability studies and innovative treatments, ASTP, and institutional controls are functioning as intended. However, the SRS extraction wells, the containment wall, and the NIT may not be functioning as intended. Groundwater elevations are not consistently below action levels stated in the PSVP for the SRS well field. An inward gradient is not being maintained along the western segment of the containment wall. And a preliminary evaluation of groundwater elevation and TCE concentration data in the vicinity of the NIT suggest that there is no intercept mechanism across the entire width of the off-Base plume and during the spring months the NIT fails to intercept all of the contaminated water.

Question B. Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objective (RAOs) used at the time of the remedy still valid?
No. The risk factors used to develop the cleanup levels for Beta-BHC, methylene chloride, tetrachloroethene, and trichloroethene at OU 2 are now 10-times to 10,000-times more stringent (EPA Region III 2002; URS 2002c).

The baseline risk assessment (BRA) (Radian 1992b) considered the inhalation of indoor air as a potentially significant current and future pathway for both onsite and offsite residential exposure. Since then, EMR, EPA, and Utah DEQ have jointly established a new action level for TCE concentration in indoor air of 0.43 ppbv. In addition, new homes have been built and new subdivisions developed in formerly agricultural areas downgradient of the source (Himle, C. 2003). The new indoor action level for TCE, combined with the increasing residential use downgradient of the source, raises the potential for indoor air quality issues, by way of soil gas migration, that may not have been previously addressed.

Question C. Has any other information come to light that could call into question the protectiveness of the remedy?
Yes. In 1997, after construction of the containment wall, an accumulation of mobile-phase DNAPL was discovered outside of the containment wall during a treatability study. This accumulation, the "G-Pool," was adjacent to the northeast corner of the containment wall and contained an estimated 2,800 gallons of DNAPL. Approximately 2,500 gallons of DNAPL have been recovered from the G-Pool, and small volumes of free-phase DNAPL continue to be recovered. Groundwater extraction wells maintain the water level below a specified elevation in the G-Pool, reducing the potential of the G-Pool as a continuing source of contamination. Aside from reducing the hydraulic gradient across the G-Pool, the containment wall does not control contaminant flux out of the G-Pool. In addition, a recent review of time-series data (URS 2003) of TCE concentration in U2-675 raises the possibility of increasing contaminant concentrations in groundwater downgradient of the NIT.

VIII Issues

1. A joint evaluation of the SRS and the containment wall is ongoing. Protectiveness provided by these remedies cannot be determined until the data have been thoroughly evaluated and interpreted.

2. The proper function of the SRS extraction well remedy cannot be determined because the action level stated in the PSVP does not correspond to the water level elevation that can be

achieved within the containment wall with maximum pumping of these wells. No rationale for this action level is given in the PSVP.

3. A preliminary evaluation of groundwater elevation and TCE concentration data from wells in the vicinity of the NIT suggest the possibility that during the spring months the NIT fails to intercept contaminated groundwater. Also, based on the latest interpretation of the off-Base plume (see Figure OU2-1), the NIT does not intercept the entire width of the plume.

4. The data collected by the LTM contractor are not readily available to the O&M contractor, though they may have a bearing on the operation of the remedies.

5. Since the baseline risk assessment (Radian 1992b), EMR, EPA, and Utah DEQ have jointly established a new action level for TCE concentration in indoor air of 0.43 ppbv. In addition, new homes have been built and new subdivisions developed in formerly agricultural areas downgradient of the source.

6. The leading edge of the plume is very near the southern boundary of NE ¼, Sect. 29, T5N R1W, which is not subject to water rights restrictions imposed by Hill AFB in conjunction with the Utah Department of Natural Resources (HAFB 1998). Should the plume advance, it could impinge on this quarter section.

7. A thorough review of several portions of the remedial systems addressing contamination at OU 2 may be justified sooner than the PSVR scheduled in 2006 because they have been in operation since 1993.

IX Recommendations and Follow-up Actions for OU 2

1. Jointly evaluate the effectiveness of the SRS and the containment wall.

2. Identify the appropriate action level for well field operations and document new level and rationale in the PSVP.

3. Water level and analytical data in the vicinity of the NIT, the performance of the NIT, and the location of the NIT with respect to the dissolved-phase plume should be thoroughly evaluated.

4. Expedite submittal of LTM data to ERPIMS for timely review of remedy effectiveness.

5. Continue use of the portable DNAPL pump assembly to remove free-phase DNAPL from wells. Consider purchase of a second system, which would enable simultaneous recovery of DNAPL from two separate wells.

6. Investigate the relationship between new residential development and the plume.

7. Re-evaluate the risk analysis for OU 2 to determine if revised contaminant action levels are warranted based on new standards and toxicity factors as explained in the Technical Assessment above.

8. Consider the need to restrict water rights in the northeast quarter of Sect. 29, T5N R1W.

9. Evaluate whether a thorough review of the remedies at OU 2 can be performed before 2006.

X Protectiveness Statement for OU 2

A protectiveness determination of the remedies associated with OU 2 cannot be made until further information is available. Within the time between the remedy selection and this Five-Year Review, USEPA has published changes to toxicity factors that affect chemical-specific clean-up levels at OU 2. Therefore, a re-evaluation of potential risk at OU 2 must be conducted before the protectiveness of the current remedies can be determined.

The remedies specified by the ROD and now in-place constitute an appropriate response to contamination resulting from WP007 if operating as designed. A comprehensive evaluation of relevant data generated since remediation began is needed, however, in order to make a strong protectiveness statement by comparing operating data against design objectives. An assessment of the joint performance of the containment wall and the SRS, in operation together since 1996 is needed to make a clear statement about the prevention of continuing downgradient groundwater stemming from the source area. This assessment, along with a completed PSVR, due in 2006, will be useful for determining the protectiveness of the remedial actions at OU 2 during the next Five-Year Review (2008).

XI Next Review

The next FYR for OU 2 is required by 2008. No future review is required for Site SS021 (Perimeter Road) because no further remedial action is planned at this site.

XII References for Operable Unit 2 Summary

(CH2M 1996) Final Record of Decision and Responsiveness Summary for Operable Unit 2, CH2M Hill, September 1996.

(CH2M 1997) Remedial Design Report and Work Plan Schedule A and B Construction Operable Unit 2, CH2M Hill, December 1997.

(CH2M 2000) Draft Remedial Action Report Operable Unit 2 North Interceptor Trench, Spring U2-326 Interceptor Trench, Containment Wall, and Air Stripper Treatment Plant, CH2M Hill, March 2000.

(CH2M 2001) Performance Standard Verification Plan Operable Unit 2, CH2M Hill, November 2001.

(EPA Region III 2002) Risk-Based Concentration Table, EPA Region III, October 9, 2002, EPA Region III, 9 October 2002.

(HAFB 1998) OO-ALC-HAFB Supplement I, AFI 32-7020, 29 April 1998, Hill AFB, 29 April 1998.

(HAFB EMR 1991a) Decision Document for Perimeter Road, Site SS21, Hill AFB EMR, June 1991.

(HAFB EMR 1991b) Focused Feasibility Study for Operable Unit 2, Hill AFB EMR, February 1991.

(HAFB EMR 1991c) Record of Decision for Interim Action at Operable Unit 2, Final, HAFB EMR, August 1991.

(HAFB EMR 1998) CERCLA 1998 Five-Year Review Hill Air Force Base, Utah, Hill AFB EMR, September 1998.

(MW 2000) Final Remedial Action Project Report For Operable Unit 2 Spring U2-304 Seep Intercept System, Montgomery Watson, July 2000.

(Radian 1992a) Remedial Investigation Report for Operable Unit 2 Sites WP07, SS21 Volume 1 Report and Appendices A & B, Radian, July 1992.

(Radian 1992b) Baseline Risk Assessment for Operable Unit 2 Sites WP07, SS21 Volume 1 Report, Radian, March 1992.

(Radian 1994) Operable Unit 2 Source Removal System and Industrial Waste Treatment Plan Modifications Construction Report, Radian, January 1994.

(Rice 1997) AATDF Surfactant/Foam Process for Aquifer Remediation, Rice University, November 1997.

(URS 1999) Final Dense Nonaqueous Phase Liquid (DNAPL) Source Delineation Report Operable Unit 2, URS Corporation, September 1999.

(URS 2001) Final 2000 Cost and Performance Report, Operable Unit 2, Hill Air Force Base, Utah, URS, 15 February 2001.

(URS 2002c) Memorandum, Comparison of Standards and Cleanup Levels at Hill AFB, URS, 16 December 2002.

(URS 2002b) Final Operable Unit 2 Panel 1 and 5 Surfactant Enhanced Aquifer Remediation (SEAR) Report, URS Corporation, February 2002.

(URS 2002a) 2001 Cost & Performance Report, Operable Unit 1, Hill AFB, UT, URS, 11 February 2002.

(URS 2002c) 2001 Cost and Performance Report Operable Unit 2, URS, March 2002.

(URS 2003) Draft 2002 Cost and Performance Report, Operable Unit 2, Hill Air Force Base, Utah, URS Corporation, March 2003.

(Himle, C. 2003) Himle, C., O&M Contractor, URS, Personal Communication, 03 March 2003.

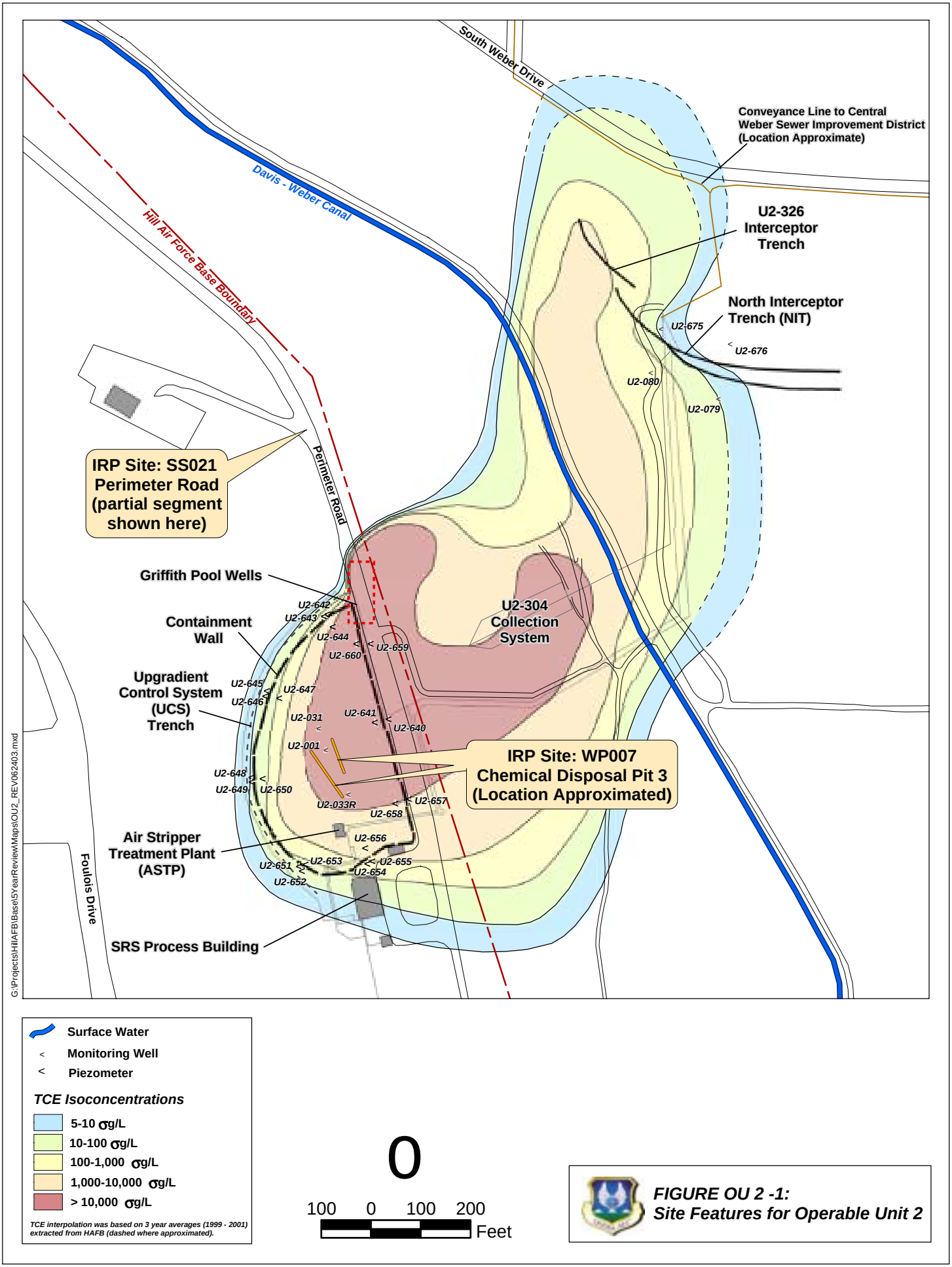

FIGURE OU 2 -1:
Site Features for Operable Unit 2

Table OU 2 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
OU 2	**OPERABLE UNIT 2**			
	1981	Investigations begin at OU 2		Focused Feasibility Study for Operable Unit 2
07	1987	OU 2 placed on the National Priorities List		Focused Feasibility Study for Operable Unit 2
	1998	First Five-Year Review of remedial actions at OU 2		Hill AFB Five-Year Review, September 1998
WP007	**CHEMICAL PIT 3**			
	1967	Disposal of wastes begins in Chemical Disposal Pit 3	Wastes consist of solvents and sludges from HAFB degreasing operations. Disposal continued to 1975. Volume of disposed wastes unknown, estimated between 100,000 and 1,000,000 gals.	Record of Decision for Interim Action at Operable Unit 2, Final
	1983	Volatile organic compounds first identified at OU 2	How contaminants were identified, and in what media, is not described in the reference document (ROD).	Record of Decision for Interim Action at Operable Unit 2, Final

Table OU 2 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
	1986	High levels of VOCs confirmed in shallow groundwater near Base boundary	Contaminants found in springs downgradient from the disposal trenches. Maximum TCE concentration detected in groundwater off-Base is 11,000 ug/L.	Record of Decision for Interim Action at Operable Unit 2, Final
	1986	Response measures to protect off-base users of shallow groundwater	Five properties provided alternate sources of water. Two of the five provided municipal drinking water; the remaining three provided with alternate sources of irrigation water. Note that the year(s) in which this occurred is uncertain. It is not specified in the reference document.	Record of Decision for Interim Action at Operable Unit 2, Final
05	1986	Community participation begins		Record of Decision for Interim Action at Operable Unit 2, Final
08	1991	Record of Decision for interim action	Pump-and-treat system for removal and destruction of free-phase DNAPLs from groundwater is selected as the remedy for interim action. Operating life is expected to be approximately two years following a one year construction period.	Record of Decision for Interim Action at Operable Unit 2, Final
03	1992	Baseline Risk Assessment issued	Estimated carcinogenic risk values for the off-site future residential scenarios, due to the presence of TCE in groundwater, exceeded the CERCLA risk range site remediation goal.	Baseline Risk Assessment for Operable Unit 2 Sites WP07, SS21 Volume 1 Report
12	1993	Initial extended (6 months) operation of the source recovery system (SRS)	Construction of the SRS was completed in August 1993, implementing the 1991 ROD for interim action. The initial period of sustained operation began in December 1993 and continued through the first part of June 1994. Pumped 22,904 gallons of free-phase DNAPL from the aquifer during initial extended operation and the system startup test (October - November 1993); additional 456 gallons of DNAPL generated by steam stripping/recondensation.	System Evaluation Report SRS Commissioning, Startup, and Initial Operation Interim Remedial Action, 2

Table OU 2 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
	1996	Pilot-scale treatability studies	Three partitioning interwell tracer tests and two surfactant enhanced aquifer remediation tests were conducted in a portion of the DNAPL pool in the vicinity of the disposal trenches near Panels 3 and 4. PITTs were determined to be effective and were later used to characterize the entire source area. Full-scale SEARs were also judged to be feasible in portions of the source area, and were conducted in 2000, 2001, and 2002, each in different portions of the source.	2001 Cost and Performance Report Operable Unit 2
09	1996	Record of Decision	The selected remedy addresses contaminated groundwater, contaminated soil, and contaminated surface water at OU 2. Two components are addressed: the source area and non-source area. Source area remedy: encircling vertical barrier; shallow groundwater extraction, treatment, and discharge; soil vapor extraction; continued operation of the SRS; a surface cap; treatability studies. Non-source area remedy: shallow groundwater extraction, treatment, discharge; continued collection, treatment and discharge of water from springs and seeps. Remedy for both areas includes environmental monitoring and institutional controls.	Final Record of Decision and Responsiveness Summary for Operable Unit 2
12	1996	Source containment system constructed	Containment wall and upgradient control trench constructed.	UCS O&M and Performance Verification Plan Operable Unit 2
	1997	The Air Stripper Treatment Plant is constructed	The ASTP treats contaminated groundwater through an air stripper treatment process.	2001 Cost and Performance Report Operable Unit 2
	1997	Additional PITTS performed to characterize the DNAPL source	Additional PITTs performed in late 1997 and 1998 to characterize the entire subsurface channel containing DNAPL. PITTs conducted in panels 1 through 5.	2001 Cost and Performance Report Operable Unit 2

Table OU 2 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
	1997	DNAPL pool discovered outside of the containment wall	During the characterization of the entire subsurface channel, a DNAPL pool was discovered outside of the northeast corner of the containment wall. This DNAPL pool is denoted the G-pool.	2001 Cost and Performance Report Operable Unit 2
	1997	Additional treatability studies conducted	A surfactant flood involving a foam surfactant to enhance subsurface sweep recovered little DNAPL. Approximately 2,000 gals DNAPL recovered as a result of steam injection and the installation of the steam injection wellfield.	2001 Cost and Performance Report Operable Unit 2
	1997	Off-base extraction system constructed	The North Intercept Trench is constructed. The NIT is a groundwater collection trench designed to cut off the leading edge of the off-Base plume. The water is pumped uphill to the ASTP.	2001 Cost and Performance Report Operable Unit 2
03	1997	Surfactant/foam flood demonstration project in source area		AATDF Surfactant/Foam Process for Aquifer Remediation
	1998	Additional off-Base trench completed near the NIT to drain a seasonal spring	Off-Base trench U2-236 completed to drain a seasonal spring located near the NIT. Water from the trench is pumped to the NIT sump, where it is conveyed for treatment at either the IWTP or the ASTP.	2001 Cost and Performance Report Operable Unit 2
	1998	Four large-scale PITTs conducted in source area		Final Dense Nonaqueous Phase Liquid (DNAPL) Source Delineation Report Operable Unit 2

Table OU 2 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
	1999	Spring 304 Intercept System constructed		Final Remedial Action Project Report For Operable Unit 2 Spring U2-304 Seep Intercept System
	1999	New extraction well field installed in the G-Pool	17 wells drilled and developed in the G-pool. The well field was connected to the existing SRS piping to convey DNAPL and groundwater extracted from the G-Pool to the SRS for phase separation and treatment. Approximately 2,200 gals of additional DNAPL removed since the start-up of the well field.	2001 Cost and Performance Report Operable Unit 2
	1999	PITT conducted in the G-Pool	After the mobile DNAPL was extracted from the G-Pool well field, the remaining DNAPL was characterized using a PITT. An additional 350 gals of DNAPL were recovered during the PITT.	2001 Cost and Performance Report Operable Unit 2
	1999	Gravel interceptor trench for spring U2-304	A gravel interceptor trench for spring U2-304 was constructed. The purpose of the trench is to collect contaminated groundwater and prevent it from advancing in the off-Base plume.	2001 Cost and Performance Report Operable Unit 2
	2000	First full-scale SEAR completed	The first full-scale SEAR at OU 2 was completed in Panel 2, recovering 430 +/- 59 gallons of DNAPL.	2001 Cost and Performance Report Operable Unit 2
	2000	A cometabolic bioventing test was conducted in the source area	The Remediation Technology Development Forum (RTDF) funded a cometabolic bioventing test in the source area of OU 2. A vadose zone PITT was completed using the RTDF well field and acclimation of the subsurface microbes was initiated.	2001 Cost and Performance Report Operable Unit 2

Table OU 2 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
01	2000	Air strippers placed on-line	The air strippers were placed on-line in January 2000 after a successful demonstration of a datalink required by South Weber City to monitor the volume of water treated by the ASTP and sent to the Central Weber Sewer Improvement District (CWSID). Over 5 million gallons of contaminated water from the UCS and NIT were treated and sent to the CWSID.	2001 Cost and Performance Report Operable Unit 2
	2001	SRS modified to enable breakdown of surfactant in the SEAR effluent	Modifications to the SRS were required to break down surfactant in the SEAR effluent, including a hydrolysis unit that treated the wastewater to mitigate foam generation downstream of the SRS at the IWTP and the North Davis Publicly Owned Treatment Works (POTW). During the Panel 1 SEAR, approximately 31,000 pounds of sodium hydroxide were used to treat over 350,000 gals of surfactant-laden wastewater.	2001 Cost and Performance Report Operable Unit 2
	2001	SEAR conducted in Panel 1	Approximately 1,100 gals of DNAPL were recovered as a result of the application of a SEAR in Panel 1. Foam injection was used to improve subsurface sweep. A post-SEAR PITT suggests that additional DNAPL remains in the southern portion of the panel.	2001 Cost and Performance Report Operable Unit 2
	2002	Panel 1 SEAR conducted from September 21 to Novemenber 1		Final Operable Unit 2 Panel 1 and 5 Surfactant Enhanced Aquifer Remediation (SEAR) Report
SS021	**PERIMETER ROAD**			
06	1991	Decision to no longer track Perimeter Road (SS021) as an IRP site	Decision based on the results of a 1988 soil gas study documented in: Radian, 1990. Site Evaluation Report for Perimeter Road and the Spoils Area. August 1990.	Decision Document for Perimeter Road, Site SS21

Table OU 2 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	*YEAR*	*EVENT*	*COMMENTS*	*REFERENCE*
09	1996	Record of Decision	Perimeter Road (IRP Site SS021) is found to be free of contamination except in those areas being addressed as part of existing OUs. No further action is needed for Perimeter Road as part of OU 2.	Final Record of Decision and Responsiveness Summary for Operable Unit 2

XIII Five-Year Review of Sites in OU 2

Operable unit review results are summaries of findings for all of the sites in each operable unit. The following site summaries present a detailed review of each IRP site. Therefore, much of the information presented in the Site Summaries is a duplicate of what was presented in the OU Summary.

The reader is encouraged to use the Site Summary to obtain details on specific contaminants of concern and the technical assessment for each site.

OU 2 WP007 CHEMICAL PIT 3

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

IRP site WP007, also known as Chemical Disposal Pit 3, consists of two unlined trenches, several feet wide and approximately 50 to 100 feet long (Radian 1992a), which were used from 1967 to 1975 for the disposal of unknown quantities of trichloroethene waste from solvent recovery units, sludge from vapor degreasers, and possibly plating tank bottoms (CH2M 1996). The waste solvents migrated downward through the vadose zone into the shallow aquifer and accumulated as a mobile phase DNAPL, pooled in topographic lows of a clay aquitard underlying sandier surface soils of the Provo Formation (HAFB EMR 1991b; Radian 1992a). Contaminated soils and the pooled DNAPL are the source of shallow groundwater contamination extending approximately 1500 feet downgradient, and beyond the Hill AFB boundary.

II. Site Chronology

See Table OU 2-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

IRP site WP007, Chemical Disposal Pit 3, is located approximately 100 feet west of Perimeter Road, near the northeast boundary of Hill AFB, as shown on Figure OU 2-1. Past disposal of chlorinated solvents at WP007 has contributed to on- and off-Base contamination of the natural environment (Radian 1992a). A steep, terraced, northeast-facing escarpment, 310 feet high and leading from the Base to the Weber River Valley below, separates the on-Base portion of OU 2 from the off-Base portion.

The exact size and depth of the trenches is not known. The facilities of the Source Recovery System and other structures supporting the removal, treatment, and investigation of DNAPL in the subsurface are constructed over and obscure the trenches. In addition to solvent disposal, an unknown volume of plating tank bottoms was disposed at this site in the early 1940s (CH2M 1996). The estimated volume of waste solvents disposed in the trenches exceeds 10,000 gallons, and may exceed 100,000 gallons (HAFB EMR 1991c; CH2M 1996) and is approximately 70% TCE (URS 1999).

Contaminated soils near the trenches and the pooled DNAPL are the source of shallow, dissolved phase groundwater contamination extending approximately 1500 feet downgradient, and beyond the Hill AFB boundary (HAFB EMR 1991b; Radian 1992a; CH2M 1996; URS 2002a). Downgradient seeps and springs have also exhibited contamination. Concentrations of TCE in groundwater exceeding 10,000 ug/L occur both on- and off-Base. Groundwater contamination appears limited to the shallow, unconfined aquifer of the Provo Formation, above the Alpine Formation aquitard.

The Record of Decision for Operable Unit 2, issued in 1996, specifies both source and non-source remedies to address contamination due to WP007 (CH2M 1996). The source area corresponds approximately to the on-Base regions of contamination, the non-source areas to the off-Base regions. One of the remedies specified by the ROD is a low permeability containment wall encircling the source area to reduce the potential for further contamination of groundwater. After the wall was built, however, an additional accumulation of free-phase DNAPL was identified outside of the wall (URS 1999). This accumulation is informally known as either the "Griffith Pool" or the "G-Pool."

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
GW	1,1,1-TRICHLOROETHANE	200 ug/L
SW	1,1,1-TRICHLOROETHANE	200 ug/L
GW	BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	0.01 ug/L
SW	BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	0.01 ug/L
GW	cis-1,2-DICHLOROETHENE	70 ug/L
SW	cis-1,2-DICHLOROETHENE	70 ug/L
SW	GAMMA BHC (LINDANE)	0.2 ug/L
GW	METHYLENE CHLORIDE	6 ug/L
SW	METHYLENE CHLORIDE	6 ug/L
GW	TETRACHLOROETHENE(PCE)	5 ug/L
SOIL	TETRACHLOROETHENE(PCE)	12.31 mg/kg
SW	TETRACHLOROETHENE(PCE)	5 ug/L
GW	TOLUENE	1000 ug/L
SW	TOLUENE	1000 ug/L
GW	TRICHLOROETHENE (TCE)	5 ug/L
SOIL	TRICHLOROETHENE (TCE)	58.21 mg/kg
SW	TRICHLOROETHENE (TCE)	5 ug/L

Remedial Action Objectives

* Eliminate the sources of groundwater contamination either through source control or removal in accordance with the Utah Corrective Action Cleanup Standards Policy - UST and CERCLA Sites.
* Meet chemical-specific ARARs. Restoration goals are drinking water MCLs. Meeting MCLs will satisfy restoration goals of the State Groundwater Quality Protection Rule.
* Prevent further degradation of groundwater quality in accordance with the Utah Corrective Action Cleanup Standards Policy - UST and CERCLA Sites.
* Remove as much of the DNAPL as practicable.
* The goal of the remedial action is to restore the shallow groundwater to its beneficial use.

IV. Remedial Actions

Source Area - Containment Wall

The containment wall is a vertical, low permeability, soil/bentonite slurry wall encircling the OU 2 source area, isolating the source area from the shallow aquifer (CH2M 1997). The wall

is approximately 1500 feet long, varies in depth from 67 to 92 feet bgs, and is completed a minimum of 35 feet into the lower permeability soils underlying the shallow aquifer. The containment wall provides two protective functions: 1) a low permeability physical barrier to lateral contaminant migration, and 2) a hydraulic barrier whereby the extraction of water from the source area within the wall produces an inward hydraulic gradient along the southern, western and northern segments of the wall. Maintenance of an inward gradient on the eastern segment of the wall is not feasible due to the steep slope on the east. Eastward migration of contaminated groundwater is mitigated, however, by keeping the groundwater elevation below 4665 feet above mean sea level (amsl) on both sides of the eastern wall segment (CH2M 2001). Twenty-one piezometers spaced around the perimeter of the wall (eight inside and 13 outside of the wall) constitute a network of eight piezometer nests used to monitor the gradient across the wall.

The upgradient control system is an element of the containment wall system designed to eliminate groundwater mounding on the upgradient side of the containment wall, which could lead to slope instability and failure (CH2M 1997). The UCS is a gravel trench excavated to depths ranging from 21.5 to 34 feet, approximately 700 feet long, and aligned parallel to and 15 to 25 feet upgradient from the containment wall. Associated sumps, pumps and piping convey intercepted groundwater to either the Source Recovery System process plant or the Air Stripper Treatment Plant for treatment and disposal.

Source Area – Source Recovery System
The SRS consists of a free-product and contaminated groundwater recovery well field and a process treatment facility. The primary functions of the SRS are to remove DNAPL from the source area groundwater and recover it by phase separation; separate dissolved contaminants from the aqueous phase using steam stripping; and meet effluent discharge objectives (Radian 1994; URS 2002a). In addition, the SRS treats groundwater and fluids extracted during enhanced DNAPL removal technology applications, which have been conducted episodically at the site since 1996. In conjunction with the containment wall, the SRS extraction well field provides hydraulic control of the source area by lowering the elevation of shallow groundwater within the wall (CH2M 1997).

The original SRS well field within the containment wall consisted of four wells extracting both contaminated groundwater and free-phase DNAPL (Radian 1994). Usually three wells (U2-001, U2-031, and U2-033R) now operate, removing only contaminated groundwater from within the wall; DNAPL is no longer recovered from the wells (URS 2002a). Extracted groundwater is conveyed to the Source Recovery System process plant for treatment and disposal. All conveyance piping between the wellfield and the treatment plant is double walled. Total flow from the wells range from approximately one to ten gpm, and varies depending on season and during other remediation activities (such as surfactant flooding) within the containment wall (URS 2002a). Pumping rates of wells within the containment wall have apparently decreased with time, possibly in response to the combined effect of the containment wall and the UCS (URS 2002a).

DNAPL is still encountered in other wells within the containment wall, however, and is removed using a portable DNAPL pump assembly; wells requiring DNAPL removal are identified by monthly soundings (Himle, C. 2003). Approximately 20 gallons per month can be recovered using the portable assembly, but the system can only operate during warm

weather.

Contaminated groundwater and other fluids (from enhanced recovery activities) extracted from the source area are piped to one of three phase separators. DNAPL is separated from groundwater by gravity and transferred to a solvent storage tank, where it is accumulated for disposal off-Base at a RCRA permitted facility. Since its initial operation in 1993 through 2001, approximately 43,500 gallons of DNAPL have been recovered from the source area and shipped off-Base (URS 2002b).

Contaminated water separated from the DNAPL is treated using a steam stripper. Highly concentrated solvent vapor is condensed and recycled to the phase separators, and treated water is transferred to an effluent holding tank. Current piping configurations allow the treated effluent to be discharged either to the air stripper treatment plant or to the Hill Air Force Base Industrial Wastewater Treatment Plant for further treatment.

The SRS process plant also receives contaminated groundwater from the G-Pool. Four extraction wells typically operate in the G-Pool, at a combined flow rate of from less than one to approximately 10 gpm (URS 2002a). A fixed set of wells is not pumped; instead, the pumped wells are varied according to observed VOC concentrations in groundwater and to maintain hydraulic control of the contaminated groundwater to prevent downgradient migration.

Source Area – Treatability Studies
Several pilot-scale treatability studies involving innovative technologies have been conducted in the source area. These include partitioning inter-well tracer tests (PITTs) to estimate the volume of immobile residual DNAPL remaining in the source area aquifer (URS 1999); surfactant enhanced aquifer remediations (SEARs) to remove immobile DNAPL (URS 2003); a SEAR involving a surfactant foam, intended to improve the subsurface sweep of surfactant (Rice University, et al. 1997); steam injection to mobilize residual DNAPL (URS 2002b); and a cometabolic bioventing application designed to remove VOC contamination in vadose zone soils by enhancing the growth of naturally occurring, VOC-consuming bacteria. The success of the pilot-scale PITT and SEAR studies led to PITT characterization of the entire source area and the application of three full-scale SEAR applications in the northern portion of the source area (URS 2003). Approximately 6,000 gallons of DNAPL have been removed from the source area as the combined result of treatability studies and subsequent full-scale innovative treatments.

Source Area – Soil Vapor Extraction
The source area SVE system specified in the ROD to remove VOCs from subsurface soils has not been implemented, and no timetable is specified in the ROD for implementation. The schedule will be established pending the completion of treatability studies. In 2002 a pilot-scale soil vapor extraction study was recommended to Hill AFB and is under review.

Source Area – Surface Cap
A surface cap over the source area, designed to prevent infiltration of surface water and further degradation of groundwater, has not been built. The ROD indicates the cap is to be delayed until source area treatment by innovative technologies is completed and their effectiveness evaluated.

Source and Non-Source Area – Air Stripper Treatment Plant
The ASTP is designed to treat extracted groundwater containing relatively low concentrations of VOCs from both the source and non-source areas (CH2M 1997). It can treat flows from the UCS, the SRS (after initial treatment in the steam stripper), and the North Interceptor Trench (discussed below). In addition, it can receive extracted groundwater from OU 1.

Prior to treatment by the ASTP, influent enters a 4,000-gallon storage feed tank. When the tank reaches a pre-determined level, a feed pump delivers contaminated water to one of two air strippers, each rated at 150 gallons per minute (gpm). Treated water flows by gravity to a sanitary sewer connection leading to the Central Weber Sewer Improvement District treatment facility. During 2001, VOC concentrations in ASTP effluent were consistently below detection limits (URS 2001). The CWSID requires total VOC concentrations discharged to the sanitary sewer to be below 2.13 ppm (URS 2001).

Non-Source Area – North Interceptor Trench
The NIT is a gravel trench drain located near the leading edge of the off-Base plume, designed to intercept contaminated groundwater to prevent further downgradient migration (CH2M 1997). It extends roughly halfway across the plume, and is approximately 500 feet long, 50 feet deep, with perforated horizontal pipes at depths of approximately 22 and 35 feet bgs. A sump located at the lowest pipe entry elevation of the NIT receives groundwater intercepted by the trench, and also receives water intercepted by similar trenches at springs U2-304 and U2-326. Double-walled high-density polyethylene (HDPE) piping conveys untreated groundwater from the NIT sump to the ASTP for treatment. The NIT has been upgraded to pump untreated NIT flows directly to CWSID.

Non-Source Area – Spring U2-326 Interceptor Trench
The U2-326 interceptor trench is located northwest of the NIT, and consists of a gravel trench approximately 163 feet long with perforated horizontal pipes at depths of approximately 12 and 20 feet bgs (CH2M 2000). Like the NIT, the trench is designed to intercept contaminated groundwater near the leading edge of the off-Base plume to prevent further downgradient migration. Groundwater intercepted by the trench is conveyed to the NIT sump, where it is subsequently conveyed to the ASTP for treatment.

Non-Source Area – Spring U2-304 Interceptor System
This passive system is located off-Base in the central portion of the dissolved contaminant plume (MW 2000). The system collects seasonal seepage from Spring U2-304 and conveys it by gravity to the NIT sump, where it is subsequently conveyed to the ASTP for treatment. The objective of the system is to prevent potential exposure to indigenous plants and animals, livestock, and humans.

Institutional Controls
A Continuing Order (HAFB 1998) has been issued to restrict disturbance of contaminated soil and groundwater and to restrict installation of water wells on-Base at OU 2. The Utah Department of Natural Resources, Division of Water Rights also has restricted water well drilling and the use of shallow groundwater at off-Base areas near OU 2.

On-Base remediation facilities are not fenced, but are locked when unoccupied. Warning signs are posted at multiple locations in the source area. Off-Base remediation facilities are fenced and/or posted with signs. Only one of the facilities, U2-326, has a locked gate; fences surrounding the NIT and the U2-304 interceptor system cannot be locked due to lease restrictions. The building at the NIT is locked. All off-Base manholes are locked (Himle, C. 2003).

Environmental Monitoring
The ROD requires a program of long-term monitoring for contaminants and treatment system performance. A Performance Standard Verification Plan (CH2M 2001) was completed in 2001, describing the data needed to assess whether the remedial actions specified in the ROD are operating properly and successfully, and establishing a program to collect the data. The PSVP specifies annual reporting of operations and maintenance activities for the treatment systems, the annual cost of O&M, and an annual groundwater sampling report. The annual groundwater sampling report is a summary of the groundwater sampling conducted during the previous year, and includes data reporting and charting; it does not, however, include data interpretation. Thorough interpretation and evaluation of the data is deferred until 2006, when a Performance Standard Verification Report is scheduled. All environmental monitoring data, derived from either the O&M or groundwater sampling reporting, are submitted to ERPIMS.

V. Progress Since Last Review

The estimate of initial free-phase DNAPL accumulation in the G-Pool, outside of the containment wall, has been refined from 5,000-10,000 gallons (1998) to 2,800 gallons (currently). Approximately 2,500 gallons have been recovered from the G-Pool.

Many incremental improvements have been and continue to be achieved in the operation of the remedies.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer)

No

Question A (Comment)

Some portions of the remedy appear to be functioning as intended, but others do not, as described below.

Containment wall: no.
Groundwater elevation data through April 2001 suggest that an inward gradient is not maintained along a portion of the western segment of the wall which includes the piezometer nest consisting of U2-645, U2-646, and U2-647, and the nest consisting of U2-648, U2-649, and U2-650. A slight outward gradient occurs in this area, indicating the potential for outward contaminant migration. The (visually assessed) trend of these piezometer data, however, suggests that groundwater elevations inside the wall continue to decline in response to extraction, at least in the zone(s) in which the piezometers are screened; if the trend continues, an inward gradient may eventually be achieved. Future

measurements are needed to make this determination. Separate, though related, issues are 1) whether the nested piezometers are screened in hydraulically comparable intervals; and 2) whether exterior piezometers are affected by the UCS. As a group, the nest piezometers inside the wall show a steady decline in groundwater elevation relative to the exterior piezometers, suggesting dewatering inside of the wall. The data also indicate that the groundwater elevation outside of the eastern segment of the wall is kept below 4665 feet amsl, as desired.

Source recovery system, process plant: yes.
Operating data suggest that the SRS process plant effectively separates DNAPL from contaminated groundwater and other fluids extracted from the source, and also effectively treats contaminated water generated by the separation process. Approximately 1,259 gallons of DNAPL were extracted from the source area and recovered by the SRS in 2001; the cumulative total recovered is approximately 43,500 gallons. Steam stripping during 2001 reduced the TCE concentration of contaminated groundwater from an average of 549 ppm to an average 3 ppm, consistently meeting the IWTP influent limit of 16 ppm and maintaining a removal efficiency above 98%. The total VOC influent limit to the IWTP of 25 ppm was not exceeded during 2001.

Source recovery system, extraction wells: no.
Although contaminated groundwater is extracted from the shallow aquifer within the containment wall, groundwater elevations in the extraction wells increased over a period of 5 to 6 months during 2001, and exceeded the action level of 4660 feet amsl for most of the year even though the extraction wells were operated until water yield ceased. Therefore, the proper function of the SRS extraction well remedy cannot be determined until the PSVP action level is reviewed.

Treatability studies and innovative treatments: yes.
SRS operating data indicate that approximately 6,000 gallons (cumulative) of DNAPL have been recovered from the source area as the result of activities associated with treatability studies and subsequent innovative treatments.

Air Stripper Treatment Plant: yes.
During 2001, the ASTP treated approximately 10.5 million gallons of water from the NIT and UCS with removal efficiencies above 99.9% and consistently met the CWSID influent limit of 2.13 ppm total VOCs. The total mass of TCE removed in 2001 from the ASTP was 10.3 lbs.

North Interceptor Trench: no.
A recent and preliminary evaluation (URS 2003) of historical groundwater elevation data form U2-079, U2-080, U2-675, and U2-676 suggest that during the spring portions of the NIT may fail to intercept groundwater flow. In addition, a review of recent TCE concentration data suggests the possibility of increasing TCE concentrations in groundwater samples from U2-675, downgradient of the NIT. Together, these indicate the potential failure of portions of the NIT to intercept contaminated groundwater, at least during certain times of the year. In addition, the latest interpretation of the off-Base groundwater plume (see Figure OU2-1) suggests the NIT does not intercept the entire width of the plume.

Spring U2-326 Interceptor Trench: yes.
Historical TCE concentration data from U2-326 indicate that the U2-326 interceptor trench successfully intercepts shallow contaminated groundwater. However, the trench sump is typically dry except during the spring.

Spring U2-304 Interceptor System: yes.
Historical TCE concentration data from U2-304 indicate that the U2-304 interceptor trench successfully intercepts shallow contaminated groundwater. However, the spring has been dry in recent years.

Institutional Controls: yes.
The institutional controls as implemented appear to be effective. However, The leading edge of the plume is very near the southern boundary of NE ¼, Sect. 29, T5N R1W, which is not subject to water rights restrictions imposed by Hill AFB in conjunction with the Utah Department of Natural Resources. Should the plume advance, it could impinge on this quarter section.

Environmental Monitoring: To be determined.
The long-term environmental monitoring data are not due to be evaluated until 2006.

Question B (Answer)

No

Question B (Comment)

Cleanup levels, listed in the OU 2 ROD (1996), of 1,1,1-trichloroethane, cis 1,2-dichlorethene, lindane, tetrachloroethene, toluene, and trichloroethene for groundwater and surface water are based on the drinking water standard, are still valid (Utah Rule R309-103, MCLs, July 2002). The cleanup levels of Beta-BHC and methylene chloride for groundwater and surface water, and of tetrachloroethene and trichloroethene for soil are based on risk to human health. The risk factors, specifically the cancer slope factors, used to develop the cleanup levels for OU 2 are now 10-times to 10,000-times more stringent (EPA Region III 2002; URS 2002c).

The baseline risk assessment (Radian, 1992b) considered the inhalation of indoor air in conjunction with showering as a potentially significant current and future pathway for both onsite and offsite residential exposure. However, no indoor air sampling was performed during the remedial investigation (Radian, 1992a), perhaps because the off-site land use at the time was predominantly agricultural. Since then, EMR, EPA, and Utah DEQ have jointly established a new action level for TCE concentration in indoor air of 0.43 ppbv. In addition, new homes have been built and new subdivisions developed in formerly agricultural areas downgradient of the source (Himle, C. 2003). A map showing the relationship between the new subdivisions and the off-Base plume had not been developed at the time of this review. The new indoor action level for TCE, combined with the increasing residential use downgradient of the source, raises the potential for indoor air quality issues that have not been addressed. This possibility should be investigated by updating maps showing the relationship between new residential development and the groundwater contamination plume.

Question C (Answer) Yes

Question C (Comment) In 1997, after construction of the containment wall, an accumulation of mobile-phase DNAPL was discovered outside of the containment wall during a treatability study. This accumulation, the "G-Pool," was adjacent to the northeast corner of the containment wall and contained an estimated 2,800 gallons of DNAPL. (Note: The 1998 FYR indicated an estimated 5,000 to 10,000 gallons in the G-Pool, made without the benefit of subsequent characterization and treatability studies.) Approximately 2,500 gallons of DNAPL have been recovered from the G-Pool, and small volumes of free-phase DNAPL continue to be recovered. To prevent the G-Pool from acting as a continuing source of dissolved-phase contamination, groundwater is maintained by extraction at an elevation less than 4460, the elevation of a saddle east of the pool in the topography of the Alpine Formation. Although hydraulic control is effective, the G-Pool is a source of contamination outside of the containment wall, so the wall does not control contaminant flux out of the G-Pool.

A large body of data exists for WP007. A check of these data indicates that they sometimes appear to support multiple, and conflicting, interpretations (e.g., dewatering interior to the containment wall). In other cases a remedy may be seasonally ineffective (e.g., at least one portion of the NIT does not appear to intercept groundwater during the spring months). There has not been a comprehensive study of the remedies, however, since remedial action began in 1993 with the startup of the SRS. Given the high level of investment, such a review is warranted. The mechanical systems (the SRS, ASTP, and associated liquid conveyance systems) appear to be functioning as designed.

A recent review of time-series data (URS 2003) of TCE concentration in U2-675 raises the possibility of increasing contaminant concentrations in groundwater downgradient of the NIT. The review is preliminary, but reinforces the need for an interim evaluation, before the PSVR in 2006, of the remedies addressing contamination stemming from WP007.

VIII. Issues

1. A joint evaluation of the SRS and the containment wall is ongoing. Protectiveness provided by these remedies cannot be determined until the data have been thoroughly evaluated and interpreted.

2. The proper function of the SRS extraction well remedy cannot be determined because the action level stated in the PSVP does not correspond to the water level elevation that can be achieved within the containment wall with maximum pumping of these wells. No rationale for this action level is given in the PSVP.

3. A preliminary evaluation of groundwater elevation and TCE concentration data from wells in the vicinity of the NIT suggest the possibility that during the spring months the NIT fails to intercept contaminated groundwater. Also, based on the latest interpretation of the off-Base plume (see Figure OU2-1), the NIT does not intercept the entire width of the plume.

4. The data collected by the LTM contractor are not readily available to the O&M contractor, though they may have a bearing on the operation of the remedies.

5. Since the baseline risk assessment (Radian 1992b), EMR, EPA, and Utah DEQ have jointly established a new action level for TCE concentration in indoor air of 0.43 ppbv. In addition, new homes have been built and new subdivisions developed in formerly agricultural areas downgradient of the source.

6. The leading edge of the plume is very near the southern boundary of NE ¼, Sect. 29, T5N R1W, which is not subject to water rights restrictions imposed by Hill AFB in conjunction with the Utah Department of Natural Resources (HAFB 1998). Should the plume advance, it could impinge on this quarter section.

7. A thorough review of several portions of the remedial systems addressing contamination at OU 2 may be justified sooner than the PSVR scheduled in 2006 because they have been in operation since 1993.

IX. Recommendations

1. Jointly evaluate the effectiveness of the SRS and the containment wall.

2. Identify the appropriate action level for well field operations and document new level and rationale in the PSVP.

3. Water level and analytical data in the vicinity of the NIT, the performance of the NIT, and the location of the NIT with respect to the dissolved-phase plume should be thoroughly evaluated.

4. Expedite submittal of LTM data to ERPIMS for timely review of remedy effectiveness.

5. Continue use of the portable DNAPL pump assembly to remove free-phase DNAPL from wells. Consider purchase of a second system, which would enable simultaneous recovery of DNAPL from two separate wells.

6. Investigate the relationship between new residential development and the plume.

7. Re-evaluate the risk analysis for OU 2 to determine if revised contaminant action levels are warranted based on new standards and toxicity factors as explained in the Technical Assessment above.

8. Consider the need to restrict water rights in the northeast quarter of Sect. 29, T5N R1W.

9. Evaluate whether a thorough review of the remedies at OU 2 can be performed before 2006.

X. Protectiveness

Protectiveness cannot be determined until further information is obtained

Protectiveness Statement

A protectiveness determination of the remedies associated with WP007 cannot be made until further information is available. Within the time between the remedy selection and this Five-Year Review, USEPA has published changes to toxicity factors that affect

chemical-specific clean-up levels at the site. Therefore, a re-evaluation of potential risk at WP007 must be conducted before the protectiveness of the current remedies can be determined.

The remedies specified by the ROD and now in-place constitute an appropriate response to contamination resulting from WP007 if operating as designed. A comprehensive evaluation of relevant data generated since remediation began is needed, however, in order to make a strong protectiveness statement by comparing operating data against design objectives. An assessment of the joint performance of the containment wall and the SRS, in operation together since 1996 is needed to make a clear statement about the prevention of continuing downgradient groundwater stemming from the source area. This assessment, along with a completed PSVR, due in 2006, will be useful for determining the protectiveness of the remedial actions at WP007 during the next Five-Year Review (2008).

XI. Next Required FYR 2008

OU 2 SS021 PERIMETER ROAD

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

SS021, also known as Perimeter Road, is located along the northeastern boundary of Hill AFB. No remedial action is required at this site; it is included in the 2003 Five-Year Review for completeness.

II. Site Chronology

See Table OU 2-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

SS021 (Perimeter Road) was reportedly the site of previously unidentified dumping of waste solvents prior to 1979, in addition to dumping known to have occurred at a number of sites now associated with other Operable Units. A soil gas investigation conducted in 1998 along the entire length of SS021 concluded that dumping of solvents occurred only at sites now associated with other Operable Units; employees who conducted the dumping operations prior to 1979 confirmed this conclusion.

A Final Decision Document (HAFB EMR 1991a) states that no further response is required at SS021. The Record of Decision for Operable Unit 2 (CH2M 1996) states that SS021 has been found to be free of contamination except in those areas being addressed as part of existing Operable Units, and that no further action is needed.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
NA	NA - No history of contamination at this site.	NA

Remedial Action Objectives

* None

IV. Remedial Actions

None. No further action is needed at this site.

V. Progress Since Last Review

The Record of Decision for Operable Unit 2 determined that no further action is needed at this site. SS021 was not reviewed in the 1998 Five-Year Review.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer) Not Applicable

Question A (Comment) No further action is needed at this site.

Question B (Answer) Not Applicable

Question B (Comment)	No further action is needed at this site.
Question C (Answer)	Not Applicable
Question C (Comment)	No further action is needed at this site.
VIII. Issues	None. No further action is needed at this site.
IX. Recommendations	None.
X. Protectiveness	Not Applicable
Protectiveness Statement	The Perimeter Road site (SS021) was recommended for NFRAP status in 1991 because the site has been found to be free of contamination except in those areas being addressed as part of existing Operable Units.
XI. Next Required FYR	None - Current FYR is Final

Operable Unit 3

I Introduction

OU 3 is a soils-only OU that consists of five IRP sites, including the Sodium Hydroxide Tank Site, Berman Pond, the IWTP Sludge Drying Beds, Building 514 [Refueling Vehicle Maintenance Facility (RVMF)], and Pond 2 (see Table OU 3-1). The IWTP Sludge Drying Beds, Building 514, and Pond 2 are closed sites with no further remedial action planned. The remedial actions at the Sodium Hydroxide Spill Site and Berman Pond are inspected and maintained annually. Groundwater contamination below OU 3 is addressed as part of OU 8.

Table OU 3-1. OU 3 Site Identification

Site ID	Site Name
ST004	SODIUM HYDROXIDE TANK SITE
WP005	BERMAN POND
WP006	IWTP SLUDGE DRYING BEDS
ST018	BUILDING 514
SD046	POND 2

II Site Chronology

See Table OU 3-2 for a history of events in this OU. The table is organized to describe events that impacted the OU as a whole, followed by events impacting specific IRP sites within the OU.

III Background

OU 3 is located near the South Gate Entrance at Hill AFB and includes two open IRP sites (Sodium Hydroxide Tank Site and Berman Pond), and three closed IRP sites (IWTP Sludge Drying Beds, Building 514, and Pond 2). The list of contaminants of concern for Berman Pond are included in the Site Summary (Section XIII) for Site WP005. The remedial actions for the two open sites are cap installation, cap maintenance, and institutional controls. Contaminated soils from these two sites have been capped with an asphalt cover to minimize infiltration. Performance indicators for these two sites include increased contaminant concentrations observed in monitoring wells (MWs) upgradient and/or downgradient of these sites, which may indicate that groundwater is in contact with the contaminated soils and migrating off-site. The other three IRP sites were either closed following remedial action success (ST018) or after the RI indicated that no contamination was evident (SD046 and WP006). Two additional sites were originally investigated as part of OU 3 [Pond 1 (SD034) and Pond 3 (SD023)]. These sites were closed under OU 3, but have been reopened and are undergoing further investigation as part of OU 9.

IV Remedial Actions

No remedial actions were implemented at the IWTP Sludge Drying Beds or Pond 2. Remedial actions that have been implemented at OU 3 to address soil contamination are listed below:

ST018 – Building 514

1. In-Situ Vapor Extraction
   An SVE system was installed to reduce the concentrations of 1,1-DCE in the soil to 0.8 mg/kg. The SVE system consisted of a concrete pad foundation and security fence, a 15-foot deep SVE well inside Building 514, two trenches (one from the new SVE well and another from an existing well outside Building 514) leading to the SVE system pad (MW 1996). The remedy was successful and closure was therefore approved on May 2001.

2. Institutional Controls
   Institutional controls consisted of fence installation with warning signs to restrict access to the treatment facility and implementation of the continuing order to restrict access (HAFB 1998).

ST004 – Sodium Hydroxide Tank Site

1. Cap Installation and Maintenance
   In 1992, a temporary cap was constructed at the ground surface after the tanks were removed and the area backfilled in 1992 (HAFB EMR 1992a). An area of approximately 29,000 square feet was capped to cover the apparent lateral extent of the NaOH plume in the soil beneath the tanks. The tank removal project was administered by UDERR via its Underground Storage Tank (UST) rules. An annual cap inspection program is ongoing at the permanent remedy.

2. Institutional Controls
   The institutional controls specified in the ROD include a continuing order from the Installation Commander and covenants to the deed (HAFB 1998), which will be in effect as long as the property is owned by the Air Force. The continuing order restricts installation of any new underground utilities or other construction activities in the area of the cap and requires that the integrity of the cap is maintained.

WP005 – Berman Pond

1. Cap Installation and Maintenance
   Prior to the cap installation, the water in the former pond was extracted to the extent possible. The selected capping system is designed to meet the regulatory permeability requirement of $1x10^{-7}$ cm/sec. The cap reduces the potential for exposure to the contaminated soils and minimizes seepage through the soils to groundwater thereby protecting groundwater quality. Perched water elevations measured in four sumps located within the asphalt cap are measured to ensure that they do not exceed the prescribed elevation action levels (CH2M 2001). If the perched groundwater levels exceed the prescribed elevation action level, pumps should be installed in the extraction sumps.

2. Institutional Controls
   Institutional controls include a provision for long-term maintenance of the cap and development of standard operating procedures (SOPs) to ensure effectiveness, posting of signs warning of subsurface contaminated soil in the area, and a continuing order from the Installation Commander (HAFB 1998). The continuing order restricts access to contaminated soils as long as Hill AFB owns the property.

V Progress Since Last Five-Year Review

The sites included in the 1998 Five-Year Review (HAFB EMR 1998) were ST004, WP005, and ST018. All of the recommendations that were included in the 1998 Five-Year Review have been addressed except for institutional controls, such as signage and painted delineations, at Berman Pond and the Sodium Hydroxide Tank Site.

VI Five-Year Review Process

Site review was conducted per the process described in this report for the overall 2003 FYR.

VII Technical Assessment

Results of the technical assessment for each site in OU 3 and for the Operable Unit as a whole are listed in Table OU 3-3. Details of the technical assessment for each site in OU 3 are provided in their respective site summaries (see Section XIII).

Table OU 3-3. Technical Assessment Summary for OU 3

Site ID	Remedy	Technical Assessment*			Protectiveness	Next Five-Year Review
		Question A	Question B	Question C		
ST004	Cap Maintenance and Institutional Controls	Yes	Yes	Yes	Protective	2008
WP005	Cap Maintenance and Institutional Controls	Yes	No	No	Protective	2008
WP006	NA	NA	NA	NA	NA	NA
ST018	In-Situ Vapor Extraction and Institutional Controls	Yes	Yes	No	Protective	NA
SD046	NA	NA	NA	NA	NA	NA
OU 3	Cap Maintenance and Institutional Controls	Yes	No	Yes	Protective	2008

* Question A: Is the remedy functioning as intended by the decision documents?
Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objective (RAOs) used at the time of the remedy still valid?
Question C: Has any other information come to light that could call into question the protectiveness of the remedy?
NA = Not Applicable

Question A. Is the remedy functioning as intended by the decision documents?

ST004 – Sodium Hydroxide Tank Site
Yes. Performance indices (CH2M 2001) include significant increases in groundwater pH or in concentrations of TDS, sodium, arsenic, or selenium downgradient of the original tank location. No significant increases are evident for any of these parameters over the eight-year period since August 1996.

WP005 – Berman Pond
Yes. During a cap inspection in August of 2002, the cap was found to be performing as designed. Permeability tests ranged from 38 to 78 mL/min. Groundwater levels at the extraction sumps at Berman Pond show that the elevations are approximately 10 feet above the action level prescribed in the PSVP (CH2M 2001) and have been since 1998. Pumps have not been installed in the groundwater extraction sumps, as prescribed in the ROD (HAFB EMR 1995). According to the interviews conducted as part of this review, Hill EMR believes that the OU 8 interim remedial action (extraction wells) is capturing the elevated perched contaminated groundwater from OU 3 (Watkins, J. 2002).

ST018 – Building 514
Yes. The SVE remedial action decreased the soil contamination of 1,1-DCE to below detectable concentrations (0.005 mg/kg) in all of the samples collected from the confirmation soil borings. The goal of the remedy was to decrease the concentrations of 1,1-DCE to less than 0.8 mg/kg.

Question B. Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objective (RAOs) used at the time of the remedy still valid?

ST004 – Sodium Hydroxide Tank Site
Yes. The arsenic cleanup level is currently valid. However, it should be noted that the revised arsenic standard of 10 ug/L (ppb) will be effective in 01/26/2006.

WP005 – Berman Pond
No. The inhalation cancer slope factor (CSF) for methylene chloride has increased from 1.65×10^{-6} to 1.65×10^{-3} $(mg/kg/d)^{-1}$ (1,000 times more stringent) at OU 2 and OU 3 (EPA Region III 2002). There was no MCL available for 1,1,2,2-tetrachloroethane for the risk analysis in the ROD, so a toxicity factor was not listed for comparison. However, there was a change for this compound in the EPA Region 3 RBC Table in Oct 1998.

ST018 – Building 514
Yes. The 1,1-DCE MCL of 0.8 mg/kg is still valid.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

ST004 – Sodium Hydroxide Tank Site
Yes. It was noted in the annual inspection report (URS 2002a) that several roll-off bins had been stored to the south of Building 577 for some time. Subsequently, an inspection of the asphalt on August 12, 2001 revealed a number of depressions in the asphalt, which were recommended for repair.

WP005 – Berman Pond
No. No additional information has come to light that could call into question the protectiveness of the remedy.

ST018 – Building 514
No. No additional information has come to light that could call into question the protectiveness of the remedy.

VIII Issues

Based on the information reviewed, issues that may affect protectiveness of the selected remedies at OU 3 are:

ST004 – Sodium Hydroxide Tank Site

1. Storage of heavy equipment (roll-off bins) on the asphalt cap at ST004 may jeopardize the integrity of the cap (URS 2002). Warning signs have been made but have not been installed to date.

WP005 – Berman Pond

2. Pumps were initially installed five years ago to pump the perched water level down as far as possible and then removed when the asphalt cap was installed. However, the groundwater levels in the extraction sumps at Berman Pond have been above the elevation actions level set in the PSVP (CH2M 2001) for the past four years. The ROD (HAFB EMR 1995) states that when the perched groundwater elevations exceed the action level, pumps should be installed and a pumping strategy, sampling and analysis plan, and continued groundwater level monitoring should be implemented. These activities have not been conducted to date because EMR staff believe the OU 8 interim remedial action (extraction wells) is capturing any contaminated groundwater originating from Berman Pond.

3. Warning signs and painted delineations of the asphalt cap (as recommended by the 1998 Five Year Review) have not been installed to date.

4. Recommendations made by the site inspector on September 2002 (Vicelja, J. 2002) have not been addressed to date. These recommendations included slurry sealing the asphalt cap in the fall of 2002 and changing the landscape-watering scheme to reduce ponding on the cap surface.

IX Recommendations and Follow-up Actions for OU 3

The recommendations and follow-up actions for OU 3 are:

1. If future work compromises the integrity of the remedies at OU 3, the risk analysis for the active sites should be re-evaluated to determine if revised contaminant action levels are warranted based on new standards and toxicity factors as explained in the Technical Assessment above.

ST004 – Sodium Hydroxide Tank Site

2. Continue inspection and monitoring program for the cap.
3. Patch any damaged areas of the cap in the areas where the roll-off bins were located.
4. Continue with the current groundwater-monitoring plan.
5. Add painted delineations to the perimeter of the asphalt cap.
6. Post warning signs prohibiting storage of equipment and excavation without permission.
7. Develop procedures for excavation and equipment storage to minimize defects in the asphalt cap.

WP005 – Berman Pond

8. The PSVP should be revised to document the change of remedial actions at the site (the groundwater contamination from Berman Pond is captured by the OU 8 interim remedial action and therefore the pumping action level is not required).
9. Change the watering scheme for the landscaping around the asphalt cap at Berman Pond according to the recommendations made following the September 2002 cap inspection (Vicelja, J. 2002).
10. Slurry seal the asphalt cap in the summer of 2003 to prevent excess infiltration according to recommendations made following the September 2002 cap inspection (Vicelja 2002).
11. Post warning signs prohibiting storage of equipment and excavation without permission.
12. Add painted delineations to the perimeter of the asphalt cap.

X Protectiveness Statement for OU 3

The remedies associated with OU 3 are protective of human health and the environment. However, within the time between the remedy selection and this Five-Year Review, USEPA has published changes to toxicity factors that affect chemical-specific clean-up levels at OU 3. Therefore, if future work at OU 3 compromises the integrity of the remedies, a re-evaluation of potential risk must be conducted to determine if revised contaminant action levels are warranted based on new standards and toxicity factors.

Additional items that need to be addressed are described in the previous issues and recommendations and include revision of the PSVP to document the change of remedial action at the site. A completed PSVR, due in 2006, will be useful for determining the protectiveness of the remedial actions at OU 3 during the next Five-Year Review (2008).

XI Next Review

The next FYR for OU 3 is required by 2008. No future review is required for the IWTP Sludge Drying Beds, Building 514, or Pond 2 sites because no further remedial actions are required at these sites.

XII References for Operable Unit 3 Summary

(CH2M 2001) Performance Standard Verification Plan Operable Unit 3, CH2M Hill, November 2001.

(EPA Region III 2002) Risk-Based Concentration Table, EPA Region III, October 9, 2002, EPA Region III, 9 October 2002.

(HAFB 1998) OO-ALC-HAFB Supplement I, AFI 32-7020, 29 April 1998, Hill AFB, 29 April 1998.

(HAFB EMR 1992b) U.S. Air Force Installation Restoration Program Remedial Investigation / Feasibility Study Hill AFB, Utah, Decision Paper Site SD046 - Storm Pond 2 No Further Response Action Planned., Hill AFB EMR, 30 June 1992.

(HAFB EMR 1992a) Record of Decision for Interim Action at Operable Unit 3 Site ST04, Hill AFB EMR, September 1992.

(HAFB EMR 1995) Record of Decision for Operable Unit 3, Hill AFB EMR, September 1995.

(HAFB EMR 1998) CERCLA 1998 Five-Year Review Hill Air Force Base, Utah, Hill AFB EMR, September 1998.

(MW 1996) 100 Percent Technical Specifications - SVE System Remedial Design Operable Unit 3, Montgomery Watson, September 1996.

(MW 1999a) Remedial Action Project Close-Out Report for Operable Unit 3, Montgomery Watson, April 1999.

(MW 1999b) Annual Report for Operable Unit 3 Sodium Hydroxide Tank Site and Berman Pond, December 1999, Montgomery Watson, December 1999.

(URS 2001) Statement of Concurrence With No Further Response Action Planned (NFRAP), Building 514 Refueling Vehicle Maintenance Facility (RVMF), Installation Restoration Program (IRP) Site ST018, URS Greiner, Inc., May 2001.

(URS 2002) 2001 Operation and Maintenance Reports OU 3 Sodium Hydroxide Tank Site Cap and Berman Pond Cap, OU 4 Landfill 1 Cap and Soil Vapor Extraction Drain System, and OU 7 Building 225 Floor Slab, Hill Air Force Base, Utah, URS, March 2002.

(Vicelja, J. 2003) Consulting Engineer, P.E., Joseph Vicelja Consulting Engineering, Personal Communication, 07 February 2003.

(Watkins, J. 2002) EM Operations Program Manager, Hill AFB EMR, Personal Communication, 24 October 2002.

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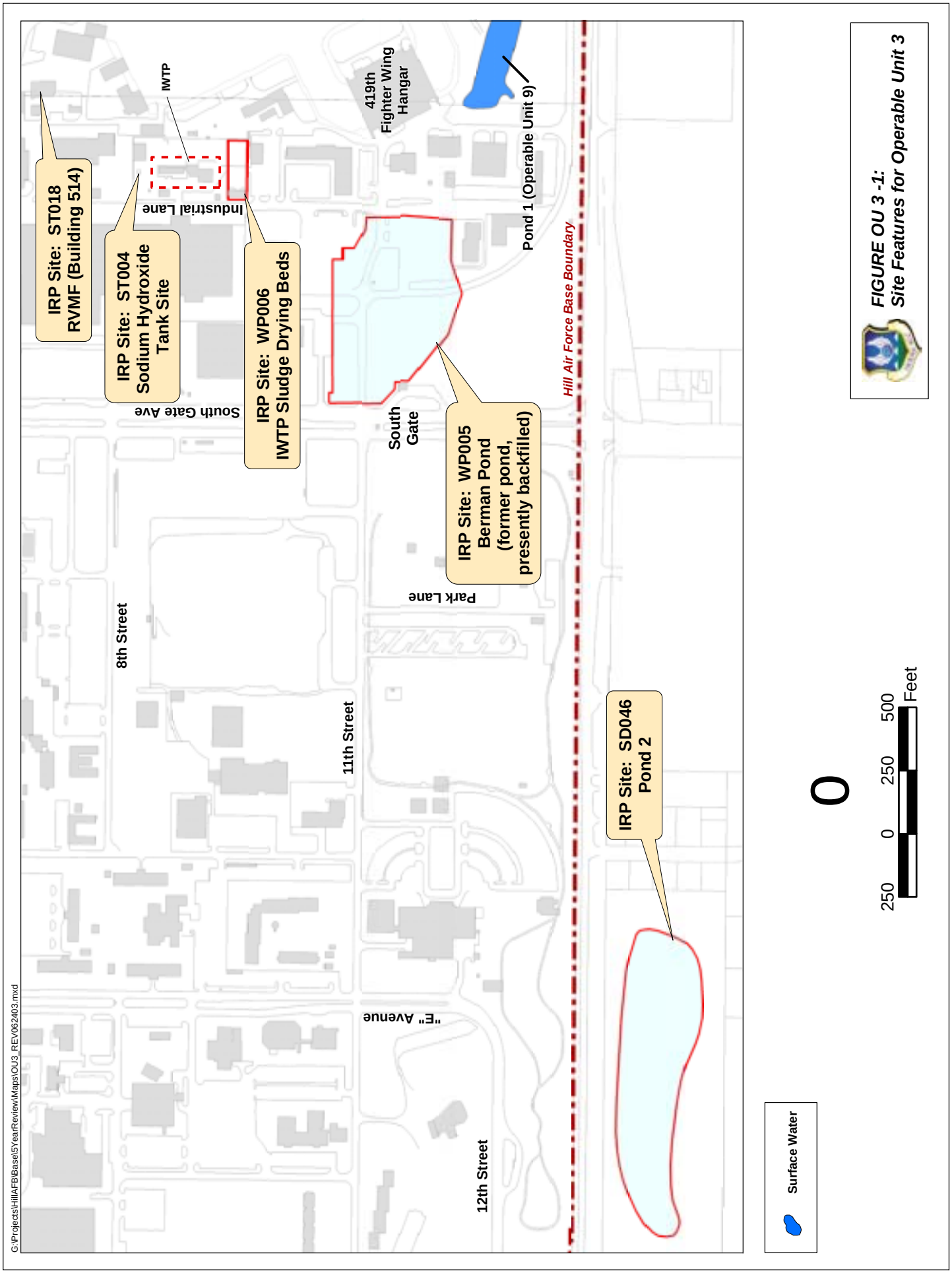

FIGURE OU 3 -1:
Site Features for Operable Unit 3

Table OU 3 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
OU 3	**OPERABLE UNIT 3**			
	1993	Contaminated groundwater designated as OU 8	Due to multiple sources of groundwater contamination, the contaminated groundwater underlying the South Area was designated as OU 8.	Performance Standard Verification Plan Operable Unit 3
	1995	Remedial Investigation	The Remedial Investigation was submitted to EMR in 1995. The Baseline Risk Assessment was included in this submission.	Remedial Investigation Report for Operable Unit 3 (IRP Sites ST04, WP05, WP06, ST18, SD23, OT33, SD34, and SD46), Draft Final
	1995	Feasibility Study	The Final Feasibility Study was submitted to EMR in 1995. Results concluded that no remedial action was required for the IWTP Sludge Drying Beds.	Feasibility Study for Operable Unit 3 (IRP Sites ST04, WP05, WP06, ST18, SD23, SD34)
09	1995	Record of Decision	The selected remedy called for SVE at Site ST018, a cap at Berman Pond (WP005), and cap maintenance at Site ST004. The ROD also closed the IWTP Sludge Drying Beds.	Record of Decision for Operable Unit 3
ST004	**SODIUM HYDROXIDE TANK SITE**			
	1950	Construction	The construction of two storage tanks for sodium hydroxide (NaOH).	Record of Decision for Interim Action at Operable Unit 3 Site ST04

Table OU 3 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
	1980	NaOH Spill	Approximately 150,000 gallons of NaOH leaked from tanks in one year period.	Record of Decision for Interim Action at Operable Unit 3 Site ST04
04	1984	NaOH Spill	An additional 134,000 gallons leaked from April to June in 1984. The concentration of NaOH was 25 percent by weight.	Record of Decision for Interim Action at Operable Unit 3 Site ST04
09	1992	NaOH tanks removed	Both 12,000 gallons tanks were removed in accordance with UDEQ.	Record of Decision for Operable Unit 3
08	1993	Remedial Action	An asphalt surface covering was installed over the area.	Record of Decision for Interim Action at Operable Unit 3 Site ST04
	1999	Additonal cap construction	The interim remedial cap was covered with a permanent remedial asphalt layer.	Record of Decision for Operable Unit 3

Table OU 3 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
WP005 BERMAN POND				
	1940	Operation	From 1940 to 1956, Berman Pond (WP005) was operated as an unlined evaporation pond that received storm water runoff and industrial wastewater, which may have included spent solvents, heavy metals, and hydrocarbons.	Performance Standard Verification Plan Operable Unit 3
	1956	Operation	Prior to 1956, Berman Pond was connected to Pond 1 (see Figure OU 3-1), which received overflow from Berman Pond during high intensity storms. After construction of the lWTP in 1956, Berman Pond was connected to a sanitary sewer line and was used only as a storm water retention pond.	Performance Standard Verification Plan Operable Unit 3
	1958	Operation	In 1958, pond overflow was re-routed to the storm drainage system, and between 1958 and 1970, the pond was filled with construction rubble and soils, and regraded.	Performance Standard Verification Plan Operable Unit 3
	1984	A soil cap was installed over a portion of the pond	The cap was not effective in reducing infiltration	Hill AFB Environmental Restoration Management Action Plan - 2001
	1986	Remedial Action	A cap, consisting of silt and clay, was installed over a portion of the pond.	Record of Decision for Interim Action at Operable Unit 3 Site ST04

Table OU 3 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
	1994	Treatabilty Study	Dewatering treatability study completed. The pond was dewatered for the installation of the cap.	Record of Decision for Interim Action at Operable Unit 3 Site ST04
	1997	Remedial Action	An asphalt cap was installed over the entire pond to reduce infiltration.	Hill AFB Environmental Restoration Management Action Plan - 2001
WP006	**IWTP SLUDGE DRYING BEDS**			
	1956	Waste disposal started	Beginning in 1956, sludge from the clarifier was pumped to two sludge drying bed areas south of the treatment facility. The sludge material was composed of paint stripping, chrome plating, and degreasing wastes and was stored in the sludge beds to dry.	Remedial Investigation Report for Operable Unit 3 (IRP Sites ST04, WP05, WP06, ST18, SD23, OT33, SD34, and SD46), Draft Final
	1985	Remedial Investigation	RI at the IWTP initiated. Based on the findings, the IWTP Sludge Drying Beds did not pose any current or future health risks or present a threat to groundwater	Remedial Design Report and Work Plan for Operable Unit 3
	1987	Sludge dewatering facilty started	In June 1987, a sludge dewatering facility was put into operation to dewater IWTP sludge with a filter press and dryers. The sludge drying beds are still used for temporary storage before running the sludge through the dryers.	Remedial Investigation Report for Operable Unit 3 (IRP Sites ST04, WP05, WP06, ST18, SD23, OT33, SD34, and SD46), Draft Final

Table OU 3 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
	1995	NFRAP	Accepted for NFRAP status in the ROD	Record of Decision for Operable Unit 3
ST018	**BUILDING 514**			
	1985	Operation	Through 1985, drained fuels were collected in a floor drain at the RVMF, passed through an oil/water separator, and either disposed of or recycled. Collected water was stored in a small underground storage tank (UST) and subsequently pumped to the IWTP for treatment.	Record of Decision for Operable Unit 3
10	1997	SVE System Installed at RVMF	An SVE system was installed at Bldg. 514 and began operation on October 10, 1997. The system was operated for approximately one year.	Remedial Action Project Close-Out Report for Operable Unit 3
05	2001	NFRAP	The site was recommended for NFRAP status and was accepted due to the success of the SVE.	Statement of Concurrence With No Further Response Action Planned (NFRAP), Building 514 Refueling Vehicle Maintenance Facility (RVMF), Installation Restoration Program (IRP) Site ST018
SD046	**POND 2**			
	1974	Operation	Pond 2 was an ephemeral stormwater pond that received occasional excess surface runoff from Hill AFB until 1974. At that time, the storm drain was rerouted to Pond 3.	U.S. Air Force Installation Restoration Program Remedial Investigation/Feasibilty Study Hill AFB, Utah, Decision Paper Site SD046 - Storm Pond 2 No Further Response Action Planned.

Table OU 3 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
	1991	Sold to private entity	The site was closed with a decision document in 1992 and sold off-Base to a private entity in 1991	U.S. Air Force Installation Restoration Program Remedial Investigation/Feasibilty Study Hill AFB, Utah, Decision Paper Site SD046 - Storm Pond 2 No Further Response Action Planned.

XIII Five-Year Review of Sites in OU 3

Operable unit review results are summaries of findings for all of the sites in each operable unit. The following site summaries present a detailed review of each IRP site. Therefore, much of the information presented in the Site Summaries is a duplicate of what was presented in the OU Summary.

The reader is encouraged to use the Site Summary to obtain details on specific contaminants of concern and the technical assessment for each site.

OU 3 ST004 SODIUM HYDROXIDE TANK SITE

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

ST004 is the former location of two 12,000-gallon USTs that were used to store sodium hydroxide solution. Several large spills occurred at the site which contaminated the soils with high pH solution. As part of interim remedial actions, an asphalt cap was constructed in 1993 to prevent exposure to high pH soils. Several groundwater monitoring wells are sampled for arsenic, TDS, selenium, sodium, and pH. The upgradient and downgradient concentrations of selenium, sodium, TDS, pH, and arsenic have remained steady over the past eight years.

II. Site Chronology

See Table OU 3-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

ST004 is located in the southeast quadrant of Hill AFB in an industrial area used to service and maintain aircraft. ST004 is north of the 419th Fighter Wing hanger (see to Figure OU 3-1). ST004 is the former location of two 12,000-gallon USTs that were used to store 25% by weight solution of NaOH. During the period that the tanks were used, several hundred thousand gallons of solution were lost due to leakage. Both tanks were removed in 1992 in accordance with UDEQ requirements. An asphalt cap was installed in 1993 as an interim action and covers approximately 29,000 square feet (see Figure OU 3-1). Elevated levels of soil pH (resulting from the release of sodium hydroxide solution) were present in subsurface soil; soil pH ranged from 6.2 to 12.9 pH units. Several metals also were detected above background levels, including cadmium and total chromium. Based on the findings and conclusions of the OU 3 RI/FS and the risk assessments, only soils with high pH required remedial action. The area of soil impacted by the sodium hydroxide solution is approximately 70 feet deep and 170 feet wide. The zone of highest pH appears to be located between 25 and 40 feet bgs.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
NA	NA	NA

Remedial Action Objectives

* Reduce contaminant transport from within source areas and reduce chemical transport from soil to ground water by minimizing surface water infiltration.
* Prevent human exposure to contaminated soil through ingestion, inhalation, and dermal contact, so that the individual excess cancer risk is below 1E -4 with a target of 1E-6, and the threshold non-cancer hazard index is less than 1.0.

IV. Remedial Actions

Cap Installation and Maintenance

In 1992, a temporary cap was constructed at the ground surface after the tanks were removed and the area backfilled in 1992 (HAFB EMR 1992a). An area of approximately 29,000 square feet (170 feet by 170 feet) was capped to cover the apparent lateral extent of the NaOH plume in the soil beneath the tanks. The tank removal project was administered by UDERR via its Underground Storage Tank (UST) rules. All related UST activities were conducted pursuant to a permit issued by UDERR. An annual cap inspection program is ongoing at the now permanent remedy.

Institutional Controls

The institutional controls specified in the ROD include a continuing order from the Installation Commander and covenants to the deed, which will be in effect as long as the property is owned by the Air Force (HAFB 1998). The continuing order restricts installation of any new underground utilities or other construction activities in the area of the cap, provides for the use of proper protective equipment in the event that access through the cap is required, and requires that the integrity of the cap is maintained (i.e., repair cracks that may develop) so that fluids cannot infiltrate to the subsurface.

V. Progress Since Last Review

Recommendations for this site in the 1998 Five-Year Review (HAFB EMR 1998) included paving the entire site with asphalt (permanent remedial action, completed in 1999) and continuing the yearly cap inspection. A database and geographic information service (GIS) system was being developed, at the time of the review, to track the long term operation and maintenance of this remedial action. Currently this information is being captured by ERPIMS.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer)

Yes

Question A (Comment)

Performance indices (CH2M 2001) include a significant rise in groundwater pH or an increase in concentrations of TDS or sodium, increased concentrations of arsenic or selenium, downgradient of the original tank location [U3-029R and U9-002, please refer to the Annual Report for Operable Unit 3 Sodium Hydroxide Tank Site and Berman Pond (MW 1999b) for the location of the two monitoring locations]. No significant increases are evident for any of these parameters over the eight year period since August 1996.

Question B (Answer)

Yes

Question B (Comment)

The arsenic cleanup level is currently valid. However, it should be noted that the revised arsenic standard of 10 ug/L (ppb) will be effective in 01/26/2006.

The RAOs for the remedial actions at ST004 are still valid.

Question C (Answer)

Yes

Question C (Comment)

It was noted in the annual inspection report (URS 2002a) that several roll-off bins had been stored to the south of Building 577 for some time. These bins were recently removed. Subsequently, an inspection of the asphalt on August 12, 2001 revealed a number of depressions in the asphalt which were recommended for repair. However, this repair had not been performed at the time of the site inspection for this review. Damage to the cap

could jeopardize its integrity and allow infiltration.

VIII. Issues

*Storage of heavy equipment on the asphalt cap may jeopardize the integrity of the cap.
*Warning signs and painted delineations of the cap have not been installed to deter storage of this kind of equipment.

IX. Recommendations

*Continue inspection and monitoring program for the cap.
*Patch any damaged areas of the cap in the areas where the roll-off bins were located.
*Continue with the current groundwater-monitoring plan
*Add painted delineations to the perimeter of the asphalt cap.
*Post warning signs prohibiting storage of equipment and excavation without permission.
*Develop procedures for excavation and equipment storage to minimize defects in the asphalt cap.

X. Protectiveness

Protective

Protectiveness Statement

The remedial actions at ST004 are protective of human heath and the environment based on steady upgradient and downgradient concentrations of selenium, sodium, TDS, pH, and arsenic over the past eight years. The asphalt cap is performing as designed but defects in the cap should be repaired as soon as they are discovered to ensure continuing protectiveness.

XI. Next Required FYR

2008

OU 3 WP005 BERMAN POND

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

Berman Pond (WP005) was operated as an unlined evaporation pond that received storm water runoff and industrial wastewater. As part of interim remedial actions at Berman Pond, a cap consisting of silt and clay was installed over a portion of the pond in 1986. Construction of the asphalt cap was completed in July of 1998. Annual inspection and maintenance of the cap is ongoing as well as groundwater monitoring to determine if the perched water levels are below the action level set forth in the PSVP (CH2M 2001).

II. Site Chronology

See Table OU 3-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

From 1940 to 1956, Berman Pond (WP005) was operated as an unlined evaporation pond that received storm water runoff and industrial wastewater, which may have included spent solvents, heavy metals, and hydrocarbons. Prior to 1956, Berman Pond was connected to Pond 1 (see Figure OU 3-1), which received overflow from Berman Pond during high intensity storms. After construction of the IWTP in 1956, Berman Pond was connected to a sanitary sewer line and was used only as a storm water retention pond. In 1958, pond overflow was re-routed to the storm drainage system, and between 1958 and 1970, the pond was filled with construction rubble and soils, and regraded. Information obtained from aerial photographs indicates that the maximum dimensions of Berman Pond were approximately 800 feet long and 420 feet wide, and encompassed an area of approximately six acres. Berman Pond is located east of the South Gate of Hill AFB in an industrial area used for the servicing and maintaining aircraft. The area is flat, well-drained, and covered by industrial facilities, parking lots, and roadways. A cap, consisting of silt and clay, was installed over a portion of the pond in 1986. Construction of an asphalt cap was completed in July of 1998. Annual inspection and maintenance of the cap continues.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
SOIL	1,1,1-TRICHLOROETHANE	4 mg/kg
SOIL	1,1,2,2-TETRACHLOROETHANE	0.0001 mg/kg
SOIL	1,1,2-TRICHLOROETHANE	0.04 mg/kg
SOIL	1,2-DICHLOROBENZENE	20 mg/kg
SOIL	1,2-DICHLOROETHANE	0.03 mg/kg
SOIL	1,4-DICHLOROBENZENE	2.8 mg/kg
SOIL	ARSENIC	4.1 mg/kg
SOIL	BENZENE	0.05 mg/kg
SOIL	BENZO(a)PYRENE	0.07 mg/kg
SOIL	bis(2-ETHYLHEXYL) PHTHALATE	6 mg/kg

SOIL	CADMIUM	16 mg/kg
SOIL	CHLOROBENZENE	0.95 mg/kg
SOIL	HEPTACHLOR EPOXIDE	0.004 mg/kg
SOIL	METHYLENE CHLORIDE	0.02 mg/kg
SOIL	PCB-1254 (AROCHLOR 1254)	0.06 mg/kg
SOIL	trans-1,2-DICHLOROETHENE	0.7 mg/kg
SOIL	TRICHLOROETHENE (TCE)	0.07 mg/kg
SOIL	VINYL CHLORIDE	0.02 mg/kg

Remedial Action Objectives

* Reduce contaminant transport from within source areas and reduce chemical transport from soil to groundwater by minimizing surface water infiltration.
* Prevent human exposure to contaminated soil through ingestion, inhalation, and dermal contact, so that the individual cancer risk is below 1E–4, with a target of 1E-6, and the threshold non-cancer index is less than 1.0.

IV. Remedial Actions

Cap Installation and Maintenance
Prior to the cap installation, the water in the former pond was extracted to the extent possible. The selected capping system consists of a gravel subbase overlain by a two-inch layer of hydraulic asphalt and a two- to three-inch structural wearing course asphalt layer. The cap reduces the potential for exposure to the contaminated soils and minimizes seepage through the soils to groundwater thereby protecting groundwater quality. Perched water elevations measured in four groundwater extraction sumps located within the asphalt cap are measured to ensure that they do not exceed the prescribed elevation action levels (CH2M 2001). According to the ROD (HAFB EMR 1995), if the perched water levels exceed the prescribed elevation action level, pumps should be installed in the extraction sumps.

Institutional Controls
Institutional controls include a provision for long-term maintenance of the cap and development of standard operating procedures to ensure it remains effective, posting of signs warning of subsurface contaminated soil in the area, and a continuing order from the Installation Commander (HAFB 1998). The continuing order restricts access to, or disturbance of, contaminated soils as long as Hill AFB owns the property.

V. Progress Since Last Review

Recommendations from the 1998 Five-Year Review (HAFB EMR 1998) included the installation of warning signs; verification that the asphalt cap is properly maintained; monitoring of the four settlement monitoring markers annually to detect any significant settlement that might affect cap integrity; and evaluation of the effectiveness of the asphalt cap and perched-water extraction system by monitoring both the water levels within the perched-water zone of Berman Pond and the COC concentrations in one existing upgradient monitoring well and two downgradient wells. All of the recommendations have been instituted except for institutional controls.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer)

Yes

Question A (Comment)

During a cap inspection in August of 2002, the cap was found to be performing as designed. Permeability tests ranged from 38 to 78 mL/min which, according to the inspector, were very low. However, the inspector did suggest that the asphalt cap would need to be slurry sealed and that the landscape watering scheme should be changed to minimize ponding and infiltration. This repair had not been conducted at the time of the site inspection for this Five-Year Review.

Groundwater levels at the extraction sumps at Berman Pond show that the elevations are approximately 10 feet above the action level prescribed in the PSVP (CH2M 2001) and have been since 1998 [please refer to the Annual Report for Operable Unit 3 Sodium Hydroxide Tank Site and Berman Pond (MW 1999b) for the location of the four sump locations]. Pumps have not been installed in the groundwater extraction sumps, as prescribed in the ROD (HAFB EMR 1995). According to the interviews conducted as part of this review, Hill EMR believes that the OU 8 interim remedial action (extraction wells) is capturing the elevated perched contaminated groundwater from OU 3 (Watkins, J. 2002).

Question B (Answer)

No

Question B (Comment)

The inhalation cancer slope factor (CSF) for methylene chloride has increased from 1.65E-6 to 0.00165 (1000x more stringent) (EPA Region III 2002).

The ingestion CSF for PCB-1254 decreased from 7.7 to 2.0 per (mg/kg/d) (less stringent), and the inhalation CSF for PCB-1254 is now available at 2.01 per (mg/kg/d) (EPA Region III 2002).

There was no MCL available for 1,1,2,2-tetrachloroethane for the risk analysis in the ROD, so a toxicity factor was not listed for comparison. However, there was a change for this compound in the EPA Region 3 RBC Table in Oct 1998. Risk may need to be reevaluated.

The RAOs are still valid for the selected remedy.

Question C (Answer)

No

Question C (Comment)

Not applicable.

VIII. Issues

*The groundwater levels in the extraction sumps at Berman Pond have been above the elevation actions level set in the PSVP (CH2M 2001) for the past four years. When the perched groundwater elevations exceed the action level, pumps should be installed and a pumping strategy, sampling and analysis plan, and continued groundwater level monitoring should be implemented. These activities have not been implemented to date. The interviews conducted as part of this review revealed that pumps have not been installed as per the PSVP because Hill EMR believe that the OU 8 groundwater plume is hydraulically connected to the groundwater at OU 3 and that the OU 8 remedial action (extraction wells) is capturing and treating the groundwater from Berman Pond.

*Warning signs and painted delineations of the asphalt cap have not been installed to date.

*Recommendations made by the site inspector on September 2002 (Vicelja, J. 2002) have not been addressed. These recommendations included slurry sealing the asphalt cap in the fall of 2002 and changing the landscape-watering scheme to reduce ponding on the cap surface.

IX. Recommendations

*The PSVP should be revised to document the change of remedial actions at the site (the groundwater contamination from Berman Pond is captured by the OU 8 interim remedial action and therefore the pumping action level is not required).
*Change the watering scheme for the landscaping around the asphalt cap at Berman Pond according to the recommendations made following the September 2002 cap inspection (Vicelja, J. 2002).
*Slurry seal the asphalt cap in the summer of 2003 to prevent excess infiltration through the course layer of asphalt concrete to the hydraulic asphalt layer (which should not exceed a maximum permeability of 1E-7 cm/sec).
*Post warning signs prohibiting storage of equipment and excavation without permission.
*Add painted delineations to the perimeter of the asphalt cap.

X. Protectiveness

Protective

Protectiveness Statement

Based on the findings of this review, the remedies associated with WP005 are protective of human health and the environment. However, within the time between the remedy selection and this Five-Year Review, USEPA has published changes to toxicity factors that affect chemical-specific clean-up levels at OU 3. Therefore, if future work at OU 3 compromises the integrity of the remedies, a re-evaluation of potential risk must be conducted to determine if revised contaminant action levels are warranted based on new standards and toxicity factors.

Additional items that need to be addressed are described in the issues and recommendations sections and include revision of the PSVP to document the change of remedial action at the site. A completed PSVR, due in 2006, will be useful for determining the protectiveness of the remedial actions at OU 3 during the next Five-Year Review (2008).

XI. Next Required FYR	2008

OU 3 WP006 IWTP SLUDGE DRYING BEDS

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

The IWTP began operating in 1956, and sludge from the clarifier was pumped to two sludge drying bed areas south of the facility. A remedial investigation at the IWTP Sludge Drying Beds (WP006) was initiated in 1985 to evaluate the potential for soil and groundwater contamination from past activities. However, the RI/FS and the risk assessments found contaminants in the subsurface soil below the former sludge drying beds were not a current or future health risk or a threat to groundwater. Consequently, cleanup actions were not necessary at the IWTP Sludge Drying Beds. This site was closed in the ROD (HAFB EMR 1995).

II. Site Chronology

See Table OU 3-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

WP006 is located in the southeast quadrant of Hill AFB in an industrial area used for the servicing and maintaining aircraft, just north of the 419th fighter wing hangar (see Figure OU 3-1). Sludge from the IWTP consisted of paint stripping, chrome plating, and degreasing wastes. The drying bed areas were used until 1982 to store semi-solid sludges. The area underlain by the west beds currently is used for a parking area and a warehouse building. The east beds were backfilled to accommodate a 220,000-gallon aboveground wastewater storage tank.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
NA	NA - Risk Assessment indicates no risk to human health and the environment.	NA

Remedial Action Objectives

* Not applicable. No COCs or RAOs for this site.

IV. Remedial Actions

Not applicable. There are no RAOs for this site.

V. Progress Since Last Review

WP006 was not included in the 1998 Five-Year Review.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer)

Not Applicable

Question A (Comment)

There are no remedies associated with this site.

Question B (Answer)

Not Applicable

Question B (Comment)	Not applicable.
Question C (Answer)	Not Applicable
Question C (Comment)	Not applicable.
VIII. Issues	Not applicable.
IX. Recommendations	Not applicable.
X. Protectiveness	Not Applicable
Protectiveness Statement	WP006 was closed in the ROD in 1995 because contaminants in the subsurface soil below the former sludge drying beds did not pose current or future health risks or present a threat to groundwater.
XI. Next Required FYR	None - Current FYR is Final

OU 3 ST018 BUILDING 514

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

From the late 1950s until 1985, the Refueling Vehicle Maintenance Facility (ST018) was used for draining excess fuel from refueling vehicles prior to their maintenance in Building 514 (see Figure OU 3-1). Soil contamination from activities at the RVMF was remediated by in-situ soil vapor extraction. ST018 was granted No Further Remedial Action Planned status in 2001 (URS 2001).

II. Site Chronology

See Table OU 3-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

Through 1985, drained fuels were collected in a floor drain at the RVMF, passed through an oil/water separator, and either disposed of or recycled. Collected water was stored in a small underground storage tank (UST) and subsequently pumped to the IWTP for treatment. Building 514 is no longer used as a collection facility for fuel, and, since September 1988, it has been the Base's Hazardous Waste Control Facility. Building 514 is located in the industrial portion of Hill AFB within the controlled area, which is fenced and access limited (see Figure OU 3-1).

Soil contamination (1,1-DCE) resulting from the activities that took place at the RVMF was remediated using in-situ soil vapor extraction. The SVE system was started on 10 October 1997 and operated for approximately one year when contaminant concentrations of 1,1-DCE in the extracted soil vapor had declined to levels that indicated that the system could be shut down. As confirmation, two soil borings (U3-932 and U3-933) located on the east and west sides of the extraction well, were sampled for VOCs. The results indicated that there were no detectable contaminant concentrations for 1,1-DCE. The RVMF site was recommended and accepted for NFRAP status in May 2001 (URS 2001).

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
SOIL	1,1-DICHLOROETHENE	0.8 mg/kg

Remedial Action Objectives

* Prevent human exposure to the contaminated soils through ingestion, inhalation and dermal contact, so that the individual excess cancer risk is below 1E-4 with a target of 1E-6, and the threshold non-cancer index is less than 1.0.

IV. Remedial Actions

In-Situ Vapor Extraction

An in-situ soil vapor extraction (SVE) system was installed to reduce the concentrations of 1,1-DCE in the soil to 0.8 mg/kg. The SVE system consisted of a concrete pad foundation and security fence, a 15-foot deep SVE well inside Building 514, two trenches (one from the new SVE well and another from an existing well outside Building 514) leading to the SVE system pad (MW 1996). The remedy was successful and closure was therefore approved on May 2001.

Institutional Controls

Institutional controls consisted of installing fencing with warning signs to restrict access to the treatment facility and implementing the continuing order to restrict access (HAFB 1998).

V. Progress Since Last Review

The SVE system at ST018 was in operation during the 1998 Five-Year Review. The review (HAFB EMR 1998) concluded that confirmation sampling was expected by the end of December of 1998. Sampling results would then be interpreted and closure would be determined based upon a review of the data with EPA and UDEQ. During the 1998 Review, pressure readings indicated that the radius of influence had exceeded the calculated design radius for the system. EPA Region VIII, UDEQ, and Hill AFB EMR representatives conducted a final inspection of the SVE system on 20 July 1998 and no significant concerns were identified. The system was later deactivated. A Continuing Order was also issued by the Base Commander in April of 1998 restricting access to, or disturbance of, the RVMF remedial equipment (AFI 32-7020). The 1998 review made no recommendations for the system at ST018.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer)

Yes

Question A (Comment)

The SVE remedial action decreased the soil contamination of 1,1-DCE to below detectable concentrations (0.005 mg/kg) in all of the samples collected from the confirmation soil borings. The goal of the remedy was to decrease the concentrations of 1,1-DCE to less than 0.8 mg/kg.

Question B (Answer)

Yes

Question B (Comment)

The 1,1-DCE MCL (0.8 mg/kg) for soil is still valid.

The RAOs for the remedy at ST018 is still valid.

Question C (Answer)

No

Question C (Comment)

Not applicable.

VIII. Issues

None.

IX. Recommendations

None.

X. Protectiveness

Protective

Protectiveness Statement	The remedy associated with ST018 is protective of human health and the environment because the SVE system decreased soil contamination levels of 1,1-DCE to below the MCL. The site was recommended and accepted for NFRAP status in May 2001 (URS 2001).
XI. Next Required FYR	None - Current FYR is Final

OU 3 SD046 POND 2

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

SD046 (Pond 2) was recommended for No Further Response Action Planned and accepted on 30 June 1992. The site was sold to Mr. Lyle Warner on 13 August 1991 (HAFB EMR 1992b).

II. Site Chronology

See Table OU 3-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

Pond 2 was an ephemeral stormwater pond that received occasional excess surface runoff from Hill AFB until 1974. At that time, the storm drain was rerouted to Pond 3. Pond 2 has been a grass covered surface depression since then. In 1989, two soil samples were taken to analyze VOC concentrations at the site. Contaminants were not detected above quantitation limits for soils and no compounds were detected in the groundwater above federal drinking water standards. A PCB Clearance Certificate and a Finding of No Significant Contamination was submitted by Mr. Joseph H. Battaglia, the Base Commander, before the site was sold to Mr. Lyle Warner on 13 August 1991 (HAFB EMR 1992a). Pond 2 is located on the south side of Utah Highway 193 and is adjacent to the main property of Hill AFB (see Figure 1).

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
NA	NA - No history of contamination at this site.	NA

Remedial Action Objectives

* Not applicable. No COCs or RAOs for this site.

IV. Remedial Actions

Not Applicable.

V. Progress Since Last Review

This site was not included in the 1998 Five-Year Review.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer)

Not Applicable

Question A (Comment)

Not Applicable.

Question B (Answer)

Not Applicable

Question B (Comment)	Not Applicable.
Question C (Answer)	Not Applicable
Question C (Comment)	Not Applicable.
VIII. Issues	Not applicable.
IX. Recommendations	Not applicable.
X. Protectiveness	Not Applicable
Protectiveness Statement	SD046 was accepted for No Further Response Action Planned on 30 June 1992 because no significant contamination or health risk was found during investigations.
XI. Next Required FYR	None - Current FYR is Final

Operable Unit 4

I Introduction

OU 4 is located on the northern boundary of Hill AFB and includes five IRP sites (see Table OU 4-1) that have active remediation in place to address contaminated groundwater and soil. The location of each IRP site is shown in Figure OU 4-1. OU 4 contains a TCE contaminated groundwater plume that extends off Base in the direction of South Weber Drive. Two locations in the distal portion of the plumes do show increasing contaminant levels, but the overall plume dimensions have been relatively static through time.

Landfill No. 1 (LF011) was considered the sole source of contamination in the groundwater at OU 4 in the RI (USGS 1993) and the ROD (HAFB EMR 1994) established four media of concern and chose remedies for each of the media. The Spoils Area (OT020) was accepted as a non-hazardous site with no further remedial action planned in 1992 (Hirschi, S. 1992). Landfill No. 2 (LF012), the North Gate Dump (OT041), and the Munitions Dump (OT042) were found not to have released hazardous substances to the environment and were given NFRAP status in 1994 (HAFB EMR 1994). An area of high concentration (TCE in the groundwater above 1,000 µg/L) was discovered in the vicinity well U4-080 in 1996, suggesting the potential for an additional source near the Landfill No. 2 and the North Gate Dump areas.

Table OU 4-1. OU 4 Site Identification

Site ID	Site Name
LF011	Landfill No. 1
LF012	Landfill No. 2
OT020	Spoil Pit
OT041	North Gate Dump
OT042	Munitions Dump

II Site Chronology

See Table OU 4-2 for a history of events in this OU. The table is organized to describe events that impacted the OU as a whole, followed by events impacting specific IRP sites within the OU.

III Background

Past operations at all five sites in OU 4 include:

- Waste dumping and burning in the late 1940s at Landfills 1 & 2 until burning at Hill AFB was terminated in 1967. Though there are no records of any industrial or hazardous waste disposal at these sites, it has been reported that Landfill No. 1 received wastes from the Ogden Arsenal that included waste oils and solvents from the refueling vehicle maintenance facility (ST018 in OU 3).
- Several drums of waste solvent were reportedly dumped from trucks in the North Gate Dump Area (OT041), but no drums have been found in that area.
- The Spoils Area (OT020) received construction debris (concrete, wood, and soil) from Base activities between 1972 and 1989.
- The Munitions Dump (OT042) was operated by the Ogden Arsenal as an aboveground storage area for munitions during World War II.

Groundwater, contaminated with metals and VOCs (primarily TCE), underlies approximately 69 acres (30-50 ft bgs) at OU 4 and extends northward and off-Base, down the steep slope, into the cities of Riverdale and South Weber. Sources other than Landfill No. 1 may be contributing to the plume (Landfill No. 2 [LF012] and North Gate Dump [OT041]); however, additional investigations are required to determine the actual source of contamination.

Beyond the Base boundary, seeps and springs have been observed flowing out of the hillside. The Davis-Weber Canal, a privately owned irrigation canal, is used each year from April to October, and is located the middle of the slope. Results of analyses of canal water during the RI indicated that the canal has not been a source of contamination, nor is it contaminated with COCs at OU 4.

Located beyond the slope are residential areas and small farms. The TCE contamination has not extended into any area underlying residential areas. Groundwater in the shallow contaminated aquifer is not currently used as a source of drinking water.

IV Remedial Actions

Remedial actions have only been implemented at Landfill No. 1 (LF011) to address both on-Base and off-Base contamination. Remedial actions and remedies have not been applied to the other four IRP sites at OU 4. The remedial action objectives (RAOs) for OU 4 were detailed separately for landfill contents, groundwater and surface water, and indoor air in the ROD (HAFB EMR 1994) and include:

Landfill Contents Remedy
The landfill contents remedy included regrading and revegetation of the landfill cap to reduce infiltration and control runoff, and the installation of a soil vapor extraction system to remove vapor from the landfill contents. The SVE system has not been installed to date because analysis of soil gases show that gas concentrations are too low to justify installation. A "Proposed Explanation of Significant Differences for Operable Unit 4 Landfill Contents Remedy" (EPA Region VIII 1995), was completed to address the elimination of SVE as a portion of the landfill remedy. Piping placed beneath the cap as part of the planned SVE system is currently used to collect landfill leachate. The leachate is periodically collected, sampled and disposed of at the IWTP. There are institutional controls (HAFB 1998) associated with this remedy to restrict access and potential exposure pathways which include fencing, groundwater use restrictions, easements, leases, and signs.

Groundwater Remedy
The groundwater remedy includes the installation of a passive groundwater extraction system. The Horizontal Drain Upgrade System (HDUS) includes an air stripper to pre-treat the extracted groundwater prior to discharge to the Central Weber Sewer Improvement District (CWSID), if necessary. There are institutional controls (HAFB 1998) associated with this remedy to restrict access and potential exposure pathways which include fencing, groundwater use restrictions, easements, leases, and signs.

Surface Water Remedy
The surface water remedy consists of local collection of contaminated surface water at each spring/seep site, treatment using carbon adsorption, and discharge to the subsurface using

infiltration trenches. The collection systems have not been installed to date due to low flows at the spring/seep sites. However, they are monitored on a regular basis per the PSVP (CH2M 2001). There are institutional controls associated with this remedy to restrict access and potential exposure pathways which include fencing, groundwater use restrictions, easements, leases, and signs.

Air Remedy

The air remedy consists of semi-annual monitoring of the off-Base residences overlying contaminated groundwater that is in excess of MCLs. To date, there has not been any indoor air sampling conducted in off-Base residences because there are none located over the plume.

V Progress Since Last Five-Year Review

In the 1998 Five-Year Review (HAFB EMR 1998), it was anticipated that a ROD amendment might be needed to resolve the usefulness of the SVE system at the Landfill No. 1, the low flow rates of the seeps and springs, and the overall practicality of reaching MCLs. Specific progress made since the 1998 FYR includes:

- The HDUS air stripper water effluent permit was changed in August 2000, allowing for a total concentration of 2,130 µg/L total VOCs from the previous limit of 100 µg/L total VOCs. The air stripper was subsequently taken off line on January 2001 due to consistent untreated effluent concentrations well below the new discharge limit (URS 2002).
- A review of the site conceptual model for OU 4 was completed to determine whether a quantitative geosystem model of the site was warranted for future site management purposes (JS/I 2002).
- A slope stability study was conducted to determine the long-term impact of additional extraction trenches (URS 2001).
- The low flow rates of the seeps and springs and the overall practicality of reaching MCLs has not yet been addressed with a ROD amendment. An amendment of the ROD for the seeps and springs is not needed to address the flow rate since the ROD addresses both a low-flow and a higher-flow treatment option.
- The issue of reaching MCLs is a basewide issue that may be addressed at a later date.

VI Five-Year Review Process

Site review was conducted per the process described for the overall 2003 FYR.

VII Technical Assessment

Results of the technical assessment for each site in OU 4 and for the operable unit as a whole are listed in Table OU 4-3. Details of the technical assessment for each site in OU 4 are provided in their respective site summaries (see Section XIII).

Table OU 4-3. Technical Assessment Summary for OU 4

Site ID	Remedy	Technical Assessment *			Protectiveness	Next Five-Year Review
		Question A	Question B	Question C		
LF011	Landfill Cap, HDUS, seep/spring control, air monitoring	No	No	Yes	Protective in the short-term	2008
LF012	NA	NA	NA	NA	NA	2008
OT020	NA	NA	NA	NA	NA	NA
OT041	NA	NA	NA	NA	NA	2008
OT042	NA	NA	NA	NA	NA	NA
OU 4	Landfill Cap, groundwater extraction, surface water and groundwater use restrictions, site access restrictions	No	No	Yes	Protective in the short-term	2008

* Question A: Is the remedy functioning as intended by the decision documents?
Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objective (RAOs) used at the time of the remedy still valid?
Question C: Has any other information come to light that could call into question the protectiveness of the remedy?
NA = Not applicable

Question A. Is the remedy functioning as intended by the decision documents?
No.

Groundwater Remedy
The groundwater remedy was intended to provide hydraulic containment, which would prevent further migration of contaminated water off-Base (HAFB EMR 1994). The HDUS is not functioning as intended and does not effectively contain the plume. Furthermore, spring U4-308 and well U4-069 in the distal portion of the plumes do show increasing contaminant trends. Even with the limited impact the HDUS system has on the plume, the overall plume dimensions are relatively stable through time and the composite plume does not seem to be growing significantly (JS/I 2002).

Landfill Contents Remedy
The Landfill No. 1 cap is intended to limit infiltration and reduce the leaching of contaminants from the landfill contents into the underlying groundwater (HAFB EMR 1994). Proper function of the landfill cap cannot be determined without an additional in-depth data evaluation.

Question B. Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objective (RAOs) used at the time of the remedy still valid?
No. The Reference Dose for Inhalation (RfD(i)) for boron is now available at 5.7×10^{-3} mg/kg/day (EPA Region III 2002), which may affect the cleanup level for boron (2,700 ug/L) stated in the ROD. The EPA and UDEQ have established an action level for TCE in indoor air at 0.43 ppbv.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?
Yes.

Groundwater Remedy
Due to the increasing contaminant trends in spring U4-308 and well U4-069 in the distal portion of the plumes and the evidence that suggests the HDUS system is not effectively containing the plume, it appears that the RAOs pertaining to the prevention of further degradation of the groundwater quality are not being achieved. However, it should also be noted that the composite plume does not seem to be growing significantly and the overall plume dimensions are relatively static through time (JS/I 2002).

The possibility of additional soil contamination was discovered in March 2002. Contaminated water from the HDUS system was discharging into the surrounding soil through a hole in the effluent line and was repaired in April 2002. The air stripper was taken off-line in January 2001 due to an increase in the allowable VOC content in the effluent stream leading to the CWSID. Therefore, untreated groundwater may have been leaking into the surrounding soils for a maximum duration of 16 months. The surrounding soil was not sampled during repair. This issue was discussed during the FYR interview session with EMR and this location was promptly sampled on 13 March 2003. Analytical results of soil samples showed trace levels of TCE were found, and the results were compared with Risk-Based Screening Levels (RBSL) to determine if soils present a risk to human health or the environment. It was determined that contamination detected in the soil samples was below Risk-Based Screening Levels (CH2M 2003).

Landfill Contents Remedy
After reviewing the data available for the PSVP-specified monitoring locations, an increasing TCE trend in one of the two monitoring points indicates that additional data evaluation and investigation are required before long-term protectiveness can be determined.

VIII Issues

Based on the information reviewed, issues that may affect protectiveness of the selected remedies at OU 4 are listed below:

OU 4 - Treatment and Containment
- Although the OU 4 plume is not currently impacting receptors, the remedial actions that are presently in place do not effectively contain the plume. Furthermore, evidence of increasing contaminant trends exists in the distal portions of the plumes. Therefore, the current actions are not in compliance with the RAOs set forth in the ROD, namely to prevent further degradation of groundwater quality in accordance with the Utah Corrective Action Cleanup Policy. This issue is somewhat offset by the information detailed in the Jacobs Sverdrup report, which suggests that the overall plume dimensions, are "relatively static" (JS/I 2002).
- Regulatory changes to the COC levels may affect the protectiveness of a remedy.
- Additional source areas may have been identified near Landfill No. 2 (LF012) and the North Gate Dump Areas (OT041), two sites with NFRAP status.

Landfill No. 1 - Treatment and Containment

- The long-term monitoring data have not been analyzed in detail to provide specific recommendations on proper plume management and future HDUS operations.
- The effectiveness of the landfill cap in limiting infiltration and reducing the contaminant leaching is uncertain based on analytical results from the downgradient landfill monitoring location, U4-047.
- No action levels (flow level) exist in either the ROD or the PSVP that would require implementation of a surface water collection and treatment system.
- The existing well network may not be sufficient to monitor conditions within and at the distal edges of the plume.

Landfill No. 1 - Operations and Maintenance

- Upon inspection of the HDUS, several drain lines were exposed. The lines should have at least 24" of cover to prevent freezing and pipe breakage. Erosion is a significant problem in the area, possibly due to poor compaction during construction.
- No signage is evident in the off-Base area to prevent unauthorized excavation.
- The HDUS flows are declining, but the cause is unknown.
- Analytical data from water collected from the landfill leachate collection sumps and HDUS drain set flows were not readily available to evaluate the remedy performance.
- Currently, the remedies for the seeps are protective. However, protection in most cases is due to low flow from the seeps and not due to institutional controls. One seep, U4-308, does flow on private property with TCE concentrations above MCLs, but does not have institutional controls. The property owner has been informed but the owner does not want a fence installed.

IX Recommendations and Follow-up Actions for OU 4

The recommendations and follow-up actions for OU 4 are:

OU 4 - Treatment and Containment

- Thoroughly evaluate existing data and determine if additional data and/or modeling are required to develop a plume management plan that meets the RAOs.
- Evaluate clean-up levels for COCs and amend the ROD, if required, to address current ARAR levels.
- Continue to monitor wells in the plume area and if sustained increasing trends are observed which result in an expansion of plume boundaries, an evaluation should be completed to determine if additional source area characterization is warranted.
- Review the PSVP in light of remedy protectiveness and achievement of RAOs and the data required to ascertain these. Update the PSVP, if necessary and evaluate the need to perform the PSVR in a more timely fashion than the current FFA schedule suggests.
- Evaluate the existing well network to determine if it is adequate to monitor conditions within and at the distal edges of the plume and add additional monitoring locations as necessary.

Landfill No. 1 - Treatment and Containment

- Complete an investigation into the increase of TCE concentrations in U4-047 and closely monitor future analytical results from this location.
- Establish flow levels for implementation of a surface water collection and treatment system at the seeps.

Landfill No. 1 - Operations and Maintenance

- Protect drain lines from damage with proper soil cover.
- Install additional signage to prevent unauthorized off-Base excavation.
- Evaluate the causes of reduced flows in the HDUS drain sets (upper, middle, and lower horizontal drain sets) (see Figure OU 4-1) using video logs and flow data. Access points at each drain line may be necessary to allow a video log and to obtain the flow data of each line.
- Data from the sumps in Landfill No. 1 and the drain set flows of the HDUS system should be included in the ERPIMS database to allow for trends to be examined. All data that are required in the PSVP should be included in the database. If no data are available during the sampling round or if a point has been discontinued, it should be noted in the database for clarification.
- Complete a risk-based analysis for seep U4-308 and if risk-based levels are exceeded, institutional controls should be enforced.

X Protectiveness Statement for OU 4

The remedies at OU 4 protect human health and the environment in the short-term. There is no immediate risk to human health and the environment at this site. This, however, is not due to the implementation of the groundwater remedy at the site, but is due to institutional controls and the lack of receptors. Increasing concentrations observed in some monitoring wells indicate the potential for plume migration. If plume migration does occur, completion of an exposure pathway is possible, causing potential risk to human health and the environment. Also, within the time between the remedy selection and this Five-Year Review, USEPA has published changes to toxicity factors that affect chemical-specific clean-up levels at OU 4. Therefore, a re-evaluation of potential risk at OU 4 must be conducted before the long-term protectiveness of the current remedies can be determined.

XI Next Review

The next FYR for OU 4 is required by 2008. No future review is required for the Spoils Area (OT020) or the Munitions Dump (OT042) sites because no further remedial actions are planned at these sites. Due to the unknown source of the elevated contamination levels near Landfill No. 2 (LF012) and the North Gate Dump Areas (OT041), these IRP sites require an additional review in 2008 to ensure NFRAP status is still applicable.

XII References for Operable Unit 4 Summary

(CH2M 2001) Operable Unit 4 Performance Standard Verification Plan, CH2M Hill, November 2001.

(CH2M 2003) Contract F42650-98-D-0067, Delivery Order 0020, Cost Reimbursable Project Number 1. – Draft Operable Unit 4 Sewer Connection Soil Sampling Letter Report, CH2M Hill, April 2, 2003.

(EPA Region III 2002) Risk-Based Concentration Table, EPA Region III, October 9, 2002, EPA Region III, 9 October 2002.

(EPA Region VIII 1995) Proposed Explanation of Significant Differences for Operable Unit 4 Landfill Contents Remedy, USEPA Region VIII, March 1995.

(HAFB 1998) OO-ALC-HAFB Supplement I, AFI 32-7020, 29 April 1998, Hill AFB, 29 April 1998.

(HAFB EMR 1994) Record of Decision and Responsiveness Summary for Operable Unit 4 (IRP Sites LF11, LF12, OT20, OT41, OT42), Hill AFB EMR, June 1994.

(HAFB EMR 1998) CERCLA 1998 Five-Year Review Hill Air Force Base, Utah, Hill AFB EMR, September 1998.

(Hirschi, S. 1992) Decision Document for Site OT20- Spoils Area, Hill AFB EMR, June 1992.

(JS/I 2002) Site Conceptual Model Review OU 4, Jacobs Sverdrup/Intera Inc., December 2002.

(MW 1993) Proposed Plan for Operable Unit 4 (IRP Sites LF11, LF12, OT20, OT41, OT42), Montgomery Watson, September 1993.

(MW 1997) Annual Report for Operable Unit 4 - 1997, Montgomery Watson, November 1997.

(URS 2001) Geotechnical Report Hill Air Force Base OU-4 Proposed Extraction Trenches Long-Term Impact Review, URS, March 12, 2001.

(URS 2002) Treatment System Operation Report for OU 4, 2002, URS, March 2002.

(USGS 1990) Technical Memorandum Second Draft Vol 1 Report Site Characteristics Summary Report, First Phase of Remedial Investigation, Operable Unit 4, Landfills 1 and 2, U.S. Geological Survey, January 1990.

(USGS 1993) Addendum to Remedial Investigation Report for Operable Unit 4, Volume 12 Appendices A, B, C, D, E, and F (Vol 2 of 8), U.S. Geological Survey, April 1993.

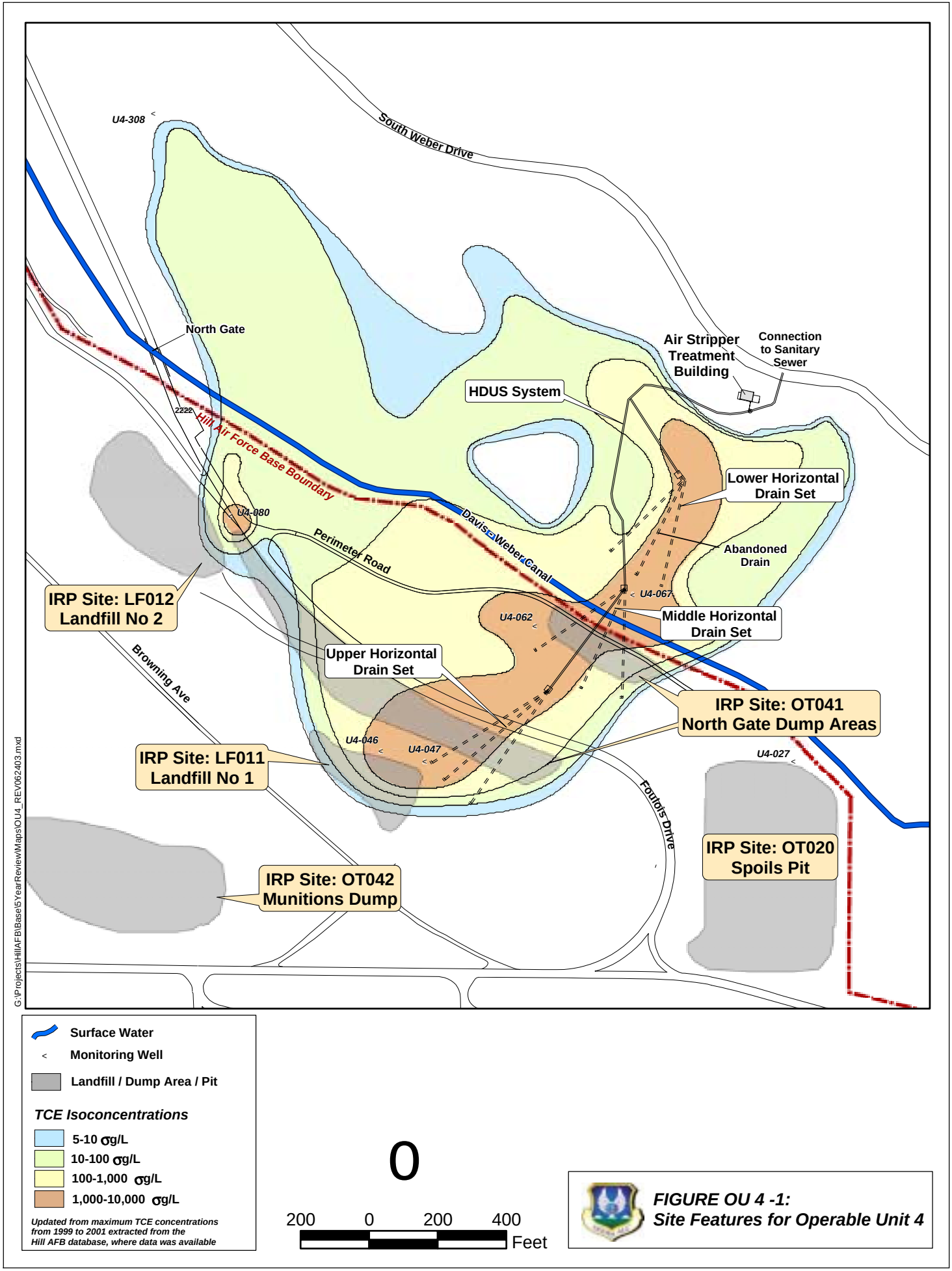

FIGURE OU 4 -1:
Site Features for Operable Unit 4

Table OU 4 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
OU 4	**OPERABLE UNIT 4**			
	1981	Phase I Records Search	Provided a history of landfill operations and indicated that organic chemicals had not been disposed in Landfills 1 and 2.	Technical Memorandum Second Draft Vol 1 Report Site Characteristics Summary Report, First Phase of Remedial Investigation, Operable Unit 4, Landfills 1 and 2
	1987	Remedial Investigation	13 volatile organic and 2 inorganic contaminants were detected in water from monitoring wells and seeps in the area of OU 4. Comparison of the concentrations of observed contaminants to appropriate standards indicated that TCE exceeded the primary MCL in water from 20 monitoring wells and 3 seeps; benzene exceeded the MCL in 1 well; and 1,2-DCA, nitrate, and sulfate did not exceed the MCL in water from any of the wells or seeps. TCE identified as CoC.	Vol. 1 Report Remedial Investigation Report for Operable Unit 4, First Draft
04	1993	Addendum to the RI and Risk Assessment	Findings of the initial RI were confirmed and revised, the extent and quantity of the ground-water contamination were defined, and the primary source of contamination was identified as Landfill 1.	Remedial Design Work Plan for Operable Unit 4 (IRP Sites LF11, LF12, OT20, OT41, OT42)
10	1993	Proposed Plan (public comments)	Public meeting on Tuesday, October 19, 1993	Proposed Plan for Operable Unit 4 (IRP Sites LF11, LF12, OT20, OT41, OT42)
06	1994	Record of Decision	ROD completed. No removal actions, remedial actions, notices of violation, or other enforcement actions taken prior to the ROD.	Record of Decision and Responsiveness Summary for Operable Unit 4 (IRP Sites LF11, LF12, OT20, OT41, OT42)

Table OU 4 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
08	1996	Conceptual Model	A second small source was located down-slope of Landfill 2.	Annual Report for Operable Unit 4 - 1997
LF011	**LANDFILL NO 1**			
	1946	Unofficial Dumping	Photos in the RI show activity in 1946 at Landfill 1.	Site Conceptual Model Review OU 4
	1955	Facility use between 1955 and 1967	Landfill 1 officially operated as a hillside dump with a daily burning operation from 1955 until 1967, when burning at Hill AFB was terminated and the dump was closed.	Vol. 1 Report Remedial Investigation Report for Operable Unit 4, First Draft
	1982	Installation Restoration Program	Landfill 1 identified as potential hazardous site in Phase I of the IRP.	Record of Decision and Responsiveness Summary for Operable Unit 4 (IRP Sites LF11, LF12, OT20, OT41, OT42)
11	1985	Remedial Investigation	Groundwater monitoring was conducted from November 1985 to November 1987 during the Phase II Installation Restoration Program (IRP). High concentrations of trichloroethene (TCE), 4,185 µg/L, were detected in the well downgradient of Landfill 1. The detection of TCE indicated that further investigation was necessary.	Technical Memorandum Second Draft Vol 1 Report Site Characteristics Summary Report, First Phase of Remedial Investigation, Operable Unit 4, Landfills 1 and 2

Table OU 4 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
	1991	Semi-annual ground water sampling initiated		Site Conceptual Model Review OU 4
	1993	Quarterly ground water sampling began for VOCs	Selected wells	Site Conceptual Model Review OU 4
	1993	2001 Annual Report	The horizontal drain system was initially installed on a temporary basis as part of a treatability study to ascertain if the drains could collect groundwater for treatment successfully. Wastes generated at the time were disposed through the Base Hazardous Waste Storage Facility.	Treatment System Operation Report for OU 4, 2002
04	1993	Addendum Remedial Investigation	Landfill 1 determined to be the "most probable" source of TCE.	Addendum to Remedial Investigation Report for Operable Unit 4, Volume 12 Appendices A, B, C, D, E, and F (Vol 2 of 8)
03	1995	Proposed Explanation of Significant Differences (PESD)	The significant differences between the landfill contents remedy described in the ROD and as proposed in this PESD were: 1) SVE treatment of the landfill contents was not to be constructed. This included all SVE equipment, structures, and associated facilities. 2) Perched water within the landfill contents would be removed, conveyed to the on-Base Industrial Wastewater Treatment Plant (IWTP) and treated.	Proposed Explanation of Significant Differences for Operable Unit 4 Landfill Contents Remedy
09	1995	Construction Completed	Landfill 1 Cap construction began in Sept. 1995 and completed in June 1996	Remedial Action Report for the Landfill 1 Cap Site (IRP Site LF11)

Table OU 4 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
09	1996	Construction Completed	Construction of the Horizontal Drain Upgrades began on September 13, 1996, and was completed on June 5, 1997.	Remedial Action Report Phase II Remedial Action Horizontal Drain Upgrades Operable Unit 4
	1997	Remediation Study	Remediation by Natural Attenuation showed biodegradation unlikely. This was re-emphasized in the Site Conceptual Model Review in December 2002.	Site Conceptual Model Review OU 4
	1997	Air Stripper Online	Air stripper reduced total VOC content in extracted groundwater to below 100 ug/L, in accordance with the discharge permit.	Annual Report for Operable Unit 4 - 1997
	1998	Remedial Design	Design basis presented for the use of groundwater extraction trench systems for removal of contaminants in the plume to help the HDUS with the Groundwater Remedy.	Remedial Design Report and Work Plan Phase III Groundwater Extraction Trench System Operable Unit 4
	2001	Geotechnical Evaluation	Report evaluation of the impact of the Groundwater Extraction Trench System would have on the surrounding geology, short-term and long-term, and the effectiveness of the system as a remedial action. It was recommended to re-evaluate the design.	Site Conceptual Model Review OU 4
01	2001	Air stripper taken offline	Use of the system bypass was approved in January 2001 as a result of an increase in the allowable discharge concentration for the CWSID discharge permit. The bypass connects the influent line directly to the effluent line, therefore bypassing the equalization tank and air stripper. The air stripper was taken offline, and recovered groundwater was redirected through the bypass on January 23, 2001.	Treatment System Operation Report for OU 4, 2002

Table OU 4 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
03	2001	Slope Stability Study Completed	A slope stability study was conducted to determine the long-term impact of additional extraction trenches.	Geotechnical Report OU 4 Proposed Extraction Trenches Long-Term Impact Review
03	2002	Possible Contamination	Discovery of blockage and break in the drain line from the treatment building to the sewer line. Possibility of additional contamination where the untreated water leaked into the surrounding soil.	Interview with Holly Renn, PM for O&M Contractor
LF012	**LANDFILL NO 2**			
	1945	Evidence of use	Photos show use of Landfill 2 in the mid to late 1940's	Site Conceptual Model Review OU 4
	1946	Unofficial Dumping	Photos in the RI show activity in 1946 at Landfill 2.	Site Conceptual Model Review OU 4
	1963	Operations at Landfill 2 between 1963 and 1965	Landfill 2 officially operated between 1963 and 1965, when burning at Hill AFB was terminated and the dump was closed. "General waste" was dumped down the side of the hill and periodically burned.	Vol. 1 Report Remedial Investigation Report for Operable Unit 4, First Draft

Table OU 4 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
	1982	Remedial Investigation	Landfill 2 identified as potential hazardous site in Phase I of the IRP.	Record of Decision and Responsiveness Summary for Operable Unit 4 (IRP Sites LF11, LF12, OT20, OT41, OT42)
11	1985	Remedial Investigation	Groundwater monitoring was conducted from November 1985 to November 1987 during the Phase II Installation Restoration Program. In a well downgradient from Landfill 2, the concentration of TCE was 6.08 µg/L. The detection of TCE indicated that further investigation was necessary.	Technical Memorandum Second Draft Vol 1 Report Site Characteristics Summary Report, First Phase of Remedial Investigation, Operable Unit 4, Landfills 1 and 2
06	1994	NFRAP Accepted	Based on information revealed in the Remedial Investigation, Landfill 2 is noted as not being a source of contamination. The ROD is considered the NFRAP document.	Record of Decision and Responsiveness Summary for Operable Unit 4 (IRP Sites LF11, LF12, OT20, OT41, OT42)
OT020	**SPOIL PIT**			
	1972	Operations at Spoils Pit between 1972 and 1989	The Spoils Area was an active disposal site from 1972 until 1989. It received construction debris such as concrete, wood, and soils from the Base.	Decision Document for Site OT20- Spoils Area
11	1988	Soil Gas Survey	A soil gas survey that included six sampling points at OT20 was conducted. The soil gas was tested for trichloroethane, trichloroethene, tetrachloroethene, methane, benzene, toluene, xylene, and total hydrocarbons. The soil gas survey conducted at OT20 indicated TCA, TCE and PCE at part per trillion levels. Methane was detected at part per million levels.	Decision Document for Site OT20- Spoils Area

Table OU 4 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
01	1989	Initial Findings Reported	Initial findings of the soil gas survey were presented in the Informal Technical Information Report For Soil Gas Survey Conducted Along Perimeter Road and Spoils Area, Hill AFB, Utah. Results of the report were discussed at a 19 January 1989 meeting with representatives of USAF OEHL and Hill AFB.	Decision Document for Site OT20- Spoils Area
04	1989	Well Installation	The U.S. Geological Survey installed a groundwater monitoring well immediately downgradient of OT20 (U4-027).	Decision Document for Site OT20- Spoils Area
07	1989	Groundwater Sampling	Groundwater samples were collected and analyzed for volatiles, semi-volatiles, common anions, pH, alkalinity, and selected trace elements. Analysis of groundwater samples taken from the well (U4-207) reported no compound detected at or above Federal drinking water standards.	Decision Document for Site OT20- Spoils Area
08	1990	Final Report	Final Report Site Evaluation Report for Perimeter Road and the Spoils Area.	Decision Document for Site OT20- Spoils Area
06	1992	NFRAP Accepted	"Conclusion: No further response action is required at site OT20 - Spoils Area. OT20 will no longer be tracked as an IRP site."	Decision Document for Site OT20- Spoils Area

Table OU 4 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
OT041	**NORTH GATE DUMP OP UNIT 4**			
	1955	Operations at North Gate Dump	North Gate Dump Areas used for solvent disposal. Specific dates are unknown.	Site Conceptual Model Review OU 4
06	1994	NFRAP Accepted	Based on information revealed in the Remedial Investigation, North Gate Dump Area is noted as not being a source of contamination. The ROD is considered the NFRAP document.	Record of Decision and Responsiveness Summary for Operable Unit 4 (IRP Sites LF11, LF12, OT20, OT41, OT42)
OT042	**MUNITIONS DUMP OP UNIT 4**			
	1940	Operations at Munitions Dump	Munitions Dump was active from 1940 through 1946 and used to store surplus weapons above-ground.	Site Conceptual Model Review OU 4
06	1994	NFRAP Accepted	Based on information revealed in the Remedial Investigation, Munitions Dump is noted as not being a source of contamination. The ROD is considered the NFRAP document.	Record of Decision and Responsiveness Summary for Operable Unit 4 (IRP Sites LF11, LF12, OT20, OT41, OT42)

XIII Five-Year Review of Sites in OU 4

Operable unit review results are summaries of findings for all of the sites in each operable unit. The following site summaries present a detailed review of each IRP site. Therefore, much of the information presented in the Site Summaries is a duplicate of what was presented in the OU Summary.

The reader is encouraged to use the Site Summary to obtain details on specific contaminants of concern and the technical assessment for each site.

OU 4 LF011 LANDFILL NO 1

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

The Landfill No. 1 area, IRP site LF011, is located on the northern boundary of Hill AFB (see Figure OU 4-1). A groundwater plume originating from the landfill extends off Base in the direction of South Weber Drive and is currently migrating in a northwesterly direction, approximately parallel to South Weber Drive. The main contaminant of concern is TCE with a maximum concentration of approximately 12,000 ug/L for CY 2002. The ROD established four media of concern with remedial actions associated with these media. The four media types are: groundwater, surface water, landfill contents, and air (MW 1993).

II. Site Chronology

See Table OU 4-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

Landfill No. 1 is located along the top of a steep, terraced escarpment of the Weber Delta overlooking the Weber River Valley. TCE contamination underlies approximately 69 acres (30-50 ft bgs) and extends north down the steep slope, off-Base, into the cities of Riverdale and South Weber. The ROD suggests that Landfill No. 1 is the sole source of this contamination. Other sources, such as Landfill No. 2 (LF012) and the North Gate Dump Areas (OT041), may be contributing to the plume (MW 1997, JS/I 2003), but further investigations will need to be performed to make that determination.

Beyond the base boundary, the hill continues downward and seeps have been observed flowing out of the hillside. The slope is vegetated with shrubs and grasses. The Davis-Weber Canal, a privately owned irrigation canal used each year from April to October, is in the middle of the slope, and is approximately 600 feet north and approximately 100 feet below Landfill No. 1. Results of analyses of canal water during the RI indicated that the canal has not been a source of contamination, nor have chemicals from OU 4 contaminated it.

Beyond the slope, there are houses and small farms. The TCE contamination has not extended into any area that includes the homes or farms. Groundwater in the contaminated area is not currently used as a source of drinking water.

Landfill No. 1 was approximately 25 feet deep during operations and covers an area of five acres. The landfill was operated as a dump site with a daily burning operation from 1955 until 1967, when burning at Hill AFB was terminated. All landfill operations were also terminated and the landfill was closed at that time. Though there are no records of any organic chemical disposal, it has been reported that Landfill No. 1 received wastes from the Ogden Arsenal that included waste oils and solvents from the vehicle maintenance facility (USGS 1990).

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
GW	1,1-DICHLOROETHENE	7 ug/L
GW	1,2-DICHLOROETHANE	5 ug/L
GW	ARSENIC	50 ug/L

GW	BARIUM	2,000 ug/L
GW	BENZENE	5 ug/L
GW	BORON	2,700 ug/L
GW	CHLOROFORM	100 ug/L
SW	CHLOROFORM	100 ug/L
GW	cis-1,2-DICHLOROETHENE	70 ug/L
SW	cis-1,2-DICHLOROETHENE	70 ug/L
GW	METHYL ETHYL KETONE (2-BUTANONE)	830 ug/L
GW	NICKEL	100 ug/L
GW	SELENIUM	50 ug/L
GW	TETRACHLOROETHENE(PCE)	5 ug/L
GW	TOLUENE	1,000 ug/L
GW	trans-1,2-DICHLOROETHENE	100 ug/L
SW	trans-1,2-DICHLOROETHENE	100 ug/L
AIR	TRICHLOROETHENE (TCE)	5 ug/m3
GW	TRICHLOROETHENE (TCE)	5 ug/L
SW	TRICHLOROETHENE (TCE)	5 ug/L
GW	XYLENES, TOTAL	10,000 ug/L

Remedial Action Objectives

* Groundwater and Surface Water - Meet chemical-specific ARARs, which are drinking water MCLs.
* Landfill Contents - Limit cancer risk to less than 1E-4 with a target of 1E-6 due to accidental ingestion, dermal contact, or inhalation of vapors.
* Air (Indoor) - Prevent inhalation of noncarcinogens at levels exceeding a hazard index of 1 within off-Base residences.
* Air (Indoor) - Prevent inhalation of carcinogens in excess of 1E-6 cancer risk within off-Base residences.
* Air (Indoor) - Prevent the migration of contaminated soil gas into residences.

* Groundwater and Surface Water - Maintain contaminant concentrations low enough to avoid chronic health effects (as indicated by a hazard index of less than 1).
* Groundwater and Surface Water - Limit cancer risk to less than 1E-4 with a target of 1E-6 due to accidental ingestion, dermal contact, or inhalation of vapors.

* Groundwater and Surface Water - Prevent further degradation of ground-water quality in accordance with the Utah Corrective Action Cleanup Policy (R315.101).
* Landfill Contents - Eliminate the source(s) of ground-water contamination either through removal or source control in accordance with Utah Corrective Action Cleanup Policy.
* Landfill Contents - Maintain contaminant concentrations low enough to avoid chronic health effects (as indicated by a hazard index of less than 1).

IV. Remedial Actions

Groundwater
The groundwater remedy, the Horizontal Drain Upgrade System, includes the installation of a groundwater extraction system that includes an air stripper to pre-treat the extracted groundwater prior to discharge.

Three sets of horizontal drains were installed in 1993 on a temporary basis to determine if horizontal drains could successfully collect water for treatment. Each set contained three individual drains that passively convey water to a common point. One of the drains in the lowest set was abandoned when it was damaged during construction of the lines.

Extracted groundwater was conveyed by a dual-walled piping system to an air stripper treatment building and on to the Central Weber Sewer Improvement District for treatment via the City of Riverdale sanitary sewer line. When the discharge permit was changed in August, 2000, allowing for a total concentration of 2,130 ug/L total VOCs from the previous limit of 100 ug/L total VOCs, the air stripper was taken offline (Jan 2001) at the request of Hill AFB EMR. The average discharge concentration from the drain sets was 433 ug/L for calendar year (CY) 2002. The system effluent now is directly discharged to the local Publicly Owned Treatment Works (POTW) with an average flow rate of approximately 3 gallons per minute (gpm).

Surface Water
The surface water remedy consists of local collection of contaminated surface water at each spring/seep site, treatment using carbon adsorption, and discharge to the subsurface using infiltration trenches. There are institutional controls associated with this remedy to restrict access and potential exposure pathways. The collection systems have not been installed due to low flows at the spring/seep sites but they are monitored on a regular basis per the PSVP (CH2M 2001).

Landfill Contents
The landfill contents remedy included regrading and revegetation of the landfill cap to reduce infiltration and control runoff and the installation of a soil vapor extraction system to remove vapor from the landfill contents. However, the SVE system was never installed because pilot testing (MW 1994) concluded that the TCE levels were below the levels removable by SVE. It was then determined that removal of the contaminated groundwater would be more effective in reducing the contaminant mass and in reducing the potential for contaminant migration. A "Proposed Explanation of Significant Differences for Operable Unit 4 Landfill Contents Remedy", dated March 1995, was completed to address the elimination of SVE as a portion of the landfill remedy.

Indoor Air
The indoor air remedy consists of semi-annual monitoring of the off-Base residences

overlying the contaminated groundwater plume. At the present, there are no residences within the plume boundary, and therefore no monitoring is being conducted. If the plume migrates under any residences, monitoring would begin. If VOCs are detected in the air, the affected residences will have a ventilation system installed along the foundation of the home and monitoring of the ventilation system will continue semi-annually to ensure effectiveness. If concentrations of VOCs attributable to OU 4 exceed the indoor air regulatory limit an emission control device will be used.

Institutional Controls

Institutional controls for groundwater include:
* Well use advisory, water rights, and well drilling restrictions, and
* Easements and leases as necessary for monitoring and installation of equipment.

Institutional controls for surface water includes:
*Water use advisories, and water rights restrictions for contaminated surface water,
*Obtaining easements and/or leases on properties where monitoring is required, and
*Fencing seeps which provide sufficient flow for consumption by humans and livestock.

Institutional controls for landfill contents include:
* A continuing order from the Base Commander (HAFB 1998) concerning landfill restrictions,
* Recording a notice to restrict exposure to and maintain integrity of remedial action at Landfill No. 1, and
* Fencing and warning signs.

V. Progress Since Last Review

In the 1998 Five-Year Review (HAFB EMR 1998), it was anticipated that a ROD amendment might be needed to resolve the usefulness of the SVE system at Landfill No. 1, the low flow rates of the seeps and springs, and the overall practicality of reaching MCLs.
* The HDUS air stripper water effluent permit was changed in August 2000, allowing for a total concentration of 2,130 mg/L total VOCs from the previous limit of 100 ug/L total VOCs. The air stripper was subsequently taken off line on January 2001 due to consistent untreated effluent concentrations well below the new discharge limit.
* A review of the site conceptual model for OU 4 was completed to determine whether a more quantitative geosystem model of the site was warranted for future site management purposes (JS/I 2002).
* A slope stability study was conducted to determine the long-term impact of additional extraction trenches (URS 2001).
* The low flow rates of the seeps and springs and the overall practicality of reaching MCLs has not yet been addressed with a ROD amendment. An amendment of the ROD for the seeps and springs is not needed to address the flow rate since the ROD addresses both a low-flow and a higher-flow treatment option.
* The issue of reaching MCLs is a basewide issue that may be addressed at a later date.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer)

No

Question A (Comment)

Groundwater Remedy
The groundwater remedy was intended to provide hydraulic containment, which would prevent further migration of contaminated water (HAFB EMR 1994). The HDUS is not functioning as intended and does not effectively contain the plume. Furthermore, spring U4-308 and well U4-069 in the distal portion of the plumes do show increasing trends. Even with the limited impact the HDUS system has on the plume, the overall plume dimensions are relatively stable through time and the composite plume does not seem to be growing significantly (JS/I 2002).

Surface Water Remedy
The ROD recognized a lack of treatable flow from the seeps. Installation of a seep water treatment system will be reevaluated when sufficient flows are present.

Landfill Contents Remedy
The Landfill No. 1 cap is intended to limit infiltration and reduce the leaching of contaminants from the landfill contents into the underlying groundwater (HAFB EMR 1994). Proper function of the landfill cap cannot be determined without additional data evaluation. A cursory review of the representative groundwater locations per the OU 4 PSVP (CH2M 2001), wells U4-046 and U4-047, illustrate different trends. Since the landfill cap was installed in 1994, the concentration of TCE in U4-047 has decreased from approximately 2,500 ug/L to 200 ug/L over a 9-year period. This time frame was also reviewed for the U4-046 monitoring location. TCE concentrations were relatively stable through 1998 at 6,000 ug/L with a one year decrease to 2,200 ug/L TCE and a subsequent increase to 12,000 ug/L TCE in the last four years.

Annual landfill inspections are being conducted and deficiencies are corrected in a timely manner. The amount of water collected through french drains under the landfill has been minimal.

Air (Indoor) Remedy
No residences are located within the boundary of the plume. Therefore, there is no need for indoor air monitoring at this time.

Question B (Answer)

No

Question B (Comment)

TCE is the main contaminant of concern, but changes in other cleanup levels may need to be reevaluated.
Cleanup Level Changes include:
* Arsenic cleanup level of 50 ug/L is currently valid. However arsenic standard of 10 ug/L will be effective on 1/26/2006.
* The Reference Dose for Inhalation (RfD(i)) for boron is now available at 0.0057

mg/kg/day (EPA Region III 2002), which may affect the cleanup level for boron (2,700 ug/L) stated in the ROD.
* The EPA and UDEQ have established an action level for TCE in indoor air at 0.43 ppbv. The new action level does not affect the remedy at this time.

Because land use has not changed, the exposure assumptions used in the risk assessment for OU 4 remain valid.

The remedial action objectives listed in the OU 4 ROD for this site are still valid.

Question C (Answer)

Yes

Question C (Comment)

Groundwater Remedy
Due to the increasing contaminant trends in spring U4-308 and well U4-069 in the distal portion of the plumes and the evidence that suggests the HDUS system is not effectively containing the plume, it appears that the RAOs pertaining to the prevention of further degradation of the groundwater quality are not being achieved. However, it should also be noted that the composite plume does not seem to be growing significantly and the overall plume dimensions are relatively static through time (JS/I 2002).

The possibility of additional soil contamination was discovered in March 2002. Contaminated water from the HDUS system was discharging into the surrounding soil through a hole in the effluent line. The line was repaired in April 2002. The air stripper was taken off-line in January 2001 due to an increase in the allowable VOC content in the effluent stream leading to Central Weber Sewer Improvement District. Therefore, untreated groundwater may have been leaking into the surrounding soils for a maximum duration of 16 months. The surrounding soil was not sampled during repair. This issue was discussed during the FYR interview session with EMR and this location was promptly sampled on 13 March 2003. Analytical results of soil samples showed trace levels of TCE were found, and the results were compared with Risk-Based Screening Levels (RBSL) to determine if soils present a risk to human health or the environment. It was determined that contamination detected in the soil samples was below Risk-Based Screening Levels (CH2M 2003).

Surface Water Remedy
No additional information has surfaced that calls into question the protectiveness of the selected remedy. The samples taken from the flowing seeps are above the MCL for TCE, but institutional controls prevent pathway completion to receptors. The flow from the seeps is too low for the ROD-recommended treatment.

Landfill Contents Remedy
Additional information has become available that calls into question the protectiveness of the remedy. The data available for two PSVP-specified monitoring locations (U4-046 and U4-047) suggest an increasing TCE trend in one of the two monitoring points. Therefore, additional data evaluation and investigation are required before protectiveness can be determined. Monitoring data from the sumps is not available in the ERPIMS database for

evaluation.

Air (Indoor) Remedy
No homes are located within the plume boundary. Therefore, there are no issues related to indoor air.

VIII. Issues

Treatment and Containment
* Although the OU 4 plume is not currently impacting receptors, the remedial actions that are presently in place do not effectively contain the plume. Furthermore, evidence of increasing contaminant trends exists in the distal portions of the plumes. Therefore, the current actions are not in compliance with the RAOs set forth in the ROD, namely to prevent further degradation of groundwater quality in accordance with the Utah Corrective Action Cleanup Policy. This issue is somewhat offset by the information detailed in the Jacobs Sverdrup report, which suggests that the overall plume dimensions, are "relatively static" (JS/I 2002).
* The long-term monitoring data have not been analyzed in detail to provide specific recommendations on proper plume management and future HDUS operations.
* The effectiveness of the landfill cap in limiting infiltration and reducing the contaminant leaching, based on analytical results from the downgradient monitoring location (U4-047), is uncertain.
* No action levels (flow level) exist in either the ROD or the PSVP that would require implementation of a surface water collection and treatment system.
* Regulatory changes to the COC levels may affect the effectiveness of a remedy.
* The existing well network may not be sufficient to monitor conditions within and at the distal edges of the plume.

Operations and Maintenance
* Upon inspection of the HDUS, several drain lines were found exposed. The lines should have at least 24" of soil cover to prevent freezing and pipe breakage. Erosion is a significant problem in the area, possibly due to poor compaction during construction.
* No signage is evident in the off-Base area to prevent unauthorized excavation.
* The HDUS flows are declining, but the cause is unknown.
* Operating data were not readily available to evaluate the remedy performance.
* Currently, the remedies for the seeps are protective. However, protection in most cases is due to low flow from the seeps and not due to institutional controls. One seep, U4-308, does flow on private property with TCE concentrations above MCLs, but does not have institutional controls. The property owner has been informed but the owner does not want a fence installed.

IX. Recommendations

Treatment and Containment
* Complete an in-depth review of the existing data as they pertain to the effectiveness of the landfill cap. If the existing data do not provide an adequate assessment of the landfill cap effectiveness, make recommendations for additional data collection and incorporate these recommendations into the OU 4 PSVP.
* Review existing data, apply the current conceptual groundwater model (JS/I 2002), and make operational suggestions associated with the HDUS system.
* Establish flow levels for implementation of a surface water collection and treatment

system at the seeps.
* Evaluate clean-up levels for COCs and amend the ROD, if required, to reflect current risk levels.
* Evaluate the existing well network to determine if it is adequate to monitor conditions within and at the distal edges of the plume. Add additional monitoring points as necessary.
* Complete an investigation into the increase of TCE concentrations in U4-047 and closely monitor future analytical results from this location for trends.
* Address the above issues and recommendations, particularly the discovery of new potential source areas, in a PSVR prior to the scheduled timeframe of 2006 (FFA schedule).

Operations and Maintenance
* Protect drain lines from damage with proper soil cover.
* Install additional signage to prevent unauthorized off-Base excavation.
* Evaluate the causes of lower flows in the HDUS drain sets using video logs and flow data. Access points at each drain line may be necessary to allow a video log and to obtain the flow data of each line.
* Data from the sumps in Landfill No. 1 and the drain set flows of the HDUS system should be included in the ERPIMS database to allow for trends to be examined. All data that are required in the PSVP should be included in the database. If no data are available during a sampling round, or if a point has been discontinued, it should be noted in the database for clarification.
* In the case of a change of circumstances (flow rates, land use, land ownership, land access, etc.), surface water controls will need to be reevaluated and implemented.
* Complete a risk-based analysis for seep U4-308 and if risk-based levels are exceeded, institutional controls should be enforced.

X. Protectiveness Protective in the short-term

Protectiveness Statement The remedies at LF011 currently protect human health and the environment. There is no immediate risk to human health and the environment at this site. This, however, is not due to the implementation of the groundwater remedy at the site, but is due to institutional controls and the lack of receptors. Increasing concentrations observed in some monitoring wells indicate the potential for plume migration. If plume migration does occur, completion of an exposure pathway is possible, causing potential risk to human health and the environment. Also, within the time between the remedy selection and this Five-Year Review, USEPA has published changes to toxicity factors that affect chemical-specific clean-up levels at this site. Therefore, a re-evaluation of potential risk at LF011 must be conducted before the long-term protectiveness of the current remedies can be determined.

XI. Next Required FYR 2008

OU 4 LF012 LANDFILL NO 2

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

Landfill No. 2, IRP site LF012, is located in the northeastern part of Hill AFB at the northern boundary (see Figure OU 4-1). Early sampling results indicated that the site does not pose a threat to human health and the environment. The ROD states that Landfill No. 2 is "not a source of contamination" (HAFB EMR 1994), referring to evaluations in the Addendum RI (USGS 1993). Therefore, no further investigation nor remedial action was required (HAFB EMR 1994).

In 1996, an area of elevated TCE concentration was discovered at well U4-080 (3,770 ug/L in 2002), indicating a possible source down-slope of Landfill No. 2, near the northwest end of one of the North Gate Dump areas. The source of this high TCE contamination has not been determined.

II. Site Chronology

See Table OU 4-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

Landfill No. 2 is located along the top of a steep, terraced, escarpment of the Weber Delta looking on to the Weber River Valley. Beyond the Base boundary, the hill continues downward and seeps have been observed flowing out of the hillside. The Davis-Weber Canal, a privately-owned irrigation canal used each year from April to October, is in the middle of the slope. Results of analyses of canal water during the RI indicated that the canal has not been a source of contamination, nor have chemicals from OU 4 contaminated it. Beyond the slope, there are houses and small farms.

Landfill No. 2 was operated between 1963 and 1965, when it was officially closed. "General waste" was dumped down the side of the hill and periodically burned. No records have been found indicating that industrial or hazardous wastes were disposed of at this site.

Evaluations of data collected during 1992 confirmed that Landfill 2 was not a source area of TCE or other contaminants. Landfill No. 2 has NFRAP status (HAFB EMR 1994) and no further investigations are required. It was suggested in the ROD that Landfill No. 1 is the sole source of the TCE contamination area. However, elevated and slowly escalating levels of contamination, limited to a small area, have been discovered near the Landfill No. 2 area since the ROD was written.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
NA	NA - Risk Assessment indicates no risk to human health and the environment.	NA

Remedial Action Objectives

* Not applicable. No COCs or RAOs for this site.

IV. Remedial Actions

Not applicable.

OU 4 LF012 LANDFILL NO 2

Site Summary - Hill AFB 2003 Five Year Review

V. Progress Since Last Review	LF012 was not specifically reviewed in the 1998 Five-Year Review Report (HAFB EMR 1998b).
VI. FYR Process	Site review conducted per the process described in this report for the overall 2003 Five-Year review.
VII. Technical Assessment	
Question A (Answer)	Not Applicable
Question A (Comment)	Not applicable.
Question B (Answer)	Not Applicable
Question B (Comment)	Not applicable.
Question C (Answer)	Not Applicable
Question C (Comment)	Not applicable.
VIII. Issues	* An additional source of contamination is suspected near the Landfill 2 and North Gate Dump Areas.
IX. Recommendations	* Continue to monitor wells in the OU 4 plume area. If a sustained increase in contaminant trends and an expansion of plume boudaries are observed, an evaluation should be completed to determine if additional source area characterization is warranted.
X. Protectiveness	Not Applicable
Protectiveness Statement	Investigations indicate that LF012 does not pose a threat to human health and the environment and no further action was approved in the 1994 ROD (HAFB EMR 1994). However, concerns about potential sources of contamination need to be investigated and therefore this IRP site needs to be reviewed again in 2008.
XI. Next Required FYR	2008

OU 4 OT020 SPOIL PIT

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

Site OT020, also known as the Spoils Area or Spoils Pit, is located near the northern boundary of Hill AFB, at the east corner of the intersection of Browning Avenue and Foulois Drive (see Figure OU 4-1). Sampling results indicated that the site did not pose a threat to human health and the environment, and no further action was required at Site OT020 (Hirschi, S. 1992). Therefore, the Spoils area was not included in the ROD for OU 4 and no remedial action was required. This site is included in the 2003 Five-Year Review for completeness to document the site background.

II. Site Chronology

See Table OU 4-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

The Spoils Area is located along the top of a steep, terraced, escarpment of the Weber Delta looking on to the Weber River Valley. Beyond the Base boundary, the hill continues downward and seeps have been observed flowing out of the hillside. The Davis-Weber Canal, a privately-owned irrigation canal, used each year from April to October, is in the middle of the slope. Beyond the slope, there are houses and small farms.

The Spoils Area was operated as a disposal site from 1972 until 1989. It received construction debris (concrete, wood, and soil) from base activities. A soil gas survey at OT020 was conducted in November 1988 and found trace amounts of contaminants. In 1989, a well was installed immediately downgradient of the site (U4-027). Analysis of groundwater samples from this monitoring well reported no compound detected above groundwater standards. NFRAP status for the Spoils Area was accepted in 1992 before the completion of the ROD.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
NA	NA - No history of contamination at this site.	NA

Remedial Action Objectives

* Not applicable. No COCs or RAOs for this site.

IV. Remedial Actions

Not applicable.

V. Progress Since Last Review

OT042 was not specifically reviewed in the 1998 Five-Year Review Report (HAFB EMR 1998b).

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer)

Not Applicable

Question A (Comment)	Not applicable.
Question B (Answer)	Not Applicable
Question B (Comment)	Not applicable.
Question C (Answer)	Not Applicable
Question C (Comment)	Not applicable.
VIII. Issues	None.
IX. Recommendations	None.
X. Protectiveness	Not Applicable
Protectiveness Statement	Investigations indicate that OT020 does not pose a threat to human health and the environment and no further action was approved in 1992 (Hirschi, S. 1992).
XI. Next Required FYR	None - Current FYR is Final

OU 4 OT041 NORTH GATE DUMP OP UNIT 4

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

The North Gate Dump is located in two areas. The first area is located along Foulois Drive, and the second is near a segment of Perimeter Road along the northern Base fence perimeter (see Figure OU 4-1). Early sampling results indicated that the site did not pose a threat to human health and the environment. The ROD states that the North Gate Dump Area is "not a source of contamination" (HAFB EMR 1994), referring to evaluations in the Addendum RI (USGS 1993). Therefore, no further investigation nor remedial action was required.

In 1996, an area of elevated TCE concentration was discovered at well U4-080 (3,770 ug/L in 2002), indicating a possible source near the northwest end of one of the North Gate Dump Areas, down-slope of Landfill 2. The source of this high TCE contamination has not been determined.

It was suggested in the ROD that Landfill 1 is the sole source of the TCE contamination in the OU 4 contamination plume. However, elevated and slowly escalating levels of contamination, above the 1,000 ug/L level, have been discovered near the North Gate Dump areas since the ROD was written. The increase in TCE concentrations measured in monitoring well U4-062, after Landfill 1 was capped, suggests that an additional source may be present in the North Gate Dump Areas just above the Davis-Weber Canal (see Figure OU 4-1). There is no documentation of dumping in that area but it has been suggested that drums containing solvents and other material were disposed during unauthorized dumping episodes at various sites along Perimeter Road (JS/I 2002).

II. Site Chronology

See Table OU 4-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

The North Gate Dump area is located along the top of a steep, terraced escarpment of the Weber Delta overlooking the Weber River Valley. Beyond the Base boundary, the hill continues downward and seeps have been observed flowing out of the hillside. The Davis-Weber Canal, a privately-owned irrigation canal, used each year from April to October, is in the middle of the slope. Results of analyses of canal water during the RI indicated that the canal has not been a source of contamination, nor have chemicals from OU 4 contaminated it. Beyond the slope, there are houses and small farms.

Extensive analytical testing was completed in 1992 at the North Gate Dump. Concentration gradients of TCE in the unsaturated zone in these areas suggest that the TCE was derived from contaminated groundwater that migrated from Landfill 1. At that time, the North Gate Dump was not considered a source of TCE or other contaminants. NFRAP status for the North Gate Dump was accepted in 1994 (HAFB EMR 1994) and no further investigations are required.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
NA	NA - Risk Assessment indicates no risk to human health and the environment.	NA

Remedial Action Objectives	* Not applicable. No COCs or RAOs for this site.
IV. Remedial Actions	Not applicable.
V. Progress Since Last Review	OT042 was not specifically reviewed in the 1998 Five-Year Review Report (HAFB EMR 1998b).
VI. FYR Process	Site review conducted per the process described in this report for the overall 2003 Five-Year review.
VII. Technical Assessment	
Question A (Answer)	Not Applicable
Question A (Comment)	Not applicable.
Question B (Answer)	Not Applicable
Question B (Comment)	Not applicable.
Question C (Answer)	Not Applicable
Question C (Comment)	Not applicable.
VIII. Issues	* An additional source of contamination is suspected near the North Gate Dump Areas (OT041) and Landfill 2 (LF012). * There is the possibility of an additional source near the HDUS system.
IX. Recommendations	* Conduct an investigation to determine the source(s) of additional contamination near the North Gate Dump areas.
X. Protectiveness	Not Applicable
Protectiveness Statement	Investigations indicate that OT041does not pose a threat to human health and the environment and no further action was approved in the 1994 ROD (HAFB EMR 1994). However, concerns about potential sources of contamination need to be investigated and therefore this IRP site needs to be reviewed again in 2008.

XI. Next Required FYR	2008

OU 4 OT042 MUNITIONS DUMP OP UNIT 4

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

The Munitions Dump was located near the North Gate boundary at Hill AFB (see Figure OU 4-1). The ROD states that the Munitions Dump is "not a source of contamination" (HAFB EMR 1994). Therefore, no remedial action nor further investigation was required. This site is included in the 2003 Five-Year Review for completeness and to document the site background.

II. Site Chronology

Please see Table OU 4-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

The Munitions Dump is located along the top of a steep, terraced escarpment of the Weber Delta overlooking the Weber River Valley. Beyond the Base boundary, the hill continues downward and seeps have been observed flowing out of the hillside. The Davis-Weber Canal, a privately-owned irrigation canal used each year from April to October, is in the middle of the slope. Beyond the slope, there are houses and small farms.

The Munitions Dump was operated by the Ogden Arsenal as an above-ground storage area for munitions during World War II. Spent shell casings were observed in the area during the site classification activities at OU 4. Evaluation of data collected during 1992 confirmed that the Munitions Dump is not a source area of TCE or other contaminants. NFRAP status for the Munitions Dump was accepted in 1994 (HAFB EMR 1994) and no further investigations are required.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
NA	NA - Risk Assessment indicates no risk to human health and the environment.	NA

Remedial Action Objectives

* Not applicable. No COCs or RAOs for this site.

IV. Remedial Actions

Not applicable.

V. Progress Since Last Review

OT042 was not specifically reviewed in the 1998 Five-Year Review Report (HAFB EMR 1998b).

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer)

Not Applicable

Question A (Comment)

Not applicable. There are no remedies associated with this site.

Question B (Answer)	Not Applicable
Question B (Comment)	Not applicable.
Question C (Answer)	Not Applicable
Question C (Comment)	Not applicable.
VIII. Issues	None.
IX. Recommendations	None.
X. Protectiveness	Not Applicable
Protectiveness Statement	Investigations indicate that OT042 does not pose a threat to human health and the environment and no further action was approved in the 1994 ROD (HAFB EMR 1994).
XI. Next Required FYR	None - Current FYR is Final

Operable Unit 5

I Introduction

OU 5 is located along the northwestern boundary of Hill AFB. It includes three IRP sites (see Table OU 5-1) that encompass contaminated soil and groundwater on- and off-Base. There is currently no ROD in place for OU 5. Bamberger Pond (site SD016) has been designated as a site with no further remedial action planned (HAFB EMR 2000) and has been included here only for completeness and to document site background information. The other two IRP sites that are active are the subject of this FYR and include; the US Army Tooele Rail Shop (TARS) site containing what is commonly referred to as the TARS plume and the Building 1607-Evaporation Pond site (site SS091), containing what is commonly referred to as the Zone 16 plume (site SS017). The TARS plume consists of contaminated soil on-Base, and contaminated groundwater originating on-Base and continuing west off-base beneath the cities of Sunset and Clinton. This site has two operating, early action remedial systems, an air sparge system and a groundwater extraction system. A third early action is under construction that is designed to limit the migration of contaminated groundwater into the city of Clinton. The Zone 16 plume also originates on-Base and in part commingles with the TARS plume and continues off-Base in a separate plume to the north beneath the cities of Sunset and Clinton. The locations of the active IRP sites are shown in Figure OU 5-1.

Table OU 5-1. OU 5 Site Identification

Site ID	Site Name
SD016	BAMBERGER POND
SS017	US ARMY TOOELE RAIL SHOP
SS091	BLDG 1607 - EVAP. POND

II Site Chronology

See Table OU 5-2 for a history of events in this OU. The table is organized to describe events that impacted the OU as a whole, followed by events impacting specific IRP sites within the OU.

III Background

OU 5 initially included only the TARS plume and Bamberger Pond. A remedial investigation was completed in 1995. The feasibility study was in its draft version in 1999 when further investigations, performed for the OU 9 North Area Site Investigation, discovered additional groundwater in the OU 5 area that had been contaminated with TCE and other VOCs. This newly discovered contamination was referred to as the Zone 16 plume (SS091) (MWH 2002a). Its discovery prompted reopening of the OU 5 RI in 1999.

Bamberger Pond is an unlined storm-water runoff holding system located on the west side of Hill AFB just south of the West Gate and was included in the original IRP program because of nearby historical industrial activities. Elevated concentrations of arsenic and manganese in groundwater beneath Bamberger Pond were identified. However, through extensive investigation and research, it was determined that contaminant concentrations are a result of naturally occurring processes (URS 2000).

The TARS area includes a rail shop, a former Base housing area, and the footprint of a former wastewater treatment system. Groundwater contamination associated with the rail shop (constructed to service and repair railroad engines for the military) is present in the shallow aquifer and extends off-Base beneath commercial and residential areas. The groundwater is not used for drinking water, however, there are three known non-culinary users of the groundwater who have been provided with city water by Hill AFB.

The Zone 16 Complex area (which includes Building 1607) is located east of the TARS area and is currently used for missile testing, research and maintenance; historically it was the former West Fuze Plant which manufactured bombs and other munitions. Degreasing solvents likely were associated with the activities at these facilities. Shallow groundwater contamination associated with solvent use has migrated off-Base beneath commercial and residential areas.

IV Remedial Actions

Early remedial actions have been implemented at OU 5 to address off-Base groundwater contamination. The RI for OU 5 is not yet complete, however, numerous contaminants have been identified in the groundwater above their associated MCLs and are presented in the individual site summaries (see Section XIII). The early action remedial systems were primarily designed for the removal of groundwater contaminated with TCE. The following remedial action objectives for OU 5 are taken from the 1996 Action Memorandum for OU 5 (Radian Int'l 1996), and apply to all OU 5 early remedial actions performed under the OU 5 Engineering Evaluation/Cost Analysis:

- To reduce or eliminate releases and potential releases of contaminated groundwater flow through seeps and springs.
- To prevent further groundwater degradation from uncontrolled movement of the existing plume.
- To reduce the spread of contamination to currently unaffected residents.
- To prevent and minimize the effect of contaminant releases on the welfare of residents living in Sunset and Clinton.
- To support and complement the overall remediation strategy considered in the feasibility study for OU 5.

Two early action remedial systems have been constructed to mitigate off-Base plume migration at site SS017. These were implemented in two phases, phase I constructed an aeration curtain and phase II a groundwater extraction system (see Figure OU 5-1). A third early action remedial system (a groundwater extraction trench) for site SS017 is in the final stages of construction and is planned to begin operation in the spring of 2003. No remedial actions are in place at site SS091.

V Progress Since Last Five-Year Review

Four areas of progress have been made at OU 5 since the last FYR (HAFB EMR 1998) and they include:

1. A NFRAP was completed for Bamberger Pond (SD016).

2. The soil vapor extraction system at the phase I aeration curtain was taken off-line in September 2000, with concurrence from regulators (Torres, O. 2003).
3. A Remote Data System (RDS) to monitor the treatment systems was completed and installed in 2002 at the Phase I and Phase II systems.
4. The OU 5 RI was reopened and will be completed by June 2003.

VI Five-Year Review Process

Site review was conducted per the process described in this report for the overall 2003 FYR.

VII Technical Assessment

Results of the technical assessment for each site in OU 5 and for the operable unit as a whole are listed in Table OU 5-3. Details of the technical assessment for each site in OU 5 are provided in the respective site summary (see Section XIII).

Table OU 5-3. Technical Assessment Summary for OU 5

Site ID	Remedy	Technical Assessment*			Protectiveness	Next Five-Year Review
		Question A	Question B	Question C		
SD016	Not required, NFRAP site	NA	NA	NA	NA	Not required
SS017	Phase I: aeration curtain & groundwater use restrictions	Yes	Yes	Yes	Protective in the short-term	2008
SS017	Phase II: groundwater extraction system & groundwater use restrictions	No, not capturing the 100 ppb contour plume	Yes	Yes	Protective in the short-term	2008
SS017	Phase III: groundwater extraction trench (not operational at this time) & groundwater use restrictions	NA	NA	NA	Protective in the short-term	2008
SS091	No remedial actions are in-place at this time & groundwater use restrictions	NA	NA	NA	NA	2008
OU 5	Aeration curtain, groundwater extraction & groundwater use restrictions	No	Yes	Yes	Protective in the short-term	2008

* Question A: Is the remedy functioning as intended by the decision documents?
Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objective (RAOs) used at the time of the remedy still valid?
Question C: Has any other information come to light that could call into question the protectiveness of the remedy?
NA = Not Applicable

Question A. Is the remedy functioning as intended by the decision documents?

It should be noted that the remedies for OU 5 refer to early actions and not final remedies. The NA designation in Table OU 5-3 indicates either that no remedy is required (SD016) or that the remedy is not yet operational (SS017, Phase III), or has not yet been selected (SS091).

Question B. Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy still valid?

The exposure assumptions, toxicity data, and cleanup levels are undergoing evaluation as part of the current RI activities being conducted for OU 5. The RAOs (presented here in Section IV) for early action remedies associated with OU 5 are general and do not define clean-up standards. Therefore, these RAOs are still valid. Furthermore, the Utah and Federal drinking water standard for TCE of 5 µg/L, which was used as a design parameter for the aeration curtain, is still valid.

Question C. Has any other information come to light that could call into question the protectiveness of the remedy?

See Sections VIII and IX for details.

VIII Issues

Based on the information reviewed and interviews and inspections conducted, issues that may affect protectiveness of the selected remedies at OU 5 are listed below:

1. The blowers in the site SS017 Phase I aeration curtain fail approximately every 2 years and the sparge pipes have clogged intermittently since construction. Currently, the aeration curtain is allowing concentrations of TCE greater than 5 µg/L to pass through.
2. The site SS017 Phase I blower building overheats in the summer, causing the system to periodically shut down (Knutson, S., 2003).
3. The site SS017 Phase II groundwater extraction system does not appear to meet its RAO of containing the 100 parts per billion (ppb) contour. In addition, analysis of future mass removal predicts that the Phase II system will remove less than another 1% of the OU 5 dissolved contaminant mass over the next 30 years (MWH 2002a).
4. The 5 to 100 µg/L portion of the TARS plume has passed the location of the site SS017 Phase III groundwater extraction trench and therefore will not be treated by any systems currently designed. However, EMR has indicated that preliminary RI modeling (to be completed the summer of 2003) suggests that this portion of the plume will only persist for approximately 15-20 years after start-up of the Phase III trench.
5. There has been no published evaluation of indoor air quality in residences above the plumes. However, according to EMR, the Draft RI, to be completed the summer of 2003, includes indoor air sampling that indicates indoor air is not a problem.

IX Recommendations and Follow-up Actions for OU 5

The recommendations and follow-up actions for OU 5 are:

1. Evaluate the life expectancy of the site SS017 Phase I (aeration curtain) system and if appropriate replace the blowers with an air compressor.
2. Clean the site SS017 Phase I (aeration curtain) sparge lines and develop a preventive maintenance process to prevent unplanned system shutdowns in the future.
3. Increase ventilation in the site SS017 Phase I (aeration curtain) blower building.
4. Shut down the site SS017 Phase II (groundwater extraction) system.
5. Continue all institutional controls, primarily, groundwater-use restrictions on the shallow aquifer beneath sites SS017 and SS091 (HAFB 1998).

X Protectiveness Statement for OU 5

Activities at OU 5 are protective of human health in the short-term, due to restrictions on the use of contaminated groundwater beneath the current plumes. The RAOs for OU 5 are not intended to protect overall human health and the environment but are directed toward slowing migration of contamination until a permanent remedy can be installed. The site SS017 Phase I (aeration curtain) early action remedy has a very high cleanup efficiency (averaging greater than 92%) and is reducing contaminant levels as intended and, therefore, is meeting the RAOs at this time. However, it is not currently remediating the groundwater that passes through it to below MCLs (as designed). The site SS017 Phase II (groundwater extraction) system does not appear to meet RAOs. Currently, concentrations in the groundwater downgradient of the trench (see Figure OU5-1) are between 5 and 100 µg/L. According to modeling conducted for Hill AFB (MWH 2002d), contamination at these concentrations will remain in the groundwater for between 20 and 30 years. There is no remedy in place for the contaminant plume associated with SS091. An OU 5 RI is in the final stages of completion to be followed by a feasibility study, ROD, and presumably remedial designs to permanently address protectiveness of human health and the environment at OU 5.

XI Next Review

The next review for OU 5 is required by 2008. No future review is required for Bamberger Pond (SD016) because no further remedial action is planned at this site.

XII References for Operable Unit 5 Summary

(HAFB 1998) OO-ALC-HAFB Supplement I, AFI 32-7020, 29 April 1998, Hill AFB, 29 April 1998.

(HAFB EMR 2000) Bamberger Pond NFRAP Action Memorandum, Hill AFB EMR, June 2000.

(Knutson, S. 2003) Knutson, S., O&M Contractor, URS, Personal Communication, 12 February 2003.

(MWH 2001) Performance Standard Verification Plan For Phase III EE/CA, Operable Unit 5, Montgomery Watson Harza, October 2001.

(MWH 2002a) Final Conceptual Model for Operable Units 5 and 12, Montgomery Watson Harza, September 2002.

(MWH 2002b) Engineering Evaluation and Cost Assessment (EE/CA) Addendum For Operable Unit 5, Montgomery Watson Harza, January 2002.

(MWH 2002c) Final Operable Units 5 and 12 Historic Site and Source Area Review, March 2002, Montgomery Watson Harza, March 2002.

(MWH 2002d) Final Contaminant Transport Model Report for Operable Units 5, Montgomery Watson Harza, February 2002.

(Radian 1995a) Baseline Risk Assessment Operable Unit 5 Sites SS17, SD16 Executive Summary, Radian, February 1995.

(Radian Int'l 1996) Action Memorandum Operable Unit 5, Hill AFB, Radian International, March 1996.

(Torres, O. 2003) Torres, O., Project Manager, Hill AFB EMR, Personal Communication, 06 February 2003.

(URS 2000) Final Fate and Analysis of Arsenic and Manganese in the Vicinity of Bamberger Pond, URS Radian International, June 2000.

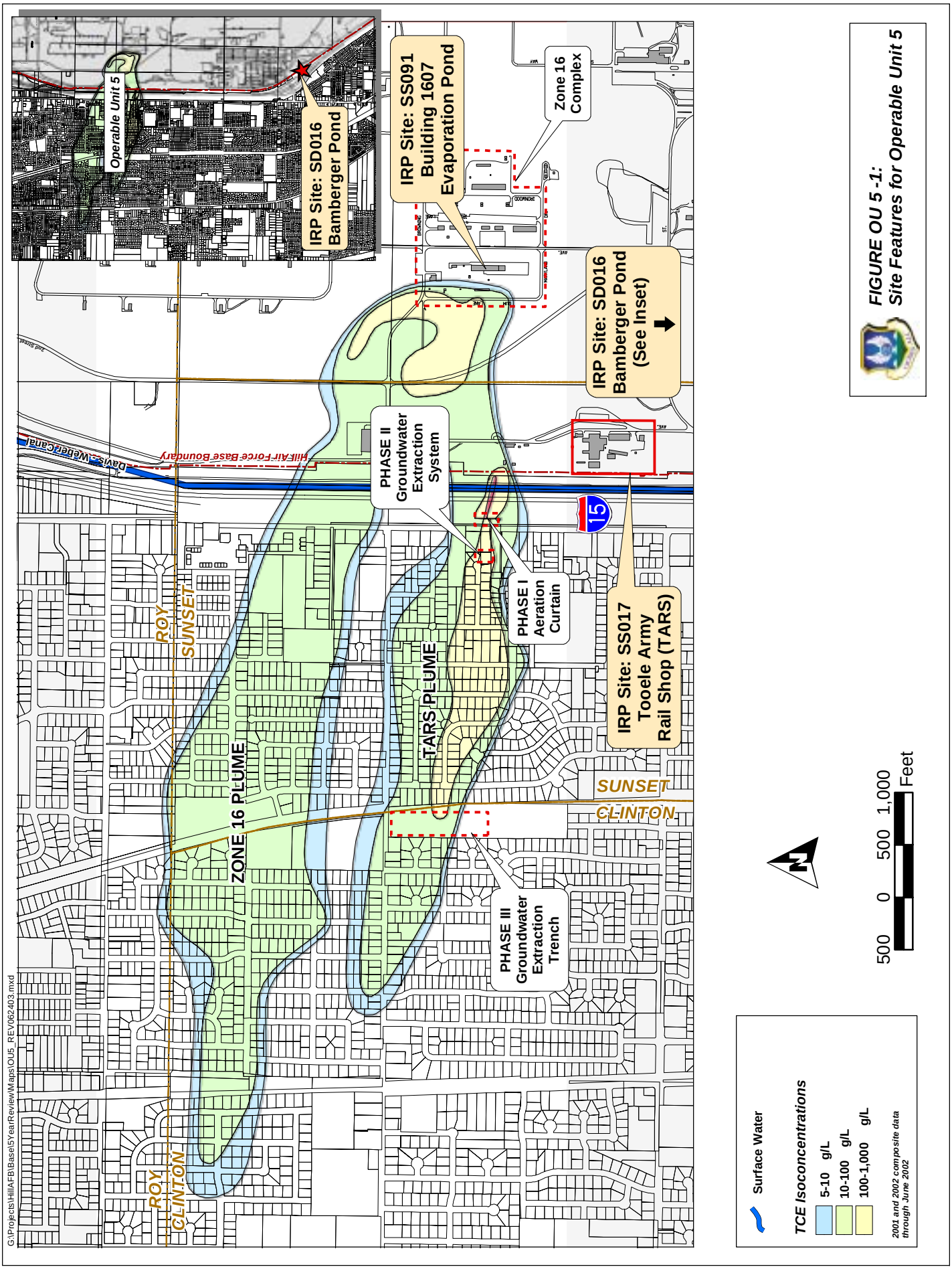

FIGURE OU 5 -1:
Site Features for Operable Unit 5

Table OU 5 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
OU 5	**OPERABLE UNIT 5**			
	1986	Field work began as part of the Installation Restoration Program	Field work was conducted at the Tooele Army Rail Shop and Bamberger Pond.	Remedial Investigation Report Operable Unit 5 Sites SS17, SD16 Volume 1 - Text
	1987	Trace quantities of trichloroethene and 1,1,1-trichloroethane were found in two residential wells and a spring located off-Base	The wells and spring were located in the cities of Sunset and Clinton approximately 1 mile west of the Base. Monitoring wells were installed and soil and groundwater samples were collected at these sites from 1989 through 1991. This would become Site SS017.	Remedial Investigation Report Operable Unit 5 Sites SS17, SD16 Volume 1 - Text
01	1988	Installation Restoration Program, Phase II Confirmation/Qualification Stage 2 completed	Identified the Tooele Army Rail Shop area and Bamberger Pond as potential sources of contamination.	Action Memorandum Operable Unit 5, Hill AFB
	1992	RI work began	OU 5 Remedial Investigation activities commenced for Sites SS017 and SD016.	Draft Conceptual Model for Operable Unit 5, May 2001
08	1994	Final Environmental Assessment, Operable Unit 5, Sites SS017, SD016	Discusses the environmental impacts of the OU 5 aeration curtain treatability study, the feasibility study pumping test, and the Engineering Evaluation Cost Analysis removal actions. No environmental impacts were expected from these activities.	Action Memorandum Operable Unit 5, Hill AFB

Table OU 5 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
12	1994	Final Engineering Evaluation and Cost Analysis for Operable Unit 5 completed	This document outlined five early actions to be implemented in phases at OU 5. The fourth (pertaining to an area now part of Zone 16) and fifth (having to do with Bamberger Pond) phases were not implemented.	Engineering Evaluation/Cost Analysis Operable Unit 5
02	1995	Final Baseline Risk Assessment. Operable Unit 5, Sites SS017, SD016	This Risk Assessment will be superseded or have an addendum in 2003 which will address the additional areas (Zone 16 plume) discovered and addressed under the reopened Remedial Investigation.	Baseline Risk Assessment Operable Unit 5 Sites SS17, SD16 Executive Summary
05	1995	Final Remedial InvestigationI Report for OU5, Sites SS017 and SD016 completed	Although this Remedial Investigation is titled 'Final' it was reopened in 1999 due to the discovery of further contamination (Zone 16 plume).	Remedial Investigation Report Operable Unit 5 Sites SS17, SD16 Volume 1 - Text
03	1996	Final Action Memorandum Operable Unit 5 completed	This document provides support and justification for implementing the early removal actions described in the Engineering Evaluation Cost Analysis.	Action Memorandum Operable Unit 5, Hill AFB
05	1996	Draft Final Feasibility Study, Operable Unit 5 completed	This feasibility study will be superseded by the Remedial Investigation and Feasibility Study, which was reopened in 1999 and is still ongoing.	Draft Final Feasibility Study, Operable Unit 5
01	1999	Remedial Investigation Reopened	Investigations performed throughout OU 9 between 1996 and 1998 identified the existence of a volatile organic compound groundwater plume substantially larger than that addressed in the 1995 RI. This plume became IRP site SS091, also known as the Zone 16 plume. The final remedial investigation is not complete as of Jan. 2003, but a draft document is anticipated in mid-summer 2003.	Draft Conceptual Model for Operable Unit 5, May 2001

Table OU 5 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
10	2001	Final Conceptual Model for Operable Unit 5 completed	This document presents a conceptual model for the fate and transport of contaminants in groundwater at OUs 5 and 12.	Final Conceptual Model for Operable Unit 5, Oct. 2001
10	2001	A northern groundwater contamination plume within OU 5 was discovered and split from OU 5 to make OU 12	This plume was discovered during additional environmental investigations in 2000.	Final Operable Units 5 and 12 Historic Site and Source Area Review, March 2002
01	2002	Final Engineering Evaluation and Cost Assessment Addendum for Operable Unit 5 completed	Addresses changes in Phase III of the original Engineering Evaluation Cost Analysis and deleted Phases IV and V from actions to be completed..	Engineering Evaluation and Cost Assessment (EE/CA) Addendum For Operable Unit 5
SD016	**BAMBERGER POND**			
06	2000	Bamberger Pond No Further Response Action Planned Action Memorandum completed	Provides a document that the State agreed with, stating that the Bamberger Pond site requires no further remedial action.	Bamberger Pond NFRAP Action Memorandum
06	2000	Final Fate and Analysis of Arsenic and Manganese in the Vicinity of Bamberger Pond completed.	This document analyzes arsenic and manganese in the vicinity of Site SD016 and provides evidence that elevated concentrations of both are a result of naturally occurring processes.	Final Fate and Analysis of Arsenic and Manganese in the Vicinity of Bamberger Pond

Table OU 5 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
SS017	**US ARMY TOOELE RAIL SHOP**			
	1991	Soil-gas survey performed at the Tooele Army Rail Shop	As a result, two underground fuel storage tanks at Building 1705 at the Tooele Army Rail Shop were removed and limited petroleum hydrocarbon contamination in soil was removed.	Remedial Investigation Report Operable Unit 5 Sites SS17, SD16 Volume 1 - Text
05	1997	Installation of Sparge Curtain complete and operation begins	The sparge curtain is Phase I of five phases recommended in the original Engineering Evaluation Cost Analysis as early actions.	Engineering Evaluation and Cost Assessment (EE/CA) Addendum For Operable Unit 5
09	1997	Installation of Groundwater Extraction System	The Groundwater Extraction System is Phase II of five phases recommended in the original Engineering Evaluation Cost Analysis as early actions. Operation began in November 1997.	Engineering Evaluation and Cost Assessment (EE/CA) Addendum For Operable Unit 5
	1999	Sparge lines and gravel pack for the Phase I Aeration Curtain were cleaned	System was experiencing operational problems with the sparge blowers due to excessive backpressure from the sparge lines due to sediment in the trench.	Draft Conceptual Model for Operable Unit 5, May 2001
10	2001	Performance Standard Verification Plan for Phase III EE/CA, Operable Unit 5 completed.	Defines the tools and procedures necessary to demonstrate progress towards or attainment of performance objectives established for the Phase III early action, consisting of a groundwater extraction trench, which was installed October 2002 through April 2003.	Performance Standard Verification Plan For Phase III EE/CA, Operable Unit 5

Table OU 5 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
SS091	**BLDG 1607-EVAP. POND**			
	1998	Zone 16 Plume discovered	Investigations performed throughout OU 9 between 1996 and 1999 identified a volatile organic compound groundwater plume in OU 5 larger than that originally identified in the 1995 remedial investigation. This became known as the 'Zone 16' plume and was labeled site SS091.	Final Conceptual Model for Operable Units 5 and 12

XIII Five-Year Review of Sites in OU 5

Operable unit review results are summaries of findings for all of the sites in each operable unit. The following site summaries present a detailed review of each IRP site. Therefore, much of the information presented in the Site Summaries is a duplicate of what was presented in the OU Summary.

The reader is encouraged to use the Site Summary to obtain details on specific contaminants of concern and the technical assessment for each site.

OU 5 SD016 BAMBERGER POND

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

Site SD016 is included in OU 5 and is comprised of Bamberger Pond. This site currently has a No Further Response Action Planned status (HAFB EMR 2000). Therefore, no remedial action is required at the site. This site is included in the 2003 Five-Year Review for completeness to document the site background.

II. Site Chronology

See Table OU 5-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

Bamberger Pond is a stormwater runoff holding system consisting of two separate, unlined basins 50 to 100 feet wide and 600 to 800 feet long that connect with a culvert drain. It was built in 1941 and is located on the west side of Hill AFB just south of the west gate and west of 6th Street (see Figure OU 5-1). It is still being used to contain stormwater runoff.

Elevated concentrations of arsenic and manganese in groundwater beneath Bamberger Pond were originally thought to be a result of Base activities. However, through extensive investigation and research, it was determined that concentrations were a result of naturally occurring processes associated with the geochemical stability of the aquifer (URS 2000). Therefore, the EPA and the UDEQ concur that there be No Further Response Action Planned for Bamberger Pond (Site SS016).

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
GW	NA	NA

Remedial Action Objectives

* Not Applicable. No further remedial action planned.

IV. Remedial Actions

Not Applicable. No remedial action required at this site due to NFRAP status.

V. Progress Since Last Review

This site was mentioned in the 1998 Five-Year Review (HAFB EMR 1998); however, no specific recommendations were made. Since the 1998 FYR, Bamberger Pond (SD016) was removed from further IRP investigations and accepted by the regulatory agencies as a closed CERCLA site requiring no further action.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer)

Not Applicable

Question A (Comment)

There are no remedies associated with this site because it has been determined that no further action is necessary. The Site has NFRAP status.

Question B (Answer)	Not Applicable
Question B (Comment)	There are no remedies associated with this site because it has been determined that no further action is necessary. The site has NFRAP status.
Question C (Answer)	Not Applicable
Question C (Comment)	There are no remedies associated with this site because it has been determined that no further action is necessary. The site has NFRAP status.

VIII. Issues	None.
IX. Recommendations	None.
X. Protectiveness	Not Applicable
Protectiveness Statement	Bamberger Pond (SD016) was recommended for NFRAP status and accepted in 2000 because there is no evidence of hazardous substances or petroleum products being released, stored for one year or more, or disposed of in or around Bamberger Pond (URS 2000).
XI. Next Required FYR	None - Current FYR is Final

OU 5 SS017 US ARMY TOOELE RAIL SHOP

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

Site SS017, located on the western boundary of Hill AFB, contains a contaminated groundwater plume referred to as the TARS plume. The re-opened Remedial Investigation for OU 5 is scheduled to be complete by mid-summer 2003. Two Early Actions, consisting of an aeration curtain (Phase I) and a groundwater extraction system (Phase II) currently exist on site and a third, a groundwater extraction trench (Phase III), is in the final stages of construction. Restrictions on future use of the shallow contaminated groundwater from this site are in place and former users of this water have been placed on city water.

II. Site Chronology

See Table OU 5-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

The US Army Tooele Rail Shop (also known as the Tooele Army Rail Shop) area is located along the northwestern edge of the Base (see Figure OU 5-1) and includes a rail shop, a former Base housing area, and the footprint of a former wastewater treatment system. The area to the east of the rail shop is generally undeveloped within about half a mile. The Base boundary, rail lines, Davis-Weber Canal, Interstate Highway 15, and Main Street in Sunset City are located to the west of the rail shop (see Figure OU 5-1).

Groundwater contamination associated with the Tooele Army Rail Shop (constructed in 1942 and upgraded in 1944 to service and repair railroad engines for the military) is present in the shallow aquifer. The TARS groundwater plume commingles with the Zone 16 (Site SS091) plume on-Base and then separates and extends approximately one mile beyond the boundary of Hill AFB under the communities of Sunset and Clinton. An open area immediately west of the rail shop was formerly used for cleaning large train parts. Trichloroethene reportedly was used for this purpose during the period of 1959-1964. Building 1712 was constructed over this area in the late 1980s. Prior to 1979, runoff from a steam cleaning system at the rail shop flowed into a drainage grate which fed an in-ground oil-water separator. Hill AFB drawings indicate the storm drain lines extended directly north from the oil-water separator and the rail shop, parallel to the rail lines, and terminated at a gravel drain/sump approximately 1,000 feet north of building 1701, adjacent to building 1723A. These drain lines likely played a key role in the off-base migration of contaminants. In 1979, the cleaning system was redesigned to collect runoff into a new oil-water separator that discharges water to the Base Industrial Wastewater Treatment Plant.

An Engineering Evaluation and Cost Analysis was completed for OU 5 (including this site) in 1994 and outlined five phases of early actions to address contaminated groundwater. Phase I (aeration curtain) and Phase II (groundwater extraction system) have been in operation since 1997. Phase III (groundwater extraction trench) was redefined in a 2002 EE/CA Addendum and is currently under construction. Phases IV and V were deleted in the 2002 EE/CA Addendum. See Figure OU 5-1 for the locations of these systems. An RI and draft FS were completed in 1995. However, further groundwater contamination was discovered in 1999 (now known as the Zone 16 Plume, SS091) causing the OU 5 RI to be re-opened. The re-opened RI will be complete by June 2003. No ROD exists for this site, but there is a 1996 Action Memorandum and 2002 Action Memorandum Addendum authorizing construction of three phases of early actions.

Groundwater-use restrictions are in place that preclude the use of groundwater from the shallow aquifer beneath OU 5.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
GW	1,1,1-TRICHLOROETHANE	No number specified, see RAOs
GW	1,1-DICHLOROETHENE	No number specified, see RAOs
GW	cis-1,2-DICHLOROETHENE	No number specified, see RAOs
GW	PERCHLORATE	No number specified, see RAOs
GW	TETRACHLOROETHENE(PCE)	No number specified, see RAOs
GW	TRICHLOROETHENE (TCE)	No number specified, see RAOs
GW	VINYL CHLORIDE	No number specified, see RAOs

Remedial Action Objectives

* To support and complement the overall remediation strategy considered in the feasibility study for OU 5.
* To prevent further groundwater degradation from uncontrolled movement of the existing plume.
* To reduce the spread of contamination to currently unaffected residents.
* To prevent and minimize the effect of contaminant releases on the welfare of residents living in Sunset and Clinton.
* To reduce or eliminate releases and potential releases of contaminated groundwater flow through seeps and springs.

IV. Remedial Actions

No ROD exists for this site. However, there are three early removal actions:

Phase I Aeration Curtain:
The Aeration Curtain consists of an air sparge (AS) system and a soil vapor extraction system which consist of two sparge blowers, two SVE blowers, an inlet separator, a heat exchanger, sparge and SVE piping, and a blower building. These systems are connected to a trench approximately 400 feet long, 30 feet deep, and 3 feet wide that runs north to south on the east side of Main St. in Sunset, UT. The aeration curtain was installed to intercept contaminated groundwater traveling west from Hill AFB and treat it in situ by blowing air from the pipes at the bottom of the trench through the contaminated groundwater, stripping TCE in the process. It has been in operation since May 1997.

Phase II Groundwater Extraction System:
The GES consists of five extraction wells, five piezometers, and piping to pump groundwater to a sanitary sewer manhole for treatment by the North Davis County Sewer District (NDCSD). The system is located at 2125 N. 55 W. (approximately one block west of Main Street) in the City of Sunset, UT. The system was installed to provide capture of the >100 ppb TCE portion of the contaminated groundwater plume downgradient of the aeration curtain. It has been in operation since November 1997.

Phase III Groundwater Containment System:
Construction of this system is in its final stage and will be operational in April 2003. The system is located at 550 W and 2250 N in the City of Clinton, UT and is comprised of a groundwater extraction trench and a downgradient slurry wall.

V. Progress Since Last Review

During the last Five-Year Review in 1998 (HAFB EMR 1998), no specific recommendations were made for site SS017. However, it was mentioned that a study was being conducted to evaluate conversion of the aeration curtain to a groundwater extraction system. This conversion has not been made due to economic reasons and the aeration curtain is still performing to meet RAOs. Since the last FYR, the soil vapor extraction system has been turned off (in September 2000), with concurrence from regulators (Torres, O. 2003), because TCE concentrations were not detected in the collected vapor. A Remote Data System to monitor the treatment systems was completed in 2002. The location proposed for the Phase III Groundwater Extraction Trench at the time of the last FYR has been changed from the City of Sunset to the City of Clinton (see Figure OU 5-1 for current location). The OU 5 RI has been reopened and is estimated to have a draft complete by mid-summer 2003.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer)

No

Question A (Comment)

Phase I (aeration curtain): The system still appears to be meeting the RAOs (by controlling the movement of the plume and reducing the spread of contamination) and is operating at an average efficiency of greater than 92%. However, the system is not currently functioning as designed (concentrations of TCE greater than 5 ug/L are passing through the curtain) due to blower failures and sparge pipe clogging, which reduce efficiency and, if not rectified, may cause the system to no longer function as intended. Historically, when the aforementioned problems were not occurring, the system functioned at or above its design specifications.

Phase II (groundwater extraction system): This system is not capturing the plume as originally designed and is not functioning as intended.

Question B (Answer)

Yes

Question B (Comment)

The RAOs (presented here in Section III) for these early action remedies are intended to mitigate the plume until long-term remedial actions are implemented and do not define clean-up standards. The RAOs are still valid. The Utah and Federal drinking water standard for TCE of 5 ug/L, which was used as a design parameter for the aeration curtain, is also still valid. The MCLs used to determine contaminants of concern are also still valid.

Question C (Answer) Yes

Question C (Comment) Phase I (aeration curtain): According to interviews conducted for this review with Oscar Torres, Mark Loucks, Curt Himle, Steve Knutson, and Tyler Esplin, there are several equipment problems (sparge blowers fail approximately every two years and continually leak oil, and the sparge lines clog intermittently). At the time of inspection, only one blower was operable. These problems will affect the system's efficiency and potentially could jeopardize the ability of the system to meet RAOs. The last two quarters of 2002 showed that all of the wells downgradient of the aeration curtain had TCE levels above the MCL of 5 ug/L. Prior to this, since the system started operation, downgradient concentrations were below 5 ug/L.

Phase II (groundwater extraction system): According to interviews and contaminant contour maps, this system is no longer preventing migration of the contaminant plume or removing significant mass. The system will be recommended for shutdown in the upcoming FS because it is not achieving its goal and the predicted TCE mass removal over the next 30 years will only increase by one percent from the mass currently removed.

VIII. Issues

*Currently, the aeration curtain is allowing concentrations of TCE greater than 5 ug/L to pass through.
*The Phase II groundwater extraction system does not appear to be affecting the plume and is predicted to only remove another one percent of contaminant mass over the next 30 years.
*The 5 to 100 ug/L portion of the plume has passed the location of the Phase III groundwater extraction trench and therefore will not be treated by any systems currently designed.
*According to documents included in this review (those published up to September 2002), there has been no evaluation of indoor air quality in residences along the plume. However, according to EMR, an indoor air evaluation is being conducted as a part of the re-opened RI.
OPERATIONAL PERFORMANCE ISSUES:
*Phase I aeration curtain equipment: the blowers fail every two years; the sparge pipes have clogged intermittently since construction; and the blower building overheats in the summer, causing the system to periodically shut down (Knutson, S. 2003).
*Efficiency of the Phase I aeration curtain is calculated using concentrations from a set of wells that are not all directly up and downgradient of one another or the aeration curtain. It is not immediately apparent how this combination would effect the efficiency calculation, however, it appears that the calculation does not give a true representation of the aeration curtain efficiency.

IX. Recommendations

Phase I (aeration curtain):
*Evaluate the life expectancy of the system and consider replacing the blowers with an air compressor if appropriate
*Clean the sparge lines and develop a preventive maintenance process to prevent unplanned system shutdowns
*Increase ventilation in the blower building

*Use only up and downgradient well pairs in the efficiency calculation

Phase II (groundwater extraction system):
* Shut down system

Generally:
*Continue with groundwater use restrictions on the shallow aquifer

X. Protectiveness

Protective in the short-term

Protectiveness Statement

Due to the restrictions on the use of contaminated groundwater beneath the current plume, the early actions associated with SS017 are protective in the short-term. Although the Phase I early action remedy appears to be meeting the RAOs at this time, it is not currently remediating the groundwater to below MCLs (as it was designed to do). Additionally, the current RAOs for this site are not intended to protect overall human health and the environment, but only to minimize the migration of contamination. The Phase II groundwater extraction system does not appear to meet the RAOs. The Phase III system is currently under construction and should help to minimize further migration of the portion of the plume greater than 100 ug/L into the city of Clinton. However, it appears that the 5 to 100 ug/L portion of the plume has already passed the Phase III location.

XI. Next Required FYR

2008

OU 5 SS091 BLDG 1607-EVAP. POND

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

Site SS091 (Building 1607-Evaporation Pond) is a part of OU 5, is comprised of contaminated groundwater, and is referred to as the Zone 16 plume. This plume was discovered in 1999 during investigations conducted for OU 9 and instigated the reopening of the OU 5 Remedial Investigation in 1999. The reopened RI for OU 5 will be complete in June 2003 (Loucks, M. 2003). No remedial actions, early actions, or interim actions currently exist on site.

II. Site Chronology

See Table OU 5-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

This site is referred to as the Zone 16 plume (also known as the Bldg. 1607-Evaporation Pond) with its suspected source area (Zone 16 Complex) being east of the Tooele Army Rail Shop (TARS) area (See Figure OU 5-1). This site was not identified during the original Remedial Investigation for OU 5 (Radian 1995). It was discovered during site inspection investigations performed for the OU 9 North Area and was delineated in March of 1999 (MWH 2002a). Its discovery prompted the reopening of the OU 5 RI in 1999.

The Zone 16 source investigation area is a series of buildings (buildings 1600-1609 within 1600 complex) currently used for munitions storage, and historically known as the West Fuze Plant in the 1940s. The contaminant plume commingles with the TARS plume on-Base and then continues off-Base, beneath the cities of Sunset and Clinton, in a discrete plume to the north of the TARS plume (See Figure OU 5-1 for details).

The Zone 16 area, located within the former West Fuze Plant, includes the Building 1607 Complex, which refers to the entire fenced area around this group of buildings including the former flash pond, and is believed to be a primary source area for groundwater contamination. Building 1607 was originally the Small Arms Repair Warehouse which became the Loading and Assembly Line Building. Degreasing solvents were likely associated with the activities conducted at these facilities.

Although the RI is not complete, and formal contaminants of concern or specific clean-up levels not yet identified, investigations have been completed that indicate the following contaminants exist in the groundwater above their associated maximum contaminant levels (MCLs): carbon tetrachloride, cis-1,2-dichloroethene, perchlorate, tetrachloroethene (PCE), and trichloroethene (MWH 2002b; MWH 2002c). It is likely that the formal COCs will include some or all of the aforementioned contaminants. EMR has indicated, in personal communications (Knutson, S. 2003; Torres, O. 2003), that ongoing data collection and modeling suggest the plume is stable.

The Remedial Action Objectives for this site are general OU 5 RAOs that could apply to this site if any early actions were taken prior to a Record of Decision.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
GW	NA - Remedial Investigation and Risk Assessment have not been completed; therefore, no CoCs are defined to date.	NA

Remedial Action Objectives	* To prevent and minimize the effect of contaminant releases on the welfare of residents living in Sunset and Clinton. * To reduce or eliminate releases and potential releases of contaminated groundwater flow through seeps and springs. * To prevent further groundwater degradation from uncontrolled movement of the existing plume. * To reduce the spread of contamination to currently unaffected residents. * To support and complement the overall remediation strategy considered in the feasibility study for OU 5.
IV. Remedial Actions	No remedial actions are in place at this time. Site is still in the Remedial Investigation stage.
V. Progress Since Last Review	This site had not been established as an IRP site at the time of the last (1998) Five-Year Review.
VI. FYR Process	Site review conducted per the process described in this report for the overall 2003 Five-Year review.
VII. Technical Assessment	
Question A (Answer)	Not Applicable
Question A (Comment)	No remedial actions are in place at this time. Site is still in the Remedial Investigation stage.
Question B (Answer)	Not Applicable
Question B (Comment)	No remedial actions are in place at this time. Site is still in the Remedial Investigation stage.
Question C (Answer)	Not Applicable
Question C (Comment)	No remedial actions are in place at this time. Site is still in the Remedial Investigation stage.
VIII. Issues	None.
IX. Recommendations	*Continue with groundwater-use restrictions on the shallow aquifer.
X. Protectiveness	Not Applicable

Protectiveness Statement	As there are no remedies in place at this time, a statement concerning protectiveness for SS091 is not applicable at this time. There are, however, restrictions on the use of contaminated groundwater present in the shallow aquifer beneath the current plume. Monitoring data should continue to be reviewed to ensure model accuracy. A remedial investigation is in the final stages of completion to be followed by a feasibility study, ROD, and presumably a remedial design to address human health and the environment.
XI. Next Required FYR	2008

Operable Unit 6

I Introduction

OU 6 is located in the northern portion of Hill AFB. It includes 3 IRP sites (see Table OU 6-1) and has active remediation systems in place to address contaminated groundwater and soil. The location of each IRP site is shown in Figure OU 6-1. These sites were investigated and are managed under OU 6 because of their proximity to each other. The Asphalt Pad site (OT026) consists of the larger east TCE contaminated groundwater plume and the source area with 1,1-DCE contaminated subsurface soil. Contaminated groundwater surfaces as springs in some off-Base areas. The on-Base groundwater is extracted and treated with air stripping, then discharged to a re-infiltration drain field. The off-Base groundwater is extracted and discharged untreated to the storm sewer because influent concentrations are below the discharge limit. The treatment system at Cooley's Pond has achieved the cleanup objectives and has been shutdown. The pond is under a monitoring program. The Sump Leach Field site (ST022) consists of the smaller west TCE contaminated groundwater plume. This site is being monitored for natural attenuation. The Building 1946 Evaporation Pond (SD40B) received wash water from a propellant testing laboratory. It has been designated as a site with no further remedial action planned (Radian, 1997) and has been included here for completeness and to document site background information.

Table OU 6-1. OU 6 Site Identification.

Site ID	Site Name
ST022	SUMP LEACH FIELD
OT026	ASPHALT PAD
SD40B	BUILDING 1946 EVAPORATION POND

II Site Chronology

Please see Table OU 6-2 for a history of events in this OU. The table is organized to describe events that impacted the OU as a whole, followed by events impacting specific IRP sites within the OU.

III Background

OU 6 includes buildings and adjacent land in the 1900 and 2000 Areas of Hill AFB, as well as portions of the Craigdale and Farr subdivisions of the City of Riverdale, Utah. Important features within the OU are the Roy Gate Pond, the Davis-Weber Canal, the Class IV landfill, the active Electrical Substation No. 2, and the privately owned off-Base pond (also known as Cooley's Pond). The on-Base buildings within OU 6 are occupied and operated mainly by the Silo-Based ICBM Program Office. The 2000 Area, along with buildings in the 2100 and 2200 Areas, comprises a security area known as the MAMS-2 (Missile Assembly Maintenance and Storage) area. Off-Base areas are primarily residential subdivisions. Groundwater in the shallow aquifer is currently not used as a source of drinking water, but off-Base water has historically been used for irrigation of lawns and gardens and as water for pets and livestock. In instances where contaminated groundwater was used for these purposes, alternative clean sources have been supplied to residents.

Although buildings in areas now designated as OU 6 have been in use for various purposes since the 1940s, it is believed that the use of operations-related solvent and fuel began in the 1960s when several buildings were modified to support the Bomarc missile testing and maintenance activities. Historically, hazardous wastes generated by the industrial operations were disposed of at the Base Industrial Wastewater Treatment Plant, in chemical disposal pits, in waste disposal ponds, or in landfills. The sources of the OU 6 groundwater contamination have never been documented, as this area did not have historical disposal pits, ponds or waste landfills. The best estimate at this time is that the contamination was introduced to the soils from infrequent, small volume disposals in floor drains, from leaking USTs or merely from wastes being dumped in the sandy areas between buildings. The relatively small mass of contamination in the groundwater and soils is consistent with these scenarios.

IV Remedial Actions

Remedial actions have been implemented at OU 6 to address both on-Base and off-Base contamination. The contaminants of concern at OU 6 include TCE in groundwater and surface water, and 1,1-DCE in on-Base subsurface soil. The remedial action objectives are:

- Restore the groundwater aquifer and seeps and springs, and the Cooley's Pond water to TCE concentrations of 5 µg/L or less (i.e., the drinking water standard), which results in a risk that is protective of human health.

- Prevent human exposures to 1,1-DCE in subsurface soil that lead to a total excess cancer risk for 1,1-DCE greater than 1E-6. This corresponds to a concentration of 26 µg/kg or lower.

Three treatment systems, including extraction wells and air strippers, have been constructed to stop plume migration and to treat groundwater and surface water contaminated with TCE at the east plume (OT026). Locations of the extraction wells and treatment systems are shown in Figure OU 6-1. For the west plume (ST022), no active treatment was selected, but natural attenuation of the TCE contamination plume is being monitored. No remedial action was required at SD40B because investigation indicated that the site does not pose significant risk to human health and the environment. A continuing order (HAFB 1998) restricts water rights restrictions in both on- and off-Base areas at OU 6. Access restrictions to protect workers from exposure to contaminated soil have been implemented for the on-Base source area of the east plume (OT026).

V Progress Since Last Five-Year Review

Since the 1998 FYR (HAFB EMR 1998), additional monitoring wells were installed in 1998 (U6-044, U6-045, U6-046, U6-047) to monitor the west plume. The on-Base pump and treat system was constructed in 1999 and extraction well pumps were upgraded in 2000. Groundwater TCE concentrations continue to decrease due to active remediation and natural attenuation. From 1998 to 2002, the average influent TCE concentrations at the off-Base Craigdale system have declined from 45 to 20 µg/L. From 1999 to 2002, the average influent TCE concentrations at the on-Base system have decline from 80 to 59 µg/L. The Cooley's Pond treatment system was shutdown in 2002 because TCE concentrations in the pond and the influent from the garage spring have dropped below 5 µg/L and the volume of groundwater flows has decreased significantly due to operation of the on-Base system and relining of the Davis Weber Canal. Subsequent sampling has shown that TCE concentrations continue to remain below 5 µg/L. The air stripper at the off-Base Craigdale system has been bypassed because the influent concentration of TCE is below the

discharge limit now that the storm sewer has been lined. Also, the Remote Data System to monitor the treatment systems was completed in 2002.

VI Five-Year Review Process

Site review was conducted per the process described in this report for the overall 2003 FYR.

VII Technical Assessment

Results of the technical assessment for each site in OU 6 and for the Operable Unit as a whole are listed in Table OU 6-3 (Technical Assessment of OU 6). Details of the technical assessment for each site in OU 6 are provided in the respective site summary (see Section XIII).

Table OU 6-3. Technical Assessment Summary for OU 6

Site ID	Remedy	Technical Assessment*			Protectiveness	Next Five-Year Review
		Question A	Question B	Question C		
OT026	Extraction and air stripping	No	No	No	Cannot be determined	2008
SD40B	Not required, NFRAP site	NA	NA	NA	NA	Not required
ST022	Natural attenuation	Yes	Yes	No	Protective	2008
OU 6	Extraction and air stripping, and natural attenuation	No	No	No	Cannot be determined	2008

* Question A: Is the remedy functioning as intended by the decision documents?
Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objective (RAOs) used at the time of the remedy still valid?
Question C: Has any other information come to light that could call into question the protectiveness of the remedy?
NA = Not applicable

Question A. Is the remedy functioning as intended by the decision documents?

OT026 – Asphalt Pad
No. Equipment limitations at the site OT026 On-Base Pump and Treat System (target groundwater levels not reached at extraction wells) and off-Base Craigdale Pump and Treat System (failure of an extraction well) have caused the systems to no longer function as intended. However, it does not appear that this affects protectiveness in the short-term. The extraction well U6-213 was brought back on line on April 28, 2003.

ST022 – Sump Leach Field
Yes. Long-term monitoring data indicate TCE concentrations are decreasing due to natural attenuation.

Question B. Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objective (RAOs) used at the time of the remedy still valid?

OT026 – Asphalt Pad
No. When the remedial investigation was originally conducted, air sampling was performed in homes above the plume that detected levels of TCE that were not considered to be a risk based on the indoor air action level at that time. However, since then, EMR, EPA, and Utah DEQ have jointly established a new action level for TCE concentration in indoor air of 0.43 ppbv. Several of the indoor air results from the original RI were above this new action level, creating the potential for air quality issues that have not been addressed.

ST022 – Sump Leach Field
Yes. All exposure assumptions, toxicity data, cleanup levels, and RAOs are still valid.

Question C. Has any other information come to light that could call into question the protectiveness of the remedy?

No for both OT026 and ST022.

VIII Issues

Based on the information reviewed, issues that may affect protectiveness of the selected remedies at OU 6 are listed below:

1. The effectiveness of the on-Base and off-Base treatment systems in capturing the plume cannot be determined at this time because long-term monitoring data were not rigorously evaluated for this FYR. The rates of natural attenuation at the west plume and at the northern arm of the off-Base east plume have not been evaluated, and the remedial timeframe for the groundwater plumes cannot be updated. However, preliminary evaluation of monitoring data indicates that TCE concentration at the west plume appears to be decreasing by natural attenuation. Based on qualitative evaluation of monitoring data between 1998 and 2002 at sentry wells located downgradient of the east plume (U6-025 and U6-026), the east plume appears stable and not expanding.

2. Data for downgradient sentry well U6-030 was not collected between 2000 and 2002 due to technical problems. Plume stability can be more effectively monitored if samples are collected routinely at this location.

3. Analytical data collected in the northern arm of the east plume (U6-024) indicate that the TCE concentrations remain above 5 µg/L and do not appear to be decreasing by natural attenuation. Active treatment in this portion of the contaminant plume is to be evaluated, per the ROD, if the TCE concentrations have remained above 5 µg/L after 5 years [after 2002].

4. The groundwater level at extraction wells U6-225 and U6-227 of the on-Base pump and treat system has never reached the recommended design depth for plume capture (Esplin, T. 2003). Flow rates from the pumps in these wells could be increased to draw down the water level, but the air stripper discharge pump is running at 40 gpm and cannot handle the additional flow. On-Base plume capture is questionable. However, there is no immediate threat to human health due to the lack of an exposure route on-Base.

5. Biofouling at the extraction wells has reduced the volume of groundwater that can be extracted.

6. A new action level for TCE in indoor air, at 0.43 ppbv, has been established which may introduce air quality issues that have not been previously considered.

IX Recommendations and Follow-up Actions for OU 6

The recommendations and follow-up actions for OU 6 are:

1. Continue the long-term monitoring program as described in the Performance Standard Verification Plan. The monitoring at Cooley's Pond could be reduced if data indicate that surface water quality is not being affected by the contaminated groundwater (i.e., TCE concentrations remain at or below 5 µg/L and do not show an increasing trend). Also, repair well U6-030 and continue sampling to monitor plume stability.

2. Evaluate long-term monitoring data to determine if the remedy is preventing plume migration, determine the remedial progress, and update the estimated remedial timeframe. The Performance Standard Verification Report should be conducted as scheduled in 2006.

3. Evaluate the need for active treatment in the northern arm of the off-Base contamination plume, as required by the ROD.

4. Continue operation and maintenance of the extraction and discharge components of the Craigdale PTS. Discontinue anti-scaling addition in the off-line air stripper.

5. Continue operation and maintenance of the on-Base pump and treat system. Evaluate treatment system to determine why target groundwater levels at the extraction wells, an indication of plume capture, have not been achieved. System upgrades may be required or plume capture indicators may need to be updated in the O&M Manual.

6. Develop a long-term maintenance strategy to closely monitor the biofouling problem at the extraction wells and to ensure that adequate treatment is implemented.

7. Continue all institutional controls. In addition, perform routine checks of locks, fences, and signs at wells and treatment facilities to prevent accidental exposure to contaminated water.

8. Re-evaluate indoor air data, and if necessary, obtain additional air samples, to determine if the new action level for TCE (0.43 ppbv) in indoor air would warrant additional mitigation measures in off-Base residential areas.

X Protectiveness Statement for OU 6

The protectiveness at OU 6 cannot be determined until further information can be obtained. Current data indicated that TCE concentrations in the west plume appear to be decreasing by natural attenuation. The Cooley's Pond treatment system has achieved its remedial active objective and has been shutdown. The off-Base and on-Base systems removed TCE from extracted groundwater with high efficiency and have continuously met the discharge limits. Based on preliminary evaluation of monitoring data collected between 1998 and 2002, TCE

concentration in the east plume is decreasing and the plume appears stable. In addition, the required institutional controls to prevent human exposure to contaminated groundwater and subsurface soil have been implemented. However, since impact of the OU 6 groundwater plume to indoor air quality at off-Base residences is unknown at this time, protectiveness cannot be determined.

Indoor air quality should be evaluated to determine if it has been adversely affected by the OU 6 groundwater plume. Remedial action should be implemented as necessary. Also, long-term monitoring data need to be evaluated in detail to ensure that the remedy is preventing plume migration to off-Base areas; therefore, a completed PSVR, scheduled in 2006, will be useful for determining the protectiveness of the remedial actions at OU 6 during the next Five-Year Review (2008).

XI Next Review

The next FYR for OU 6 is required by 2008. No future review is required for the Building 1946 Evaporation Pond (SD40B) because no further remedial action is planned at this site.

XII References for Operable Unit 6 Summary

(ERM 1993) Preliminary Assessment/Site Investigation, Building 1946 Evaporation Pond, ERM-Rocky Mountain, Inc., January 1993.

(Esplin, T. 2003) Esplin, T., Site Engineer for OU 6, URS Corp., Personal Communication, 27 January 2003.

(HAFB 1998) OO-ALC-HAFB Supplement I, AFI 32-7020, 29 April 1998, Hill AFB, 29 April 1998.

(HAFB EMR 1998) CERCLA 1998 Five-Year Review Hill Air Force Base, Utah, Hill AFB EMR, September 1998.

(Radian 1997) Record of Decision Operable Unit 6 Sites ST022, OT026, SD40B, Radian, August 1997.

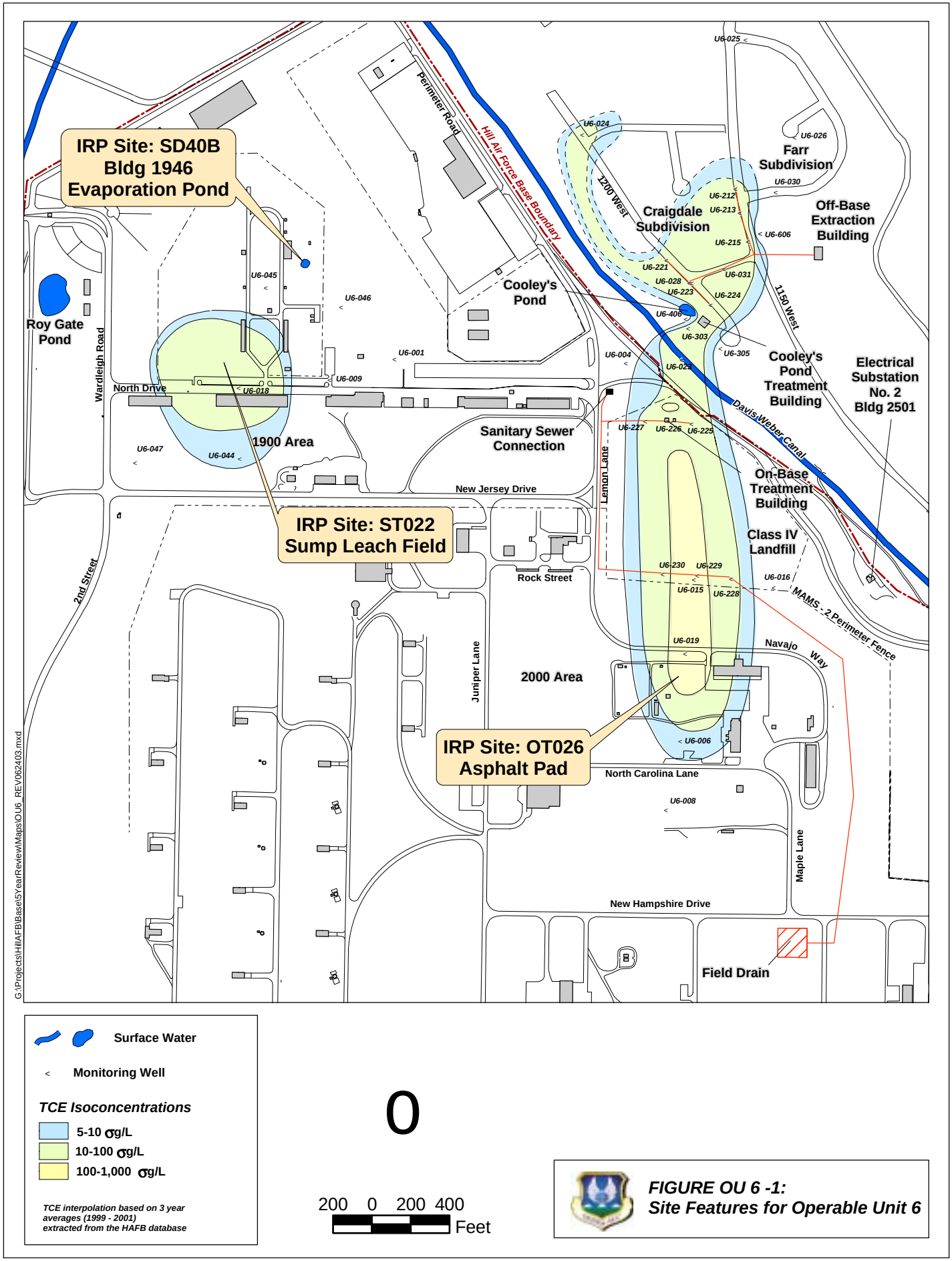

FIGURE OU 6 -1:
Site Features for Operable Unit 6

Table OU 6 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
OU 6	**OPERABLE UNIT 6**			
	1988	Investigation of the off-Base shallow groundwater and surface water east-northeast of Hill AFB boundary	1988 - 1993, performed by Hill AFB EMR. 23 locations sampled periodically for VOCs. TCE was the main contaminant detected.	Remedial Investigation Report Operable Unit 6 Sites ST22, OT26 Volume 1 Text
	1989	Preliminary Assessment	Preliminary Assessment was performed in 1989 and 1990.	Hill AFB Environmental Restoration Management Action Plan - 2001
	1989	Soil gas investigation along Perimeter Road	Performed by Radian and included an approximately one-mile stretch along Hill AFB's northern boundary through what is now known as OU 6. Results indicated elevated VOC concentrations east and northeast of the Waste Asphalt Pile, but show no "significant concentration" (two orders of magnitude above background concentration).	Remedial Investigation Report Operable Unit 6 Sites ST22, OT26 Volume 1 Text
	1990	Site evaluation study to determine whether on-Base areas are the source of contaminants (primarily TCE) detected in the off-Base area	1990 - 1992, performed by Radian. Detected on-Base TCE concentrations were approximately an order of magnitude lower than off-Base concentrations. No definitive TCE source area identified at the site. Investigators theorized source may consist of several areas of small-scale surface spills.	Remedial Investigation Report Operable Unit 6 Sites ST22, OT26 Volume 1 Text
04	1991	Hill AFB entered into a Federal Facilities Agreement with UDEQ and EPA	Agreement entered on 4/1/1991.	Record of Decision Operable Unit 6 Sites ST022, OT026, SD40B

Table OU 6 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
	1992	Site Inspection		Hill AFB Environmental Restoration Management Action Plan - 2001
10	1993	Remedial Investigation	Two groundwater contaminant plumes identified at the site: one entirely on Base and one extending to the Craigdale subdivision in the off-Base area. The approximate source areas were defined. Risk assessment determined possible future exposures associated with domestic use of groundwater containing TCE and 1,1-DCE might pose an unacceptable cancer risk.	Action Memorandum Operable Unit 6
07	1995	Remedial Investigation	-Conducted 1993-1995 -Determined the nature and extent of contamination. Identified two groundwater plumes, west plume entirely on-Base, east plume extends off Base. TCE and methylene chloride are the only organic contaminants present in concentrations greater than their MCLs for drinking water. The maximum concentration of methylene chloride was 7 ug/L, and results above the MCL were not reproducible.	Remedial Investigation Report Operable Unit 6 Sites ST22, OT26 Volume 2 Appendices
09	1996	Long Term Operation and Long Term Monitoring	Off-Base LTO/LTM began in 1996 On-Base LTM/LTM began in 1999	Hill AFB Environmental Restoration Management Action Plan - 2001
09	1996	Feasibility Study		Hill AFB Environmental Restoration Management Action Plan - 2001

Table OU 6 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
11	1996	Proposed Plan		Hill AFB Environmental Restoration Management Action Plan - 2001
12	1996	Action Memorandum - Removal action selected	Phase I&II: pump & treat systems in the Craigdale subdivision; Phase III: relining Davis-Weber Canal requires more study; Phase IV: on-Base plume should be contained, type of treatment will be selected after treatability study to evaluate in-situ air sparging/SVE and in-situ UVB technologies; Phase V: delay pump and treat system for northern portion of the off-Base plume until effectiveness of Phase II to IV can be evaluated, monitor TCE concentration in the interim	Action Memorandum Operable Unit 6
09	1998	PCB removed near Electrical substation No. 2 (Building 2501)	July to September 1998. Removal action addressed under the Toxic Substances Control Act. Contaminated soil was excavated and site was backfilled with clean soil. Electrical substation still active.	Interim PCB Contaminated Soil Removal Report for Electrical Substation No. 2
11	2001	Performance Standard Verification Plan completed	Documents the long-term monitoring plan for OU6.	Performance Standard Verification Plan Operable Unit 6
09	2006	PSVR scheduled due date		Bob Elliott, Personal Communication 1/2/2003, Federal Facilities Due Dates as of Jan 2003

Table OU 6 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
ST022	**SUMP LEACH FIELD**			
	1950	late 1950s - mid 1985: Contamination introduced at drainfield	Building 1915 was used to test Bomarc missile ramjet packages, which are the missiles' fuel delivery system. The drain field received flow from floor drains in Building 1915, and the former locations of a fuel tank and a waste fuel tank which were located between 65 and 95 feet north of the building.	Remedial Investigation Report Operable Unit 6 Sites ST22, OT26 Volume 1 Text
	1988	Site Evaluation of Building 1915 Area and Roy Gate Pond	TPH found in soils at the former site of an underground fuel storage tank. No contamination observed in solids around location of former subsurface drain field. Following sediment and surface water sampling, no further action recommended at Roy Gate Pond. Report: Chen-Northern, Inc. 1989. Building 1915 Site Evaluation Report, Hill Air Force Base, Ogden, Utah.	Remedial Investigation Report Operable Unit 6 Sites ST22, OT26 Volume 1 Text
10	1997	Record of Decision	ROD signed 10/1/1997. Contamination allowed to naturally attenuate.	Hill AFB Environmental Restoration Management Action Plan - 2001
OT026	**ASPHALT PAD**			
	1988	U.S. Air Force conducted water sampling in Craigdale subdivision area	Found chlorinated solvents, primarily TCE, in shallow groundwater and surface water.	Record of Decision Operable Unit 6 Sites ST022, OT026, SD40B
	1993	Interim Remedial Action	1993-1996. Provided an alternate source of clean irrigation water to two homes affected by shallow groundwater contamination. Collected and treated contaminated water from springs and field drains, and discharged treated water to a storm drain. Extracted and treated contaminated groundwater in the off-Base area as part of a removal action described in the Action Memorandum	Record of Decision Operable Unit 6 Sites ST022, OT026, SD40B

Table OU 6 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
	1993	Interim Remedial Action	1993-Present. Interim actions include alternate irrigation water sources, seep/spring water and groundwater recovery and treatment, alternative groundwater treatment technology evaluation. These actions have been incorporated as part of the final actions.	Hill AFB Environmental Restoration Management Action Plan - 2001
10	1994	Engineering Evaluation/Cost Analysis	Proposed to implement remedial action at OU 6 in 5 phases.	Action Memorandum Operable Unit 6
10	1994	Engineering Evaluation/Cost Analysis	The OU 6 EE/CA (Oct 1994) initiated Phase 2 of the removal action to construct the pump and treat system for the off-base portion of the plume	Hill AFB Five-Year Review, September 1998
09	1996	Startup of Craigdale Off-Base PTS	Construction of Craigdale PTS was completed under the Action Memorandum (Dec 1996). This was Phase 1 and 2 of the remedial action.	Hill AFB Five-Year Review, September 1998
09	1996	Startup of Craigdale Off-Base PTS	Technology used is air stripping. Construction period Aug/1995 – July/1996	Performance Standard Verification Plan Operable Unit 6
10	1997	Record of Decision	ROD signed 10/1/1997. Site requires active treatment.	Hill AFB Environmental Restoration Management Action Plan - 2001

Table OU 6 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
12	1997	Modification to Cooley's Pond treatment system	The Cooley's Pond Treatment System was originally completed as a removal action under the basewide seeps and springs EE/CA. (Final Basewide Engineering Evaluation/Cost Analysis for Contaminated Seeps and Springs, Hill AFB (Montgomery Watson, 1994). This treatment system has been modified over time to improve efficiency. Initially, a carbon adsorption system, housed in a separate shed, was used to treat water from the Garage Spring U6-303 and treated water was discharged to the pond. An air stripper, housed in a separate locked building, was used to treat the pond water and the treated water was discharged to the pond drain pipe. Resident complained about the noise. In 1998, a quieter air stripper was installed and the building was heavily insulated. To further reduce noise, system operation was changed from 24 hours to 16 hours per day.	Hill AFB Five-Year Review, September 1998
12	1997	Startup of Cooley's Pond PTS using a new air stripper	Technology used is groundwater extraction and air stripping.	Performance Standard Verification Plan Operable Unit 6
03	1998	Remedial Design	Design of the On-Base pump and treat system.	Hill AFB Environmental Restoration Management Action Plan - 2001
06	1999	Remedial Action	Construction of the On-Base pump and treat system with 6 extraction wells and one air stripper.	FYR Site List

Table OU 6 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
07	1999	Davis-Weber Canal failed	Canal failed downstream (west, northwest) from where the OU 6 east plume crosses to the Cooley and Craigdale systems. The systems were not impacted by the failure.	Mark Loucks, Personal Communication 3/18/03, Davis-Weber Canal Information
07	1999	Startup of on-Base PTS	Technology used is groundwater extraction and air stripping. (Phase IV of remedy)	Performance Standard Verification Plan Operable Unit 6
06	2000	The Davis-Weber Canal was relined	This corresponds to Phase III of the removal action. The canal company constructed an enclosed concrete culvert from a point east of the OU 6 plume to a point west of the plume.	Oscar Torres, Personal communication 1/30/2003, Davis-Weber Canal Information
11	2000	Cooley's residence burned	House burned on 11/18/2000 and was not rebuilt. Garage remains and still in use as of 2003. Water collected in the foundation drain was piped to Cooley's seep, which was piped to the Craigdale system. The foundation drain was destroyed when the house burned.	Interview with Oscar Torres
08	2002	Air stripper at Cooly's Pond was taken off-line, but monthly groundwater sampling continues	Garage sump and air stripper influent TCE concentrations remained below the MCL of 5.0 ug/L in August, November, and December 2002. Basis for shutdown: In 2002, Air stripper influent TCE levels were not detectable in May, June, and August, while in February, March, and July TCE levels were 0.7 ug/L or lower. April had the highest concentration of 1.50 ug/L of TCE.	Operable Unit 6 Cooley's Pond Treatment System Monthly Operation Summary, January - August 2002

Table OU 6 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
11	2002	Craigdale air stripper bypassed	System now extracts groundwater and discharges to the storm drain. After the storm drain was completely lined in fall 2001, the discharge limit was governed by the Surface Water Quality Protection rule (R317-2-14, Table 2.14.6) instead of the Groundwater Quality Protection rule (R317-6-4). The TCE discharge limit for the Craigdale treatment system was changed from 1/4 MCL (1.25 ug/L) to 81 ug/L. Acceptance by regulatory agencies was given on 9/26/2002.	Interview with Oscar Torres
SD40B	**BUILDING 1946 EVAPORATION POND**			
	1962	1962-1992 Evaporation pond held waste water from the propellant testing laboratory		Remedial Investigation Report Operable Unit 6 Sites ST22, OT26 Volume 1 Text
	1993	Preliminary assessment/site investigation of Building 1946 evaporation pond	Performed by ERM-Rocky Mountain, Inc. Concluded that past discharges to the evaporation pond have deposited some explosives in the surface soils and sediments within the dimensions of the pond and low levels of TCA in the shallow groundwater.	Remedial Investigation Report Operable Unit 6 Sites ST22, OT26 Volume 1 Text
10	1997	Record of Decision	ROD signed 10/1/1997. NFRAP for SD40B.	Hill AFB Environmental Restoration Management Action Plan - 2001

XIII Five-Year Review of Sites in OU 6

Operable unit review results are summaries of findings for all of the sites in each operable unit. The following site summaries present a detailed review of each IRP site. Therefore, much of the information presented in the Site Summaries is a duplicate of what was presented in the OU Summary.

The reader is encouraged to use the Site Summary to obtain details on specific contaminants of concern and the technical assessment for each site.

OU 6 ST022 SUMP LEACH FIELD

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

Site ST022 is the west groundwater contamination plume at OU 6. The plume is being monitored for natural attenuation.

II. Site Chronology

See Table OU 6-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

The drain field received flow from floor drains in Building 1915, and the former locations of a fuel tank and a waste fuel tank, which were located between 65 and 95 feet north of the building. From the late 1950s to 1985, Building 1915 was used to test Bomarc missile ramjet packages, which are the missiles' fuel delivery system.

The west groundwater contamination plume (Site ST022-Sump Leach Field) is located entirely on-Base near the 1900 Area and contains low concentration of TCE and occurs generally 100 ft or more below the ground surface. The direction of groundwater flow is northeast. Groundwater in the shallow aquifer is currently not used as a source of drinking water.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
GW	TRICHLOROETHENE (TCE)	5 ug/L

Remedial Action Objectives

* Restore the groundwater aquifer … to TCE concentrations of 5 ug/L or less (i.e., the drinking water standard), which results in a risk that is protective of human health.

IV. Remedial Actions

The selected remedy for the OU 6 west plume is natural attenuation.

V. Progress Since Last Review

Long-term monitoring has continued in the west plume since the last Five-Year Review (HAFB EMR 1998). Additional wells installed since 1998 to monitor the remedial progress of the OU 6 west plume include U6-044, U6-045, U6-046, U6-047. Installation was completed in September 1998.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer)

Yes

Question A (Comment)

Long-term monitoring data for a sampling location within the OU 6 west plume (U6-018) indicate that the TCE concentrations are decreasing. From 1996 to 2002, TCE concentrations at U6-018 have decreased from 30 ug/L to 10 ug/L. For the same period, TCE concentrations for locations surrounding the West Plume (U6-045, U6-046, U6-009, U6-047, U6-044) have remained below 5ug/L, mostly below the detection limit of 0.4 ug/L. This

information provides an indication that the west plume has not expanded downgradient. Detailed data analysis will be included in the upcoming PSVR and results will be available before the next Five-Year Review (2008).

Question B (Answer) Yes

Question B (Comment) The current Utah and federal drinking water standard for TCE is 5 ug/L, the same as when the risk assessment was performed at OU 6. Land use at this site has not changed. The remedial action objective listed in the OU 6 ROD for this site is still valid.

Question C (Answer) No

Question C (Comment) No information has surfaced that calls into question the protectiveness of the selected remedy.

VIII. Issues Because the long-term monitoring data have not been analyzed in detail, the rate of natural attenuation cannot be determined and the remedial timeframe cannot be updated at this time.

IX. Recommendations

*Continue long-term monitoring program at OU 6.

*Conduct the Performance Standard Verification Report as scheduled in 2006. This PSVR should provide detailed analyses of long-term monitoring data to determine the remedial progress and update the estimated remedial timeframe.

X. Protectiveness Protective

Protectiveness Statement The selected remedy associated with site ST022 is protective of human health and the environment. The TCE concentration in the west plume appears to be decreasing by natural attenuation.

XI. Next Required FYR 2008

OU 6 OT026 ASPHALT PAD

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

Site OT026 is the east groundwater contamination plume at OU 6, which extends off-Base into the city of Riverdale. Contamination consists of TCE in groundwater and surface water and 1,1-DCE in subsurface soil at the source area. Groundwater and surface water are extracted or collected and treated by air stripping in three treatment facilities.

II. Site Chronology

See Table OU 6-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

Site OT026 is located near the former waste asphalt pile, currently the Class IV landfill, near the 2000 Area. Surface features at the site include a Class IV landfill, the Davis-Weber Canal, the active Electrical Substation No. 2 (Building 2501), and the off-Base man-made pond (also known as Cooley's Pond). Groundwater in the shallow aquifer is currently not used as a source of drinking water, but off-Base it has been historically used for irrigation of lawns and gardens and as water for pets and livestock. In instances where contaminated groundwater was used for these purposes, alternative clean sources have been supplied to residents.

The TCE contamination in the groundwater begins at the 2000 Area of Hill AFB and extends off-Base into the Craigdale and Farr subdivisions of the City of Riverdale, Utah (see Figure OU 6-1). Contaminated groundwater also surfaces as springs in some off-Base areas. On-Base, the direction of groundwater flow is to the north; off-Base, the direction of groundwater flow is to the northeast. Subsurface soil contaminated with 1,1-DCE is located entirely on-Base in the high security MAMS-2 (Missile Assembly Maintenance and Storage) area. The subsurface soil contamination was found near the location of two former USTs, near test well U6-006. Underground storage tanks (USTs) and associated piping that contained solvents may have leaked and contaminated the soil and groundwater. The specific cause of the release of solvents to the environment at OU 6 is not known.

Interim remedial activities included providing off-Base residences with an alternate source of clean irrigation water, extracting and treating contaminated groundwater (Craigdale pump and treat system) to stop plume migration, and collecting and treating contaminated surface water from springs (Cooley's Pond treatment system). The OU 6 Record of Decision was published in 1997, which lead to the construction of the On-Base pump and treat system to stop contamination migration off-Base.

Surface water seen near Cooley's Pond system is thought to originate both from the natural groundwater flows and the leaking of the Davis-Weber Canal. Flow at the Cooley's Pond system has significantly reduced due to the startup of the On-Base system in 1999 and the relining of the Davis-Weber Canal in 2000.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
SOIL	1,1-DICHLOROETHENE	26 ug/kg
GW	TRICHLOROETHENE (TCE)	5 ug/L
SW	TRICHLOROETHENE (TCE)	5 ug/L

Remedial Action Objectives

* Restore the groundwater aquifer and seeps and springs, and the Cooley's Pond water to TCE concentrations of 5 ug/L or less (i.e., the drinking water standard), which results in a risk that is protective of human health.

* Prevent human exposures to 1,1-DCE in subsurface soil that lead to a total excess cancer risk for 1,1-DCE greater than 10^-6. This corresponds to a concentration of 26 ug/kg or lower.

IV. Remedial Actions

Off-Base surface water remediation - Collection and treatment in an air stripper, 1994 - 2002
The Cooley's Pond Treatment System reduces TCE concentrations in Cooley's Pond by cycling pond water through an air stripper. Water from the Garage Spring U6-303 is pumped to the pond for treatment. The air stripper has been shut down since August 2002 because the remedial action objective was achieved (i.e., the TCE concentrations in the pond water and Spring U6-303 water have remained below 5 ug/L since July 2001).

Off-Base groundwater remediation - Extraction and treatment in an air stripper, 1996 - 2002; Extraction and discharge to storm sewer, 2002 -present
The Craigdale Pump and Treat System is located downgradient of Cooley's Pond System and consists of six extraction wells located along 1150 West and 1200 West and is intended to stop plume migration. In addition, groundwater from a seep, known as the Cooley Seep, is collected and routed to the treatment system using the 1200 West groundwater conveyance lines. Extracted groundwater can be treated by a low-profile air stripper and then discharged to the Riverdale City storm drain and ultimately to the Weber River. Air stripping was discontinued (air stripper bypassed) in November 2002, when the TCE discharge limit changed from 1.25 ug/L to 81 ug/L after lining of the storm sewer was completed. Natural attenuation was chosen as the remedy for the northern arm of the off-Base contamination plume.

On-Base groundwater remediation – Extraction and treatment with an air stripper, 1999 - present
The On-Base Pump and Treat System consists of six extraction wells, located along the northern boundary of Hill AFB and along the northern edge of the MAMS-2 area, and was designed to stop migration of the contamination to off-Base areas. Extracted groundwater is treated by a low-profile air stripper and discharged to a re-infiltration drain field. As a back-up discharge provision, the treatment system includes discharge piping connected to the North Davis County Sewer District Publicly Owned Treatment Works (NDCSW POTW).

Institutional Controls
A Continuing Order (HAFB 1998) has been issued to restrict disturbance of contaminated soil and groundwater and to restrict installation of water wells on-Base at OU 6. The Utah Division of Water Rights has also restricted water well drilling and the use of shallow groundwater at off-Base areas near OU 6. The treatment building at Craigdale is locked, warning signs are posted on the building, and extraction wells are locked. The treatment building at Cooley's Pond is locked and is located on the Cooley / Winn property. The On-Base treatment building is locked and the fence around the building and well field is also locked.

V. Progress Since Last Review

The construction of the On-Base PTS was completed in 1999 and the treatment system has been operating since. In 2000, all six extraction well pumps were upgraded from 1/2 hp to 1 hp to increase the volume of groundwater that can be extracted.

The remedial action objective for Cooley's Pond treatment system has been achieved. the TCE concentration in pond water and in the influent from the garage spring has dropped below the drinking water standard (5 ug/L) and has remained below 5 ug/L since July 2001. The Cooley's Pond treatment system has been shut down since August 9, 2002, and long-term monitoring consisting of monthly sampling at the pond continues. Subsequent sampling at the pond after system shutdown has shown that concentrations continue to remain below the 5 ug/L level.

Installation of the Remote Data System at all three treatment facilities was completed in 2002. The RDS enables the remote monitoring of the treatment systems and reduced site visits and O&M cost.

Groundwater TCE concentrations continues to decrease due to active remediation and natural attenuation. From 1998 to 2002, the average influent TCE concentrations at the off-Base Craigdale system have declined from 45 to 20 ug/L. From 1999 to 2002, the average influent TCE concentrations at the on-Base system have declined from 80 to 59 ug/L.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer)

No

Question A (Comment)

Cooley's Pond Treatment System - Yes
The Cooley's Pond influent (U6-303) and pond water (U6-401) TCE concentrations have dropped below the MCL of 5 ug/L and have remained below 5 ug/L since July 2001. According to the analytical data, the remedial action object has been achieved for this treatment system. From 1990 to 2002, TCE concentrations in the Pond have decreased from 15 ug/L to 1.7 ug/L.

Off-Base Craigdale Pump and Treat System - No
In the last five years, the system has operated continuously with minor down time due to scheduled maintenance, and power failures. The system has continuously met the previous storm sewer discharge limit of 1/4 of the MCL (1.25 ug/L). From 1996 to 2002, TCE concentrations in the influent decreased from 66 ug/L to 20 ug/L. Extraction well U6-213, located at the leading edge of the contamination plume, had been off-line since February 2002 due to electrical problems. Operation of this well was restored on April 28, 2003. Failure of this well may have allowed the plume to migrate further off-Base. However, the plume does not appear to be expanding based on qualitative evaluation of data from sentry wells (U6-025 and U6-026) located downgradient of the east plume.

On-Base Pump and Treat System - No

Since startup, the On-Base PTS has been operating continuously with occasional down time due to scheduled maintenance, power failures, and equipment failure. Laboratory analysis of system effluent shows TCE concentration remained below the detectable limit of 0.4 ug/L from July 1999 (startup) to July 2002. The system removal efficiency has remained above 99% and the plant has continuously met the discharge limit of 1.25 ug/L. From 1999 to 2002, TCE concentrations in the influent have decreased from 80 ug/L to 59 ug/L. The recommended groundwater level to capture the plume at two of extraction wells (U6-225 or U6-227) have not been achieved. However, there is no immediate threat to human health due to the lack of an exposure route on-Base. Since the plume appears stable, the contaminants that migrate off-Base will be removed by the Off-Base Craigdale system.

Institutional Controls - Yes
A Continuing Order to restrict disturbance of contaminated water and soil on-Base at OU 6 has been issued and the Utah Division of Water Rights continuously enforces the restrictions on well drilling and use of shallow groundwater on-Base and off-Base at OU 6. Exposure to contaminated groundwater at treatment facilities is prevented by warning signs, fences, and locks on wells and treatment buildings. The Base continues to maintain high security at the MAMS-2 area, which prevents human exposure to contaminated subsurface soil at the source area.

Question B (Answer)

No

Question B (Comment)

The current Utah and federal drinking water standard for TCE is 5 ug/L, the same as when the risk assessment was performed at OU 6. According to EPA Region III Risk-Based Concentration Tables (October 2002), 1,1-DCE has been reclassified from cancerous to non-cancerous. Therefore, the soil cleanup level for 1,1-DCE is overprotective.

When the remedial investigation was originally conducted, air sampling was performed in a number of homes above the plume. TCE was detected in several residences, but at levels that were not considered to be a risk at that time. Due to recent emphasis on vapor intrusion, EMR has worked with the EPA and Utah State to establish an action level for TCE in indoor air at 0.43 ppbv. Because several of the air results from the original RI were above the new action level, there potentially are air quality issues that have not been addressed.

Question C (Answer)

No

Question C (Comment)

The Craigdale PTS discharges to the Riverdale City storm sewer, and the storm sewer has recently been lined. The discharge limit that was governed by the groundwater protection rule, which allowed discharge of TCE up to 1/4 the MCL (1.25 ug/L), is now governed by the surface water protection rule, which allows discharge of TCE up to 81 ug/L. As of November 2002, active treatment in the air stripper at the Craigdale PTS has ceased; groundwater is extracted and then discharged to the storm sewer. The change will not

affect the protectiveness of the remedy. Since the air stripper has been shutdown, TCE concentrations of all compliance sampling in the storm sewer have been below detection limits.

VIII. Issues

Plume Containment and Natural Attenuation Rates

* The long-term monitoring data have not been analyzed in detail, and the effectiveness of the treatment systems for containing the contaminant plume and the rate of natural attenuation have not been evaluated. The remedial timeframe cannot be updated at this time. However, preliminary evaluation of monitoring data collected between 1998 and 2002 from sentry wells located just downgradient of the plume (U6-025 and U6-026) indicates the plume appears stable and has not migrated downgradient.

* Data for downgradient sentry well U6-030 was not collected between 2000 and 2002 due to technical problems. Plume stability can be more effectively monitored if samples are collected routinely at this location.

* The northern arm of the off-Base contamination plume has been allowed to naturally attenuate. However, analytical data collected in the northern arm (U6-024) indicate that the TCE concentrations range from 7 ug/L to 32 ug/L and do not appear to be decreasing. Per the ROD, active treatment in this portion of the contaminant plume needs to the evaluated, as required by the ROD, because the TCE concentrations have remained above 5 ug/L after 5 years [after 2002].

Operations and Maintenance

* Scaling in the air stripper at the Craigdale PTS was minimized with continual addition of an anti-scale chemical polymer. However, since the air stripper was bypassed in November 2002, anti-scale treatment has continued and thus may be contributing to unnecessary O&M costs.

* Extraction well U6-213 of the Craigdale PTS, located at the leading edge of the contamination plume, had been off-line since February 2002 due to electrical problems. This could have allowed contaminated groundwater to migrate downgradient. However, the well was brought back online on April 28, 2003.

* The on-Base PTS O&M Manual (URS 2002) provides recommended water levels at each of the extraction wells to capture the plume. The groundwater level has never been lowered to the recommended depth in extraction wells U6-225 or U6-227.

* Biofouling at the On-Base and Off-Base extraction wells is a significant problem that impedes the extraction of groundwater for treatment. The extraction wells have been rehabilitated in summer of 2002; wells were acid washed, screens were cleared, wells redeveloped, and pumps cleaned. This initial treatment at the wells has increased the volume of extractable water. Quarterly chlorine treatment and annual rehabilitation of the wells is scheduled.

Institutional Controls

* Monitoring wells in the residential areas were not properly locked. Breach of security can lead to possible exposure to contaminated groundwater.

Health Risk
*Some of the indoor air sampling results, collected during the RI, exceed the new action level for TCE in indoor air (0.43 ppbv).

IX. Recommendations

Plume Containment and Natural Attenuation Rates
* Evaluate long-monitoring data to determine if the remedy is preventing plume migration, to determine the remedial progress, and to update the estimated remedial timeframe. The Performance Standard Verification Report should be conducted as schedule in 2006.
* Evaluate the need for active treatment in the northern arm of the off-Base contamination plume.
* Fix well U6-030 and continue sampling to monitor plume stability.
* Continue the long-term monitoring program. The monitoring frequency at Cooley's Pond should be reduced if concentrations continue below 5 ug/L.

Operations and Maintenance
* Continue operation and maintenance of the extraction and discharge components of the Craigdale PTS.
* Discontinue anti-scaling treatment in the off-line air stripper at the Craigdale PTS.
* Evaluate the On-Base PTS to determine why target groundwater levels at the extraction wells, which are an indication of plume capture, have not been achieved. System upgrades may be required or plume capture indicators may need to be updated in the O&M Manual.
* Develop a long-term maintenance strategy to closely monitor the fouling problem at the extraction wells and ensure that adequate treatment strategies are implemented.

Institutional Controls
* Continue all institutional controls. In addition, perform routine checks of locks, fences, and signs at wells and treatment facilities to prevent accidental exposure to contaminated water.

Health Risk
* Reevaluate RI data on indoor air and determine if the new action level for TCE in indoor air would warrant additional mitigation measures in off-Base residential areas.

X. Protectiveness

Protectiveness cannot be determined until further information is obtained

Protectiveness Statement

The protectiveness of remedies at OT026 cannot be determined until additional information can be gathered. The Cooley's Pond treatment system has achieved its remedial active objective and has been shutdown. The off-Base and on-Base systems removed TCE from extracted groundwater with high efficiency and have continuously met the discharge limits. Based on preliminary evaluation of monitoring data collected between 1998 and 2002, TCE concentration in the east plume is decreasing and the plume appears stable. Also, the required institutional controls to prevent human exposure to contaminated groundwater and subsurface soil have been implemented.

To ensure protectiveness, long-term monitoring data need to be evaluated in detail to ensure that the remedy is preventing plume migration to off-Base areas and include: a completed PSVR, scheduled in 2006, which will be useful for determining the protectiveness of the remedial actions during the next Five-Year Review (2008); an evaluation of monitoring data for the rate of natural attenuation in the northern arm of the OU 6 off-Base east plume to determine if the remedial timeframe is reasonable; evaluation of the treatment system at the on-Base PTS to determine if system upgrades are required to achieve target groundwater levels or if plume capture indicators need to be updated; and an evaluation of the RI data on indoor air and collection of additional indoor air samples as necessary to determine if the new action level for TCE (0.43 ppbv) in indoor air would warrant additional mitigation measures in off-Base residential areas.

XI. Next Required FYR

2008

OU 6 SD40B BUILDING 1946 EVAPORATION POND

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

Site SD40B is the Building 1946 evaporative pond located in the northern portion of Base near the Base museum. No remedial action was required at this site. This site is included in the 2003 Five-Year Review for completeness to document the site background.

II. Site Chronology

See Table OU 6-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

The Building 1946 evaporative pond was investigated as part of OU 6. From 1962 until 1992, the evaporation pond located near Building 1946 was used to hold wastewater from the propellant testing laboratory housed Building 1946. The pond is dry except during periods of significant rainfall. The pond is 25 ft in diameter with a maximum depth of 4 ft. The Building 1946 Evaporation Pond PA/SI (ERM-Rocky Mountain 1993) determined that past discharges to the evaporation pond deposited some explosives in the surface soils and sediments within the dimensions of the pond and low levels of TCA in the shallow groundwater. The pond was found to pose insignificant risk to human health and the environment. Per the OU 6 ROD (Radian 1997), no further action is needed for this site.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
NA	NA - Risk Assessment indicates no risk to human health and the environment.	NA

Remedial Action Objectives

* Not applicable. No COCs or RAOs for this site.

IV. Remedial Actions

Not applicable.

V. Progress Since Last Review

Site was not reviewed for 1998 Five-Year Review Report. No action has occurred since 1998.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer) Not Applicable

Question A (Comment) Not applicable.

Question B (Answer) Not Applicable

Question B (Comment) Not applicable.

Question C (Answer)	Not Applicable
Question C (Comment)	Not applicable.

VIII. Issues	None.
IX. Recommendations	None.
X. Protectiveness	Not Applicable
Protectiveness Statement	SD40B was recommended for NFRAP status and accepted in 1997 because investigations indicate that this site poses no risk to human health and the environment.
XI. Next Required FYR	None - Current FYR is Final

Operable Unit 7

I Introduction

OU 7 is a soils-only operable unit with five IRP sites (see Figure OU 7-1 for locations). Site identification numbers and site names are indicated in Table OU 7-1. The only connection among the sites other than geographical location on the Base is the connection between the Building 225 Chromium Spill site (site SS027) and the Sill property in Layton (site SS028). Fill excavated from a utility trench in Building 225 was placed at two locations on the Sill property. This fill material was later found to be contaminated with chromium. A removal action then ensued to remove the contaminated fill for proper disposal in a Resource Conservation and Recovery Act (RCRA) approved landfill.

The chromium spill site (site SS027) is a result of activities in the former Metal Plating Shop Area. The contamination associated with this site underlies a portion of Building 225. Two contaminants of concern exist at this site, hexavalent chromium and cadmium. Site SS027 is the only site containing contamination above both background levels and health risk standards. The other four sites have been closed through either separate decision documents (sites SS028 and OT029) or through the Record of Decision (ROD) (sites ST031 and SS032) and will not be discussed further in this OU Summary.

The existing floor slab overlying the former Metal Plating Shop Area in Building 225 protects human health of the area personnel by preventing exposure to contaminated soil. The ROD specifies enacting institutional controls, conducting an inspection and maintenance program, and conducting soil moisture measurements and groundwater quality monitoring for this area.

Table OU 7-1. OU 7 Site Identification

Site ID	Site Name
SS027	BUILDING 225 CHROMIUM SPILL
ST031	BUILDING 220 UNDERGROUND TANKS
SS032	BUILDING 225 PCB
SS028	SILL PROPERTY, LAYTON
OT029	BUILDING 204 BERYLLIUM UNDERGROUND WASTE TANK

II Site Chronology

Please see Table OU 7-2 for a history of events in this OU. The table is organized first to describe events that impacted the OU as a whole. Events impacting only specific IRP sites within the OU are listed separately.

III Background

The former Metal Plating Shop was located along the east side of Building 225 and was in operation from the 1940s through 1972. Contents of the plating solution tanks containing acids, bases, metal salts, and other chemicals frequently were discharged into a floor drain system that was connected to the industrial waste pipeline. Over time, the plating solutions corroded the drains and piping and the discharged liquids leaked into the subsurface soil.

The closed sites included in OU 7 have various and generally unrelated histories. Refer to individual site summaries, shown in Section XIII, for background information.

IV Remedial Actions

The selected remedy at site SS027 consists of applying institutional controls, conducting an inspection and maintenance program for the floor slab in the area of the former Metal Plating Shop, and conducting performance monitoring. Institutional controls consist of a continuing order from the Base commander to restrict water use (HAFB 1998), restrictions on worker access, deed restrictions, and warning signs (HAFB EMR 1995). The inspection and maintenance program consists of an annual inspection of the floor slabs and delineates three areas of attainment intended to ensure that cracks or fractures, that could provide a means of transporting fluids to the sub-floor soil or expose workers to contaminated soil, are repaired. The areas of attainment were delineated based on contaminant concentrations detected during the remedial investigation (RI). The performance monitoring includes semi-annual monitoring of soil moisture content to detect leaks beneath the slab at six monitoring locations and groundwater quality at three wells (one upgradient, one within the source area, and one downgradient) (MW 1998).

V Progress Since Last Five-Year Review

No actions were identified for this OU in the 1998 FYR (HAFB EMR 1998a). Since 1998, institutional controls, the inspection and maintenance program, and the performance monitoring have continued per the schedule set forth in the Final Remedial Design/Remedial Action Work Plan for Operable Unit 7 (MW 1996).

VI Five-Year Review Process

Site review was conducted per the process described in this report for the overall 2003 FYR.

VII Technical Assessment

Results of the technical assessment for each site in OU 7 and for the operable unit as a whole are listed in Table OU 7-3. Details of the technical assessment for each site in OU 7 are provided in the respective site summary (see Section XIII).

Table OU 7-3. Technical Assessment Summary for OU 7

Site ID	Remedy	Technical Assessment*			Protectiveness	Next Five-Year Review
		Question A	Question B	Question C		
SS027	Floor Slab	No	No	Yes	Protective	2008
ST031	NA	NA	NA	NA	NA	NA
SS032	NA	NA	NA	NA	NA	NA
SS028	NA	NA	NA	NA	NA	NA
OT029	NA	NA	NA	NA	NA	NA
OU 7	Floor Slab	No	No	Yes	Protective	2008

* Question A: Is the remedy functioning as intended by the decision documents?
Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objective (RAOs) used at the time of the remedy still valid?
Question C: Has any other information come to light that could call into question the protectiveness of the remedy?
NA = Not Applicable

Question A. Is the remedy functioning as intended by the decision documents?
No. The intended function for the remedy in place at site SS027 is summarized by the RAOs for this site (located in the site summary in Section XIII). Two of the three RAOs are not being achieved. First, reduction of contaminant transport within the source areas by minimizing surface water infiltration may not be realized. Annual site inspections identified defects in the floor slab, which had been noted during previous annual inspections that have not been repaired. These defects could provide a conduit for infiltration of water through the floor slab. Second, reduction in contaminant transport to rates that will not impact groundwater quality above MCLs is not being achieved. The hexavalent chromium concentrations within the source area are above the groundwater MCL for total chromium (no MCL exists for hexavalent chromium in groundwater) and have been since 1996 (pre-ROD hexavalent chromium concentrations were below MCLs). Additionally, the concentrations downgradient of the source areas consistently demonstrate chromium concentrations higher than concentrations upgradient, suggesting that transport of contaminants from the site is occurring.

One of the areas of attainment does not contain any soil moisture probes. Soil moisture compliance in this area cannot be evaluated.

Question B. Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objective (RAOs) used at the time of the remedy still valid?
No. The reference dose for hexavalent chromium has changed from 0.005 to 0.00003 in soil (100 times more stringent) per EPA Region III RBC table (EPA Region III 2002). The RAOs do not need to be modified in light of this change because the RAOs state "MCLs" and do not specify the level.

Question C. Has any other information come to light that could call into question the protectiveness of the remedy?
Yes. The warning signs within the areas of attainment do not warn area personnel of the contaminated soils underlying the floor slab or of a threat to human health if exposed to the soil. The absence of such a warning may cause unsuspected and unreported exposures.

Groundwater concentrations exceeding MCLs for chromium were reported in the 1999 Annual Report (MW 1999) and no action has been taken to determine the root cause of this issue. Also, defects in the floor slab, likely affecting infiltration, were reported in the 2001 Annual Report (URS 2002). The O&M contractor indicated, during the site inspection, that the floor is being washed on a regular basis. This suggests that infiltration has increased due to the unrepaired defects in the floor slab.

VIII Issues

All issues recommended in this section pertain to the Building 225 Chromium Spill site (site SS027) only. Additional details regarding these recommendations are available from the SS027 Site Summary found in Section XIII.

Institutional Controls

1. Warning signs within Building 225 (site SS027) are not in compliance with the intent of the ROD. Per the ROD, the selected remedy at OU 7 includes: "Posting warning signs regarding the presence of contaminated soils that could represent a threat to human health." The signs currently posted say, "Caution: Do Not Disturb Floor, Contact EMR, Phone 7-8790". The

current signs do not inform area personnel of the contaminated soils in the areas of attainment underlying the floor slab or of a threat to human health.

Inspection and Maintenance Program

2. Defects in the floor slab, that affect infiltration rates, recommended for repair in the 2001 annual report (URS 2002) have not been repaired at the time of this review.
3. The tape delineating the areas of attainment is in disrepair (torn, peeling, etc.).

Performance Monitoring

4. Hexavalent chromium concentrations above total chromium MCLs have been measured in the groundwater underlying the floor slab since 1996.
5. Downgradient concentrations of hexavalent chromium are above the upgradient concentrations suggesting a release of contaminants to the aquifer at Building 225.
6. Soil moisture monitoring objectives and process are not clear. Action levels for a soil moisture increase are not clearly identified nor is an action plan in place if an action level is reached. Data comparison is completed at one interval (7-8 feet bgs) only and no rationale for reviewing only that depth is given. Historically, logging has not been performed during the same months of the year.
7. No soil moisture data are available in ERPIMS to facilitate a thorough performance review for the floor slab remedial action.

General

8. PSVP recommendations have not been incorporated fully into the LTM and O&M contracts to ensure monitoring and reporting is comprehensive.
9. Hexavalent chromium reference dose level has been reduced since the ROD was written, indicating that hexavalent chromium is a more toxic metal than what was evaluated in the ROD.

IX Recommendations and Follow-up Actions for OU 7

All recommendations presented in this section pertain to the Building 225 Chromium Spill site (site SS027) only. Additional details regarding these recommendations are available from the SS027 Site Summary found in Section XIII.

Institutional Controls

1. When signs are replaced or additional signs are added, change the warning sign verbiage to provide a warning of the presence of contaminated soils that could pose a hazard if exposed. For example: "Caution: Do not disturb floor or soil under floor. Disturbance could cause exposure to contaminated soils. Contact EMR, 7-7890."

Inspection and Maintenance Program

2. Remedy defects in floor slab as soon as they are identified to ensure minimal infiltration. Floor slab cracks are scheduled for repair during 2003.
3. Replace tape, which outlines the areas of attainment, with another method of delineation. [The marking tape is scheduled for replacement during 2003.]

Performance Monitoring

4. Investigate the source of elevated hexavalent chromium concentrations in the groundwater underlying the SS027 site. Investigate potential remedial options if necessary.

5. Establish an appropriate action level for an increase in soil moisture content based on soil moisture results.
6. Determine what actions should be taken if an increase in soil moisture content occurs at a particular depth.
7. Annual reporting is inadequate to determine if neutron logging data are being compared to the previous logging event and the baseline log developed during initial installation of soil moisture probe locations. The annual report should be modified to capture current, historical, and baseline data for all intervals to ensure proper evaluation of these data.
8. Schedule soil moisture data collection in the same months of each year to ensure comparable results.
9. Incorporate historical data from annual reports and current neutron logging data at all intervals into ERPIMS to ensure data availability for future comparisons.

General

10. Review the PSVP and ensure either the LTM or O&M contractor is addressing all aspects of monitoring and reporting.
11. Re-evaluate risk analysis due to change in hexavalent chromium reference dose levels.

X Protectiveness Statement for OU 7

The remedy at OU 7 is protective of human health because there is no pathway for exposure. However, there is adverse impact to the environment based on concentrations that exceed MCLs in the groundwater directly below the Building 225 Chromium Spill site (Site SS027) and evidence of downgradient contamination. The actions outlined in the recommendations need to be addressed to ensure continued protectiveness, particularly identification of the source and fate of increasing hexavalent chromium concentrations in groundwater. Based on the results of these investigations, potential remedial options should be identified.

XI Next Review

The next FYR for OU 7 is required by 2008. No future review is required for Building 220 Underground Tanks (site ST031), Building 225 PCB (site SS032), Sill Property, Layton (site SS028), or the Building 204 Beryllium Underground Waste Tank (site OT029).

XII References for Operable Unit 7 Summary

(CH2M 1997) Draft Final South Area of Operable Unit 9 Site Inspection - Final Comprehensive Data Evaluation, CH2M Hill, October 1997.

(EPA 1990) Guidance for Remedial Actions for Superfund Sites with PCB Contamination, Environmental Protection Agency, August 1990.

(EPA Region III 2002) Risk-Based Concentration Table, EPA Region III, October 9, 2002, EPA Region III, 9 October 2002.

(HAFB 1998) OO-ALC-HAFB Supplement I, AFI 32-7020, 29 April 1998, Hill AFB, 29 April 1998.

(HAFB CE 1957) Building 205 Record Drawing, Installation of Lines and Tanks for Industrial Waste, Buildings 225 and 205, Sheet 1, Hill Air Force Base Civil Engineering, December 1957.

(HAFB EMR 1989) PCB Spill Sampling and Cleanup in Building 225, Hill Air Force Base, Utah, Hill AFB EMR, November 1989.

(HAFB EMR 1991) Final Decision Document for Site SS28, Sill Property, Hill AFB EMR, June 1991.

(HAFB EMR 1995) Record of Decision for Operable Unit 7, Hill AFB EMR, September 1995.

(HAFB EMR 1998a) CERCLA 1998 Five-Year Review Hill Air Force Base, Utah, Hill AFB EMR, September 1998.

(HAFB EMR 1998b) Final Decision Document for IRP Site OT 029 Category III NFRAP Building 204 Beryllium Underground Waste Tank, Hill AFB EMR, March 1998.

(JMM 1991) Site Characterization Report for a Portion of Building 225 and Site Investigation of Fill Soils at Base Supply Well 6, James M. Montgomery, Consulting Engineers, December 1991.

(MW 1995) Remedial Investigation/Feasibility Study Report for Operable Unit 7 (IRP Sites SS27, ST31, & SS32) Volume I (Text), Montgomery Watson, February 1995.

(MW 1996) Remedial Design/Remedial Action Work Plan for Operable Unit 7, Montgomery Watson, August 1996.

(MW 1998) Annual Report for Operable Unit 7, Montgomery Watson, December 1998.

(MW 1999) Annual Report for Operable Unit 7 Building 225 Floor Slab, Montgomery Watson, November 1999.

(URS 2002) 2001 Operation and Maintenance Report Building 225 Floor Slab Operable Unit 7 Hill Air Force Base, Utah, URS, March 2002.

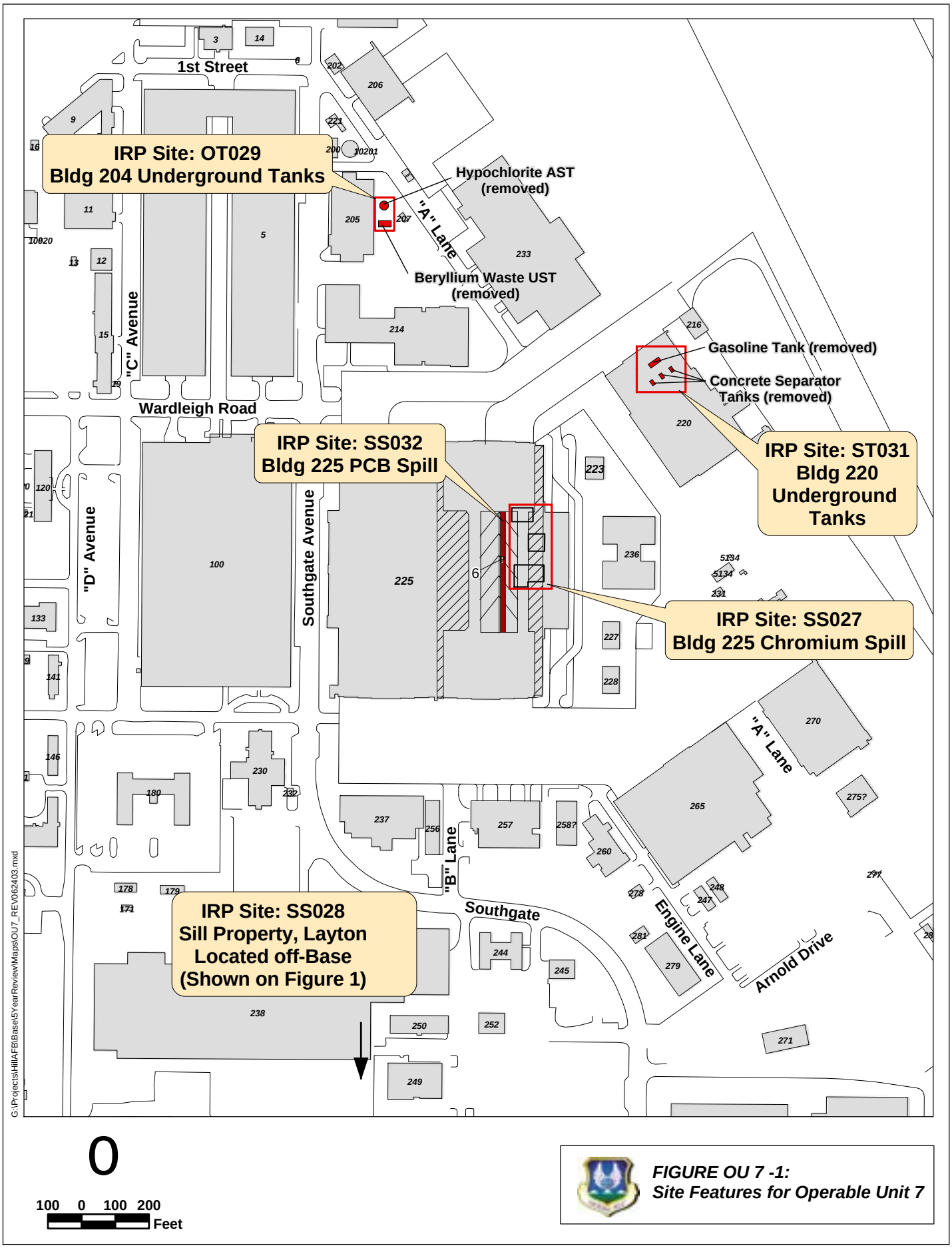

FIGURE OU 7 -1:
Site Features for Operable Unit 7

Table OU 7 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
OU 7	**OPERABLE UNIT 7**			
	1992	Remedial Investigation/Feasibility Study	The RI/FS activities for OU 7 began in the latter part of 1992 and continued until early 1995 (MW 1995).	Record of Decision for Operable Unit 7
02	1995	RI/FS Completed	A Remedial Investigation/Feasibility Study of OU 7 began in the latter part of 1992 and continued to 1995. The Remedial Investigation confirmed the presence of contaminants inside of Building 220, at Base Supply Well 6, in Building 225, at the PCB spill area, and in the former Metal Plating Shop area. In addition, four other possible source areas were investigated inside of Building 225, including the Mop Cleaning Room, a former TCE Degreaser Pit, the former Wash Rack, and the Hydraulic Room.	Record of Decision for Operable Unit 7
09	1995	ROD Completed	The ROD established RAOs and remedial actions for the active OU 7 site (SS027). Two sites (Sites ST031 and SS032) were closed and do not require any remedial actions.	Record of Decision for Operable Unit 7
SS027	**BLDG 225 CR SPILL**			
	1940	Plating Shop in Operation	A Metal Plating Shop was formerly located along the east side of Building 225. The plating shop operated from the 1940s until it was removed from Building 225 in 1972.	Record of Decision for Operable Unit 7

Table OU 7 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
	1968	Plating Area Expanded	The operation expanded and occupied additional space in Building 225. Approximately 150 tanks were used for various plating operations. The expansion included the addition of two new chromium plating areas, for a total of three chromium plating lines.	Site Characterization Report for a Portion of Building 225 and Site Investigation of Fill Soils at Base Supply Well 6
	1989	Preliminary Assessment	Soil contamination was first identified beneath the former Metal Plating Shop area when a utility trench was installed in 1989.	Record of Decision for Operable Unit 7
	1990	Site Characterization	During February and March 1990, a site characterization study for the portion of Building 225 that housed the Metal Plating Shop was performed. The objective of this study was to evaluate the nature and extent of metals contamination present beneath the floor in Building 225; assess if the fill placed at Base Supply Well 6 was hazardous; and assess the need for further investigation of the soils beneath Building 225.	Remedial Investigation/ Feasibility Study Report for Operable Unit 7 (IRP Sites SS27, ST31, & SS32) Volume II (Appendices A-L)
ST031	**B220 UNDERGROUND TANKS**			
	1957	Building 220 Constructed	This building was constructed in 1957 and was used as aircraft painting and paint stripping facility. Painting and paint stripping activities have used many types of paints, paint strippers, solvents, acids, and other chemicals. Three underground concrete separator tanks were located on the northwest side of the building. These tanks were used to separate paint chips and sludge from the wastewater solutions generated during paint stripping operations. Wastewater from the tanks was discharged to the industrial wastewater pipeline and the IWTP.	Record of Decision for Operable Unit 7

Table OU 7 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
	1984	Phase I design and cost estimate	Radian Corporation collected samples of wastewater generated from Building 220, conducted treatability studies, and prepared a report recommending a wastewater treatment system design.	Remedial Investigation/ Feasibility Study Report for Operable Unit 7 (IRP Sites SS27, ST31, & SS32) Volume II (Appendices A-L)
	1984	Environmental Investigation	An initial environmental investigation at Building 220 characterized the industrial wastewater generated by the paint stripping and painting activities. Wastewater was generally characterized by elevated levels of oil and grease, total suspended solids, chemical oxygen demand, and acidity. The majority of the organics in the wastewater are VOCs. Paint and degreasing solvents, along with BNAEs including phthalates and polynuclear aromatic hydrocarbons were also present in the wastewater.	Record of Decision for Operable Unit 7
	1985	UST Investigation at Bldg 220	Radian investigated three underground storage tanks at Building 220 suspected of releasing contaminants to the underlying soils and groundwater. Field work was conducted during October and November 1985.	Remedial Investigation/ Feasibility Study Report for Operable Unit 7 (IRP Sites SS27, ST31, & SS32) Volume II (Appendices A-L)
	1985	Soil Removal	Before the building addition was constructed, some of the contaminated soils was removed and taken to an off-Base hazardous waste disposal facility (no date given in literature, therefore date is approximate).	Record of Decision for Operable Unit 7
	1986	Building 220 renovated	Building 220 was renovated in 1986 and expanded over an area that contained the three underground separator tanks. As part of this renovation, the three underground separator tanks and a 20,000-gallon fuel storage tank located in the vicinity were excavated and removed. Because previous investigations indicated that environmental contamination was present in the soils beneath the USTs, Hill AFB personnel collected several soil samples in May 1987 following tank removal.	Remedial Investigation/ Feasibility Study Report for Operable Unit 7 (IRP Sites SS27, ST31, & SS32) Volume II (Appendices A-L)

Table OU 7 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
06	1987	Additional sampling	Additional groundwater samples were collected during June 1987. 51 soil samples and 13 groundwater and potable water samples were collected. Various inorganic and organic contaminants were detected in both the soil and groundwater in the vicinity of Building 220. However, due to problems with quality control samples some of the data were suspect.	Remedial Investigation/ Feasibility Study Report for Operable Unit 7 (IRP Sites SS27, ST31, & SS32) Volume II (Appendices A-L)
	1992	Remedial Investigation/Feasibility Study	The RI/FS activities for OU 7 began in the latter part of 1992 and continued until early 1995 (Montgomery Watson, 1995). To identify potential contamination sources, both sampling around and inside of Building 220 was completed during the RI. Organic compounds detected included several BNAEs, VOCs, furans, and PCBs. In addition, numerous metals were detected above background although, with the exception of arsenic and beryllium, none of these organic compounds or the metals above background were present in concentrations that exceeded those listed in the RBC table.	Remedial Investigation/Feasibility Study Report for Operable Unit 7 (IRP Sites SS27, ST31, & SS32) Volume I (Text)
09	1995	ROD Completed	Based on the findings of the OU 7 RI and Risk Assessment, Building 220 does not require remedial actions because either the risks posed by the contaminants at this site were not significant or the concentrations for the contaminants were within background levels.	Record of Decision for Operable Unit 7
SS032	**BLDG 225 PCB**			
	1960	Preliminary Assessment	This area was the site of a former transformer storage area that was removed in the 1960s.	Record of Decision for Operable Unit 7

Table OU 7 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
	1989	PCB Contaminated Soils Found in Excavation by Building 225	During the summer of 1989, a utility trench excavation in Building 225 revealed the presence of PCB-contaminated soils. Personnel from Hill AFB conducted a preliminary soil sampling program, prepared a brief cleanup and closure plan, removed PCB-contaminated soil, and conducted a post-removal sampling program to allow the utility trench construction project to be completed.	Remedial Investigation/ Feasibility Study Report for Operable Unit 7 (IRP Sites SS27, ST31, & SS32) Volume II (Appendices A-L)
	1989	Site Inspection	Polychlorinated biphenyls were found in soil beneath Building 225 approximately 100 feet west of the former Metal Plating Shop. During excavation of a utility trench in 1989, unusual odors and discolored soil were reported. A subsequent investigation revealed that the soil contained PCBs.	Record of Decision for Operable Unit 7
	1989	Preliminary Assessment	Circa 1989, 95 tons of contaminated soil were removed and disposed of at a facility permitted by the Toxic Substances Control Act. Following the soil removal, confirmation soil samples taken from the walls of the excavation revealed that only insignificant concentrations (less than 0.23 mg/kg) of residual PCBs remained in localized areas.	Record of Decision for Operable Unit 7
09	1995	ROD Completed	Based on the findings of the OU 7 RI and Risk Assessment, SS032 does not require remedial actions because either the risks posed by the contaminants at this site were not significant or the concentrations for the contaminants were within background levels.	Record of Decision for Operable Unit 7
SS028	**SILL PROPERTY, LAYTON**			
	1989	Chromium-contaminated soil placed at the Sill Farm	In early 1989, chromium-contaminated soil and rubble from Hill AFB (Building 225 excavation) was inadvertently placed as fill at two locations on the Sill Farm in Layton, Utah.	Final Decision Document for Site SS28, Sill Property

Table OU 7 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
03	1989	Soil Removal Action	The initial removal action for the chromium-contaminated soil at the Sill Property was completed between 18 March 1989 and 25 March 1989. Approximately 327 tons of material were removed from the south site and 163 tons from the north site.	Final Decision Document for Site SS28, Sill Property
09	1990	Additional Soil Removal	As requested by the Utah Bureau of Solid and Hazardous Waste, a subsequent sampling and removal operation was conducted. Two dump truck loads of soil from a localized portion of the north removal site were excavated and trucked offsite on 12 September 1990.	Final Decision Document for Site SS28, Sill Property
02	1991	Final Summary Report of Chromium Cleanup at Two Sites in Layton, Utah	This document summarized the study methodology and presents findings and conclusions regarding the cleanup of the Sill Farm.	Final Summary Report for Chromium Cleanup at Two Sites in Layton, Utah
06	1991	NFRAP	No further action planned document completed for the Sill Property.	Final Decision Document for Site SS28, Sill Property
OT029	**B-204 BE**			
	1957	Tank Installation	A 1,000-gallon hypochlorite above-ground storage tank and a 5,000-gallon industrial waste underground storage tank were installed at the site during 1957 or 1958.	Final Decision Document for IRP Site OT 029 Category III NFRAP Building 204 Beryllium Underground Waste Tank

Table OU 7 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
	1987	Tank Removal	During 1987, an AST and an UST were removed from the Building 205 area. Both tanks were located in close proximity to the east side of existing Building 205 and the northern side of former Building 204. Reportedly, the AST was used to store hypochlorite. The UST was used to store industrial wastes, including beryllium-related wastes, associated with previous operations conducted at existing Building 205.	Final Decision Document for IRP Site OT 029 Category III NFRAP Building 204 Beryllium Underground Waste Tank
03	1998	NFRAP	No further action was selected as the final remedy for the Building 204 Beryllium Underground Waste Tank.	Final Decision Document for IRP Site OT 029 Category III NFRAP Building 204 Beryllium Underground Waste Tank

XIII Five-Year Review of Sites in OU 7

Operable unit review results are summaries of findings for all of the sites in each operable unit. The following site summaries present a detailed review of each IRP site. Therefore, much of the information presented in the Site Summaries is a duplicate of what was presented in the OU Summary.

The reader is encouraged to use the Site Summary to obtain details on specific contaminants of concern and the technical assessment for each site.

OU 7 SS027 BLDG 225 CR SPILL

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

Three areas associated with Building 225 have been investigated (MW 1995) as a part of the SS027 site. The first area was the former Metal Plating Shop Area, which had cadmium and hexavalent chromium contamination above background levels and health based-risk concentrations. The second area, called Miscellaneous Areas, was located within Building 225 and included the former Wash Rack, the former Degreaser Pit, the Hydraulic Room, the Mop Cleaning Room, and the Industrial Wastewater pipeline connection. None of these miscellaneous areas had concentrations of contaminants detected above risk-based levels and are therefore not included in the remainder of this summary. The third area was Base Supply Well 6, where approximately 25 tons of potentially contaminated soil from the Building 225 excavation was placed. This site investigation revealed that the fill placed at Supply Well 6 was from an uncontaminated portion of the utility trench and that no further action was necessary. This area is also therefore not included in the remainder of this summary. The former Metal Plating Shop area is the only remaining active site with elevated levels of contamination in excess of health risk standards. The ROD for OU 7 (HAFB EMR 1995) selects the following remedies for this site: groundwater monitoring in areas upgradient, beneath, and downgradient of the area, soil moisture content monitoring, maintaining and preserving the building and floor slab that overlay the contaminated soils, and institutional controls.

II. Site Chronology

See Table OU 7-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

The former Metal Plating Shop was located along the east side of Building 225. Contents of the plating solution tanks containing acids, bases, metal salts, and other chemicals were frequently discharged into a floor drain system that was connected to the industrial waste pipeline. Over time, the plating solutions corroded the drains and piping and discharged liquids leaked into the subsurface soil.

A Site Characterization (SC) Study (JMM 1991) preceded the RI in the former Metal Plating Shop area. During the SC, 20 soil borings were drilled to 15 feet bgs and 90 soil samples were collected. All soil samples from the SC Study were analyzed for total chromium, hexavalent chromium, cadmium, lead, silver, and soil pH. Because the SC left a data gap regarding the depth of the contamination, the OU 7 RI included drilling and sampling three deep soil borings and one monitoring well boring. The deep soil borings were designed to evaluate the nature and vertical extent of soil contamination beneath the plating shop area, and were drilled to depths of 50 feet bgs or greater. Additionally, the monitoring well boring was drilled and sampled to approximately 10 feet below the water table (a total depth of 127 feet bgs) (MW 1995).

Based on the OU 7 RI data and data from the SC study, contaminants present beneath the former Metal Plating Shop are limited to low levels of several VOC and high levels of several metals. While VOCs were detected at less than 0.1 mg/kg, hexavalent chromium and cadmium were detected in concentrations up to 1600 and 220 mg/kg, respectively. Concentrations of total chromium were also detected above background but the concentrations were not high enough to exceed the health risk-based concentrations. Concentrations of arsenic and beryllium exceeded health based-risk concentrations, but

these concentrations were within the range considered representative of background. Metals concentrations observed in soils outside of the former Metal Plating Ship area are significantly lower than the risk-based concentrations (MW 1995).

The contaminants of concern for this site based on the SC and the RI are cadmium and hexavalent chromium. Preliminary remediation goals are identified in the ROD for OU 7 (HAFB EMR 1995).

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
SOIL	CADMIUM	7.57 mg/kg
SOIL	CHROMIUM, HEXAVALENT	1.16 mg/kg

Remedial Action Objectives

* Reduce contaminant concentrations to meet risk levels and/or reduce contaminant transport to rates that will not impact groundwater quality above Maximum Contaminant Levels.
* Reduce contaminant transport within source areas and reduce chemical transport from soil to groundwater by minimizing surface water infiltration.
* Prevent human exposure to contaminated soil through ingestion, inhalation, and dermal contact, such that the additional risk to an individual for cancer is below 1 x 10-6 and the non-cancer threshold is less than 1.0.

IV. Remedial Actions

The selected remedy at Site SS027 consists of applying institutional controls, conducting an inspection and maintenance program for the floor slab in the area of the former Metal Plating Shop, and conducting soil moisture measurements and groundwater quality monitoring. Institutional controls consist of a continuing order from the Base Commander (HAFB 1998) to restrict worker access, deed restrictions, and warning signs (HAFB EMR 1995). The inspection and maintenance program consists of an annual inspection of the floor slab delineated by three areas of attainment intended to ensure that cracks or fractures that could provide a means of transporting fluids to the sub-floor soil or expose workers to contaminated soil are repaired. The areas of attainment were delineated based on contaminant concentrations detected in the RI phase. The performance monitoring includes semi-annual monitoring of soil moisture content at six monitoring locations and groundwater quality at three wells (one upgradient, one within the source area, and one downgradient) (MW 1998).

V. Progress Since Last Review

No actions were identified for this site in the 1998 FYR (HAFB EMR 1998). Institutional controls, the inspection and maintenance program, and performance monitoring have continued per the schedule set forth in the Final Remedial Design/Remedial Action Work Plan for Operable Unit 7 dated August 1996.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer) No

Question A (Comment) The intended function for the remedy in place at Site SS027 is summarized by the RAOs for this site. Two of the three RAOs are not being achieved. First, reduction of contaminant transport within the source areas by minimizing surface water infiltration may not be realized. Annual site inspections identified defects in the floor slab which had been noted during previous annual inspections that have not been repaired. These defects could provide a conduit for infiltration of water through the floor slab. Second, reduction in contaminant transport to rates that will not impact groundwater quality above MCLs is not being achieved. The hexavalent chromium concentrations within the source area are above the groundwater MCL for total chromium (no MCL exists for hexavalent chromium in groundwater) and have been since 1996 (pre-ROD hexavalent chromium concentrations were below MCLs). Additionally, the concentrations downgradient of the source areas consistently demonstrate chromium concentrations higher than concentrations upgradient, suggesting that transport of contaminants from the site is occurring.

One of the areas of attainment does not contain any soil moisture probes. Soil moisture compliance in this area cannot be evaluated.

Question B (Answer) No

Question B (Comment) The reference dose for hexavalent chromium has changed from 0.005 to 3E-5 in soil (100 times more stringent) per EPA Region III RBC table (10/2002). The RAOs do not need to be modified in light of this change because the RAOs state "MCLs" and do not specify the level.

Question C (Answer) Yes

Question C (Comment) The warning signs within the areas of attainment do not warn area personnel of the contaminated soils underlying the floor slab or of a threat to human health if exposed to the soil. The absence of such a warning may cause unsuspected and unreported exposures.

Groundwater concentrations exceeding MCLs for chromium were reported in the 1999 Annual Report (MW 1999) and no action has been taken to determine the root cause of this issue. Also, defects likely affecting infiltration were reported in the 2001 Annual Report (URS 2002). Through conversations with site personnel, the O&M contractor indicated during the site inspection that the floor is being washed on a regular basis. Infiltration has increased due to the unrepaired defects in the floor slab.

VIII. Issues

Institutional Controls
* Warning signs within Building 225, SS027, are not in compliance with ROD intent. Per the ROD, the selected remedy at OU 7 includes: "Posting warning signs regarding the

presence of contaminated soils that could represent a threat to human health." The signs currently posted say, "Caution: Do Not Disturb Floor, Contact EMR, Phone 7-8790". The current signs do not inform area personnel of the contaminated soils in the areas of attainment underlying the floor slab or of a threat to human health.

Inspection and Maintenance Program
* Defects that affect infiltration rates recommended for repair in the 2001 annual report (URS 2002) have not been repaired at the time of this review.
* The tape delineating the areas of attainment is in disrepair (torn, peeling, etc.).

Performance Monitoring
* Hexavalent chromium concentrations above total chromium MCLs have been measured in the groundwater underlying the floor slab since 1996.
* Downgradient concentrations of hexavalent chromium are above the upgradient concentrations suggesting a release of contaminants to the aquifer at Building 225.
* Soil moisture monitoring objectives and process are not clear (i.e., Action levels for a soil moisture increase are not clearly identified nor is an action plan in place if an action level is reached. Data comparison is completed at one interval (7-8 feet bgs) only and no rationale for reviewing only that depth is given. Historically logging has not been performed during the same months of the year.).
* No soil moisture data are available in ERPIMS to facilitate a thorough performance review for the floor slab remedial action.

General
* PSVP recommendations have not been incorporated fully into the LTM and O&M contracts to ensure monitoring and reporting is comprehensive.
* Hexavalent chromium reference dose level has been reduced since the ROD was written, indicating that hexavalent chromium is a more toxic metal than what was evaluated in the ROD.

IX. Recommendations

Institutional Controls
* When signs are replaced or additional signs are added, change the warning sign verbiage to provide warning of presence of contaminated soils that could pose a hazard if exposed. For example: "Caution: Do not disturb the floor or soil under the floor. Disturbance could cause exposure to contaminated soils. Contact EMR, 7-7890."

Inspection and Maintenance Program
* Correct defects in floor slab as soon as they are identified to ensure minimal infiltration. Floor slab cracks are scheduled for repair during 2003.
* Replace tape, which outlines the areas of attainment, with another method of delineation. [The marking tape is scheduled for replacement during 2003.]

Performance Monitoring
* Investigate the source of hexavalent chromium concentrations in the groundwater underlying the SS027 site.
* Establish an appropriate action level for an increase in soil moisture content based on soil moisture results.
* Determine what actions should be taken if an increase in soil moisture content occurs

at a particular depth.
* Annual reporting is inadequate to determine if neutron logging data are being compared to the previous logging event and the baseline log developed during initial installation of soil moisture probe locations. The annual report should be modified to capture current, historical, and baseline data for all intervals to ensure proper evaluation of these data.
* Schedule soil moisture data collection in the same months of each year to ensure comparable results.
* Incorporate historical data from annual reports and current neutron logging data at all intervals into ERPIMS to ensure data availability for future comparisons.

General
* Review the PSVP and ensure all aspects of monitoring and reporting are being addressed by either the LTM or O&M contractor.
* Re-evaluate risk analysis due to change in hexavalent chromium reference dose levels.

X. Protectiveness Protective

Protectiveness Statement The remedy associated with SS027 is protective of human health because there is no pathway for exposure. However, there is an adverse impact on the environment based on hexavalent chromium concentrations that exceed MCLs in the groundwater directly below the Building 225 Chromium Spill site and evidence of downgradient contamination. The actions outlined in the recommendations need to be addressed to ensure continued protectiveness, particularly identification of the source and fate of increasing hexavalent chromium concentrations in groundwater. Based on the results of these investigations, potential remedial options should be identified.

XI. Next Required FYR 2008

OU 7 ST031 B220 UNDERGROUND TANKS

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

Building 220 is located east of Building 225 and adjacent to the main runway. Building 220 was constructed in 1957 and has been used as an aircraft painting and paint stripping facility. Based on the findings of the OU 7 Remedial Investigation and Risk Assessment, Building 220 does not require remedial actions or additional removal actions because the risks posed by the contaminants at the site are below significant levels. Therefore, no further remedial actions are planned at this site.

II. Site Chronology

See Table OU 7-2 for a history of events at this site. The table is organized first to describe events, which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

During the RI for Building 220 site, sources of contamination both internal and external of the building were investigated. The results of this investigation are detailed below.

INTERNAL BUILDING 220 INVESTIGATION

Soil samples from beneath the floor drains in the southern part of Building 220 had VOC concentrations less than 1 mg/kg with few exceptions. Additionally, gasoline and unknown hydrocarbons were detected in concentrations from 69 mg/kg to 140 mg/kg. Soil samples from beneath the former oil/water separator tank locations in the northern portion of the building had detectable organic compounds and metals above background. Organic compounds detected include several Base-Neutral-Acid Extractables (BNAEs) (in concentrations between 0.5 and 2.1 mg/kg), VOCs (in concentrations between 0.0017 and 0.044 mg/kg), Furans (in concentrations between 11 and 18 ug/kg), and PCBs (at concentration of 1.4 mg/kg). In addition, numerous metals were detected above background levels although, with the exception of arsenic and beryllium, none of these organic compounds or the metals above background levels were present in concentrations that exceed those listed in the risk-based concentration table (MW 1995).

EXTERNAL BUILDING 220 INVESTIGATION

Soil gas sampling and soil sampling around the perimeter of Building 220 and the IWTP detected low concentrations of VOCs over a broad area. VOCs most commonly detected include 1,1-DCA, 1,1,1-TCA, TCE, MEK, and toluene. The highest concentrations of VOCs were west of Building 220 where the Building 220 Industrial Wastewater Pipeline (IWP) exits and connects with the IWTP. Soil sampling in this and other areas around the perimeter of Building 220 indicated 1,1,1-TCA and TCE concentrations below the respective risk-based standards. Metals concentrations detected were within the ranges seen elsewhere at OU 7. Based on these sampling results, it appears that the IWP between Building 220 and the main IWTP has released low levels of VOCs and possibly some metals to the soils that underlie it, but no significant source areas were identified (MW 1995).

ARSENIC AND BERYLLIUM CONTAMINATION

Arsenic and beryllium were excluded as chemicals of concern based on the following information:

*Arsenic and beryllium were identified as being slightly elevated compared to background concentrations in OU 7 source areas. However, when additional information from elsewhere at Hill AFB is considered (as discussed below), arsenic and beryllium are, in fact, representative of background concentrations and should not be considered contaminants.

Therefore, the risks greater than 1E-6 reported in the Baseline Risk Assessment (MW 1995) are due to background conditions and not attributable to activities at OU 7.
* These metals were not used as part of any known industrial process at OU 7.
* The upper control limits for these metals occur at concentrations within background ranges identified at Operable Units 1, 2, and 4.
* The highest beryllium concentrations detected occur in Building 220 at depths below 48 feet bgs. Beryllium was reported at lower concentrations or was not-detected at depths above 48 feet bgs, further suggesting that the beryllium represents background concentrations and was not released from industrial processes occurring at the surface.
* The distribution of arsenic and beryllium in the soils beneath the potential source areas is not consistent with those of other environmental contaminants known to have been released at OU 7 (MW 1995).

Based on the findings of the OU 7 Remedial Investigation and Risk Assessment, Building 220 does not require remedial actions or additional removal actions because the risks posed by the contaminants at the site are below significant levels.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
NA	NA - Site under NFRAP status, elevated concentrations of contaminants determined to be naturally occuring.	NA

Remedial Action Objectives

* Not applicable. No CoCs remain at this site that are above risk-based and background levels, therefore no RAOs have been developed.

IV. Remedial Actions

In the mid-1980s, some of the contaminated soil was removed and taken to an off-Base hazardous waste disposal facility before the building addition was constructed. No mention was made in the literature regarding why or how much soil was removed. Soil sampling results indicated that only low concentrations of organic chemicals (VOCs, fuel hydrocarbons, semivolatile organic compounds (SVOCs), PCBs, and chlorinated dibenzofurans) and metals are present in the vicinity of the former separator tanks, pipeline locations, and around the perimeter of Building 220.

V. Progress Since Last Review

The ROD, published in 1995, established that contaminants at this site are below significant levels. Therefore, this site was not a part of the 1998 Five-Year Review and no actions have been completed at the site since the ROD date of 1995.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer)

Not Applicable

Question A (Comment)

Not applicable. There is no remedy at this site.

Question B (Answer)	Not Applicable
Question B (Comment)	No additional remedial or removal actions are required.
Question C (Answer)	Not Applicable
Question C (Comment)	No remedies are in place at this site.

VIII. Issues	None.
IX. Recommendations	No further action is required at this site.
X. Protectiveness	Not Applicable
Protectiveness Statement	ST031 was recommended for NFRAP status and accepted in 1995 because the risks posed by the contaminants at the site are below significant levels (MW 1995).
XI. Next Required FYR	None - Current FYR is Final

OU 7 SS032 BLDG 225 PCB

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

During excavation of a utility trench in 1989, unusual odors and discolored soil were reported. A subsequent investigation revealed polychlorinated biphenyls (PCBs) in soil beneath Building 225, approximately 100 feet west of the former Metal Plating Shop within Building 225 (see Figure OU 7-1).This area was the site of a former transformer storage area that was removed in the 1960s. As part of a cleanup effort, 95 tons of contaminated soil were removed and disposed of at a facility permitted through the Toxic Substances Control Act Permit Program. Following the soil removal, additional soil samples revealed that only insignificant concentrations (less than 0.23 mg/kg) of residual PCBs remained in localized areas. Based on the findings of the OU 7 Remedial Investigation and Risk Assessment (MW 1995), the PCB Spill Area does not require remedial actions because risks posed by the contaminants at this site are below significant levels (cancer risk less than 1E-6 and health hazard less than 1 for contaminants of concern).

II. Site Chronology

See Table OU 7-2 for a history of events at this site. The table is organized first to describe events, which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

During the summer of 1989, a utility trench excavation in Building 225 revealed the presence of PCB-contaminated soils. Hill AFB EMR personnel collected 13 soil samples along the length of the planned Building 225 utility trench excavation and submitted them for PCB analysis (see Figure OU 7-1.) Because one of the soil samples contained nearly 0.5% PCBs, a soil cleanup and removal action had to be conducted before the construction project proceeded. The cleanup consisted of collecting soil samples to delineate the extent of PCB contamination, excavating and disposing of the PCB-contaminated soils, installing concrete forms to isolate the outside trench walls, backfilling the open area between the forms and the trench walls with clean imported fill, and capping the backfilled areas with new concrete. On 30 October 1989, this removal action commenced and an area measuring 25 ft x 10 ft x 6 ft deep was excavated, and 97.5 tons of PCB-contaminated soils were removed from this utility trench. All of the excavated soil was taken to a Toxic Substances Control Act (TSCA)-permitted landfill cell in western Utah (MW 1995).

After the removal action, additional soil samples were collected from the bottom and walls of the excavation adjacent to the contaminated soils and from several other locations along the trench excavation. The results of these analyses indicate that concentrations of PCBs remaining in areas adjacent to the cleanup excavation were low, with the exception of a sample collected from the west wall of the trench, which contained 12,000 ppb PCBs. Hill AFB proposed leaving potentially PCB-contaminated soils located outside the excavation areas in place because they would be capped and would present no future health threats (MW 1995).

The PCB spill area in Building 225 was included in the OU 7 RI to assess the effectiveness of the PCB spill cleanup completed by Hill AFB in 1989 (HAFB EMR 1989) and evaluate the extent of any residual PCB contamination. RI activities at the PCB spill area consisted of drilling and sampling 12 shallow soil borings closely spaced around the cleanup area. Soil sampling in the PCB spill area identified little residual PCB contamination. PCBs were detected in only two shallow samples from borings immediately adjacent to the PCB cleanup excavation. With these two exceptions, none of the other borings contained detectable

concentrations of PCBs. Based on these results, it appears that only isolated areas immediately adjacent to the PCB cleanup excavation still contained residual PCB contamination. However, because the concentration of PCBs in one sample (0.23 ppm) exceeded the risk-based concentration, health risks associated with PCB contamination are addressed in the Baseline Risk Assessment (MW 1995).

PCB [namely PCB 1254] has been excluded as a contaminant of concern and is not carried through the FS for the following reasons:

*PCB 1254 was detected in only one of 38 samples at a concentration of 0.23 ppm. According to Guidance on Remedial Actions for Superfund Sites With PCB Contamination (EPA 1990), the recommended soil action level is 1 ppm for residential land use and 10 to 25 ppm for industrial land use. The maximum PCB concentration in the PCB Spill Area is less than one-fourth of the recommended residential action level (MW 1995).

*The baseline risk assessment calculated cancer risk of 3E-6 is only slightly above the cancer threshold value (1E-6). Because of the conservative nature of many of the assumptions used to calculate the exposure doses for ingestion and dermal contact, the actual cancer risk at the site is most likely less than the threshold value (MW 1995).

*In order to calculate environmental data statistics, non-detect results were replaced with a value equal to one-half the sample quantitation limit. This produces an additionally conservative exposure dosage as values of one-half the detection limit are likely to be high. This is especially the case when the majority of the sample set contains non-detect values. In the case of the Building 225 PCB Spill Area, 95 percent of the samples had non-detect values (MW 1995).

Results of the BRA and current operations performed at OU 7 source areas indicate that under the existing conditions, there is negligible potential for exposing receptors to contaminated soil or contaminated groundwater. This is because there are insignificant health risks (cancer risk less than 1E-6 and health hazard less than 1 for contaminants of concern) associated with the contaminated soil in and around the PCB Spill Area (MW 1995).

Based on the findings of the OU 7 Remedial Investigation and Risk Assessment, the PCB Spill Area does not require remedial actions because risks posed by the contaminant at these sites are below significant levels (HAFB EMR 1995).

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
SOIL	NA - Removal action resulted in CoCs being removed from site.	NA

Remedial Action Objectives

* Not applicable. No further remedial or removal action planned.

Site Summary - Hill AFB 2003 Five Year Review

IV. Remedial Actions	Just over 97 tons of PCB-contaminated soil were removed from the site and disposed of in a TSCA-approved facility in 1989. Additional remedial actions are not required because the risks posed by the remaining contaminants are below significant levels (cancer risk less than 1E-6 and health hazard less than 1 for contaminants of concern).
V. Progress Since Last Review	The ROD, completed in September 1995, stated that site SS032 did not require remedial actions. Therefore, no activity has been carried out at the site since the last review in 1998.
VI. FYR Process	Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer)	Not Applicable
Question A (Comment)	No remedy is in place at this site. The site is closed.
Question B (Answer)	Not Applicable
Question B (Comment)	No additional remedial or removal actions are required.
Question C (Answer)	Not Applicable
Question C (Comment)	No additional remedial actions are in place at this site.

VIII. Issues	None.
IX. Recommendations	No further action is required at this site.
X. Protectiveness	Not Applicable
Protectiveness Statement	SS032 was recommended for NFRAP status and accepted in 1995 because risks posed by the contaminant at these sites are below significant levels (cancer risk less than 1E-6 and health hazard less than 1 for contaminants of concern) (HAFB EMR 1995).
XI. Next Required FYR	None - Current FYR is Final

OU 7 SS028 SILL PROPERTY, LAYTON

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

Chromium-contaminated fill, excavated from Building 225, was placed at two locations on the Sill Property located approximately 1 mile south of Hill AFB in Layton, Utah. Two removal actions were completed in accordance with RCRA and testing concluded that the remaining soil poses no additional threats to human health and the environment. A decision document, completed in 1991, concluded that no further removal or remedial action is required at this site since all detectable traces of chromium in contaminated soil have been removed from the site (HAFB EMR 1991). This site is included in the 2003 Five-Year Review for completeness to document the site's history.

II. Site Chronology

In early 1989, chromium-contaminated soil and rubble from Hill AFB (Building 225 excavation) was inadvertently placed as fill material at two locations on the Sill Property in Layton, Utah (see Figure OU 7-1).

An initial removal action for the chromium-contaminated soil at the Sill Property was completed between 18 March 1989 and 25 March 1989. Approximately 327 tons of material were removed from the south site and 163 tons from the north site and taken to a RCRA-approved facility (HAFB EMR 1991).

As requested by the Bureau of Solid and Hazardous Waste (BSHW), a subsequent sampling and removal operation was conducted. Two dump truck loads of soil from a localized portion of the north site were excavated and trucked off-site to a RCRA-approved facility on 12 September 1990 (HAFB EMR 1991).

This site was granted no further action planned (NFRAP) status in June 1991.

III. Background

This site is farm land, where inert materials (soil, concrete, rubble) were accepted to fill in ephemeral stream gullies running through the property. Fill material was accepted from various sources. In early 1989, chromium-contaminated soil and rubble from Hill AFB was inadvertently placed as fill at two locations on this farm in Layton, Utah (HAFB EMR 1991).

Contaminated soil and concrete rubble fill were placed at two locations on the Sill Property. Samples of contaminated fill materials were collected and analyzed from both the soils remaining at the source area in Bldg 225, and from those transported to the Sill's Farm. The sampling results indicated that chromium was the principal contaminant present in both the source area and removal site soils. The extent of the chromium contamination was limited. Cleanup activity at both sites consisted of removing all fill material exhibiting yellow staining or suspected of originating from the Bldg 225 utility trench excavation. As requested by the Bureau of Solid and Hazardous Waste, a subsequent confirmation sampling round was conducted resulting in an additional removal action. Two dump truck loads of soil from a localized portion of the north site were excavated and trucked offsite on 12 Sept 1990. All contaminated soils were disposed of in a RCRA landfill (HAFB EMR 1991).

Following the excavation of contaminated soils, a comparison of EP Toxicity extract to toxicity thresholds for chromium indicate that the soils at both removal sites were not considered hazardous with respect to chromium. A statistical comparison was the primary method used to evaluate the cleanup of the two chromium removal sites. This method was selected to differentiate the Bldg 225 material from other fill at the site. The statistical

analysis found no significant difference between the sample populations from the removal areas and those from the fill from other sources, and it was concluded that Bldg 225 materials had been removed from the two areas included in the statistical analysis. All the evidence collected at both cleanup sites indicated that the objectives of the cleanup operation had been achieved (HAFB EMR 1991).

Concerns for human health and the environment have been addressed with regard to migration to groundwater, ingestion of chromium-contaminated soil, and inhalation of chromium-contaminated soil particles. The scenarios are based on small areas or cells which continued to test positive for chromium levels after removal action had taken place and represent worst case conditions for health effects associated with the contamination. All data support the conclusion that chromium contamination from Hill AFB Building 225 fill dirt deposited at the Sill Property has been effectively cleaned and poses no health threats from any type of contact with the remaining soil (HAFB EMR 1991).

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
SOIL	NA - Removal action resulted in CoCs being removed from site.	NA

Remedial Action Objectives

* Not applicable. No CoCs remain at this site, therefore no RAOs have been developed.

IV. Remedial Actions

No additional removal actions or remedial actions are required.

V. Progress Since Last Review

This site had a decision document in 1991 stating that no further remedial action is planned. Therefore, this site was not covered in the 1998 Five-Year Review.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer)

Not Applicable

Question A (Comment)

No additional removal actions or remedial actions are required.

Question B (Answer)

Not Applicable

Question B (Comment)

Not applicable. No additional removal actions or remedial actions are required.

Question C (Answer)

Not Applicable

Question C (Comment)	No additional removal actions or remedial actions are required.

VIII. Issues	None.
IX. Recommendations	None.
X. Protectiveness	Not Applicable
Protectiveness Statement	SS028 was recommended for NFRAP status and accepted in 1991 because all detectable traces of chromium in contaminated soil have been removed from the site (HAFB EMR 1991).
XI. Next Required FYR	None - Current FYR is Final

OU 7 OT029 B-204 BE

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

Site OT029, also known as the Building 204 Beryllium Underground Waste Tank, is located immediately east of existing Building 205 and south of existing Buildings 204 and 206 (see Figure OU 7-1). A 1,000-gallon hypochlorite above ground storage tank (AST) and a 5,000-gallon industrial waste underground storage tank (UST) were decommissioned and removed in 1987. Collectively, the former locations of the two tanks are designated as Site OT029. The results of investigative activities revealed that residual contaminant constituent concentrations in soil and groundwater are below risk-based action levels. Therefore, site OT029 poses no unacceptable risks to human health or the environment. A NFRAP document was generated and no further response actions were required at site closure in March of 1998 (HAFB EMR 1998b). This site is included in the 2003 Five-Year Review for completeness to document the site background.

II. Site Chronology

See Table OU 7-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

Two tanks, one UST and one AST, were installed in 1957 and were located adjacent to the eastern side of existing Building 205. The UST was used to store beryllium wastes associated with landing gear repair operations formerly located in Building 205. Periodically, the wastes were removed from the UST and transported to Landfill 5 at the Utah Test and Training Range for disposal. The AST stored hypochlorite which was also used in the repair of aircraft landing gear. The location of the tanks was obtained from the Building 205 Record Drawing, Installation of Lines and Tanks for Industrial Waste, Building 225 and 205 (HAFB CE 1957).

Both tanks were removed from the site in 1987, after landing gear repair operations were transferred to Buildings 505, 507, and 510. Samples of soils under the UST may have been taken during removal of the tanks; however, there is only limited documentation regarding the UST removal activities. The UST closure documentation did not include analytical data. Due to the limited amount of documentation available, the site was investigated as part of the South Area of Operable Unit 9 (OU 9) Site Inspection. The results of the OU 9 Site Inspection investigation are also presented in the Final Comprehensive Data Evaluation for the South Area of Operable Unit 9 (CH2M 1997).

Hill Air Force Base recommended no further action at IRP Site OT029 in March 1998. HAFB initiated and implemented detailed response actions including: tank removal, soil and groundwater investigative activities, and risk assessment review. The investigative activities involved soil and groundwater sampling, laboratory testing, risk analysis, and reporting. The results of the investigative activities revealed that residual contaminant constituent concentrations in soil and groundwater are below risk-based action levels. The risk-based action levels are protective of human health and the environment. Therefore, IRP Site OT029 poses no unacceptable risks to human health or the environment (HAFB EMR 1998b).

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
NA	NA - Risk Assessment indicates no risk to human health and the environment.	NA

Remedial Action Objectives	* Not applicable. No RAOs for this site.
IV. Remedial Actions	No remedial actions are required.
V. Progress Since Last Review	OT029 was not reviewed for 1998 Five-Year Review Report. A decision document for NFRAP was completed in March of 1998.
VI. FYR Process	Site review conducted per the process described in this report for the overall 2003 Five-Year review.
VII. Technical Assessment	
Question A (Answer)	Not Applicable
Question A (Comment)	No remedial actions are required.
Question B (Answer)	Not Applicable
Question B (Comment)	Not applicable. No remedial actions are required.
Question C (Answer)	Not Applicable
Question C (Comment)	No remedial actions are required.
VIII. Issues	None.
IX. Recommendations	None.
X. Protectiveness	Not Applicable
Protectiveness Statement	OT029 was recommended for NFRAP status and accepted in 1998 because the site does not pose any unacceptable risks to human health or the environment (HAFB EMR 1998b).
XI. Next Required FYR	None - Current FYR is Final

Operable Unit 8

I Introduction

OU 8 is a groundwater-only Operable Unit and contains one site, OT033, the Layton TCE plume (see Table OU 8-1). Chlorinated compounds, primarily TCE comprise the on-Base plume, while both TCE and 1,2-DCA have migrated off Base to the south and southwest. 1,2-DCA is minimally retarded relative to groundwater flow velocities, and has migrated up to 10,000 feet from the source areas off Base. The potential source areas that have impacted groundwater at OU 8 either previously or currently include: the Sodium Hydroxide Tank Site (ST004 in OU 3), the IWTP Sludge Drying Beds (WP006 in OU 3), the former Berman Pond (WP005 in OU 3) and Refueling Vehicle Maintenance Facility (RVMF) (ST018 in OU 3); Building 204 (OT029), Building 220 (ST031 in OU 7) and Building 225 (SS027 & SS032 in OU 7); Pond 1 (SD034 in OU 9); Layton Area; UST sites 260 (ST074) and 280 (ST035); and potentially Buildings 43 and 454 (OT097 in OU 11) (MW 2001). This Operable Unit is currently in the Proposed Plan phase and therefore does not have a final ROD in place.

Table OU 8-1. OU 8 Site Identification

Site ID	Site Name
OT033	LAYTON TCE PLUME

II Site Chronology

See Table OU 8-2 for a history of events in this OU. The table is organized to describe events that impacted the OU as a whole, followed by events impacting specific IRP sites within the OU.

III Background

The VOCs most frequently detected above their respective MCLs in OU 8 groundwater include, TCE, 1,2-DCA, 1,1-DCE, 1,1,1-TCA, chlorobenzene, and PCE. In addition, gasoline and diesel range organic compounds and related compounds (benzene, toluene, ethylbenzene, and naphthalene) have been detected in concentrations exceeding their respective MCLs near on-Base UST sites. Inorganic contaminants in groundwater detected above their respective MCLs include hexavalent chromium, nickel, and lead in the vicinity of Building 225 (OU 7) and Hill AFB IWTP (MW 2001).

Several remedial actions, corrective measures, and institutional controls have been implemented within the OU 8 area for both groundwater and source areas overlying OU 8. Remedial actions include hydraulic containment of contaminated OU 8 groundwater at the southern Base boundary as a part of an interim remedial action (IRA), implementation of the OU 3 and OU 7 RODs, implementation of interim remedial measures at the Sodium Hydroxide Tank Site (ST004), and implementation of corrective actions at UST sites ST035 (Building 280) and ST074 (Building 260) (MW 2001). Water rights restrictions are in place for all affected areas (HAFB 1998).

The areal extent of TCE and 1,2-DCA plumes are shown in Figures OU 8-1 and OU 8-2, respectively. Although these two figures illustrate TCE and 1,2-DCA, other COCs may be present within the boundaries of these plumes. The off-Base TCE plume splits into separate eastern and western legs. Off-Base TCE concentrations are highest in the area extending south

from the OU 8 IRA hydraulic containment system, and the distal portions of both east and west legs. Chemical partitioning calculations estimate the total mass of TCE within the OU 8 plume is approximately 10,500 pounds, with approximately 2,900 pounds in the aqueous phase (i.e., dissolved). The estimated volume of groundwater contaminated with TCE at OU 8 is approximately 4 billion gallons (MW 2001).

The 1,2-DCA plume has migrated approximately 3,000 feet past the furthest extent of the off-Base TCE plume. The estimated total mass of 1,2-DCA within the OU 8 plume is approximately 2,800 pounds with approximately 2,100 pounds in the aqueous phase (dissolved). The estimated volume of groundwater contaminated with 1,2-DCA at OU 8 is approximately 2.8 billion gallons (MW 2001).

There is chemical and geochemical evidence to suggest that biodegradation of TCE and 1,2-DCA is occurring off Base; however, while TCE concentrations on-Base have attenuated over time there is no evidence to indicate that biodegradation is contributing to this process beneath the industrial area. There is evidence to suggest that dechlorination of 1,1,1-TCA may be occurring on Base. Lead, nickel, and cadmium are readily sorbed to soils or precipitated as carbonates, such that natural attenuation processes may be sufficient to mitigate their transport. Reduction of hexavalent chromium to immobile trivalent forms occurs in subsurface environments and may be sufficient to mitigate its transport (MW 2001).

The Remedial Investigation (RI) and the Feasibility Study (FS) for OU 8 were completed in December 2001 and March 2003, respectively. The FS contains both on-Base and off-Base remedial alternatives, however the FS does not outline the preferred remedial alternative for either on- or off-Base sections of the plume. The preferred remedial alternative will be outlined in the Proposed Plan scheduled for general release 18 June 2003. The on-Base alternatives include no further action, limited action, MNA, and two pump and treat options. The off-Base alternatives include no action, limited action, MNA, and three pump and treat options.

IV Remedial Actions

The OU 8 IRA addresses contaminated groundwater along the southern boundary of Hill AFB. The interim remedy selected for OU 8 is designed to prevent further groundwater transport of contamination to off-Base areas, thereby controlling the volume and areal extent of contamination and reducing future potential off-Base risk and cleanup costs. The interim remedy selected for OU 8 was designed to contain the migration of contaminants at the southern boundary of Hill AFB by removing groundwater using a series of vertical extraction wells. Since the objective of the IRA is containment, cleanup levels were not established.

The OU 8 IRA hydraulic containment system has been operational since 18 May 1998. Eight extraction wells pump groundwater on a semi-continuous basis discharging to the sanitary sewer for treatment at North Davis County Sewer District (NDCSD). Because the system transects Hillfield Drive adjacent to the south gate of Hill AFB, the conveyance and instrumentation are operated independently as separate East and West systems (see insert on Figure OU 8-1). The East system consists of three extraction wells, and the West system consists of five extraction wells.

V Progress Since Last Five-Year Review

No recommendations were made in the 1998 FYR for OU 8. Since 1998 however, the IRA hydraulic containment system continued operation without major changes as the CERCLA process continues. Other progress includes finalization of the RI and the FS for OU 8, which were completed in December 2001 and March 2003, respectively. The Proposed Plan and ROD are scheduled for completion in June and November 2003, respectively.

VI Five-Year Review Process

Site review was conducted per the process described in this report for the overall 2003 FYR.

VII Technical Assessment

Question A. Is the remedy functioning as intended by the decision documents?
Yes. The principal goal of the IRA is to prevent further groundwater transport of contaminant to off-Base areas, not to restore the contaminated aquifer to drinking water standards (HAFB EMR 1997). Based on potentiometric surface maps, the extraction wells are capturing groundwater in the OU 8 plume at the Base boundary.

A final remedy has not been selected and a final ROD has not been implemented at the time of this review. This question should be addressed again following implementation of the final remedy.

Question B. Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objective (RAOs) used at the time of the remedy still valid?
No. The Utah and Federal Standard for Drinking Water for arsenic at the time the Interim ROD was written was 50 µg/L. This value is currently valid; however, the arsenic standard of 10 µg/L will be effective on 1/26/2006. This decrease should be taken into consideration when writing the final ROD.

The Utah and Federal Standard for Drinking Water for hexavalent and total chromium was 50 ug/L at the time the Interim ROD was written. Since an MCL for hexavalent chromium in groundwater is not published, the MCL for total chromium in groundwater is used for both hexavalent and total chromium. The MCL for total chromium in groundwater is 100 µg/L. The value of 100 µg/L for hexavalent and total chromium should be used when the final ROD is written.

Question C. Has any other information come to light that could call into question the protectiveness of the remedy?
The hydraulic containment system's intent was not protectiveness. Therefore, this question is not applicable.

VIII Issues

1. Table 3-1 of the Interim ROD identifies 10 different contaminants (HAFB EMR 1997). The RI (MWH 2001) has 5 contaminants detected above their respective MCLs that are not

identified in the Interim ROD. These contaminants are toluene, ethylbenzene, naphthalene, nickel, and lead. Also, arsenic is not mentioned in the RI as a contaminant, but it is listed in the Interim ROD.

2. U8-201, U8-207, and U8-208 (the East system) have had very low TCE concentrations (i.e., less than 17 µg/L) since April 1999 and U8-201 has not been above 5 µg/L, the MDL, since April 1999. It may be possible to turn off wells within the East system while still meeting the IRA objective of containing groundwater with contaminant concentrations above MCLs.

3. Calculations in Appendix L of the 2002 O&M Plan (URS 2002), illustrate that U8-203 can be shut down for a maximum of 38 days while still maintaining (or regaining) capture of the migrating contaminants during the well's shutdown period. This duration was then translated into the maximum allowable system shutdown period. This system shutdown duration may not be appropriate since U8-203 yields substantially more volume than other wells and it is screened in a higher hydraulically conductive zone than other wells in the system.

   Further, due to well fouling issues and pump mechanical problems, individual wells within the IRA system have been inoperable for consecutive months (based on a review of 2 years of monthly and annual reports). No guidance is given in the O&M Plan for the maximum downtime for individual wells within the IRA prior to loss of hydraulic containment (URS 2002).

4. During the interviews with personnel from the O&M contractor, several operational issues were identified.
   a. It was reported that some of the pumps in the wells are oversized. Pump sizing in the current O&M plan is based on projections of modeled flows and from pump tests performed prior to construction. With the exception of U8-203, all projections over estimated actual ground water production rates. Since the flows are less than projected, current pump sizing specified in current version of O&M Plan is in excess of requirements.
   b. Spare pumps are operational, but require cleaning and maintenance prior to re-installation.
   c. The design and location of the pressure transmitter enclosures allows excessive moisture into the enclosure and inflates operational costs.

5. Air sampling has been performed in a number of homes above the plume. Due to recent emphasis on vapor intrusion, EMR has worked with the EPA and Utah State to establish an action level for TCE in indoor air at 0.43 ppbv, which may be different than the TCE action level at the time of the OU 8 indoor air testing.

6. A potential exposure pathway, where groundwater comes to the surface in a field drain that has no institutional controls, was identified in the interview with Rob Petrie of EMR (28 January 2003). The sample identification number for this stream is, U3-633. [A review of the analytical data from this location shows four samples taken between 1993 and 1996. All four samples contained TCE concentrations above the MCL of 5 µg/L. The results ranged from 11-19 µg/L of TCE.] The concentrations at this sampling event were 5 and 6 µg/L for 1,1-DCE and TCE, respectively. Due to the lack of an adequate number of data points, it cannot be determined at this time if this location poses an unacceptable threat to human health.

IX Recommendations and Follow-up Actions for OU 8

1. Clarify appropriate COCs in the final ROD.

2. Investigate the following options:
   a. Reduce the cost of the sampling program by reducing the frequency of sampling for the East system wells if the change does not significantly impact the accuracy of the mass removal calculation,
   b. Reduce the MDL with the laboratory to a reporting limit less than 5 µg/L for better quantification of contaminant concentration to support taking wells off-line,
   c. In an effort to reduce system operating costs, take some or all of the East System wells off-line (U8-201, U8-207, U8-208) based on statistically-proven concentrations below MCLs and modeling to ensure that capture of the 5 µg/L contour is not compromised, and
   d. Change the discharge point of the East System from the sanitary sewer to the storm drain due to the low concentrations being captured by this section of the system.

3. Calculate maximum shutdown durations for each well within the IRA system to ensure future capture of the entire plume transect. Compare the maximum well shutdown durations for each well to determine the maximum system shutdown duration.

4. Address operational issues:
   a. During the next revision of the O&M Plan, the pump specifications based on predicted flows should be replaced by pump specifications based on actual flows.
   b. Clean and maintain spare pumps.
   c. Complete a cost-benefit analysis for replacement or re-engineering of the current pressure transmitter enclosures.

5. Re-evaluate previous indoor air data, and if necessary obtain additional air samples to determine if the new action level for TCE (0.43 ppbv) in indoor air would warrant additional mitigation measures in off-Base residential areas.

6. Review analytical sampling results for U3-633 to quantify exposure risks at this location. Continue sampling at this location to develop a statistically relevant representation of the exposure risks.

X Protectiveness Statement for OU 8

The protectiveness of the remedies at OU 8 cannot be determined or evaluated until a final remedy is selected, implemented, and performance data are reviewed. The FS for this site was finalized in March 2003. A Proposed Plan and a ROD are expected within calendar year 2003.

XI Next Review

The next FYR for OU 8 is required by 2008.

XII References for Operable Unit 8 Summary

(HAFB 1998) OO-ALC-HAFB Supplement I, AFI 32-7020, 29 April 1998, Hill AFB, 29 April 1998.

(HAFB EMR 1997) Record of Decision for an Interim Remedial Action at Operable Unit 8, Hill AFB EMR, May 1997.

(HAFB EMR 1998) CERCLA 1998 Five-Year Review Hill Air Force Base, Utah, Hill AFB EMR, September 1998.

(MWH 2001) Remedial Investigation Report for Operable Unit 8, Montgomery Watson Harza, December 2001.

(MWH 2003) Feasibility Study Report for OU 8, Montgomery Watson Harza, March 2003.

(URS 2002) Treatment System Operation Report Interim Remedial Action Hydraulic Containment System Operable Unit 8, Hill AFB, Utah, URS, June 2002.

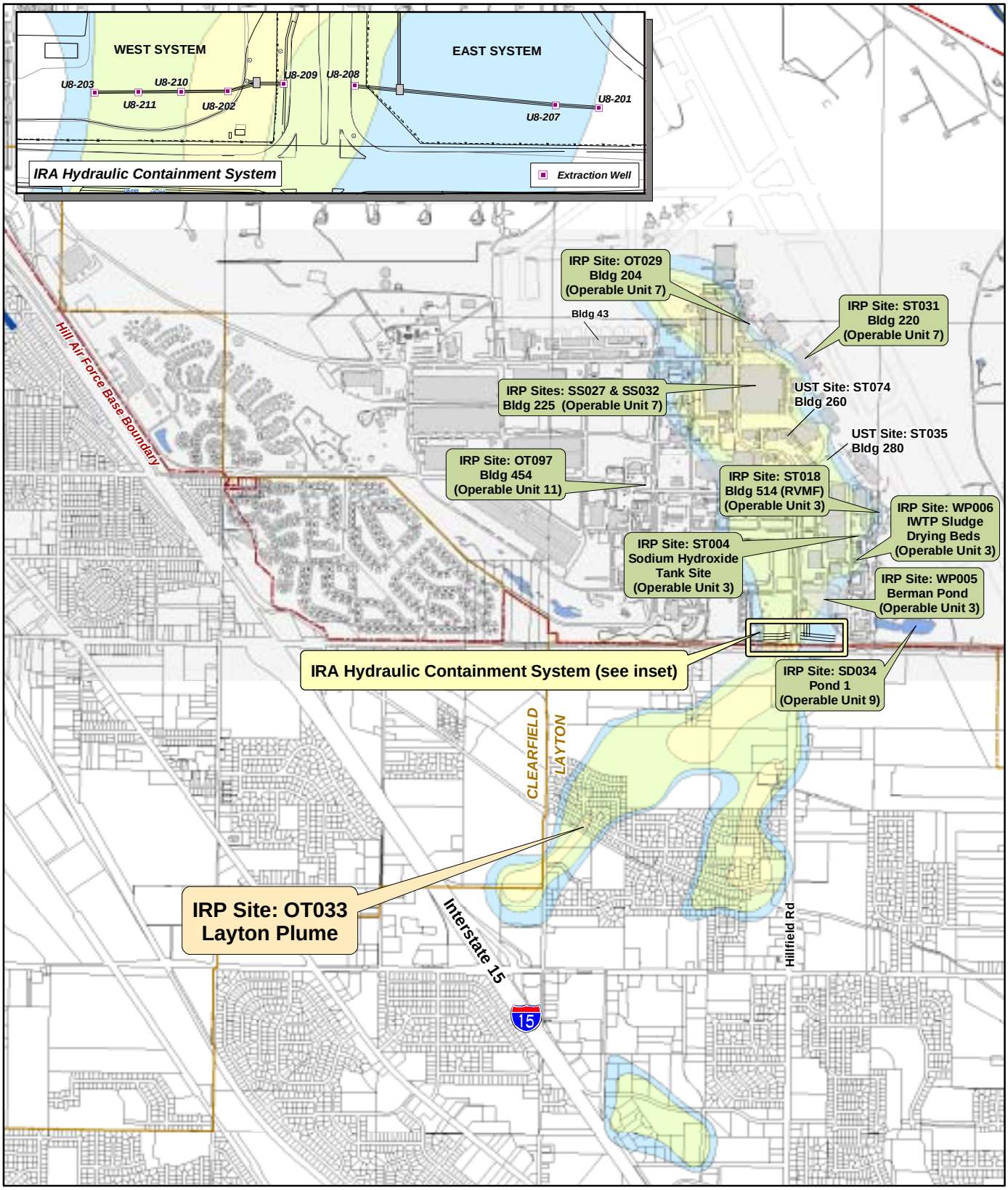

FIGURE OU 8 -1:
Site Features for Operable Unit 8
Showing TCE Plume

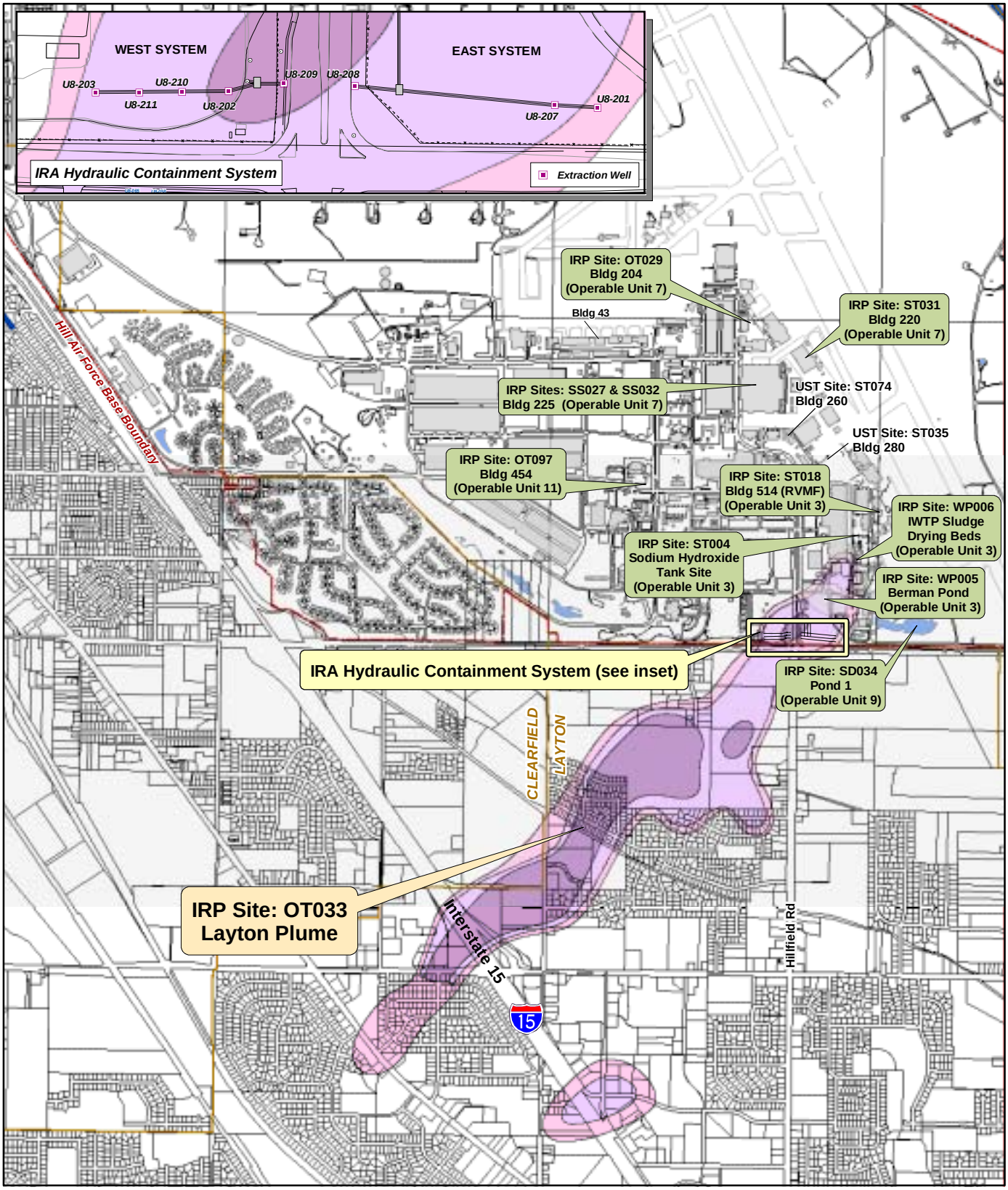

FIGURE OU 8 -2:
Site Features for Operable Unit 8 Showing DCA Plume

Table OU 8 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
OT033	**LAYTON TCE PLUME**			
	1993	OU 8 Created	OU 8 was created in 1993, and consisted of contaminated groundwater previously considered part of OU 3 and OU 7.	Remedial Investigation Report for Operable Unit 8
05	1997	Interim Record of Decision	An interim ROD for an Interim Remedial Action at OU 8 was finalized in May 1997.	Remedial Investigation Report for Operable Unit 8
10	1997	Hydraulic containment system constructed	The hydraulic containment system was constructed from the 20 October 1997 and completed 1 May 1998.	Construction Completion Report for Operable Unit 8 Interim Remedial Action Hydraulic Containment System
	1998	Final Inspection of the Interim Remedial Action	Final inspection of the OU 8 IRA Hydraulic Containment System was conducted on 4 May 1998. A final facility inspection by the EPA and UDEQ was conducted on 20 July 1998. O&M system startup was on 18 May 1998.	Final Interim Remedial Action Report for Operable Unit 8
05	1998	The West System was operational		Remedial Investigation Report for Operable Unit 8

Table OU 8 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
04	1999	The East System was placed on-line after modifications	The East System was shut down on May 21, 1998 after only four days of operation due to flooding of the electrical pullbox that resulted in electrical component damage. After several design changes were implemented, the East System was restarted in April 1999.	Remedial Investigation Report for Operable Unit 8
12	2001	Remedial Investigation	Remedial Investigation finalized.	Remedial Investigation Report for Operable Unit 8
03	2003	Feasibility Study	Feasibility Study finalized.	Feasibility Study Report for OU 8

Operable Unit 9

I Introduction

The eight sites included in OU 9 are listed in Table OU 9-1. The location of each site is shown in Figure OU 9-1. Facilities with deferred action, included in site OT106, are located throughout the Base, and therefore, are not shown on the site map. These facilities are listed in Table OU 9-4.

Though these sites are currently investigated and managed under OU 9, they are mostly unrelated to each other in location and in history. There is currently no ROD in place for OU 9. The majority of the OU 9 sites, including Pond 3 (SD023), Pond 7 (SD040), the 1100 Area (SS089), the Zone 7 Golf Course (SS090), and the 800/900 Warehouse Area (SS108), are under remedial investigation for soil and groundwater contamination. The Deferred Areas (OT106) currently include more than 160 facilities with deferred action. Building 786 (SS092) has been designated as a site with no further response action planned. A soil cover, to be constructed May 2003, will be used to contain soil contamination at Pond 1 (SD034). All OU 9 sites have been included for completeness and to document the site background information. The summary of the FYR for each site is shown in Section XIII (OU 9 Site Summaries).

Table OU 9-1. OU 9 Site Identification

Site ID	Site Name
SD023	POND 3
SD034	POND 1
SS092	BLDG 786
OT106	DEFERRED AREAS
SD040	POND 7 AREA
SS089	1100 AREA
SS090	ZONE 7 GOLF COURSE
SS108	800/900 WAREHOUSE AREA

II Site Chronology

See Table OU 9-2 for a history of events in this OU. The table is organized to describe events that impacted the OU as a whole, followed by events impacting specific IRP sites within the OU.

III Background

Sites included in OU 9 have various and unrelated histories. Refer to individual site summaries, shown in Section XIII, for background information.

IV Remedial Actions

Pond 1 is the only site with a selected remedy. The list of contaminants of concern is presented in the Site Summary (Section XIII) for Pond 1. The soil cover, selected under the EE/CA to contain sediment contamination, is planned for construction in May 2003. See Pond 1 Site Summary (Section XIII) for details of the remedial action. No remedy is required at Building 786, a NFRAP site. The remaining sites are under remedial investigation and the need for remedial action has not been determined.

V Progress Since Last Five-Year Review

Since the 1998 FYR (HAFB EMR 1998a), additional investigation has been conducted at all sites included in OU 9 and site characterization continues under the OU 9 RI/FS effort at most of the sites. A remedy was selected for Pond 1 in 2002 to address contamination in pond sediment. A NFRAP document was also developed for Building 786 in 2002.

VI Five-Year Review Process

A review for all sites, except the Deferred Areas (OT106), was conducted per the process described for the overall 2003 FYR. Because site characterization has been deferred for OT106 facilities and protectiveness cannot be evaluated, this site was not reviewed. A list of the deferred facilities, shown in Table OU 9-4, has been included in this report for completeness.

VII Technical Assessment

Results of the technical assessment for each site in OU 9 are listed in Table OU 9-3. A technical assessment for the OU as a whole is not provided because the sites are unrelated. Details of the technical assessment for each site in OU 9 are provided in the respective site summary (see Section XIII).

Table OU 9-3. Technical Assessment Summary for OU 9

Site ID	Remedy	Technical Assessment*			Protectiveness	Next Five-Year Review
		Question A	Question B	Question C		
SD023	Not determined	NA	NA	NA	NA	2008
SD034	Soil cover	Yes	Yes	No	Protective once remedy is completed	2008
SS092	Not required, NFRAP site	NA	NA	No	Protective	Not required
OT106	Not determined	NA	NA	NA	NA	2008
SD040	Not determined	NA	NA	NA	NA	2008
SS089	Not determined	NA	NA	NA	NA	2008
SS090	Not determined	NA	NA	NA	NA	2008
SS108	Not determined	NA	NA	NA	NA	2008
OU9	Soil cover	NA	NA	NA	Protective once remedy is completed	2008

* Question A: Is the remedy functioning as intended by the decision documents?
Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objective (RAOs) used at the time of the remedy still valid?
Question C: Has any other information come to light that could call into question the protectiveness of the remedy?
NA = Not applicable

VIII Issues

Based on the information reviewed, no issues have been identified that may affect protectiveness of the selected remedy (soil cover at Pond 1) at OU 9. The majority of the sites are still under remedial investigation. However, institutional controls are in place and there is no immediate threat to human health.

IX Recommendations and Follow-up Actions for OU 9

The recommendations and follow-up actions for OU 9 are:

1. Construct soil cover at Pond 1 as scheduled in May 2003.

2. Complete remedial investigation and present results in RI report as scheduled in 2004.

3. Continue institutional controls at sites under RI to limit human exposure to potential contamination.

4. Continue annual inventory of deferred facilities to determine when site characterization can be conducted.

X Protectiveness Statement for OU 9

The remedy for site SD034 at OU 9 will be protective of human health and the environment once it is completed. Institutional controls have been implemented at all deferred sites under remedial investigation to limit human exposure to potential contamination until the need for remedial action can be determined.

XI Next Review

The next FYR for OU 9 is required by 2008. No future review is required for Building 786 (SS092) because no further remedial action is planned for this site.

XII References for Operable Unit 9 Summary

(CH2M 2002a) Engineering Evaluation/Cost Analysis for the OU9 Pond 1 Removal Action, Final Report, CH2M Hill, April 2002.

(CH2M 2002b) Building 786 No Further Response Action Planned Decision Document, IRP Site SS092, Final Report, CH2M Hill, September 2002.

(HAFB 1998) OO-ALC-HAFB Supplement I, AFI 32-7020, 29 April 1998, Hill AFB, 29 April 1998.

(HAFB EMR 1995) Record of Decision for Operable Unit 3, Hill AFB, September 1995.

(HAFB EMR 1998a) CERCLA 1998 Five-Year Review Hill Air Force Base, Utah, Hill AFB EMR, September 1998.

(HAFB EMR 1998b) Decision Document for IRP Site SD40A Category III NFRAP Pond 6, Hill AFB EMR, March 1998.

(MW 2000) Final Data Summary Report and Preliminary Conceptual Model for Operable Unit 9 Investigation Areas, Montgomery Watson, October 2000.

Table OU 9-4. OU 9 Site OT106 Deferred Sites
Source: Hill Air Force Base Calendar Year 2001 Deferred Site Inventory Report

Building Number	Facility Use	Site Status
1 / 1A	Maintenance Hangar and Annex	Defer action
5	Office and Shop Area	Defer action
25	Three Aircraft Maintenance Hangars	Defer action
30	Metal Shop	Defer action
37	General Aircraft Maintenance Hangar	Defer action
39	Aircraft Maintenance Shops / Supply Storage	Defer action
40	General Aircraft Maintenance Hangar	Defer action
42	General Aircraft Maintenance Hangar	Defer action
43	Fuel Systems Maintenance Hangar	Defer action
45	General Aircraft Maintenance Hangar	Defer action
46	General Aircraft Maintenance Hangar	Defer action
48	Corrosion Control Facility	Defer action
49	Fueling Station	Defer action
55	Storage	Defer action
100	Lab / Office Space	Defer action
202	Flight-Line Vehicle Maintenance Facility	Defer action
205	Former Landing Gear Repair Shop - Currently Electrical Circuit Plating Shop / Component Repair Facility	Defer action
206	Indoor C-130 Wash Rack	Defer action
214	Precision Maintenance and Evaluation Laboratory	Defer action
220	Main Painting Hangar	Defer action

Table OU 9-4. OU 9 Site OT106 Deferred Sites (Cont.)

Building Number	Facility Use	Site Status
225	Main Maintenance Hangar	Defer action
227/228	Defueling Hangars	Defer action
233	Final Flight Test Hangar	Defer action
236	Fuel System Maintenance Facility	Defer action
238	F-16 and C-130 component repair	Defer action
256	Chemical Distribution Area	Defer action
257	Plastics Repair - Fabrication Facility / Compressed Gas Cylinder Testing Shop	Defer action
260	Steam Heating Plant	Defer action
265	Shop Facility	Defer action
270	C-130 Paint Hangar	Defer action
279	Aircraft Engine Storage Area	Defer action
287/15090	Aircraft Fuel Purge and Outside Maintenance Area	Defer action
295	Office Space / Aircraft Hangar	Defer action
505	Plating and Grinding Shop	Defer action
507	Landing Gear Repair Facility	Defer action
509	Weapons System Repair Facility / Fuel Tank Calibration Lab	Defer action
510	Machine Shop	Defer action
511	IWCS connection	Defer action
515	Small Vehicle Maintenance Shop	Defer action
575	Industrial Wastewater Treatment Plant	Defer action
576	F-16 Fuel System Repair / Repair of External Fuel Tanks	Defer action
589	Aircraft Engine Inspection / Maintenance Shop	Defer action
590	Repair / Maintenance Hangar	Defer action
592	Locker Room / Flight-Line Vehicle Maintenance Facility	Defer action
597	Clean Labs / Aircraft Component Repair Shops	Defer action
732	Small Arms Facility	Defer action

Table OU 9-4. OU 9 Site OT106 Deferred Sites (Cont.)

Building Number	Facility Use	Site Status
741	Small Arms Marksmanship Training Unit Building	Defer action
752	Weapon Depot Shop	Defer action
776	Storage Shed	Defer action
786	Pesticide and Herbicide Storage	Site Investigation completed in 2002. Results pending.
787	Test Equipment Storage	Site Investigation completed in 2002. Results pending.
800	Current Use - Warehouse and Office Space	Building planned for demolition in 2009
847	Missile Transportation Vehicle Maintenance	Defer action
893/896/897	DRMO Storage Sheds	Defer action
911	Fuel Truck Repair / Above Ground Fuel Tank Storage	Defer action
916	Paint Service Magazine	Site Investigation to be completed in 2003
918	Waste Oil Storage / Liquid Oxygen and Nitrogen Storage and Distribution	Site Investigation to be completed in 2003
924	IWCS Lift Station 1	Defer action
935	Maintenance / Inspection Building	Defer action
940	Missile Disassembly / Assembly Building	Defer action
960	Maintenance	Defer action
965	Missile Assembly Shop	Defer action
970	Missile Assembly Shop	Defer action
975	Missile Assembly Shop	Defer action
980	Missile Assembly Shop	Defer action
983	Rocket Check Assembly Storage	Defer action
1011	Black Powder Rest House	Site Investigation completed in 2002. Results pending.
1012	Precious Element Service Magazine	Site Investigation completed in 2002. Results pending.
1021	Paint and Oil Service Building	Site Investigation completed in 2002. Results pending.
1023	Paint and Oil Service Building	Site Investigation completed in 2002. Results pending.
1112	Fuel Oil Tank	Site Investigation to be completed in 2003
1116	Incinerator	Site Investigation to be completed in 2003

Table OU 9-4. OU 9 Site OT106 Deferred Sites (Cont.)

Building Number	Facility Use	Site Status
1117	Ordnance Depot Septic Tank	Site Investigation completed in 2002. Results pending.
1132	Locomotive Shelter	Defer action
1133	Vehicle Maintenance Shop	Defer action
1135	Utilities Shop Building	Defer action
1140	Former Janitor's Office	Site Investigation completed in 2002. Results pending.
1141	Garage/Storage	Defer action
1202	Software Control Center	Defer action
1203	Engineering Test Facility	Defer action
1243	Vehicle Maintenance Shop	Defer action
1248	Material Process Depot	Defer action
1253	Vehicle Maintenance Shop	Defer action
1258	Administrative Building	Defer action
1264	Integrated Support Facility	Defer action
1267	Photographic Laboratory	Defer action
1289	Administrative Building	Defer action
1312	Base Maintenance Shop	Site Investigation completed in 2002. Results pending.
1377	Munitions Processing Facility	Defer action
1422	Material Process Depot	Defer action
1424	Missile Assembly Shop	Building planned for demolition in 2008
1503	Asbestos Abatement Building and Transformer Pad	Site Investigation completed in 2002. Results pending.
1504	Boiler House	Site Investigation completed in 2002. Results pending.
1521	Explosive Storage	Site Investigation completed in 2002. Results pending.
1522	Boiler House	Site Investigation completed in 2002. Results pending.
1524	Acid Storage Shed	Site Investigation to be completed in 2003
1528	Hazardous Storage Shed	Site Investigation completed in 2002. Results pending.
1534	TNT Box Opening Building	Site Investigation completed in 2002. Results pending.

Table OU 9-4. OU 9 Site OT106 Deferred Sites (Cont.)

Building Number	Facility Use	Site Status
1538	Air Force Plant 77 storage shed	Site Investigation completed in 2002. Results pending.
1539	Wash House	Site Investigation completed in 2002. Results pending.
1542	Explosive Storage	Site Investigation completed in 2002. Results pending.
1543	Explosive Storage	Site Investigation completed in 2002. Results pending.
1545	Explosive Storage	Site Investigation completed in 2002. Results pending.
1548	Boiler / Heating Plant	Site Investigation completed in 2002. Results pending.
1566	Tactical Missile G/W Shop	Defer action
1590	Heating Facility Building	Defer action
1600	Test Facility	Site Investigation to be completed in 2003
1606	Munitions Storage	Site Investigation completed in 2002. Results pending.
1643	Flammable Material Storage Building	Site Investigation to be completed in 2003
1644	Fuse Test Building	Site Investigation completed in 2002. Results pending.
1649	Missile Test Facility	Defer action
1653	Tetryl Screening and Blending	Site Investigation completed in 2002. Results pending.
1654	Tetryl Screening and Blending	Site Investigation completed in 2002. Results pending.
1655	Tetryl Service Magazine	Site Investigation completed in 2002. Results pending.
1833	PBPS Surveillance Facility	Defer action
1907	Vehicle Storage Wash Building	Site Investigation completed in 2002. Results pending.
1913	Pneudraulic Shop	Building planned for demolition in 2006
1917	ICBM Dir / Propellant Analysis	Building planned for demolition in 2006
1919	Museum BLDG / MMIT Simulator Repair	Defer action
1931	Missile Service Shop	Defer action
1934	Storage Building	Site Investigation completed in 2002. Results pending.
1936	Wash Rack	Defer action
1937	Hazardous Storage Depot	Site Investigation completed in 2002. Results pending.
1939	Missile Service Shop	Site Investigation completed in 2002. Results pending.

Table OU 9-4. OU 9 Site OT106 Deferred Sites (Cont.)

Building Number	Facility Use	Site Status
1948	Quality Control Lab	Building planned for demolition in 2007
1950	Propellant Packaging Facility	Building planned for demolition in 2007
1952	Propellant Packaging Facility	Building planned for demolition in 2007
2001	Hazard Storage Depot	Site Investigation completed in 2002. Results pending.
2002	Nitric Acid Storage	Site Investigation completed in 2002. Results pending.
2007	Instrument Overhaul	Site Investigation completed in 2002. Results pending.
2008	Compass Repair	Site Investigation completed in 2002. Results pending.
2015	Primer Rest House	Site Investigation completed in 2002. Results pending.
2016	Transformer Pad	Site Investigation to be completed in 2003
2112	Munitions Storage	Site Investigation to be completed in 2003
2114	Missile Service Shop	Site Investigation to be completed in 2003
2122	Storage Magazine / Paint Services	Site Investigation completed in 2002. Results pending.
2133	Tetryl Pellet Rest House	Site Investigation completed in 2002. Results pending.
2137	Primer Magazine	Site Investigation completed in 2002. Results pending.
2143	Storage Building	Site Investigation completed in 2002. Results pending.
2144	Storage Building	Site Investigation completed in 2002. Results pending.
2145	Storage Building	Site Investigation completed in 2002. Results pending.
2149	Missile Service Shop	Site Investigation to be completed in 2003
2201	Storage Building	Building planned for demolition in 2004
2202	Missile Service Storage Building	Site Investigation completed in 2002. Results pending.
2214	Conventional Munitions Shop	Defer action
2310	Magazine Storage and Pellet Rest House	Site Investigation completed in 2002. Results pending.
2314	Magazine Storage and Black Powder Screen and Blend	Site Investigation completed in 2002. Results pending.
2317	Magazine Storage and Black Powder Storage	Site Investigation completed in 2002. Results pending.
2331	Magazine Storage and Pellet Rest House	Site Investigation completed in 2002. Results pending.
2332	Magazine Storage and Pellet Rest House	Site Investigation completed in 2002. Results pending.

Table OU 9-4. OU 9 Site OT106 Deferred Sites (Cont.)

Building Number	Facility Use	Site Status
2335	Magazine Storage and Black Powder Screen and Blend	Site Investigation completed in 2002. Results pending.
2338	Magazine Storage and Black Powder Storage	Site Investigation completed in 2002. Results pending.
2401	Guided Missile Production Facility	Defer action
2402	Guided Missile Production Facility	Site Investigation to be completed in 2003
2405	Guided Missile Production Facility	Defer action
2406	Guided Missile Production Facility	Defer action
2407	Guided Missile Production Facility	Defer action
2408	Guided Missile Production Facility	Defer action
2410	Utility Vault	Site Investigation completed in 2002. Results pending.
11420	Underground Transformer Vault	Defer action
11647	Missile Test Facility	Defer action
OB/OD Range	Open Burn / Open Detonation	Defer action
SW outfall in Zone 1500	Storm Sewer Outlet (Zone 1500)	Site Investigation to be completed in 2003

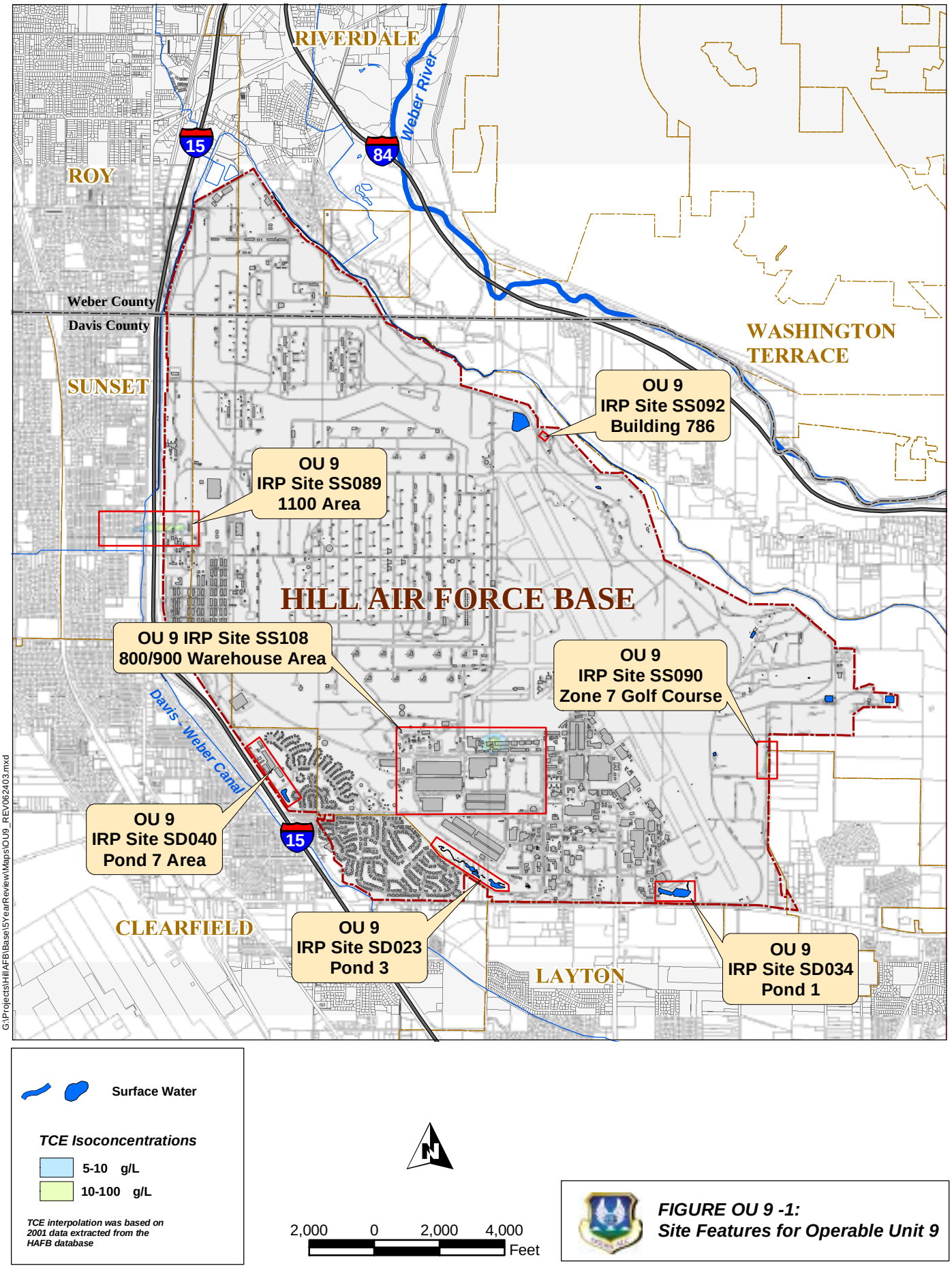

FIGURE OU 9 -1:
Site Features for Operable Unit 9

Table OU 9 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
SD023	**POND 3**			
	1989	RI/FS process for Pond 3 was initiated	Evaluate the presence/absence of contaminants in pond surface water and sediment.	Record of Decision for Operable Unit 3
04	1992	Remedial Investigation OU 3, Phase I. Site characterization at Pond 3	Investigation to evaluate the nature and extent of surface water and sediment contamination. Surface water and pond sediments sampled.	Record of Decision for Operable Unit 3
03	1995	Remedial Investiontion OU 3, Phase II. Site characterization at Pond 3	Investigation to evaluate the nature and extent of surface water and sediment contamination. Surface water and pond sediments sampled.	Record of Decision for Operable Unit 3
09	1995	Record of Decision for OU 3, include Pond 3	Based on OU 3 RI/FS and Risk assessments, contaminants in Pond 3 surface water and sediment do not pose current or future health risk or present a threat to groundwater. Therefore, cleanup actions area not necessary at Pond 3.	Record of Decision for Operable Unit 3
09	1999	EMR voluntarily initiated additional investigation at Pond 3 when contamination was detected on Pond 1 inlet. Detailed topographic survey	Included a fly over on Sep 8, 1999 by Olympus Aerial Survey of Salt Lake City; and depth measurement of Pond 3. Investigation reopened under OU 9.	Final Data Summary Report and Preliminary Conceptual Model for Operable Unit 9 Investigation Areas

Table OU 9 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
10	2000	Remedial Investigation - soil samples collected at Pond 3	Investigation included hand augured soil borings at 10 locations. Each were driven to a depth ranging from 3 to 4 ft. Soil samples were collected beneath the surface of the water and were sampled for VOCs, SVOCs and trace metals. Investigation was to provide information on the horizontal and vertical extent of potentially contaminated sediment. Findings will be summarized in a future conceptual site model report. (Completion of the RI is planned for 2004.)	Final Analytical Data Report (ADR) For Operable Unit 9 Investigation Areas 1 May Through 10 October 2000
SD034	**POND 1**			
	1940	1940 -1944 Pond 1 received discharge from Berman Pond during times of overflow from high intensity storms	Berman Pond operated as an unlined evaporation pond from 1940 to 1956 and received storm-water runoff and industrial wastewater, which includes spent solvents, metals, and hydrocarbons.	Final Data Summary Report and Preliminary Conceptual Model for Operable Unit 9 Investigation Areas
	1956	Pond 1 was disconnected from Berman Pond	Berman Pond was connected to a sewer line leading to the IWTP in 1956.	Final Data Summary Report and Preliminary Conceptual Model for Operable Unit 9 Investigation Areas
09	1988	RI/FS process for Pond 1 was initiated	Investigation to evaluate the presence/absence of contaminants in pond surface water and sediment.	Record of Decision for Operable Unit 3
04	1992	Remedial Investigation OU 3, Phase I. Site characterization at Pond 1	Investigation to evaluate the nature and extent of surface water and sediment contamination. Surface water and pond sediments sampled.	Record of Decision for Operable Unit 3

Table OU 9 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
03	1995	Remedial Investiontion OU 3, Phase II. Site characterization at Pond 1	Investigation to evaluate the nature and extent of surface water and sediment contamination. Surface water and pond sediments sampled.	Record of Decision for Operable Unit 3
09	1995	Record of Decision for OU 3, including Pond 1	Based on OU 3 RI/FS and Risk assessments, contaminants in Pond 1 surface water and sediment do not pose current or future health risk or present a threat to groundwater. Therefore, cleanup actions are not necessary at Pond 1.	Record of Decision for Operable Unit 3
01	1997	Samples collected northeast corner of Pond 1 near the inlet. RBSLs were exceeded for arsenic, beryllium, PCBs, chlorobenzene, and dichlorobenzene	Samples collected near Pond 1 inlet to investigate potential contamination of pond sediments as a result of contamination detected in the storm water system at Berman Pond . Investigation performed under OU 9.	Engineering Evaluation/Cost Analysis for the OU9 Pond 1 Removal Action, Final Report
08	1999	Detailed topographic survey	Crew measured approx. 925 locations for vertical and horizontal control. Objective of the survey was to provide enough data to create an accurate contour map of the pond area.	Final Data Summary Report and Preliminary Conceptual Model for Operable Unit 9 Investigation Areas
09	1999	Phase I Pond 1 investigation	Investigation included direct-push borings and hand auger borings . 50 soil samples were collected and analyzed for VOCs, SVOCs, PCBs, pesticides, and TVPH, TEPH, hexavalent chromium, and trace metals. Industrial RBSLs were not exceeded. Residential RBSLs were exceeded for trace metals, PCB, and SVOCs.	Final Data Summary Report and Preliminary Conceptual Model for Operable Unit 9 Investigation Areas
08	2000	Sediment samples collected at Pond 1	Investigation included direct-push soil borings at 29 locations. Each were driven to a depth ranging from 4 to 12 ft. 40 soil samples were collected from various depths throughout the pond footprint and analyzed for VOCs, SVOCs, PCBs, petroleum hydrocarbons (PHC), and trace metals. Sediment samples were found to exceed both residential and industrial RBSLs for PHC, cadmium, and mercury	Engineering Evaluation/Cost Analysis for the OU9 Pond 1 Removal Action, Final Report

Table OU 9 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
	2001	Soil sample collected in the drainage channel and in the pond	7 hand auger borings were excavated to a depth of 6 to 10 ft bgs. The borings were located in the drainage channel between the flight line storm drain outlet east of Pond 1 and the pond basin. The samples were analyzed for VOCs, SVOCs, metals, and TPH. Residential RBSLs were not exceeded.	Engineering Evaluation/Cost Analysis for the OU9 Pond 1 Removal Action, Final Report
04	2002	Engineering Evaluation / Cost Analysis	4 areas of contaminated pond sediments found. EE/CA recommends excavation of pond sediments that exceed residential RBSLs in two areas, combine these sediments with the other two areas, and place an 8-ft soil cover on top. Also included pond expansion. After construction and implementation of the recommended institutional controls, the soil cover is expected to be protective of human health and the environment. The 8 ft soil cover will limit the exposure pathway for any future residential and industrial tenant on the facility. The soil cover also reduces the potential mobility of the contaminants. However, the toxicity and volume of the contaminants remain unchanged. (Construction is scheduled for May 2003)	Engineering Evaluation/Cost Analysis for the OU9 Pond 1 Removal Action, Final Report
SS092	**BUILDING 786**			
	1984	1984 - 1997 Building was used as a pesticide/herbicide storage building		Building 786 No Further Response Action Planned Decision Document, IRP Site SS092, Final Report
06	1996	Site Inspection	Samples were collected during the OU 9 North Area Site Inspection. Pesticides were detected above residential RBSLs in one soil sample.	Building 786 No Further Response Action Planned Decision Document, IRP Site SS092, Final Report

Table OU 9 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
	1997	Building was demolished		Building 786 No Further Response Action Planned Decision Document, IRP Site SS092, Final Report
04	2000	Remedial Investigation	Two soil borings were drilled to 16 ft bgs. Groundwater was not encountered. Pesticides and herbicides were not detected at or above residential RBSLs.	Building 786 No Further Response Action Planned Decision Document, IRP Site SS092, Final Report
06	2000	Remedial Investigation	Surface soil samples were collected at 8 locations from 0-6 inches. Pesticides were not detected at or above residential RBSLs.	Building 786 No Further Response Action Planned Decision Document, IRP Site SS092, Final Report
09	2002	EPA concured with NFRAP	September 4, 2002	Building 786 No Further Response Action Planned Decision Document, IRP Site SS092, Final Report
09	2002	NFRAP Decision Document developed		Building 786 No Further Response Action Planned Decision Document, IRP Site SS092, Final Report

Table OU 9 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
OT106	**DEFERRED AREAS**			
04	1994	Preliminary Assessment - South Area		Final South Area Of Operable Unit 9 Site Inspection, Final Comprehensive Data Evaluation, Volume 1
06	1995	Preliminary Assessment - North Area		North Area Preliminary Assessment Report, June 1995, Final
07	2000	Site Inspection - North Area	Facilities were categorized based on level of contamination found, threat to human health, accessibility for sampling (deferred action), environmental management programs.	Operable Unit 9 Calendar Year 2001 Deferred Sites Inventory Report, Hill Air Force Base, Utah. Draft
02	2001	Site Inspection - South Area	Facilities were categorized based on level of contamination found, threat to human health, accessibility for sampling (deferred action), environmental management programs.	Operable Unit 9 Calendar Year 2001 Deferred Sites Inventory Report, Hill Air Force Base, Utah. Draft
	2002	Site Investigation - Phase I	Phase I conducted in summer 2002 at 50 facilities. Results pending. Once results are published for a site, the site will be removed from OT106 deferred list.	Operable Unit 9 Calendar Year 2001 Deferred Sites Inventory Report, Hill Air Force Base, Utah. Draft

Table OU 9 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
03	2002	Site Management Plan for OU 9 Deferred Sites	Provides mechanism to track and inventory deferred sites.	Operable Unit 9 Calendar Year 2001 Deferred Sites Inventory Report, Hill Air Force Base, Utah. Draft
SD040	**POND 7 AREA**			
	1976	Construction of Pond 7	Designed to store runoff from the southwest side of Hill AFB.	Decision Document for IRP Site SD40A Category III NFRAP Pond 6
09	1993	Preliminary Assessment / Site Inspection at Pond 7	Surface soil, pond sediments, groundwater, and surface water were investigated. Detected organics levels were below the residential RBSLs. Metals were observed at only slightly higher concentrations than established background concentrations.	Final South Area Of Operable Unit 9 Site Inspection, Final Comprehensive Data Evaluation, Volume 1
03	1998	NFRAP developed for Pond 7 (aka Pond 6)	Pond 7 was incorrectly identified as Pond 6 in the Decision Document.	Decision Document for IRP Site SD40A Category III NFRAP Pond 6
	1999	Groundwater contamination was detected downgradient of Pond 7 Area during the basewide CPT investigation	Part of basewide CPT investigation. TCE detected from 22 - 55 ft bgs and maximum TCE conc. detected was 150 ug/L. Other VOCs detected were all below their respective MCLs.	Final Data Summary Report and Preliminary Conceptual Model for Operable Unit 9 Investigation Areas

Table OU 9 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
07	2000	Site Inspection - North Area	Potential groundwater contamination originated from Pond 7 area. Additional investigation was recommended.	Final South Area Of Operable Unit 9 Site Inspection, Final Comprehensive Data Evaluation, Volume 1
10	2000	Remedial Investigation - physical and analytical data collection at the Pond 7 Area	Investigation includes CPT investigation, groundwater sampling, installation of 5 CPT piezometers and 4 monitoring wells, and groundwater elevation measurements. Findings will be summarized in a future Conceptual Site Model (CSM) report.	Final Analytical Data Report (ADR) For Operable Unit 9 Investigation Areas 1 May Through 10 October 2000
01	2002	Remedial Investigation - physical and analytical data collection at the Pond 7 Area	Groundwater mapping, CPT investigation, groundwater sampling, and groundwater elevation measurements. Data will be evaluated in the RI report (planned for 2004).	OU10 Remedial Investigation/Feasibility Study Operable Unit 10 Analytical Data Report, May 1 2001 - January 31 2002
SS089	**1100 AREA**			
03	1998	Site Inspection - OU 9 North Area - includes the West Gate area	Field data was collected between Dec 1995 and Mar 1998 for various OU 9 investigation sites.	Final Data Summary Report and Preliminary Conceptual Model for Operable Unit 9 Investigation Areas
04	2000	Remedial Investigation - included the West Gate area	Field data was collected between April 1998 and April 2000 for various OU 9 investigation sites.	Final Data Summary Report and Preliminary Conceptual Model for Operable Unit 9 Investigation Areas

Table OU 9 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
10	2000	Remedial Investigation -physical and analytical data collection at the 1100 Area	Investigation included CPT and direct-push groundwater sampling, installation of 11 new monitoring wells (U9-11-008 through U9-11-018) ranging from 32-42 ft bgs, and in-situ permeability tests (slug tests) at the new wells. Findings will be summarized in a future Conceptual Site Model (CSM) report.	Final Analytical Data Report (ADR) For Operable Unit 9 Investigation Areas 1 May Through 10 October 2000
10	2000	Preliminary conceptual site models were developed for the West Gate area	Based on data collected during the North Area Site Inspection (1995 to 1998) and between 1998 and 2000, during the ongoing RI/FS investigation of OU 9. Sources of the groundwater contamination plume are unknown since the soil investigations have not been conclusive.	Final Data Summary Report and Preliminary Conceptual Model for Operable Unit 9 Investigation Areas
01	2002	Remedial Investigation - physical and analytical data collection at the 1100 Area	Investigation performed at on and off-Base locations and included groundwater mapping, CPT investigation, groundwater sampling, and groundwater elevation measurements. Data will be evaluated in the RI report (planned for 2004).	OU10 Remedial Investigation/Feasibility Study Operable Unit 10 Analytical Data Report, May 1 2001 - January 31 2002
SS090	**ZONE 7 GOLF COURSE**			
03	1998	Site Inspection - OU 9 North Area	Field data was collected between Dec 1995 and Mar 1998 for various OU 9 investigation sites.	Final Data Summary Report and Preliminary Conceptual Model for Operable Unit 9 Investigation Areas
04	2000	Remedial Investigation - included the Golf Course Area	Field data was collected between Apr 1998 and April 2000 for various OU 9 investigation sites.	Final Data Summary Report and Preliminary Conceptual Model for Operable Unit 9 Investigation Areas

Table OU 9 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
10	2000	Remedial Investigation -physical and analytical data collection at the Golf Course	Investigation was performed as part of the ongoing RI/FS investigation at OU 9. Investigation included CPT and direct-push groundwater sampling to define the nature and extent of groundwater contamination. Groundwater samples were analyzed for VOCs. Five new monitoring wells (U9-07-007 through U9-011) were installed in the Golf Course area with depths ranging from 40 to 51.5 ft. Groundwater was sampled at one of the new wells and 6 previously established wells. Groundwater sampled from the monitoring wells was analyzed for VOCs, cations, sulfide, anions, alkalinity, total dissolved solids (TDS), total organic carbon (TOC), and field parameters. Soil from the screened intervals was also sampled. Groundwater elevation measurements were taken in 11 monitoring wells and 12 piezometer locations throughout the study area. Findings will be summarized in a future Conceptual Site Model (CSM) report.	Final Analytical Data Report (ADR) For Operable Unit 9 Investigation Areas 1 May Through 10 October 2000
10	2000	Preliminary conceptual site models were developed for the Golf Course	Based on data collected during the North Area Site Inspection (1995 to 1998) and between 1998 and 2000, during the ongoing RI/FS investigation of OU 9. Building 710, the maintenance shop, is the likely source of the groundwater contamination.	Final Data Summary Report and Preliminary Conceptual Model for Operable Unit 9 Investigation Areas
	2001	Remedial Investigation - source of contamination identified	Building 710 (golf course maintenance shop) was identified as the primary source of contamination in the area. TCE and PCE were detected above their respective MCLs in groundwater with CPT and monitoring well samples.	OU11 Remedial Investigation/Feasibility Study, Operable Unit 11 Analytical Data Report, May 1 2001 - January 31 2002
01	2002	Remedial Investigation - physical and analytical data collection at the Golf Course Area to further delineate the horizontal and vertical plume boundaries.	Phase I investigation to further delineate the extent of the horizontal and vertical plume boundaries. Investigation included groundwater mapping, CPT investigation, groundwater sampling, and groundwater elevation measurements. Data will be evaluated in the RI report.	OU11 Remedial Investigation/Feasibility Study, Operable Unit 11 Analytical Data Report, May 1 2001 - January 31 2002

Table OU 9 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
10	2002	Management of the Zone 7 Golf Course was transferred from OU 11 to OU 9	The OU 9 RI report is planned for 2004.	FYR Site List
SS108	**800/900 WAREHOUSE AREA**			
12	1993	Basewide Underground Storage Tank (UST) Program (Building 914)	Free product detected at 30 ft bgs near Building 914 and is being investigated as part of the basewide UST Program. Draft Final Subsurface Investigation Report for UST Sites 780 (ST77), 859 (ST84; EGTD) 914 (ST71; EHVC), and 1243 (ST57), December 1993	Proposed 1st Round Cone Penetration Testing Locations for the 800 / 900 Area, Operable Unit 11
	2001	Management of the 800/900 Warehouse Area was transferred from OU8 to OU11	In fall of 2001	OU11 Remedial Investigation/Feasibility Study, Operable Unit 11 Analytical Data Report, May 1 2001 - January 31 2002
02	2001	Site Inspection - South Area	SI performed near the 800/900 Warehouse Area	Proposed 1st Round Cone Penetration Testing Locations for the 800 / 900 Area, Operable Unit 11
12	2001	Remedial Investigation - OU 8	During the RI, chlorinated solvents were detected above their respective MCLs in the groundwater at 150-165 ft bgs at monitoring well U8-091. RI concluded that the contamination at U8-091 was not hydraulically connected with the OU8 plume.	Proposed 1st Round Cone Penetration Testing Locations for the 800 / 900 Area, Operable Unit 11

Table OU 9 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
01	2002	Basewide CPT Investigation	TCE detected above its MCL at 74 ft bgs (U9-BW-639) and at 91 ft bgs (U9-BW-644). Free product detected near Building 914 is being investigated as part of the basewide UST Program.	Proposed 1st Round Cone Penetration Testing Locations for the 800 / 900 Area, Operable Unit 11
10	2002	Management of the 800/900 Warehouse Area was transferred from OU 11 to OU 9	Additional investigation planned under OU 9. The OU 9 RI report is planned for 2004.	FYR Site List

XIII Five-Year Review of Sites in OU 9

Operable unit review results are summaries of findings for all of the sites in each operable unit. The following site summaries present a detailed review of each IRP site. Therefore, much of the information presented in the Site Summaries is a duplicate of what was presented in the OU Summary.

The reader is encouraged to use the Site Summary to obtain details on specific contaminants of concern and the technical assessment for each site.

OU 9 SD023 POND 3

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

Pond 3 is a storm water retention pond under remedial investigation for soil contamination. This site is a former NFRAP site under the OU 3 ROD, but has been reopened for additional investigation under OU 9. The need for remedial action has not been determined. This site is included in the 2003 Five-Year Review for completeness to document the site background and the status of the remedial investigation.

II. Site Chronology

See Table OU 9-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

Pond 3 is located in the southern portion of the Base, and has been used as a storm water retention pond since 1957. Pond 3 is also designed as a wildlife habitat area. Surface water runoff from the southern end of the Base, including a portion of the industrial area and aviation ramp areas, is collected by a storm sewer system which discharges to Pond 3. Surface water runoff collected in Pond 1 also drains into Pond 3. Water in Pond 3 drains to the south and eventually discharges to Kay's Creek located southeast of the Base. Pond 3 was investigated during the OU 3 Remedial Investigation in 1992, but no significant contamination was detected and the site was designated as a NFRAP site under the OU 3 ROD (HAFB EMR 1995). However, as a result of the detection of contamination around the inlet to Pond 1, additional investigation of Pond 3 inlet was initiated voluntarily by EMR in 1999. Further soil investigation is being performed at Pond 3 as part of the ongoing OU 9 RI/FS effort. The estimated completion date for the OU 9 RI is April 2004 and the estimated completion date for the OU 9 ROD is June 2005.

The National Pollutant Discharge Elimination System (NPDES) permit currently does not require discharge sampling at Pond 3. The groundwater under Pond 3 was investigated as part of OU 3 and no evidence of groundwater contamination was found, so monitoring is not warranted.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
NA	NA - Remedial Investigation and Risk Assessment have not been completed; therefore, no CoCs are defined to date.	NA

Remedial Action Objectives

* Not applicable. No COCs or RAOs for this site.

IV. Remedial Actions

The need for remedial action has not been determined. The site is under remedial investigation.

V. Progress Since Last Review

Pond 3 was designated as a NFRAP site at the time of the 1998 Five-Year Review (HAFB EMR 1998a). Since then, the site has been reopened for further investigation and is part of the ongoing OU 9 RI/FS effort. In 1999, a detailed topographical survey was performed, which included aerial survey and pond depth measurements. Pond sediment was sampled in 2000 to characterize the horizontal and vertical extent of potential soil contamination. Evaluation of the data has not been published, but findings will be summarized in the OU 9

RI report scheduled in 2004.

VI. FYR Process Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer) Not Applicable

Question A (Comment) The need for remedial action has not been determined. The site is under remedial investigation.

Question B (Answer) Not Applicable

Question B (Comment) The need for remedial action has not been determined. The site is under remedial investigation.

Question C (Answer) Not Applicable

Question C (Comment) The need for remedial action has not been determined. The site is under remedial investigation.

VIII. Issues Extent of soil contamination has not been defined.

IX. Recommendations

* Continue remedial investigation to identify the extent of the soil contamination at Pond 3.
* Continue institutional controls to limit human exposure to potential contamination.

X. Protectiveness Not Applicable

Protectiveness Statement SD023 is under remedial investigation and the need for remedial action has not been determined. However, institutional controls have been implemented to prevent human exposure to potential contamination. The site is included in the Continuing Order AFI 32-7020 (HAFB 1998) and shown on the Restricted Use Access Map (updated 2/13/2003) to restrict the disturbance of soil and groundwater. In addition, the Utah Division of Water Rights also restricts water well drilling and use of shallow groundwater in this area. A sign has been posted to restrict swimming in the pond.

XI. Next Required FYR 2008

OU 9 SD034 POND 1

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

Pond 1 is used as a storm water overflow storage pond, and the water in Pond 1 is drained to Pond 3 as soon as possible after a storm. Soil contamination includes fuel-related hydrocarbons, metals, polyaromatic hydrocarbons (PAHs), and PCBs. The selected remedy, a soil cover of the contaminated sediment, is scheduled for construction in May 2003.

II. Site Chronology

See Table OU 9-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

Pond 1 is located along the southern boundary of Hill AFB, east of the South Gate and southeast of Berman Pond. From 1940 to 1956, Pond 1 received overflow from Berman Pond, which operated as an evaporation pond and received storm water runoff and industrial wastewater containing spent solvents, metals, and hydrocarbons from shop operations and spills in the industrial area. The storm drain system operated as the industrial sewer until the construction of the IWTP in 1956 when the drain system was routed directly to Pond 1. During storm events, storm water from the industrial area and the flight line flows into Pond 1. After the storm event, the water is released via an underground storm drain to Pond 3. The water from Pond 3 is released to the city of Layton storm drain system, which discharges into Kays Creek, and eventually flows into the Great Salt Lake. The NPDES permit currently does not require discharge sampling at Pond 1.

A series of investigations at Pond 1 were carried out from the early 1990s to 2001. Pond 1 surface water and sediments were sampled in the early 1990s as part of the OU 3 remedial investigation. Results of the OU 3 RI indicated that contamination was not above risk - based levels, and the Final Record of Decision for Operable Unit 3 did not require any remedial activities at Pond 1(HAFB EMR 1995). Discovery of a large volume of contaminated sediments from the industrial complex storm drain system resulted in additional investigation at Pond 1 between 1997 and 2001. Four areas of soil contamination, with levels above residential risk-based screening levels, were identified. The contamination found in the Pond 1 sediments may have been deposited during the 1940s through the early 1960s when the storm drain system was used as the industrial sewer. The principal contaminants in sediments at Pond 1 are fuel-related hydrocarbons, metals, PAHs, and PCBs. The majority of the highly contaminated locations are concentrated near the northwest inlet of the pond, where the influent enters Pond 1.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
SOIL	1,4-DICHLOROBENZENE	10483.22 ppm
SOIL	ARSENIC	9.76 ppm
SOIL	BENZO(a)ANTHRACENE	877.16 ppm
SOIL	BENZO(a)PYRENE	87.72 ppm
SOIL	BENZO(g,h,i)PERYLENE	877.17 ppm

SOIL	BENZO(k)FLUORANTHENE	8770.21 ppm
SOIL	BENZOFLUORANTHENE ISOMER	877.09 ppm
SOIL	BERYLLIUM	0.67 ppm
SOIL	bis(2-ETHYLHEXYL) PHTHALATE	45644.57 ppm
SOIL	CADMIUM	3.58 ppm
SOIL	CHROMIUM, HEXAVALENT	504.61 ppm
SOIL	DIBENZ (a,b) ANTHRACENE	87.72 ppm
SOIL	INDENO(1,2,3-c,d)PYRENE	877.17 ppm
SOIL	LEAD	400 ppm
SOIL	MERCURY	0.65 ppm
SOIL	PCB-1248 (AROCHLOR 1248)	5436.63 ppm
SOIL	PHC as DIESEL FUEL	344.86 ppm

Remedial Action Objectives

* Minimize the threat of human and environmental exposure to contaminated pond sediments.

IV. Remedial Actions

Pond sediment - Soil cover

The selected remedy is described in the EE/CA for Pond 1 (CH2M 2002a). Four areas of Pond 1 have been identified to contain sediment with contaminant levels exceeding residential risk-based screening levels. Contaminated sediment at the two eastern areas will be excavated and distributed over the contaminated sediment located at the two western areas. An 8-ft soil cover will be constructed at the western portion of the pond, over all the contaminated pond sediment that will be stockpiled there. Construction of the soil cover would decrease the pond capacity. To maintain pond capacity, the south area of the pond will be excavated to expand the pond. The excavated soil from the pond expansion will be used as the fill material for the soil cover and as backfill for the excavated contaminated sediment. To limit storm water saturation of the soil cover, the pond will be graded to drain to a new outlet located at the southwest corner of the pond. Construction of the remedial action is scheduled to begin May 2003.

Institutional controls will be required to ensure the future integrity of the soil cover. Groundwater under Pond 1 is monitored as part of OU 8. The site is included in the Continuing Order (HAFB 1998) and shown on the Restricted Use Access Map (updated 2/13/2003) to restrict the disturbance of soil and groundwater. In addition, the Utah Division of Water Rights also restricts water well drilling and use of shallow groundwater in this area.

V. Progress Since Last Review

Pond 1 was not reviewed for 1998 Five-Year Review (HAFB EMR 1998a) because this site was designated as a NFRAP site at that time. Since the 1998 Five-Year Review, additional investigations have been performed at Pond 1 and a remedy has been selected. Soil sampling of pond sediments and surrounding areas was conducted in 1997, 1999, 2000, and 2001. A detailed topographical survey of Pond 1 was conducted in 1999. The EE/CA for Pond 1 was developed in 2002 to document the selected remedy.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer)

Yes

Question A (Comment)

After construction and implementation of the recommended institutional controls, the soil cover is expected to be protective of human health and the environment. The 8-ft soil cover will limit the exposure pathway for any future residential and industrial tenant on the facility. Since the contaminants will not be removed, the toxicity and volume of the contaminants will remain the same, but the soil cover will reduce the potential mobility of the contaminants.

Question B (Answer)

Yes

Question B (Comment)

Risk assessment analysis was performed in 2002 as part of the EE/CA for Pond 1 (CH2M 2002a). Exposure assumptions, toxicity data, cleanup levels, and remedial action objectives are still valid.

Question C (Answer)

No

Question C (Comment)

No information has surfaced that call into question the protectiveness of the remedy.

VIII. Issues

No issues have been identified during the review.

IX. Recommendations

* Construct soil cover as scheduled in May 2003.
* Implement institutional controls to ensure the future integrity of the soil cover.

X. Protectiveness

Will be protective once remedy is completed

Protectiveness Statement

The remedy associated with SD034 will be protective of human health and the environment once the soil cover is constructed and institutional controls are implemented.

XI. Next Required FYR	2008

OU 9 SS092 BUILDING 786

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

Building 786 was a pesticide / herbicide storage area and has been demolished. Sampling results indicate the site does not pose a threat to human health or the environment. Therefore, no remedial action is required (CH2M 2002b). This site is included in the 2003 Five-Year Review for completeness to document the site background.

II. Site Chronology

See Table OU 9-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

Building 786 was located along the eastern boundary of the Base near the north end of the runway. From 1984 to 1997, the building was used for pesticide / herbicide storage. In 1997, the building was demolished. The site is expected to remain available for industrial use in the foreseeable future. The proximity to the runway prohibits the potential for residential use as Base housing. Soil in the vicinity of Building 786 was investigated during three sampling events between 1996 and 2000. Pesticides were not detected at or above residential risk-based screening levels except for one sample collected in 1996. No further remedial action is required at this site (CH2M 2002b).

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
NA	NA - Risk Assessment indicates no risk to human health and the environment.	NA

Remedial Action Objectives

* Not applicable. No COCs or RAOs for this site.

IV. Remedial Actions

The data available to date indicate that the Building 786 site does not pose a threat to human health or the environment. No further response action was recommended and approved by EPA Region VIII for the Building 786 site (CH2M 2002b).

V. Progress Since Last Review

Since the 1998 Five-Year Review (HAFB EMR 1998), two additional soil sampling events were conducted in 2000. Pesticides and herbicides were not detected at or above residential risk-based screening levels (RBSLs) during those investigations.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer) Not Applicable

Question A (Comment) No remedy was required.

Question B (Answer)	Not Applicable
Question B (Comment)	No remedy was required.
Question C (Answer)	No
Question C (Comment)	No remedy was required.
VIII. Issues	No issues have been identified during the review.
IX. Recommendations	* No further action is required at this site. It will not require future Five-Year Reviews.
X. Protectiveness	Protective
Protectiveness Statement	SS092 was recommended for NFRAP status and accepted in 2002 because investigations indicate that this site does not pose a threat to human health and the environment (CH2M 2002b).
XI. Next Required FYR	None - Current FYR is Final

OU 9 OT106 DEFERRED AREAS

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

This site currently includes more than 160 facilities, located throughout Hill AFB, with deferred action. Deferred facilities are inventoried annually to determine when site characterization can be conducted. Once site characterization has been initiated, the facility will be removed from site OT106, and future management of the facility will depend on the result of the investigation. This site is included in the 2003 Five-Year Review for completeness to document the site background and the site management plan.

II. Site Chronology

See Table OU 9-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

The deferred sites include facilities and areas that pose low risk to human health based on existing land use and lack of an exposure route. Complete site characterization of these sites has been deferred because preliminary sampling results indicate contaminant concentrations were below the risk-based screening levels for the current land use or sampling cannot be performed without disturbing facility operations. Investigations at these sites are deferred until access can be gained for sampling or until land use changes from industrial to residential. The deferred sites are inventoried annually until they can be further characterized. Once a site characterization is completed, the site will be either be removed from the inventory list, if the concentrations of the detected contaminants are below the risk-based screening levels, or further investigated under a new site ID. The description and status of the deferred facilities are provided in a separate listing (see Table OU 9-4).

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
NA	NA - Remedial Investigation and Risk Assessment have not been completed; therefore, no CoCs are defined to date.	NA

Remedial Action Objectives

* Not applicable. No COCs or RAOs for this site.

IV. Remedial Actions

The need for remedial action has not been determined. Site characterization has been deferred.

V. Progress Since Last Review

This site was not reviewed for the 1998 Five-Year Review (HAFB EMR 1998a). In 2002, site investigation was initiated at 50 facilities and results will be published in 2003.

VI. FYR Process

Since action has been deferred for facilities included in this site, a list of deferred facilities has been included in the 2003 Five-Year Review Report in a separate table (see Table OU 9-4) for completeness.

VII. Technical Assessment

Question A (Answer) Not Applicable

Question A (Comment)	The need for remedial action has not been determined. Site characterization has been deferred.
Question B (Answer)	Not Applicable
Question B (Comment)	The need for remedial action has not been determined. Site characterization has been deferred.
Question C (Answer)	Not Applicable
Question C (Comment)	The need for remedial action has not been determined. Site characterization has been deferred.
VIII. Issues	No issues were identified during the review. Site characterization has been deferred.
IX. Recommendations	*Continue annual inventory of deferred facilities and update deferred facilities list when warranted. *Conduct site characterization when possible, then remove investigated facilities from deferred list as appropriate.
X. Protectiveness	Not Applicable
Protectiveness Statement	No action has occurred at facilities included in this site.
XI. Next Required FYR	2008

OU 9 SD040 POND 7 AREA

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

The Pond 7 Area is under remedial investigation for soil and groundwater contamination. The need for remedial action has not been determined. This site is included in the 2003 Five-Year Review for completeness to document the site background and the status of the remedial investigation.

II. Site Chronology

See Table OU 9-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

The Pond 7 investigation area is located on the western edge of the Base, south of the West Gate and the Defense Reutilization and Marketing Office (DRMO) area. The DRMO is a military salvage yard, which has been used for storage of unneeded government property and scrap metal. Hazardous materials and hazardous waste may have been stored in this area. Pond 7 was constructed in 1976 and receives surface runoff from the DRMO area and other on-Base areas surrounding the pond. Subsurface soil, sediment, surface water, and groundwater near Pond 7 were investigated as part of the Pond 7 PA/SI. Risk analysis indicated that Pond 7 did not pose significant risks to human health or the environment. A NFRAP was developed for Pond 7 in 1998 (HAFB EMR 1998b). Pond 7 was mistakenly identified as Pond 6 in this NFRAP decision document.

During the basewide CPT investigation, TCE concentration above MCL was detected downgradient of the Pond 7 Area. The site was reopened for further investigation. Current data indicate that groundwater contamination, composed primarily of TCE, extends off-Base into the city of Clearfield. There may be several sources of contamination, but they have not been defined. TCE contamination has been found about 1/4 mile north of the pond and may be associated with past storage and use of solvents in the vicinity of the DRMO storage yard. Pond 7 may have received contaminated surface water runoff, and contaminants may have leached through the pond sediment into the shallow groundwater.

Investigation at the Pond 7 Area is part of the ongoing RI/FS investigation at OU 9. The estimated completion date for the OU 9 RI is April 2004 and the estimated completion date for the OU 9 ROD is June 2005.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
NA	NA - Remedial Investigation and Risk Assessment have not been completed; therefore, no CoCs are defined to date.	NA

Remedial Action Objectives

* Not applicable. No COCs or RAOs for this site.

IV. Remedial Actions

The need for remedial action has not been determined. The site is under remedial investigation.

V. Progress Since Last Review

This site was not included in the last Five-Year Review (HAFB EMR 1998a).
A NFRAP was developed for Pond 7 in 1998 (HAFB EMR 1998b). The site was reopened for

investigation when elevated TCE contamination was detected in the groundwater downgradient of the site during the basewide cone penetration testing (CPT) investigation in 2000 (MW 2000). Additional investigations to evaluate the extent of groundwater contamination and to identify the source areas are part of the ongoing RI/FS effort at OU 9. Four monitoring wells and five piezometers were installed, and groundwater was sampled in 2000. Groundwater mapping, CPT investigation, groundwater sampling, and groundwater elevation measurements were conducted in 2002. Evaluation of the data has not been published, but findings will be included in the OU 9 RI report scheduled for 2004.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer)

Not Applicable

Question A (Comment)

The need for remedial action has not been determined. The site is under remedial investigation.

Question B (Answer)

Not Applicable

Question B (Comment)

The need for remedial action has not been determined. The site is under remedial investigation.

Question C (Answer)

Not Applicable

Question C (Comment)

The need for remedial action has not been determined. The site is under remedial investigation.

VIII. Issues

* Sources and extent of groundwater contamination have not been defined.
* Gate near 6th Avenue, located on the southwest side of Pond 7, was not locked.

IX. Recommendations

* Continue remedial investigation to identify the sources and extent of the groundwater contamination.
* Continue institutional controls to limit human exposure to potential contamination. Secure all gates around Pond 7 to restrict access to potential contamination in the pond.

X. Protectiveness

Not Applicable

Protectiveness Statement

SD040 is under remedial investigation and the need for remedial action has not been determined. However, institutional controls have been implemented to prevent human exposure to potential contamination. The site is included in the Continuing Order AFI 32-

7020 (HAFB 1998) and shown on the Restricted Use Access Map (updated 2/13/2003) to restrict the disturbance of soil and groundwater. A fence has also been installed around the pond to restrict access.

XI. Next Required FYR	2008

OU 9 SS089 1100 AREA

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

The 1100 Area is under remedial investigation for contaminated groundwater both on-Base and off-Base. The need for remedial action has not been determined. This site is included in the 2003 Five-Year Review for completeness to document the site background and the status of the remedial investigation.

II. Site Chronology

See Table OU 9-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

The 1100 Area is approximately 128 acres located in the western portion of the Base. Zone 11 includes the Base administration area, fire station (Building 1151), and several vehicle maintenance shops (Building 1133, 1135, 1140, and 1141). The groundwater contamination, composed primarily of TCE, extends off-Base into the city of Sunset. Contamination of the shallow groundwater is the result of improper handling of solvents and possibly of other petroleum products in this area. VOCs were detected in the shallow groundwater, but only TCE exceeded its MCL. No contaminants have been detected in the deep aquifer, possibly due to the thick silt and clay sedimentary units that could impede vertical migration of contaminants. There has been limited source area investigation and possible contaminants in soil include VOCs. Potential sources include the machine shops, vehicle maintenance garages, and utility shops.

Investigation at the 1100 Area is part of the ongoing RI/FS investigation at OU 9. The estimated completion date for the OU 9 RI is April 2004 and the estimated completion date for the OU 9 ROD is June 2005.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
NA	NA - Remedial Investigation and Risk Assessment have not been completed; therefore, no CoCs are defined to date.	NA

Remedial Action Objectives

* Not applicable. No COCs or RAOs for this site.

IV. Remedial Actions

The need for remedial action has not been determined. The site is under remedial investigation.

V. Progress Since Last Review

A preliminary conceptual site model of the 1100 Area was developed in 2000 based on data collected between Dec 1995 and April 2000. As part of the ongoing OU 9 remedial investigation, 11 monitoring wells were installed (U9-11-008 through U9-11-018) and groundwater sampling was performed in 2000. All wells are monitored semiannually. Additional investigation was conducted at on- and off-Base locations in 2002. Results of the investigations will be evaluated in the OU 9 RI report scheduled in 2004.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer)	Not Applicable
Question A (Comment)	The need for remedial action has not been determined. The site is under remedial investigation.
Question B (Answer)	Not Applicable
Question B (Comment)	The need for remedial action has not been determined. The site is under remedial investigation.
Question C (Answer)	Not Applicable
Question C (Comment)	The need for remedial action has not been determined. The site is under remedial investigation.

VIII. Issues Sources of groundwater contamination have not been defined.

IX. Recommendations

* Continue remedial investigation to further define the sources and extent of the groundwater contamination.
* Continue institutional controls to limit human exposure to potential contamination.

X. Protectiveness Not Applicable

Protectiveness Statement SS089 is under remedial investigation and the need for remedial action has not been determined. However, institutional controls have been implemented to prevent human exposure to potential contamination. The site is included in the Continuing Order AFI 32-7020 (HAFB 1998) and shown on the Restricted Use Access Map (updated 2/13/2003) to restrict the disturbance of soil and groundwater. In addition, the Utah Division of Water Rights also restricts water well drilling and use of shallow groundwater in this area.

XI. Next Required FYR 2008

OU 9 SS090 ZONE 7 GOLF COURSE

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

The Golf Course Area is under remedial investigation for groundwater contamination. The need for remedial action has not been determined. This site is included in the 2003 Five-Year Review for completeness to document the site background and the status of the remedial investigation.

II. Site Chronology

See Table OU 9-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

The Golf Course Area is located on the southeastern edge of the Base. Contamination at the Golf Course Area is believed to be the result of improper handling of solvents and other products used in the Golf Course maintenance shop, Building 710. During wash down of the maintenance-building floor, overflow water from a former catch basin located south of the maintenance flowed across the land surface and collected in a drainage ditch along the Base boundary fence line.

Several VOCs have been detected, but the levels were below the risk-based screening levels. (MW 2000). Contaminants have migrated to the shallow groundwater. TCE and PCE have been detected above their respective MCLs in the groundwater. Local mounding of the groundwater table, caused by the irrigation of the Golf Course and the adjacent alfalfa field, may have carried contaminants upgradient of the suspected source area. It is believed that contamination in the shallow aquifer is not migrating to the deep drinking water aquifer because a 100-ft thick clay layer separates them. The TCE groundwater plume is approximately 200 ft wide and 900 ft long and is located at depth ranging from 26 to 50 ft bgs.

Investigation at the Golf Course Area is part of the ongoing RI/FS investigation at OU9. The estimated completion date for the OU 9 RI is April 2004 and the estimated completion date for the OU 9 ROD is June 2005.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
NA	NA - Remedial Investigation and Risk Assessment have not been completed; therefore, no CoCs are defined to date.	NA

Remedial Action Objectives

* Not applicable. No COCs or RAOs for this site.

IV. Remedial Actions

The need for remedial action has not been determined. The site is under remedial investigation.

V. Progress Since Last Review

Investigation focused on the southeast portion of the course was conducted between 1998 and 2000 and a preliminary conceptual model for the site was developed in 2000. Additional investigation, focused on the south and southwestern portion of the plume, was conducted between 2001 and 2002 in order to further delineate the horizontal and vertical plume boundaries. Five new monitoring wells (U9-07-007 through U9-07-011) were installed in 2000. All wells are monitored semiannually. This site has been included with the OU 9 RI,

which is scheduled for completion in 2004.

VI. FYR Process Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer) Not Applicable

Question A (Comment) The need for remedial action has not been determined. The site is under remedial investigation.

Question B (Answer) Not Applicable

Question B (Comment) The need for remedial action has not been determined. The site is under remedial investigation.

Question C (Answer) Not Applicable

Question C (Comment) The need for remedial action has not been determined. The site is under remedial investigation.

VIII. Issues Sources and extent of groundwater contamination have not been defined.

IX. Recommendations

* Continue remedial investigation to identify the sources and extent of the groundwater contamination.
* Continue institutional controls to limit human exposure to potential contamination.

X. Protectiveness Not Applicable

Protectiveness Statement SS090 is under remedial investigation and the need for remedial action has not been determined. However, institutional controls have been implemented to prevent human exposure to potential contamination. The site is included in the Continuing Order AFI 32-7020 (HAFB 1998) and shown on the Restricted Use Access Map (updated 2/13/2003) to restrict the disturbance of soil and groundwater.

XI. Next Required FYR 2008

OU 9 SS108 800/900 WAREHOUSE AREA

Site Summary - Hill AFB 2003 Five Year Review

I. Introduction

The 800/900 Warehouse Area is under remedial investigation for groundwater contamination. The need for remedial action has not been determined. This site is included in the 2003 Five-Year Review for completeness to document the site background and the status of the remedial investigation.

II. Site Chronology

See Table OU 9-2 for a history of events at this site. The table is organized to first describe events which impacted the whole OU, followed by events impacting only specific IRP sites within the OU.

III. Background

Previous investigations at the 800/900 Warehouse Area indicate that the groundwater is contaminated mainly with chlorinated solvent and fuel-type compounds. Known sources of contamination include Site 914 UST and the industrial buildings located east and southeast of this site, and no other sources have been conclusively identified. The OU 8 RI concluded that the contamination at this site is not hydraulically connected to the OU 8 groundwater contamination plume. Investigation at the 800/900 Warehouse Area is part of the ongoing RI/FS investigation at OU9. The estimated completion date for the OU 9 RI is April 2004 and the estimated completion date for the OU 9 ROD is June 2005.

Contaminants of Concern

Media	Contaminant(s)	Cleanup Level Required
NA	NA - Remedial Investigation and Risk Assessment have not been completed; therefore, no CoCs are defined to date.	NA

Remedial Action Objectives

* Not applicable. No COCs or RAOs for this site.

IV. Remedial Actions

The need for remedial action has not been determined. The site is under remedial investigation.

V. Progress Since Last Review

The 800 / 900 Warehouse Area was not reviewed for the 1998 Five-Year Review Report. Previous investigations at this site include the South Area Site Inspection for OU 9 in 2001, Remedial Investigation for OU 8 in 2000, basewide Underground Storage Tank Program at Building 914 in1993, and basewide CPT Investigation in 2002. This site has been included with the OU 9 RI, which is scheduled for completion in 2004.

VI. FYR Process

Site review conducted per the process described in this report for the overall 2003 Five-Year review.

VII. Technical Assessment

Question A (Answer)

Not Applicable

Question A (Comment)

The need for remedial action has not been determined. The site is under remedial investigation.

Question B (Answer)	Not Applicable
Question B (Comment)	The need for remedial action has not been determined. The site is under remedial investigation.
Question C (Answer)	Not Applicable
Question C (Comment)	The need for remedial action has not been determined. The site is under remedial investigation.

VIII. Issues	Sources and extent of groundwater contamination have not been defined.
IX. Recommendations	* Continue remedial investigation to identify the sources and extent of the groundwater contamination. * Continue institutional controls to limit human exposure to potential contamination.
X. Protectiveness	Not Applicable
Protectiveness Statement	SS108 is under remedial investigation and the need for remedial action has not been determined. However, institutional controls have been implemented to prevent human exposure to potential contamination. The site is included in the Continuing Order AFI 32-7020 (HAFB 1998) and shown on the Restricted Use Access Map (updated 2/13/2003) to restrict the disturbance of soil and groundwater. In addition, the Utah Division of Water Rights also restricts water well drilling and use of shallow groundwater in this area.
XI. Next Required FYR	2008

Operable Unit 10

I Introduction

SS109, the 1200 Area, is the only site within OU 10. The 1200 Area is located on the western edge of the Base near the West Gate (see Figure OU 10-1) and is heavily developed with streets and office space. Even though the space is primarily an administrative area, there are several maintenance facilities and a heating plant. One or more of these facilities are possible sources of contamination.

The 1200 Area plume appears to extend off-Base toward the cities of Sunset and Clearfield, but the plume boundaries have not been fully delineated. An ongoing remedial investigation is scheduled for completion in December 2004, and because remedial action is anticipated, site SS109 has been included in this FYR. Remedial action objectives and remedies will be established upon completion of the OU 10 ROD scheduled for completion in December 2005.

Table OU 10-1 summarizes this Operable Unit.

Table OU 10-1. OU 10 Site Identification

Site ID	Site Name
SS109	1200 AREA

II Site Chronology

See Table OU 10-2 for a history of events in this OU. The table is organized to describe events that impacted the OU as a whole, followed by events impacting specific IRP sites within the OU.

III Background

The 1200 Area occupies approximately 146 acres along the western boundary of Hill AFB immediately north of the West Gate. The groundwater contamination, composed primarily of TCE, extends off-Base into the cities of Sunset and Clearfield. Contamination of the shallow groundwater is the result of improper handling of solvents and possibly of petroleum products in this area.

Previous investigations (CH2M 2002) have shown the groundwater in the 1200 Area is present in two aquifers. The upper groundwater aquifer is located at 30 ft bgs and the lower aquifer is located at about 90-100 ft bgs. VOCs were detected in the groundwater; and TCE and PCE exceeded the MCL. TCE has been detected in the upper groundwater aquifer at concentrations as high as 45 µg/L, but was found at four times that concentration (180 µg/L) in the deeper groundwater aquifer. PCE has been discovered at 38 ft bgs at a concentration of 200 µg/L, but was not found at levels above the MCLs in the deeper groundwater aquifer (MW 2000). Potential sources of the contamination include the machine shops, vehicle maintenance garages, and utility shops. The highest concentration of TCE was recorded west of Building 1285, the optical shop, but a source for the contamination has not been determined.

Development in the 1200 Area began in the early 1940s with the construction of combat equipment and inert-material warehouses for the Ogden Arsenal. In addition to the warehouses,

two maintenance shops (Buildings 1243 and 1253), an optical shop (Building 1285), and a boiler house, now known as the heating plant (Building 1286), were built. Limited information is available regarding specific materials that were stored in the combat and inert-material warehouses. Two 25,000 gallon underground storage tanks (UST) were installed in 1994 on the east side of Building 1286. The USTs store diesel fuel as a backup fuel supply for the plant and have a leak detection system.

An isolated pocket of contamination has also been found just west of the base boundary, to the northwest of the primary area of contamination (see Figure OU 10-1). Previous investigations have not determined if this area is connected to the 1200 Area of contamination. The RI, once completed, may determine the source of this contamination.

The 1200 Area was originally part of OU 9 until its redesignation to OU 10 in September 2000 in an effort to optimize investigation procedures and clearly define Operable Units with similar completion time frames. Area 1100 and the Defense Reutilization Marketing Office/Pond 7 Area were originally part of OU 10, but were placed back into OU 9 in late 2002 as the remedial investigation of the 1200 Area became more extensive.

Land use in the 1200 Area today is largely administrative, with several vehicle maintenance facilities and the heating plant. The land use in the cities of Sunset and Clearfield, where potential contamination has been tentatively delineated, is residential.

IV Remedial Actions

Remedial action has not been selected, however groundwater use restrictions are in place that encompass the extent of the currently delineated plume (HAFB 1998). The site in OU 10 is under remedial investigation.

V Progress Since Last Five-Year Review

Not Applicable. This site had no remedial actions in operation at the time of the last Five-Year Review. Remedial action objectives will be established in the ROD, which is planned for completion in December 2005.

VI Five-Year Review Process

Site review was conducted per the process described in this report for the overall 2003 FYR.

VII Technical Assessment

Question A. Is the remedy functioning as intended by the decision documents?
No remedy has been selected. OU 10 is under remedial investigation.

Question B. Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objective (RAOs) used at the time of the remedy still valid?
No changes in exposure assumptions, toxicity data, cleanup levels, or remedial action objectives have been identified. OU 10 is under remedial investigation.

Question C. Has any other information come to light that could call into question the protectiveness of the remedy?
No remedy has been selected. The site in OU 10 is under remedial investigation.

VIII Issues

1. Sources and extent of groundwater contamination have not been fully delineated.
2. Indoor air sampling has not been conducted in off-Base residential areas potentially impacted by the OU 10 plume.

IX Recommendations and Follow-up Actions for OU 10

1. Continue remedial investigation to identify the sources and extent of the groundwater contamination.
2. Evaluate the selected remedy for protectiveness of human health and the environment in the next FYR scheduled in 2008.
3. Conduct air sampling in off-Base residences to determine if the new action level for TCE (0.43 ppbv) in indoor air warrants mitigation measures in off-Base residential areas.

X Protectiveness Statement for OU 10

Not applicable. SS109, the 1200 Area, is still under remedial investigation and no remedy has been selected.

XI Next Review

SS109, the 1200 Area, will be reviewed during the next FYR in 2008.

XII References for Operable Unit 10 Summary

(CH2M 2002) OU10 Remedial Investigation/Feasibility Study Operable Unit 10 Analytical Data Report, May 1 2001 - January 31 2002, CH2M Hill, July 2002.

(HAFB 1998) OO-ALC-HAFB Supplement I, AFI 32-7020, 29 April 1998, Hill AFB, 29 April 1998.

(MW 2000) Final Data Summary Report and Preliminary Conceptual Model for Operable Unit 9 Investigation Areas, Montgomery Watson, October 2000.

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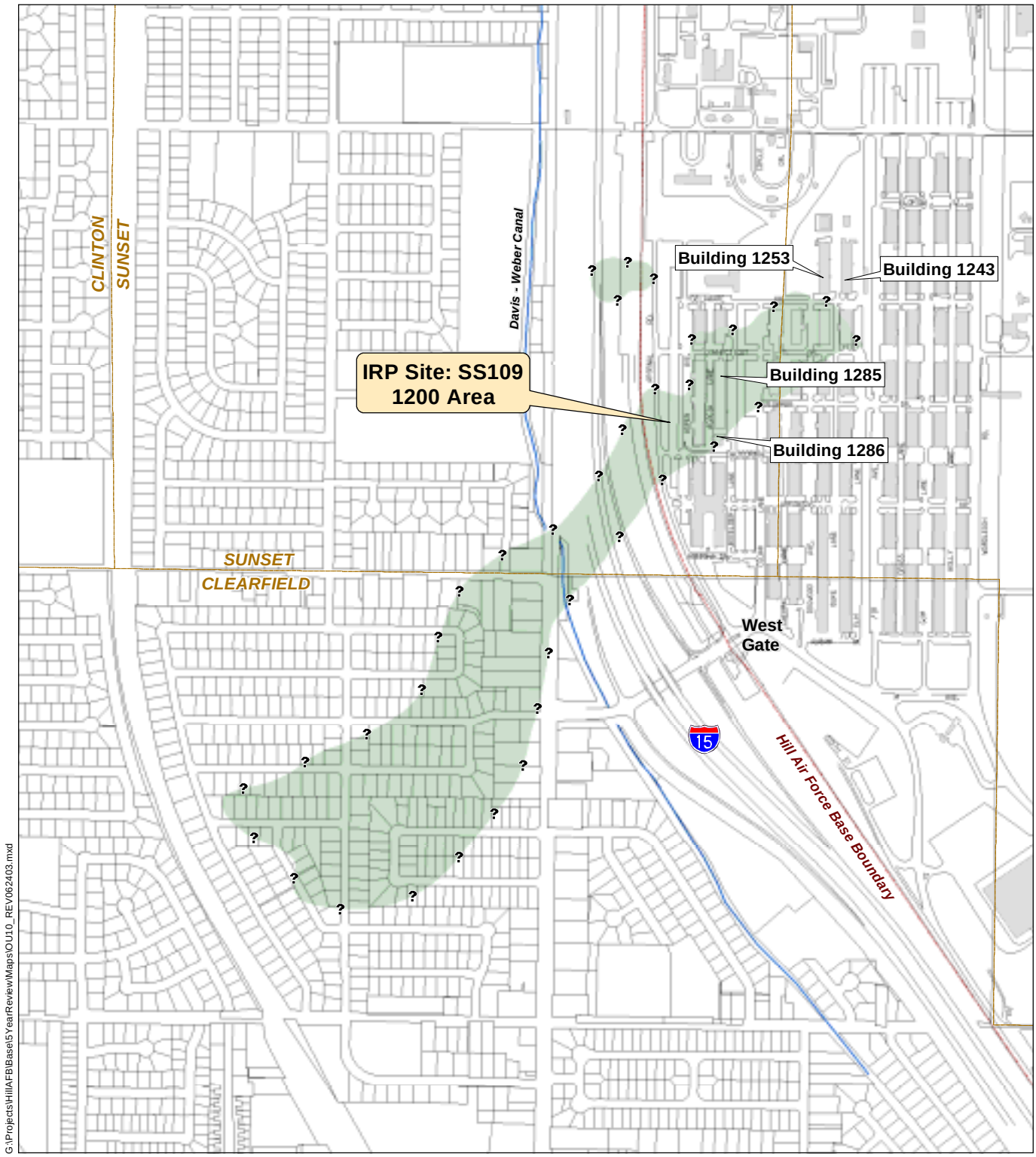


Surface Water

Estimated Area of TCE Contamination (as of Dec 2002)

N

200 0 200 400 Feet

FIGURE OU 10 -1:
Site Features for Operable Unit 10

Table OU 10 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
SS109	**1200 AREA BUILDINGS**			
	1995	Site Inspection	SI approach was designed to focus on the 311 facilities most likely to have released contaminants to the environment. The objective was to evaluate whether environmental contamination was present at each facility of potential concern, and to categorize each facility according to its threat to human health and the environment.	North Area Preliminary Assessment Report, June 1995, Final
12	1995	Site Inspection	Field data was collected between Dec 1995 and Mar 1998 for various OU 9 investigation sites.	Final Data Summary Report and Preliminary Conceptual Model for Operable Unit 9 Investigation Areas
09	2000	Site Inspection	Redesignation of groundwater contamination plumes identified during OU 9 investigations. SS109, the 1200 Area, redesignated as OU 10.	OU10 Remedial Investigation/Feasibility Study Operable Unit 10 Analytical Data Report, May 1 2001 - January 31 2002
05	2001	Remedial Investigation	Sampling being conducted in potentially contaminated area in the cities of Sunset and Clearfield.	OU 10 RI/FS, Operable Unit 10 Analytical Data Report, May 1, 2001 - January 31, 2002
02	2004	Scheduled Remedial Investigation	Final RI to be completed.	NA

Table OU 10 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	*YEAR*	*EVENT*	*COMMENTS*	*REFERENCE*
03	2005	Scheduled Feasibility Study	Final FS to be completed.	NA
12	2005	Scheduled Record of Decision	Final ROD to be completed.	NA

Operable Unit 11

I Introduction

OU 11 consists of one site, OT097 or former Building 454, which was the location of the Base Exchange Service Station and the Auto Care and Auto Parts Store at Hill AFB. There is currently no ROD in place for OU 11. Due to the previous activities at the site, namely gasoline pumping and car maintenance, three plumes, consisting of benzene, toluene, ethylbenzene, and xylenes (BTEX); TCE; and methyl tert-butyl ether (MTBE) are suspected and are being delineated in the remedial investigation (RI) at the site. Two UST sites are located in the vicinity of Building 454 and are not discussed in detail because UST sites are not a part of this CERCLA review process. The RI for site OT097 should be complete in late 2004. Because this site is being actively investigated, it has been included in this FYR.

Table OU 11-1. OU 11 Site Identification

Site ID	Site Name
OT097	Building 454

II Site Chronology

See Table OU 11-2 for a history of events in this OU. The table is organized to describe events that impacted the OU as a whole, followed by events impacting specific IRP sites within the OU.

III Background

Building 454, shown in Figure OU 11-1, was located at the corner of 6th Street and E Avenue on Hill AFB, approximately 150 feet southeast of the current Auto Pride gasoline station (Building 420) (MW 2001). The Building 454 facility included four maintenance bays inside the building. Each maintenance bay contained a mud and grease trap that collected waste liquids and delivered the waste to an oil/water separator.

Between 1957 and 1980, two fuel tanks (a 6,000-gallon “ethyl [sic]” tank and an 8,000-gallon regular tank) and a 500-gallon waste oil tank were located on the north side of the facility. The site was upgraded in 1963 and renovated in 1980 (MW 2000). The age of the tanks would suggest that other fuel types such as regular gasoline and diesel could have been stored at the site in the past (DM 1994).

In August 1995, the original USTs and associated piping were removed. Building 454 and the north pump island were demolished in the summer of 1999, and the new Base "Auto Pride" gasoline station (Building 420) was constructed (MW 2000).

The former underground storage tanks passed tightness tests performed in 1991, 1992, 1993, and 1994 suggesting that the tanks were structurally intact. Thus, the probable cause of contamination is believed to be spills and overfills (DM 1994, Smith, S. 2003). The range of contaminants is suggestive of impact from former diesel and gasoline tanks, the oil-water separator, and solvents that may have been released during former Building 454 maintenance activities. In addition, the presence of MTBE may suggest a more recent source for at least some of the gasoline-related contamination (MW 2000).

A possible release was detected on August 23 and 24, 1993, during environmental soil sampling near the operating tanks. Hydrocarbon odors were noted and organic vapors were recorded with a PID while collecting subsurface soil samples near the base of the tanks. Laboratory results from analysis of soil samples indicated petroleum hydrocarbons were present in soils. The release was reported to the Utah Division of Environmental Quality, Division of Environmental Response and Remediation (UDEQ, DERR) verbally on October 1, 1993 by Dames and Moore, and written communication was submitted October 7, 1993 by EMR (DM 1994).

During the demolition of Building 454, a tractor-trailer loaded with regular gasoline pulled into the site parking lot and brushed a tree, pulling off a valve cover that resulted in a release of unleaded fuel. In a spill report filed shortly thereafter, it was estimated that 5 gallons were released into the storm drain. The remaining surface fuel was picked up and overpacked (HAFB EMR 2000).

Previous investigations (DM 1994; CH2M 2001a; CH2M 2001b) identified soil and groundwater contamination at the site. Trace concentrations of solvents were detected in addition to hydrocarbons in groundwater, while only hydrocarbons were detected in soil. In light of this, the decision was made to divide the site in an effort to address these separate issues. After meeting with both leaking underground storage tank (LUST) and CERCLA regulatory personnel, the decision was made that free-product and soil (vadose zone) contamination would be addressed under the LUST section of UDEQ, DERR while the groundwater contamination would be addressed under CERCLA (CH2M 2002).

Land use in the immediate vicinity of former Building 454 is industrial. No residential areas share a common property boundary with the site. Surrounding land use in the area around Hill AFB is varied and includes uses as diverse as agriculture and heavy industry (CH2M 2001b).

There are no culinary or municipal water rights within the vicinity of the plume. Water rights restrictions are in place for potentially affected groundwater associated with the site (Hill 1998).

IV Remedial Actions

No remedial actions are established at this time.

V Progress Since Last Five-Year Review

The last Five-Year Review of Building 454 was in September 1998 under OU 9 (HAFB EMR 1998), which yielded no suggestions or recommendations. At the time of the 1998 review, investigation was underway to determine if additional contaminants (other than petroleum) were present.

Numerous investigational activities have either commenced or been completed. TCE was identified as a contaminant at the site as well as MTBE and BTEX. Therefore, the source of the TCE, MTBE, and BTEX and their dissolved-phase plumes are being delineated through the use of CPT and Hydropunch technologies as well as monitoring well installation. Due to the elevated level of contamination, relative to other OU 9 sites, the OT097 site (or Building 454) has been redesignated as OU 11. A draft RI report is expected late in 2004 with an FS to follow.

VI Five-Year Review Process

Site review was conducted per the process described in this report for the overall 2003 FYR.

VII Technical Assessment

Question A. Is the remedy functioning as intended by the decision documents?
Not applicable. There is no remedy at this site.

Question B. Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objective (RAOs) used at the time of the remedy still valid?
Not applicable. There is no remedy at this site. A draft RI report is scheduled for submission in late 2004.

Question C. Has any other information come to light that could call into question the protectiveness of the remedy?
Not applicable. No remedy is in place at this time.

VIII Issues

Definition of the volume and extent of the BTEX, TCE, and MTBE dissolved-phase plumes is not yet completed at the OU11 site.

IX Recommendations and Follow-up Actions for OU 11

1. Perform a comprehensive groundwater characterization for contaminants of concern in the groundwater. Compile characterization information in the RI report and generate FS.

2. Select and implement a remedy, if required, in accordance with CERCLA criteria.

X Protectiveness Statement for OU 11

Not applicable. Protectiveness cannot be determined or evaluated until the remedial investigation is complete and a remedy, if required, is selected and implemented. Additional investigational work is underway to define the extent of the BTEX, TCE, and MTBE dissolved phase plumes. A Draft RI report will be submitted late in 2004 with an FS to follow.

XI Next Review

The next FYR for OU 11 is required by 2008.

XII References for Operable Unit 11

(CH2M 2001a) Final South Area Of Operable Unit 9 Site Inspection, Final Comprehensive Data Evaluation, Volume 1, CH2M Hill, February 2001.

(CH2M 2001b) Subsurface Investigation Report for Underground Storage Tank Site 454, CH2M Hill, February 2001.

(CH2M 2002) OU11 Remedial Investigation/Feasibility Study, Operable Unit 11 Analytical Data Report, May 1 2001 - January 31 2002, CH2M Hill, November 2002.

(DM 1994) Final Draft Abatement and Initial Site Characterization Report Building 454, Site EIHG, Dames and Moore, October 1994.

(HAFB 1998) OO-ALC-HAFB Supplement I, AFI 32-7020, 29 April 1998, Hill AFB, 29 April 1998.

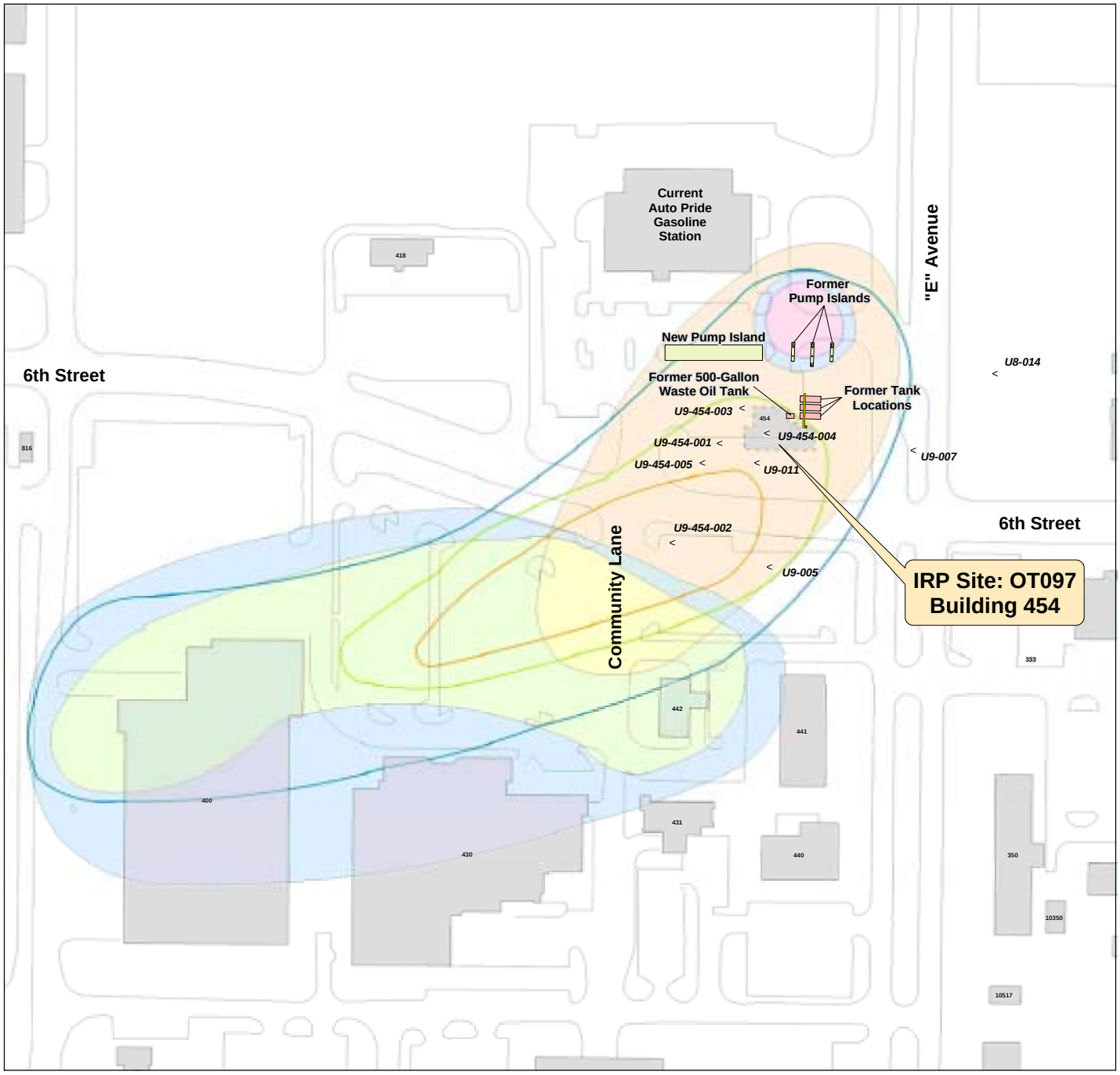
(HAFB EMR 1998) CERCLA 1998 Five-Year Review Hill Air Force Base, Utah, Hill AFB EMR, September 1998.

(HAFB EMR 2000) Comprehensive Event Report, Hill AFB, November 2000.

(MW 2000) Building 454 Investigation Tech Memo Operable Unit 9 Final, Montgomery Watson, November 2000.

(MW 2001) Final Analytical Data Report (ADR) For Operable Unit 9 Investigation Areas 1 May Through 10 October 2000, Montgomery Watson, February 2001.

(Smith, S. 2003) Smith, S., Project Engineer, Hill AFB, EMR, Personal Communication, 19 February 2003.



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< Monitoring Well

Benzene Isoconcentrations

- 5-1000 σg/L
- 1,000-10,000 σg/L
- >10,000 σg/L

TCE Isoconcentrations

- 5-10 σg/L
- 10-100 σg/L

MTBE Isoconcentrations

- 10-1000 σg/L
- 1,000-10,000 σg/L
- >10,000 σg/L

Operable Unit 11 Analytical Data Report May 1, 2001 - January 31, 2002 and additional Remedial Investigation data collected through October 2002.

0

50 0 50 100

Feet

FIGURE OU 11 -1:
Site Features for Operable Unit 11

Table OU 11 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
OU 11	**OPERABLE UNIT 11**			
09	2000	Zone 7 - Golf Course Area (Site SS090) and Former Building 454 (IRP site OT097) were redefined as OU 11 instead of OU 9	The re-designation was a result of efforts to optimize investigation procedures and more clearly define operable units with similar completion time frames.	Final Analytical Data Report (ADR) For Operable Unit 9 Investigation Areas 1 May Through 10 October 2000
	2002	OU 11 Realignment	At one point, the golf course, 800&900 warehouse buildings, and Building 454 were all a part of OU 11. After further delineation of the contamination, the golf course and the 800&900 warehouse buildings were placed back into OU 9 because they had low levels of TCE contamination and will likely have similar remedies. The contaminants, contaminant levels, and potential remedies for Building 454 are different and more complex than the other two sites, so it remained in OU 11. A letter was sent to the regulators on 30 September 2002 proposing this realignment between OUs 11 and 9. Verbal concurrence was received from the regulators in a subsequent meeting.	Personal Communication with Sheri Rolfsness, OU 11 Project Engineer (EMR), on 12/31/02
OT097	**GAS STATION (454)**			
	1957	Use of Building 454 area between 1957 and 1999	Building 454 was located in the South Area of Hill AFB, UT and served as the Base Exchange Service Station, Auto Care, and Auto Parts facility between 1957 and 1999.	Final Draft Abatement and Initial Site Characterization Report Building 454, Site EIHG
	1963	Building 454 upgraded in 1963	The station was upgraded around 1963 to add two maintenance bays on the west end of the building and to construct an additional pump island on the east end of the building.	Building 454 Investigation Tech Memo Operable Unit 9 Final

Table OU 11 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
	1980	Site renovated	The site was renovated in 1980 by relocating all three pump islands to the north of the building. At this time, the station had three fuel storage tanks just north of the east end of the building. The tanks consisted of an 8,000-gallon "regular" gasoline UST, a 6,000-gallon "premium" gasoline UST, an 8,000-gallon "no-lead" gasoline UST, and a 500-gallon waste oil UST.	Building 454 Investigation Tech Memo Operable Unit 9 Final
	1993	Preliminary Subsurface Investigation	In 1993, Hill AFB initiated a preliminary subsurface investigation at several of the UST locations to evaluate the potential for petroleum contamination in soils as a result of leaks, spills, and overfills (Dames and Moore, 1994).	Final Draft Abatement and Initial Site Characterization Report Building 454, Site EIHG
08	1993	Possible Release	A possible release was detected on August 23 and 24, 1993, during environmental soil sampling near the operating tanks. Hydrocarbon odors were noted and organic vapors were recorded with a PID while collecting subsurface soil samples near the base of the tanks. Laboratory results from analysis of soil samples indicated petroleum hydrocarbons were present in soils. The release was reported to the DERR verbally on October 1, 1993 by Lori Robison of Dames and Moore. A written communication was submitted October 7, 1993 by Kevin Bourne of EMR.	Final Draft Abatement and Initial Site Characterization Report Building 454, Site EIHG
	1995	Another potential 25,000 gallon UST was identified in the South Area Preliminary Assessment Report	However, no evidence of this site was found during the South Area OU 9 Site Inspection site visit, no further action was recommended.	Work Plan for South Area of Operable Unit 9 Site Inspection Volume 1: Report and Appendices A-D
08	1995	Original USTs and associated piping removed	In August 1995, the original USTs and associated piping were removed and (1) 12,000-gallon and (2) 10,000-gallon fuel tanks were installed, replacing the previous tanks.	Building 454 Investigation Tech Memo Operable Unit 9 Final

Table OU 11 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
12	1995	Horizontal SVE	The USTs were removed in 1995 and five soil vapor probes and one horizontal soil vapor extraction wells were installed in the tank basin under the UST program (DM, 1996). The horizontal SVE well was installed to a depth of 10.5 feet bgs and was located 43 feet north from (perpendicular to) the north side of the building. The SVE system was in operation from December 1995 until February 1998. The LUST site (EIHG) was closed with no further action required.	Draft Subsurface Investigation Report and Corrective Action Plan for Building 454, LUST Site EIHG
	1999	Demolition	Building 454 and the north pump island were demolished in 1999, and the new Base "Auto Pride" gasoline station (Building 420) was constructed with new pump islands south of the new building.	Building 454 Investigation Tech Memo Operable Unit 9 Final
02	1999	Gasoline Spill	During demolition of Building 454 in February 1999, a tractor-trailer loaded with regular gasoline pulled into the site parking lot and brushed a tree, pulling off a valve cover that resulted in a release of unleaded fuel. In a spill report filed shortly thereafter, it was estimated that 5 gallons were released into the storm drain. Remaining surface fuel was picked up and overpacked.	Comprehensive Event Report
08	2000	Another UST added to the Auto Pride gas station	In August, 2000, a fourth 10,000-gallon tank was installed due to fuel demand at the station.	Building 454 Investigation Tech Memo Operable Unit 9 Final

Operable Unit 12

I Introduction

OU 12 consists of one site, SS107, which encompasses what is believed to be one of the source areas for the associated TCE contaminated groundwater plume. This plume was discovered in 2000 during remedial investigation activities for OU 5 and is being delineated in the RI for OU 12. A draft of the RI should be complete in the summer of 2003. There is no ROD in place for OU 12. Currently there is a Hydraulic Containment Treatability Study System in the final stages of construction on Base at the Base boundary. Therefore, OU 12 and site SS107 have been included in this FYR. Table OU 12-1, shown below, summarizes this Operable Unit.

Table OU 12-1. OU 12 Site Identification

Site ID	Site Name
SS107	ASPEN AVE. DISPOSAL AREA

II Site Chronology

See Table OU 12-2 for a history of events in this OU. The table is organized to describe events that impacted the OU as a whole, followed by events impacting specific IRP sites within the OU.

III Background

Operable Unit 12 is located in the northwest region of Hill AFB and is comprised of contaminated groundwater beneath the area northwest of the former Wastewater Treatment Plant and west of the MAMS-2 area, and off-Base areas beneath the city of Roy (see Figure OU 12-1). The OU 12 plume begins on-Base in the area northwest of the former WWTP and continues north and northwest beneath the Davis-Weber Canal, Interstate Highway 15, Union Pacific Railroad, 2700 West, and apparently terminates west of the Denver and Rio Grande Railroad. The depth to groundwater at OU 12 varies from approximately 3 feet bgs in the vicinity of 2700 West off-Base in Roy to approximately 110 feet bgs on-Base in the vicinity west of the MAMS-II area and north of the former WWTP.

The exact on-Base origin of the OU 12 contaminant plume is not known at this time. When the plume was first discovered, it was thought that the possible source was the former WWTP (MWH 2002). However, a soil-gas survey, Cone Penetration Testing (CPT), and direct push groundwater sampling indicate that the source is located north of the former WWTP (MWH 2002). This northern area is characterized by debris, half-buried drums, abandoned foundations, and several trench-like features. Additionally, ash beds with vitrified material (suggesting possible rocket testing or propellant burning) were identified north and west of the former WWTP. Finally, increasing and/or highly variable TCE concentrations in the OU 12 source area, and particularly in MW U9-16-011, indicate a continuing source.

Currently, a Hydraulic Containment Treatability Study System is being constructed on-Base to prevent highly contaminated groundwater from crossing the Base boundary.

IV Remedial Actions

No remedial actions are currently in place at OU 12. A Base Boundary Hydraulic Containment Treatability Study System is in the final stages of construction as of March 2003. This is a pump and dispose system. Its goal is to contain contaminated groundwater within the area defined by the 100 µg/L TCE contour at the Base boundary. Remedial measures to protect human health will be addressed after completion of the RI/FS and ROD and are scheduled to be in place by 2007 (Loucks, M. 2003). Groundwater use restrictions are in place that encompass the containment plume (HAFB 1998).

V Progress Since Last Five-Year Review

This site had not been established as an IRP site at the time of the last Five-Year Review.

VI Five-Year Review Process

Site review was conducted per the process described in this report for the overall 2003 FYR.

VII Technical Assessment

Question A. Is the remedy functioning as intended by the decision documents?
To be determined. The system is currently under construction.

Question B. Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objective (RAOs) used at the time of the remedy still valid?
Not applicable. The system under construction is a Treatability Study and the RI/FS and ROD for this site are not complete, so there are no formal RAOs for the site. The goal of this system is not to achieve reduction of TCE concentrations down to the MCL, but to contain contaminated groundwater within the area defined by the 100 µg/L TCE contour at the Base Boundary.

Question C. Has any other information come to light that could call into question the protectiveness of the remedy?
Not applicable. There is no remedy functioning at this site. There is a treatability study currently under construction.

VIII Issues

Based on the information reviewed and interviews and inspections conducted, issues that may affect protectiveness at OU 12 are listed below:

1. It appears that the source of contamination in OU 12 has not yet been fully delineated.

2. The depth to groundwater is very shallow in some areas of the contaminant plume and samples from the basements of 8 houses off-Base have demonstrated indoor air contamination from the TCE present in the shallow aquifer beneath them. This contamination has been addressed in seven of the houses by installing air exchange units in the basements, but there is apparently one that has not yet allowed access to mitigate the

situation. There is potential for indoor air quality to become a problem in other homes above very shallow portions of the plume.

3. There is one location off-Base (see Figure OU 12-1) where it is suspected that groundwater surfaces within the confines of the OU 12 plume. This is a depressed area that encompasses residential properties (these properties have an underdrain system). The area is dry some times of the year and wet other times of the year. However, CPT in this area has shown that groundwater is located virtually at the ground surface (Mills, D. 2003). According to Dave Mills, this water has been sampled in the past and no contamination was detected.

IX Recommendations and Follow-up Actions for OU 12

The recommendations and follow-up actions for OU 5 are:

1. Delineate and remove the source area.
2. Continue with installation of the Base Boundary Hydraulic Containment Treatability Study System, as it should allow for continuing work to remove and investigate the source area without concern of contaminant migration off-Base.
3. Consider the possibility of an early action to address the area of the plume off-Base where basements are being affected.
4. Determine areas of potential risk for indoor air contamination and develop a sampling plan to catch and address any contamination early.
5. Institute a sampling plan for the location off-Base where groundwater surfaces to identify any contamination, if it exists, as early as possible.

X Protectiveness Statement for OU 12

The remedy at OU 12 is not protective. The current remedy is not intended to be protective of human health but is a treatability study meant to prevent highly contaminated groundwater from migrating off-Base. Remedial measures for the contaminated groundwater will be addressed after completion of the RI/FS and ROD and are scheduled to be in place by 2007. Although there are groundwater use restrictions in place that encompass the contaminant plume, there are areas within the plume and beneath residences, where groundwater is very shallow and indoor air quality is a concern. Hill AFB has installed vapor removal systems in several residences where TCE concentrations have been found to exceed human-health based screening values and will continue to address such cases as they are identified.

XI Next Review

The next FYR for OU 12 is required by 2008.

XII References for Operable Unit 12 Summary

(HAFB 1998) OO-ALC-HAFB Supplement I, AFI 32-7020, 29 April 1998, Hill AFB, 29 April 1998.

(Loucks, M. 2003) Loucks, M., Historical PM, Hill AFB EMR, Personal Communication, 11 February 2003.

(Mills, D. 2003) Mills, D., Project Manager, EMR, Personal Communication, 05 March 2003.

(MWH 2002) OU 12 Base Boundary Hydraulic Containment System Work Plan, Montgomery Watson Harza, June 2002.

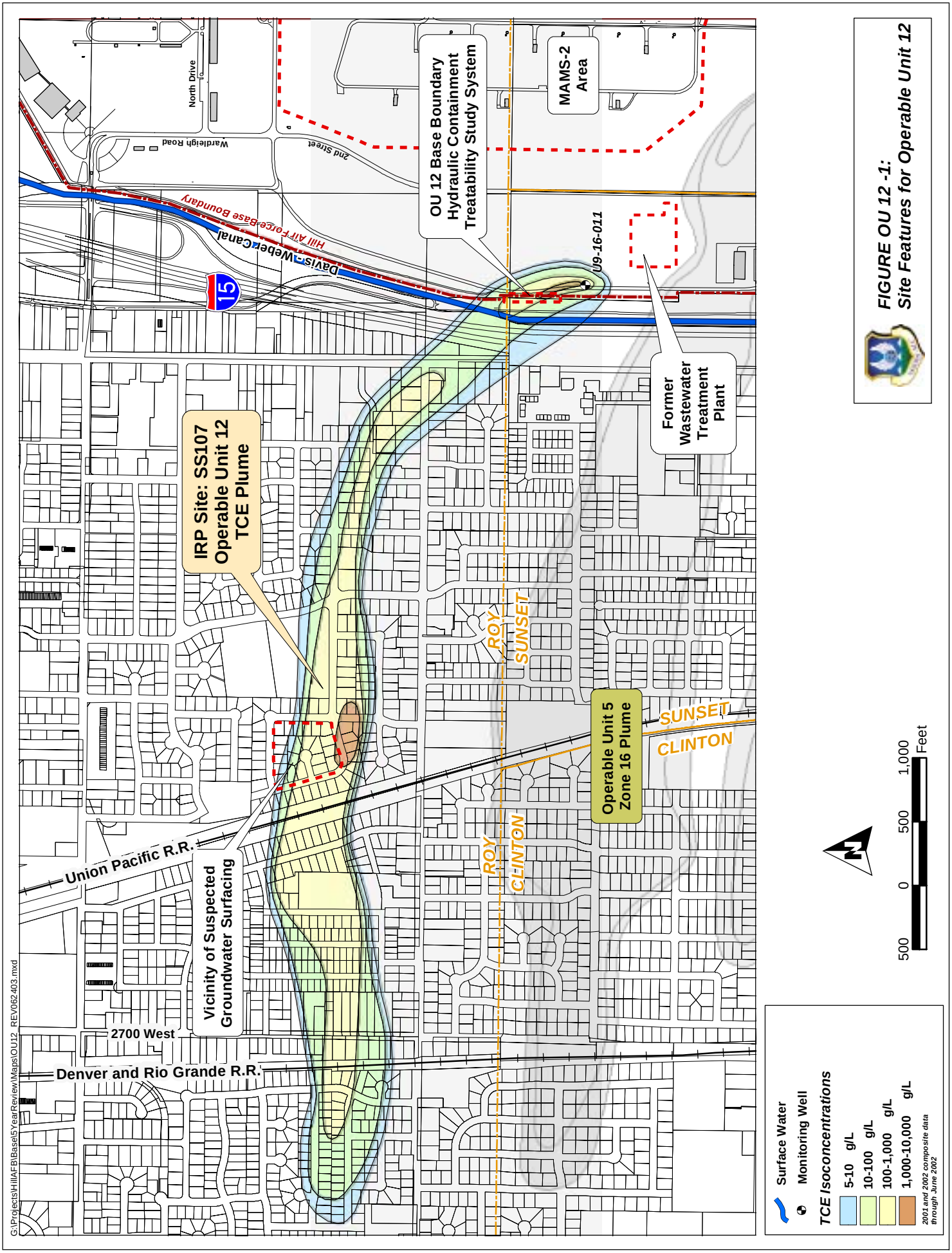
FIGURE OU 12 -1:
Site Features for Operable Unit 12
IRP Site: SS107
Operable Unit 12
TCE Plume
OU 12 Base Boundary
Hydraulic Containment
Treatability Study System
MAMS-2
Area
Former
Wastewater
Treatment
Plant
U9-16-011
Davis-Weber Canal
Hill Air Force Base Boundary
North Drive
Warleigh Road
2nd Street
15
ROY
SUNSET
CLINTON
Operable Unit 5
Zone 16 Plume
Union Pacific R.R.
Vicinity of Suspected
Groundwater Surfacing
2700 West
Denver and Rio Grande R.R.
Surface Water
Monitoring Well
TCE Isoconcentrations
5-10 g/L
10-100 g/L
100-1,000 g/L
1,000-10,000 g/L
2001 and 2002 composite data
through June 2002
500
0
500
1,000
Feet
G:\Projects\HillAFB\Base\5YearReview\Maps\OU12_REV062403.mxd

Table OU 12 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	YEAR	EVENT	COMMENTS	REFERENCE
OU 12	**OPERABLE UNIT 12**			
01	1999	OU 5 RI Investigation Reopened. Investigation includes OU 12.	Investigations performed throughout OU 9 between 1996 and 1998 identified the existence of a VOC GW plume (now known as the Zone 16 plume) in OU 5 substantially larger than that addressed in the 1995 OU 5 RI. This reopened investigation has lead to a separate OU 12 RI that is scheduled to be complete in draft form by mid-summer 2003.	Draft Conceptual Model for Operable Unit 5, May 2001
10	2001	The northern GW contamination plume within OU 5 is designated OU 12.	This plume was discovered in 2000 during additional environmental investigations for the re-opened OU 5 RI.	Final Operable Units 5 and 12 Historic Site and Source Area Review, March 2002
09	2002	Final Conceptual Model for Operable Units 5 and 12 completed	This document provides a conceptual model for the fate and transport of contaminants in groundwater at Operable Units 5 and 12. It interprets and presents the results of investigation tasks performed at OUs 5 & 12 by MWH and other contractors as part of the revised RI (not yet complete) including: Monitoring well installation, groundwater and surface water sampling, CPT and direct-push groundwater sampling, field drain sampling, aquifer testing, in-situ permeability testing, soil sampling, water-level monitoring, residential air and water sampling, historic site review, low-flow sampling study, active soil-gas survey, etc.	Final Conceptual Model for Operable Units 5 and 12
SS107	**ASPEN AVE. DISPOSAL AREA**			
06	2002	Final Operable Units 5 and 12 Active Soil-Gas Survey Source Area Investigation Report completed	Soil-gas investigation conducted to define source areas in OU 5 and 12. This investigation indicated that the source area for OU 12 was north of the former WWTP.	Final Operable Units 5 and 12 Active Soil-Gas Survey Source Area Investigation Report

Table OU 12 -2: Site Chronology - Hill AFB 2003 Five Year Review

MONTH	*YEAR*	*EVENT*	*COMMENTS*	*REFERENCE*
06	2002	OU 12 Base Boundary Hydraulic Containment System Work Plan delivered	This is the work plan for a treatability study on-Base at the Base boundary.	OU 12 Base Boundary Hydraulic Containment System Work Plan