Five-Year Review Report

Second Five-Year Review Report
for
Fort Richardson, Alaska

February 2008

Prepared by

United States Army Alaska
Directorate of Public Works
ATTN: APVR-RPW
730 Quartermaster Road #6500
Fort Richardson, Alaska 99505-6500

UNITED STATES ARMY
PROTECTIVENESS STATEMENT

Based on the Statutory Determinations set forth in the Records of Decision for Operable Units B, C, D, and E and the results of this Five-Year Review, the United States Army hereby finds that the remedies for all of the Fort Richardson NPL Site operable units are expected to be protective of human health and the environment upon completion, and in the interim, that exposure pathways that could result in unacceptable risk are being controlled.

Approved by:

David L. Shutt
Colonel, U.S. Army
Commanding

26 Feb 08
Date

REGULATORY AGENCY CONCURRENCES

Signature sheet for the Second Five-Year Review of Records of Decision,
Fort Richardson, Alaska

United States
Environmental Protection Agency
"...to protect human health and to safeguard the natural environment..."

EPA's concurrence with the findings of this five year review is based on the information presented in the accompanying *Five-Year review Report, First Five-Year Review Report for Fort Richardson, Alaska.*

2/22/08

Daniel D. Opalski, Director Date
Environmental Cleanup Office, Region 10
United States Environmental Protection Agency

REGULATORY AGENCY CONCURRENCES

Signature sheet for
the Second Five-Year Review of Records of Decision,
Fort Richardson, Alaska

Alaska Department of Environmental Conservation

ADEC's concurrence with the findings of this five year review is based on the information presented in the accompanying *Five-Year review Report, Second Five-Year Review Report for Fort Richardson, Alaska.*

Jennifer Roberts, Section Manager
ADEC Contaminated Sites

Feb 27 2008
Date

TABLE OF CONTENTS

PAGE NO.

LIST OF ACRONYMS

EXECUTIVE SUMMARY i

FIVE-YEAR REVIEW SUMMARY FORM ii

1.0 INTRODUCTION 1-1

1.1 PURPOSE 1-1
1.2 STATUTORY REVIEW 1-1
1.3 AGENCY OVERSIGHT AGREEMENTS 1-2
1.4 PUBLIC INVOLVEMENT 1-5

2.0 APPROACH 2-1

2.1 REPORT ORGANIZATION 2-1
2.2 FIVE-YEAR REVIEW TEAM 2-1
2.3 FIVE-YEAR REVIEW TASKS 2-1

3.0 FORT RICHARDSON NPL SITE BACKGROUND 3-1

3.1 POST HISTORY 3-1
3.2 CERCLA HISTORY 3-2
3.3 LAND AND RESOURCE USE 3-3
3.4 PHYSICAL CHARACTERISTICS 3-4
3.5 HISTORY OF CONTAMINATION 3-7
3.6 INSTITUTIONAL CONTROLS 3-7

4.0 OPERABLE UNIT A 4-1

5.0 OPERABLE UNIT B 5-1

5.1 OUB POLELINE ROAD DISPOSAL AREA BACKGROUND 5-1
5.2 REMEDY SELECTION 5-6
5.3 STATUS OF REMEDIATION 5-9
5.4 FIVE-YEAR ASSESSMENT 5-14

6.0 OPERABLE UNIT C 6-1

6.1 OUC EAGLE RIVER FLATS BACKGROUND 6-1
6.2 REMEDY SELECTION 6-5
6.3 STATUS OF REMEDIATION 6-8
6.4 FIVE-YEAR ASSESSMENT 6-16
6.5 OB/OD EVALUATION 6-18

TABLE OF CONTENTS

PAGE NO.

7.0 OPERABLE UNIT D 7-1

7.1 OUD SOURCE AREAS WITH NO FURTHER ACTION DECISIONS IN OUD ROD 7-2
7.2 OUD SOURCE AREAS REFERRED TO THE TWO-PARTY AGREEMENT 7-3
7.3 OUD SOURCE AREAS WITH NO FURTHER ACTION DECISIONS IN OUE ROD 7-3
7.4 OUD SOURCE AREAS SUBJECT TO RCRA CLOSURE REQUIREMENTS 7-3
7.5 OUD SOURCE AREAS TRANSFERRED TO OUE 7-4

8.0 OPERABLE UNIT E 8-1

8.1 ARMORED VEHICLE MAINTENANCE AREA (AVMA) 8-1
8.2 BUILDING 35-752 AREA 8-12

9.0 SITE-WIDE SUMMARY AND RECOMMENDATIONS 9-1

9.1 GENERAL 9-1
9.2 OPERABLE UNIT AND SOURCE AREA SPECIFIC 9-2

10.0 PROTECTIVENESS STATEMENTS 10-1

10.1 OUB – POLELINE ROAD DISPOSAL AREA 10-1
10.2 OUC – EAGLE RIVER FLATS 10-1
10.3 OUE – ARMORED VEHICLE MAINTENANCE AREA & BUILDING 35-752 10-1

11.0 NEXT REVIEW 11-1

12.0 REFERENCES 12-1

TABLES

Table 2-1 Fort Richardson Second Five-Year Review Resource Documents
Table 3-1 Current Disposition of Source Areas Identified at Fort Richardson Identified in the Original FFA
Table 5-1 History of Regulatory Events at the OUB
Table 5-2 Remedial Cleanup Goals for Groundwater
Table 5-3 Remedial Cleanup Goals for Soil
Table 6-1 History of Regulatory Events at the OUC ERF
Table 6-2 Estimated Mortality Data per Year
Table 6-3 Summary of Performance Related to RAOs at OUC ERF
Table 7-1 List of OUD Source Areas and Their Current Status
Table 8-1 History of Regulatory Events at the OUE AVMA
Table 8-2 Cleanup Levels for Chemicals of Concern at OUE AVMA
Table 9-1 Response to Recommendations from 2003 Five-Year Review
Table 9-2 Current Recommendations and Follow-Up Actions
Table 10-1 Protectiveness Statement Basis

FIGURES

Figure 1-1 Fort Richardson Vicinity Map
Figure 1-2 Site Location Map
Figure 3-1 Institutional Control Areas for Fort Richardson
Figure 5-1 Poleline Road Disposal Areas
Figure 5-2 Hot Spot Area Identified at Poleline from the ROD
Figure 5-3 Poleline Road Groundwater Monitoring Data for Shallow, Unconfined Aquifer
Figure 5-4 Poleline Road Groundwater Monitoring Data for Deep, Semi-Confined Aquifer
Figure 5-5 1,1,2,2 PCA Concentration vs Time
Figure 5-6 TCE Concentration vs Time
Figure 5-7 cis-1,2 DCE Concentration vs Time
Figure 6-1 OUC Site Location Map
Figure 6-2 Eagle River Flats Pond Groups
Figure 6-3 Eagle River Flats pond status at the end of the 1998 season and the signing of the ROD
Figure 6-4 Eagle River Flats pond status at the end of the 2002 season
Figure 6-5 Eagle River Flats pond status at the end of the 2007 season
Figure 7-1 OUD Source Area Location Map
Figure 8-1 AVMA Site Location Map
Figure 8-2 Conceptual Cross-Sectional Model at the AVMA Site
Figure 8-3 Extent of PCE Concentration in the Groundwater at time of ROD
Figure 8-4 AVMA Historic Sampling Results
Figure 8-5 Historical PCE Concentration Trends for Wells within the PCE Plume
Figure 8-6 Building 35-752 Sample Locations
Figure 8-7 Building 955 Sludge Bin Site Map
Figure 8-8 Building 796 Site Map

APPENDICES

Appendix A Two-Party Agreement Sites at Fort Richardson
Appendix B Site Inspection Checklist and Photographic Log
Appendix C Public Document Repository Memorandum
Appendix D Interview Forms and Responses
Appendix E Memorandum for Institutional Controls
Appendix F RCRA Closure Evaluation

LIST OF ACRONYMS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
ADC	Alaskan Defense Command
ADF	Alaska Defense Forces
ARARs	Applicable or Relevant and Appropriate Requirements
AS	Air sparging
AS/SVE	Air Sparging and Soil Vapor Extraction
AVMA	Armored Vehicle Maintenance Area
AWQS	Alaska Water Quality Standard
BGS	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene(s)
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
CRREL	Cold Regions Research and Engineering Laboratory
DCE	Dichloroethene
DERA	Defense Environmental Restoration Act
DNAPL	Dense Non-Aqueous Phase Liquid
DPW	Directorate of Public Works
DRO	Diesel Range (Petroleum Hydrocarbon) Organic Compounds
DSERTS	Defense Site Environmental Restoration Tracking System
DVS	Design Verification Study
EDB	1,2-Dibromoethane
EPA	Environmental Protection Agency
ERF	Eagle River Flats
HHRA	Human Health Risk Assessment
FES	Fairbanks Environmental Services
FFA	Federal Facility Agreement
FFCA	Federal Facility Compliance Agreement
FR	Federal Register
FS	Feasibility Study
FT	Feet

LIST OF ACRONYMS continued

GIS	Geographic Information System
HASP	Health And Safety Plan
HVE	High Vacuum Extraction
IAG	Interagency Agreement
IC	Institutional Control
IRP	Installation Restoration Program
IAP	Installation Action Plan
ITR	Independent Technical Review
LB	Pound
LTM	Long Term Monitoring
MCLs	Maximum Contaminant Levels
MCLG	Maximum Contaminant Level Goal
Mg/kg	Milligrams per Kilogram
Mg/l	Milligrams per Liter
MOA	Municipality of Anchorage
MSL	Mean Sea Level
NCP	National Oil And Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
NFA	No Further Action
O&M	Operation and Maintenance
OU	Operable Unit
PA	Preliminary Assessment
PAH	Polycyclic Aromatic Hydrocarbon
PA/SI	Preliminary Assessment/ Site Investigation
1,1,2,2-PCA	1,1,2,2-Tetrachloroethane
PCB	Polychlorinated Biphenyls
PCE	Tetrachloroethene
POL	Petroleum, Oil And Lubricant
PRG	Preliminary Remediation Goal
PSE	Preliminary Site Evaluation
PSE2	Expanded Preliminary Site Evaluation
RA	Remedial Action
RAB	Restoration Advisory Board

LIST OF ACRONYMS continued

RAO	Remedial Action Objective
RAR	Remedial Action Report
RBC	Risk Based Concentrations
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RD/RA	Remedial Design/Remedial Action
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
ROLF	Railcar Off-Loading Facility
RPM	Remedial Project Manager
SARA	Superfund Amendments and Reauthorization Act of 1986
SI	Site Investigation
SOP	Standard Operating Procedure
SPSH	Six-Phase Heating System
SVE	Soil Vapor Extraction
SVOC	Semi-volatile Organic Compound
TBC	To Be Considered (in addition to ARARs)
TCA	Trichloroethane
TCE	Trichloroethene
USARAK	United States Army Alaska
UST	Underground Storage Tank
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

The United States Army Alaska (USARAK) conducted the second Five-Year Review of the remedial actions at the Fort Richardson National Priorities List (NPL) site, Anchorage, Alaska, from November 2007 through February 2008. This report presents the results of that review.

The purpose of this review is to ensure that remedial actions selected in the Records of Decisions (RODs) for the Fort Richardson Operable Units (OUs) are being implemented and that they continue to be protective of human health and the environment. To achieve this purpose, this review evaluates the status of implementation of the selected remedies, identifies significant variances from the RODs, and makes recommendations for reconciling variances and/or for improving performance of remedial actions.

This statutory review is required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) since all of the RODs for this site were signed after the effective date of the Superfund Amendments and Reauthorization Act of 1986 (SARA) and some of the remedial actions result in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure.

The Fort Richardson NPL site is comprised of five OUs: OUA, OUB, OUC, OUD, and OUE. Records of Decision (RODs) have been written and signed for all five of these OUs, although it should be noted that the OUE ROD was signed in 2005, following the first Five-Year Review. The Five-Year Review found that the remedies for all Fort Richardson OUs are expected to be protective of human health and the environment upon completion, and in the interim, exposure pathways that could result in unacceptable risk are being controlled. It should be noted that because the sites in OUA and OUD sites have all been previously recommended for NFA or deferred to other regulatory authorities, no protectiveness determination was necessary for these OUs.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION

Site name (*from WasteLAN):* Fort Richardson, Alaska

EPA ID (*from WasteLAN):* AK6214522157

Region: 10 **State:** AK **City/County:** Anchorage

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:** 2004

Has site been put into reuse? ☐ YES ☒ NO Active Army installation

REVIEW STATUS

Reviewing agency: ☒ EPA ☒ State ☐ Tribe ☒ Other Federal Agency U.S. Army _____

Author name: U.S. Army Corps of Engineers, Alaska District

Review period:** 11/1/2007 to 02/22/2008

Date(s) of site inspection: 11/19/2007

Type of review: ☒ Statutory
☐ Policy ☐ 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 RAA Onsite Construction at OU #___ ☐ Actual RA Start at OUB
☐ Construction Completion ☒ Previous Five-Year Review Report
☐ Other (specify)
_____

Triggering action date *(from WasteLAN):* 02/22/2003

Due date (five years after triggering action date): 02/22/2008

*["OU" refers to operable unit.]

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

Five-Year Review Summary Form

Issues:

One issue potentially affecting future protectiveness was identified at OUB. A remedial action was performed that addressed soil contamination with the “hot spot”. However, RAOs for groundwater have not yet been achieved within the “hot spot” and free product was detected within this area. This could affect future protectiveness at the site and the timeframe for achievement of RAOs for groundwater at the site.

At OUC, waterfowl mortality data may be temporarily skewed by active remedial activities. In addition the Army proposes to initiate year-round firing in Eagle River Flats which could have an impact on the types and frequency of monitoring for ERF.

Two sites (the AVMA and Bldg 35-752) were moved from OUD to OUE, and two OUD sites (Bldg 796 and Bldg 955) were designated as NFA in the OUE ROD. All remaining OUD sites have either been designated for NFA or have been referred to the Two-Party Agreement.

No other issues affecting current or future protectiveness were identified during the Five-Year Review.

Recommendations and Follow-Up Actions:

Recommendations and follow-up items at OUB included continuing to monitor groundwater contaminant reduction and performing groundwater modeling for trend analysis; continuing to analyze groundwater samples for VOCs using methods that include compounds not addressed in the ROD such as vinyl chloride.

At OUC, evaluating waterfowl recovery trends upon completion of remedial action is recommended and adjust monitoring program if year-round firing is approved. Also, continue to track the progress of the EIS that is currently under development.

In general, the project managers should review continued operation and planned optimization changes to determine whether they are performing as intended (continuing to make progress toward achieving the RAOs). The project managers will further determine whether the plan is operating efficiently and cost-effectively. Based on the results of the annual evaluation, the project managers will set the operating parameters of the plan for the next year. The Army will make operational adjustments that they consider reasonable and in accordance with agreements made during the last annual evaluation. If the project managers can not reach concurrence on the operating parameters, then operating parameters previously agreed to will be followed until the issue is resolved in accordance with the dispute resolution procedures incorporated in the Federal Facility Agreement.

A summary of recommendations and follow-up actions is included in Section 9 of this report.

Protectiveness Statements:

Protectiveness statements were developed using the sequential process described in EPA guidance for conducting Five-Year Reviews.

Five-Year Review Summary Form
The remedy at OUB is expected to be protective of human health and the environment upon attainment of groundwater cleanup goals and in the interim ICs are preventing exposure to contaminated groundwater. The initial soil removal in 1993 and 1994 and subsequent treatability studies removed the most highly contaminated soil and debris. The remedy is expected to prevent and limit human and environmental exposure to hazardous substance. ICs that address the potential UXO hazards in Areas A-1 and A-2 have been implemented since the last 5-year review. Fencing with warning signs has been placed around Areas A-1 and A-2. The remedy at OUC is protective of human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled with ICs. The remedy at OUE is expected to be protective of human health and the environment upon attainment of groundwater cleanup goals through natural attenuation. In the interim, exposure pathways that could result in unacceptable risks are being controlled and ICs are preventing exposure to, or ingestion of, contaminated groundwater. Protectiveness statements are developed in Section 10 of this report.

1.0 INTRODUCTION

The United States Army Alaska (USARAK) has conducted the second Five-Year Review of the remedial actions at the Fort Richardson National Priorities List (NPL) site, Anchorage, Alaska (Figure 1-1), from October 2007 through February 2008. The U.S. Army Corps of Engineers Alaska District (USACE) performed work in support of this review. This report presents the results of the second Five-Year Review for Operable Units A through E shown on Figure 1-2.

1.1 PURPOSE

The purpose of this review is to ensure that remedial actions selected in the Records of Decision (RODs) for the Fort Richardson Operable Units (OUs) are being implemented, that they continue to be protective of human health and the environment, and are functioning as designed. To achieve this purpose, this review evaluates the status of implementation of the selected remedies, identifies any significant variances from the RODs, and makes recommendations for reconciling variances and/or for improving performance of remedial actions. In addition, the review identifies any new information that becomes evident, documents that no new contaminant sources or exposure pathways were discovered, confirms that no new OUs were established, and verifies that no additional work was performed that was not identified in the RODs.

1.2 STATUTORY REVIEW

This Five-Year Review was conducted to meet the statutory mandate under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121(c). A review is required for all RODs that were signed after the effective date of the Superfund Amendments and Reauthorization Act of 1986 (SARA) and for sites where remedial actions resulted in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure[1].

The Army must conduct Five-Year Reviews consistent with CERCLA and the National Oil And Hazardous Substances Pollution Contingency Plan (NCP). CERCLA §121 (c), as amended, 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.*

[1] EPA OSWER no. 9355.7-03B-P states: "Unlimited use and unrestricted exposure (UU/UE) means that the selected remedy will place no restrictions on the potential use of land or other natural resources. In general, if the selected remedy relies on restrictions of land and/or groundwater use by humans and/or ecological populations to be protective, then the use *has been limited and a five-year review should be conducted*. For example, if a site is cleaned up to an industrial-use level, and/or other types of uses are restricted (e.g., residential use), then, generally, UU/UE is not met."

This requirement is interpreted further in the NCP part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR), which 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 the initiation of the selected remedial action.*

The Environmental Protection Agency (EPA) Five-Year Review guidance states that "the first Five-Year Review generally should be completed and signed by the EPA Region within five years of the initial trigger date", and "for the purpose of a Five-Year Review, a remedial action typically is initiated on the date of actual Remedial Action (RA) on-site construction or the 'actual RA start' date for federal facilities". The date of actual RA on-site construction generally corresponds to the date the contractor begins work at a site for the remedial action, typically the date of on-site mobilization. The definition of the "actual RA start" varies as outlined in the Superfund/Oil Program Implementation Manual OSWER Directive 9200.3-14-1G-P. The first remedial action at the Fort Richardson NPL site was for OUB and was initiated on February 22, 1998.

Five-year review guidelines state "an entire site is subject to a statutory review if any one of its remedial actions is subject to a statutory review". A full Five-Year Review was conducted for three of the Fort Richardson OUs: OUB (discussed in Section 5), OUC (discussed in Section 6), and OUE (discussed in Section 8). OUA is discussed briefly in Section 4; however, a Five-Year Review was not conducted for OUA because all of the source areas within this OU were determined to be NFA under CERCLA. Issues subject to Five-Year Review for OUD are discussed in Section 7, but all sites in that operable unit have either been determined to be NFA under CERCLA or were transferred to OUE.

1.3 AGENCY OVERSIGHT AGREEMENTS

1.3.1 Federal Facility Agreement

The EPA (Region 10), the Alaska Department of Environmental Conservation (ADEC), and the United States Department of the Army signed a Federal Facility Agreement (FFA) for Fort Richardson on December 5, 1994. The FFA ensures that environmental impacts associated with past practices at Fort Richardson are investigated and remedial actions are completed to protect human health and the environment. This agreement establishes a procedural framework and schedule for developing, implementing, and monitoring appropriate response actions in accordance with CERCLA, the NCP, national Superfund guidance and policy, Resource Conservation and Recovery Act (RCRA), national RCRA guidance and policy, and applicable state law. The FFA establishes and describes the CERCLA process as applied to Fort Richardson. In accordance with the CERCLA guidance, a review of the remedies implemented at each site will be conducted at least every five years to assure that human health and the environment are being protected.

The FFA also facilitates cooperation, exchange of information, and participation of the Army, EPA, and ADEC in these actions. It details the responsibilities and authority associated with each party pursuant to the CERCLA process and the environmental investigation and remediation requirements associated with Fort Richardson. The FFA divided Fort Richardson into four operable units: OUA, OUB, OUC, and OUD, and outlines the general requirements for

investigation and/or remediation of suspected historical hazardous waste source areas associated with Fort Richardson. OUD was originally established as the final OU to be investigated at Fort Richardson. However, it was necessary to establish a new OU, OUE, to integrate all previous and any new sources not addressed under the RODs for OUA through OUD. OUE addresses two source areas previously identified in the OUD ROD. No additional source areas or environmental concerns have come to light since OUE was established and no additional OUs are anticipated.

The FFA also addressed integration of the Army's CERCLA and RCRA requirements at sites where both regulations applied. The FFA states that RCRA corrective actions required at solid waste management units identified in the Federal Facilities Compliance Agreement (FFCA) would be integrated with any ongoing CERCLA response actions so that duplication of effort would not occur and the Army could realize cost savings as a result. Work performed at these sites under CERCLA was intended to meet or exceed the requirements of the RCRA corrective action program.

A Remedial Project Manager (RPM) represents each of the parties to the Fort Richardson FFA. The term RPM is used in this report to refer to these three representatives from ADEC, EPA, and Army. In general, the RPMs meet quarterly, to discuss the Army's progress regarding remedial actions selected in the RODs and to address related issues as they arise during the course of remedial action. The RPMs meet more frequently than quarterly when needed and make themselves available to each other for purposes of Fort Richardson remediation (e.g., for technical reviews, modifying monitoring programs, etc.) and to meet the intent and commitments of the FFA.

1.3.2 Remedy Protectiveness, Optimization and Cost-Effectiveness

Optimization of remedy and assessment of cost effectiveness is an on-going process for the Fort Richardson NPL site. Performance of remedies is evaluated at all FFA meetings and discussed by the RPMs. Upon agreement of the RPMs, remedial action can be modified as necessary to ensure efficacy, protectiveness, and the best use of resources. Such modifications have included decisions to perform additional investigation, to terminate operation, to restart operation, to decommission treatment systems, to move treatment systems to new locations, to revise groundwater monitoring systems, and to implement institutional controls. Changes are generally presented in annual reports. Groundwater monitoring programs are updated at least annually based on findings from the preceding year to ensure that well locations and sampling regimes are meeting the objectives of the RODs.

1.3.3 Two-Party Agreement

Source areas where petroleum contamination was identified were referred to the Two-Party Agreement between the Army and the State of Alaska. The Two-Party Agreement is actually two separate agreements which focus on source areas at Fort Richardson contaminated with petroleum from underground storage tanks (UST) and petroleum source areas not associated with USTs. These Two-Party Agreements, which represent the petroleum cleanup strategy, document all known historical petroleum sources on Fort Richardson and their current cleanup status.

The Army and ADEC signed the State-Fort Richardson Underground Storage Tank Compliance Agreement for USTs (Two-Party Agreement) in 1993. The agreement defines the process by which the Army agrees to investigate and remediate petroleum-contaminated areas. These areas are associated with USTs that have leaked or with surface spills of petroleum products, such as lubricating oils/grease, heating fuels, and motor fuels.

Fort Richardson also negotiated the State-Fort Richardson Environmental Restoration Agreement (Two-Party Agreement) for Non-UST source areas with ADEC for petroleum-contaminated source areas not associated with USTs on November 3, 1994. This Agreement sets the framework to cooperatively address known or suspected non-UST petroleum-contaminated source areas. The Two-Party agreement, officially designated as the State-Fort Richardson Environmental Restoration Agreement, is a companion agreement to the FFA that guides parallel track investigations under the auspices of the CERCLA FFA between the Army, EPA, and ADEC for Fort Richardson. These source areas are not included in the work being conducted under CERCLA.

The Two-Party Agreements guide how the Army performs necessary site assessments, monitors, remediates, and closes petroleum contaminated source areas not subject to CERCLA oversight. These agreements verify the Army's commitment to adequately address these source areas in a manner consistent with the State of Alaska Administrative Code, Title 18, Chapters 75, Oil & Hazardous Substances Pollution Control, and 78, Underground Storage Tanks. Two-party source areas are discussed further in the OUD ROD and the current status is presented in Appendix A of this report.

1.3.4 Military Munitions Response Program

The United States Congress established the Military Munitions Response Program (MMRP) under the Defense Environmental Restoration Program (DERP) to address unexploded ordnance (UXO), discarded military munitions (DMM), and munitions constituents (MC) located on current and former military installations in September 2001.

The DOD is currently establishing policy and guidance for munitions response actions under the MMRP. However, key program drivers developed to date conclude that munitions response actions will be conducted under the process outlined in the National Contingency Plan (NCP) (40 CFR 300) as authorized by CERCLA (42 U.S. Code 9605) and as amended by SARA (Pub. L. 99-499).

The U.S. Army completed a preliminary assessment (PA) of the MMRP, also known as Closed Transferred and Transferring Range Inventory, in December of 2003. In Alaska, MMRP PAs were completed for three active army installations (Fort Richardson; Ft Wainwright; and Ft Greely) in September of 2002. At Ft Richardson, the PA/Range Inventory identified a total of twelve Munitions Response Sites (MRS), including five closed and seven transferred ranges:

Closed Ranges

- Mortar Ranges 1B, 1C, and 2B
- The Pistol Range
- The Rifle Range

Transferred Ranges

- Davis Ranges A and B
- Grezelka Machine Gun Range
- Mahon Machine Gun Range
- McGee Machine Gun Range
- Mortar Ranges 1A and 2A

The next step in the process is the Site Inspection (SI). The primary goal of the MMRP SI is to collect the appropriate amount of information necessary to make one of the following decisions: 1) whether a Remedial Investigation/Feasibility Study is required at the site; 2) whether an immediate response is needed; or 3) whether the site qualifies for no further action. The secondary goal of the SI is to collect information for cost to complete estimates and site prioritization for MMRP sites.

The SI phase for all three installations in Alaska began in October 2005. The SI is completed in two phases. The initial phase is the Historical Records Review (HRR) which has been completed. The primary goal of the HRR is to perform a records search to document historical and other known information for the MMRP sites at each installation in order to supplement the information developed during the PA. The information presented in the HRR helps to facilitate the decision making process and to determine the second phase to be taken in the SI process. The second phase of the SI includes a Work Plan, field work, and an SI report. The field activity includes visual surveys, geophysical surveys, and surface and subsurface soil sampling. Each of the SI processes includes stakeholders involvement. At a minimum, stakeholders include the installation, U.S. Army Environmental Command, State Regulators, EPA, U.S. Army Corps of Engineers, and contractors.

At Ft Richardson, the SI is still in progress. The HRR and field work have been completed and the SI report is currently being reviewed. Anticipated completion for the Ft Richardson SI is in 2008.

1.4 PUBLIC INVOLVEMENT

1.4.1 Community Involvement at Fort Richardson

Community involvement regarding environmental issues associated with the Eagle River Flats impact area began in the late 1980s with the discovery of high water fowl mortality due to white phosphorus contamination. The Eagle River Flats Task Force, a cooperative agreement between the Fort Richardson and state and federal agencies, was formed in 1988. One function of the task force was to foster community involvement. The Community Relations Plan, published in April 1995, identified current issues of community concern regarding known and potential contamination at Fort Richardson and included proposals for community involvement activities to address these concerns.

Fort Richardson began publishing a quarterly newsletter in January 1995. The Newsletter covers information about all OUs, Two-Party agreement source areas, and other restoration activities, and has been sent to interested community members since 1995. The most recent newsletter was published in Fall of 2007.

Prior to the formation of the Restoration Advisory Board (RAB) Fort Richardson conducted several informational public meetings. The first meeting conducted on June 29, 1995, covered

information about the progress that had been made involving the environmental monitoring and cleanup process occurring at Fort Richardson. In addition, OU specific public meetings were held in conjunction with a public comment period for each of the associated Proposed Plans. The proposed plan public meetings presented investigative information and proposed cleanup plans for each of the OUs with a focus on receiving public comments on the proposed actions. The public was offered several different venues for providing public comments: written, verbal, and via a toll-free telephone comment line.

Three information repositories were established in 1996 to contain microfiche copies of the Administrative Record for Fort Richardson restoration activities. The locations of the three information repositories include:

- The library at the Directorate of Public Works (DPW) Environmental office in Building 724 on Ft Richardson
- The University of Alaska Anchorage (UAA) Consortium Library
- Alaska Resources Library and Information Services (ARLIS) (which is currently located within the UAA Consortium Library)

The official copy of the Administrative Record was established and is currently maintained at the DPW office, Building 724, on Fort Richardson. The Administrative Record has been updated annually since inception. An assessment of the current state of the information repositories was conducted for this five-year review and the results are included in Appendix C of this report.

1.4.2 Restoration Advisory Board

USARAK established a Restoration Advisory Board (RAB) in October 1997. The RAB originally consisted of 12 community members, and representatives from the Army, EPA, and ADEC. The RAB was established in October 1997 and has met quarterly since its inception. Community members represent academic institutions, state/national environmental activist group, adjacent Elmendorf Air Force Base, and the Anchorage/Eagle River community at large.

The RAB regularly reviews available technical reports and offers written comments and recommendations concerning the Fort Richardson restoration program. Besides quarterly meetings, the RAB also participates in site visits to Fort Richardson OU source areas and attends other environmental meetings and conferences publicized during RAB meetings and in quarterly fact sheets. The Army presents technical briefings for the RAB as needed, and members of the RAB have the opportunity to share their concerns about the site and provide input on remediation studies and remedial actions. The Army continues to look for opportunities to keep the community informed and involved in the remediation process.

The Army's Installation Restoration Program (IRP), the RAB, the FFA, and the Two-Party Agreement effectively ensure public involvement and environmental agency oversight of the remediation process at Fort Richardson. The active nature of military operations at Fort Richardson ensures an ongoing federal presence and has contributed to the Army's ability to meet the commitments in the RODs.

1.4.3 Community Involvement during the Five-Year Review Process

The First Five-Year Review was an important milestone for public involvement at a NPL site. This Second Five-Year Review provides additional information that has become available and provides the public with further opportunity to become involved. The public was informed of the Fort Richardson Second Five-Year Review as follows:

- A public notice of the Five-Year Review was published in the *Anchorage Daily News* and in the Fort Richardson *POST* Newspaper during November and December of 2007. A copy of the notice is provided below.
- The Army included a Five-Year Review update in the October 2007 *Environmental Restoration News.*

Following completion of the Five-Year Review, a notice of availability will be published in the *Anchorage Daily News* notifying the public of the availability of the review, and the Review Report will be added to the Administrative Record and placed at the Fort Richardson NPL site public information repositories.

The results of the Five-Year Review will also be presented at the April 2008 RAB meeting.

Copy of Five-Year Review Notice that was published in Anchorage Daily News and Alaska Post

NOTICE OF FIVE-YEAR REVIEW

U.S. Army Alaska (USARAK) announces the beginning of the Five-Year Review of soil and groundwater remedies implemented at the Operable Units on Fort Richardson, Alaska (FRA).

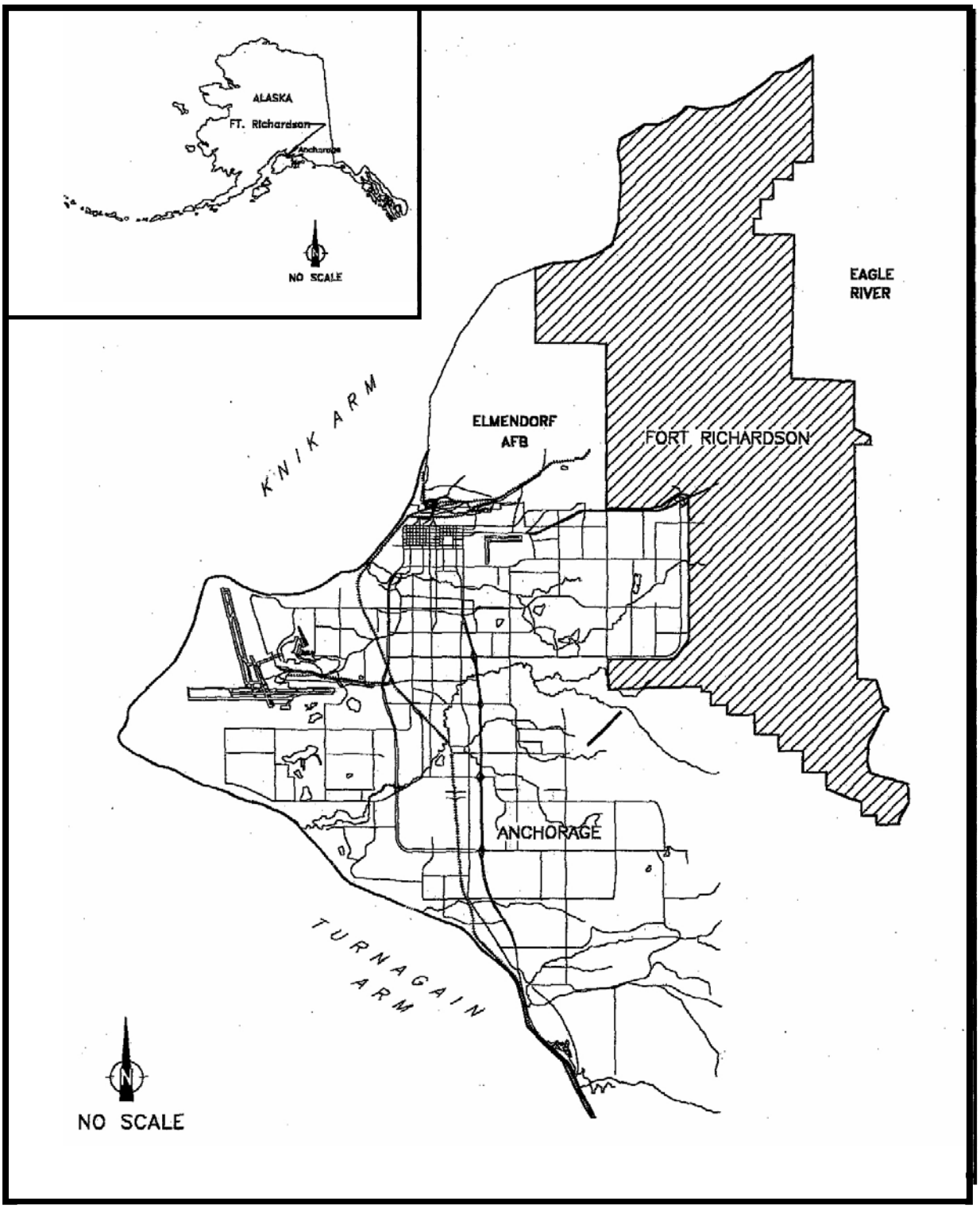
Section 121 (C) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan state "a remedial action that resulted in hazardous substances, pollutants, or contaminants remaining at the site shall be reviewed no less frequently than every five years." Thus, CERCLA requires a statutory Five-Year Review of the selected remedial actions at Fort Wainwright.

USARAK initiated the Five-Year Review process in October 2007 and it will be completed by February 2008.

The findings of the Five-Year Review will be available for public review after February 2008 at: University of Alaska Consortium Library in Anchorage; Alaska Resources Library and Information Services (ARLIS); and the Fort Richardson Directorate of Public Works-Environmental Resources Library. These three libraries contain detailed information concerning the selected remedies at Fort Richardson and the contamination addressed by the remedies.

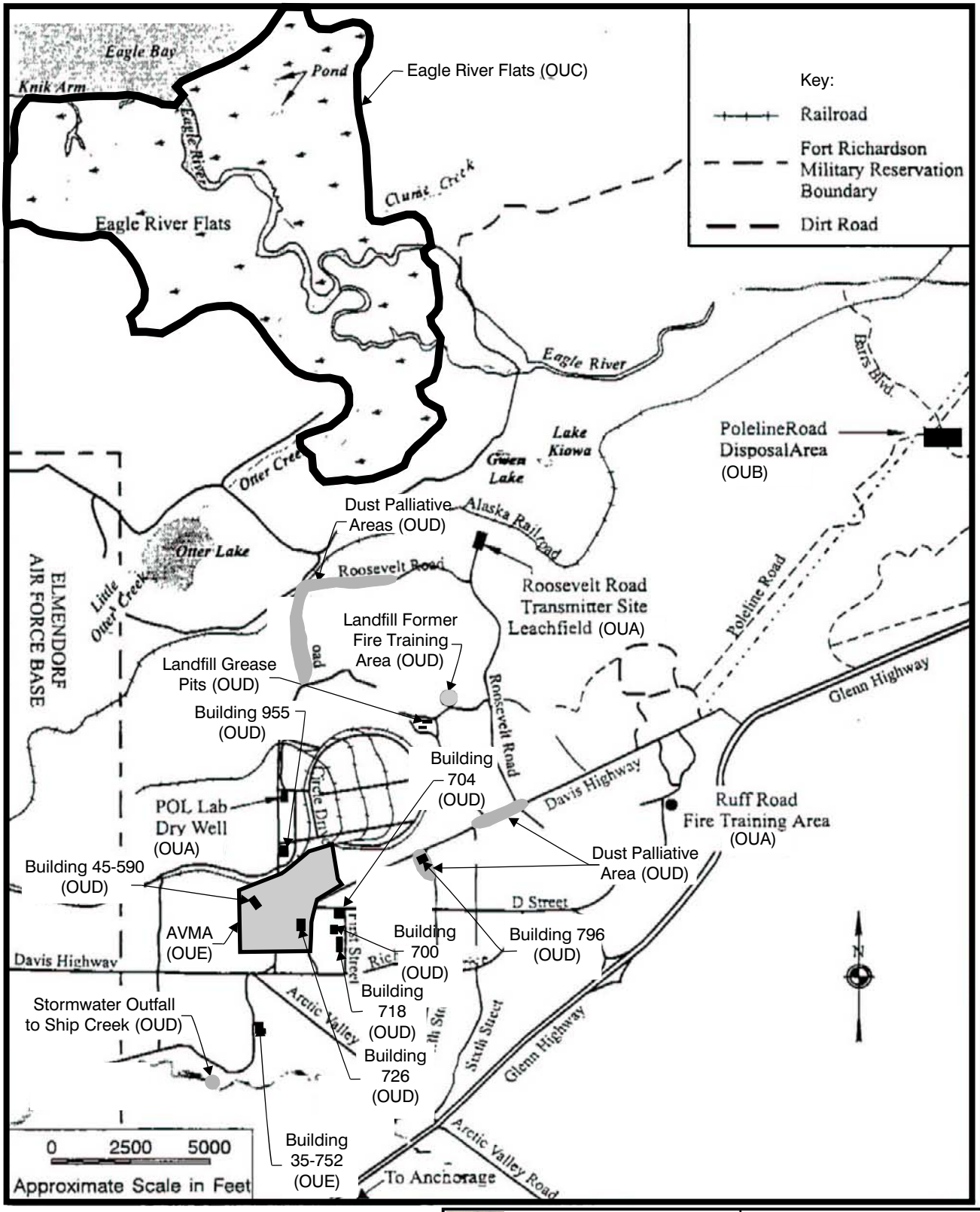
Information on the cleanup process is distributed to interested persons through the FRA Restoration Newsletter. If you are interested in receiving the newsletter or if you have any questions regarding the Five-Year Review process, inquiries may be directed to:

Dick Nenahlo
U.S. Army Alaska Directorate of Public Works
ATTN: IMPA-FRA-PWE (R. Nenahlo)
724 Postal Service Loop #4500
Fort Richardson AK 99505-4500
(907) 384-3295 – richard.nenahlo@us.army.mil



Fort Richardson Vicinity Map

ARMY ENVIRONMENTAL CENTER		CORPS OF ENGINEERS ALASKA DISTRICT
Fort Richardson Vicinity Map Second 5 Year Review Fort Richardson, Alaska		
SOURCE: NA	FIGURE: 1–1	DATE: 1/08



ARMY ENVIRONMENTAL CENTER

CORPS OF ENGINEERS
ALASKA DISTRICT

Site Location Map

Second 5 Year Review
Fort Richardson, Alaska

SOURCE:	FIGURE:	DATE:
NA	1–2	2/08

2.0 APPROACH

2.1 REPORT ORGANIZATION

The Five-Year Review was performed in accordance with the *Interim Army Guidance for Conducting CERCLA Five-Year Reviews* (April 2000) and *EPA Comprehensive Five-Year Review Guidance* (June 2001).

The basic report structure is derived from the EPA guidance document, modified to accommodate all of the Fort Richardson RODs. To the extent possible, discussion related to all of the OUs appears at the beginning of the report and OU-specific discussion appears in the different OU sections of the report.

One of the goals of this report is to compile information from existing OU reports into a single status document. To make best use of resources, this report has taken much of the discussion and information from the RODs, other reports, and Army summaries. Findings that were overseen, reported, reviewed, and accepted by the Fort Richardson RPMs have been included in the Five-Year Review report without further scrutiny.

The findings and recommendations sections of this report document ongoing issues and concerns, identify variances in the implementation of remedial actions, and suggest changes to ensure that remedial actions undertaken pursuant to the RODs are adequately protective of human health and the environment.

2.2 FIVE-YEAR REVIEW TEAM

This Five-Year Review was performed at the direction of the USARAK Directorate of Public Works (DPW) Environmental Office (federal lead agency for this site) with EPA Region 10 and ADEC oversight pursuant to the FFA and Two-Party agreement. This work was conducted by the USACE and its subcontractors.

2.3 FIVE-YEAR REVIEW TASKS

The objectives of the Five-Year Review are to answer the following questions:

- Are the remedies functioning as intended by the decision document?
- Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy still valid?
- Has any other information come to light that could call into question the protectiveness of the remedy?
- Are human health and the environment being protected in the short- and long-term?

The Five-Year Review has been accomplished by five major tasks:

- Review of relevant documents in the Administrative Record including but not limited to the RODs and Remedial Design/Remedial Action (RD/RA) Reports to determine the initial effectiveness of the remedies;

- Review of Monitoring Plans, Annual Sampling Reports, and Operation and Maintenance (O&M) Reports to determine the ongoing effectiveness and protectiveness of the chosen remedies;
- Review of chemical, location, and action-specific Applicable or Relevant and Appropriate Requirements (ARARs) identified in the RODs for each OU to determine whether changes have occurred that might affect the protectiveness of the remedies;
- Site inspections to observe visible elements of remedies; and
- Interviews of various individuals who have been involved with the OUs.

2.3.1 Document Review

Documents consulted in the course of this Five-Year Review include:

- Interim Army Guidance for conducting Five-Year Reviews
- *Comprehensive Five-Year Review Guidance*, OSWER Directive 9355.7-03B-P (June 2001)
- First Five Year Review for Fort Richardson (February 2003)
- RODs for OUs A through E
- Remedial Designs (RDs) (including drawings and as-builts)
- Draft Interim Remedial Action Reports (IRARs)
- Community Relations Plan
- O&M reports and manuals
- Groundwater sampling results
- Other sampling results, monitoring data, and summaries
- Preliminary Close-Out Reports

Table 2-1 is a compilation of reports and documents available at the time of this review. Key information sources used in this review are identified in this table.

2.3.2 ARARs and Numeric Cleanup Goal Review

As part of this Five-Year Review, significant ARARs for each ROD were reviewed for changes or the promulgation of new laws since the ROD was signed that might be considered ARARs if the RODs were to be written today. New laws that might be considered ARARs today are applicable for Fort Richardson only if they are essential to ensure protectiveness of the remedies.

As part of this review, RAOs were reviewed, and contaminant-specific standards used to set numeric cleanup goals in each ROD were compared to present day values to assess continued protectiveness of the remedies. More specifically, current Maximum Contaminant Levels (MCLs) and toxicity and/or carcinogenicity values were compared to MCLs and toxicity/carcinogenicity values at the time of the RODs. At sites where regulatory values for COCs were not available at the time the ROD was developed, RBC values were used to establish cleanup goals. For these sites, current Region 3 (2002) RBCs were used to evaluate if ROAs have changed. The OU-specific RAOs, ARARs, and cleanup goals are discussed in the OU sections of this report.

2.3.3 Site Inspections

Site inspections were conducted on November 19, 2007. The purpose of the inspection was to assess the protectiveness of the remedy, including the presence of control measures to restrict access, the integrity of the treatment system, and the condition of the site. The site-inspection checklist and photographs taken during the site inspections are included in Appendix B of this report. Because Fort Richardson is a site with ongoing Army presence and agency oversight, it was possible to discuss project status with people familiar with site histories and remediation status.

The Fort Richardson NPL site public information repositories were also inspected to confirm availability of Administrative Record documents for public review. The findings and recommendations from the repository inspections are included in Appendix C of this report.

2.3.4 Interviews

During the course of this Second Five-Year Review, written interviews were conducted with several parties involved with the site. Interview Record Forms documenting the issues discussed during these interviews are provided in Appendix D.

Interview responses were overwhelmingly positive. The principal impression was that remedial action at Fort Richardson has been well planned and effective. Several comments were made regarding security issues that cropped up at OUB and OUC (trespassers at the site; equipment theft). Some interviewees also expressed concern that some support services for operations at OUC had decreased over time or were now more expensive, but also noted that operations at the site are ramping down. The overall impression of the remedy effectiveness at all the OUs was that the remedial actions undertaken pursuant to the RODs are adequately protective of human health and the environment.

Table 2-1: Fort Richardson Second Five-Year Review Resource Documents

OU	Key Ref[1]	Document	Issuance Date
All		Notice of Noncompliance, Compliance Schedule, and Notice of Necessity for Conference, In the Matter of the Environmental Protection Agency	Jun-90
All		Draft Site Screening Inspection Report for FRA	Nov-92
All		ODPC Plan, Oil Discharge Prevention and Contingency Plan, Fort Richardson, Alaska	Sep-93
All		Sampling Report for Groundwater Monitoring Network at Fort Richardson, Alaska	Jan-94
All		Geotechnical Report for Groundwater Monitoring Network, Fort Richardson, Alaska	Apr-94
All		Areawide Community Relations Plan, Fort Richardson, Alaska	Jun-98
All		Subsurface Geologic Investigations of the Fort Richardson Contonment Area, Alaska	Apr-99
All	X	Installation Action Plan for Fort Richardson, Alaska	Mar-99
All		Glacial Geology and Stratigraphy of Fort Richardson, Alaska, A Review of Available Data on the Hydrogeology	Apr-00
All		Technical Memorandum, Land Use Evaluation, Environmental Noise Management Plan, Fort Richardson, Alaska	May-00
All	X	Installation Action Plan For Fort Richardson, Alaska	Aug-00
All		Draft Environmental Staging Facility Standard Operating Procedures	Sep-00
All		Pollution Prevention Plan Fort Richardson Alaska	Dec-00
All		Final Environmental Staging Facility Standard Operating Procedures	Mar-01
All		Fort Richardson Groundwater Sampling Program Health and Safety Plan	Aug-01
All		Fort Richardson Groundwater Sampling and Analysis Plan	Aug-01
All		Final Installation Environmental Noise Management Plan	Oct-01
All	X	*First Five-Year Review Report*	Feb-03
A/B	X	OUA and OUB ROD	Aug-97
A		Remedial Design	
		Management Plan, Remedial Investigation/Feasibility Study, OUA	Feb-95
	X	Remedial Investigation Report, OUA (Volume 2: Appendix H, Analytical Data)	Mar-96
		Final, Baseline Human Health and Ecological Risk Assessments, OUA	Aug-96
		Final Feasibility Study, OUA, Ruff Road Fire Training Area	Nov-96
		Final Work Plan, Final Site Safety and Health Plan, Treatment System Demonstrations and Design Verification Study, Ruff and Roosevelt Road	Mar-98
		Investigation of the Roosevelt Road Transmitter Site Using Ground-Penetrating Radar, Draft Report	May-98
		CRREL Report 99-4, Investigation of the Roosevelt Road Transmitter Site Using Ground-Penetrating Radar	Mar-99
		Final Environmental Baseline Survey Existing and Proposed Railroad Right-of-Way	Feb-01
A		Remedial Action Report(s)	
		Proposed Plan for Final Remedial Action at OUA and OUB, Public Comment Period and Information Exchange	Jan-97
		Delivery Order, Request for Proposal, Indefinite Delivery Type (IDT), Remedial Action (RA), OUA, POL Laboratory (Building 986) Dry Well	Apr-97
A		Drawings/As-builts	
	X	95% Design Analysis, OUA, POL Laboratory (Building 986) Dry Well	Apr-97
A		Sampling/Monitoring Plans, Reports, and Data	
		Draft 1998 System Monitoring Report Treatment System Demonstrations and Design Verification Study Ruff & Roosevelt Road	Jan-99
		Memorandum, Subject: 1998 Summary Report, Treatment System Demonstration & Design Verification Study, Ruff and Roosevelt Road	Dec-99
		Final 1998 System Monitoring Report, Treatment System Demonstrations and Design Verification Study, Ruff & Roosevelt Road	Dec-99
		Final 1999 System Monitoring Report, Treatment System Demonstrations and Design Verification Study, Ruff Road	Aug-00
		Confirmation Soil Sampling Report Ruff Road Fire Training Area, Fort Richardson, AK	Dec-00
		Draft Design Verification Study Report for the Treatment System Demonstrations and Design Verification Study, Ruff Road, Fort Richardson, AK	Apr-01
	X	Final Design Verification Study Report for the Treatment System Demonstrations and Design Verification Study Ruff Road, Fort Richardson	Jul-01

Table 2-1: Fort Richardson Second Five-Year Review Resource Documents

OU	Key Ref[1]	Document	Issuance Date
A/B	X	OUA and OUB ROD	Aug-97
B		Remedial Design	
		Surface Geophysical Investigation, U.S. Army Fort Richardson Facility, Anchorage, Alaska	Aug-90
		Final Poleline Road Disposal Area, Expanded Site Investigation, Fort Richardson, Alaska	Feb-91
		Final Poleline Road Disposal Area, Remedial Investigation Technical Plan	Aug-91
		Poleline Road Disposal Area, Remedial Investigation Technical Plan	Sep-91
		Pumping Test Work Plan for the Poleline Road Disposal Area, Fort Richardson, Alaska	Dec-90
		Final Project Work Plan, Phase 2 - Continuation of the Removal Action, Poleline Road Disposal Area, Fort Richardson, Alaska	May-94
		Reconnaissance Ground-Penetrating Radar, Electromagnetic Induction Surveys of the Poleline Road Site, Fort Richardson, AK, Draft Final Report	May-94
		Draft Final Report, Phases I & II, Poleline Road Disposal Area Project, Fort Richardson, Alaska	Dec-94
		Final Report Appendices (A-1 to A-4, and D-8 to D-11)	Dec-94
		Phase II Sampling & Analysis Report (Binder 1: Instruction Sheet for Appendix J, and Binder 2: Instruction Sheet for Appendix L)	Dec-93
		Phase I HSP Appendices	Dec-93
		Phase II HSP Appendices (Appendices HS-1 to HS-3, Appendices HS-4 to HS-8, Appendices HS-9B to HS-18, and Appendices HS-19 to HS-28)	Dec-93
		Phase I SAP Appendices	Dec-93
		Phase I SAP Appendices (Appendices A - E, Appendix F, Appendix F (cont.), and Appendices G - M)	Dec-93
	X	Final Remedial Investigation Management Plan, Operable Unit B, Poleline Road Disposal Area, Fort Richardson, Alaska	Mar-95
		Ecological Risk Approach Document, Operable Unit B, Poleline Road Disposal Area, Fort Richardson, Alaska	Aug-95
	X	Final Remedial Investigation Report, Operable Unit B, Poleline Road Disposal Area, Fort Richardson, Alaska (Volume I: Report & Appendix I, Volume II - 1 of 2, Appendices II - XIV (Except VII), and Volume II - 2 of 2, Appendix VII)	Sep-96
	X	Final Risk Assessment Report, Operable Unit B, Poleline Road Disposal Area, Fort Richardson, Alaska	Sep-96
	X	Final Feasibility Study Report, Operable Unit B, Poleline Road Disposal Area, Fort Richardson, Alaska	Jan-97
	X	Final Treatability Study Report, Operable Unit B, Poleline Road Disposal Area, Fort Richardson, Alaska	Mar-97
		Final Site Work Plan, Soil Stockpile Remediation, Poleline Road Disposal Area, Fort Richardson, Alaska	Apr-97
		Final Environmental Protection Plan, Soil Stockpile Remediation, Poleline Road Disposal Area, Fort Richardson, Alaska	Apr-97
		Final Contractor Quality Control Plan, Soil Stockpile Remediation, Poleline Road Disposal Area, Fort Richardson, Alaska	Apr-97
		Final Work Plan Technical Memorandum, Groundwater Characterization and Design Verification Study, Operable Unit B, Poleline Road Disposal Area, Fort Richardson, Alaska	May-97
		Draft Final, Engineering Evaluation/Cost Analysis, Treatment & Disposal of Chemical Agent Identification Sets (CAIS), Poleline Road Disposal Area, Fort Richardson, Alaska	May-97
		Final Long-Term Groundwater Monitoring Work Plan, Operable Unit B, Poleline Road Disposal Area, Fort Richardson, Alaska	Sep-97
		CRREL Report 97-4, Geophysical Investigations at a Buried Disposal Site on Fort Richardson, Alaska	Sep-97
		Preliminary Remedial Design Plan, Operable Unit B, Poleline Road Disposal Area, Fort Richardson, Alaska	Dec-97
		Final Remedial Design Plan, Operable Unit B, Poleline Road Disposal Area, Fort Richardson, Alaska	Apr-98
		Draft, Work Plan Technical Memorandum, Design Verification Study - Array 4, Operable Unit B, Poleline Disposal Area, Fort Richardson, AK	Jun-98
	X	Final Remedial Design Plan, Operable Unit B, Poleline Road Disposal Area, Fort Richardson, Alaska	Jun-98
		Final Long-Term Groundwater Monitoring Work Plan, June 1998 Sampling, Operable Unit B, Poleline Road Disposal Area, Fort Richardson, AK	Sep-98
		Draft, High Vacuum Extraction Treatability Study, Operable Unit B, Poleline Road Disposal Area, Fort Richardson, Alaska	Feb-99
		Final Work Plan Technical Memorandum, Design Verification Study, Arrays 4, 5, and 6, Operable Unit B, Poleline Disposal Area, Fort Richardson, Alaska	Aug-99
	X	Draft Report, Design Verification Study, Arrays 4, 5, and 6, Operable Unit B, Poleline Road Disposal Area, Fort Richardson, Alaska	Mar-00
B		Remedial Action Report(s)	
		Operable Unit B Remedial Design/Remedial Action, Statement of Work, December 5, 1997	Dec-97
		DRAFT Remedial Action Work Plan Operable Unit B Poleline Road Disposal Area, Fort Richardson, AK	Dec-00
	X	DRAFT Interim Remedial Action Report Operable Unit B Poleline Road Disposal Area, Fort Richardson, AK	Jan-03

Table 2-1: Fort Richardson Second Five-Year Review Resource Documents

OU	Key Ref[1]	Document	Issuance Date
B		Remedial Design	
		Design Verification Study Arrays 4, 5, and 6	Dec-00
		Building 762, 786, OUB and OUE Health and Safety Plan SSHP	Aug-04
		CLOSES Evaluation for OUB	Sep-04
B		O&M Manuals	
		Final Operation, Maintenance and Monitoring Manual: OUB Soil Vapor Extraction Treatment System Fort Richardson, Alaska	Oct-05
B		Sampling/Monitoring Plans, Reports, and Data	
		Long-Term Groundwater Monitoring November 1997 Sampling Operable Unit B Poleline Road Disposal Area	Nov-97
		Long-Term Groundwater Monitoring November 1997 Sampling Poleline Road Disposal Area	Jan-98
		Draft Design Verification Study, Operable Unit B, Poleline Road Disposal Area, Fort Richardson, Alaska	Feb-98
		Long-Term Groundwater Monitoring Technical Memorandum June 1998 Sampling, Operable Unit B	Jun-98
		Technical Memorandum OUB Poleline Road Disposal Area	Jul-98
		Chemical Quality Assurance Report, Operable Unit B, Fort Richardson, Alaska, Draft	Jul-98
		Final Chemical Quality Assurance Report OUB	Sep-98
		Long-Term Groundwater Monitoring Technical Memorandum June 1998 Sampling, Operable Unit B	Sep-98
		Analytical Results of Post Treatment Surface Samples Collected at Poleline Road Disposal Area, Fort Richardson, AK	Nov-98
		Final Long-Term Groundwater Monitoring, October 1998 Sampling, Operable Unit B, Poleline Road Disposal Area, Fort Richardson, Alaska	Jan-99
		Technical Memorandum for Batch Treatment Cell No. 3, Soil Stockpile Remediation, Poleline Road Disposal Area, Fort Richardson, Alaska	Apr-99
	X	Final Long-Term Groundwater Monitoring, March 1999 Sampling, Operable Unit B, Poleline Road Disposal Area, Fort Richardson, Alaska	Jun-99
		Technical Memorandum, OU-B, Poleline Road, Fort Richardson	Sep-99
		Final System Evaluation, Operable Unit B, Poleline Road Disposal Area, Fort Richardson, Alaska	Sep-99
		Technical Memorandum, OU-B, Poleline Road, Ft. Richardson, Alaska, Installation of Array 5 and Associated Soil Sampling, May 1999	Sep-99
		Final Report, Operable Unit B, Poleline Road Disposal Area, Long-Term Groundwater Monitoring Report	May-00
		Poleline Road Disposal Area Long-Term Groundwater Monitoring	Oct-00
	X	Final Report Operable Unit B Poleline Road Disposal Area October 2000 Long-Term Groundwater Monitoring Report	Nov-00
	X	Revised Final Report Design Verification Study Arrays 4, 5, and 6, Operable Unit B Poleline Road Disposal Area, Fort Richardson, Alaska	Mar-01
	X	July 2001 Long-Term Groundwater Monitoring Report	Jul-01
		Final Technical Memorandum Updating Long-Term Groundwater Monitoring Results Volume I	Dec-01
		OUB Groundwater Sampling at Operable Unit B Poleline Road March 2002 Volume I	May-02
		OUB Groundwater Sampling at Operable Unit B Poleline Road March 2002 Volume II	May-02
		OUB Groundwater Sampling at Operable Unit B Poleline Road March 2002 Volume III	May-02
		Historical Aerial Photographic Analysis Of The Poleline Road Disposal Area, OUB	Oct-02
		OUB U.S. Army Program Manager for Chemical Demilitarization EE/CA	Feb-03
		CRREL Geological Update: Hydro-Geological and Glaciological Interpretations of New Wells Drilled at Poleline Road, Poleline Road Disposal Area	Apr-03
		Operable Unit B Final Report for Decommissioning of SVE Wells, Thermocouples, and Electrodes	Apr-03
		Field Sampling Plan OUB Poleline Disposal Area 2003 GWM	Apr-03
		OUB Poleline Road Groundwater Monitoring Program Report, Spring 2003	Jul-03
		Exploration and Monitoring Well Logs OUB Poleline Road Disposal Area	Aug-03
		Fort Richardson, Operable Unit B, Poleline Road Disposal Area, Groundwater Monitoring Report	Jan-04
		OUB Final Fall 2003 Groundwater Sampling Report	Mar-04
		SAP Building 762, 786, OUB (Poleline Road), OUE (Armoured Vehicle Maintenance Area)	Aug-04
		Final Fort Richardson, OUB Poleline Road Disposal Area, Groundwater Monitoring Report Fort Richardson, Alaska	?2004
		Maps of Poleline Road Plumes and Groundwater Table, 1997-2003, Operable Unit B, Fort Richardson, Alaska	Oct-04
		Refined 3D Geologic Model of the Poleline, Road Disposal Area, Operable Unit B, Fort Richardson, Alaska	Mar-05
		Final Operation, Maintenance and Monitoring Manual: OUB Soil Vapor Extraction Treatment System Fort Richardson, Alaska	Oct-05
	X	*Final Summary Report: OUB Soil Vapor Extraction Treatment System, Fort Richardson, Alaska*	Nov-06
	X	*Final Report Fort Richardson OUB Poleline Road Disposal Area Groundwater Monitoring Report*	Jun-06

Table 2-1: Fort Richardson Second Five-Year Review Resource Documents

OU	Key Ref[1]	Document	Issuance Date
C	X	Record of Decision for OUC Fort Richardson Anchorage, Alaska	Sep-98
C		Remedial Design	
		Eagle River Flats, Expanded Site Investigation, Fort Richardson, Alaska, Final Technical Report, Data Item A011	Jun-90
		CRREL Report 92-5, Waterfowl Mortality in Eagle River Flats, Alaska, The Role of Munitions Residues	May-92
		FY 92 Final, Phase II. Remedial Investigation Report: White Phosphorus Contamination of Salt Marsh Sediments at Eagle River Flats, Alaska	Jun-93
		CRREL Report 93-23, Preliminary Assessment of Sedimentation and Erosion in Eagle River Flats, South-Central Alaska	Dec-93
	X	Interagency Expanded Site Investigation, Evaluation of White Phosphorus Contamination and Potential Treatability at Eagle River Flats, Alaska	May-94
	X	Eagle River Flats, Comprehensive Evaluation Report, Fort Richardson, Alaska	Jul-94
	X	Interagency Expanded Site Investigation, Evaluation of White Phosphorus Contamination and Potential Treatability at Eagle River Flats, Alaska, FY 94 Final Report (Volumes 1 and 2)	May-95
		Eagle River Flats, Final 1995 Work Plan, Fort Richardson, Alaska	Jun-95
		Eagle River Flats, Final Quality Assurance Program Plan, Fort Richardson, Alaska	Jun-95
		CRREL Report 96-9, Physical System Dynamics and White Phosphorus Fate and Transport, 1994, Eagle River Flats, Fort Richardson, Alaska	Aug-96
		Operable Unit C, OB/OD Pad, Fort Richardson, Alaska, Site Investigation Work Plan	Sep-96
		CRREL Report 96-13, Physical Processes and Natural Attenuation Alternatives for Remediation of White Phosphorus Contamination, Eagle River Flats, Fort Richardson, Alaska	Dec-96
		Site Safety and Health Plan for Site Visit to Eagle River Study Area	Apr-97
	X	Scope of Work for Treatability Study of Pond Pumping for Enhancement of In-Situ White Phosphorus Attenuation in Eagle River Flats	Apr-98
		Technical Memorandum: Spill Prevention and Control for Eagle River Flats Pumping Treatability Study	Jun-98
		OB/OD Pad Interim Closure Plan Approach Document	Dec-98
		Field Work and Pond Drainage Eagle River Flats, Safety and Health Plan	Dec-98
		Draft OB/OD PAD Interim Closure Plan	Mar-99
		1999 Field Work Plan for Eagle River Flats	Jun-99
		Remediating and Monitoring White Phosphorus Contamination at Eagle River Flats	Jul-00
		OUC 2002 Remediation & Monitoring Work Plan Eagle River Flats	May-02
		2003 Remedial and Monitoring Work Plan, Operable Unit C, Eagle River Flats, Fort Richardson, Alaska	Mar-03
		2004 Long-Term Monitoring Work Plan, Operable Unit C, Eagle River Flats, Fort Richardson, Alaska	Apr-04
	X	*CLOSES Evaluation Draft Final Report, OUC-Eagle River Flats White Phosphorous*	Jun-04
		2005 Long-Term Monitoring Work Plan, Operable Unit C - Eagle River Flats	Apr-05
		Final (MEC) Work Plan For Unexploded Ordnance and O&M Support For HTRW Area Sampling Eagle River Flats - Operable Unit C, Fort Richardson, Alaska	May-05
	X	Draft Fort Richardson CERLCA Federal Facility Agreement, Recommended Action, Interim Decision Summary for Eagle River Flats	May-05
		2006 Long-Term Monitoring and Remediation Work Plan Operable Unit C, Eagle River Flats, Fort Richardson, Alaska	Apr-06
		Final Letter Report For Soil Excavation, Assessment, and Treatment, Eagle River Flats, Fort Richardson, Alaska	Jun-06
		2007 Long-Term Monitoring and Remediation Work Plan Operable Unit C (Eagle River Flats), Fort Richardson, Alaska	Apr-07
C		Remedial Action Report(s)	
	X	DRAFT Interim Remedial Action Report Operable Unit C Eagle River Flats, Fort Richardson, AK	Jul-02
		OUC Field Work & Pond Drainage Eagle River Flats Safety & Health Plan Field Year #3	Jan-02
		OUC Remediating & Monitoring White Phosphorous Contamination at ERF FY 01 Draft Report	Apr-02
		OUC Field Summary Report 2001 Work Season Field Work & Pond Drainage Eagle River Flats	Jun-02
		OUC 2001 Remedial Progress Report Operable Unit C Eagle River Flats FY 01 Report	Jul-02
		Interim Remedial Action Report, Operable Unit C, Eagle River Flats, Fort Richardson, Alaska	May-03
		2003 Draft Remedial Progress Report, Operable Unit C, Eagle River Flats, Fort Richardson, Alaska	Apr-04
	X	*Remediating and Monitoring White Phosphorous Contamination at Eagle River Flats, Operable Unit C, Fort Richardson, Alaska FY04 Data Report*	Aug-05
	X	*Remediating and Monitoring White Phosphorous Contamination at Eagle River Flats, Operable Unit C, Fort Richardson, Alaska FY05 Data Report*	Apr-06
	X	*Remediating and Monitoring White Phosphorous Contamination at Eagle River Flats, Operable Unit C, Fort Richardson, Alaska FY06 Data Report*	May-07
	X [2]	*Waterbird Use of Eagle River Flats from Aerial Surveys, April - October 2007*	Dec-07
C		*Sampling, Monitoring Plans, Reports, Data*	
		Fort Richardson RAB Field Trip Summary Report	Apr-04
		Interim Waterfowl Mortality Monitoring Report OUC-Eagle River Flats Impact Area	Jul-04
		2005 Annual Summary Report, Operable Unit C - Eagle River Flats	Aug-04

Table 2-1: Fort Richardson Second Five-Year Review Resource Documents

OU	Key Ref[1]	Document	Issuance Date
D	X	Record of Decision, Operable Unit D, Fort Richardson, Alaska	Jun-00
D		Remedial Design	
		Fort Richardson, Operable Unit D, Preliminary Source Evaluation 2, Site-Specific Safety and Heath Plan, Final	Sep-94
		Analytical Data for Preliminary Source Evaluation 2, Operable Unit D (Volume II of III: Building 796, Building 955, Dust Palliative Roadways, Fire Training Pit) Fort Richardson, Alaska	Apr-95
		Analytical Data for Preliminary Source Evaluation 2, Operable Unit D (Volume III of III: Grease Pits, Background, Decontamination Water) Fort Richardson, Alaska	Apr-95
	X	Fort Richardson, Alaska, Preliminary Source Evaluation 2 Operable Unit D Draft	Apr-95
		Preliminary Source Evaluation 2, Operable Unit D, Fort Richardson, Alaska	Jun-96
		OUD, Field Sampling Plan, Addendum 1, Final, Fort Richardson, Alaska	Jul-97
		OUD, Field Sampling Plan, Addendum 2, Final, Fort Richardson, Alaska	Sep-97
		Field Sampling Plan OUD Modification 3 DRAFT	Nov-97
		Feasibility of Using Resistivity Geophysical Surveys for Mapping the Confining Layer on Fort Richardson: Preliminary Results	Dec-97
		Subject: Overview Letter and Schedule for Operable Unit D, Feasibility Study, Fort Richardson, Alaska	Dec-97
	X	Final RI/FS, Operable Unit D, Fort Richardson, Alaska (Volume Ia - Remedial Investigation Report, Volume Ib - Remedial Investigation Report Appendices, Volume IIa - Risk Assessment, and Volume IIb - Postwide Risk Assessment)	Nov-98
	X	Final RI/FS, Operable Unit D, Fort Richardson, Alaska (Volume III - Feasibility Study)	Jan-99
		Revised Proposal for OUD Sampling, Fort Richardson, Alaska	Jul-00
D		Remedial Action Report(s)	
	X	Re: Draft Remedial Design/Remedial Action Report - Building 35-752, Building 45-590, and Building 796	No Date
		Draft Remedial Design/Remedial Action Report - Building 35-752, Building 45-590, and Building 796	Aug-99
D		O&M Manuals	
		Operation and Maintenance Manual, Building 796, Install/Replace Oil Water Separators, Fort Richardson, Alaska	Jan-98
D		Sampling/Monitoring Plans, Reports, and Data	
		Delivery of Draft Sampling Memos, 2000 Sampling	Sep-00
		OUD Groundwater B 796 9000-219	Feb-01
	X	Draft Post RI Sampling Report - Buildings 796 and 955, Fort Richardson	Mar-01
E	X	*Record of Decision, Operable Unit E, Fort Richardson, Alaska*	Sep-05
E		*Remedial Design*	
		Fort Richardson, Analysis of Existing Facilities/Environmental Assessment Report	Feb-83
		Site Safety and Health Plan, Site 4, Building 35-752, High Frequency Transmitter Site, Fort Richardson, Alaska	Aug-93
		Release Investigation Report And Corrective Action Plan Building 45-590 Fort Richardson, Alaska	Sep-94
		Release Investigation Report Underground Storage Tank Sites Fort Richardson, Alaska	Jan-94
		Draft Quarterly Ground Water Monitoring Report March 1995 Sampling Event Building 45-590 Fort Richardson, AK	May-95
	X	*Decision Document For Building 45-590, Underground Storage Tank 59A Fort Richardson, Alaska*	Sep-96
		Draft Remedial Design/Remedial Action Report - Building 35-752, Building 45-590, and Building 796	Nov-96
		OUE Revised Final Management Plan Remedial Investigation/Feasibility Study	May-02
		OUE FRA Environmental Staging Facility Work Plan FRA	Jun-02
		OUE Environmental Staging Facility Work Plan and Quality Program Plan	Jun-02
		Circle Drive Stockpiles and Building 47-220 Excavation, Assessment, and Treatment - Fort Richardson, Alaska	Aug-02
		Circle Drive Stockpile Assessment, Fort Richardson, Alaska	Sep-02
		OUE Revised Final Management Plan Remedial Investigation/Feasibility Study	Nov-02
		OUE RI Chemical Quality Assurance Report	May-04
		Final OUE FS	Sep-04
		Final OUE RI/FS	Sep-04
	X	*Final OUE Proposed Plan*	Oct-04
	X	*RCRA Closure Evaluation and Respone For Building 755 - Auto Hobby and Crafts Center, Building 955 - DEH Preventative Maintenance Oil/Water Separator Sludge Bin, Building 986 - Tanks and Containers, Building 35-752, January 2006*	Jan-06
E		*Sampling/Monitoring Plans, Reports and Data*	
		Groundwater sampling @ OUE March 2002 Volume 1	Apr-02
		Groundwater sampling @ OUE March 2002 Volume 2	Apr-02

Table 2-1: Fort Richardson Second Five-Year Review Resource Documents

OU	Key Ref[1]	Document	Issuance Date
		Groundwater sampling @ OUE March 2002 Volume 3	Apr-02
		Groundwater sampling @ OUE March 2002 Volume 4	Apr-02
		OUE Environmental Staging Facility Progress Status & Management Report	May-02
		OUE Environmental Staging Facility Progress Status & Management Report	Jul-02
		OUE Environmental Staging Facility Progress Status & Management Report	Jan-03
		OUE Environmental Staging Facility Progress Status & Management Report	Jan-03
		Groundwater Sampling at OUE August 2002	Apr-03
		Groundwater Sampling at OUE August 2002	Nov-02
		OUE Groundwater Monitoring Program Report, Spring 2003	Sep-03
		OUE Final Fall 2003 Groundwater Sampling Report	May-04
		Annual Reports, OUB, OUE AVMA, Bldg 786 and 762, Ft Richardson Groundwater Sampling Program DERA	Nov-05
		OUB, OUE AVMA, Bldg 786 and 762 Fall Groundwater Monitoring Reports	Jun-06
	X	*OUE Armored Vehicle Maintenance Area - Groundwater Monitoring Report*	Dec-06
	X	*OUE Armored Vehicle Maintenance Area October 2007 Groundwater Monitoring Report*	Jan-08

[1]Key reference used in Fort Richardson Five-Year Review

[2]All FY07 data presented in Section 6.0 of the Second Five Year Review will be available in the comprehensive Remediating and Monitoring White Phosphorous Contamination at Eagle River Flats, Operable Unit C, Fort Richardson, Alaska FY07 Data Report. This report is expected to be published in 2008.

Notes: Source areas in *italics* indicate a change of status since listed in the 2003 5 Year Review.

3.0 FORT RICHARDSON NPL SITE BACKGROUND

This section is an overview of the post wide Fort Richardson NPL site. Background information on the individual OUs is presented in the OU-specific sections of this document.

3.1 POST HISTORY

In 1939, increasing world tensions caused the establishment of Elmendorf Field just outside of Anchorage. One year later, the name Fort Richardson was adopted by the U.S. War Department in memory of Brigadier General Wilde P. Richardson.

Japanese aggression in the Aleutian Islands emphasized the strategic importance of Alaska. Fort Richardson's first mission was defense of southern Alaska by establishing a permanent air base, supply depot, and garrison. When the Japanese attacked Pearl Harbor in 1941, Fort Richardson was charged with defending Alaska from invasion and coordinating the Alaskan war effort. Before the outbreak of World War II, military strength in Alaska was less than 3,000; it soon grew to 7,800 troops stationed at Fort Richardson alone, including the 4th Infantry, 85th Field Artillery, and 75th Coast Artillery (Anti-Aircraft). As the war progressed, Fort Richardson's mission expanded significantly as the logistics base for numerous Army garrisons and the Air Corps.

Army troops were redesignated as the United States Army Alaska on November 15, 1947, and assigned to the Alaskan Command, the nation's unified command staffed jointly by Army, Navy, and Air Force officers.

Headquarters for U.S. Army Alaska were established at FRA. At that time the post was located on what is now Elmendorf Air Force Base. After the establishment of the Air Force as a separate service in 1947, the Army post was rebuilt on its present location in 1950.

In December 1974, as part of worldwide realignments, U.S. Army Alaska was inactivated and the post became headquarters for the 172nd Infantry Brigade (Separate) in January 1975. As in previous years, subordinate posts were maintained at FWA (near Fairbanks) and Fort Greely (near Delta Junction).

In a subsequent realignment in March 1986, the newly reactivated 6th Infantry Division (Light) replaced the 172nd Infantry Brigade (Separate). This marked a new mission for the Army in Alaska as a light, deployable force capable of defending United States interests across the globe. The division became aligned more closely with the Defense Department's forces in the Pacific when, in 1989, it began reporting to the US Army Western Command in Hawaii (later re-designated United States Army Pacific).

Headquarters was established on FRA and remained there until 1990. In 1990, headquarters for the 6th was moved to FWA. In 1993, as part of Army-wide downsizing, the 6th was reorganized as a light infantry brigade. The 6th Infantry Division (Light) was inactivated July 1994, and FRA became headquarters for United States Army Alaska (USARAK) when U.S. Army Alaska was restructured. In 1998, the 1st Brigade, 6th Infantry Division (Light) was deactivated, and the 172nd Infantry Brigade (Separate) was reactivated.

Fort Richardson was identified for realignment/joint basing with Elmendorf Air Force Base during the 2005 Base Closure and Realignment (BRAC) selection process. The realignment also supports the Department of Defense's global force re-posturing while restructuring important support functions to capitalize on advances in technology and business practices.

While details of how this will impact all the cleanup (restoration) sites on Fort Richardson remains to be addressed, it is known that Garrison support functions, including that of the Environmental Department and Cleanup Branch, will generally transfer to the Air Force. Cleanup responsibilities may be split from retention with the Army to transfer to the Air Force. How current agreements such as the Federal Facilities Agreement or signed Records of Decision, will be handled, also remains to be determined. The action for the transfer of functions and property is currently set for 1 October 2009.

3.2 CERCLA HISTORY

In 1988, EPA Region 10 placed Fort Richardson on the hazardous waste compliance docket. The Army's investigation of contaminated sites at Fort Richardson under the IRP began in 1988. The objectives of the IRP are to assess sites where potentially hazardous material may exist and to develop and recommend remedial actions for those sites that pose a threat to human health and welfare or the environment. The IRP is the basis for response actions under the provisions of CERCLA.

Because known or suspected releases of hazardous chemicals were identified on the Post, Fort Richardson was proposed for placement on the CERCLA NPL on June 18, 1993 and listed on June 1, 1994. As a result, environmental assessment and remediation activities at Fort Richardson are being performed to comply with CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 and subsequent amendments.

Attachment I to the FFA describes the investigation and restoration approach agreed upon by the Army and the regulatory agency parties to the agreement. The FFA identified a number of source areas based on historical uses and past investigations and initially listed 102 potential source areas at Fort Richardson. No Further Action (NFA), response complete, was selected for 70 of these source areas. An additional nine source areas were identified for NFA under CERCLA following the FFA. Nineteen of the remaining potentially contaminated source areas were grouped into four OUs. Four source areas with known or suspected Petroleum (non-UST) contamination were transferred for investigated in accordance with the Environmental Restoration Agreement (Two Party Agreement). A listing of all the sites identified in the FFA and their current disposition is provided in Table 3-1.

Source areas were evaluated through a screening process called a Preliminary Source Evaluation (PSE). The PSE included record searches, interviews, and if warranted, limited field investigations. During the investigations, analytical data was generated for many chemicals. The target analyte list for each source area was determined based on site history and previous investigations. PSEs lead into the remedial investigations (RI), followed by feasibility studies (FS) for the selection of remedies, remedial designs (RD), remedial action (RAs), Operation and maintenance (O&M) associated with remedial actions, and long-term monitoring (LTM). The history of contamination and remediation of source areas are summarized in the OU-specific sections of this report. Documents that record all investigation and cleanup decisions are located in the administrative record.

Under OUD, a post wide human health and ecological risk assessment was performed for the entire Fort Richardson Army Post to supplement the individual risk assessments conducted for each source. The objectives of the post wide risk assessment were to evaluate potential risks to wide-ranging receptors that may be exposed to multiple source areas and to fill data gaps that became evident upon thorough review of all data collected during each RI for each OU. The current postwide human health risk assessment remains protective; however, it will be evaluated as part of the OUE RI/FS and updated as necessary.

Pursuant to the 1991 FFCA, the Army conducted sampling activities at solid waste management units addressed in the FFCA to establish whether or not hazardous wastes were managed at these units, and in some instances, prepared closure plans. These closure plans, developed under the RCRA program guidelines, were used as an integral part of the CERCLA cleanup actions.

3.3 LAND AND RESOURCE USE

Fort Richardson encompasses approximately 61,376 acres. The post is located in south-central Alaska adjacent to the cities of Anchorage and Eagle River, and Elmendorf Air Force Base. The Knik Arm of Cook Inlet borders the north side of the post, and Chugach State Park lies to the south and southeast. The Town of Eagle River lies along the northeast border; Anchorage and Elmendorf Air Force Base form the western boundary.

The western boundary is approximately 11 miles long, from the Knik Arm to its terminus beside Anchorage and Chugach State Park. The eastern border is 21 miles, and also runs from the Knik Arm to Chugach State Park. Fort Richardson is approximately six miles across, from east to west. The cantonment area is situated at the base of the Chugach foothills, on the alluvial floodplain between the Chugach Mountains and the Knik Arm of Cook Inlet. Located approximately seven miles from downtown Anchorage, the cantonment area is bordered on the west by Elmendorf Air Force Base, on the north by training areas, on the east by the Glenn Highway, and on the south by Ship Creek, recreational areas, and training areas.

The majority of the land currently used by USARAK is on long-term withdrawal from the public domain and was originally assigned to the Bureau of Land Management (BLM). Residual responsibility for USARAK withdrawn lands remains with the BLM, which retains interest in the stewardship of the transferred parcel even though the land is under the Department of Defense's long-term management.

Land use at Fort Richardson is varied. More than 75 percent of the total land area in Fort Richardson is dedicated to ranges, combat courses, drop zones, airfields, troop loading yards, training facilities, open storage areas, and ammunition storage areas. Other industrial-type activities that take place at Fort Richardson occur mostly in the cantonment area and include the following: vehicle maintenance, general equipment and building maintenance, pest control and grounds keeping, photographic processing, printing, dry-cleaning, drinking water treatment, and dental and medical services. A portion of the base has been developed for troop training and support operations, including housing and recreational facilities. The remaining acreage is basically undeveloped and includes wetlands, lakes, and ponds. Fort Richardson's land use also provides the services, facilities, and infrastructure necessary to support the rapid deployment of Army forces from Alaska to the Pacific Theater. Force transformation for U.S. Army Alaska has resulted in construction of new infrastructure including barracks, motor pools, and housing. Recreational uses are permitted where consistent with the military mission.

Eagle River and Ship Creek are the primary streams on the installation, running from east to west. Ship Creek, the primary water source for Fort Richardson and Elmendorf Air Force Base, runs through Fort Richardson. Fort Richardson obtains drinking water from the Ship Creek Dam Reservoir and has several emergency water supply wells near Ship Creek. Groundwater used for the emergency water supply is obtained from the confined aquifer in the Knik outwash deposit. Water storage for Fort Richardson is provided by a permanent 2.5 million gallon underground reservoir in the Elmendorf Moraine, and by the Ship Creek Dam Reservoir at the base of the Chugach Mountain Range. A water treatment plant near the dam processes the drinking water. A drinking water well is located at the Otter Lake Recreational facility, located approximately 2 miles from the cantonment area.

3.4 PHYSICAL CHARACTERISTICS

3.4.1 Physiography

Fort Richardson lies in an alluvial plain, often referred to as the Anchorage Lowland, which is bordered on the east by the Chugach Mountains and on the north, south, and west by waters of the Cook Inlet. Fort Richardson is situated in a transitional zone on the eastern edge of the Anchorage Lowland and is inundated with four major drainages that originate in the Chugach Mountains. The topography of Fort Richardson has been highly influenced by glacial activity and the effects of stream deposition and erosion.

The Chugach Mountains rise rather abruptly to more than 5,000 feet along their front facing the Anchorage lowlands. Only a small western section of the Chugach Mountains is contained within the boundaries of Fort Richardson. The valleys of the Chugach Mountains are occupied by major and minor drainages including Ship Creek, Eagle River, Campbell Creek, and Chester Creek.

The Anchorage Lowland is characterized by rolling hills with 50 to 250 feet of relief in eastern areas along the Chugach Mountains. Towards the west, the terrain flattens into an alluvial plain that is inundated with broad shallow channels and wetlands. This area is characteristic of glaciated terrain and contains various landforms, including moraines, esker deposits, outwash plains, and estuarine sediments.

The principal features transecting Fort Richardson are the Elmendorf moraine, the Mountain View alluvial fan, ground moraines, and Eagle River Flats tidal marsh. The Mountain View fan originates at the mouth of the Eagle River Valley. The fan slopes gently to the west-southwest and underlies most of the main cantonment area of Fort Richardson. The main deposits of the Elmendorf moraine form a low lying ridge that tends to run east to west across the region immediately north of the main cantonment area of Fort Richardson.

The ground moraines were formed by a number of physical processes that operate underneath glaciers. The ground moraine found on the northern part of Fort Richardson was probably formed at the same time as the Elmendorf moraine. The southern ground moraine lies much deeper and was likely created by a glacial event that preceded formation of the northern ground moraine. The ground moraines tend to be extensive deposits of glacial till with hummocky surfaces and moderately gentle slopes.

Eagle River Flats is a low-lying tidal marsh located north-northwest of the main cantonment area on Fort Richardson that was created by various estuarine processes. Modern estuarine

sediments are continually deposited during spring flood events and by tidal fluctuations of up to 30 feet or more. Older estuarine deposits are found extensively in Eagle River Flats and were likely deposited during the Holocene Epoch. Estuarine deposits are generally composed of well-bedded and sorted silt and fine sands.

3.4.2 Geology

The geology of Fort Richardson and adjacent lands has been extensively mapped. The thick sequences of unconsolidated Quaternary deposits that underlie Fort Richardson have accumulated primarily as a result of glacial and marine sedimentation. These deposits thicken westward from the base of the Chugach Mountains. Below the Fort Richardson cantonment, glacial sediments range from 230 to 320 feet thick according to well logs. They are up to 1000 feet thick elsewhere in the Anchorage basin.

The underlying geology of Fort Richardson is complex and highly variable due to deposition that occurred during the advance and retreat of glaciers with intermittent marine incursion (marine sedimentary processes). The following paragraphs provide descriptions of the various geologic units, but are not intended to reflect exact conditions underlying any given site on Fort Richardson.

The Mountain View fan is commonly on the order of 40 to 60 feet thick under most of the main cantonment area. The fan consists mostly of sands and gravels with a high concentration of silt and clay. The formation is highly layered, and it is common to find lenses of clay and silt interbedded within the sand and gravel. Silt and clay lenses were likely deposited during floods and also could have resulted from deposition in small ponds and lakes.

The Elmendorf moraine lies beneath the Mountain View fan in the area of the main cantonment. The Elmendorf moraine is an end moraine and consists primarily of diamicton (poorly-sorted mixtures of silt, sand, and gravel) along with coarse gravel, fine well-sorted sand, dense silt, and moderately to well-compacted clay. The lateral and ground moraine deposits tend to consist of diamicton of variable thickness with interbedded lenses of sand, silt, and gravel. In areas where the Mountain View fan is absent, the moraine deposits represent the upper geologic unit. Coarse outwash deposits intermingled with deposits of unsorted material can be found along the front of the moraine. Older ground moraine deposits can be found in the southern part of the cantonment area.

The Bootlegger Cove Formation, an intermediate formation often referred to as the Bootlegger Cove Clay, was formed during the advance and retreat of glacial ice, with an intermittent period of marine intrusion. The thickness of the Bootlegger Cove Formation is quite variable, but has been found to be almost 300 feet thick in parts of the Anchorage Lowland. Even though the Bootlegger Cove Formation is extensive, evidence exists to suggest that the formation does not extend much further northeast than the edge of the cantonment area. The formation is likely not found north and east of the cantonment area and is suspected to be only about 30 feet thick in the south-southwest areas of the post.

The lower geologic sequences (Dishno Pond moraines, Fort Richardson moraines, and Rabbit Creek moraines) all tend to be glacial diamictons. Because of a lack of deep geologic borings and geophysical surveys, many of the descriptions of these sequences are speculative and descriptions vary. The Dishno Pond Sequence appears to underlie much of the Anchorage Lowland and the diamicton should be similar to the Fort Richardson diamicton, and be a few to

tens of meters thick. The Fort Richardson diamicton is thought to be highly stratified with sand and gravel horizons. This description is based on the proposed glacial history of the Anchorage basin. The Rabbit Creek moraine lies on top of the Kenai Formation (sedimentary bedrock). There is some evidence that layers of silt and clay were deposited between these moraines during periods of marine inundation.

3.4.3 Hydrology

Groundwater on Fort Richardson is found in both an unconfined and a confined aquifer. Water recharges the groundwater on Fort Richardson and the Anchorage Bowl in several ways. Along the mountains, groundwater seeps from bedrock fractures into the glacial deposits. In the foothills and lowlands, water flows from streams into the unconfined aquifer where the water table is below the stream elevation. In the lowlands, rain and snowmelt percolate from the surface into the groundwater.

The hydrogeology of Fort Richardson is complicated due to deposits from multiple glacial advances through the region. There is an unconfined aquifer and multiple confined aquifers that connect in some places. The unconfined aquifer is generally composed of poorly sorted, sandy gravel with varying amounts of silt. In general, low-permeability layers containing clay and sand underlie the unconfined aquifer. The clay is present at depths ranging from 30 to 175 feet. The low-permeability clays create a lower boundary for the unconfined aquifer and an upper boundary for the confined aquifer. The confined aquifer joins the unconfined aquifer just north of the Davis Highway, where the clay layers end. The hydraulic gradient of the unconfined aquifer generally trends northwesterly, following the topography of the Mountain View Fan. The overall trend in flow direction in the confined aquifer is to the northwest, except to the north of Bryant Airfield where groundwater flow patterns are unclear.

Perched groundwater tables are common on Fort Richardson. They form when water from precipitation infiltrates the ground surface and forms pools on top of discontinuous layers of low-permeability silt and clay layers. These perched groundwater tables are found at a higher elevation than the main unconfined groundwater table. Contaminants that enter the ground from the surface can also pool on discontinuous, low-permeability layers. Measured depths to groundwater on Fort Richardson range from near the surface at Ship Creek, to 200 feet near Bryant Airfield.

Four major streams and rivers pass through sections of Fort Richardson. In addition, numerous other small streams, lakes, and wetland area are found on Fort Richardson. Fort Richardson has 12 named lakes and ponds and multiple other unnamed surface water bodies. The combined area for the named lakes and ponds is 359 acres. Five relatively large lakes, Clunie, Otter, Gwen, Thompson, and Waldon, are managed for recreational fishing.

Eagle River is a glacial waterway that originates at the base of the Eagle Glacier in the Chugach Mountains. Eagle River meanders across Fort Richardson, where it flows over an alluvial base of glacial outwash and into Eagle River Flats, a 2,200-acre estuarine tidal marsh.

Ship Creek, a non-glacial stream, originates at Ship Lake in the Chugach Mountains and flows 25 miles to the Knik Arm. A water supply dam located at the base of the Chugach Mountains on Fort Richardson, approximately 10 miles from the mouth of the river diverts water from the stream. The watershed encompasses 90.5 square miles above the diversion dam.

Chester Creek and Campbell Creek, both non-glacial streams, are located south of Ship Creek and flow through the southwestern portion of Fort Richardson. The creeks flow into marsh wetlands at the base of the Chugach Mountains on Fort Richardson but rechannelizes near the western boundary of the post.

3.5 HISTORY OF CONTAMINATION

Since World War II, Fort Richardson has supported combat unit training and operations (primarily light infantry) that have resulted in various hazardous substances being released to soil and groundwater. Used oils, solvents, and fuel spills were reportedly discharged to the floor drains that drained directly to the sanitary sewer or to dry wells which discharged to subsurface soils. Spent solvents and contaminated fuels were routinely mixed with waste oils in the past. Waste oils, solvents, and contaminated fuels have been used for fire training practice at the fire bum pits. Waste oil USTs were installed at many of the maintenance facilities in the 1940's. Current Army practices no longer allow uncontrolled or unpermitted releases of pollutants to the environment.

The primary environmental contaminants at Fort Richardson are white phosphorous, volatile organic compounds (VOCs, usually solvents and cleaners), polychlorinated biphenyls (PCBs), fuel products, and polycyclic aromatic hydrocarbons ([PAHs] commonly used in wood preservatives and also given off in automobile or truck exhaust or during burning activities).

3.6 INSTITUTIONAL CONTROLS

The Army has established Standard Operating Procedures (SOP) and a Geographic Information System (GIS) based tracking system to ensure that the land use restrictions are enforced. The IC system has been incorporated into the post wide Master Plan, and compliance with ICs is reported in the Annual Monitoring Reports for each OU. The IC policy applies to all USARAK units and activities, Military and Civilian Support Activities, Tenants Organizations and Agencies and Government and Civilian Contractors. The initial Institutional Control Memorandum was signed by Major General Cash in February 1999. The IC Policy required a Work Authorization Permit for all groundwater and soils on USARAK lands. The memorandum was updated in February 2002 and signed by the Commanding General. The major revision was the addition of a section on areas with ICs mandated by a Record of Decision and a section on areas where contamination is not suspected. Currently, all contracts that include intrusive activities require a Work Authorization Permit. The Permit was recently updated to clearly alert the user on procedures to follow when potential contamination is encountered. The Standard Operating Procedure (SOP) for ICs will include a more detailed section on the procedures and responsibilities for incidents where potential contamination is found. The SOP is currently being updated.

Fort Richardson instituted a post wide IC policy for all known or suspected contaminated source areas. A map showing the IC boundaries for all the OUs at Ft Richardson is provided as Figure 3-1. Further details of the Army/Fort Richardson IC policy can be found in Appendix E of the OUB *Draft Interim Remedial Action Report.* Copies of the U.S. Army Alaska Institutional Controls Standard Operating Procedures [(APVR-RPW [200-1)], and a Memorandum on Institutional Controls [APVR-RPW-EV (200-1c)] are provided in Appendix E of this document. IC policies include the following:

- No unauthorized intrusive actions take place at source areas,

- No unauthorized potable water wells are installed on source areas with groundwater contamination, and
- No soil excavation greater than six inches can occur without obtaining an Excavation Clearance Request (ECR). The ECR will identify potential concerns at the source area, insure knowledge of the procedures for handling contaminated soils on Fort Richardson, and identify potential areas of concern.

USARAK DPW maintains the GIS database with information on all of the contaminated source areas on Post. The DPW is responsible for ensuring ICs on Fort Richardson are enforced. ICs will remain in place as long as hazardous substances remain on site at levels that preclude unrestricted use.

Table 3-1: Current Disposition of Source Areas at Fort Richardson Identified in the Original FFA.

OU	BLDG/ LOC.	SITE DESCRIPTION	POTENTIAL COCs	STATUS	COMMENTS	WC REPORT SITE #	1990 RFA SWMU	NOTES & REFS.
2PTY	986	POL LABORATORY DRYWELL	WASTE OIL, LUBRICANTS, AVIATION FUELS, SOLVENTS, ACID, ALCOHOL, REAGENTS, POL SOIL	2PTY, CURRENTLY NFA - LTO PHASE WITH ICs	CLOSES EVALUTATION CONDUCTED IN 2004.	W020	60	USATHAMA 1991 PROPERTY REPORT AND RCRA FACILITY ASSESSMENT (1990 RFA)
A	67630	ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD	PCB'S IN TRANSFMR OIL	2PTY, CURRENTLY NFA - WITH ICs	CONTAMINATED SOIL WAS EXCAVATED PRIOR TO ROD AND SITE WAS NFA IN ROD. SITE HAS SINCE BEEN SAMPLED AND CAPPED WITH 6 FEET OF SOIL.	W010	118	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
A	FMR LNDFIL#9 (RUFF ROAD)	RUFF ROAD FORMER FIRE TRAINING AREA	CONSTRUCTION RUBBLE, JP-4, CHLORINATED & NONCHLOR. SOLVENTS	2PTY, CURRENTLY NFA - WITH ICs	SITE UNDERWENT SVE TREATMENT AS PART OF 2PTY AGREEMENT AND HAS SINCE BEEN NFRAP WITH ICs.	W040	97	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
B	POLELINE ROAD DISPOSAL AREA	POLELINE ROAD DISPOSAL AREA	DECON. SOLVENTS, SMOKE CANNISTERS, CW TRAINING MATERIAL	LTM WITH ICs	CURRENTLY PERFORMING GROUNDWATER MONITORING AND DEVELOPING GROUNDWATER CONTAMINANT MODEL. TWO ADDITIONAL WELLS INSTALLED.	N087		NONE
C	EAGLE RIVER FLATS	EAGLE RIVER FLATS IMPACT AREA	WHITE PHOSPHORUS	SHORT TERM RAO OBJECTIVE MET. LONG TERM OBJECTIVE WORK IN PROGRESS	STARTING 10TH YEAR OF ACTIVE REMEDIAL ACTION WITH PONDING PUMPING TO DRY SEDIMENTS AND ELIMINATE WP.	W006	117	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
C	EAGLE RIVER FLATS	OPEN BURN/OPEN DEMO AREA	POWDER BAGS, FUZES, TNT, GRENADES,ROCKET MOTORS, PROJECTILES, ASH	RCRA CLOSURE	NFA UNDER CERCLA AND REFERRED TO RCRA FOR CLOSURE.	W025	99	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
D	700	FORMER DRUM/PCB STORAGE AREA	POL	NFA UNDER CERCLA AND 2PTY	NFA IN OUD ROD. GROUNDWATER SAMPLING INDICATED THAT SITE WAS CLEAN AND NFRAP UNDER 2PTY.	W009	1, 91	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
D	704	FORMER ROADS AND GROUNDS DRUM STORAGE & WASTE ACCUMULATION AREA	WASTE SOLVENT	NFA UNDER CERCLA AND 2PTY	NFA IN OUD ROD. SAMPLING INDICATED THAT SITE WAS CLEAN AND NFRAP UNDER 2PTY.	R053	3, 4	1990 RFA
D	726	FORMER LAUNDRY & DRYCLEANING USTs	PERCHLORETHYLENE, SLUDGE	NFA	NFA IN OUD ROD. LOW LEVEL CONTAMINATION AT DEPTH NOT CONSIDERED A RISK.	W016	9, 10, 11, 12, 13, 14, 15, 120	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
D	796	DOL MAINT, AREA --FORMER BATTERY ACID DISPOSAL SITE	NEUTRALIZED BTRY ACID, HEAVY METALS	NFA IN OUE ROD	GROUNDWATER AT THE SITE WAS SAMPLED POST OUD ROD. NO CONTAMINANTS EXCEEDED MCLs.	R059	37	1990 RFA
2PTY	955	USED OIL TRANSFER AREA (SLUDGE BIN)	PESTICIDES, USED OIL/FUEL	NFA IN OUE ROD WITH RCRA CLOSURE	CONTAMINATED SOIL DISPOSED OF AT PERMITTED DISPOSAL FACILITY. SOIL SAMPLES COLLECTED POST OUD ROD. NO CONTAMINANTS EXCEEDED CLEANUP LEVELS OR RBCs SO SITE WAS BE CLOSED UNDER THE OUE ROD.	R060	41	1990 RFA

Table 3-1: Current Disposition of Source Areas at Fort Richardson Identified in the Original FFA.

OU	BLDG/ LOC.	SITE DESCRIPTION	POTENTIAL COCs	STATUS	COMMENTS	WC REPORT SITE #	1990 RFA SWMU	NOTES & REFS.
2PTY	45590	MOTOR POOL	WASTE OIL, LUBRICANTS, ANTIFREEZE, ACID, SOLV.	NFA UNDER CERCLA WITH RCRA CLOSURE	NFA UNDER CERCLA. NO EVIDENCE OF CONTAMINANT RELEASE THAT POSES AN UNACCEPTABLE RISK. GROUNDWATER IS MONITORED AS PART OF CLOSURE PLAN FOR FORT RICHARDSON LANDFILL.	W002	83	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
D	FRA LANDFILL (EAST SIDE)	LANDFILL FORMER FIRE TRAINING AREA	OIL, SOLVENT, TRANSM./BRAKE/HYDRAULIC FLUID, WATER CONTAM. DIESEL, JP-4	NFA	NFA UNDER CERCLA. NO EVIDENCE OF CONTAMINANT RELEASE THAT POSES AN UNACCEPTABLE RISK. GROUNDWATER IS MONITORED AS PART OF CLOSURE PLAN FOR FORT RICHARDSON LANDFILL.	W015	98	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
D	FRA LANDFILL (EAST SIDE), approx. 1000' sw of FF PIT #2	GREASE PIT #1	COOKING GREASE, PETROLEUM, GREASE/OIL, O/W SEDIMENT SEPARATOR BOTTOMS, FUEL TANK WATER, ETHYL GLYCOL	NFA	NFA UNDER CERCLA. NO EVIDENCE OF CONTAMINANT RELEASE THAT POSES AN UNACCEPTABLE RISK. GROUNDWATER IS MONITORED AS PART OF CLOSURE PLAN FOR FORT RICHARDSON LANDFILL.	R072	92	1990 RFA
D	FRA LANDFILL (EAST SIDE), approx. 1000' sw of FF PIT #2	GREASE PIT #2	COOKING GREASE, PETROLEUM, GREASE/OIL, O/W SEDIMENT SEPARATOR BOTTOMS, FUEL TANK WATER, ETHYL GLYCOL	NFA	NFA UNDER CERCLA. NO EVIDENCE OF CONTAMINANT RELEASE THAT POSES AN UNACCEPTABLE RISK. GROUNDWATER IS MONITORED AS PART OF CLOSURE PLAN FOR FORT RICHARDSON LANDFILL.	R073	93	1990 RFA
D	CIRCLE ROAD DRUM SITE	CIRCLE ROAD DRUM SITE	POL	NFA WITH RCRA CLOSURE	CONTAMINATION REMOVED FROM SITE AND CONFIRMATION SAMPLING INDICATED NO EVIDENCE OF CONTAMINATION REMAINING AT THE SITE THAT POSED UNACCEPTABLE RISK.	N090		NONE
D	FRA	STORM DRAINAGE OUTFALL TO SHIP CREEK	OILS, FUELS, SOLVENTS	NFA	NFA UNDER CERCLA. NO EVIDENCE OF CONTAMINANT RELEASE THAT POSES AN UNACCEPTABLE RISK. GROUNDWATER IS MONITORED AS PART OF CLOSURE PLAN FOR FORT RICHARDSON LANDFILL.	R075	115	1990 RFA
D	FRA ROADs	DUST PALLIATIVE	WASTE OIL, SOLVENT	NFA	SAMPLING INDICATED NO EVIDENCE OF CONTAMINATION THAT POSES UNACCEPTABLE RISK.	W028		USATHAMA 1991 PROPERTY REPORT
E	35752	PCB SITE/UST (ANTENNA BLDG)	PCBs, POL,	RCRA CLOSURE (INSIDE BLDG), CERCLA RI/FS OUTSIDE	SITE IS BEING INVESTIGATED AS PART OF OUE AND REQUIREMENTS WILL BE DOCUMENTED IN THE OUD ROD.	W023	90	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
E	AVMA	GROUNDWATER PLUME UPGRADIENT OF 45590 SITE	CARBON TETRACHLORIDE, PCE	CERCLA RI/FS	SITE IS PART OF OUE ROD. CONTAMINANTS EXCEED MCLs. GROUNDWATER SAMPLING ANNUALLY			

Table 3-1: Current Disposition of Source Areas at Fort Richardson Identified in the Original FFA.

OU	BLDG/ LOC.	SITE DESCRIPTION	POTENTIAL COCs	STATUS	COMMENTS	WC REPORT SITE #	1990 RFA SWMU	NOTES & REFS.
	604	MEDICAL LAB	FIXATIVE W/SILVER, METHYL METHACRYLATE, REAGENTS	NFA	NO REPORTED SPILLS. WASTE GENERATED INSIDE BLDG. MEDICAL LAB REAGENT DISCHARGES INTO SANITARY SEWER SYSTEM.	W004		USATHAMA 1991 PROPERTY REPORT
	700	PAINT SHOP SPRAY BOOTH	WASTE PAINT	NFA	RELEASES TO SOIL, SURFACE WATER, OR GROUND WATER UNLIKELY; UNIT LOCATED INDOORS ON THIRD FLOOR; FILTERS CAPTURE AIR RELEASES.	R051	2	1990 RFA
2PTY	704	ROADS AND GROUNDS WASH RACK SUMP AND OIL/WATER SEPARATOR	WASHWATER W/OIL, GREASE, DIRT	NFA	SOIL SAMPLING INDICATD THAT NO RELEASE HAD OCCURRED.	R054	5, 6	1990 RFA
	706	SELF-HELP SHOP	POL, WASTE PAINT, SOLVENTS	NFA	NO REPORTED RELEASES TO SOIL, AIR, OR GROUND WATER.	N082		NONE
2PTY	710	AAFES SERVICE STATION	WASTE OIL	NFA	UNIT IN GOOD CONDITION WITH LOW POTENTIAL FOR RELEASES.	R056	7	1990 RFA
	721	PESTICIDE STORAGE AREA	INSECTICIDES, HERBICIDES, AVICIDES, RODENTICIDES, PAINT, DDT, RINSATE	NFA	NO REPORTED SPILLS. WASTE GENERATED INSIDE BLDG. WASTE WATER DISCHARGES INTO SANITARY SEWER SYSTEM.	W007	8	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
2PTY	732	MOTOR POOL	WASTE OIL, LUBRICANTS, ANTIFREEZE, ACID, SOLV.	NFA	UST TWO-PARTY SITE; NO OTHER REPORTED RELEASES TO AIR, SOIL, OR GROUND WATER.	W002	16, 71	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
	740	FORMER PAINT BOOTH	WASTE PAINTS, SOLVENTS	NFA	NO REPORTED RELEASES TO SOIL, AIR, OR GROUND WATER.	N095		DRAFT ECAR, DEC '93
2PTY	740	MAINTENANCE SHOP, WASHRACK & O/W SEP.	OIL/GREASE FROM WASH	NFA	DUE TO SUFFICIENT CONTROLS & SMALL QUANTITIES GENERATED, UNLIKELY FOR RELEASES TO GW, SW, OR AIR.	W018	17, 18, 19	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
2PTY	750	MOTOR POOL, WASHRACK & O/W SEP.	OIL/GREASE FROM WASH	NFA	DUE TO SUFFICIENT CONTROLS & SMALL QUANTITIES GENERATED, UNLIKELY FOR RELEASES TO GW, SW, OR AIR.	W018	20, 21, 22, 23, 24	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
2PTY	750	MOTOR POOL, WASHRACK & O/W SEP.	OIL/GREASE FROM WASH	NFA	DUE TO SUFFICIENT CONTROLS & SMALL QUANTITIES GENERATED, UNLIKELY FOR RELEASES TO GW, SW, OR AIR.	W018	20, 21, 22, 23, 24	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
	754	O/W SEPARATOR	WASH WATER W/OIL, GREASE, FUEL	NFA	UNIT IN GOOD CONDITION WITH LOW POTENTIAL FOR RELEASES.	R093	25	1990 RFA

Table 3-1: Current Disposition of Source Areas at Fort Richardson Identified in the Original FFA.

OU	BLDG/ LOC.	SITE DESCRIPTION	POTENTIAL COCs	STATUS	COMMENTS	WC REPORT SITE #	1990 RFA SWMU	NOTES & REFS.
2PTY	755	AUTO & CRAFT SHOP	WASTE PAINTS, GREASE, MINERAL SPIRITS, OIL	NFA	PETROLEUM CONTAMINATION AT DEPTH NOT LEACHING TO GROUNDWATER. SITE CLOSED WITH NFRAP AND ICs .	R057	27, 72	1990 RFA
2PTY	756	MOTOR POOL, WASHRACK & O/W SEP.	OIL/GREASE FROM WASH	NFA	DUE TO SUFFICIENT CONTROLS & SMALL QUANTITIES GENERATED, UNLIKELY FOR RELEASES TO GW, SW, OR AIR.	W018	28, 29, 73	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
	764	MOTOR POOL	WASTE OIL, LUBRICANTS, ANTIFREEZE, ACID, SOLV.	NFA	DUE TO SUFFICIENT CONTROLS & SMALL QUANTITIES GENERATED, UNLIKELY FOR RELEASES TO GW, SW, OR AIR.	N084		NONE
2PTY	770	MOTOR POOL	WASTE OIL, LUBRICANTS, ANTIFREEZE, ACID, SOLV.	NFA	DUE TO SUFFICIENT CONTROLS & SMALL QUANTITIES GENERATED, UNLIKELY FOR RELEASES TO GW, SW, OR AIR.	W002	75	
	772	IN-SERVICE TRANSFORM.	PCB'S IN TRANSFMR OIL	NFA	TRANSFORMER INSIDE SECURE BUILDING. SUFFICIENT CONCRETE CURBING AROUND TRANSFORMER TO CONTAIN SPILLS. NO FLOOR DRAIN.	W008		USATHAMA 1991 PROPERTY REPORT
2PTY	778	MOTOR POOL, WASHRACK & O/W SEP.	OIL/GREASE FROM WASH	NFA	DUE TO SUFFICIENT CONTROLS & SMALL QUANTITIES GENERATED, UNLIKELY FOR RELEASES TO GW, SW, OR AIR.	W018	31, 76	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
2PTY	782	VEH. WASHRACK & O/W SEP.	OIL/GREASE FROM WASH	NFA	DUE TO SUFFICIENT CONTROLS & SMALL QUANTITIES GENERATED, UNLIKELY FOR RELEASES TO GW, SW, OR AIR. 2PTY STATUS CLOSED.	W018		USATHAMA 1991 PROPERTY REPORT
2PTY	784	MOTOR POOL, WASHRACK & O/W SEP.	OIL/GREASE FROM WASH	NFA	DUE TO SUFFICIENT CONTROLS & SMALL QUANTITIES GENERATED, UNLIKELY FOR RELEASES TO GW, SW, OR AIR.	W018	32, 77	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
	789	DS/GS MAINTENANCE FACILITY	TCE, WASTE SOLVENT/OIL, GREASE, PAINT, ACID	NFA	DUE TO SUFFICIENT CONTROLS & SMALL QUANTITIES GENERATED, UNLIKELY FOR RELEASES TO GW, SW, OR AIR.	W001	78	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
2PTY	794	CANNIBILIZATION YARD	POL, SOLVENTS	NFA	SAMPLING INDICATED THAT CONTAMINANTS ARE NOT PRESENT ABOVE RISK LEVELS.	N096		DRAFT ECAR, DEC '93
2PTY	796	VEH.WASHRACK & O/W SEP.	OIL/GREASE FROM WASH	NFA	UNIT IN GOOD CONDITION WITH LOW POTENTIAL FOR RELEASES.	W018	34	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
	796	SPRAY PAINT BOOTH AND VEHICLE & WEAPONS SHOP	ENAMEL/CARC PAINT FUME	NFA	DUE TO SUFFICIENT CONTROLS & SMALL QUANTITIES GENERATED, UNLIKELY FOR RELEASES TO GW, SW, OR AIR.	R058	36	1990 RFA

Table 3-1: Current Disposition of Source Areas at Fort Richardson Identified in the Original FFA.

OU	BLDG/ LOC.	SITE DESCRIPTION	POTENTIAL COCs	STATUS	COMMENTS	WC REPORT SITE #	1990 RFA SWMU	NOTES & REFS.
	798	DS/GS MAINTENANCE	TCE, WASTE SOLVENT/OIL, GREASE, PAINT, ACID	NFA	DUE TO SUFFICIENT CONTROLS & SMALL QUANTITIES GENERATED, UNLIKELY FOR RELEASES TO GW, SW, OR AIR.	W001	79	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
	802	SUPPLY WAREHOUSE	SOLVENTS,WASTE OIL, REAGENTS, PHOTO FIXATIVE, WASTE PAINT/LITHIUM BATTERIES, HVY METALS	NFA	NO REPORTED SPILLS. WASTE GENERATED INSIDE BLDG. WASTE WATER DISCHARGES INTO SANITARY SEWER SYSTEM.	W011		USATHAMA 1991 PROPERTY REPORT
	802	RAD. MATRL. STORAGE	PDR-27, KRYPTON-85, PROMETHIUM-147, TRITIUM, RADIUM	NFA	NO REPORTED SPILLS. WASTE GENERATED INSIDE BLDG. WASTE WATER DISCHARGES INTO SANITARY SEWER SYSTEM.	W012		USATHAMA 1991 PROPERTY REPORT
	804	SUPPLY WAREHOUSE	SOLVENTS,WASTE OIL, REAGENTS, PHOTO FIXATIVE, WASTE PAINT/LITHIUM BATTERIES, HVY METALS	NFA	NO REPORTED SPILLS. WASTE GENERATED INSIDE BLDG. WASTE WATER DISCHARGES INTO SANITARY SEWER SYSTEM.	W011		USATHAMA 1991 PROPERTY REPORT
	804	RAD. MATRL. STORAGE	PDR-27, KRYPTON-85, PROMETHIUM-147, TRITIUM, RADIUM	NFA	NO REPORTED SPILLS. WASTE GENERATED INSIDE BLDG. WASTE WATER DISCHARGES INTO SANITARY SEWER SYSTEM.	W012		USATHAMA 1991 PROPERTY REPORT
	812	MOTOR POOL, WASHRACK & O/W SEP.	OIL/GREASE FROM WASH	NFA	DUE TO SUFFICIENT CONTROLS & SMALL QUANTITIES GENERATED, UNLIKELY FOR RELEASES TO GW, SW, OR AIR.	W018	40, 80	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
	908	PRINT SHOP/PHOTO LAB	GREASE,MINERAL SPIRITS, OIL, SOLV, INK, SILVER, RAGS	NFA	NO REPORTED SPILLS. WASTE GENERATED INSIDE BLDG. WASTE WATER DISCHARGES INTO SANITARY SEWER SYSTEM.	W003		USATHAMA 1991 PROPERTY REPORT
	974	SPER SHOP -- WASTE SOLVENT (TCE) ACCUMULATION AREA	TCA	NFA	NO EVIDENCE OF RELEASE TO SOIL, AIR, OR GROUND WATER.	R062	45	1990 RFA
	974	SPER SHOP	USED OIL/SOLVENTS, CHLORINATED SOLV, ANTIFREEZE, GREASE, POTASSIUM HYDROXIDE, WASTE WATER, TRICHLOROETHANE, BRAKE FLUID, CONTAM. OIL/DIESEL	NFA	NO EVIDENCE OF RELEASE TO SOIL, AIR, OR GROUND WATER.	R061	44	1990 RFA
2PTY	974	VEH.WASHRACK & O/W SEP.	OIL/GREASE FROM WASH	NFA	UNIT IN GOOD CONDITION WITH LOW POTENTIAL FOR RELEASES.	W018	49	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
	974	FUEL BLIVET CLNG AREA	WASHWATER W/FUEL, DETERG.	NFA	NO EVIDENCE OF RELEASE TO SOIL, AIR, OR GROUND WATER; SURFACE OF CLEANING AREA IS COATED CONCRETE W/CURB.	R091	46, 47	1990 RFA
2PTY	975	ELECTRONICS MAINTENANCE SHOP, VEH.WASHRACK & O/W SEP.	OIL/GREASE FROM WASH	NFA	DUE TO SUFFICIENT CONTROLS & SMALL QUANTITIES GENERATED, UNLIKELY FOR RELEASES TO GW, SW, OR AIR.	W018	50, 51, 52	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
	976	MAINT SHOP,ACID BATH/TK	WASTE ACIDS	NFA	UNIT LOCATED INSIDE BUILDING; NO REPORTED RELEASES TO SOIL, AIR, OR GROUND WATER; UNIT INACTIVE SINCE 1974; UNIT HAS BEEN REMOVED.	R065	56	1990 RFA

Table 3-1: Current Disposition of Source Areas at Fort Richardson Identified in the Original FFA.

OU	BLDG/ LOC.	SITE DESCRIPTION	POTENTIAL COCs	STATUS	COMMENTS	WC REPORT SITE #	1990 RFA SWMU	NOTES & REFS.
	976	MAINT SHOP, FIB.GLAS FILT.	FIBERGLASS PARTICLES	NFA	FILTERS LOCATED INSIDE ALUMINUM BOX INSIDE BUILDING; NO REPORTED RELEASES SOIL, AIR, OR GROUND WATER.	R066	57	1990 RFA
	978	PHOTO LAB, SILVER RECOV.	HYPO SOLUTION	NFA	SELF-ENCLOSED UNIT INSIDE BUILDING; NO REPORTED RELEASES TO SOIL, AIR, OR GROUND WATER.	R067	58	1990 RFA
	978	TASC PAINT SPRAY BOOTH	WASTE PAINTS	NFA	UNIT LOCATED INSIDE BUILDING; NO REPORTED RELEASES TO SOIL, AIR, OR GROUND WATER.	R068	59	1990 RFA
	988	RETAIL FUEL STORAGE YD	DIESEL FUEL, GASOLINE	NFA	NO EVIDENCE OF RELEASE TO SOIL, AIR, OR GROUND WATER;	W031		USATHAMA 1991 PROPERTY REPORT
	27006	MOOSE RUN GOLF CRSE	GREASE, OIL	NFA	DUE TO SUFFICIENT CONTROLS & SMALL QUANTITIES GENERATED, UNLIKELY FOR RELEASES TO GW, SW, OR AIR.	R078	81	1990 RFA
	28002	WATER TREATMENT PLANT	FILTER BACKWASH WATER., SETTLED SLUDGE, FUEL OIL	NFA	SUBJECT TO NPDES PERMIT MONITORING	W046		USATHAMA 1991 PROPERTY REPORT
	36012	CENT.HEAT & PWR PLANT/WASTE ACCUM. AREA	DIESEL FUEL, COAL, FLY ASH	NFA	SINCE UNIT IS COVERED, PAVED, AND HANDLED SMALL QUANTITIES OF WASTE, RELEASE TO GROUND WATER OR SURFACE WATER UNLIKELY.	W026	62, 104-114	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
	36013	CLASSIFIED WASTE INCIN.	CLASSIFIED WASTE, ASH	NFA	DUE TO ABSENCE OF HAZARDOUS CONSTITUENTS IN WASTES, NO POTENTIAL FOR HARMFUL RELEASES.	W027	103	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
2PTY	39600	FORMER NIKE MISSILE SITE (UPPER SITE SUMMIT), & LOWER SITE SUMMIT	WATER W/RESIDUAL SOLV, FUELS, RADIOACTIVE MATERIAL, ASBESTOS	ACTIVE 2PTY SITE	SITE WILL UNDERGO ADDITIONAL INVESTIGATION STARTING IN FY05	W048		USATHAMA 1991 PROPERTY REPORT
	45040	BOAT SHOP	ANTIFREEZE, DRYCLEAN SOLVENT, OIL, PAINT THINNER	NFA	DUE TO SUFFICIENT CONTROLS & SMALL QUANTITIES GENERATED, UNLIKELY FOR RELEASES TO GW, SW, OR AIR.	R079	82	1990 RFA
	45125	HAZ WASTE STORAGE FAC.	WASTE SOLVENT/OIL/PAINT FUEL, PCB-CONTAM. MATERIAL	NFA	INVESTIGATE IAW RCRA PERMITTING PROCESS	W022	88	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
	45133	HAZ WASTE STORAGE AREA	CONTAM. SOILS (OIL/FUEL)	NFA	INVESTIGATE IAW RCRA PERMITTING PROCESS	R071	89	1990 RFA
	45703	176 EOD MAINT FAC		NFA	DUE TO SUFFICIENT CONTROLS & SMALL QUANTITIES GENERATED, UNLIKELY FOR RELEASES TO GW, SW, OR AIR.	N081		NONE
2PTY	45726	23 EN CO MAINTENANCE FACILITY, WASHRACK & O/W SEP.	OIL/GREASE FROM WASH	NFA	DUE TO SUFFICIENT CONTROLS & SMALL QUANTITIES GENERATED, UNLIKELY FOR RELEASES TO GW, SW, OR AIR.	W018	64, 65	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA

Table 3-1: Current Disposition of Source Areas at Fort Richardson Identified in the Original FFA.

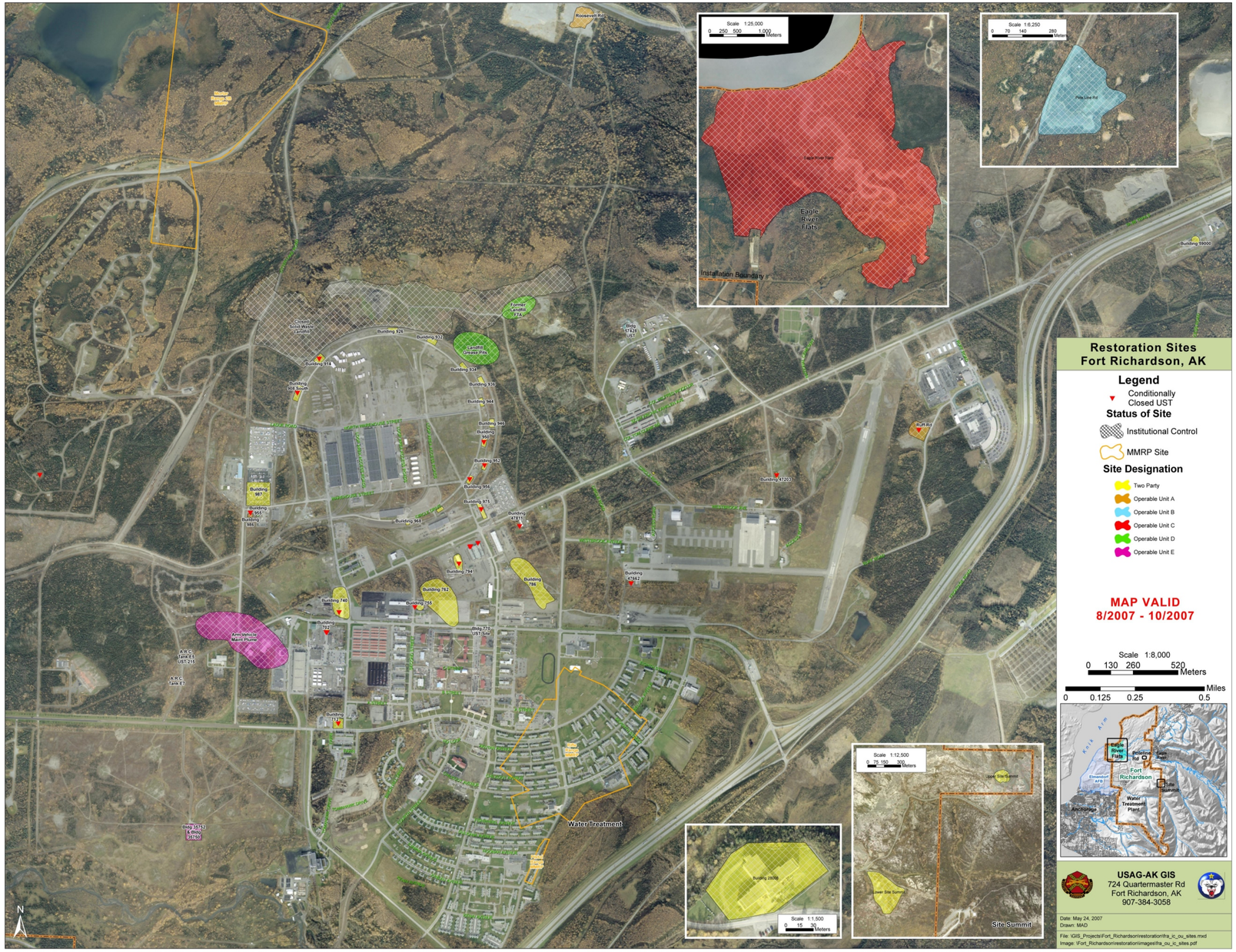
OU	BLDG/ LOC.	SITE DESCRIPTION	POTENTIAL COCs	STATUS	COMMENTS	WC REPORT SITE #	1990 RFA SWMU	NOTES & REFS.
2PTY	47203	AIRCRAFT MAINTENANCE FACILITY	WASTE JP-4, JET FUEL, OIL, HYDRAULIC FLUID, PETROL. NAPTHA, HEAVY METALS	NFA	ACLs FOR dro CONTAMINATION AT SITE. NFRAP WITH ICs.	N095		NONE
	47427	AIRCRAFT MAINTENANCE FACILITY	WASTE JP-4, JET FUEL, OIL, HYDRAULIC FLUID, PETROL. NAPTHA, HEAVY METALS	NFA	NO EVIDENCE OF RELEASE TO SOIL, AIR, OR GROUND WATER.	W021	86, (1990 RFA MISTAKENLY LISTS AS BLDG 47727 -- NO SUCH BUILDING ON RECORD)	USATHAMA 1991 PROPERTY REPORT, 1990 RFA
	47430	AIRCRAFT MAINTENANCE FACILITY	WASTE JP-4, JET FUEL, OIL, HYDRAULIC FLUID, PETROL. NAPTHA, HEAVY METALS	NFA	NO EVIDENCE OF RELEASE TO SOIL, AIR, OR GROUND WATER.	W021		USATHAMA 1991 PROPERTY REPORT
	47430	A/C WASHRACK & O/W SEP.	OIL/GREASE FROM WASH	NFA	NO EVIDENCE OF RELEASE TO SOIL, AIR, OR GROUND WATER;	W019		USATHAMA 1991 PROPERTY REPORT
	47431	AIRCRAFT MAINTENANCE FACILITY	DRYCLEAN SOLV, GREASE, HYDRAULIC FLUID, METHYL ETHYL KETONE, NAPTHA, WASTE FUELS/OIL	NFA UNDER FFA	NO EVIDENCE OF CONTAMINANT RELEASE AND SITE WAS NFA IN THE FFA.	W021	67	USATHAMA 1991 PROPERTY REPORT
	47432	AIRCRAFT MAINTENANCE FACILITY	WASTE JP-4, JET FUEL, OIL, HYDRAULIC FLUID, PETROL. NAPTHA, HEAVY METALS	NFA	NO EVIDENCE OF RELEASE TO SOIL, AIR, OR GROUND WATER;	R070	84	
	47433	AIRCRAFT MAINTENANCE FACILITY	WASTE JP-4, JET FUEL, OIL, HYDRAULIC FLUID, PETROL. NAPTHA, HEAVY METALS	NFA	NO EVIDENCE OF RELEASE TO SOIL, AIR, OR GROUND WATER;	W021		USATHAMA 1991 PROPERTY REPORT
2PTY	47641	AIRCRAFT MAINTENANCE FACILITY	WASTE FUEL, GREASE, OIL	NFA	NO EVIDENCE OF RELEASE TO SOIL, AIR, OR GROUND WATER.	R094	85	1990 RFA
2PTY	47811	VETERANARY INCIN.	ANIMAL CARCASSES, INFECTIOUS WASTE, ASH	NFA	DUE TO NATURE OF HAZARDOUS WASTES AND UNIT CONSTRUCTION, LITTLE POTENTIAL FOR HARMFUL RELEASES.	W027	102	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
	55295	AMMO DEACTIV. FURNACE	WASTE SMALL CAL. AMMO, CARTRIDGES, ASH, HVY METALS, PROPELLANT, PRIMERS, FUZES	NFA UNDER CERCLA	PENDING PERMIT APPLICATION.	W024	101	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
2PTY	59000	AK ARNG VEH MAINT FAC	WASTE FUEL, GREASE, OIL, SOLVENTS, ANTIFREEZE; OIL/GREASE FROM WASH	NFA	STATE OF THE ART UNIT LOCATED INSIDE BUILDING; NO REPORTED RELEASES TO SOIL, AIR, OR GROUND WATER.	N086		NONE
	AMMO AREA C	RAD. MATRL. DISPOSAL	RADIOACTIVE WASTES	NFA	INACTIVE SITE WITH NO KNOWN RELEASES.	W013		USATHAMA 1991 PROPERTY REPORT

Table 3-1: Current Disposition of Source Areas at Fort Richardson Identified in the Original FFA.

OU	BLDG/ LOC.	SITE DESCRIPTION	POTENTIAL COCs	STATUS	COMMENTS	WC REPORT SITE #	1990 RFA SWMU	NOTES & REFS.
	AMMO HOLDING AREA	AMMO SUPPLY POINT	AMMUNITION	NFA	AMMO SECURED INSIDE CONCRETE BUNKERS. NO KNOWN RELEASES WITHIN ASP COMPOUND.	W029		USATHAMA 1991 PROPERTY REPORT
	FIELD LOC	SEPTIC TANKS/LEACH FLDS	SAN. WASTE WATER, INDUSTRIAL WASTEWATER	NFA	NO EVIDENCE OF PAST RELEASES	W017		USATHAMA 1991 PROPERTY REPORT
	FIELD LOC	SPILL AREAS	DIESEL, MOGAS, JP-4	NFA	ALL KNOWN SPILL SITES REMEDIATED.	W049		USATHAMA 1991 PROPERTY REPORT
	FRA	ABOVE GND STORAGE TNKS	DIESEL, GASOLINE, HTNG OIL	NFA	SUFFICIENT CONTROLS IN PLACE; NO EVIDENCE OF PAST RELEASES	W041		USATHAMA 1991 PROPERTY REPORT
	FRA	ABOVE GND STORAGE TNKS	DIESEL, GASOLINE, HTNG OIL	NFA	SUFFICIENT CONTROLS IN PLACE; NO EVIDENCE OF PAST RELEASES	W042		USATHAMA 1991 PROPERTY REPORT
	FRA	UNDERGROUND STOR.TNKS	DIESEL, MOGAS, WASTE OIL,	NFA	SUBJECT TO UST TWO-PARTY AGREEMENT	W043	7, 16, 19, 23, 24, 26, 29, 30, 35, 38, 39, 42, 43, 48, 53, 61, 63, 66, 68, 69, 70, 119, 120	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
	FRA	FORMER USTs	DIESEL, MOGAS, FUEL OIL,	NFA	SUBJECT TO UST TWO-PARTY AGREEMENT	W044		USATHAMA 1991 PROPERTY REPORT
	FRA	FORMER USTs	WASTE OIL, FUEL OIL	NFA	SUBJECT TO UST TWO-PARTY AGREEMENT	W045		USATHAMA 1991 PROPERTY REPORT
	FRA	SANITARY SEWER SYSTEM	SANITARY/INDUSTRIAL WASTEWATER W/OILS, GREASE	NFA	SUBJECT TO NPDES PERMIT MONITORING	R076	116	1990 RFA
	LANDFILL #1, east sector of FRA LF, 400 acres	LANDFILL	SANITARY WASTE, WASTE OIL/BRAKE FLUID, PESTICIDES	NFA UNDER CERCLA	CLOSED UNDER SOLID WASTE REGS WITH LONG-TERM GW MONITORING	W032	94, 95	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
	LANDFILL #2, north-central sector of FRA LF; 338 acres	LANDFILL	SAN. WASTE, UNKNOWN	NFA UNDER CERCLA	CLOSED UNDER SOLID WASTE REGS WITH LONG-TERM GW MONITORING	W033		USATHAMA 1991 PROPERTY REPORT
	LANDFILL #3, south-central sector of FRA LF; 60 acres	LANDFILL	SAN. WASTE, UNKNOWN	NFA UNDER CERCLA	CLOSED UNDER SOLID WASTE REGS WITH LONG-TERM GW MONITORING	W034		USATHAMA 1991 PROPERTY REPORT
	LANDFILL #4, southwest sector of FRA LF; 3 acres	LANDFILL	CONSTRUCTION DEBRIS	NFA UNDER CERCLA	CLOSED UNDER SOLID WASTE REGS WITH LONG-TERM GW MONITORING	W035		USATHAMA 1991 PROPERTY REPORT
	LANDFILL #5, northwest sector FRA LF; 3 acres	LANDFILL	CONSTR. DEBRIS, SANITARY WASTE, METAL, WOOD, ASBESTOS, EXPLOSIVES, INFECTIOUS WASTE	NFA UNDER CERCLA	CLOSED UNDER SOLID WASTE REGS WITH LONG-TERM GW MONITORING	W036		USATHAMA 1991 PROPERTY REPORT

Table 3-1: Current Disposition of Source Areas at Fort Richardson Identified in the Original FFA.

OU	BLDG/ LOC.	SITE DESCRIPTION	POTENTIAL COCs	STATUS	COMMENTS	WC REPORT SITE #	1990 RFA SWMU	NOTES & REFS.
	LANDFILL #6, west edge of FRA LF; unk. size	LANDFILL	UNKNOWN	NFA UNDER CERCLA	CLOSED UNDER SOLID WASTE REGS WITH LONG-TERM GW MONITORING	W037		USATHAMA 1991 PROPERTY REPORT
	LANDFILL #7, adjacent to old Davis Highway (vic. Anchorage LF)	LANDFILL	SANITARY WASTE	NFA UNDER CERCLA	CLOSED UNDER SOLID WASTE REGS WITH LONG-TERM GW MONITORING	W038		USATHAMA 1991 PROPERTY REPORT
	LANDFILL #8, adj. to old Davis/Glenn Highways, approx 3 km south of the Eagle River; 3 acres	LANDFILL	CARS W/WASTE OIL, JUNK	NFA UNDER CERCLA	CLOSED UNDER SOLID WASTE REGS WITH LONG-TERM GW MONITORING	W039		USATHAMA 1991 PROPERTY REPORT
	UC553983	RT BRAVO TRANSFORMER SITE (VIC. GWEN LAKE)	PCBs, METALS	NFA	CONTAMINANTS BELOW EPA ACTION LEVELS.	N089		USAPACEHEA REPORT, 31 JAN 94
	VARIOUS FIELD LOCATIONS	OPEN BURNING SITES AND FIRING RANGES/IMPACT AREAS	LEAD, MUNITIONS WASTE FROM MORTAR, SMALL ARMS, GRENADES, ROCKETS	NFA	ACTIVE TRAINING FACILITIES FOR MARKSMANSHIP/GUNNERY TRAINING WITH NO EVIDENCE OF ADVERSE ENVIRONMENTAL EFFECTS.	W005	100	USATHAMA 1991 PROPERTY REPORT AND 1990 RFA
	VIC. UC577959	TRANSFER STATION	FRA SOLID WASTE, ASBESTOS	NFA	NO REPORTED RELEASES TO SOIL, AIR, OR GROUND WATER.	R074	96	1990 RFA



Building 796 (FTRS-01)
RRSE RATING: Low
CONTAMINANTS OF CONCERN:
Chloroform, Carbon Tetrachloride
MEDIA OF CONCERN:
Soil, Groundwater
COMPLETED IRP PHASE:
PA/SI, RI/FS, IRA
CURRENT IRP PHASE:
Response Complete - 2000

Building 756 North (FTRS-03)
RRSE RATING: NE
CONTAMINANTS OF CONCERN:
Petroleum
MEDIA OF CONCERN:
Soil
COMPLETED IRP PHASE:
PA/SI, RI/FS, IRA, RA
CURRENT IRP PHASE:
Response Complete - 1994

Building 45-590 (FTRS-05)
RRSE RATING: Low
CONTAMINANTS OF CONCERN:
Petroleum
MEDIA OF CONCERN:
Soil, Groundwater
COMPLETED IRP PHASE:
PA/SI, RI/FS, 6 IRAs, RA
CURRENT IRP PHASE:
Response Complete - 2000

Building 794 (FTRS-07)
RRSE RATING: Low
CONTAMINANTS OF CONCERN:
Petroleum, VOC, Ethylene Glycol, Metals
MEDIA OF CONCERN:
Soil, Groundwater
COMPLETED IRP PHASE:
PA/SI, RI/FS
CURRENT IRP PHASE:
Response Complete - 1998

Building 986, POL Dry Well (FTRS-09)
RRSE RATING: Low
CONTAMINANTS OF CONCERN:
Petroleum
MEDIA OF CONCERN:
Soil
COMPLETED IRP PHASE:
PA/SI, RI/FS, 3 IRAs, RD, RA, RA(O)
CURRENT IRP PHASE:
Response Complete - 2003

Building 634, Dental Lab (FTRS-11)
RRSE RATING: NE
CONTAMINANTS OF CONCERN:
None
MEDIA OF CONCERN:
None
COMPLETED IRP PHASE:
PA/SI
CURRENT IRP PHASE:
Response Complete - 1993

Main Shop, Bldg T-45 (FTRS-13)
RRSE RATING: NE
CONTAMINANTS OF CONCERN:
Petroleum
MEDIA OF CONCERN:
Soil
COMPLETED IRP PHASE:
PA/SI, RI/FS, RA
CURRENT IRP PHASE:
Response Complete - 1994

Poleline Road Disposal Area (FTRS-39)
RRSE RATING: Medium
CONTAMINANTS OF CONCERN:
Solvents
MEDIA OF CONCERN:
Soil, Groundwater
COMPLETED IRP PHASE:
PA/SI, 5 IRAs, RI/FS, RA, RD, RA, RA(O)
CURRENT IRP PHASE:
LTM
FUTURE IRP PHASE:
LTM

Nike Site Summit (FTRS-47)
RRSE RATING: Medium
CONTAMINANTS OF CONCERN:
Petroleum, VOCs
MEDIA OF CONCERN:
Soil, Groundwater
COMPLETED IRP PHASE:
PA/SI
CURRENT IRP PHASE:
RI/FS
FUTURE IRP PHASE:
RI/FS, RA, LTM

Building 908 South (FTRS-72)
RRSE RATING: Not Required
CONTAMINANTS OF CONCERN:
Petroleum
MEDIA OF CONCERN:
Soil
COMPLETED IRP PHASE:
RI/FS, RA
CURRENT IRP PHASE:
Response Complete
FUTURE IRP PHASE:
IC, Response Complete

Synopsis From Fort Richardson Installation Action Plan FY06

Building 908 North (FTRS-02)
RRSE RATING: NE
CONTAMINANTS OF CONCERN:
Petroleum
MEDIA OF CONCERN:
Soil
COMPLETED IRP PHASE:
PA/SI, RI/FS, 2 IRAs
CURRENT IRP PHASE:
Response Complete - 1994

Building 760(FTRS-04)
RRSE RATING: NE
CONTAMINANTS OF CONCERN:
Petroleum
MEDIA OF CONCERN:
Soil
COMPLETED IRP PHASE:
PA/SI
CURRENT IRP PHASE:
Response Complete - 1994

Building 740 (FTRS-06)
RRSE RATING: NE
CONTAMINANTS OF CONCERN:
Petroleum, VOCs
MEDIA OF CONCERN:
Soil, Groundwater
COMPLETED IRP PHASE:
PA/SI, RI/FS, 2 IRAs
CURRENT IRP PHASE:
Response Complete - 1994

Building 812 (FTRS-08)
RRSE RATING: NE
CONTAMINANTS OF CONCERN:
Petroleum
MEDIA OF CONCERN:
Soil
COMPLETED IRP PHASE:
PA/SI, IRA
CURRENT IRP PHASE:
Response Complete - 1991

Building 986 (FTRS-10)
RRSE RATING: NE
CONTAMINANTS OF CONCERN:
Petroleum
MEDIA OF CONCERN:
Soil
COMPLETED IRP PHASE:
PA/SI, 2 IRAs
CURRENT IRP PHASE:
Response Complete - 1994

Building 604 TMC (FTRS-12)
RRSE RATING: NE
CONTAMINANTS OF CONCERN:
None
MEDIA OF CONCERN:
None
COMPLETED IRP PHASE:
PA/SI
CURRENT IRP PHASE:
Response Complete - 1993

Impact Area, Eagle River Flats (FTRS-22)
RRSE RATING: High
CONTAMINANTS OF CONCERN:
White Phosphorus
MEDIA OF CONCERN:
Sediments
COMPLETED IRP PHASE:
PA/SI, RI/FS, 7 IRAs, RA, RA(O)
CURRENT IRP PHASE:
LTM
FUTURE IRP PHASE:
LTM

PCB Site 35-752 (FTRS-44)
RRSE RATING: Low
CONTAMINANTS OF CONCERN:
VOCs
MEDIA OF CONCERN:
Groundwater
COMPLETED IRP PHASE:
PA/SI, 3 IRAs, RI/FS
CURRENT IRP PHASE:
LTM
FUTURE IRP PHASE:
RA, LTM

Building 762 (FTRS-58)
RRSE RATING: Medium
CONTAMINANTS OF CONCERN:
Petroleum
MEDIA OF CONCERN:
Soil, Groundwater
COMPLETED IRP PHASE:
PA/SI, 4 IRAs, RI/FS
CURRENT IRP PHASE:
RA (O)
FUTURE IRP PHASE:
LTM

Building 762 (FTRS-88)
RRSE RATING: Low
CONTAMINANTS OF CONCERN:
Petroleum
MEDIA OF CONCERN:
Soil, Groundwater
COMPLETED IRP PHASE:
PA/SI, RI/FS, RD, RA, LTM
CURRENT IRP PHASE:
RC - 1998

Armored Vehicle Wash/ Disposal Area (FTRS-89)
RRSE RATING: Low
CONTAMINANTS OF CONCERN:
VOC
MEDIA OF CONCERN:
Groundwater
COMPLETED IRP PHASE:
PA/SI, RI/FS
CURRENT IRP PHASE:
RA (O)
FUTURE IRP PHASE:
LTM

Acronyms and Abbreviations Used: Preliminary Assessment (PA), Remedial Action (RA), Remedial Action Operation (RA(O)), Remedial Design (RD), Remedial Investigation (RI), Site Inspection (SI), Interim Remedial Action (IRA), Installation Restoration Program (IRP), Feasibility Study (FS), Volatile Organic Compounds (VOC)

ARMY ENVIRONMENTAL CENTER

CORPS OF ENGINEERS
ALASKA DISTRICT

Institutional Control Areas for Fort Richardson

Second 5 Year Review
Fort Richardson, Alaska

SOURCE:	FIGURE:	DATE:
DPW Army, 2007	3-1	2/08

4.0 OPERABLE UNIT A

The OUA ROD included the following three source areas:

- Roosevelt Road Transmitter Site Leach field
- Ruff Road Fire Training Area
- Building 986 Petroleum Oil and Lubricant (POL) Laboratory Dry Well

The Army, EPA, and ADEC determined that the source areas included within OUA did not represent unacceptable risk to human health or the environment, based on EPA criteria for residential use. Thus, no remedial action was necessary to ensure protection of human health and the environment under CERCLA.

However, the levels of petroleum contamination in the soil did exceed the ADEC soil cleanup criteria. Accordingly, the sites were transferred to the Non-UST POL Environmental Restoration Agreement (Two-Party Agreement) between the Army and ADEC. Two of the sites, Roosevelt Road Transmitter Site Leachfield and Ruff Road Fire Training Area, have undergone remedial action and have been closed under the Two-Party Agreement. The Building 986 POL Laboratory Dry Well site is still an active site but is not currently undergoing active remediation at the time of this review.

A description of these sites and NFA decisions can be found in the OUA/OUB ROD. During the Five-Year Review process, the remedies conducted under the Two Party Agreement were reviewed and determined to be protective. A summary of remedial actions at the OU source areas can be found in the Administrative Record and are presented on Table 3-1. In addition, Table 3-1 contains updated information for all sites listed in the FFA. Because the OUA POL source areas are addressed through the Two-Party Agreement, they are not discussed further in this Five-Year Review.

5.0 OPERABLE UNIT B

The OUA and OUB source areas were the first to undergo Remedial Investigation at Fort Richardson and reach a final-action ROD. RODs for the two OUs were contained in a single document. The OUA/OUB ROD was signed September 18, 1997 and initially addressed four source areas. OUB consists of a single source area, the Poleline Road Disposal Area (Poleline Road).

5.1 OUB POLELINE ROAD DISPOSAL AREA BACKGROUND

5.1.1 Overview

Two former soldiers stationed at Fort Richardson in the 1950s identified the Poleline Road Disposal Area in 1990. It was determined that four chemical disposal areas were used from 1950 to 1972. During this time, chemical agent identification sets and other military debris were burned and disposed in trenches. The chemical agents were neutralized with a mixture of bleach or lime and chlorinated solvents before burial. Based on maps, aerial photography, and geophysical surveys, Poleline Road was divided into four disposal areas; Areas A-1, A-2, A-3, and A-4. Figure 5-1 is a site map of Poleline Road showing the locations of the disposal areas.

The RI determined that the principal contamination at OUB was chlorinated solvents in soil and groundwater. Remedial action was accomplished through, a dual-phased, high vacuum extraction (HVE) treatability study conducted from March through October 1998 and six-phase soil heating (SPSH) treatability studies conducted in 1997 and 1999. The six-phase soil heating treatability studies incorporated soil heating and high-vacuum extraction to facilitate removal of contaminants from soil and groundwater. The SPSH was discontinued in 1999 and decommissioned in 2002. Results of the SPSH treatability studies indicated that about 95 percent of the contaminants in soil had been removed during system operations, thus reducing the source of groundwater contamination at the site.

A groundwater monitoring plan was developed in 1997 to determine the effectiveness of the HVE treatment system and to determine whether or not groundwater contaminant levels were decreasing, increasing, or remaining stable. Groundwater samples have been collected twice per year since 1997 and while there have been increases in individual wells, overall trends indicate that the contaminant plume does not appear to be expanding. Analytical results from chemical analysis of soil samples collected after the SPSH treatability studies indicate that RAOs have been achieved for soil. A revised long-term monitoring plan and exit strategy, CLOSES (CH2MHILL, May 2004) was prepared in 2004.

Dates related to the history of the Poleline Road source area contamination and remediation are summarized in the following table.

Table 5-1. History of Regulatory Events at the OUB

Date	Event
1950s to 1972	Chemical disposal activities
1990	Poleline Road Disposal Area identified by ex-soldiers
1990 and 1992	Expanded Site Investigation conducted
1993	Rapid Response Removal began
1994	Removal Response completed
1994	Geophysical investigation in disposal areas A-3 and A-5 using ground-penetrating radar (GPR) and electromagnetic induction (EM61) to locate buried debris.
June 1994	Fort Richardson added to NPL
December 1994	FFA signed
July 1995	Remedial Investigation Management Plan issued
August 1995	Additional geophysical investigations in disposal areas A-1 and A-2 using GPR and EM61 to locate buried objects.
1995	Remedial Investigation conducted
1995	Human Health Risk Assessment conducted in conjunction with the Ecological Risk assessment
1996	Feasibility Study conducted to evaluate remedial alternatives
1997	SVE/AS Treatment study conducted
January 1997	Proposed Plan for Remediation for OUB issued
June 1997	First SPSH treatability study initiated
September 18, 1997	ROD for OUA and OUB signed
September 15, 1997	Long-Term Monitoring Work Plan
November 1997 - Present	Long-Term Groundwater Monitoring/Sampling Initiated
December 5,1997	Remedial Design/Remedial Action Management Plan
February 22,1998	Remedial Action Construction initiated, trigger date for Five-Year Review
March – October 1998	Dual-Phase High Vacuum Extraction Test
July 31, 1999	Begin operating SPSH system treatability study
October 31, 1999	Discontinue operation of the six phase soil heating system
November 2001	Preliminary hydrogeologic interpretations in 3D geologic model.
January 2002	Additional geophysics in areas A-1 and A-2 using GPR, EM61, and GEM 300 to locate any remaining buried objects.
July 2002	4 Monitoring Wells Installed
September 2002	Technical Memorandum Long-Term Groundwater Monitoring Results
October 2002	Decommissioned remaining components of the six phase soil heating system
October 2002	Collection of monthly manual water level measurements from all wells at the site begins

Table 5-1. History of Regulatory Events at the OUB (continued)

Date	Event
November 2002	Geophysical investigations to determine subsurface geology using GPR, shallow seismics, and electrical resistivity.
January 2003	Draft Interim Remedial Action Report
June 2003	Installed fencing around areas A-1 and A-2. Warning signs were placed around the enclosure.
2003	Chemical Agent Identification Sets (CAIS) that were recovered from the site during the initial removal actions were chemically treated using the Army's Rapid Response System.
October 2003	Updated hydrogeologic model
2004	Water level pressure transducers installed in select wells
2004	3 Monitoring Wells Decommissioned and Replaced, and 6 New Monitoring Wells Installed
2004	SVE system was re-installed at a few wells at the site to treat residual solvent contamination in near surface soils. These systems utilized existing wells and other existing infrastructure.
August 2004	Groundwater tracer study started
October 2004	Wetland investigated by hand coring; temporary wells installed in wetland
March 2005	Updated 3D geologic model based on lithology
June 2007	Geophysical investigation of possible additional source area south of the cleared area
2007	1 Monitoring Well Installed

5.1.2 Physical Characteristics

The Poleline Road Disposal Area is located on Fort Richardson approximately 1.1 miles southwest of the Eagle River at the intersection of Poleline Road and Barrs Boulevard, a dirt road extending from the landfill to Poleline Road. Figure 3-1 shows the Poleline Road source area in relation to the Fort Richardson main cantonment area. The Poleline Road source area is a low-lying, relatively flat area bordered by wooded terrain. An 80-foot hill is located to the west; wetlands are directly south and southwest of the main disposal area (Areas A-3 and A-4), and low wooded hills are on the remaining perimeters. Geophysical surveys have detected buried metallic debris in Areas A-1 and A-2 (area is approximately 1.5 acres in size). Areas 3 and 4 are located west of the road, at the base of the hill, and north of the marsh. Vegetation in this area has obviously been affected by the soil heating process used during site remediation; however, vegetation growth has improved since soil heating was shut down in October 1999. Vegetation was not observed in Areas 1 and 2, located east of the road.

Four water-bearing intervals have been identified at Poleline Road:

- A perched zone – The top of the perched interval was encountered at 4 feet to 10 feet bgs and is approximately 5 feet thick.
- A shallow groundwater zone – The shallow saturated zone is an average of 10 feet thick; the top was encountered at 20 feet to 25 feet bgs. Groundwater in the shallow zone flows in a northeasterly direction.

- An intermediate groundwater zone – The intermediate zone was encountered at approximately 65 feet to 95 feet bgs. Groundwater flow in this zone is not well defined.
- A deep aquifer – The deep aquifer is an advance moraine/till complex with a thickness between 3 feet and 40 feet and was encountered at 80 feet to 125 feet bgs. Groundwater elevations indicate that the flow direction in the deep aquifer is locally to the northeast and regionally to the northwest.

Zones of very dense, low-porosity, compact tills separate the saturated intervals, but the detection of contaminants in all four intervals suggests that they are interconnected to some degree. Hydraulic conductivities were estimated to average 0.5 feet per day (ft/day) for all saturated zones except the intermediate zone, which averaged 0.05 ft/day. These relatively low hydraulic conductivities suggest that groundwater flow in the site area would not significantly disperse dissolved contaminants.

5.1.3 Land and Resource Use

The OUB site (approximate 300 acre site) is off limits except to authorized personnel and access is controlled by locked gates. Signs posted around the perimeter of the site clearly indicate that the site is a contaminated and a controlled area. The land surrounding OUB currently is used for Army training activities and limited recreational purposes where allowed. Access to OUB and the surrounding area must be coordinated with Range Control. Visitors must call Range Control before entering and upon departure.

At present, there are no plans for development of OUB. The deep aquifer may provide sufficient yield for installation of drinking water wells, however, future development of the deep aquifer for this purpose is unlikely.

5.1.4 History of Contamination

The Poleline Road Disposal Area was identified in 1990 through interviews conducted by the Army with two former soldiers who were stationed at Fort Richardson in the 1950s who recalled the disposal of chemicals, smoke bombs, and Japanese cluster bombs. The disposal location was corroborated by a 1954 United States Army Corps of Engineers map showing a “Chemical Disposal Area” at Poleline Road and by 1957 aerial photography showing trenches in the area. Two separate burial areas were identified at Poleline Road: Areas A-1 and A-2 are suspected to contain buried munitions, and Areas A-3 and A-4 where chemical warfare decontamination kits and chemical agent identification sets (CAIS) disposal occurred. The disposal areas were active from approximately 1950 to 1972. The standard practice at Poleline Road to dispose of chemical agents and munitions materials consisted of a series of four steps:

- A layer of “bleach/lime” was laid down in the bottom of the trench.
- The materials contaminated with chemical agent were placed on a pallet in the trench.
- Diesel fuel was poured on the agent and then ignited with thermal grenades.
- After burning was completed, a mixture of either bleach or lime, combined with chlorinated solvent carrier was poured over the materials to neutralize the chemical agent.

No known documentation exists detailing what types of chemicals were buried. However, a removal action at Areas A-3 and A-4 uncovered CAIS and other general debris.

Based on eyewitness accounts from former soldiers, Areas A-1 and A-2 are suspected to contain buried munitions. Geophysical surveys confirmed the presence of buried metallic objects at the site. Few COCs were observed in subsurface soil samples collected near burial trenches A-1 and A-2. COCs that were detected around A-2 are also located adjacent to area A-3 and A-4, the suspected source area. Because soil sampling has not identified Areas A-1 and A-2 as a source of contamination, and because of the dangers associated with potential UXO, the Areas were not excavated.

5.1.5 Pre-ROD Response

Pre-RI activities began in 1993 and included a removal action in Areas A-3 and A-4. The removal action was halted when CAIS and other chemical agent related materials were unearthed. A geophysical survey performed in early 1994 indicated that anomalies were present in the trenches that were consistent with buried metallic debris. Of the four disposal areas, A-3 and A-4 showed the greatest evidence of buried debris, including possible stacked canisters or cylinders. The removal action was resumed in 1994. Approximately 3,600 cubic yards of soil contaminated with chlorinated hydrocarbons (1,1,2,2-PCA, TCE, and PCE) and diesel fuel were excavated and stockpiled on-site. This soil was thermally treated on-site using a thermal desorption system.

Another geophysical survey was performed in June 1995 to determine whether any anomalous material remained in the recently excavated areas and to investigate thoroughly areas not excavated during the 1994 removal action. Results of the survey confirmed that buried material previously encountered in Areas A-3 and A-4 had been removed, thereby removing a primary source of subsurface contaminants.

During fall 1996, a treatability study was conducted at the site to evaluate the effectiveness of potential remedial technologies addressed in the FS. The treatability study involved field tests to evaluate the potential performance of soil vapor extraction (SVE) and air sparging (AS) of groundwater. The study also involved characterization of hydraulic conductivity of water bearing zones underlying the site and collection of groundwater samples to assess which types of natural attenuation processes may be degrading contaminants in groundwater.

In June 1997, prior to the signing of the ROD, a design verification study (DVS) was initiated to evaluate the applicability of six-phase heating as an *in situ* technology for remediating solvent-contaminated soils. The remedial system design involved incorporation of both soil vapor extraction and soil heating. The soil was heated using six-phase soil heating elements and vapors generated through the soil heating process were extracted using an HVE system. Results of this treatability study are discussed in Section 5.3.

5.2 REMEDY SELECTION

5.2.1 Nature of Contamination

Several investigations and a removal action have been conducted at Poleline Road since its discovery in 1990. This information was used to focus the RI. Site investigations were conducted between 1990 and 1992 and included a geophysical survey, a water level study, aquifer tests, and soil, soil gas, and groundwater sampling. The results of the site investigations indicated the presence of VOCs in the subsurface. The RI concluded that the principal contamination at Poleline Road was chlorinated solvents in soil and groundwater and the highest concentrations of contaminants detected in soil and groundwater samples were found in Areas A-3 and A-4. No measurable levels of chemical agent have been detected in groundwater at the site.

The specific reasons for conducting remedial actions at Poleline Road are provided below, with the main focus being protection of groundwater in accordance with the NCP Groundwater Protection Strategy:

- VOCs, including PCE; TCE; and 1,1,2,2-PCA, in contaminated soils were a continuing source of groundwater contamination; and
- VOCs (i.e., PCE; TCE; and 1,1,2,2-PCA) in groundwater at Poleline Road were present at concentrations above state and federal MCLs and risk-based criteria.

A Human Health Risk Assessment (HHRA) was performed in 1995. The risk assessment was based on groundwater fate and transport modeling and showed 1) that it would take 120 years for concentrations of TCE exceeding the drinking water MCL (0.005 milligrams per liter [mg/L]) to reach the Eagle River, and 2) that it would take 170 years for concentrations of 1,1,2,2-PCA exceeding 0.005 mg/L to reach the Eagle River.

Soil

Contaminated soils associated with past disposal practices at the Poleline Road source area appear to have been the source of contamination detected in the groundwater. Soil data collected from the excavation during the removal action and from soil borings drilled during the RI indicated that a layer of soil with high concentrations of 1,1,2,2-PCA (greater than 2,000 milligrams per kilogram [mg/kg]) existed around 15 to 25 feet bgs.

Areas A-1 and A-2 were not excavated because of the potential presence of unexploded ordnance. The concentration of COCs detected in soils near Areas A-1 and A-2 were less than RAOs. Solvents released in Areas A-3 and A-4 are the suspected source of contamination around Areas A-1 and A-2. Thus, Areas A-1 and A-2 were not considered to be source areas.

Groundwater

Groundwater sampling conducted prior to the 1993 and 1994 removal action indicated a localized area of groundwater was contaminated with chlorinated solvents. There was no evidence that the contamination was migrating, however, the level of solvents was sufficient to indicate the presence of a source of these contaminants.

During the RI, 1,1,2,2-PCA and TCE were found in groundwater at concentrations significantly higher, and over a greater extent, than any other chemical detected at the site. Contaminants were detected in each of the four saturated intervals. A well installed near Area A-3 and screened in the perched interval had the highest concentrations of 1,1,2,2-PCA and TCE. Contaminants were also detected in wells screened in the deep aquifer. Contamination in the deep aquifer indicates that there is interconnection between the saturated intervals that allow contaminants to migrate vertically.

A review of known information on the Poleline Road Disposal Area indicated that Areas A-1 and A-2 might potentially contain buried ordnance. Investigations conducted around Areas A-1 and A-2 detected only low concentrations of solvents. No chemical agent or breakdown products were detected in the soil or groundwater. Available data suggests that chlorinated solvents were not disposed in Areas A-1 and A-2, and that any solvents detected migrated from the adjacent Areas A-3 and A-4, which had high concentrations of solvents in the soil and groundwater. Thus, Areas A-1 and A-2 were not considered to be source areas for the groundwater contamination.

The area of greatest contamination identified at the source area during the RI was referred to as the “hot spot”. The “hot spot” encompasses an area approximately 150 feet by 300 feet that is bounded by a 1 milligram per liter (mg/L) or greater concentration of 1,1,2,2-PCA in groundwater. The “hot spot”, as estimated in 1999, is shown on Figure 5-2.

5.2.2 Remedial Action Objectives

As a part of the Remedial Investigation/Feasibility Study (RI/FS) process, RAOs were developed in accordance with NCP and EPA guidance. The overall objective is to reduce contamination in groundwater at OUB to levels that do not pose a threat to human health and the environment.

RAOs are based on either human health risk estimates that exceed or fall within the 1×10^{-6} to 1×10^{-4} risk range, or on federal and state ARARs. The objectives of remedial action at OUB continue to be in accordance with the ROD signed in 1997 and are as follows:

- Reduce contaminant levels in the groundwater to comply with drinking water standards;
- Prevent contaminated soil from continuing to act as a source of groundwater contamination;
- Prevent the contaminated groundwater from adversely affecting the Eagle River surface water and sediments; and
- Minimize degradation of the State of Alaska’s groundwater resources at the site as a result of past disposal practices.

5.2.3 ARARs

The OUB ROD cited the most significant ARAR for the remedy selection at Poleline Road to be:

> *State and federal MCLs are relevant and appropriate for groundwater. These MCLs set the active remediation goals for groundwater contaminants regulated by state and federal drinking water regulations.*

Cleanup Goals

Groundwater

- Federal and State of Alaska drinking water MCLs were adopted as groundwater cleanup goals for benzene, carbon tetrachloride, cis-1,2-dichloroethene, trans-1,2-dichloroethene, PCE, and TCE
- The concentration corresponding to the EPA Region 3 RBC (10^{-4}) in residential drinking water was adopted as the cleanup goal for 1,1,2,2-PCA

Numeric values for cleanup goals in groundwater are presented in the Table 8-2.

Table 5-2. Remedial Cleanup Goals for Groundwater

Contaminant of Concern	Remedial Action Objective (mg/L)	Source of RAO
Benzene	0.005	MCL
Carbon Tetrachloride	0.005	MCL
cis-1,2-Dichloroethene	0.07	MCL
trans-1,2-Dichloroethene	0.1	MCL
Tetrachloroethene (PCE)	0.005	MCL
Trichloroethene (TCE)	0.005	MCL
1,1,2,2-Tetrachloroethane (1,1,2,2-PCA)	0.052[1]	RBC

[1] The RAO listed in the ROD appears to be incorrect and the value should have been 0.0053 µg/L. The risk assessment and groundwater model results were all based on an RBC of 0.005 mg/l for 1,1,2,2- PCA.

Soil

RAOs for soil are based on protection of the groundwater from leaching of the contaminants (EPA, Region 3, RBCs, 1995). Numeric values for cleanup goals in soil are presented in Table 8-3.

Table 5-3. Remedial Cleanup Goals for Soil

Contaminant of Concern	Remedial Action Objective (mg/kg)	Source of RAO
Tetrachloroethene	4.0	RBC
1,1,2,2-Tetrachloroethane	0.1	RBC

5.2.4 Selected Remedy

The major components of the preferred remedy identified in the OUB ROD are listed below.

Component 1 – Treat the "hot spot" (*The "hot spot" is defined in the ROD as the subsurface area containing greater than 1.0 milligram per liter of 1,1,2,2-tetrachloroethane in groundwater and/or free-phase solvents*) through HVE of soil vapor and groundwater in the perched and shallow zones to prevent the main source of contamination from continuing as a threat to

groundwater. Soil vapors extracted from the "hot spot" soil will be treated as necessary to meet state and federal air quality standards before release to the atmosphere. Extraction wells will be placed in areas of highest contamination and operated until state and federal maximum contaminant levels (MCLs) and risk-based criteria are achieved in the "hot spot".

Component 2 – Treat extracted groundwater through air stripping to achieve state and federal MCLs before discharge.

Component 3 – Allow natural attenuation of groundwater contamination in areas outside the "hot spot".

Component 4 – Evaluate and modify the treatment system as necessary to optimize effectiveness in achieving RAOs.

Component 5 – Monitor groundwater measurements to determine the attainment of RAOs and to detect and thoroughly characterize possible dense non-aqueous phase liquid (DNAPL). The HVE system is expected to operate from seven to twelve years for soil and shallow groundwater in the "hot spot" and natural attenuation is expected to last 150 years before the remaining groundwater meets state and federal MCLs and risk-based criteria.

Component 6 – Evaluate the effectiveness of the HVE system to meet long-term restoration goals during initial implementation.

Component 7 – Conduct treatability studies to evaluate innovative technologies with potential to enhance the remedial action, and implement successful innovative technologies if the initial remedy proves ineffective.

Component 8 – Maintain institutional controls, including restrictions governing site access, construction, and well development, as long as hazardous substances remain at levels that preclude unrestricted use on site. Implement restrictions on groundwater until contaminant levels are below state and federal MCLs and risk-based criteria.

5.3 STATUS OF REMEDIATION

The following Sections identify the status of remediation for each component of the selected remedy.

5.3.1 Treat the "Hot Spot" Through HVE

Component 1a – *Treat the "hot spot" through HVE of soil vapor and groundwater in the perched and shallow zones to prevent the main source of contamination from continuing as a threat to groundwater.*

The "hot spot" is defined in the ROD as the subsurface area containing greater than 1.0 milligram per liter of 1,1,2,2-tetrachloroethane in groundwater and/or free-phase solvents. The remedy prescribed by the ROD was implemented through a series of treatability studies. The first treatability study evaluated dual-phased HVE and was conducted from March 18, 1998 through October 16, 1998. The HVE system combined the benefits of the SVE system

(evaluated pre-ROD) with a separate groundwater extraction system. This treatability study also included groundwater sampling, additional soil borings and monitoring wells.

An additional SPSH design verification study was conducted in 1999. This remedial action was similar to the treatability study conducted in 1997 because it incorporated both soil vapor extraction and six-phase soil heating technologies. Because the six-phase heating study performed in 1997 was very successful at removing contaminants in a short time period, this technology was, in accordance with the ROD, selected as the final remedy. Soil and groundwater samples collected after completion of the second SPSH treatability study indicated that about 95 percent of the contaminants in soil had been removed during system operations, thus reducing the source of groundwater contamination at the site. The system was less successful at treating groundwater contamination, but about 76 percent of groundwater contaminants were removed during system operations.

> **Component 1b** – *Soil vapors extracted from the "hot spot" soil will be treated as necessary to meet state and federal air quality standards before release to the atmosphere.*

Initially, a catalytic oxidizer (CATOX) was used to treat off-gas from the condenser while heating array 1. The CATOX removed solvents in the off-gas by heating the off-gas to 650 degrees Fahrenheit (ºF) in the presence of a catalyst. USEPA regulations limit discharge to the atmosphere to 10 tons per year or more of one hazardous contaminant or 25 tons per year of 2 or more in combination (40 CFR 264.1032). Since the concentration of solvents in the off-gas vapor was less than expected, the CATOX was removed from the site before the first array was completed. To comply with ADEC regulations (18 MC 50.110) air was discharged away from the operations area and the breathing zone was monitored to ensure that the contents of soil vapor did not exceed health and safety standards.

> **Component 1c** – *Extraction wells will be placed in areas of highest contamination and operated until state and federal maximum contaminant levels (MCLs) and risk-based criteria are achieved in the "hot spot"*

Soil gas and groundwater were extracted from two HVE wells (DPE-1 and DPW-2) that were located within the "hot spot", in the area of highest known contaminant concentrations. Undiluted off-gas and condensate samples were collected approximately every other day while the system was running. Analytical results were used, along with system instrument readings, to calculate the mass of contaminants removed via the extracted soil gas and condensate water. The system removed approximately 500,000 gallons of groundwater and approximately 230 lbs of chlorinated solvents. Analysis of the test data indicated that the cost to operate the system and treat the groundwater produced during system operation greatly exceeded previous estimates. The increased cost was due in large part to an increase in the time estimated for the HVE system to remediate the groundwater plume. Also, the groundwater samples collected during the test did not clearly indicate that the HVE system was effective at reducing the concentration of chlorinated solvents in the groundwater at this site. Because HVE alone was not expected to be effective at treating the "hot spot", the remedy, as prescribed in the ROD, was enhanced with the introduction of six-phase heating.

5.3.2 Treat Extracted Groundwater

> **Component 2** – *Treat extracted groundwater through air stripping to achieve state and federal MCLs before discharge*

Groundwater, and condensed soil vapors were collected in a knockout tank attached to the extraction system. Contaminants were removed from the water using a cooling tower equipped with an air-stripper. Up to 50 percent of the water added to the cooling tower evaporated. When treated water accumulated in the tower, it was pumped into drip tubes and discharged to the soil surface. Water samples were periodically collected from the treated water tank and analyzed for contaminants. None of samples were found to contain contaminants.

5.3.3 Allow Natural Attenuation Outside the "Hot Spot"

Component 3 – *Allow natural attenuation of groundwater contamination in areas outside the "hot spot"*

A varying number of monitoring wells (12 to 20) at the site have been sampled, at least yearly, for 10 years (Figures 5-3 and 5-4). The most recent groundwater monitoring report (CH2MHILL, November 2007) includes figures that show decreasing concentrations of several COCs, including 1,1,2,2-PCA, trichloroethene, and cis-1,2-dichloroethene. Figures from the CH2MHILL report are included as 5-5, 5-6 and 5-7. Concentrations of COCs in shallow monitoring wells within the hotspot area continue to be above RAOs; however, concentrations of 1,1,2,2-PCA decreased slightly and daughter product concentrations also are declining (see Figure 5-3). Outside the hotspot in the shallow monitoring wells, 1,1,2,2-PCA and trichloroethene are above RAOs in AP-3747, with 1,1,2,2-PCA declining and TCE holding within historical ranges.

Concentrations of 1,1,2,2-PCA in the deep hot-spot well (AP-4017) have decreased significantly (see Figure 5-4). The combination of decreasing 1,1,2,2-PCA, as well as PCE, in association with the increasing concentrations of the daughter compounds appears to be evidence that natural attenuation is occurring. Vinyl Chloride has been detected in some hot-spot wells, but has not been detected in wells outside the hotspot. RAOs have not been achieved in the deep hot spot wells. TCE is the primary COC present in the deep aquifer. The furthest downgradient RAO exceedance in the deep aquifer exists at AP-4344 (15 µg/L TCE), where neither increasing nor declining trends are evident.

Other evidence suggesting that natural attenuation is occurring has been gathered over the past couple of years. Contractors sampling groundwater from monitoring wells near the wetlands have reported black precipitate and sulfur smell indicating sulfate reduction of contaminants could be potentially occurring. The recent groundwater monitoring report also includes the results of several geochemical tests of groundwater from the site. The natural attenuation parameters include: dissolved oxygen, pH, nitrate, dissolved iron and manganese, sulfate, methane, ethane, ethane, and chloride. Comparison of the natural attenuation parameters to background and the declining concentration of several COCs, continues to provide supporting evidence that reductive dechlorination is occurring at the site, especially in the hot spot area.

5.3.4 Evaluate and Modify the Treatment System

Component 4 – *Evaluate and modify the treatment system as necessary to optimize effectiveness in achieving RAOs*

The dual-phase HVE treatability study completed during the summer of 1998 showed that further design work would be necessary before installation of a reliable system. The dual-phase

system, as installed, was prone to shut down and took several hours to restart. The crux of the problem was the drop tubes used to extract air and water. The bottom of the drop tube was set just above the water table in the well. If water level in the well rose rapidly, the drop tube would be flooded, and unable to further extract either water or air.

Rather than exclusively use the selected remedy (HVE), SPSH was also used to treat the hotspot. The ROD stated that if HVE alone failed to remediate the source area within a reasonable time frame, then soil heating would be combined with the selected remedy.

5.3.5 Monitor Groundwater

> **Component 5a** – *Monitor groundwater measurements to determine the attainment of RAOs and to detect and thoroughly characterize possible dense non-aqueous phase liquid (DNAPL). The HVE system is expected to operate from seven to twelve years for soil and shallow groundwater in the "hot spot" and natural attenuation is expected to last 150 years before the remaining groundwater meets state and federal MCLs and risk-based criteria*

Free-phase solvent was identified in monitoring well AP-3746, during sampling in spring 2004. In response, the groundwater sampling contractor began hand bailing of the free-phase solvent during site visits. An SVE system was installed on site to further extract the free-phase liquids. Prior to starting the system, four additional monitoring wells were installed. The SVE system removed soil vapor from AP-3746 and the four new monitoring wells from May 2005 to January 2006. An estimated 681 pounds of volatile organic compounds were removed by the system. No free-phase product has been observed at the site since January 2006.

Groundwater monitoring at OUB continues to provide data on groundwater contaminant trends. Samples are collected in accordance with, and the rationale for sampling each well is presented in, the Long-term Groundwater Monitoring Work Plan Operable Unit B, Poleline Road Disposal Area, Fort Richardson, Alaska. Seventeen rounds of groundwater samples have been collected from November 1997 through March 2007. Separate reports for each of the groundwater monitoring events are available and included in the administrative record. Results of the groundwater samples collected during the groundwater monitoring have shown that the concentrations of the primary VOCs (1,1,2,2-tetrachloroethane, TCE and PCE) were reduced as a result of the SPSH treatment in 1997 and 1999. Figures 5-5, 5-6 and 5-7 show contaminant concentrations over time for 1,1,2,2-PCA, TCE and cis-1,2 dichloroethene. The latest groundwater monitoring report (CH2MHILL, November 2007) includes a table with contaminant trends for 10 compounds in 14 wells. Using the Mann-Kendall statistical analysis, 11 compounds have increasing trends, 46 have decreasing trends and 83 have no statistically significant trend.

5.3.6 Evaluate HVE for Meeting Goals

> **Component 6** – *Evaluate the effectiveness of the HVE system to meet long-term restoration goals during initial implementation*

An HVE pilot study was conducted in 1998. Soil gas and groundwater were extracted from two extraction wells. The HVE system primarily removed soil gas from low permeability formations and groundwater removal was a secondary function. System monitoring was conducted twice each week for the duration of the HVE system test. Extracted soil gas and groundwater were

periodically sampled and analyzed for VOCs to monitor the effectiveness of the HVE system. Approximately 500,000 gallons of groundwater were extracted and treated during system operation, and an estimated 230 pounds of chlorinated solvents were removed from groundwater. Additionally, the system was estimated to have removed approximately 490 pounds of contaminants from the soil.

There were many equipment failures and shutdowns during operation of the system. Groundwater samples collected during the test did not clearly indicate that the HVE system was effective at reducing the concentration of chlorinated solvents in the groundwater. Because the system was not effective at reducing groundwater contaminants, HVE as a remedy for this site, did not appear to meet the long-term restoration goals prescribed in the ROD.

5.3.7 Conduct Treatability Studies

Component 7 – *Conduct treatability studies to evaluate innovative technologies with potential to enhance the remedial action, and implement successful innovative technologies if the initial remedy proves ineffective*

Because the HVE system was not as effective at treating groundwater as anticipated by the ROD, the Army implemented a second treatability study to evaluate SPSH as an enhancement for the selected remedy prescribed in the ROD. The SPSH treatability study ran from July to October 1999. Six-phase heating uses six-phase electricity to resistively heat soils and groundwater and create an *in situ* source of steam to strip contaminants that are then captured using SVE. Both the 1997 and 1999 studies removed contaminants of concern from saturated and unsaturated soil. The 1999 study also showed that SPSH could remove contaminants of concern from groundwater. In 1999, the SPSH system was used to heat a region approximately 110 ft long by 50 ft wide by 35 ft deep for 9 weeks. The volume of soil treated in 1999 was about 20 percent greater than treated in 1997. The mass of chlorinated solvents removed via the extracted soil in 1999 (1,450 lbs) was nearly twice the mass removed in 1997 (756 lbs).

During the 1999 study, soil temperatures showed that soil at a depth of 25 ft in most locations was heated to approximately 100°C, the boiling point of water. Once soil was heated to this temperature, water in the soil turned to steam and was removed by the SVE system. The volume of condensate from extracted soil gas averaged approximately 1,100 gallons per day. Concentrations of the primary VOCs detected in the off-gas and condensate generally decreased during operation of the SPSH system. The estimated mass of TCE, PCE, and 1,1,2,2-PCA removed via the off-gas was 1,385 lbs, while the mass of these contaminants removed in the condensate was 65 lbs.

The concentration of solvents in the extracted soil gas during the 1999 DVS were very similar to the 1997 DVS and much higher than the concentration of solvents from the 1996 unheated SVE test. This result clearly demonstrates that heat enhancement increases the concentration of solvents in the extracted soil gas.

Soil samples collected before SPSH indicated the highest VOC concentrations were detected near the groundwater interface (about 15 to 25 ft bgs). After SPSH was completed, soil samples collected from borings located adjacent to the initial borings showed that approximately 99.9 percent of the 1,1,2,2-PCA present before treatment was removed from the soil within the

treatment area. Removal of PCE ranged from 79.5 to 99.6 percent and removal of TCE ranged from 68.5 to 97.2 percent.

5.3.8 Maintain Institutional Controls

> **Component 8 –** *Maintain institutional controls, including restrictions governing site access, construction, and well development, as long as hazardous substances remain at levels that preclude unrestricted use on site. Implement restrictions on groundwater until contaminant levels are below state and federal MCLs and risk-based criteria.*

To ensure long-term effectiveness of the remedy, institutional controls have been put into place at Poleline Road. Institutional controls restrict access to the site, water use, excavations, and property transfers. Since the last 5-year review, fencing was installed around Areas A-1 and A-2 to limit exposure to potential buried munitions. The ICs that are in place are supplementing engineering controls (fencing and gates) for both short-term and long-term management to prevent and limit human and environmental exposure to hazardous substances, pollutants, and contaminants. The Army has inspected this site regularly since the ROD was signed and visual observations verify that the institutional controls are effective. Locked gates limit access to the site and signs posted around the perimeter of the site clearly identify the area as a contaminated site. One component of the IC policy involves obtaining an Excavation Clearance Request (USARAK Form 81 a – 1 Mar 02) to prevent undertaking work inconsistent with established ICs at a particular site.

U.S. Army Alaska Institutional Control Standard Operating Procedures (SOP) (APVR-RPW (200-1) and a Memorandum on Institutional Controls [APVR-RPW-EV (200-1c)] establishes the procedures, responsibilities, and policies for complying with institutional controls at Fort Richardson. This document has been provided in Appendix E of the OUD ROD. This document is reviewed and reissued approximately every two years with the change of command at U.S. Army – Alaska.

5.4 FIVE-YEAR ASSESSMENT

5.4.1 Are the Remedies Functioning as Intended by the Decision Document?

Remedial Action Performance

As specified in the ROD, an evaluation of the effectiveness of the HVE system to meet long-term restoration goals was conducted during initial implementation. Ultimately, HVE was supplemented with SPSH that effectively remediated the soil at the site and reduced contaminate levels in groundwater to near RAO levels. Operation of the SPSH system resulted in contaminant reduction in the “hot spot”. Groundwater monitoring data collected since the completion of the SPSH study show that VOC concentrations have decreased overall since the time of the ROD. Natural attenuation of contaminants in groundwater continues to be monitored to collect information necessary to perform a trend analysis. This information will be used to determine the effectiveness of natural attenuation as a remedy for achieving compliance with state and federal MCLs.

The results of the 1999 SPSH treatability study established that through the remedial actions that have occurred at OUB, the RAOs have been achieved for soil.

The following table summarizes performance to date related to the RAOs for this source area.

Remedial Action Objective	Performance to Date
Reduce contaminant levels in the groundwater to comply with drinking water standards.	Contaminant concentrations have been reduced; however, concentrations remain above federal MCLs.
Prevent contaminated soil from continuing to act as a source of groundwater contamination.	The RAOs have been achieved for soil.
Prevent the contaminated groundwater from adversely affecting the Eagle River surface water and sediments.	No increases in the extent of the contaminant plume or magnitude of contaminant concentrations have been observed. New wells installed since the last 5-Year Review show that the plume is bounded to the northeast. However, additional wells may be needed to the northwest.
Minimize degradation of the State of Alaska's groundwater resources at the site as a result of past disposal practices.	Contaminant concentrations have been reduced, minimizing degradation of groundwater.

Implementation of Institutional controls

The ICs for Poleline Road, as described in Section 5.3.8, are functioning as intended and continue to be protective of human health and the environment. Figure 3-1 depicts the OUB Poleline Road area subject to restricted use under the IC policy.

System Operations

The SPSH system that was installed and operated at Poleline Road to treat the soil and groundwater was discontinued in 1999 following the treatability study and the heating equipment was removed from the site. Wells associated with the treatment system were decommissioned in October 2002.

Natural attenuation data collected during the last 10 years suggests little bioremediation is occurring at the site. This could be for couple of reasons:

- Chlorinated solvents are difficult to biologically reduce, and
- No other energy source for the microbes is present.

Declining contaminant concentrations are most likely a function of reductive dechlorination by hydrolysis, which is an abiotic process.

Optimization

The timeframe for natural attenuation is estimated at 150 years as stated in the ROD. Groundwater monitoring over the past 10 years indicates that natural attenuation of contaminants is occurring to some extent. However, several more years of monitoring will be required to see if the 150 year estimate is accurate. Because the majority of the natural attenuation is abiotic, there are no viable alternatives for optimizing or increasing the rate of degradation.

5.4.2 Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?

Changes in Standards

No new contaminant sources have been identified; however, three additional constituents (1,1,2-TCA, 1,1-DCE, and vinyl chloride) were identified within and down gradient of the Poleline Road source area. Vinyl chloride first appeared after the 1997 SPSH treatability study. Regular sampling for 1,1,2-TCA and 1,1-DCE did not start until 2002. Because these contaminants are VOCs and because monitoring data shows that the concentrations of these compounds are relatively stable, the remedial action at OUB remains protective in the short- and long-term.

There have been no changes to ARARs or TBCs identified in the ROD.

After the OUB ROD, the state of Alaska promulgated a new groundwater cleanup standard of 0.004 mg/L for 1,1,2,2-PCA. The ADEC has also promulgated soil cleanup levels for tetrachloroethene (0.03 mg/kg) and 1,1,2,2-PCA (0.017 mg/kg). The ADEC cleanup levels are not based on site-specific risk data, but are generic cleanup levels. ADEC will approve alternate cleanup levels based on site-specific risk assessments and will allow a ten-times increase in the cleanup levels if the department determines that the groundwater is not a current source of drinking water or that the reasonably expected potential future use if the groundwater is not a drinking water source. Institutional controls for groundwater at this site preclude the installation of groundwater supply wells or the use of groundwater at this site, thus these newly promulgated soil and groundwater cleanup standards for the state of Alaska do not call into question the protectiveness of the remedy.

Exposure Pathways

- There are no changes in land use or the anticipated land use on or near the site.
- No new human health or ecological exposure pathways or receptors have been identified.
- Since the last 5-year review additional groundwater monitoring wells have been installed that provide additional information on the groundwater flow direction and quality which serve to confirm the plume is generally stable although some questions remain regarding deeper aquifers in the northwest direction. Except for the one area noted, the shallow and deep contaminant plume boundaries appear to be defined by the monitoring wells present on the site.

5.4.3 Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

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

5.4.4 Issues

The following table describes the issues that were identified during this second Five-Year Review.

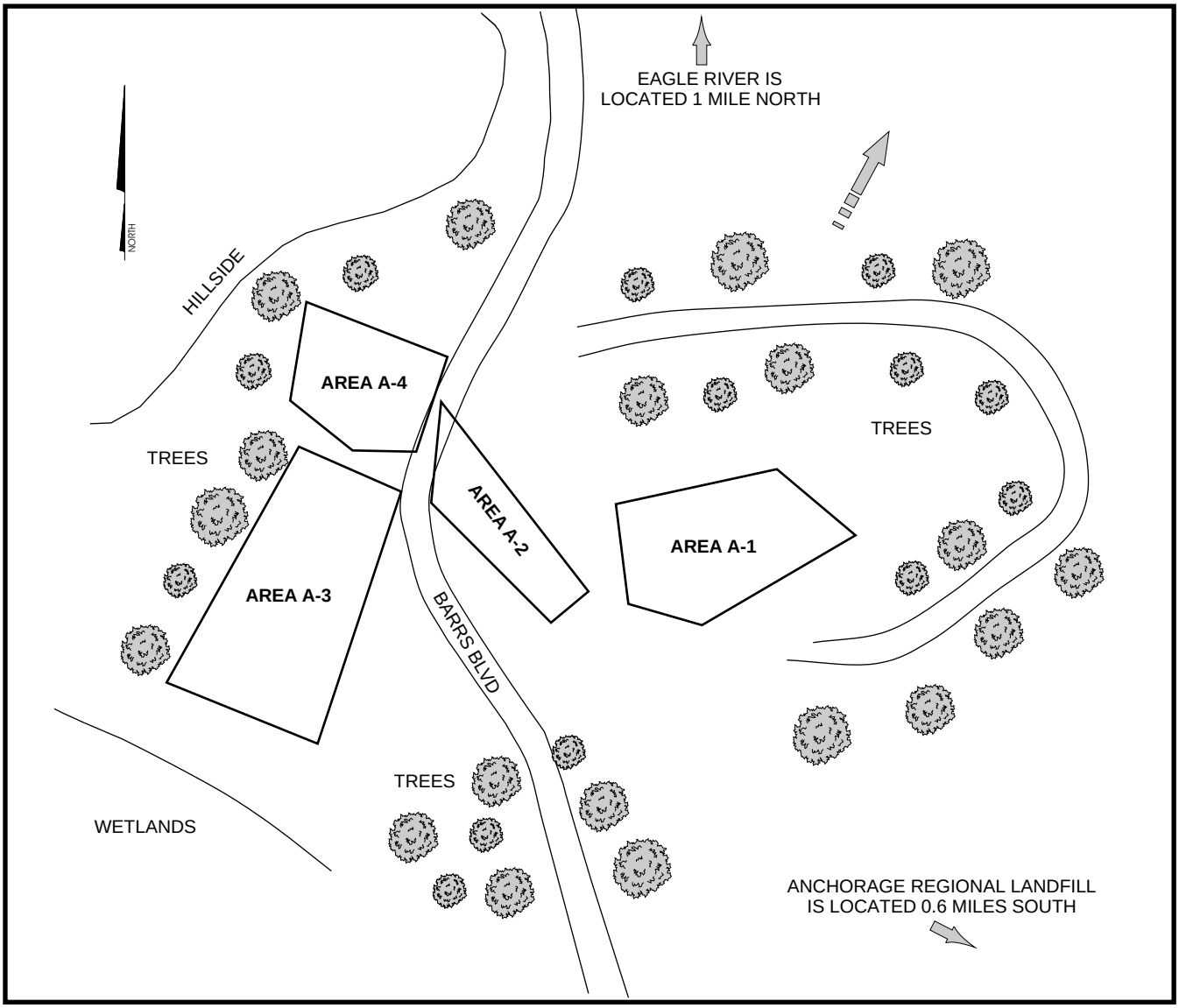
Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Remedial action was performed that effectively remediated the site; however, RAOs for groundwater have not yet been achieved within the “hot spot”.	N	Potential

5.4.5 Recommendations and Follow-up Actions from 2003

Issue	Recommendations / Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Outcome
COCs in groundwater still exceed MCLs	Continue to monitor groundwater contaminant reduction and perform groundwater modeling for a trend analysis.	U.S. Army	EPA/ADEC	9/1/2003	Ongoing
Contaminants not identified in the ROD.	Continue analyzing groundwater samples for VOCs using methods that include the compounds not addressed in the ROD, such as vinyl chloride.	U.S. Army	EPA/ADEC	Ongoing	Ongoing
Contaminant migration north of the source area	Include new wells, installed in 2002, in the long-term groundwater monitoring program.	U.S. Army	EPA/ADEC	Ongoing	New Wells Installed
UXO ICs	Identify an IC specific to UXO buried in Areas A-1 and A-2. The IC will be included in the master plan and real estate documents, range maps, the Environmental GIS, and the IC policy.	U.S. Army	EPA/ADEC	6/1/2003	Fence Installed around A-1 & A-2

5.4.6 Recommendations and Follow-up Actions for 2008

Issue	Recommendations / Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date
COCs in groundwater still exceed MCLs	Continue to monitor groundwater contaminant reduction and perform groundwater modeling for a trend analysis.	U.S. Army	EPA/ADEC	Ongoing
Contaminants not identified in the ROD.	Continue analyzing groundwater samples for VOCs using methods that include the compounds not addressed in the ROD, such as vinyl chloride.	U.S. Army	EPA/ADEC	Ongoing



KEY

APPROXIMATE GROUNDWATER FLOW DIRECTION IN SHALLOW INTERVAL AND DEEP AQUIFER

0 50 100 200

Approximate Scale in Feet

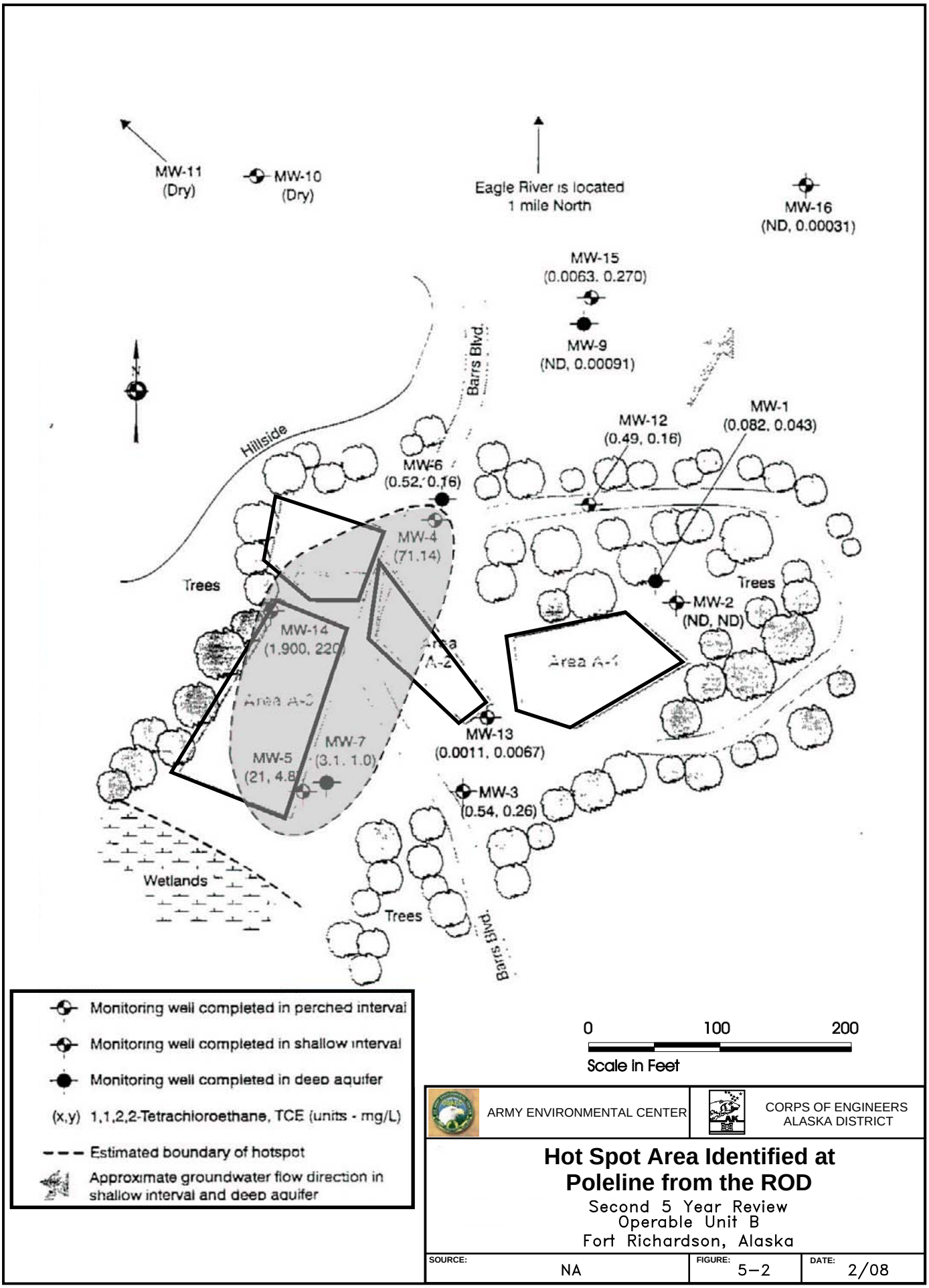
ARMY ENVIRONMENTAL CENTER

CORPS OF ENGINEERS
ALASKA DISTRICT

Poleline Road Disposal Areas

Second 5 Year Review
Operable Unit B
Fort Richardson, Alaska

SOURCE:	FIGURE:	DATE:
NA	5–1	2/08



ARMY ENVIRONMENTAL CENTER

CORPS OF ENGINEERS
ALASKA DISTRICT

Hot Spot Area Identified at Poleline from the ROD

Second 5 Year Review
Operable Unit B
Fort Richardson, Alaska

SOURCE:	FIGURE:	DATE:
NA	5–2	2/08

AP-4352

Total Depth 33.1 ft.	Jun-03	Aug-04	Oct-04	Jun-05	Oct-05	Sep-06	Jun-07	Oct-07
GW Elevation (m):	87.91	87.91	87.85	88.48	87.07	86.09	88.39	85.75
Benzene	0.12J	ND (0.4)	ND (0.4)	ND (0.4)	ND (0.4)	ND(1)	ND(1)	NS
Carbon Tetrachloride	ND	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	NS
cis-1,2-Dichloroethene	ND	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	NS
trans-1,2-Dichloroethene	ND	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	NS
Tetrachloroethene	ND	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	NS
Trichloroethene	ND	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	NS
1,1,2,2-Tetrachloroethane	ND	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND(1)	ND(1)	NS
Vinyl chloride	ND	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	NS
1,1,1-trichloroethane	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	NS
1,1,2-Trichloroethane	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	NS
1,1-Dichloroethene	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	NS
1,2-Dichloroethane	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND(1)	ND(1)	NS

HISTORICAL HOT SPOT WELLS

AP-3989

Total Depth 36.3 ft.	Nov-96	Nov-97	Jun-98	Oct-98	Mar-99	Oct-99	Apr-00	Oct-00	Apr-01	Mar-02	Sep-02	Mar-03	May-05	Sep-05	Aug-04	Oct-04	Jun-05	Oct-05	Sep-06	Jun-07	Oct-07
GW Elevation (m):	85.53	86.22	85.88	85.42	85.79	85.89	85.71	86.48	NA	84.78	NA	85.18	NA	84.86	85.62	84.97	85.76	85.61	85.31	85.96	85.19
Benzene	ND	2	2	3	2	ND	NS	NS	NS	ND	2J	2.30	2.30	ND (8.4)	2.29	1.47	1.64	1.68	1.2	1.6	1.3
Carbon Tetrachloride	ND	ND	ND	ND	ND	NS	NS	NS	NS	ND	ND (0.43)	ND (2.5)	ND (8.6)	0.32J	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
cis-1,2-Dichloroethene	170	1,100	87	200	190	90	NS	NS	NS	180	200	170	200	190	194	147	19	18	23 J+	140	15
trans-1,2-Dichloroethene	1,100	31	85	60	28	NS	NS	NS	NS	42.0	48.0	59.0	48.0	34J	46.2	35.7J+	49.1	40.4	37	45	31
Tetrachloroethene	ND	2J	1J	1J	1J	1	1	NS	NS	0.6J	0.8	2.7	7.8	ND (9.0)	8.85	6.29	5.44	4.56	4.3	6	4
Trichloroethene	940	1,400	900	1,300	740	980	NS	NS	NS	810	870	980	1,000	900	1,080	886	876	806	885 J+	980	860
1,1,2,2-Tetrachloroethane	1,400	1,600	1,000	1,300	1,000	890	NS	NS	NS	880	890	880	880	880	940	897	880	880	900 J+	900	890
Vinyl chloride	NA	NA	ND(1)	ND(100)	ND (1)	ND (1)	NS	NS	NS	ND (0.1)	ND (0.31)	ND (0.83)	ND (2.6)	ND (11)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,1-Trichloroethane										ND	ND	ND (0.81)	ND (2.5)	ND (12)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,2-Trichloroethane										0.5J	1J	1J	1	ND (8.2)	0.85	0.8	0.8	0.8	0.8	1	0
1,1-Dichloroethene										2.6J	2.6J	3.00J	2.8J	ND (11)	2.79	2.63	ND (1.0)	1.61	1.4 J+	1.4 J+	1.4J
1,2-Dichloroethane										ND	ND	ND (0.37)	ND (2.5)	ND (7.4)	ND (0.8)	ND (0.8)	ND (0.8)	ND (0.8)	ND(1)	ND(1)	ND(1)

AP-3983

Total Depth 30.3 ft.	Nov-97	Jun-98	Oct-98	Mar-99	Oct-99	Apr-00	Oct-00	Apr-01	Mar-02	Sep-02	Mar-03	Sep-03	Aug-04	Oct-04	Jun-05	Oct-05	Sep-06	Oct-07
GW Elevation:	86.18	86.53	86.44	85.82	85.54	85.56	86.44	53.72	84.58	NA	85.37	84.89	85.30	85.38	85.66	85.63	85.65	85.58
Benzene	84	28	33	68	18	17	61	68	ND	1.6J	ND (1.8)	1.6J	1.93	0.86	1.83	1.49	ND(1)	1.6
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND (2.1)	ND (0.43)	0.6J	ND (1.0)	ND (1.0)	ND (1.0)	1.3	0.43 J
cis-1,2-Dichloroethene	1,100	1,600	2,200	5400	2600	600	1400	2200	890	800	880	880	885	840	848	808	20	880
trans-1,2-Dichloroethene	1,100	490	790	820	680	680	820	820	34	35	41	78	78	14.5	62.8	65	4.2	68
Tetrachloroethene	180	170	140	80	50	50	68	84	ND	5	4.1J	5.1	4.8	4.8	4.8	4.8	4.8	4
Trichloroethene	17,000	11,000	13,0	12,000	8,100	11,000	8,100	2,800	980	1,400	980	470	1,100	1,10	885	855	890	2,300
1,1,2,2-Tetrachloroethane	15,000	14,000	9,000	28,000	15,000	18,000	9,000	5,400	980	1,400	470J	940	1,400	980	854	498	75	880
Vinyl chloride	NA	ND(1)	9	2	4	6	2.8	4.7	1.1J	1	7.8J	1	2.8	3.86	2.61	3.78	ND(1)	0.96 J
1,1,1-Trichloroethane									ND	1J	ND (3)	ND (1.61)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)
1,1,2-Trichloroethane									0.4J	ND	2J	1	1	2.8	1.1	0.8	1.1	1
1,1-Dichloroethene									ND	4.9	ND (1.6)	7.8	5.7J	5.12	3.18	4.34	0.87 J+	3.3
1,2-Dichloroethane									ND	2.7	2.3J	1.1	3.19	2.66	ND (0.60)	ND (0.50)	ND(1)	0.98 J

AP-3984

Total Depth 32.5	Nov-97	Jun-98	Oct-98	Mar-99	Oct-99	Apr-00	Oct-00	Apr-01	Mar-02	Sep-02	Mar-03	Sep-03	Oct-04	Jun-05	Oct-05	Sep-06	Jun-07	Oct-07
GW Elevation:	85.54	86.52	86.06	85.31	84.37	85.14	86.75	86.12	84.85	86.72	85.23	85.72	86.28	87.00	86.74	86.42	85.24	86.25
Benzene	8	4	7	ND	ND	4	2	1.8	0.48J	0.77J	0.18J	ND (1.6)	1.08	0.41	0.70J	1.8	ND(1)	ND(1)
Carbon tetrachloride	1	1J	1	ND	3.70	7	5	ND	3.40	2.40	0.41	ND (2.1)	1.20	1.16	1.18	ND(1)	0.89J	1.40
cis-1,2-Dichloroethene	790	180	790	190	68	180	78	280	41	54	17	44	76.3	19.1	16.8	180	29.0	17.0
trans-1,2-Dichloroethene	79	48	80	60	15	44	20	22	9	12	3.4	6.6J	21.90	3.13	2.72	21.00	7.2	3.8
Tetrachloroethene	300	84	180	82	28	98	60	18	68	28	7.40	3.5J	12.4	4.19	2.67	5.8	6.8	5.4
Trichloroethene	8,700	8,600	7,800	3,700	1,800	4,600	3,200	680	790	780	380	254	208	180	210	180	200	240
1,1,2,2-Tetrachloroethane	9,000	8,700	10,000	2,800	800	1,100	880	280	80	180	340J	81J	180	84	54	18	48	48
Vinyl chloride	ND	ND(1)	ND(1)	ND (16)	ND (1)	ND (1)	ND (0.3)	2.2	ND (0.31)	ND (0.31)	ND (0.11)	ND (3.7)	0.43J	ND (1.0)	ND (1.0)	2.8	ND(1)	ND(1)
1,1,1-Trichloroethane									ND	ND	ND (5.12)	ND (3)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,2-Trichloroethane									1.7J	3.0	0.92	ND (2.1)	3.17	0.620J	0.620J	0.8	ND(1)	0.64J
1,1-dichloroethene									1.6J	0.94J	0.3J	ND (2.7)	1.09	0.440J	0.420J	1.5 J+	0.81J	0.55J
1,2-dichloroethane									ND	ND	ND (0.074)	ND (1.8)	ND (0.5)	ND (0.5)	ND (0.5)	ND(1)	ND(1)	ND(1)

AP-4550

Total Depth 43.0 ft	Oct-05	Sep-06	Jun-07	Oct-07
GW Elevation (m):	84.95	85.81	85.97	85.60
Benzene	1.48	1.7	0.7J	1.7
Carbon Tetrachloride	ND (1.0)	ND(1)	ND(1)	ND(1)
cis-1,2-Dichloroethene	240	180	200	180
trans-1,2-Dichloroethene	64.4	50	51	50
Tetrachloroethene	28.8	8	10	8
Trichloroethene	2,880	1,100	1,000	1,700
1,1,2,2-Tetrachloroethane	1,300	880	890	1,100
Vinyl chloride	0.800J	1.2 J+	ND(1)	0.87 J
1,1,1-Trichloroethane	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,2-Trichloroethane	0.8	0.8	0.8	0.8
1,1-Dichloroethene	6.13	10 J+	8.6J+	6.9
1,2-Dichloroethane	ND (0.8)	ND(1)	ND(1)	ND(1)

AP-3985

Total Depth 32.6 ft	Jun-98	Oct-98	Mar-99	Oct-99	Apr-00	Oct-00	Apr-01	Mar-02	Sep-02	Mar-03	Sep-03	Aug-04	Oct-04	Jun-05	Oct-05	Sep-06	Jun-07	Oct-07
GW Elevation (m):	87.00	87.42	86.64	86.54	86.48	87.35	86.57	53.48	NA	85.58	85.51	85.05	85.20	87.00	86.55	86.44	86.25	86.19
Benzene	1	2	ND	ND	ND	0.8J	ND	ND	ND	ND (0.084)	ND (1.8)	ND (0.4)	0.22J	ND (0.4)	ND (0.4)	ND(1)	ND(1)	ND(1)
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND (0.588)	ND (2.1)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
cis-1,2-Dichloroethene	140	180	200	200	1,400	280	88	180	99.00	9.60	48.00	43.40	68.1	27.6	38.8	39	31	30
trans-1,2-Dichloroethene	63.00	68.00	94.00	38.00	70.00	28.00	12.00	51.00	12.00	2.10	8.4J	12.6	10.7	6.04	8.06	7.30	8.20	7.6
Tetrachloroethene	28.0	18.0	72.0	10.0	7.0	10.0	8.8	15.0	8.8	1.4	3.5J	7.84	8.88	8.88	8.88	8.8	8.4	8.7
Trichloroethene	2,200	1,700	3,100	870	1,700	690	440	570	210	220	340	288J	407	288	404	340	280	480 J
1,1,2,2-Tetrachloroethane	17,000	11,000	17,000	130	980	480	340	11	98	73J	18J	78.8	122	88.80	77.0	48	67	81
Vinyl chloride	ND(1)	ND(1)	ND (10)	8.00	8.00	1.70	ND (1)	ND (0.31)	ND (0.31)	ND (0.11)	ND (3.7)	0.46J	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,1-trichloroethane								ND	ND	ND (0.18)	ND(9)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,2-Trichloroethane								0.8	2.7	0.38J	3.7J	2.44	2.80	1.64	2.48	1.6	ND(1)	1.7
1,1-Dichloroethene								2.9	2.6	0.87	ND (2.7)	2.40	4.10	2.13	3.70	2.7 J+	2.3J+	2.4
1,2-Dichloroethane								ND	ND	ND (0.074)	ND (1.8)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND(1)	ND(1)	ND(1)

AP-3981

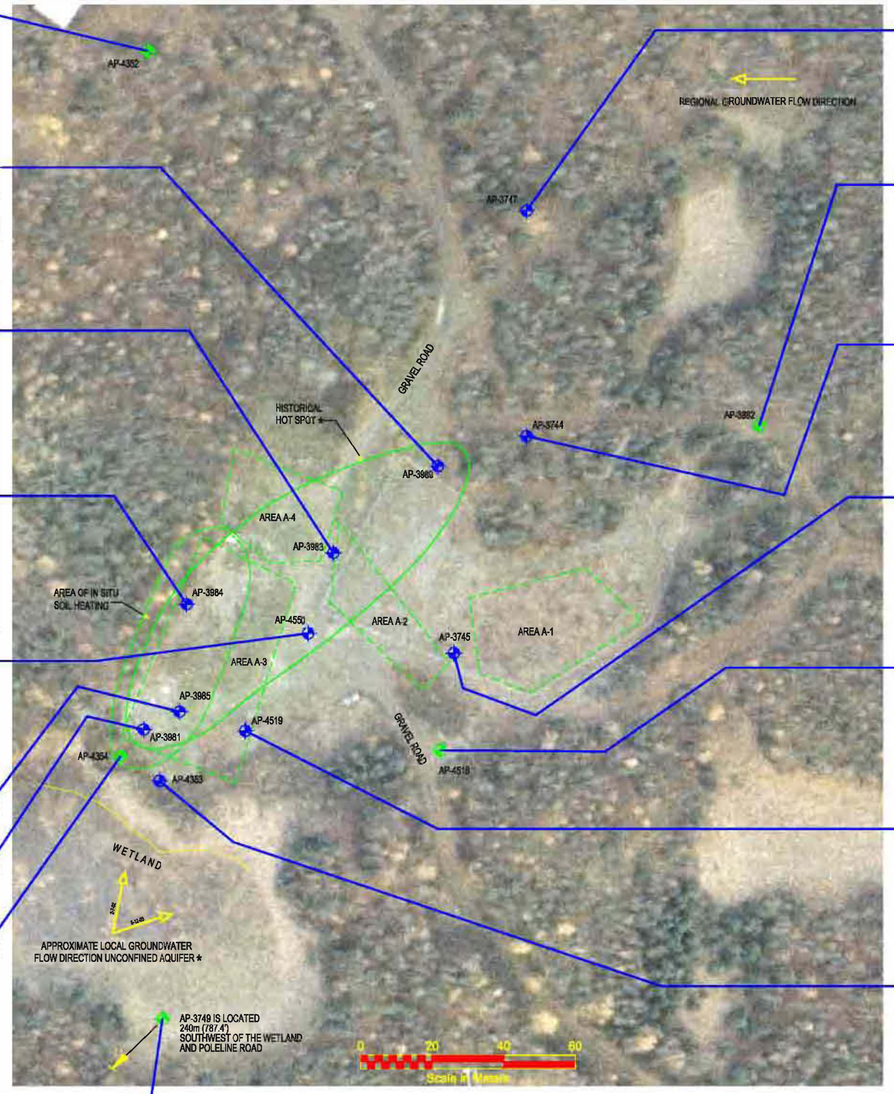
Total Depth 47.0 ft	Nov-97	Jun-98	Oct-98	Mar-99	Oct-99	Apr-00	Oct-00	Apr-01	Mar-02	Sep-02	Mar-03	Sep-03	Aug-04	Oct-04	Jun-05	Oct-05	Sep-06	Jun-07	Oct-07
GW Elevation (m):	83.07	82.91	83.28	85.51	85.88	85.87	87.41	86.80	84.77	85.6	84.51	84.29	85.55	86.56	85.64	86.36	86.21	85.19
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND (0.32)	ND (0.32)	ND (0.4)	ND (0.4)	ND (0.4)	ND(1)	ND(1)	ND(1)
Carbon tetrachloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND (0.43)	ND (0.43)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
cis-1,2-Dichloroethene	78	14	11	14.0	10.0	4.0	1.4	ND	ND	1.3J	ND (0.47)	ND (0.47)	ND (1.0)	0.470 J	0.470 J	1.9	1.3	1.3
trans-1,2-Dichloroethene	78	5	5	6.0	1.3	ND	ND	ND	ND	ND	ND (0.61)	ND (0.61)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
Tetrachloroethene	8	2	6	7	ND	ND	ND	ND	ND	ND	ND (0.46)	ND (0.46)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
Trichloroethene	800	80	170	280	81	18	1.3	0.8	0.45J	0.8	1.5J	ND (0.56)	1.6	1.81	0.785J	1.8	0.8	0.87 J
1,1,2,2-Tetrachloroethane	1,100	240	600	690	280	40	0.3	ND	ND	1.1J	ND (0.48)	ND (0.48)	1.0	ND (0.5)	ND (0.5)	3.7	2.8	ND(1)
Vinyl chloride	NA	ND(1)	ND(1)	ND (1)	ND (1)	ND (1)	ND (0.3)	ND (0.5)	ND (0.31)	ND (0.31)	ND (0.53)	ND (0.53)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,1-trichloroethane									ND	ND	ND (0.61)	ND (0.61)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,2-Trichloroethane									ND	ND	ND (0.41)	ND (0.41)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1-Dichloroethene									ND	ND	ND (0.53)	ND (0.53)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,2-Dichloroethane									ND	ND	ND (0.37)	ND (0.37)	ND (0.5)	ND (0.5)	ND (0.5)	ND(1)	ND(1)	ND(1)

AP-4354

Total Depth 18.0 ft	Jun-03	Aug-04	Oct-04	Jun-05	Oct-05	Sep-06	Jun-07	Oct-07
GW Elevation (m):	90.63	88.90	90.68	90.50	89.93	90.28	90.70	89.83
Benzene	0.18J	ND (0.4)	ND (0.4)	ND (0.4)	ND (0.4)	ND(1)	ND(1)	ND(1)
Carbon Tetrachloride	ND	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
cis-1,2-Dichloroethene	1.30	0.75J	0.42J	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
trans-1,2-Dichloroethene	0.3J	0.32J	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
Tetrachloroethene	0.11J	0.67J	0.44J	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
Trichloroethene	3.70	1.45	0.59J	ND (1.0)	0.500J	ND(1)	ND(1)	ND(1)
1,1,2,2-Tetrachloroethane	3.80	2.69	ND (0.5)	ND (0.5)	ND (0.5)	ND(1)	ND(1)	ND(1)
Vinyl chloride	ND	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,1-Trichloroethane	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,2-Trichloroethane	ND (0.5)	0.67J	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1-Dichloroethene	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,2-Dichloroethane	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND(1)	ND(1)	ND(1)

AP-3749

Total Depth 24.8 ft	Oct-95	Nov-96	Nov-97	Jun-98	Oct-98	Mar-99	Oct-99	Apr-00	Oct-00	Apr-01	Mar-02	Sep-02	Mar-03	Sep-03	Aug-04	Oct-04	Jun-05	Oct-05	Sep-06	Jun-07	Oct-07
GW Elevation (m):	88.83	85.74	86.87	85.52	86.71	86.66	88.25	NA	NA	NA	86.69	87.62	88.47	88.48	88.03	88.51	88.54	89.33	88.89	89.72	88.98
Benzene	NS	NS	ND	ND	NS	NS	ND	NS	NS	ND	ND	ND	ND (0.32)	ND (0.32)	ND (0.4)	ND (0.4)	ND (0.4)	ND (0.4)	ND(1)	ND(1)	ND(1)
Carbon Tetrachloride	NS	NS	ND	ND	NS	NS	ND	NS	NS	ND	ND	ND	ND (0.43)	ND (0.43)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
cis-1,2-Dichloroethene	NS	NS	ND	ND	NS	NS	ND	NS	NS	ND	ND	ND	ND (0.47)	ND (0.47)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
trans-1,2-Dichloroethene	NS	NS	ND	ND	NS	NS	ND	NS	NS	ND	ND	ND	ND (0.61)	ND (0.61)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
Tetrachloroethene	NS	NS	ND	ND	NS	NS	ND	NS	NS	ND	ND	ND	ND (0.46)	ND (0.46)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
Trichloroethene	NS	NS	ND	ND	NS	NS	ND	NS	NS	ND	ND	ND	ND (0.56)	ND (0.56)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,2,2-Tetrachloroethane	NS	NS	ND	ND	NS	NS	1.00	NS	NS	ND	ND	ND	ND (0.48)	ND (0.48)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND(1)	ND(1)	ND(1)
Vinyl chloride	NS	NS	ND	ND	NS	NS	ND	NS	NS	ND	ND	ND	ND (0.53)	ND (0.53)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,1-Trichloroethane											NS	ND	ND (0.61)	ND (0.61)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,2-Trichloroethane											NS	ND	ND (0.41)	ND (0.41)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1-Dichloroethene											NS	ND	ND (0.53)	ND (0.53)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,2-Dichloroethane											NS	ND	ND (0.37)	ND (0.37)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND(1)	ND(1)	ND(1)



AP-3747

Total Depth 32.1 ft.	Oct-95	Nov-96	Nov-97	Jun-98	Oct-98	Mar-99	Oct-99	Apr-00	Oct-00	Apr-01	Mar-02	Sep-02	Mar-03	Sep-03	Aug-04	Oct-04	Jun-05	Oct-05	Sep-06	Jun-07	Oct-07
GW Elevation (m):	85.2	83.11	85.13	86.54	85.37	84.45	84.98	84.49	85.38	84.5	DRY	83.88	84.11	83.7	84.43	84.52	85.53	84.09	84.8	84.52	84.484
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND (0.084)	ND (1.8)	ND (0.4)	ND (0.4)	ND (0.4)	ND (0.4)	ND(1)	ND(1)	ND(1)
Carbon Tetrachloride	1.4	NS	ND	ND	ND	3	3	4	1	3.2	NS	NS	1.1J	0.22J	2	0.71J	0.98J	0.260J	0.640J	1.1	0.82J
cis-1,2-Dichloroethene	15	NS	25	8	17	34	40	50	16	44	NS	28	3.8	34	17.5	24	8.5	10.1J	21	18	23
trans-1,2-Dichloroethene	4.1	NS	29	2	4	10	9.3	15	4.8	13	NS	7.2	1.2	6.7	3.01	3.22	1.78	3.07J+	6.4	4.9	7
Tetrachloroethene	2.1	NS	2	3	6	6	1	2.8	7.8	NS	NS	3.9	0.5	3.4	2.57	3.22	1.01	1.78J-	5.1	2.2	3.2
Trichloroethene	270	NS	980	940	880	790	870	1,000	280	480	NS	880	980	480	887	488	887	98J-	980 J	280	880
1,1,2,2-Tetrachloroethane	NA	NS	4	2	4	1	1	87	8	87	NS	7.8	0.58J	88	1.82	2.66	1.06	1.06	2.5	2.8	8.8
Vinyl chloride			ND(1)	ND(1)	ND (1)	ND (1)	ND (1)	ND (0.3)	ND(1)	ND(0.3)	NS	NS (0.3J+)	ND (0.11)	ND (2.7)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)	ND(1)
1,1,1-Trichloroethane											NS	ND	ND (0.12)	ND (9)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,2-Trichloroethane											NS	3.1	0.45	4.4	1.83	2.1	0.500J	0.760J-	1.8	1.4	2.2
1,1-Dichloroethene											NS	0.95J	0.18J	3	0.8J	ND (1.0)	ND (1.0)	0.440J-	1.4 J+	0.88J+	1.3
1,2-Dichloroethane											NS	ND	ND (0.074)	ND (1.8)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND(1)	ND(1)	ND(1)

AP-3982

Total Depth: 37.5 ft	Nov-97	Jun-98	Oct-98	Mar-99	Oct-99	Apr-00	Oct-00	Apr-01	Mar-02	Sep-02	Mar-03	Sep-03	Aug-04	Oct-04	Jun-05	Oct-05	Sep-06	Jun-07	Oct-07
GW Elevation (m):	83.5	84.18	83.79	85.49	85.61	85.38	86.02	85.43	83.49	84.49	85.4	85.12	84.9	84.87	85.55	85.34	85.06	84.97	84.946
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND (0.32)	ND (0.32)	ND (0.4)	ND (0.4)	ND (0.4)	ND (0.4)	ND(1)	ND(1)	ND(1)
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND (0.43)	ND (0.43)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
cis-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND (0.47)	ND (0.47)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
trans-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND (0.61)	ND (0.61)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
Tetrachloroethene	ND	1	ND	ND	ND	ND	ND	ND	ND	ND	ND (0.46)	ND (0.46)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
Trichloroethene	8	8	1J	17J	1.00	ND	ND	ND	ND	ND	ND (0.56)	ND (0.56)	0.8J	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,2,2-Tetrachloroethane	9	10	10	20J	40J	8J	ND	ND	3.20	ND	ND (0.48)	ND (0.48)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND(1)	ND(1)	ND(1)
Vinyl chloride	NA	ND(1)	ND(1)	ND (1)	ND (1)	ND (1)	ND (0.3)	ND (0.5)	ND (1.0)	ND (1.0)	ND (0.53)	ND (0.53)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,1-trichloroethane									ND	ND	ND (0.61)	ND (0.61)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,2-Trichloroethane									ND	ND	ND (0.41)	ND (0.41)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1-Dichloroethene									ND	ND	ND (0.53)	ND (0.53)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,2-Dichloroethane									ND	ND	ND (0.37)	ND (0.37)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND(1)	ND(1)	ND(1)

AP-3744

Total Depth: 47.0 ft	Oct-95	Nov-96	Nov-97	Jun-98	Oct-98	Mar-99	Oct-99	Apr-00	Oct-00	Apr-01	Mar-02	Sep-02	Mar-03	Sep-03	Jun-05	Oct-05	Sep-06	Jun-07	Oct-07
GW Elevation (m):	85.80	84.34	85.22	86.79	85.48	85.24	85.39	82.68	83.36	82.68	83.79	84.50	NA	84.15	83.82	85.37	85.15	86.02	85.00
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND(0.084)	ND(0.

AP-4350
Total Depth 186.5 ft

	Jun-03	Aug-04	Oct-04	Jun-05	Oct-05	Sep-06	Jun-07	Oct-07
GW Elevation (m):	49.56	48.00	48.04	48.98	49.29	48.94	48.91	48.97
Benzene	ND	ND (0.4)	ND (0.4)	ND (0.4)	ND (0.4)	ND(1)	ND(1)	ND(1)
Carbon Tetrachloride	ND	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
cis-1,2-Dichloroethene	ND	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
trans-1,2-Dichloroethene	ND	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
Tetrachloroethene	ND	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	0.41 J
Trichloroethene	0.15 J	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,2,2-Tetrachloroethane	ND	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND(1)	ND(1)	ND(1)
Vinyl chloride	ND	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,1-trichloroethane	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,2-Trichloroethane	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1-Dichloroethene	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,2-Dichloroethane	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND(1)	ND(1)	ND(1)

AP-4344
Total Depth 184.0 ft

	Jun-03	Aug-04	Oct-04	Jun-05	Oct-05	Sep-06	Jun-07	Oct-07
GW Elevation (m):	50.43	49.33	49.39	49.85	50.13	49.78	49.74	49.81
Benzene	0.63	ND (0.4)	ND (0.4)	ND (0.4)	ND (0.4)	ND(1)	ND(1)	ND(1)
Carbon Tetrachloride	0.49J	0.81J	0.58J	0.630J	0.660J	ND(1)	ND(1)	ND(1)
cis-1,2-Dichloroethene	0.51	0.54J	0.48J	0.520J	0.910J	ND(1)	ND(1)	ND(1)
trans-1,2-Dichloroethene	ND	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
Tetrachloroethane	ND	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	0.35 J
Trichloroethene	13.0	19.8	19.1	18.2	26.5 J-	14	15	13
1,1,2,2-Tetrachloroethane	0.22J	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND(1)	ND(1)	ND(1)
Vinyl chloride	ND	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,1-trichloroethane	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,2-Trichloroethane	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1-Dichloroethene	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,2-Dichloroethane	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND(1)	ND(1)	ND(1)

AP-5246
Total Depth 158.0 ft

	Jul-07	Oct-07
GW Elevation (m):	49.67	49.72
Benzene	ND (1)	ND (1)
Carbon Tetrachloride	ND (1)	ND (1)
cis-1,2-Dichloroethene	ND (1)	ND (1)
trans-1,2-Dichloroethene	ND (1)	ND (1)
Tetrachloroethene	ND (1)	0.39 J
Trichloroethene	ND (1)	ND (1)
1,1,2,2-Tetrachloroethane	ND (1)	ND (1)
Vinyl chloride	ND (1)	ND (1)
1,1,1-Trichloroethane	ND (1)	ND (1)
1,1,2-Trichloroethane	ND (1)	ND (1)
1,1-Dichloroethene	ND (1)	ND (1)
1,2-Dichloroethane	ND (1)	ND (1)

AP-4345
Total Depth 187.0 ft

	Jun-03	Aug-04	Oct-04	Jun-05	Oct-05	Sep-06	Jun-07	Oct-07
GW Elevation (m):	51.00	49.87	49.73	50.45	50.76	50.37	50.33	50.408
Benzene	0.15 J	ND (0.4)	ND (0.4)	ND (0.4)	ND (0.4)	ND(1)	ND(1)	ND(1)
Carbon Tetrachloride	ND	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
cis-1,2-Dichloroethene	ND	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
trans-1,2-Dichloroethane	ND	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
Tetrachloroethane	ND	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	0.32 J
Trichloroethane	0.39 J	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,2,2-Tetrachloroethane	ND	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND(1)	ND(1)	ND(1)
Vinyl chloride	ND	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,1-trichloroethane	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,2-Trichloroethane	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1-Dichloroethene	ND (0.5)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,2-Dichloroethane	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND(1)	ND(1)	ND(1)

AP-3748
Total Depth 171.6 ft

	Oct-05	Nov-06	Nov-97	Jun-98	Oct-98	Mar-99	Oct-99	Apr-00	Oct-00	Apr-01	Mar-02	Sep-02	Mar-03	Sep-03	Aug-04	Oct-04	Jun-05	Oct-05	Sep-06	Jun-07	Oct-07
GW Elevation (m):	51.50	50.78	50.62	50.79	51.46	51.79	51.50	51.41	51.93	51.70	49.67	49.69	50.10	49.92	50.24	50.29	50.77	51.08	50.70	50.63	50.73
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND (0.32)	ND (0.32)	ND (0.4)	ND (0.4)	ND (0.4)	ND (0.4)	ND(1)	ND(1)	ND(1)
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND (0.43)	ND (0.43)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
cis-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND (0.47)	ND (0.47)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
trans-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND (0.61)	ND (0.61)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND (0.45)	ND (0.45)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	0.35 J
Trichloroethene	3.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND (0.55)	ND (0.55)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	0.71 J	ND(1)	ND(1)
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND (0.48)	ND (0.48)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND(1)	ND(1)	ND(1)
Vinyl chloride	NA	NA	NA	ND(1)	ND(1)	ND (1)	ND (1)	ND (1)	ND (0.3)	ND (0.5)	ND	ND	ND (0.53)	ND (0.53)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,1-trichloroethane											ND	ND	ND (0.61)	ND (0.61)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,2-Trichloroethane											ND	ND	ND (0.41)	ND (0.41)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1-Dichloroethene											ND	ND	ND (0.53)	ND (0.53)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,2-Dichloroethane											ND	ND	ND (0.37)	ND (0.37)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND(1)	ND(1)	ND(1)

AP-4019
Total Depth 153.0 ft

	Oct-95	Nov-97	Jun-98	Oct-98	Mar-99	Oct-99	Apr-00	Oct-00	Apr-01	Mar-02	Sep-02	Mar-03	Sep-03	Oct-04	Jun-05	Oct-05	Oct-06	Jun-07	Oct-07
GW Elevation (m):	-	-	50.19	50.93	50.83	50.53	50.45	51.00	50.72	49.57	49.55	50.04	49.81	49.76	50.29	50.31	50.19	50.14	50.22
Benzene	0.73	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND (0.32)	ND (0.32)	ND (0.4)	ND (0.4)	ND (0.4)	ND(1)	ND(1)	ND(1)
Carbon tetrachloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND (0.43)	ND (0.43)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
cis-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND (0.47)	ND (0.47)	0.36 J	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
trans-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND (0.61)	ND (0.61)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND (0.45)	ND (0.45)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	0.31 J
Trichloroethene	0.91	ND	ND	ND	ND	ND	ND	0.2 J	ND	ND	0.55 J	ND (0.55)	ND (0.55)	0.41 J	ND (1.0)	5.02	ND(1)	ND(1)	ND(1)
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND (0.48)	ND (0.48)	ND (0.5)	ND (0.5)	ND (0.5)	ND(1)	ND(1)	ND(1)
Vinyl chloride			ND(10)	ND(1)	ND (1)	ND (1)	ND (1)	ND (0.3)	ND (0.5)	ND	ND	ND (0.53)	ND (0.53)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,1-trichloroethane										ND	ND	ND (0.61)	ND (0.61)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,2-Trichloroethane										ND	ND	ND (0.41)	ND (0.41)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1-Dichloroethene										ND	ND	ND (0.53)	ND (0.53)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,2-Dichloroethane										ND	ND	ND (0.37)	ND (0.37)	ND (1.0)	ND (0.5)	ND (0.5)	ND(1)	ND(1)	ND(1)

AP-4525
Total Depth 127.4 ft

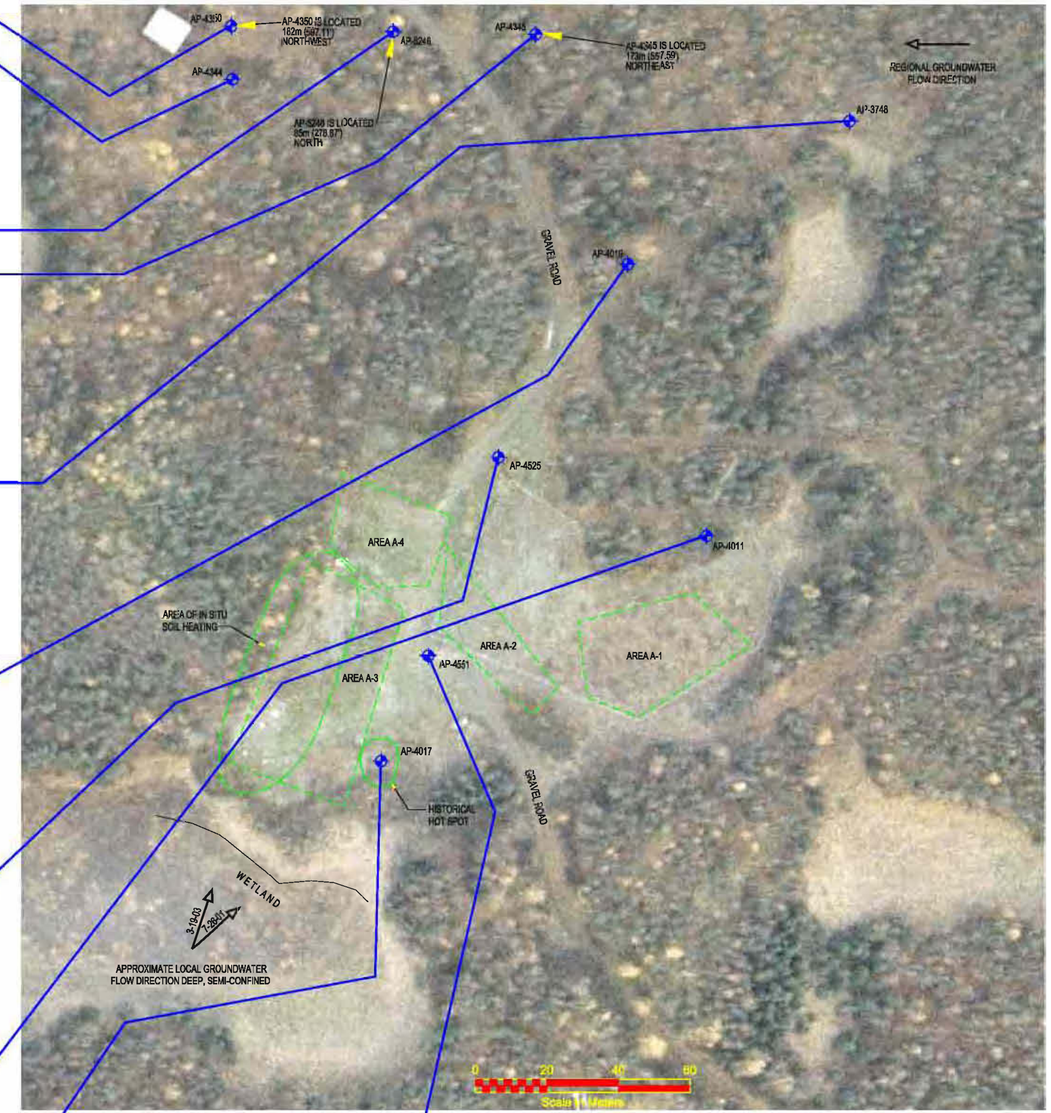
	Aug-04	Jun-05	Oct-05	Sep-06	Jun-07	Oct-07
GW Elevation (m):	56.96	54.83	54.89	54.89	54.82	54.81
Benzene	0.69	0.54	ND (0.4)	ND (1)	0.58 J	ND(1)
Carbon tetrachloride	8.9	7.8	0.680J	3.2	ND (1)	0.92 J
cis-1,2-Dichloroethene	384	367	87.70	340	81	140
trans-1,2-Dichloroethene	75.4	70.5	10.2	46.0	9.0	16.0
Tetrachloroethene	24.4	27.1	5.62	14	2.7	5.1
Trichloroethene	5720	4530	865	3900	600	1900
1,1,2,2-Tetrachloroethane	463	883	385	370	120	180
1,1-Dichloroethene	9.04	9.94	ND (1.0)	5.1 J+	ND (1.0)	1.50
1,1,2-Trichloroethane	24.5	29.2	13.9	25	12	17

AP-4011
Total Depth 140.0 ft

	Oct-95	Nov-97	Jun-98	Oct-98	Mar-99	Oct-99	Apr-00	Oct-00	Apr-01	Mar-02	Sep-02	Mar-03	Sep-03	Aug-04	Oct-04	Jun-05	Oct-05	Sep-06	Jun-07	Oct-07
GW Elevation (m):	54.88	54.91	54.9	54.83	55.32	55.37	55.27	55.19	55.26	54.31	54.42	54.4	54.44	54.62	54.8	54.78	54.70	54.83	54.82	54.80
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND (0.64)	ND (0.32)	ND (0.4)	ND (0.4)	ND (0.4)	ND (0.4)	ND(1)	ND(1)	ND(1)
Carbon Tetrachloride	ND	ND	1	ND	ND	1	1	1.2	0.85	0.67J	0.79J	0.11J	ND (0.43)	0.52J	0.63J	0.640 J	0.640 J	0.55 J	ND(1)	0.83 J
cis-1,2-Dichloroethene	5.3	ND	5	5	4	4.1	4	6	4.8	3.3	4.8	0.8	3.9J	3.73	3.3	3.25	2.49	3	3.1	2.7
trans-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	0.56	ND	ND	0.71 J	ND (0.12)	ND (0.61)	0.38J	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND (0.09)	ND (0.45)	0.4J	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
Trichloroethene	43	30	34	29	35	34	36	38	37	27	35	5.9	25J	24.2	24.9	24.8	18.2	19	17	17
1,1,2,2-Tetrachloroethane	52	47	54	39	18	47	71	33	18	12	8.8	2.1	10J	3.39	3.66	2.7	ND (0.5)	1.3	1.3	1.2
Vinyl chloride	NA	NA	ND(1)	ND(1)	ND (1)	ND (1)	ND (1)	ND (0.3)	ND (0.5)	ND (0.31)	ND (0.31)	ND (0.11)	ND (0.53)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,1-trichloroethane										ND	ND	ND (0.12)	ND (0.61)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,2-Trichloroethane										ND	0.51J	ND (0.082)	0.58J	0.32J	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1-Dichloroethene										ND	ND	ND (0.11)	ND (0.53)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,2-Dichloroethane										ND	ND	ND(0.074)	ND (0.37)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND(1)	ND(1)	ND(1)

AP-4017
Total Depth 97.1 ft

	Oct-95	Nov-97	Jun-98	Oct-98	Mar-99	Oct-99	Apr-00	Oct-00	Apr-01	Mar-02	Sep-02	Mar-03	Sep-03	Aug-04	Oct-04	Jun-05	Oct-05	Sep-06	Jun-07	Oct-07
GW Elevation (m):	70.77	71.12	71.22	71.29	71.39	71.66	71.68	71.79	71.51	70.98	71.23	72.71	72.35	73.73	73.59	73.77	73.40	73.35	73.37	73.46
Benzene	ND	ND	ND	ND	ND	ND	ND	0.3J	ND	ND	0.53J	ND (3.2)	ND (3.2)	1.01	0.92	ND (0.4)	0.43	ND(1)	0.54 J	ND(1)
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND (4.3)	ND (4.3)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
cis-1,2-Dichloroethene	280	ND	300	330	280	290	193	280	390	320	300	330	360	257	48	357	427	460	370	460
trans-1,2-Dichloroethene	58	ND	82	74	75	59	48	56	100	80	120	100	83	21.2	142	113	142	140	120	130
Tetrachloroethene	ND	4	5	3	4	2	2	2.1	ND	4.2	3.9	ND (2.5)	ND (4.5)	2.4	2.44	2.90J	2.73	1.4	1.2	1.5
Trichloroethene	1000	1300	920	850	1100	980	880	730	1300	810	1000	1000	1100	902	1430	1300	1320	1500	1200	1800
1,1,2,2-Tetrachloroethane	3100	1500	1100	1300	950	1200	690	1000	1200	700	760	690J	880J	463	525	481	458	370	290	420
Vinyl chloride			ND(1)	ND(1)	ND (1)	ND (1)	ND (1)	0.069	ND (5)	2.7	2.7	ND (5.3)	ND (5.3)	0.7J	2.54	3.00J	3.8	4 J+	2.5	2.3
1,1,1-trichloroethane										ND	ND	ND (6.1)	ND (6.1)	ND (1.0)	ND (1.0)	ND (5.0)	ND (1.0)	ND(1)	ND(1)	ND(1)
1,1,2-Trichloroethane										21	25	23	31	18.7	25.7	23	25.9	18	16	20
1,1-Dichloroethene										12	11	9J	ND (5.3)	8.02	11.2	10.5	13.8	14 J+	11 J+	11
1,2-Dichloroethane										ND	ND	ND (3.7)	ND (3.7)	ND (0.5)	ND (0.5)	ND (2.50)	ND (0.5)	ND(1)	ND(1)	ND(1)



AP-4551
Total Depth 98.3 ft

	Oct-05	Sep-06	Jun-07	Oct-07
GW Elevation (m):	64.29	64.32	64.37	64.35
Benzene	0.290J	ND(1)	0.67 J	ND(1)
cis-1,2-Dichloroethene	85.5	150	180	110
trans-1,2-Dichloroethene	9.57	18	12	11
Tetrachloroethene	2.52	4.2	1.9	2.9
Trichloroethene	1610	2300	1900	3000
1,1,2,2-Tetrachloroethane	90.5	130	120	130
1,1,2-Trichloroethane	8.27	12	9.8	11
1,1-Dichloroethene	7.4	8 J+	11 J+	12

NOTES *

Groundwater elevation in meters. Previous groundwater elevations taken from archived reports.

Data from March 1999 to April 2001 collected by URS Corporation (URS, 2001)

Data from March 2002 to April 2003 and from September 2006 to Present collected by CH2M Hill.

All non-detect values before August 2004 are reported as the Method Detection Limit (MDL)

2004 August and October non-detect values are reported as the Practical Quantitation Limit (PQL)

All concentrations are measured in µg/L

Exceedances compared against Remedial Action Objectives values

Regulatory Exceedances of RAOs in **Bold, Blue**

Historical maximum concentrations/elevations are indicated by a box

Approximate Groundwater flow directions were obtained from Hydrogeology of the Poleline Road Disposal Area, (CRREL, 2003).

Hot Spot has been defined in the OUB ROD as the Area of Groundwater where 1,1,2,2-PCA concentrations exceed 1,000 µg/L.

ABBREVIATIONS:

Dup = Duplicate Sample
NA = Not Available
ND = No Analyte Detected
J = Estimated Quantity
J+ = Analyte is present, but value may not be accurate or precise (estimated high)
J- = Analyte is present, but value may not be accurate or precise (estimated low)
B = Lab Blank Contamination
RAO = Remedial Action Objectives

Cleanup Level Values

Chemical of Concern	Remedial Action Objectives values
Benzene	5 µg/L
Carbon Tetrachloride	5 µg/L
cis-1,2-Dichloroethene	70 µg/L
Tetrachloroethene	5 µg/L
trans-1,2-Dichloroethene	100 µg/L
Trichloroethene	5 µg/L
1,1,2,2-Tetrachloroethane	5.3 µg/L
Vinyl chloride	2 µg/L
1,1,1-Trichloroethane	200 µg/L
1,1,2-Trichloroethane	5 µg/L
1,1-Dichloroethene	7 µg/L
1,2-Dichloroethane	5 µg/L

LEGEND

Monitoring Well Location

ND Maximum Historic Concentrations

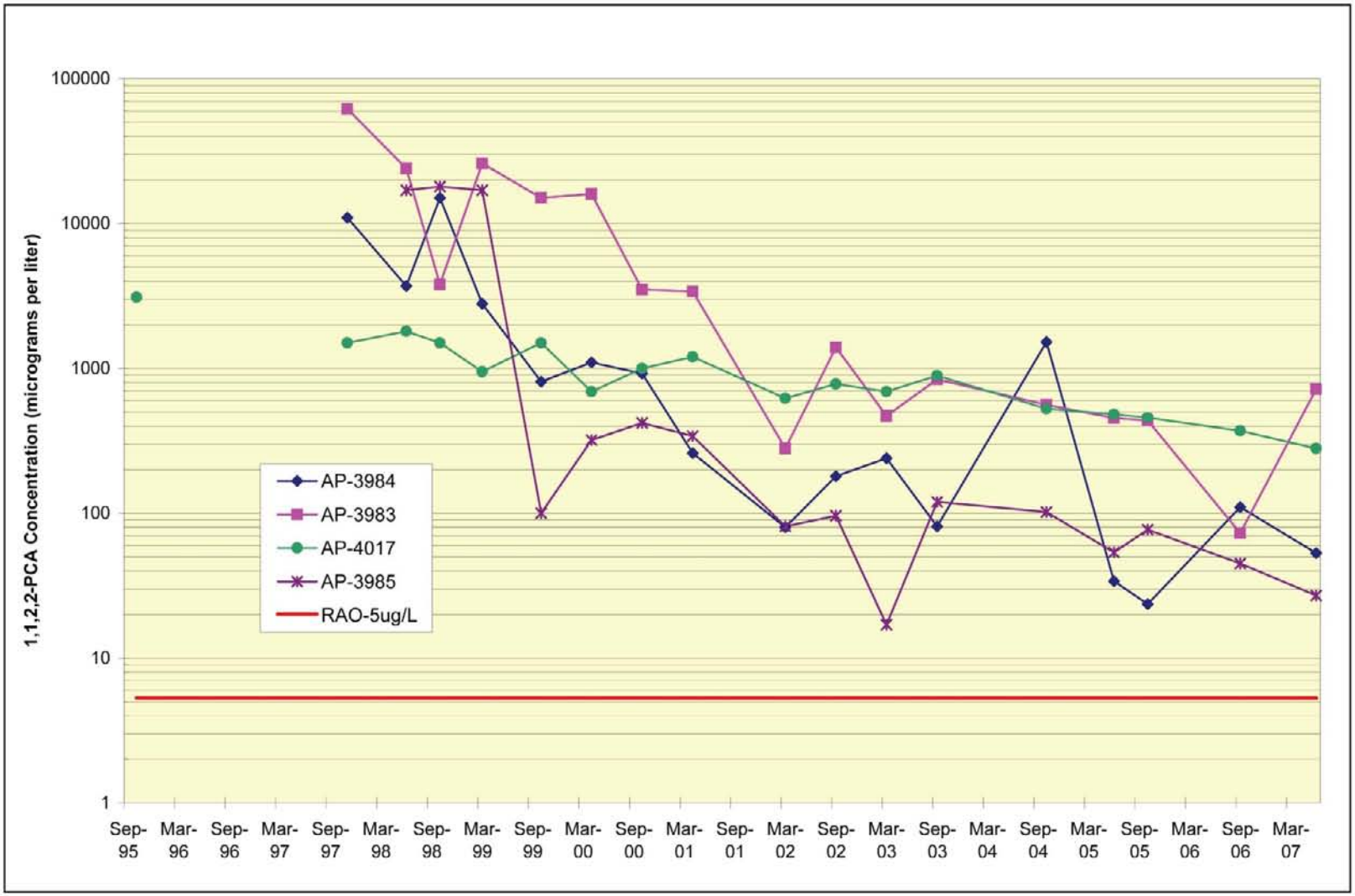
ARMY ENVIRONMENTAL CENTER

CORPS OF ENGINEERS ALASKA DISTRICT

Poleline Road Groundwater Monitoring Data for Deep, Semi-Confined Aquifer

Second 5 Year Review
Operable Unit B
Fort Richardson, Alaska

SOURCE: CH2MHILL, 2008 | FIGURE: 5-4 | DATE: 2/08



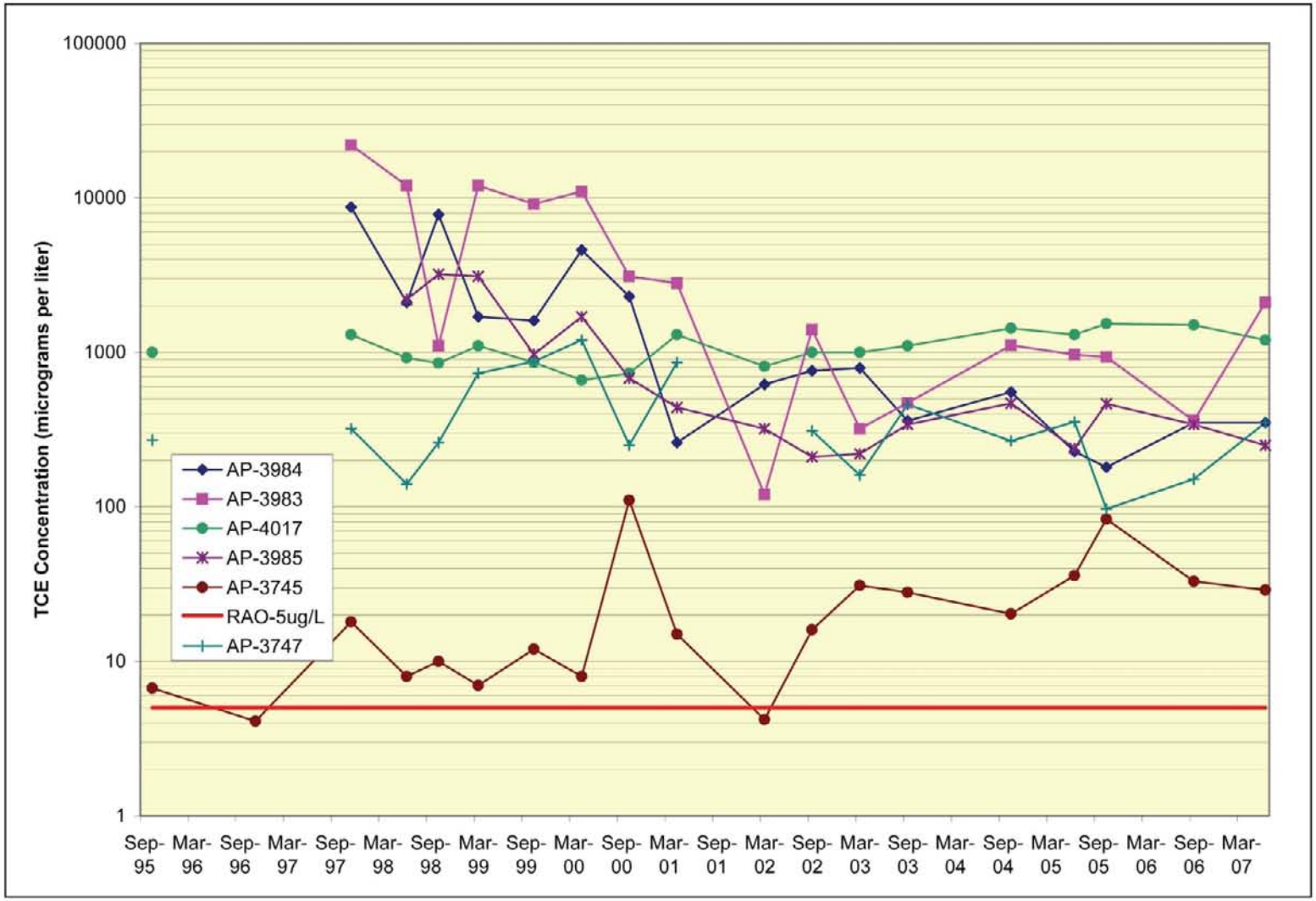
ARMY ENVIRONMENTAL CENTER

CORPS OF ENGINEERS
ALASKA DISTRICT

1,1,2,2 PCA Concentration vs Time

Second 5 Year Review
Operable Unit B
Fort Wainwright, Alaska

SOURCE:	FIGURE:	DATE:
NA	5–5	2/08



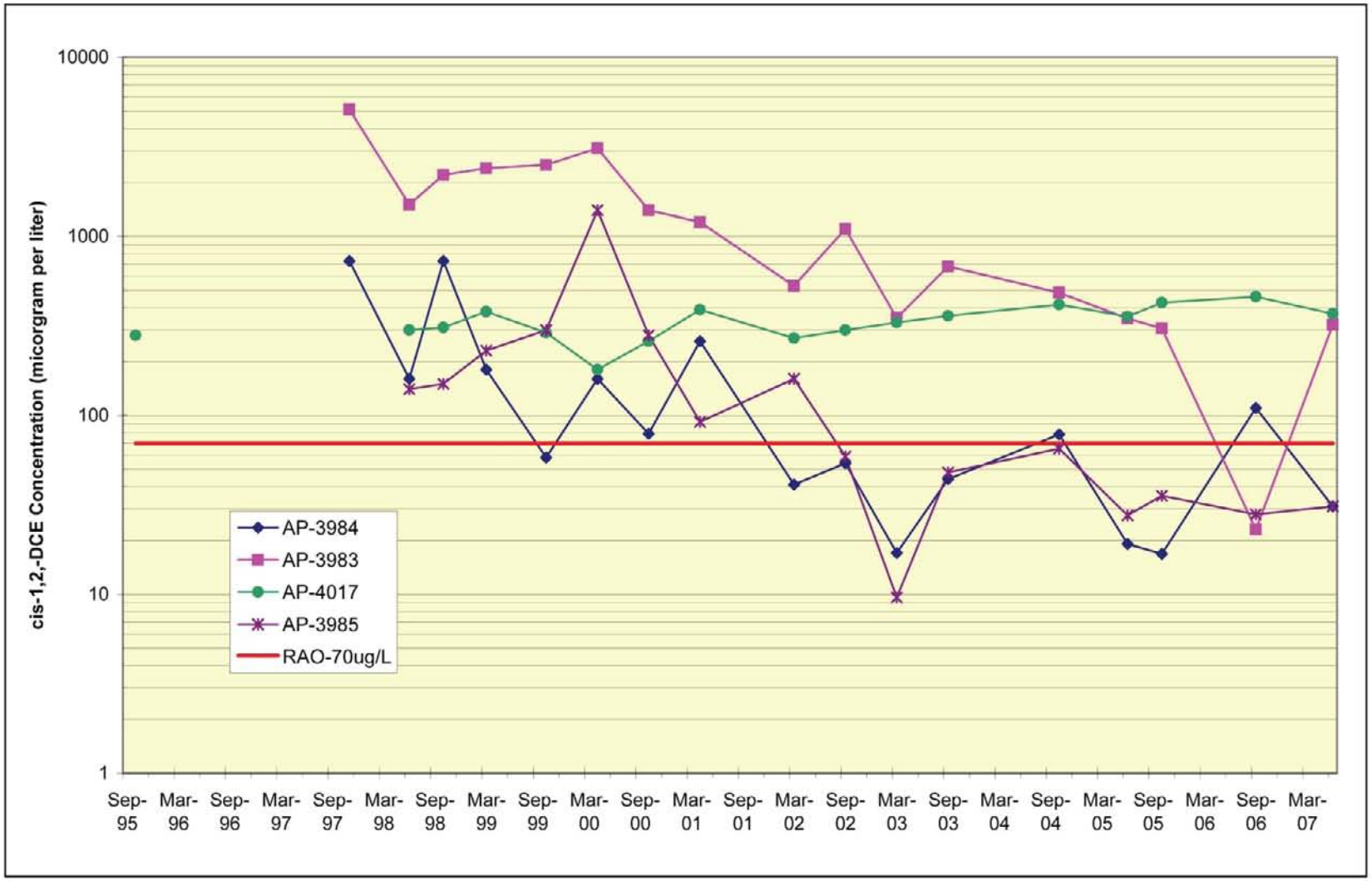
ARMY ENVIRONMENTAL CENTER

CORPS OF ENGINEERS
ALASKA DISTRICT

TCE Concentration vs Time

Second 5 Year Review
Operable Unit B
Fort Wainwright, Alaska

SOURCE:	FIGURE:	DATE:
NA	5–6	2/08



ARMY ENVIRONMENTAL CENTER

CORPS OF ENGINEERS
ALASKA DISTRICT

cis-1,2 DCE Concentration vs Time

Second 5 Year Review
Operable Unit B
Fort Wainwright, Alaska

SOURCE:	FIGURE:	DATE:
NA	5–7	2/08

6.0 OPERABLE UNIT C

OUC is the third OU to reach the final-action ROD at the Fort Richardson National Priorities List site and was signed September 30, 1998. OUC has two source areas, Eagle River Flats (ERF) and the Open Burning/Open Detonation (OB/OD) pad. The ROD for OUC addresses sediment contamination at the ERF source area. No further action under CERCLA was selected for the OB/OD pad. It will be closed under RCRA concurrently with final clearance of the operating range.

6.1 OUC EAGLE RIVER FLATS BACKGROUND

6.1.1 Overview

Eagle River Flats is a 2,160-acre salt marsh on Fort Richardson where Eagle River meets tidal waters in Knik Arm. It has been used for artillery training since 1949. In the early 1980's, the Army noticed an unusually high number of waterfowl deaths. In response, the Army initiated a comprehensive sampling program to determine if munitions or munitions constituents were the cause of mortality. Pre-RI investigations conducted in 1990 analyzed 172 sediment samples for 14 chemicals of concern (munitions constituents). Eventually in 1991, it was determined that white phosphorus was the cause of mortality. Some areas, used more frequently as targets, received higher amounts of white phosphorus. Therefore, white phosphorus particles are not distributed uniformly throughout sediments at ERF. As a result of the discoveries at ERF, the Army stopped using white phosphorus during training at wetland impact areas nationwide.

Eagle River Flats was divided into nine areas for RI/FS activities and other investigation purposes: A, B, C, C/D, D, Racine Island, Bread Truck, Coastal East, and Coastal West. To define areas most likely to contain white phosphorus, investigations focused on (1) areas with the most craters, (2) areas preferred by the waterfowl at risk (dabblers), and (3) areas where carcasses were observed. The sediments in the open ponds in these areas were extensively sampled for white phosphorus. The RI for ERF was completed in July 1996. Figure 6-1 shows the locations and approximate boundaries for the ERF areas.

From 1994 through 1997, the ERF investigations focused on finding a feasible remedy for white phosphorus contamination in sediments. Priority cleanup areas were evaluated by using data from white phosphorus sampling, waterfowl telemetry, carcass transects, physical system dynamics, and mapping of landcovers (combinations of topographical features such as ponds and vegetation).

Based on the results of these studies, pond draining by pumping was chosen as the preferred alternative for remediating the contaminated areas of ERF. The objective of this remedial action is to temporarily drain ponds to allow the pond sediments to dry and allow white phosphorus to sublimate and oxidize.

Dates relating to the history of the ERF source area contamination and remediation are summarized in Table 6-1. Detailed information concerning specific pre-ROD investigations and reports can be found in the Administrative Record and the OUC ROD.

Table 6-1. History of Regulatory Events at the OUC ERF

DATE	EVENT
1949 to 1990	Artillery training at ERF used white phosphorous
1980	Dead ducks and swans discovered during field reconnaissance
1982 to 1987	Conducted studies to determine the extent of the waterfowl mortality
1988 to 1990	Conducted investigations to determine the cause of the mortality
1991 to 1993	Conducted investigations to understand and define the extent of the contamination
June 1994	Fort Richardson added to the NPL
December 1994	FFA signed
1994 to 1996	Identified contamination hot spots and began developing remedial technologies
May 1997	Final Remedial Investigation Report presenting the results of the OU-C RI, including the primary ordnance impact area at ERF and the adjacent gravel pad used for OB/OD
September 1997	Final Feasibility Study Report for OUC
December 1997	Final Proposed Plan for OUC
September 30, 1998	ROD for OU-C signed
April, 1999	Remedial Action Work Plan and Final Design
May – Sept, 1999	First Remediation Season
May – Sept, 2000	Second Remediation Season
May – Sept, 2001	Third Remediation Season
May – Sept, 2002	Fourth Remediation Season
February 2003	Final Five Year Review Report
May – Sept, 2003	Fifth Remediation Season
May – Sept, 2004	Sixth Remediation Season (limited)
June 2004	Draft Final CLOSES Evaluation
May – Sept, 2005	Seventh Remediation Season (limited)
May – Sept, 2006	Eighth Remediation Season (limited)
Sept 2006	Ft. Richardson PCOR signed
May – Sept, 2007	Ninth Remediation Season (limited)

6.1.2 Physical Characteristics

ERF is an estuary salt marsh at the mouth of the Eagle River that is surrounded by forested uplands on the west, south, and east sides, and bounded by the Knik Arm on the north. Although ERF is an active impact area, it remains a productive wetland and serves as an important staging ground for migrating waterfowl during the spring and fall. ERF also supports local populations of fish, birds, mammals, and macro invertebrates. A series of ponds distributed throughout ERF provides excellent habitat for dabbling ducks and other waterfowl.

The topography of ERF is relatively flat, with landform and vegetation changes. Measured elevations in ERF range from 3 feet above mean sea level (msl) at the river bottom of the Eagle River to 18 feet above msl on top of the highest levees along the river.

The discharge from Eagle River bisects ERF. Distributaries cut through the mud flats and connect ponds with Eagle River. Subtle changes in elevation of the channel floors dictate whether tidal flooding occurs daily, occasionally, or rarely.

In summer, there may be long periods between flooding tides, and parts of ERF can become relatively dry. During winter, Eagle River continues to flow, but ice thickens over ERF with succeeding flood events during cold temperatures. Ice breakup typically occurs in April or early May. It appears that the river dominates the hydrology and sedimentology of the upper third of ERF; the remainder of the area is dominated by the tides.

6.1.3 History of Contamination

Operable Unit C underwent considerable investigation before being placed on the NPL; therefore, before implementation of the formal CERCLA process all potential contaminants of concern, except white phosphorus, were eliminated. Investigations into the mortality of birds began in 1988-1990, with extensive fieldwork to determine if munitions or munitions compounds were the cause of bird deaths. During this time over 200 samples of water and sediments were analyzed for explosive compounds, metals and VOCs. The only chemical of concern detected on ERF was white phosphorus. 2,4-DNT was detected near the OB\OD pad at levels exceeding 1 part per million (ppm). However, these values were much less than the RBC of 4,100 mg/kg for soil ingestion at an industrial site.

A baseline risk assessment was conducted to analyze the potential, current, and future adverse health and environmental effects caused by releases and exposure to site-related chemicals. To develop the baseline risk assessment, a data quality review was conducted on all pre-RI data to demonstrate the adequacy and quality required under CERCLA and RCRA. The risk assessment demonstrated that white phosphorous was the only contaminant of concern at ERF.

In 1990, after extensive investigation to monitor by-products, it was discovered that ingestion of particles of white phosphorus, a component in smoke munitions, was the cause of waterfowl deaths. White phosphorus and hexachloroethane-zinc-mixture smokes are the two most common agents used by the military to produce white smokes in the visible spectrum. White phosphorus, consisting primarily of elemental phosphorus, has been used as a smoke-producing material in munitions since World War I. When munitions containing white phosphorus are detonated, the phosphorus breaks up into minute particles that disperse over a large area; white phosphorus reacts spontaneously with air creating a column of smoke. Unburned particles from exploded white phosphorus munitions can rain down and become buried in the wet, soft mud. Dabbling waterfowl can pick up the particles of white phosphorus as they are sieving the mud for food.

Because white phosphorus persists (does not sublimate and oxidize) when wet or submerged, the water and sediment conditions at ERF are conducive to the long-term retention of white phosphorus. ERF investigations performed after 1990 focused on defining the extent of the white phosphorus contamination, determining site conditions and other factors that affect the likelihood of exposure to white phosphorus, and understanding the physical dynamics of ERF. In 1993, waterfowl telemetry studies were initiated.

Results of a 1994 Cold Regions Research and Engineering Laboratory (CRREL) study showed that white phosphorus particles remained intact and relatively unaffected in water-saturated sediments, but began to immediately degrade and disappear when the sediments became unsaturated, especially at warmer temperatures. Therefore, sublimation/oxidation was determined to be a viable remedial option for mud flats and intermittent ponds that have the potential to drain and dry. This conclusion led to feasibility studies conducted from 1994 through 1998 aimed at determining potential technologies that could be used in ERF to remediate white phosphorus.

Investigations performed to define contaminant hot spots determined that the most significant areas of concern for exposure to white phosphorus were the sediments in ponds and some marshes. Twenty-two hot ponds were identified, covering 57 acres. Figure 6-2 illustrates the pond groups within the ERF areas.

All of the ponds identified in the ROD as potential hot spots, with the exception of Pond 145 (Area C), have been sampled for white phosphorous. Pond 145 is believed to have grown over as field samplers were unable to identify its location. Composite sampling has been conducted to locate and refine areas of known contamination. This information has helped direct remediation efforts.

6.1.4 Land and Resource Use

ERF is the only impact area for heavy artillery and mortars on Fort Richardson. It is situated on land that is withdrawn from the public domain for military purposes by Executive Order. Current land use is for military readiness activities. ERF is considered an operational range. In 1990, the Army banned the firing of munitions containing white phosphorus into ERF. Several additional restrictions currently apply and are listed in the Record of Environmental Consideration, *Modified Firing Regime for the Eagle River Flats Impact Area*, Fort Richardson, Alaska, October 9, 2001.

Since the ROD in 1998, the Army has undergone transformation to support the stationing of approximately 2,000 additional soldiers at Fort Richardson. Due to the current firing restrictions at the ERF impact area, soldiers cannot satisfy all Army-wide semi-annual and quarterly training requirements for artillery and mortars at Fort Richardson and must travel to Fort Wainwright or Donnelly Training Area to complete training requirements.

The Army is in the process of developing an Environmental Impact Statement (EIS) that identifies and evaluates a range of alternatives to accommodate training needs at Ft Richardson. The results of remedial action work performed at ERF indicate that the areas west of Eagle River, Northern Area A and Pond 290, consistently meet the remedial action objectives (RAOs) (Section 6.2.2) outlined in the ROD since 2002 and provide no evidence that these areas pose unacceptable risk to human or ecological health. The Army will account for this information while developing and evaluating alternatives for the EIS.

The community of Eagle River lies within the boundaries of the Municipality of Anchorage (MOA), about 4 miles upstream of the nearest point of ERF. The 2000 Census estimated the population of Eagle River to be about 29,917. The primary source of drinking water for the residents of the Eagle River community is surface water from Eklutna Lake, 15 miles to the northeast. Most residents of the urban/suburban Eagle River area are served by the MOA water system. Those residences and businesses outside of the MOA water system service area use private wells for a water supply. However, there is only one water supply well within a 4-mile radius of the nearest point of ERF, on the west shore of Otter Lake. The surface water and near surface groundwater are highly saline because of the estuarine nature of the site. Consequently, surface water and groundwater from the site are not currently used as potable water supplies and future use is not expected.

Because the site continues to be used as an active range, access to the site will continue to be restricted. At this time, the military plans to continue using the site as an operational range. Potential UXO and the estuarine habitat prevent use of the area as future residential or industrial sites.

6.1.5 Pre-ROD Response

Treatability studies conducted between 1994 through 1998 are listed below:

- In 1995, cap-and-fill technology was tested at Pond 285 on Racine Island. This pond was filled with AquaBlok, a gravel–clay mixture, which was intended to prevent ducks from feeding in the contaminated sediment. The mixture also supported the growth of vegetation.
- In 1995 and 1996, small areas of contaminated sediments (<1.5 acres total) were removed from Pond 146 by a remote-controlled dredge during another treatability study.
- In 1996, Pond 109 (8.2 acres) was drained with a blasted ditch. Draining by breaching has discouraged waterfowl use and has initiated a slow remediation by sediment drying.
- In 1997, Ponds 293 and 297 (1.5 acres) on Racine Island were drained with a blasted ditch.
- Also in 1997, a single 2,000-gpm pump powered by a separate floating diesel genset was used to drain Pond 183 in Area C to test the equipment and determine feasibility.
- In 1998, a full-scale pump system treatability study was conducted using six pump systems. Pumps were deployed in Ponds 183, 155, and 146 in Area C and Ponds 290, 256, and 258 in Area A.

6.2 REMEDY SELECTION

6.2.1 Nature of Contamination

The principal COC at the ERF source area is particulate white phosphorus in sediment. When white phosphorus particles settle into pond and marsh sediments that remain saturated, they can last for an indefinite time. However, white phosphorus particles will break down into harmless materials when exposed to air and temperatures above 15°C.

A grid for collecting composite samples was established in 1998, which was the first year that a decline in white phosphorus concentration was evident. Sampling results showed that the highest concentration of white phosphorus was found on Racine Island, followed by Bread Truck, and Pond 183 in Area C. The average depth of white phosphorus is generally within the top 8-inches of sediment, but it has been found as deep as 24 inches.

In Areas A and C/D, only small amounts of white phosphorus were found. However, bird use and deaths in Area A were historically high. No white phosphorus was detected in Areas B and D. White phosphorus has not been detected in the water of the gullies or the Eagle River. Only trace amounts of white phosphorus contamination have been detected in the gully sediments. No evidence of movement of white phosphorus through Eagle River to Knik Arm was found.

6.2.2 Remedial Action Objectives

As part of the RI/FS process, RAOs were developed in accordance with the NCP and EPA guidance for conducting RI/FS investigations. The primary objective of the remedial action is to reduce the number of waterfowl deaths attributable to white phosphorus. At the time of this review, both the short and long-term objectives have been met.

Short and long-term RAOs for the remedial action at OUC are as follows:

- Within five years of the ROD being signed, reduce the dabbling duck mortality rate attributable to white phosphorus to 50% of the 1996 mortality rate attributable to white phosphorus. Radio tracking and aerial surveys suggest that about 1,000 birds died from white phosphorus at ERF in 1996. Therefore, the allowable number of duck deaths from white phosphorus would be approximately 500.
- Within 20 years of the ROD being signed, reduce the mortality attributable to white phosphorus to no more than 1% of the total annual fall population of dabbling ERF ducks. Currently, that population is about 5,000. Therefore, the allowable number of duck deaths from white phosphorus would be approximately 50. This long-term goal could be adjusted based on future population studies conducted during the monitoring program.

It was determined that these objectives would be achieved by reducing the area of white phosphorus-contaminated media; thus, reducing waterfowl exposure to white phosphorus. Reducing the exposure to white phosphorus reduces the availability of white phosphorus to ducks, which in turn reduces duck deaths.

6.2.3 ARARs

The OUC ROD cited the most significant ARARs for the remedy selection at OUC Eagle River Flats to be:

- Section 404 of the Clean Water Act, which coincides with Alaska water quality standards, for protection of wetlands.
- Provisions in the Migratory Bird Treaty Act of 1972 that prohibit unregulated “taking” of birds, including poisoning at waste sites.

6.2.4 Selected Remedy

The dates established in the selected remedy were estimated based on costing purposes. The dates, originally described in the OUC ROD, have not been referenced in this Five-Year Review but will be evaluated annually to determine if they remain valid. The Draft Final CLOSES Evaluation for OUC, prepared by CH_2MHill in June 2004, served as the initial evaluation of the selected remedy. Subsequent evaluations of the selected remedy continue with scientific professionals familiar with the site re-evaluating the CLOSES model and decision matrix when needed.

The major components of the preferred remedy for OUC are listed below.

Component 1 – Treat white phosphorus-contaminated sediment by draining ponds with pumps. Pumping will allow the sediments to dry and the white phosphorus to sublimate and oxidize. The treatment season will begin in May and end in August or September. A pond elevation survey will be conducted to determine the optimal pump placement. To enhance drainage, explosives may be used to make small sumps for the pumps and shallow drainage channels. These shallow drainage channels will enhance the hydraulic connectivity between ponds to encourage drainage.

Component 2 – Implement the following protective procedures to minimize disturbances to wetlands habitat:

a) Restriction of activities that disturb wildlife in Area B and Area D, which are prime waterfowl habitat areas
b) Selection of the narrowest and shortest walking corridors to minimize disturbances to vegetation and habitat
c) Proper maintenance of equipment and structures
d) Minimize the use of equipment and staging-area footprints
e) Minimal localized use of explosives
f) Preparation of work plans and solicitation of agency reviews
g) Monitoring for impacts to wetlands habitat
h) Monitoring for waterfowl use of ERF

Component 3 – Sample pond bottoms for white phosphorus at the beginning of the treatment season to confirm or determine that the pond or area requires remediation. The sampling also would establish a white phosphorus baseline and determine additional areas that may require remediation. The baseline sampling would be performed at the beginning of each field-pumping season.

Component 4 – Sample pond bottoms for white phosphorus after treatment to determine effectiveness of the treatment system. This verification sampling would be performed at the end of each field-pumping season.

Component 5 – Perform telemetry monitoring and aerial surveys concurrently with pumping activities to determine bird populations, usage, and mortality. These activities would begin in 1999. Monitoring would be continued for 3 additional years to verify that short-term goals are maintained.

Component 6 – Perform limited aerial surveys and ground truthing to evaluate waterfowl mortality, physical habitat changes, and vegetation rebound.

Component 7 – Perform aerial photography (beginning in 1999) to monitor habitat changes resulting from remedial actions. Changes in drainage, topography, and vegetation would be evaluated.

Component 8 – Perform habitat mapping to evaluate impacts to habitat as a result of remedial actions, as well as to observe habitat rebound after pumping is discontinued.

Component 9 – Perform limited hazing (only as a contingency) starting in 1999, if incidental hazing from pumping operations and other fieldwork activities does not deter bird usage.

Component 10 – After remedial action objectives are achieved and pumping is discontinued, apply cap-and-fill material in ponded areas that did not drain and dry sufficiently to enable the white phosphorus to sublimate and oxidize.

Component 11 – Monitor cap and fill material integrity after the material is placed.

Component 12 – Incorporate white phosphorus sampling, telemetry, aerial survey, habitat, and physical landform data into a GIS database.

Component 13 – Maintain institutional controls, including the restrictions governing site access, construction, and road maintenance and the required training for personnel who work at OUC source areas. The objective of these institutional controls is protection of human health, safety, and the environment by limiting or preventing access to contaminated areas or otherwise denying exposure pathways.

6.3 STATUS OF REMEDIATION

At the time of this review, both the long term and short-term objectives have been met. The mortality rates are derived from the aerial census data and the ground-based mortality survey. This reduction is strengthened by the sediment-sampling program, which continues to verify a sustained decrease in the amount of white phosphorus contamination. Results of the sampling program in combination with the morality data indicates that cleanup goals are being met. Because duck mortality data are obtained concurrently with remediation and sampling activities that can cause bird hazing, the true mortality will not be known until after remediation is completed and waterfowl usage of ERF is uninhibited by remedial activities.

6.3.1 Treat White Phosphorus-Contaminated Sediment

Component 1 – *Treat white phosphorus-contaminated sediment by draining ponds with pumps beginning in 1999. Pumping will allow the sediments to dry and the white phosphorus to sublimate and oxidize. The treatment season will begin in May and end in August or September. A pond elevation survey will be conducted to determine the optimal pump placement. To enhance drainage, explosives may be used to make small sumps for the pumps and shallow drainage channels. These shallow drainage channels will enhance the hydraulic connectivity between ponds to encourage drainage.*

Full-scale remediation with six pump systems occurred during the summer field seasons from 1999 through 2003. Each season, permanent pond habitat was temporarily drained. Sample results in 2003 confirmed that white phosphorous remained in localized areas in Pond 155

(Area C) and in small previously untreated ponds in both Area C and Bread Truck. Additional areas of contamination were also suspected in the Northern C Marsh and Area C/D.

To address the remaining white phosphorous contamination at ERF, the RPMs decided to extend limited remediation during the summer field seasons from 2004 through 2007.

2004

One pump system was deployed in Pond 146 to drain Area C in support of monitoring efforts. Interconnected drainage channels previously excavated in the area allowed the pump to reduce the water in the Northern C Marsh and in Ponds 146, 155, 171, and 183 despite monthly flooding tides. Extended drying periods were experienced in the Northern C Marsh and in Ponds 146, 171, and 183, while only marginal drying periods were experienced in Pond 155 as significant amounts of water remained in the pond's drainage system due to the lack of additional pumps.

Drainage channels were excavated at the Duck Pond Complex in southeastern Bread Truck. The drainage system had immediate affect on the pond complex allowing some ponds to dry prior to the first flooding tide in late August.

Several white phosphorous rounds were mistakenly detonated in the Northern C Marsh, ejecting particles of white phosphorous into Area C. The accidental release of white phosphorous coupled with the continued mortality observed in the area prompted RPMs to expand the treatment of Area C.

2005

Limited remediation continued with two pump systems. The first system was deployed in Pond 146; the second system was deployed in the Bomb Crater sump. Despite the additional pump, some water remained in the Area C drainage system over the treatment season. A continuous 63-day non-flooding period from late May through late July helped Ponds 146, 155, 171, and 183 dry. Multiple flooding tides followed this period to interrupt remediation. Sensors placed in the sediment of the northern drainage channel for Area C and in the Blow-In-Place (BIP) Craters east of Pond 155 showed little drying. However, sections of the marsh's southern drainage channel did appear to dry.

Favorable conditions were experienced at the Duck Pond Complex. An additional tide gate was installed. Sediment at the monitoring station was desaturated for 22 days.

2006

Limited remediation continued with three pump systems. The first two systems were deployed in the same areas as 2005; the third system was deployed in the southernmost channel complex in Area C. High points in existing drainage channels were deepened and new drainage channels were excavated to promote the drying of the Northern C Marsh drainage system. Drainage channels were also excavated in southern Area C near a newly delineated contaminated area. A continuous 87-day non-flooding period from mid May through late August allowed ponds and hotspots to dry despite frequent rain. Sediment in the Northern C Marsh drainage system showed periodic drying.

Sheet flooding from the south affected remediation at the Duck Pond Complex. The complex was slow to dry but sediment at the monitoring station was desaturated for 10 days. Rusted hinges on a tide gate were replaced.

2007

For the final year of limited remediation, three pump systems were deployed in the same areas as 2006. The generator for the pump system in Pond 146 experienced major mechanical problems and was inoperable for a significant portion of time. As a result, the sediment in the areas typically drained by this system remained saturated most of the treatment season. Additional drainage channels were excavated in the Northern C Marsh to further promote the drying of the drainage system sediments. Sediment monitored in the marsh's southern drainage channel was desaturated for 24 days.

The drainage channels excavated in 2006 in southern Area C were effective in draining ponds in this area. Sediment in this area experienced intermittent drying.

The drainage channels and tide gates at the Duck Pond Complex functioned effectively. Sediment monitored at the Duck Pond Complex was desaturated for 39 days.

2008 and Beyond (Future Work)

One pump system is expected to be deployed to ease access for monitoring efforts in 2008. Per RPM direction, the pump will only operate periodically in the spring and fall when active sampling is being conducted on the flats. This system will no longer operate for remediation purposes. A long-term monitoring plan, currently under development, will assist RPMs in determining the continued need for pump systems in Area C.

6.3.2 Implement Protective Procedures to Minimize Disturbances to Wetlands

Component 2 – *Implement the following protective procedures to minimize disturbances to wetlands habitat:*

a) Restriction of activities that disturb wildlife in Area B and Area D, which are prime waterfowl habitat areas

No remediation activities are occurring in Areas B and D. No access is required into or through these areas. With the exception of limited helicopter flight surveys in Area B in early August, no low-level flight activities occur over these areas.

b) Selection of the narrowest and shortest walking corridors to minimize disturbances to vegetation and habitat

Walking paths to areas undergoing remediation or sampling are flagged. Prior to use, a UXO technician clears the areas along the paths. All access within ERF is limited to these cleared and flagged paths. This ensures the safety of the personnel by limiting potential exposure to UXO. It also limits the potential impacts to the habitat to a few restricted paths.

c) Proper maintenance of equipment and structures

Pumping equipment is inspected and maintained on a regular basis by a qualified O&M contractor. During system operations, equipment is monitored through on-site inspections. External fuel tanks for the generator sets are ADEC-approved, double-walled tanks. An oil spill prevention and cleanup plan is in place. Spill kits are deployed at each generator set and at the staging area on the OB/OD pad adjacent to ERF. As an additional containment measure, spill berms are in use. Each trailer-mounted generator set is staged within a spill berm to capture any accidental fuel spillage that may occur before it can be released to the environment.

d) Minimize the use of equipment and staging-area footprints

Pump systems, discharge pipe, and supplemental materials are airlifted into ERF by helicopter to minimize potential impacts. In the past, generator sets and external fuel tanks have also been airlifted into ERF. However, the Global War on Terrorism has continued to impact the availability of medium-lift capable helicopters.

To reduce aircraft dependency, the staging area was expanded beyond the OB/OD pad to provide an access route to the edge of the Northern C Marsh that supports the use of shore-based equipment. To minimize impact to the footprint, the access route followed an existing trail behind the OB/OD pad. The trail was cleared and widened and a limited amount of gravel was placed to support vehicular traffic. Using geotextile fabric and gravel from the OB/OD pad the access route was extended beyond the terminus of the existing trail to the edge of the Northern C Marsh. Power and instrumentation cord connect the shore-based generator sets to deployed pump systems.

e) Minimal localized use of explosives

Sumps for the floating pump systems are explosively excavated in the early spring prior to arrival of waterfowl at ERF. Sumps are located within existing pond basins. Explosives are used to excavate shallow drainage channels to link various low points within pond basins to the pump sumps. All ditching is within pond basin complexes and does not affect the external drainage of these ponds. Once pumping remediation is completed within a pond complex and the pump is removed, the pond refills naturally and the sumps and ditches become part of the pond habitat.

f) Preparation of work plans and solicitation of agency reviews

Work plans are prepared prior to each season. The results of the previous season's fieldwork and work planned for the following season are reviewed each year by the Remedial Project Managers from the Army and various regulatory agencies.

g) Monitoring for impacts to wetlands habitat

A monitoring program is in place to assess changes to wetlands habitat due to remediation efforts. Aerial photography, long-term study plots, and ground-based field observations are used to monitor changes. A monitoring plan, currently under development, will assist RPMs in determining how wetland habitat will be monitored in the future.

h) *Monitoring for waterfowl use of ERF*

U.S. Fish & Wildlife Service personnel conduct periodic aerial surveys throughout the field season. The aerial survey data provides detailed information on both the numbers of waterfowl using ERF and the specific areas used by waterfowl for resting and feeding activities.

6.3.3 Sample Pond Bottoms for White Phosphorus

Component 3 – *Sample pond bottoms for white phosphorus at the beginning of the treatment season to confirm or determine that the pond or area requires remediation. The sampling also would establish a white phosphorus baseline and determine additional areas*

that may require remediation. The baseline sampling would be performed at the beginning of each field-pumping season.

<u>Component 4</u> – *Sample pond bottoms for white phosphorus after treatment to determine effectiveness of the treatment system. This verification sampling would be performed at the end of each field-pumping season.*

Composite sampling for white phosphorus at OUC has been conducted during each field season. Magnetometer surveys have also been performed at ERF to better identify objects that may contribute to white phosphorous contamination. Discrete sampling is conducted when UXO, ordnance scrap, or fragments potentially containing white phosphorous are discovered. Sample data for each year are compared to those from previous years and to mortality studies to determine the progress of remediation and to identify additional areas of contamination. All monitored ponds, hot spots, and drainage channels showed a reduction of white phosphorous through 2006. This reduction was determined by calculating the loss of white phosphorous from a known quantity of planted white phosphorous particles. For 2006, the mean white phosphorus reduction was 69% for monitored ponds, 53% for monitored hotspots, and 29% for monitored drainage channels. The reduction of white phosphorous continued in 2007; however, equipment failure during the 2007 treatment season inhibited drainage in Area C impacting the overall loss of planted white phosphorous particles in select ponds. Figures 6-3 through 6-5 illustrate pond status at the end of select treatment seasons. A summary of pond sampling results is provided below:

- White phosphorus contamination in Ponds 226, 246, 256, 258, and 290 (Area A) is no longer detectable.
- Pond 109 (Bread Truck) has been drained and no longer serves as viable habitat for waterfowl feeding.
- Ponds in the Duck Pond Complex (Bread Truck) still contain localized areas of white phosphorous contamination. RPMs plan to have the ponds in this complex capped with geotextile fabric and sorted gravel between 2008 and 2009 to eliminate them from waterfowl feeding (Section 6.3.8).
- Composite sampling in Pond 146 (Area C), which had a white phosphorous concentration of 7.31 micrograms per gram (µg/g) in June 1999, did not detect white phosphorous in 2006 or 2007.
- Multiple discrete and composite samples were collected from Pond 155 (Area C) in 2007. Only one composite sample measured white phosphorous at the method detection limit (0.0002 µg/g); the results for all other samples were below the detection limit.
- Multiple composite samples were collected from Pond 171 (Area C) in 2006. Only one composite sample measured white phosphorous at the method detection limit; the results for all other samples were below the detection limit.
- Sediment monitored in Pond 183 (Area C) continued to show a significant reduction of white phosphorous from planted white phosphorous particles. In 2004, the reduction was measured at 97%.
- Several small ponds in northern and southern Area C still contain localized areas of white phosphorous contamination. One pond in northern Area C (Pond 23) was capped with geotextile fabric and gravel in 2007. RPMs plan to have the remaining ponds capped with geotextile fabric and sorted gravel between 2008 and 2009 to eliminate them from waterfowl feeding (Section 6.3.8).

- No white phosphorous has been detected in composite samples taken from Pond 730 (Area C/D). Pumping at Pond 730 was initiated based on waterfowl mortality in the area, but no feeding has been observed at this deep pond.
- Ponds 285, 293, and 297 (Racine Island) have been drained or capped and no longer serve as viable habitat for waterfowl feeding.

Localized areas of white phosphorous contamination remain in select hot spots and drainage channels in Area C. These areas will be capped between 2008 and 2009 to eliminate them from waterfowl feeding (Section 6.3.8).

6.3.4 Perform Telemetry Monitoring and Aerial Surveys

Component 5a – *Perform telemetry monitoring and aerial surveys concurrently with pumping activities to determine bird populations, usage, and mortality. These activities would begin in 1999.*

Aerial surveys have been performed at ERF to monitor bird populations and usage. The practical difficulties of procuring a helicopter for telemetry monitoring along with the imprecision of the data prompted RPMs to adopt the weight-of-evidence approach outlined in the CLOSES Evaluation for OUC. Beginning in 2004, ground-based mortality surveys replaced telemetry monitoring. The census data from the aerial surveys are combined with the transect survey data in a mortality model to estimate the dabbler mortality attributable to white phosphorous. Bird mortality has decreased since 1996 when an estimated 655 ducks died due to ingestion of white phosphorus. Table 6-2 presents estimated mortality data from 1996 through 2007.

Table 6-2. Estimated Mortality Data per Year

YEAR	ESTIMATED MORTALITY[1]	ESTIMATED MORTALITY RATES[2]
1996	655	10.6 to 23.9%
1997	240	4.3 to 9.7%
1998	355	7.6 to 17.1%
1999	198	13.4 to 30.2%
2000	-	-
2001	87	2.4 to 5.4%
2002	224	7.2 to 16.2%
2003	-	-
2004	111	2.0 to 4.5%
2005	49	1.0 to 2.4%
2006	25	0.3 to 0.6%
2007	36	0.4 to 0.9%

[1] From 1996 through 2002 mortality was estimated using aerial survey and telemetry data. No mortality data is provided for years 2000 and 2003 as telemetry monitoring was not performed. From 2004 through 2007 mortality was estimated using aerial survey and ground-based transect data.

[2] The estimated mortality rates are adjusted for potential uncertainties in total population (±20%) and mortality (+50%). No mortality rate is provided for years 2000 and 2003 as telemetry monitoring was not performed.

The current projected mortality number continues to satisfy the short-term RAO of less than 500 deaths attributable to white phosphorous. Mortality rates in 2006 and 2007 are below the long-term RAO of less than 1% of the total annual fall population of dabbling ERF ducks. However, RPMs require continued monitoring to verify the short-term and long-term RAOs continue to be met.

> **Component 5b** –*Monitoring would be continued for 3 additional years to verify that short-term goals are maintained.*

Monitoring efforts, using a weight-of-evidence approach, continued during limited remediation efforts at ERF. The monitoring results for these additional years verify that the short-term and long-term goals for this source area are being maintained. A monitoring plan outlining future monitoring efforts at ERF is currently under development.

> **Component 6** – *Perform limited aerial surveys and ground truthing to evaluate waterfowl mortality, physical habitat changes, and vegetation rebound.*

Limited aerial surveys have been conducted periodically throughout the period of remediation. The dates established in the selected remedy and described in the OUC ROD were estimated based on costing purposes and will be evaluated annually to determine if they remain valid.

6.3.5 Perform Aerial Photography

> **Component 7** – *Perform aerial photography (beginning in 1999) to monitor habitat changes resulting from remedial actions. Changes in drainage, topography, and vegetation would be evaluated.*

Aerial photography has been performed to monitor habitat changes. No comprehensive evaluation of the aerial photography collected has yet been conducted. However, ground-truthing efforts have identified the following changes at ERF:

- Drainage systems installed in Bread Truck, Area C, and Racine Island continue to alter drainage in these areas. Ponds affected by these systems remain permanently drained and no longer serve as viable habitat for waterfowl feeding.
- Natural vegetation at the permanently drained ponds has been replaced by either halophytic herb meadow or sedge meadow (Section 6.3.6).

6.3.6 Perform Habitat Mapping

> **Component 8** – *Perform habitat mapping to evaluate impacts to habitat as a result of remedial actions, as well as to observe habitat rebound after pumping is discontinued.*

Habitat mapping has been performed. The habitat in Area A experienced no permanent change from the remedial efforts that occurred. After remediation ceased in this area the habitat rebounded, returning to its natural state. A portion of mudflats and select ponds in Bread Truck, Area C, and Racine Island experienced permanent habitat change resulting from the drainage systems installed in these areas. Pond 109 (Bread Truck) and select intermittent ponds in Area C have been permanently drained; the natural habitat in these areas has been replaced by halophytic herb meadows. Ponds in Racine Island have been permanently drained or capped; the natural habitat in this area has been replaced by sedge meadow. The Army is evaluating the need to continue habitat mapping in the future.

6.3.7 Perform Limited Hazing as a Contingency

Component 9 – *Perform limited hazing (only as a contingency) starting in 1999, if incidental hazing from pumping operations and other fieldwork activities does not deter bird usage.*

Hazing proved unsuccessful in 1999. Therefore, the Army no longer conducts hazing activities. Field activities conducted at ERF continue to be sufficient at deterring bird usage.

6.3.8 Apply and Monitor Cap-and-Fill Material

Component 10 – *After remedial action objectives are achieved and pumping is discontinued, apply cap-and-fill material in ponded areas that did not drain and dry sufficiently to enable the white phosphorus to sublimate and oxidize. Cap-and-fill material placement is expected to occur in Year 5 (2003).*

Placement of cap-and-fill material at ERF did not occur in 2003 because white phosphorous contamination remaining in Bread Truck and Areas C and C/D prompted RPMs to extend limited remediation through 2007. During the final year of limited remediation, one small pond in Area C (Pond 23) was capped. As recommended in the 2001 OUC *Remedial Progress Report*, gravel replaced AquaBlok as the preferred capping material. Pond 23 was capped with geotextile material and gravel. Localized small areas of white phosphorus contamination have been identified for capping at ERF in 2008 and 2009.

Component 11 – *Monitor cap and fill material integrity after the material is placed.*

In 2007, Pond 23 in Area C was capped with geotextile fabric and gravel. Over the course of the 2007 treatment season the integrity of the cap was monitored and determined to be stable. RPMs plan to have additional areas at ERF capped between 2008 and 2009. All capped areas will continue to be monitored for integrity as outlined in the ROD.

6.3.9 Incorporate Data into a GIS Database

Component 12 – *Incorporate white phosphorus sampling, telemetry, aerial survey, habitat, and physical landform data into a GIS database.*

A comprehensive geographical information system (GIS) database was established in 1994 and continues to be maintained by the Directorate of Public Works (DPW). The database includes ERF data and information on all contaminated sites on post. The format of the comprehensive GIS database has been revised. Due to the system revisions and a lack of technician support, ERF data has not been continuously uploaded into this GIS database. Instead, ERF data has been regularly incorporated into a separate GIS database managed by the CRREL.

6.3.10 Maintain Institutional Controls

Component 13 – *Maintain institutional controls, including the restrictions governing site access, construction, and road maintenance and the required training for personnel who work at OUC source areas. The objective of these institutional controls is protection of human health, safety, and the environment by limiting or preventing access to contaminated areas or otherwise denying exposure pathways.*

Institutional controls (ICs) at OUC have been implemented. Fort Richardson has established a post wide IC policy at all known or suspected contaminated sites. Further details regarding the Army/Fort Richardson IC policy can be found in the OUD ROD, the U.S. Army Institutional Controls Standard Operating Procedures [APVR-RPW (200-1)], and a Memorandum on Institutional Controls [APVR-RPW-EV (200-1c)], from Major General James J. Lovelace – Fort Richardson, Alaska.

This policy ensures that limitations on access, water use, excavations, and property transfers as appropriate for the site have been established. At OUC, controls include a locked gate limiting access, fences and signs around the perimeter of the area, and large signs at access points to Eagle River. One component of the IC policy involves obtaining an Excavation Clearance Request (USARAK Form 81 a – 1 Mar 02) to control excavation inconsistent with established ICs at a particular site. ICs will remain in place as long as hazardous substances remain on site at levels that preclude unrestricted use. Army Regulation (AR) 385-63 (Access Restrictions to Army Impact Areas and Ranges) and USARAK Regulation 350-2 (Training) provide further use restrictions for OUC.

6.4 FIVE-YEAR ASSESSMENT

6.4.1 Are the Remedies Functioning as Intended by the Decision Document?

Remedial Action Performance

The Army has determined that the remedy is operational and functional. Components of the preferred remedy that were scheduled to occur from 2004 to 2007 have been implemented as planned with the following exceptions:

- The practical difficulties of procuring a helicopter for telemetry monitoring along with the imprecision of the data prompted RPMs to discontinue telemetry monitoring. Beginning in 2004 ground-based surveys replaced telemetry monitoring.
- As the result of extending limited remediation, the placement of cap-and-fill material at ERF did not occur in the 2003. Pond 23 (Area C) was capped and monitored during the final year of limited remediation in 2007. Additional capping efforts are expected to begin in 2008.

Table 6-3 summarizes performance to date related to the RAOs for this source area.

Implementation of Institutional controls

ERF is an active range and subject to Army regulations. The institutional controls for ERF, as described in Section 6.3.10, are functioning as intended and continue to be protective of human health and the environment. Figure 6-1 depicts the OUC Eagle River Flats area subject to restricted use under the IC policy (i.e. the OUC Site Boundary, excluding the OB/OD Pad).

Operation and Maintenance

System maintenance (i.e. oil changes and oil filter replacements) continues to be routinely performed. During system operation, equipment is monitored through on-site inspection.

Additional actions taken to address components of the Remedial Action Objective are addressed in the 2004 through 2006 data reports, *Remediating and Monitoring White Phosphorous Contamination at Eagle River Flats for OUC, Fort Richardson, Alaska*.

Table 6-3. Summary of Performance Related to RAOs at OUC ERF

Remedial Action Objectives	Performance to Date
Within five years of the ROD being signed, reduce the dabbling duck mortality rate attributable to white phosphorus to 50% of the 1996 mortality rate attributable to white phosphorus. Radio tracking and aerial surveys suggest that about 1,000 birds died from white phosphorus at ERF in 1996. Therefore, the allowable number of duck deaths from white phosphorus would be approximately 500.	Duck mortality rate is currently less that the short term RAO. Waterfowl mortalities in 2004, 2005, 2006, and 2007 were all below the short-term RAO of approximately 500.
Within 20 years of the ROD being signed, reduce the mortality attributable to white phosphorus to no more than 1% of the total annual fall population of dabbling ERF ducks. Currently that population is about 5,000. Therefore, the allowable number of duck deaths from white phosphorus would be approximately 50. This long-term goal could be adjusted based on future population studies conducted during the monitoring program.	Duck mortality was below the long term RAO of 1% in 2006 and 2007. However, RPMs require continued monitoring to verify the RAO continues to be met.

6.4.2 Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?

Standards

There are no changes in standards identified as ARARs, newly promulgated standards, and/or changes in TBCs identified in the ROD, that could call into question the protectiveness of the remedy.

Exposure Pathways

- There are no changes in land use or the anticipated land use on or near the site;
- No new human health or ecological exposure pathways, receptors, or populations at risk have been identified;
- No new contaminants or contaminant sources have been identified;
- No changes in the physical site conditions have been observed; and
- No changes in the toxicity factors for contaminants of concern have been identified.

6.4.3 Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No new information is available to question the protectiveness of the current remedy.

6.4.4 Issues

The following table describes the issues that were identified during this second Five-Year Review.

Issue	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Mortality data may be skewed by active remedial activities.	N	N
An EIS is currently under development to evaluate alternatives for artillery and mortar training at Ft Richardson. Potential changes to the current modified firing regime at ERF may affect the overall protectiveness of the remedy.	N	To be determined

6.4.5 Recommendations and Follow-up Actions

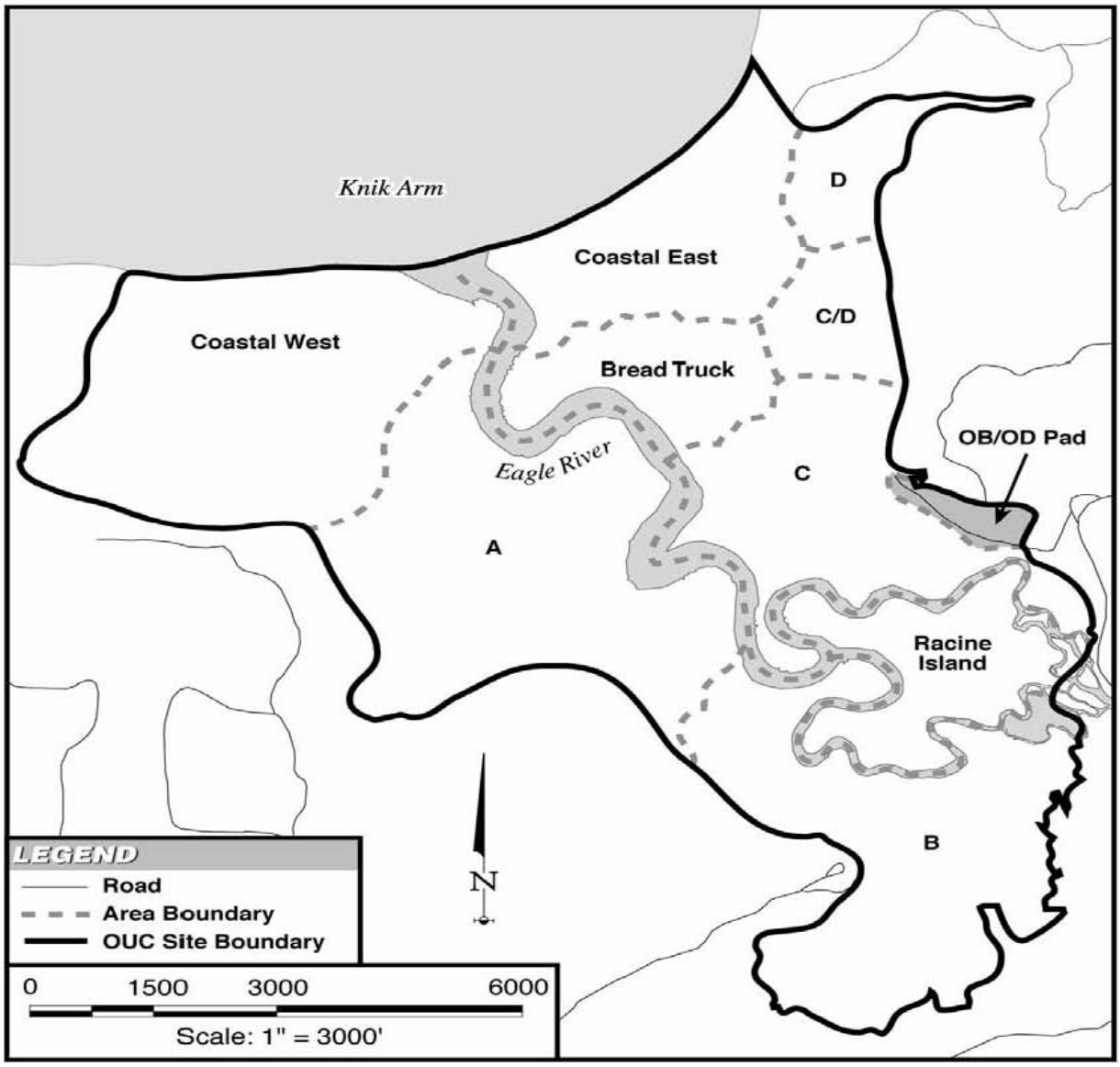
Issue	Recommendations / Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date
Potentially Skewed mortality data	Complete evaluation of recovery trends. A monitoring plan that outlines future monitoring objectives for the ERF source area is currently under development.	U.S. Army	EPA/ADEC	Ongoing
Potential changes to the current modified firing regime at ERF	Continue to track the progress of the EIS currently under development	U.S. Army	EPA/ADEC	Ongoing

6.5 OB/OD EVALUATION

The RI conducted at the OB\OD pad indicated that no concentrations of contaminants of concern above regulatory levels specified in the Operable Unit C RI/FS Management Plan have been discovered. In addition, the ecological and human health risk assessments completed during the RI indicate that the risks are very low. Therefore, no further action under CERCLA was selected.

The OUC ROD selected the remedial action under CERCLA, as well as the EPA decision under RCRA regarding closure of the OB\OD pad. The OB\OD pad is designated as a RCRA regulated unit and subject to closure under 40 CFR 265, Subpart G and P. The RPMs mutually agreed to delay final RCRA closure of the OB\OD pad until final clearance of the operating range.

The ROD stipulates that no less often than during the CERCLA 5-year reviews, the Army will evaluate the OB/OD area. Because the range has not been closed and Fort Richardson remains an active installation, the Army has determined that delayed closure will not affect the OB/OD area. The Army's evaluation concluded that ICs for the OB/OD area remain protective. No new RCRA or munitions rules/regulations specific to post-closure procedures for former OB/OD areas have been promulgated. Therefore the selected remedy remains protective. The Second 5-Year Review Range Analysis is included in Appendix F.



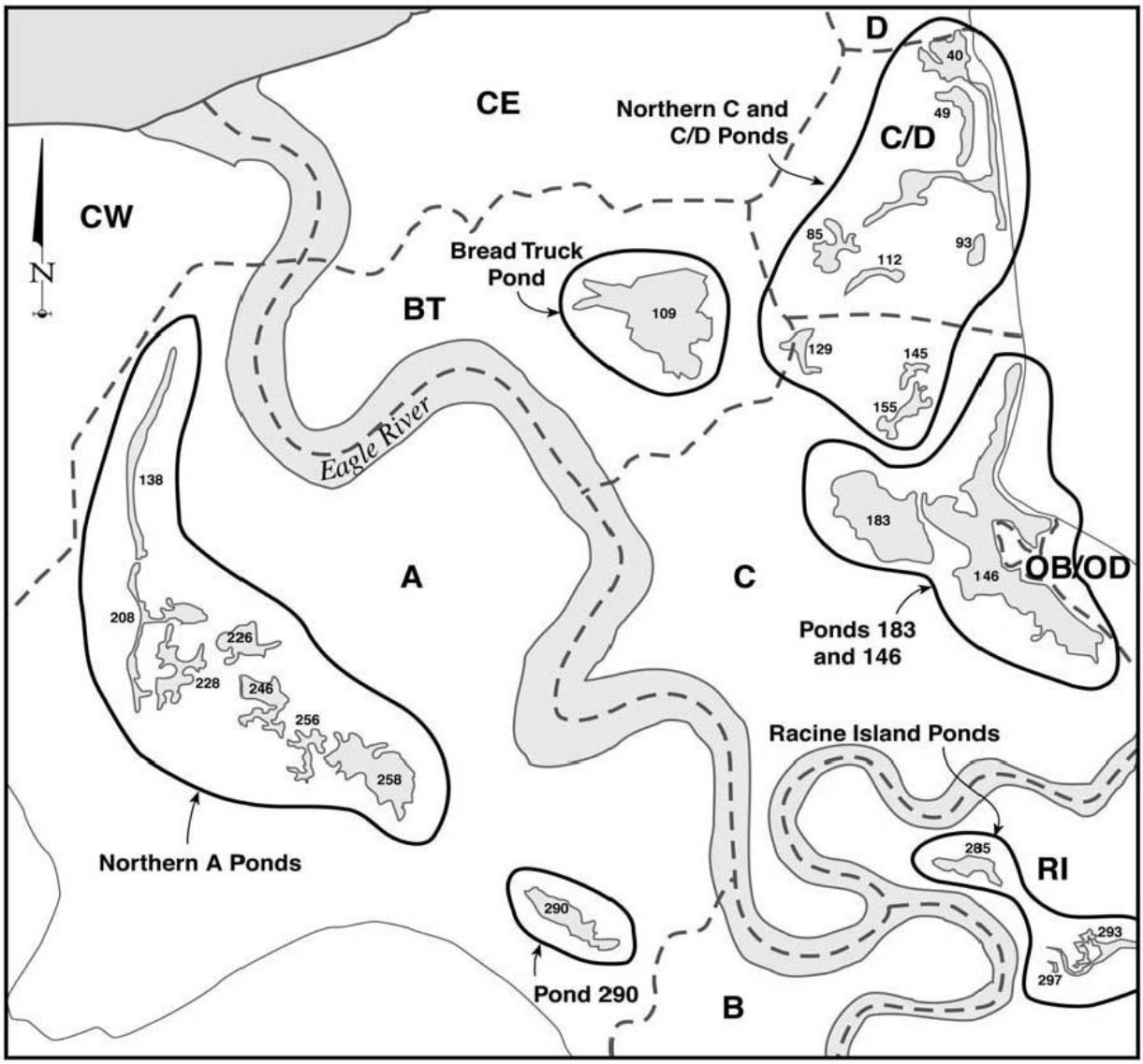
ARMY ENVIRONMENTAL CENTER

CORPS OF ENGINEERS
ALASKA DISTRICT

OUC Site Location Map

Second 5 Year Review
Operable Unit C
Fort Richardson, Alaska

SOURCE:	FIGURE:	DATE:
ANNUAL REPORT, USACE, 2007	6-1	2/08



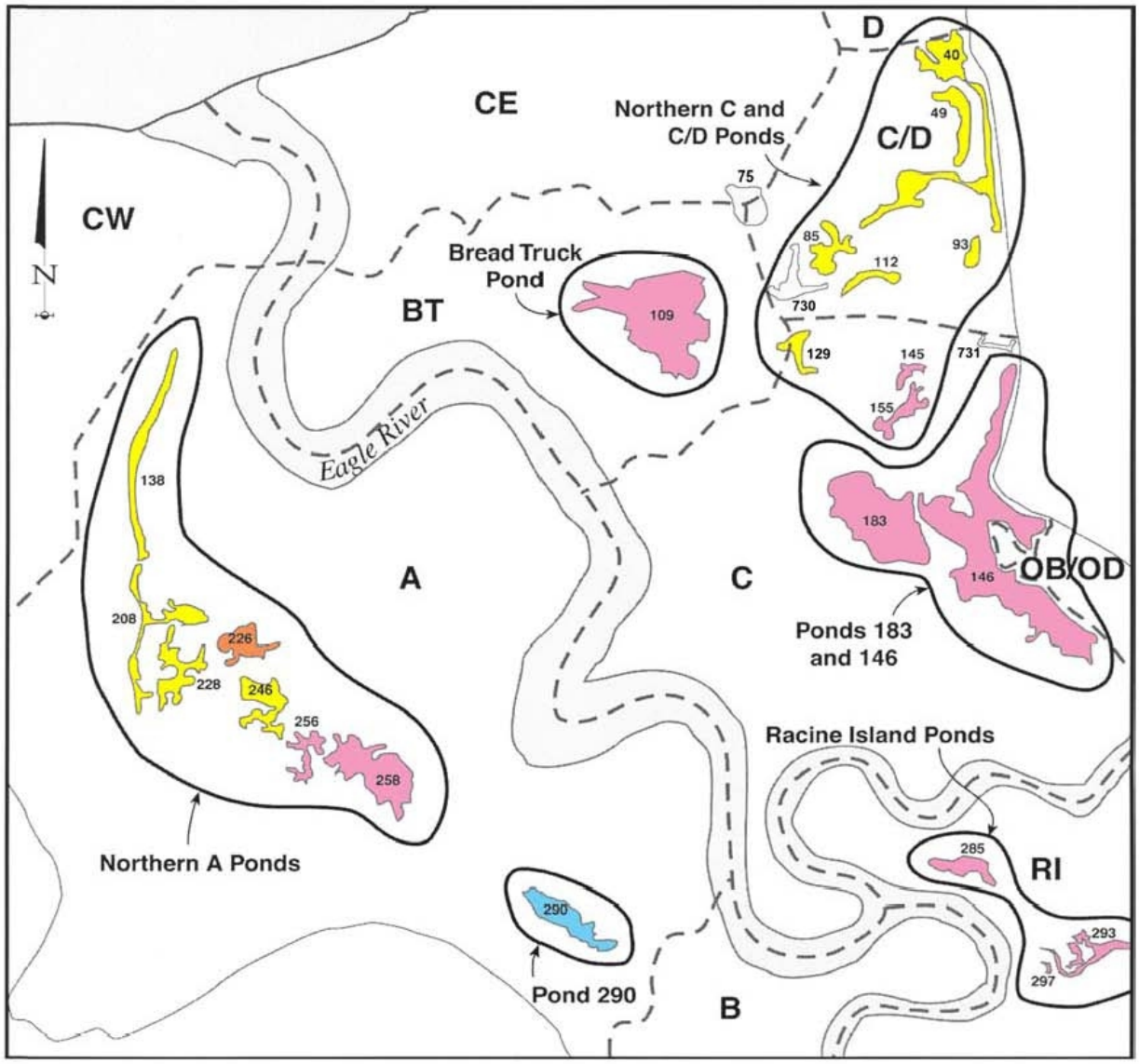
ARMY ENVIRONMENTAL CENTER

CORPS OF ENGINEERS
ALASKA DISTRICT

Eagle River Flats Pond Groups

Second 5 Year Review
Operable Unit C
Fort Richardson, Alaska

SOURCE:	FIGURE:	DATE:
ANNUAL REPORT, USACE, 2007	6–2	2/08



Identified in ROD as contaminated or potentially contaminated with white phosphorus

Confirmed contaminated or newly identified as contaminated with white phosphorus

Tested and confirmed as uncontaminated with white phosphorus

Undergoing remediation

Remediated

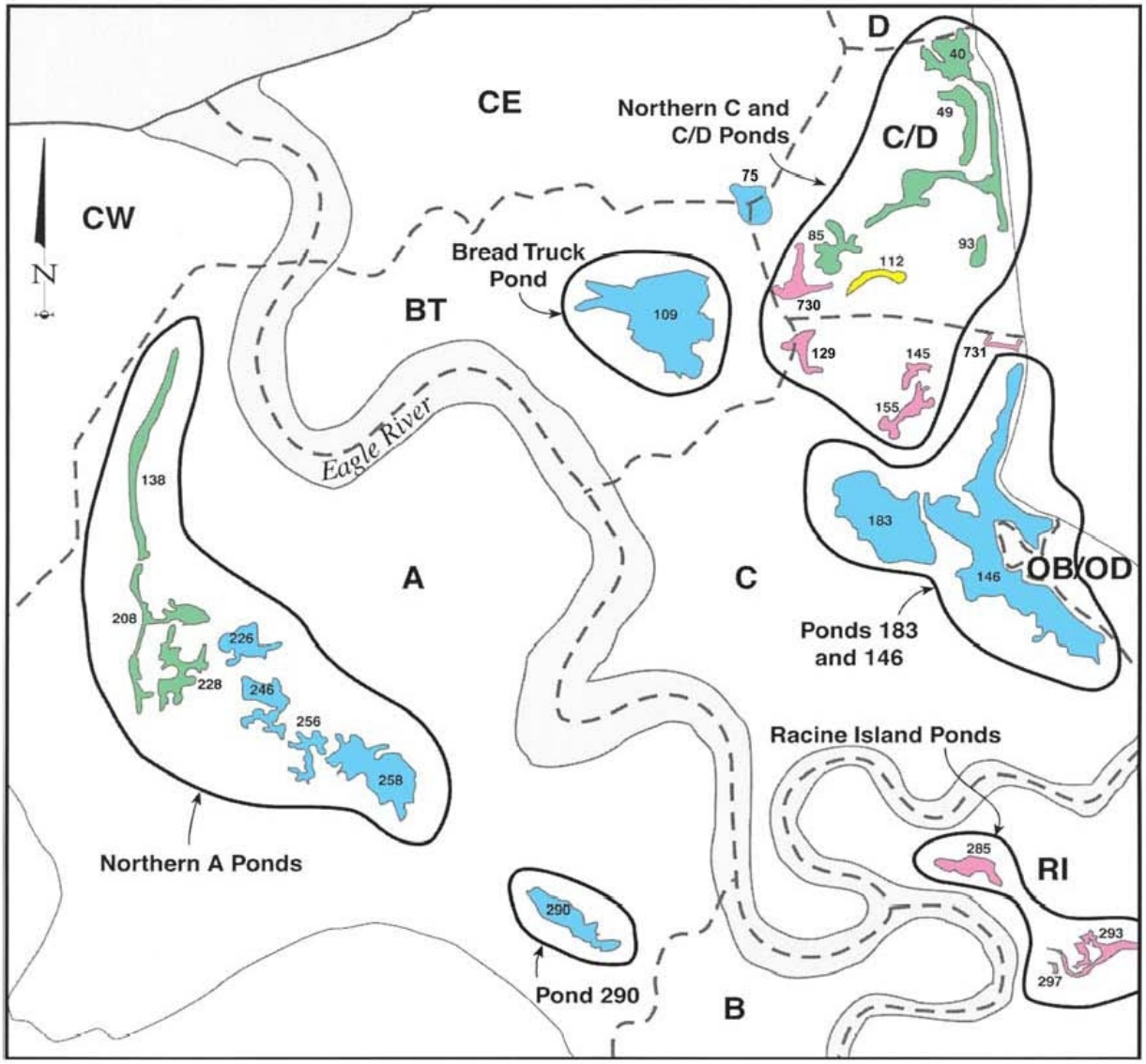
ARMY ENVIRONMENTAL CENTER

CORPS OF ENGINEERS
ALASKA DISTRICT

Eagle River Flats pond status at the end of the 1998 season and the signing of the ROD

Second 5 Year Review
Operable Unit C
Fort Richardson, Alaska

SOURCE:	FIGURE:	DATE:
ANNUAL REPORT, USACE, 2007	6–3	2/08



Identified in ROD as contaminated or potentially contaminated with white phosphorus

Confirmed contaminated or newly identified as contaminated with white phosphorus

Tested and confirmed as uncontaminated with white phosphorus

Undergoing remediation

Remediated

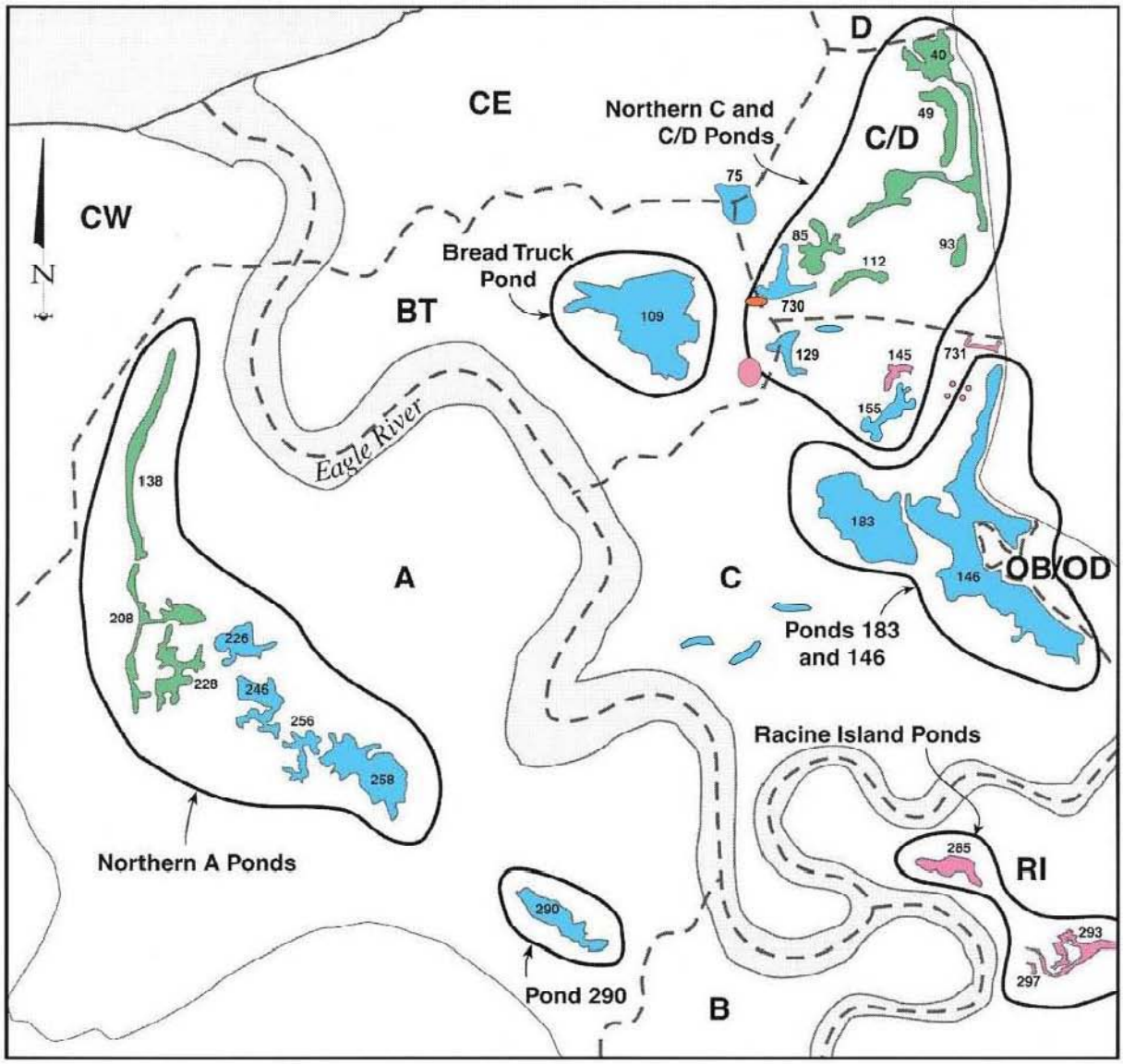
ARMY ENVIRONMENTAL CENTER

CORPS OF ENGINEERS
ALASKA DISTRICT

Eagle River Flats pond status at the end of the 2002 season

Second 5 Year Review
Operable Unit C
Fort Richardson, Alaska

SOURCE:	FIGURE:	DATE:
ANNUAL REPORT, USACE, 2007	6-4	2/08



Identified in ROD as contaminated or potentially contaminated with white phosphorus

Confirmed contaminated or newly identified as contaminated with white phosphorus

Tested and confirmed as uncontaminated with white phosphorus

Undergoing remediation

Remediated

ARMY ENVIRONMENTAL CENTER

CORPS OF ENGINEERS
ALASKA DISTRICT

Eagle River Flats pond status at the end of the 2007 season

Second 5 Year Review
Operable Unit C
Fort Richardson, Alaska

SOURCE:	FIGURE:	DATE:
ERDC/CRREL, DEC 2007	6–5	2/08

7.0 OPERABLE UNIT D

OUD is the fourth OU to reach a final-action ROD and was signed June 30, 2000. This ROD documented a NFA Decision in accordance with EPA Guidance. OUD was originally established to be the final OU to be investigated at Fort Richardson. Additional background details and general site information is documented in the OUD ROD and in the Administrative Record for each source area listed in this Section.

OUD originally consisted of the 12 potential source areas. A list of these source areas and their current status is shown in Table 7-1 and their locations are shown on Figure 7-1.

Table 7-1. List of OUD Source Areas and Their Current Status

Source Area	Current Status
Building 35-752 - High Frequency Transmitter Site	Site transferred to OUE; NFA in OUE ROD
Building 45-590 - Auto Hobby Shop (Armored Vehicle Maintenance Area [AVMA])[a]	Bldg 45-590: NFA in OUD ROD
	AVMA: Transferred to OUE
Building 700/718	Referred to Two-Party
Building 704	Referred to Two-Party
Building 726 - Laundry Facility	NFA in OUD ROD
Building 796 - Battery Shop	NFA in OUE ROD (following additional sampling)
Building 955 – Former Sludge Bin	POL contamination: Referred to Two-Party
	DDT contamination: NFA in OUE ROD (following additional sampling)
Circle Road Drum Site	NFA in OUD ROD
Dust Palliative Locations (four separate areas)	NFA in OUD ROD
Grease Pits	NFA in OUD ROD
Landfill Fire Training Area	NFA in OUD ROD
Storm water Outfall to Ship Creek	NFA in OUD ROD

[a]The OUD ROD concluded that Building 45-590 was not the source of contamination and it was considered NFA under CERCLA. A new upgradient source area, the AVMA, was referred to the OUE for further investigation.

Each source area was evaluated through the PSE process (Pre-RI), and where warranted, limited field investigations, called PSE2s, were conducted. Based on the PSE2, petroleum contamination at Building 955 – Former Sludge Bin qualified to be investigated under the Two-Party agreement while DDT contamination at the site was evaluated as part of OUD.

Four of the original source areas were carried through an RI/FS: the Building 726 - Laundry Facility; the Building 796 - Battery Shop; the Building 35-752 High Frequency Transmitter Site; and, the Building 45-590 - Auto Hobby Shop. Based on the PSE and RI information, the Army, ADEC, and EPA determined in the OUD ROD that:

- Seven source areas required NFA under CERCLA
- Three source areas should be referred to the Non-UST Two-Party Agreement
- Two source areas be recommended for NFA under CERCLA following additional limited monitoring
- Two source areas were referred to a newly created OU, OUE, for investigation and further evaluation (this included the AVMA site, which was not one of the original 12 OUD source areas, but discovered during the RI).

7.1 OUD SOURCE AREAS WITH NO FURTHER ACTION DECISIONS IN OUD ROD

The NFA decision was recommended for source areas if:

- no visible sign of contamination was observed during the source area inspection;
- a removal action eliminated existing and potential risks to human health and the environment; or
- environmental sampling results showed that contamination, if present, was at levels below the protective human health-based levels for unrestricted use.

The NFA decisions for seven of the sites identified in the ROD were intended to document that the risk to human health and the environment associated with contamination from past activities at Fort Richardson was not present at these sites. Two of these source areas, the landfill fire training area and the grease pits, are being monitored in accordance with the requirements of the Fort Richardson Landfill Closure Plan (see Section 7.4). Institutional controls established for these source areas are shown on Figure 3-1. The NFA decision under CERCLA was made in the OUD ROD for the following source areas:

- Building 45-590 – Auto Hobby Shop
- Building 726 - Laundry Facility
- Circle Road Drum Site
- Dust Palliative Locations (four separate areas)
- Grease Pits
- Landfill Fire Training Area
- Storm water Outfall to Ship Creek

7.2 OUD SOURCE AREAS REFERRED TO THE TWO-PARTY AGREEMENT

Three source areas were referred to the Two-Party Agreement because the only contaminants of concern were petroleum. This agreement is part of the FFA for Fort Richardson. This Two-Party Agreement, officially referred to as the State-Fort Richardson Environmental Restoration Agreement, presents the petroleum cleanup strategy and documents all known historical petroleum sources on Fort Richardson and their current cleanup status. It also confirms the Army's commitment to adequately address these petroleum source areas in a manner consistent with state regulations. Further information concerning the status of source areas referred to the Two-Party agreement can be found in the Administrative Record and in Appendix A of this document. Appendix D and E of the OUD ROD also further explains these agreements. The source areas that were referred to the Two-Party agreement and do not require any additional action under the OUD ROD include:

- Building 700/718
- Building 704
- Building 955 petroleum contaminated soils

7.3 OUD SOURCE AREAS WITH NO FURTHER ACTION DECISIONS IN OUE ROD

The OUD ROD determined that two source areas, Building 796 - Battery Shop and Building 955 – Former Sludge Bin (DDT contaminated soils), required further monitoring before a decision could be made for NFA. The additional monitoring determined that the levels of chemicals of concern at these sites were below MCLs or EPA risk based criteria and do not pose a threat to human health or the environment. They were therefore recommended for NFA in the OUE ROD and are discussed in more detail in Section 8.

7.4 OUD SOURCE AREAS SUBJECT TO RCRA CLOSURE REQUIREMENTS

An additional goal of the FFA was to integrate the Army's CERCLA response obligations and RCRA Corrective Action requirements resulting from the EPA's and Army's 1991 FFCA. As stipulated in the OUD ROD, the following six source areas are subject to RCRA Closure in accordance with the FFCA:

- Building 700/718
- Building 704
- Building 955
- Building 35-752
- Building 45-590
- Circle Road Drum site

The former landfill fire training source area and the grease pits source area were recommended for NFA under CERCLA with unrestricted use and have been closed in accordance with RCRA Subtitle D of Solid Waste Landfill Regulations and State of Alaska Solid Waste Regulation 18 AAC 60.

As part of the closure plan, groundwater sampling has been conducted in wells located around the perimeter of the landfill since 1989. The depth to groundwater under the landfill is 180 feet. An annual report for groundwater monitoring and cap integrity is provided to the State of Alaska. To date, no contamination has been detected in either the down gradient or up gradient wells. This monitoring program is expected to continue for thirty years under the landfill closure plan. Documents detailing the analytical results for long-term monitoring at the landfill are located in the Administrative Record.

The Army's evaluation indicates that ICs for the landfill area remain protective. Institutional controls established for these source areas are shown on Figure 3-1. No new RCRA rules have been promulgated specific to post-closure procedures for the former landfill fire training source area or the grease pits source area.

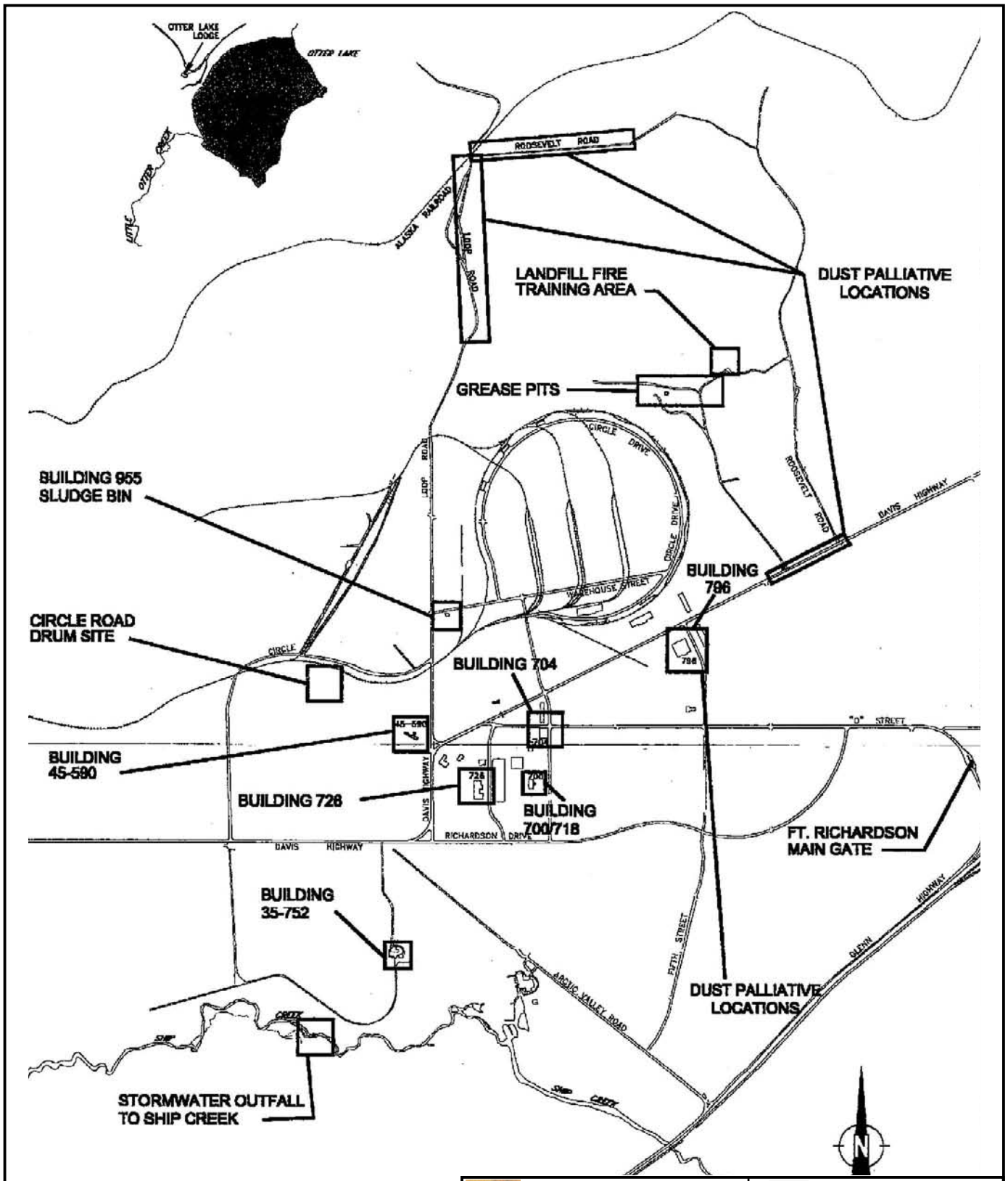
7.5 OUD SOURCE AREAS TRANSFERRED TO OUE

While the OUD ROD was being developed, new information was discovered concerning two OUD sites: the Building 35-752 source area and the Former Building 45-590 site. This new information indicated that polychlorinated biphenyl (PCB) containing oil had been released and burned at the Building 35-752 site, and that additional investigation was necessary to assess if other chemicals of potential concern (COPCs), specifically dioxins and furans, were present at the site. Additionally, while the Former Building 45-590 was determined not to be the source of solvent-contaminated groundwater in the area (and designated as NFA under CERCLA), groundwater contamination was attributed to an upgradient source area referred to as the AVMA.

Thus, OUE was formed from two existing contaminant source areas:

1) The Building 35-752 site, which was transferred from OUD into OUE; and
2) Solvent contaminated groundwater thought to be associated with the newly identified AVMA.

These two source areas were reinvestigated as part of the OUE RI/FS and are discussed in further detail in Section 8 under OUE.



0 2500 5000

APPROXIMATE SCALE IN FEET

ARMY ENVIRONMENTAL CENTER

CORPS OF ENGINEERS
ALASKA DISTRICT

OUD Source Area Location Map

Second 5 Year Review
Operable Unit D
Fort Richardson, Alaska

SOURCE:	FIGURE:	DATE:
NA	7–1	2/08

8.0 OPERABLE UNIT E

OUE is the fifth OU to reach a final-action ROD and was signed September 29, 2005. OUE was established because two potential hazardous-substance source areas, the Building 35-752 Area and the Armored Vehicle Maintenance Area (AVMA), required further investigation to determine the nature and extent of contamination at the sites. Based on the remedial investigation and risk assessments, soil and groundwater at the Building 35-752 Area and the soil in the AVMA were recommended for No Further Action (NFA) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Groundwater at the AVMA was identified for continued action due to persistent solvent contamination at the site.

In addition, the OUD ROD deferred a decision regarding two potential source areas, Building 796-Battery Shop and Building 955-Former Sludge Bin, until further monitoring could be completed. Based on sample data collected in 2000 and 2001, these two source areas were re-evaluated as part of the OUE ROD and recommended for NFA under CERCLA.

8.1 ARMORED VEHICLE MAINTENANCE AREA (AVMA)

The AVMA is the only OUE site determined to require further action under CERCLA. This determination was based on the remedial investigation (RI), risk assessments, and evaluation in the feasibility study (FS).

8.1.1 Overview

The AVMA is located in the western region of the cantonment area of Fort Richardson (Figure 8-1). The area consists of open fields, grasslands, woods, and some buildings covering approximately 140 acres. The AVMA site encompasses an area that lies between two sites investigated during the OUD remedial investigation. The former Building 45-590 site lies downgradient from the AVMA and the Building 726 site lies immediately upgradient from the AVMA site.

Solvent contamination (carbon tetrachloride and PCE) in groundwater at the site was first discovered during a UST release investigation conducted at the former Building 45-590 site in 1994. Further investigation during the OUD RI indicated that the highest levels of solvent contamination (PCE and carbon tetrachloride) were detected upgradient from the Building 45-590 site. Therefore, Building 45-590 was determined to not be the source of PCE contamination in groundwater. In addition, the OUD investigations, including a conservative residential risk screening, determined that soil contamination at the Building 45-590 site was not a concern. As documented in the OUD ROD, the Building 45-590 site was designated as an NFA site under CERCLA.

Building 726 (a laundry facility) was also investigated as part of OUD. The site is the location of a laundry and dry cleaning facility where solvents were stored in underground tanks until 1972. The tanks were determined to have leaked and were removed in 1987. As part of the tank removal, solvent contaminated soil was removed, aerated in an adjacent parking lot and then placed back in the excavation. During the OUD RI, soil borings were drilled at the former tank site and samples were collected and analyzed for the presence of petroleum hydrocarbons,

solvents, and metals. Groundwater samples were also collected and analyzed for the same constituents. The concentration of solvents in soil and groundwater at the site were less than levels required for unrestricted use. Therefore, the Building 726 site was determined to require NFA, as documented in the OUD ROD.

Because neither the Building 45-590 site nor the Building 726 site were considered to be the source for solvent contamination in groundwater, efforts were made to identify other potential source areas. Historic aerial photographs showed a large disturbed area east of former Building 45-590 that had reportedly been used for field maintenance of armored vehicles (tanks). This area was identified as a potential source of the groundwater contamination upgradient from the Building 45-590 site.

The OUD ROD specified that an area north of Buildings 726 and 732 (a motor pool) would be investigated as part of OUE, referring to the area as the AVMA. The suspected source areas within the AVMA include areas of buried debris and drainage ditches east of former Building 45-590 identified on historic aerial photographs. Additionally, the area north of Building 726 (including Building 732) was considered to be a potential source requiring further investigation.

The OUE RI, risk assessment, FS, and Proposed Plan were completed in 2004. The data and assessments indicated that solvent contaminated groundwater at the AVMA site required action under CERCLA. Contaminants in soil were determined to not pose an unacceptable risk to human health or the environment and therefore contamination in soil at the site did not require further action. Based on these assessments, it was determined that further action at the site was only required to address the groundwater and not the soils.

Periods of use and dates related to the history of the AVMA source area contamination are summarized in Table 8-1.

8.1.2 Background

Physical Characteristics

The AVMA site lies on an alluvial plain, often referred to as the Anchorage Lowland. The Elmendorf moraine can be found approximately one-half mile north of the site. The underlying geology at the AVMA is complex and highly variable. The Mountain View fan is on the order of 40- to 60-feet thick under most of the site. The fan consists mostly of sands and gravels with localized deposits of silt and clay. There are no wetlands or surface water features located on the site.

Groundwater underlying the AVMA is encountered in both shallow and deep aquifers separated by a confining layer. The thickness of the confining layer varies across the site and pinches out towards the north edge of the site. The confining layer is about 37 feet thick at the well AP-4412/AP-4413 location and 30 feet thick at the well AP-4415/AP-4416 location. The northern extent of the confining unit was determined to be adjacent to the Davis Highway, northwest of Building 732.

In areas where the confining layer is present, a shallow unconfined aquifer is encountered at about 60 feet bgs and a deeper confined aquifer is encountered at about 100 feet bgs. The aquifers merge where the confining layer pinches out, forming a thick unconfined aquifer. Groundwater flow at the site is complex due the nature of the geology, but the general groundwater flow direction is towards the northwest. Figure 8-2 (on page 8-4) shows a conceptual cross-sectional model of the geology and hydrology at the site.

Table 8-1. History of Regulatory Events at the OUE AVMA[a]

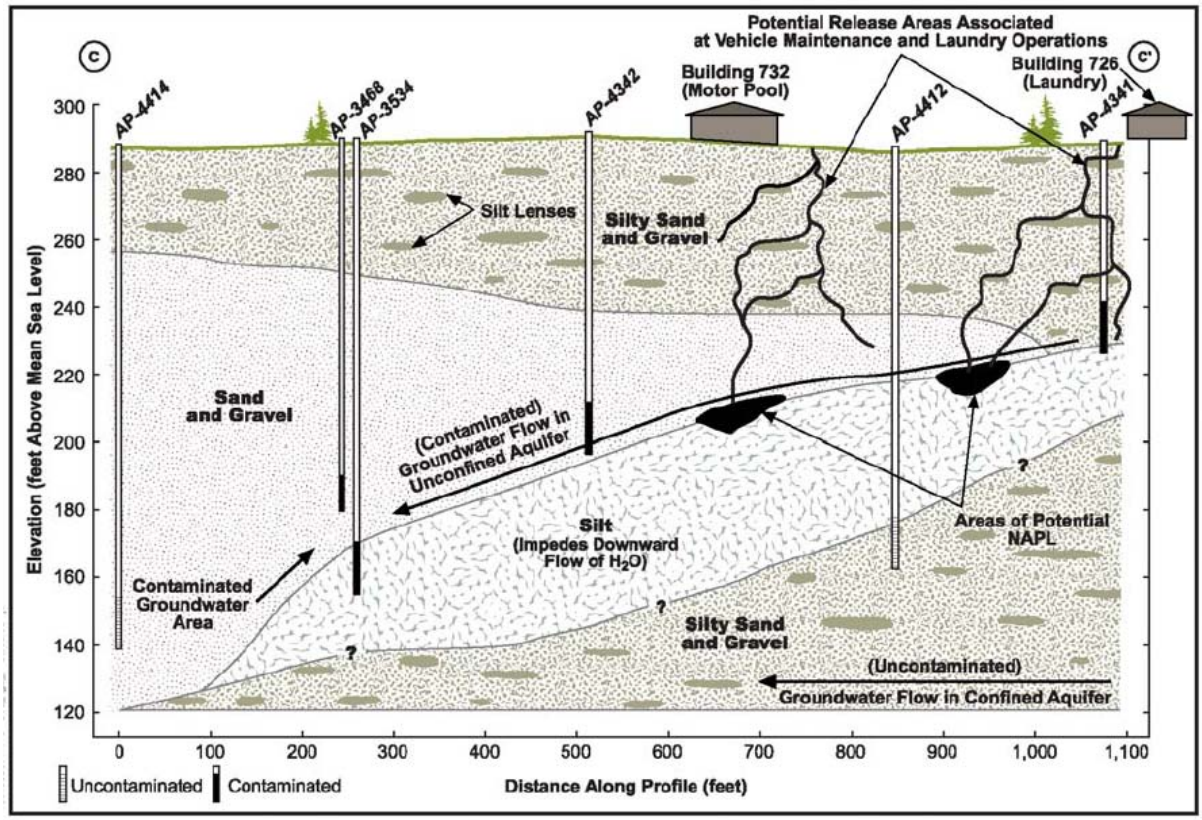
Event	Date
Low level armored vehicle maintenance, oil and other waste material disposal	1950-1966[b]
UST Remediation Sampling program conducted at AVMA	1990
Site Assessment at UST location	1993
Solvent contamination (carbon tetrachloride and PCE) first discovered in groundwater at the site	1994
Fort Richardson added to the NPL	June 1994
FFA signed	Dec 1994
Geophysical investigations	2000
Historical aerial photograph analysis and additional geophysical investigations	2001
Remedial Investigations and Risk Assessments	2000-2003
OUE Management Plan finalized	2002
Ft Richardson First Five-Year Review	Feb 2003
OUE Feasibility Study Report	2004
Final OUE Proposed Plan	2004
OUE Groundwater Monitoring Program initiated	2004
OUE ROD signed	Sept 2005
Ft Richardson PCOR signed	Sept 2006
OUE Interim Remedial Action Report	Aug 2007

[a]Information compiled from the OUE ROD; *Preliminary Site Characterization Report* (CH2M Hill, 2003); and the Five-Year Review Report Document Log.
[b]It is uncertain exactly when the facility stopped being used as a maintenance area.

Land and Resource Use

The AVMA area covers approximately 140 acres of developed and undeveloped land. The undeveloped land consists of forested areas and some open fields. The site also has several buildings with associated parking lots, including: a laundry facility (Building 726), a commercial building (Headquarters for the Directorate of Public Works), a military motor pool (Building 732), and a military training facility (Building 733). The downgradient area north of Building 732 has been used as a training area and obstacle course since 1973. The Army is in the process of reconstructing a jump tower at the site, and will be upgrading the training facilities (obstacle course) at the site during the next several years.

Figure 8-2. Conceptual Cross-Sectional Model of the AVMA Site



Land use at the AVMA and neighboring areas is industrial and will remain industrial for the reasonably anticipated future. Future residential use of the OUE land is not reasonable, nor is it consistent with the Master Plan for Fort Richardson. The AVMA area does not fit the criteria for residential land use as outlined in the Army's Master Planning Guidance, AR 210-20 (Army, 2005).

History of Contamination

The AVMA was used as a gravel source during construction of the railroad on Ft Richardson in 1950. Later in the 50s and 60s, military vehicles were washed at the eastern end of the AVMA.

During this time, pits, drainage ditches, and other ditches were excavated (Astley and Lawson 2001). Most of these excavations were later filled and graded with unknown material that may have included various solid and liquid wastes. The area has been used as a physical training area and obstacle course since 1973, although much of the obstacle course has been leveled or removed (Astley et al. 2001 [see Management Plan])

Solvent contamination (specifically PCE) was first detected in groundwater at the AVMA during a 1994 UST investigation. The highest concentrations of PCE were observed in the shallow, unconfined aquifer located in an area between Building 726 and the former Building 45-590. The contaminated groundwater plume extends about 600 feet northwest from Building 726. Current data indicate that the plume is stable and contained.

After significant sampling efforts, including borings and wells installed during the OUD investigations, contaminated soil areas were not detected, and therefore a specific release site

or mechanism could not be identified at the AVMA site. The OUD remedial investigations conducted at Buildings 45-590 and 726 did not detect significant levels of soil contamination that exceeded cleanup standards or that indicated potential source areas were present at the sites. Based in part on this finding, both the Building 726 and the Building 45-590 sites were considered NFA as documented in the OUD ROD.

Although the OUD investigations did not find PCE contamination in the soils at the laundry facility, the data collected during the OUE RI strongly suggest that PCE contamination in groundwater at the AVMA resulted from vehicle maintenance and laundry operations conducted at Buildings 732 and 726, respectively. Historical data show that PCE was used at the laundry facility and low levels of PCE were detected in soils at the Building 726 site during the OUD RI. There appears to be a direct link between the Building 726 site and the downgradient contamination. It is highly likely that PCE contamination from the former underground tanks located at Building 726 had been removed during excavation of the USTs or had migrated downgradient prior to the time the OUD RI had been conducted. Thus, soil and groundwater samples collected directly at the site did not contain high levels of solvents.

In addition, the OUD data appear to be biased by the fact that the groundwater samples were not collected from the unconfined aquifer in the area between Building 726 and Building 45-590. Groundwater samples collected during the OUE RI from wells installed in the unconfined aquifer indicated that PCE contamination was present, and that there was a contaminant pathway linking the Building 726 site with the PCE contamination found near Building 45-590 (see Figure 8-2).

Groundwater contamination was detected immediately downgradient from the Building 732 location during the OUD RI. Low levels of PCE contamination were detected in well AP-3789 and could indicate a link to vehicle maintenance activities conducted at Building 732.

Pre-ROD Response

A Groundwater Monitoring Plan was initiated in 2004.

8.1.3 Remedy Selection

Nature of Contamination

Laboratory analyses were performed on soil and groundwater samples collected from the AVMA site during both the OUD and OUE RIs. All the information was evaluated to understand the amount and types of contamination that are present at the site.

Soils

Soil sampling conducted as part of the OUD RI detected low level concentrations of several POL compounds (DRO, GRO, some PAHs) and PCE, but all at levels that were below the applicable cleanup levels. Although high levels of arsenic were found, it was determined to be naturally occurring. Based on these results, soils were determined not to be a concern at this site, as discussed below:

- The disturbed area east of former Building 45-590, where historic photographs showed potential areas of contamination, was characterized. No significant source of contamination was identified during the trench excavations.
- Low level concentrations of petroleum compounds (DRO, GRO), and PAHs such as benzo(a,h)anthracene were detected in soil samples collected during installation of

borings and monitoring wells. Contaminant concentrations did not exceed cleanup levels, and did not indicate that a significant source area existed at the AVMA.

- Low levels of PCE were detected at the Building 726 site during the OUD RI, but not at concentrations exceeding cleanup or risk levels.

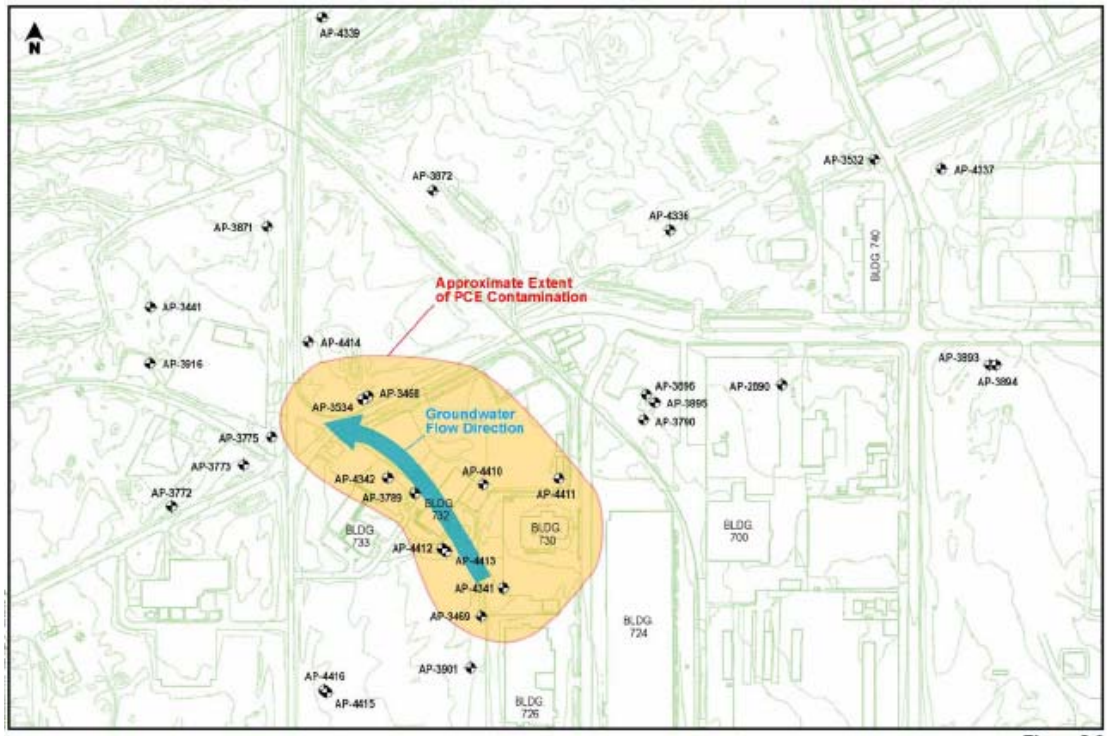
Groundwater

Even though significant levels of soil contamination were not detected at the AVMA site, there was anecdotal evidence to indicate that a localized source area must have existed near the northwest side of Building 726. Water sampling data indicated that dissolved-phase PCE contamination in groundwater originated in the area immediately downgradient from Building 726. Dry cleaning solvents (PCE and/or Stoddard solvent) were stored in USTs at the site and tank bottoms were disposed in a dumpster at the site. Low levels of PCE contamination were detected in soils at the Building 726 site, indicating that PCE had been used at the facility.

Groundwater sampling was conducted as part of the OUE RI. The sampling results demonstrated the presence of a dissolved PCE plume in the area to the north of Bldg 726 (as shown on Figure 8-3) and the following observations were made:

- Where contamination was encountered it extended from an area immediately downgradient from Building 726 to slightly past the junction of the confined and unconfined aquifers north of the Davis Highway. PCE contamination was detected in the shallow unconfined aquifer underlying the Building 726 and 732 areas, but not in the deeper confined aquifer located under those sites.
- PCE contamination exceeding the MCL was detected in the area where the unconfined and confined aquifers merge (wells AP-3534 and AP-3468). Groundwater found at, and downgradient from, wells AP-3534 and AP-3468 contains high metals levels and PCE.

Figure 8-3. Extent of PCE Contamination in the Groundwater at time of ROD



Ongoing monitoring indicates that the contaminant is slowly attenuating downgradient from the point of origin near Building 726. The primary means of attenuation appears to be dilution. Since no significant concentrations of breakdown products have not been found, chemical degradation does not appear to be a major pathway of contaminant reduction at this site.

Remedial Action Objectives

The RAOs for groundwater at the AVMA are:

- Prevent exposure to and use of groundwater as a potential drinking water source where chemical concentrations pose an unacceptable risk or exceed MCLs
- Return groundwater to beneficial use as a potential drinking water source within a reasonable time frame
- Monitor groundwater PCE concentrations within the contaminated area to establish concentration trends and provide an early warning if the downward concentration trend does not continue

Applicable or Relevant and Appropriate Requirements (ARARs)

The OUE ROD cited the most significant ARARs for the remedy selected for the AVMA. The following significant requirements are applicable to groundwater contamination at the AVMA:

- Federal Safe Drinking Water Act (40 CFR 141 and 40 CFR 143) and Alaska Drinking Water Regulations (18 AAC 80). The MCLs and nonzero maximum contaminant level goals (MCLGs) were established under the Safe Drinking Water Act and are relevant and appropriate for groundwater that is a potential drinking water source.
- Alaska Oil and Other Hazardous Substances Pollution Control Regulations (18 AAC 75). These regulations are applicable. Under these regulations, responsible parties are required to clean up oil and hazardous substance releases in Alaska, and are consistent with Alaska UST requirements.

Cleanup Goals

Based on the data collected during the RI and the results of the baseline risk assessment for current and projected land use at the site, one COC was identified in groundwater at the AVMA that drives the need for remedial action. Table 8-2 lists the COC identified in groundwater at the AVMA site.

Table 8-2. Cleanup Levels for Chemicals of Concern at OUE AVMA

Media	Chemical of Concern	ROD Cleanup Level	Basis	Current Cleanup Level[a]
Groundwater	PCE	5 µg/L	MCL	5 µg/L

[a]Cleanup level from 18 AAC 75 Table C, as amended December 30, 2006.

Notes: PCE = tetrachloroethylene
µg/L = micrograms per litter (equivalent to parts per billion)
MCL = maximum concentration level

Groundwater

Only one COC was established for groundwater at this site in the ROD: PCE. Federal and State of Alaska drinking water MCLs were adopted as the groundwater cleanup goals.

Soil
No COCs were identified in the ROD for the soils at this site.

Selected Remedy
The remedy selected in the ROD for the AVMA is Land Use Controls, Natural Attenuation, and Monitoring.

Land Use/Institutional Controls
The performance objectives of the ICs for the AVMA are:

- The installation or use of groundwater supply wells at the site is prohibited until the cleanup standards (which would allow for unrestricted use of the groundwater) are achieved throughout the groundwater plume.
- The integrity of any current or future monitoring wells will be maintained.

Natural Attenuation and Groundwater Monitoring
- The goal is to achieve the RAOs for this source area through natural attenuation.
- A network of existing monitoring wells will be sampled for GRO/BTEX, VOCs, and natural attenuation parameters; sampling will be conducted annually for 4 years, with a subsequent reduction to biennially for 6 years, and then every 5 years for the following 20 years, assuming contaminant levels are declining.
- Groundwater monitoring will be used:
  - To establish concentration trends and provide an early warning if the downward concentration trend does not continue
  - To determine the effectiveness of the remedy

8.1.4 Status of Remediation

Groundwater Monitoring
For costing purposes, the ROD assumed that 15 existing monitoring wells would be included in the AVMA monitoring network, but during the course of the remedial design, the RPM's concluded that 10 monitoring wells would be sufficient to adequately monitor the site. The decision was also made to drop GRO/BTEX from the parameter list.

All 10 wells were sampled prior to the signing of the ROD, some as far back as August 2002. This data has been used in determining contaminant trends. The ROD specified sampling would be conducted annually for 4 years (through 2009), and then if contaminant concentrations continue to decrease sampling intervals would subsequently decrease. As part of the post-ROD monitoring, all 10 wells were sampled for VOCs and natural attenuation parameters in May and October 2005, September 2006, and July and October 2007. Current and historic sampling results are shown in Figure 8-4.

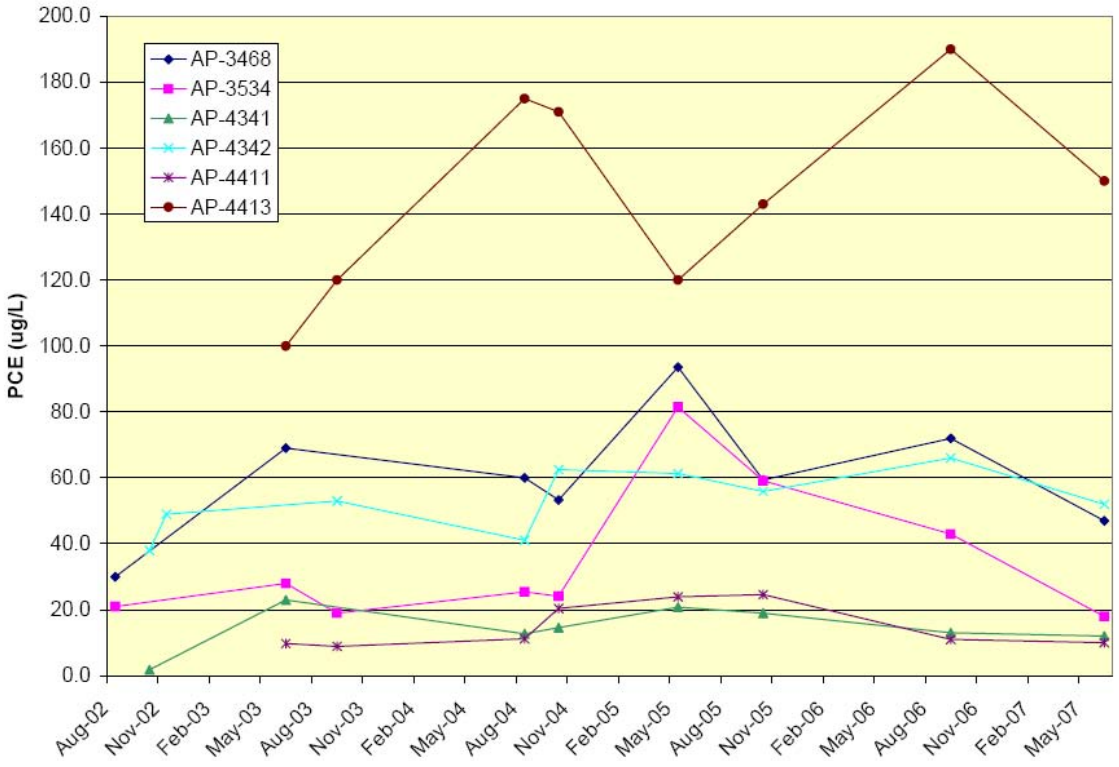
PCE
The most recent sampling effort was conducted in October 2007. PCE was detected in samples from six wells (AP-3468, AP-3534, AP-4341, AP-4342, AP-4411, and AP-4413) with concentrations ranging from 9 micrograms per liter (µg/L) to 120 µg/L. All six PCE detections were above the MCL and similar to results from past sampling efforts. All six wells have a history of PCE contamination. Four of these wells (AP-4341, AP-4342, AP-4411, and AP-4413)

are screened in the unconfined aquifer, directly below the AVMA site. The other two wells (AP-3468 and AP-3534) are located downgradient from these four wells, at the confluence of the unconfined aquifer system and the locally confined system (Figure 8-2). PCE was not detected in the three wells located downgradient of the plume (AP-3774, AP-3870, and AP-3871), or in the cross-gradient well (AP-3893).

A Mann-Kendall (M-K) analysis was performed to statistically identify PCE concentration trends in wells within the PCE plume. M-K analysis is designed to indicate whether an increasing or decreasing trend is present, and to give a percentage that represents the statistical confidence that a trend exists. A confidence of 90% or above is considered a “significant” indication that a trend exists.

According to the Mann-Kendall analysis, results from one of the six wells (AP-4342) within the contaminant plume show a significant trend for PCE. PCE in this well appears to be increasing (94% confidence interval). Figure 8-5 shows historic results from this and other wells within the PCE plume. As the graph shows, results from other wells appear to be relatively stable, evidenced by the fact that the M-K analysis was not able to definitively show a trend.

Figure 8-5. Historical PCE Concentration Trends for Wells within the PCE Plume



Natural attenuation parameters (dissolved oxygen [DO], iron, methane, sulfate, and nitrate/nitrite) were also analyzed in all the wells. The 2007 results were similar to previous results. DO concentrations indicate that conditions within the plume are aerobic, which are not favorable for reductive dechlorination of PCE. The concentrations of the other parameters

(along with the lack of PCE daughter products) suggest that biodegradation plays a limited role in natural attenuation at the site. The primary natural attenuation pathway for PCE at the AVMA is considered to be dilution. However, it should be noted that because natural attenuation has only been monitored at this site since 2005, there is limited data and further evaluation may be necessary to determine if natural attenuation is occurring at the site.

Other Contaminants

Other analytes detected during this sampling effort included carbon tetrachloride and chloroform, both of which were detected in multiple wells but at levels below their MCLs. These contaminants were detected in wells with PCE and without PCE. Since neither compound is a breakdown product of PCE, these results were determined to be indicative of a separate type of low-level contamination at the site.

Two metals, aluminum and arsenic, were also detected in several wells. Arsenic exceeded its MCL in two wells. Aluminum does not have a Federal MCL, but exceeded its secondary MCL for drinking water (18 AAC 80) in one well.

Detections of aluminum have been sporadic at the site. Dramatic differences in concentrations often exist from year to year within individual wells; for example, results from well AP-4341 have ranged from non-detect to 13,000 µg/L. These differences may be attributed to the fact that some of the earlier sampling results may have been reported as total metals results, whereas more recent results (2004 to the present) have reported only dissolved metals. The cause of the high aluminum levels is not currently understood.

Arsenic levels are believed to be the result of natural background levels in the area. These detections continue to remain below the MCL (10 µg/L) within the area of PCE contamination. The highest levels of arsenic are consistently found in cross-gradient well AP-3893 where they range from 13.5 to 20.7µg/L.

Institutional Controls

ICs have been implemented at the AVMA. Fort Richardson instituted a post wide IC policy for all known or suspected contaminated source areas. Further details of the Army/Fort Richardson IC policy can be found in Appendix E, which includes copies of the U.S. Army Alaska Institutional Controls Standard Operating Procedures [(APVR-RPW [200-1)], and a Memorandum on Institutional Controls [APVR-RPW-EV (200-1c)]. IC policies include the following:

- No unauthorized intrusive actions take place at source areas,
- No potable water wells are installed on source areas, and
- No soil excavation can take place without possession of a valid site-specific Fort Richardson Excavation Permit.

USARAK DPW maintains a GIS database with information on all of the contaminated source areas on Post. The DPW is responsible for ensuring ICs on Fort Richardson are enforced. ICs will remain in place as long as hazardous substances remain on site at levels that preclude unrestricted use.

Site Inspection

The AVMA Site was inspected on November 19, 2007. All wells appeared to be in good condition at that time. No unusual conditions were observed.

8.1.5 Five-Year Assessment

Are the Remedies Functioning as Intended by the Decision Document?

Implementation of Institutional Controls
The ICs at the AVMA are functioning as intended and continue to be protective of human health and the environment. Excavation in the area is restricted and requires a permit. Groundwater intrusion is also restricted.

Monitoring and Natural Attenuation
The selected remedies for the AVMA are functioning as intended. Monitoring results indicate that the contaminant plume is relatively stable. Although concentrations of PCE have fluctuated in some wells within the plume, PCE has consistently not been deteted in wells outside of the plume, indicating that the plume is not growing. Natural attenuation parameters appear to be stable, and the lack of daughter products indicates that degradation of the PCE is playing a very limited role in the attenuation of the contamination. Dilution still appears to be the primary process of natural attenuation at this site.

The following table summarizes performance to date related to the RAOs for this source area.

Remedial Action Objective	Performance to Date
Prevent exposure to and use of groundwater as a potential drinking water source where chemical concentrations that pose an unacceptable risk or exceed MCLs	ICs are in place per APVR-RPW (200-1) and APVR-RPW-EV-(200-1c) and are effectively controlling exposure pathways that could result in unacceptable risk
Return groundwater to beneficial use as a potential drinking water source within a reasonable time frame	Contaminant plume is not growing, although concentrations in some wells within the plume have fluctuated
Monitor groundwater PCE concentrations within the contaminated area to establish concentration trends and provide an early warning if the downward concentration trend does not continue	Groundwater is monitored annually at the site; the data is used to determine concentration trends and is discussed by the RPMs at regularly scheduled FFA Meetings

Are the Assumptions Used at the Time of Remedy Selection Still Valid?

Changes in Standards
No new contaminant sources have been identified.

There have been no changes to ARARs or TBCs identified in the ROD.

Exposure Pathways
There are no changes in land use or the anticipated land use on or near the site. No new human health or ecological exposure pathways or receptors have been identified.

Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

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

Issues / Variances

There are no known variances from the ROD.

Recommendations and Follow-up Actions

The selected remedy for this site is implementation of ICs for groundwater use at the site, along with regular groundwater monitoring that includes monitoring of natural attenuation. The ICs for this site appear to be properly maintained and enforced. Monitoring results indicate that the contaminant plume is generally stable, although one well within the plume has shown an increasing trend. Because the plume is stable, natural attenuation appears to be occurring with the primary process being dilution. The lack of any breakdown products and the stability of the natural attenuation parameters indicate that no significant biodegradation is occurring.

Based on these results, the existing monitoring network appears to be adequate and there does not appear to be any reason to make changes to the remedy as specified in the ROD. There are no recommendations or follow-up actions for the AVMA at this time.

8.2 BUILDING 35-752 AREA

8.2.1 Overview

Building 35-752 is a former generator/power supply building for a high-frequency transmitter facility located in the adjacent Building 35-750. The potential hazardous source areas at the Building 35-752 Area are related to transformer maintenance and operation, the discharge and burning of transformer cooling oil containing PCBs, the use of PCB-contaminated soil as a base for the peripheral road, and residual contamination in an area where soil containing PCBs had been stockpiled.

This site was one of the 12 sites originally included in OUD. However, while the OUD ROD was being developed, new information about the potential source of the PCB contamination was discovered. Reportedly, the oil from several of the transformers was drained onto the ground and burned using diesel fuel as an accelerant. Based on this information, it was determined that the site had not been adequately characterized and additional RI work needed to be performed to determine the extent of the contamination. Rather than hold up the completion of the OUD ROD, the site was therefore transferred to OUE for further study.

8.2.2 Background

The Building 35-752 Area is located approximately one-third of a mile south of the Davis Highway, in a relatively undeveloped part of Fort Richardson that includes high-frequency transmitter antennas (see Figure 8-1). Building 35-752 is currently vacant and a locked chain-link fence surrounds the area to restrict access.

The primary industrial activities conducted at the site that contributed contamination to soil and groundwater included operation of USTs and electrical power generation equipment (generators and transformers). Diesel generators were operated at the site from 1953 to 1987. The generators were housed inside Building 35-752 and were used to power a high-frequency transmitter array and control center located in the adjacent Building 35-750. Fuel for the generators was stored in seven 5,000-gallon USTs located on the south side of the building. Cooling ponds, located southwest of the building, stored water to cool the generators. The generators were removed in 1987 and the building was used for general storage for several years afterward. The building was boarded up and secured with a locked fence in 1995.

Four large transformers (750-kilovolt) were located at the site during operation of the power generation facility. The transformers were located on the northwest side of the adjacent Building 35-750. Sometime around 1982 these transformers were replaced and removed from the site.

Pre-OUD ROD Investigations

In 1990, seven USTs were excavated from the south side of the building. During the UST closure, petroleum hydrocarbon contamination was found in the excavation as well as PCB and Aroclor 1260 in the associated stockpiled soil.

A PSE was conducted at Building 35-752 during fall and winter 1994 and 1995. PCBs were detected in samples collected from the floor of Building 35-752. PCBs and petroleum hydrocarbons were detected in soil and groundwater samples collected in the former UST area. PCBs and petroleum hydrocarbons were detected in subsurface soil samples collected in the drum storage area. Petroleum hydrocarbons, PCBs, pesticides, and solvents were detected in sediments collected from the cooling pond. Petroleum products and metals were detected in groundwater samples collected near the cooling pond. Petroleum products and solvents were present in groundwater samples collected from wells around the building.

OUD Remedial Investigation

The OUD RI began in 1996 and was completed in 1998. The RI focused on contamination inside Building 35-752 (PCB contaminated dust), soils at the former UST area, soils at the former drum accumulation area, soils in the cooling pond area, and groundwater. The OUD RI confirmed the results of previous investigations and showed that low levels of PCBs, petroleum hydrocarbons, and solvents were present at the site. However, the OUD risk assessment indicated that contaminant levels present at the site did not pose an unacceptable risk to human health or the environment.

In 1997, approximately 1,500 cubic yards of soil were excavated from the gravel parking lot at the site in order to construct a more permanent asphalt surface. Soil removed during excavation activities was found to contain PCBs at higher concentrations than samples collected at other locations evaluated during the RI. A definitive source of the PCBs was never determined. The Proposed Plan for OUD indicated that the soil removed during the excavation would be treated using phytoremediation. The soil was stockpiled at the site and later packaged and shipped to a TSCA permitted TSDF for disposal.

While the OUD ROD was being developed, new information was discovered about the source of PCB contamination in this area. Interviews with Fort Richardson personnel indicated that oil from four 750-kilovolt transformers located behind Building 35-750 was drained via a trench into a pit located adjacent to Building 35-752 and burned with diesel fuel. The interviews also indicated that another transformer was drained onto the ground in the area directly east of Building 35-752.

Considering the new information obtained after issuing the Proposed Plan, it was determined that the site had not been adequately characterized for PCBs and potentially dioxins. As a result, the site was transferred to OUE.

OUE Remedial Investigations

The OUE RI began in 2002 and was completed in 2003. The OUE investigations at the Building 35-752 site focused on areas where PCBs had reportedly been disposed and burned at the site. These areas included reported releases around a transformer mounting pad, a suspected PCB burn area, potential PCB-contaminated soil in the base for the peripheral road, and an area where soil containing PCBs had been stockpiled. These were areas that had not been previously investigated as part of OUD. The COPCs investigated at this site were PCBs and dioxin/furan compounds that might have been generated as a result of burning PCB-containing oil at the site.

During the OUE RI, 87 soil samples were collected from the various areas of investigation at the site. Soil samples were analyzed for PCBs, dioxin/furans, solvents, and petroleum compounds. Groundwater samples were collected from seven monitoring wells located at the site. Groundwater samples were analyzed for PCBs, VOCs, semi-volatile organic compounds, metals, and petroleum compounds. Figure 8-6 shows locations where samples were collected at the Building 35-752 site.

Soil Investigation. The highest level of PCBs detected during the RI (99.9 milligrams per kilogram [mg/kg]) was confined to a small area less than one square meter in size next to the transformer mounting pad by Building 35-750. This area has limited accessibility being located between the transformer enclosure and the building and is not widely used except during maintenance of transformers and other electrical equipment. However, due to concerns for potential exposure, the surface soil around the transformer mounting pad was excavated following completion of the RI.

All areas outside the building fit the definition of low-occupancy under the Toxic Substances Control Act (TSCA) regulation (e.g., unoccupied areas outside a building, electrical equipment vaults, or non-office space in a warehouse where occupancy is transitory). Thus, the relevant TSCA cleanup level was 25 ppm. All of the surface soils around the transformer mounting pad that contained PCBs in excess of 1 mg/kg were excavated and disposed at a TSCA landfill. The highest level of PCBs detected in the subsurface following excavation was 14.1 mg/kg at a depth of 1 foot below the ground surface (bgs). The concrete surface of the mounting pad was tested using wipe samples and PCB levels were less than detection limits (1 microgram per 100 square centimeters [1 µg/100 cm^2]). The entire area was capped with geotextile fabric and a minimum of 0.5 foot of clean soil.

Toxicity equivalent quotients (TEQs) for dioxin/furan compounds ranged from 0.79 picogram per gram (pg/g) to 32 pg/g (ppt - parts per trillion). Only 2 samples contained dioxin/furan compounds at levels exceeding screening criteria (Region 9 PRG, 16 ppt) and the highest concentration (32 ppt) sample was from an area located underneath the asphalt driveway. There are no promulgated cleanup levels for dioxins/furans and the levels of dioxin/furan detected at the site did not result in calculation of unacceptable risk for exposure to soil.

Groundwater Investigation. Data collected during the OUD RI (1996) indicated that shallow groundwater beneath Building 35-752 was contaminated with low levels of benzene, TCE, and metals (primarily aluminum, iron, and manganese). In general, these same constituents were identified in groundwater samples collected during the OUE RI that was conducted in 2002/2003.

Only two compounds were detected in groundwater at the Building 35-752 site during the OUE RI that exceeded MCLs. Benzene was detected at a concentration of 8.2 µg/L in well AP-2892 during sampling conducted in 2002. However, during the 2003 sampling event, benzene was detected at 1.6 µg/L, which is below the MCL (5 µg/L). In 2003, TCE was detected in AP-3231 at a concentration (8.6 µg/L) slightly exceeding the MCL of 5 µg/L. However, the concentration of TCE in groundwater at the site has decreased over time since 1995 and has periodically dropped below the MCL. Chemical concentrations of cis-1,2-dichloroethylene (cis-1,2-DCE) and vinyl chloride (VC), while still much lower than MCLs, have increased slightly in areas where TCE is found. The increase in concentrations of the daughter products, VC and cis-1,2-DCE, coupled with the generally decreasing concentration of TCE, tend to indicate that degradation of the TCE contamination is occurring at the site.

Results from the OUE RI indicated that only one groundwater sample contained PCBs (Aroclor 1260) at a concentration that exceeded the screening criteria (0.034 µg/L). The only PAH compound detected at concentrations exceeding screening level criteria was naphthalene. However, the concentration of naphthalene (8.3 µg/L) in groundwater at the site was much less than the ADEC cleanup level (1,460 µg/L). Several VOCs (specifically benzene, ethylbenzene, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene) were detected at concentrations exceeding screening criteria. However, concentrations of these chemicals have decreased since 1996 and are less than the MCL values or ADEC standards. Cumulative risk calculations for the groundwater contaminants at the site fell within acceptable risk ranges for unrestricted use. Groundwater at the site is not used as a drinking water supply, and in general the shallow groundwater is non-potable due to high turbidity levels.

8.2.3 ROD Recommendations

Based on the following, soil at the Building 35-752 Area was recommended for NFA under CERCLA in the OUE ROD:

- Risk assessment results indicated that contamination in soils poses no unacceptable risk to human health or the environment
- PCB contamination in soils was less than the relevant TSCA cleanup standards and surface soils containing PCBs in excess of 25 ppm were excavated and removed from the site

Based on the following data, groundwater at the Building 35-752 Area was recommended for NFA under CERCLA in the OUE ROD:

- Risk assessment results indicated that contamination in groundwater poses no unacceptable risk to human health or the environment
- Shallow groundwater is not used as a drinking water source and is non-potable due to high turbidity and high metals levels
- Contaminant concentrations in groundwater were decreasing and the concentration of TCE (8.6 µg/L) was only slightly greater than the MCL (5 µg/L); data suggested that the contaminant was degrading
- To ensure the protectiveness of the NFA decision, the Army will monitor groundwater and site conditions during the five-year reviews

8.2.4 Current Site Status

Institutional Controls

The ICs at the Building 35-752 area are functioning as intended and continue to be protective of human health and the environment. Access to Building 35-752 is restricted by a chain-link fence that surrounds the building. In addition, institutional controls prohibit access to the groundwater as a source of drinking water and the land use at this source area and neighboring source areas will remain industrial for the foreseeable future.

Groundwater Monitoring

Groundwater monitoring at this site is only required at the time of the five-year review. Sampling is scheduled for spring 2008 but results were not available by the completion of this review. Previous sampling results from 2003 in OUE ROD were only slightly above 5 ppb in AP-3231 (8.6) for TCE.

Site Inspection

The Bldg 35-752 site was inspected on November 19, 2007. The building was secured and the surrounding fence was intact (see photographs in Appendix B). All wells appeared to be in good condition at that time. No unusual conditions were observed.

8.2.5 Recommendations

ICs are in effect and will continue to restrict access to the building, as well as land use and groundwater usage. Excavation in the area is restricted and requires a permit. Groundwater intrusion is also restricted. RPMs will continue to evaluate groundwater data to determine if further action is warranted.

8.3 SOURCE AREAS WITH NO FURTHER ACTION DECISIONS DEFERRED FROM OUD

8.3.1 Building 955 – Former Sludge Bin

Background

This site is the location of the former sludge bin that was used as a waste-oil transfer station. Waste liquids containing water and small amounts of solids were transported to the bin from various motor pool operations. The waste liquids were allowed to settle and the contents segregated into water, liquid petroleum compounds, and sludge. The water was pumped from the bin, and the used oil was deposited into underground storage tanks (USTs) located adjacent to the bin (see Figure 8-7).

Pre-ROD Activities

A site assessment was performed in 1993 for closure of the UST. This resulted in the detection of petroleum hydrocarbons, VOCs, herbicides and pesticides at the site. The UST site was not investigated as part of OUD, but was investigated as part of the Two-Party UST Agreement.

During a 1995 investigation, four borings were sampled for potential chemicals of concern (COCs) at this site. DDT was detected at 95 ppm at six feet bgs in one boring. This area was

considered an isolated small spill site and the Army conducted a removal action of the DDT in 1998. Approximately 100 cubic yards of DDT contaminated soil were excavated and transported to a permitted disposal facility. After the soil was removed, 72 soil samples were field screened using an Envirogard-Immunoassay test kit, but confirmation samples were not collected for laboratory analysis. Because confirmation samples were not collected and three of the field screening samples exhibited potential concentrations of DDT greater than 10 ppm, a risk determination could not be made. Therefore, the OUD ROD recommended performing confirmation sampling for DDT to confirm that concentrations did not exceed the EPA Region 3 risk-based level of 17 mg/kg or State of Alaska standard of 24 mg/kg. A Recommended Action Decision Document, which details the analytical results of confirmation sampling, a risk analysis for the source area, and a discussion of the 1998 removal action, can be found in the Administrative Record.

Post-ROD Activities

The site was re-sampled in 2000, and 16 soil samples (11 subsurface samples and 5 surface samples) were collected and analyzed for pesticides, specifically dichlorodiphenyldichloro-ethane (DDD), dichlorodiphenyldichloroethene (DDE), and DDT. Sampling results indicated that the highest levels of contaminants detected at the site were DDT at 3.96 mg/kg, DDE at 0.407 mg/kg, and DDD at 0.872 mg/kg. The maximum detected concentrations were less than the applicable EPA Region 3 RBCs for industrial soil (7.0 mg/kg for DDT and DDE, and 10 mg/kg for DDD) and State Alaska standard of 24 mg/kg. The concentration of DDT was also less than the 17 mg/kg cleanup level established in the OUD ROD.

Recommendations

Based on the results of the follow-up sampling, the site was recommended for NFA under CERCLA in the OUE ROD. The residual DDT at this site falls within the risk range defined in the NCP for acceptable risks therefore, a NFA was determined for this site.

8.3.2 Building 796 - Battery Shop

Overview

The Building 796 - Battery Shop was identified in the OUD ROD as requiring further sampling before a formal decision could be made regarding the status of the site. The OUD ROD required that the Army resample groundwater at the site to determine if COPCs, specifically 2-dibromoethane (EDB) and benzo(a)pyrene (a polynuclear aromatic hydrocarbon [PAH]), were present at levels exceeding cleanup standards.

The source area was re-sampled in 2000 following completion of the OUD ROD. Results indicated that EDB and benzo(a)pyrene contamination in groundwater did not exceed ADEC cleanup standards. The site was therefore recommended for NFA under CERCLA in the OUE ROD.

Background

Building 796, a battery, vehicle, and weapons maintenance repair shop, is located at the southwest corner of Fifth Street and Davis Highway (see Figure 8-8). The facility is used for vehicle and equipment maintenance. Historically, this site served as the Battery Shop and former activities at this source area included discharging neutralized battery fluid into a floor drain that subsequently drained into either a log crib, UST, or storm sewer. This activity took

place from the 1950's until the late 1980's. Specific details concerning this site can be found in the administrative record and the OUD ROD.

Pre-ROD Activities

Several investigations have been conducted at this site: a 1993 UST investigation; a PSE2 in 1994; and part of the RI for OUD in 1996. The 1993 UST removal identified possible petroleum contamination. However, petroleum concentrations did not exceed State soil cleanup levels. During the PSE2 investigation, carbon tetrachloride and chloroform were detected in the groundwater. The presence of chloroform or carbon tetrachloride was not confirmed during additional groundwater pre-RI sampling events; however, 1,2-Dibromoethane (EDB) was detected during 1 out of 12 of the sampling events and benzo(a)pyrene (a PAH) was detected in 2 out of 8 sampling events. Even though the concentrations of chloroform and carbon tetrachloride were below risk based cleanup levels, the source area was added to the OUD RI/FS because of the carcinogenic potency of the two chemicals.

The FS recommended a remedial action that was developed in the Proposed Plan and the Draft OUD ROD. During the ROD review, it was determined that the risk was overestimated for the contaminants detected in groundwater. Risks calculated during the RI were based on an estimated value for EDB concentration and PAH detected in samples that were unfiltered. Because the Risk Assessment and determination during the RI were based solely on contaminants that may or may not have been present in groundwater, after re-evaluating the Risk Assessment and the data, it was determined that there were no contaminants above risk levels.

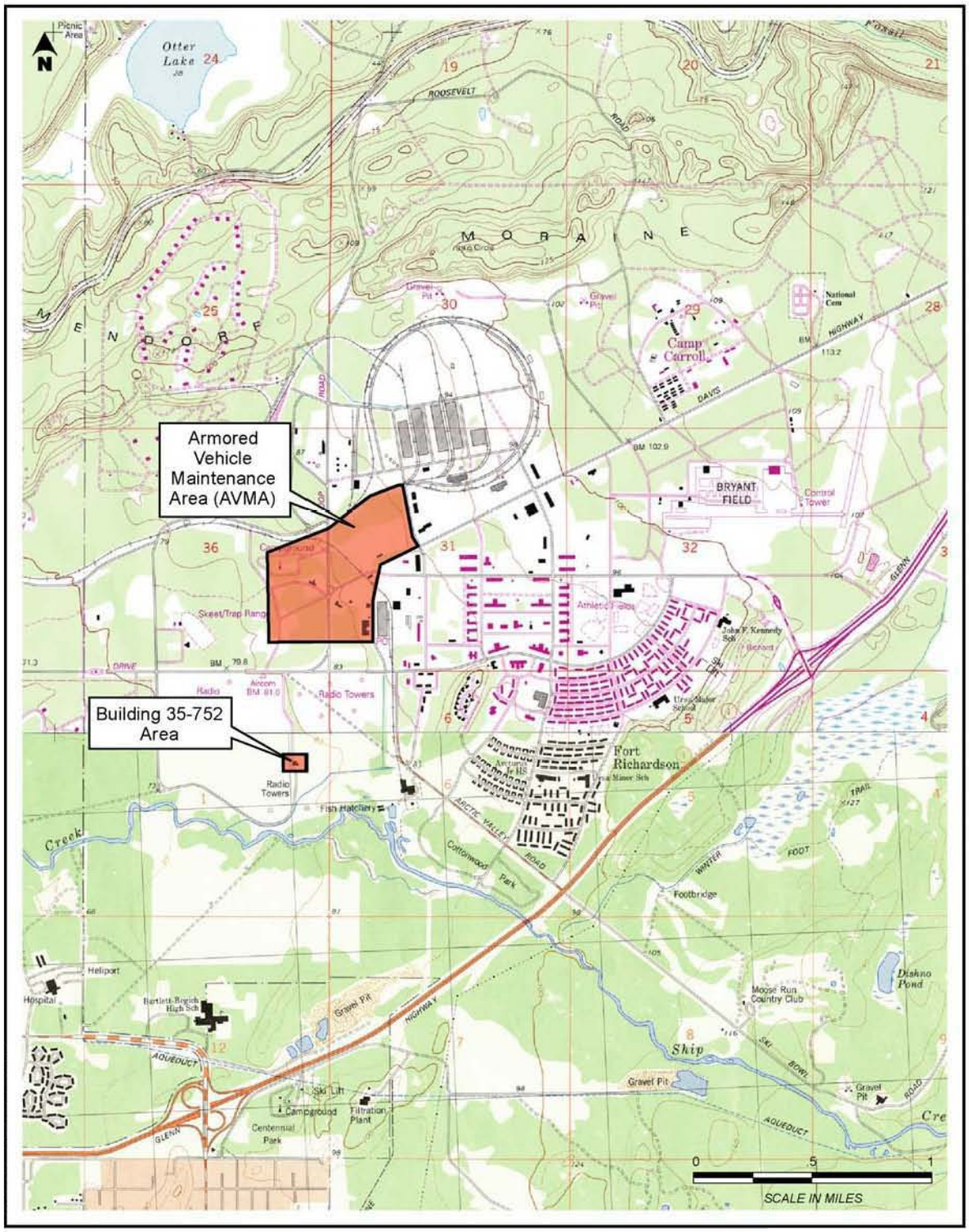
The Army, EPA, and State of Alaska agreed in the OUD ROD that an additional groundwater sampling event would be conducted. If no contaminants were detected the site would require no further action under CERCLA. This decision would be documented in the OUE ROD.

Post-ROD Activities

The Army re-sampled groundwater at the site in 2000 and 2001. Groundwater samples were analyzed for the presence of PAHs, EDB, VOCs, metals, and diesel range organics (DRO). None of the samples contained chemical constituents that exceeded applicable cleanup standards. The only PAH compounds detected were phenanthrene (0.0818 µg/L) and naphthalene (0.0611 µg/L). The concentrations of naphthalene and phenanthrene detected at the site were less than the published cleanup values. EDB was not detected in any of the groundwater samples. Carbon tetrachloride (2.28 µg/L) and chloroform (3.21 µg/L) were detected at the site, but at levels less than the State and federal MCLs.

Recommendations

Because contaminants were not detected at concentrations exceeding State and federal MCLs, the site was recommended for NFA under CERCLA in the OUE ROD.

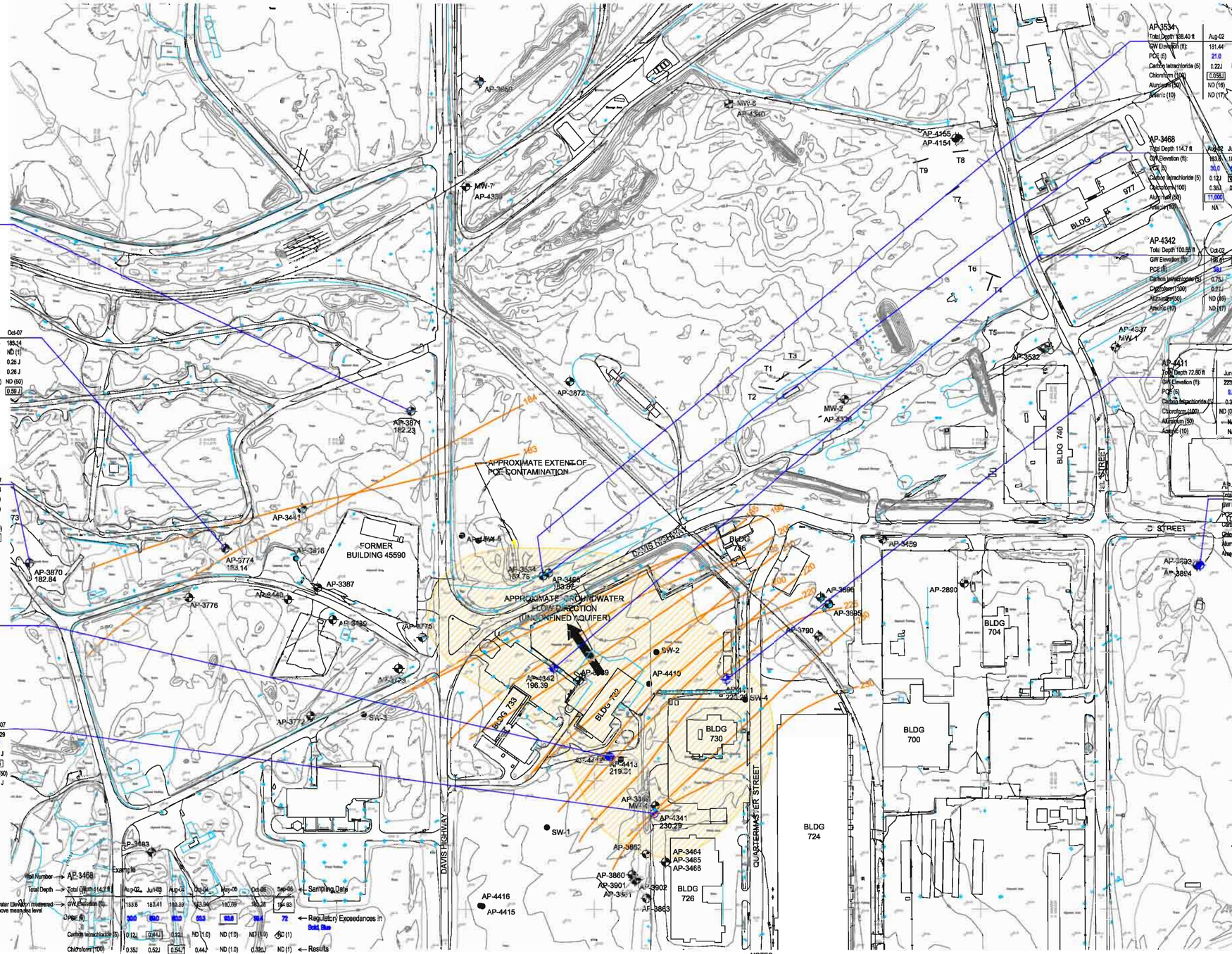


ARMY ENVIRONMENTAL CENTER		CORPS OF ENGINEERS ALASKA DISTRICT

AVMA Site Location Map

Second 5 Year Review
Operable Unit E
Fort Richardson, Alaska

SOURCE:	FIGURE:	DATE:
OUE, ROD	8–1	2/08



AP-3871

Total Depth: 120.20 ft	Aug-02	Jul-03	Aug-04	Oct-04	May-05	Oct-05	Sep-06	Jul-07	Oct-07
GW Elevation (ft):	181.08	182.37	180.93	182.15	184.51	183.12	184.15	182.96	183.23
PCE (5)	ND (0.059)	ND (0.12)	ND (1)	NA	NA	NA	ND (1)	ND (1)	ND (1)
Carbon tetrachloride (5)	0.49J	0.32J	0.52J	ND (1)	ND (1)	0.940J	0.51 J	ND (1)	ND (1)
Chloroform (100)	3.6	ND (0.06)	3.26	2.70	3.00	2.92	2.2	3.0	2.8
Aluminum (50)	420	NA	ND (100)	NA	NA	NA	ND (50)	ND (50)	ND (50)
Arsenic (10)	ND (17)	NA	ND (10)	NA	NA	NA	ND (1)	ND (1)	0.72 J

AP-3774

Total Depth: 116.40 ft	Aug-02	Jul-03	Sep-03	Aug-04	Oct-04	May-05	Oct 05	Sep-06	Jul-07	Oct-07
GW Elevation (ft):	181.09	182.34	182.04	181.01	182.25	184.49	182.72	184.00	182.74	183.14
PCE (5)	ND (2)	0.26J	ND (0.46)	ND (1)	ND (1)	0.740J	0.330J+	ND (1)	ND (1)	ND (1)
Carbon tetrachloride (5)	NA	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	0.390J	0.51J	ND (1)	0.25 J
Chloroform (100)	ND (0.17)	0.18J	ND (0.43)	ND (1)	NA	NA	NA	ND (1)	ND (1)	0.26 J
Aluminum (50)	NA	NA	NA	ND (100)	117	ND (100)	ND (100)	ND (50)	ND (50)	ND (50)
Arsenic (10)	NA	NA	NA	ND (10)	NA	NA	NA	ND (1)	ND (1)	0.59 J

AP-3870

Total Depth: 109.95 ft	Jul-03	Sep-03	Aug-04	Oct-04	Jun-05	Oct-05	Sep-06	Jul-07	Oct-07
GW Elevation (ft):	182.1	181.77	180.76	182.06	184.37	182.69	183.91	182.63	182.84
PCE (5)	ND (0.12)	ND (0.45)	ND (1)	0.41J	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Carbon tetrachloride (5)	0.25J	ND (0.43)	NA	NA	NA	ND (1)	0.53J	ND (1)	ND (1)
Chloroform (100)	0.37J	ND (0.46)	ND (1)	0.3J	0.34J	0.37J	ND (1)	ND (1)	0.32 J
Aluminum (50)	NA	NA	ND (100)	NA	NA	NA	ND (50)	ND (50)	ND (50)
Arsenic (10)	NA	NA	ND (10)	NA	NA	NA	ND (1)	ND (1)	0.65 J

AP-4413

Total Depth: 75.40 ft:	Jun-03	Sep-03	Aug-04	Oct-04	May-05	Oct-05	Sep-06	Jul-07	Oct-07
GW Elevation (ft):	218.93	218.87	219.71	219.71	218.86	218.55	219.37	219.08	219.31
PCE (5)	100J	120	175	171	120	143	190	190	120
Carbon tetrachloride (5)	1.3	0.97J	1.06	1.21	1.04	1.08	1.1	1.1 J+	0.98 J
Chloroform (100)	0.6J	ND (0.46)	0.62J	0.38J	0.510J	0.660J	3.7	4.4	4.8
Aluminum (50)	NA	NA	ND (100)	NA	NA	NA	ND (50)	ND (50J)	ND (50)
Arsenic (10)	NA	NA	ND (10)	NA	NA	NA	0.47J	ND (1)	0.55 J

AP-4341

Total Depth: 68.10 ft	Oct-02	Jun-03	Aug-04	Oct-04	May-05	Oct-05	Sep-06	Jul-07	Oct-07
GW Elevation (ft):	230.41	230.16	230.05	230.37	230.27	230.26	230.31	230.22	230.29
PCE (5)	1.5J	21	12.7	14.8	20.8	19.0	13	12.0	9.3
Carbon tetrachloride (5)	0.38J	0.52J	ND (1)	0.37J	0.520J	0.370J	0.85J	0.59J+	0.61 J
Chloroform (100)	ND (0.5)	0.58J	ND (1)	0.50J	0.780J	0.780J	ND (1)	1.3	1.5
Aluminum (50)	13000	NA	ND (100)	684	ND (100)	ND (100)	3400	113J-	ND (50)
Arsenic (10)	ND (17)	NA	ND (10)	NA	NA	NA	1.6	ND (1)	0.26 J

AP-3534

Total Depth: 138.40 ft	Aug-02	Jun-03	Sep-03	Aug-04	Oct-04	May-05	Oct-05	Sep-06	Jun-07	Oct-07
GW Elevation (ft):	181.44	182.41		181.41	182.49	184.00	183.29	184.72	183.43	183.76
PCE (5)	21.0	18J	19J	25.4	24.1	81.5	59.1	43	18	18
Carbon tetrachloride (5)	0.22J	ND (0.43)	ND (0.43)	0.42J	ND (1.0)	0.49J	ND (1.0)	0.69J	ND (1)	ND (1)
Chloroform (100)	0.056J	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1)	ND (1)	0.24 J
Aluminum (50)	ND (16)	NA	NA	ND (100)	NA	NA	NA	ND (50)	ND (50)	ND (50)
Arsenic (10)	ND (17)	NA	NA	ND (10)	NA	NA	NA	0.77J	ND (1.2)	1

AP-3468

Total Depth 114.7 ft	Aug-02	Jun-03	Aug-04	Oct-04	May-05	Oct-05	Sep-06	Jun-07	Oct-07
GW Elevation (ft):	183.8	183.41	183.38	183.94	180.69	183.28	184.63	183.76	183.87
PCE (5)	30.0	99.0	80.0	83.3	93.8	59.4	72	47	61
Carbon tetrachloride (5)	0.12J	0.44J	0.32J	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	0.26 J
Chloroform (100)	0.36J	0.52J	0.54J	0.44J	ND (1)	0.320J	ND (1)	0.72J	0.83 J
Aluminum (50)	11,000	NA	ND (100)	ND (100)	72.8J	ND (100)	ND (50)	ND (50)	ND (50)
Arsenic (10)	NA	NA	3.5J	ND (10)	ND (10)	ND (10)	0.2J	ND (1)	0.37 J

AP-4342

Total Depth: 100.55 ft	Oct-02	Nov-02	Jun-03	Sep-03	Aug-04	Oct-04	May-05	Oct-05	Sep-06	Jul-07	Oct-07
GW Elevation (ft):	196.61	197.51	195.95	195.87	195.78	197.01	195.56	196.34	196.59	196.10	196.39
PCE (5)	38J	49.0	NA	53.0	41.1	82.5	61.3J-	55.9	88	52.0	52
Carbon tetrachloride (5)	0.75J	0.44J	NA	NA	0.58J	0.91J	0.90J-	0.680J	0.98 J	0.95 J	1
Chloroform (100)	0.27J	0.28J	NA	ND (0.46)	ND (1)	ND (1)	0.35J-	ND (1)	0.61 J	2.4	2.3
Aluminum (50)	ND (16)	NA	NA	NA	ND (100)	NA	NA	NA	74.8	ND (50)	ND (50)
Arsenic (10)	ND (17)	NA	NA	NA	ND (10)	NA	NA	NA	0.46J	ND (1)	0.53 J

AP-4411

Total Depth 72.80 ft	Jun-03	Sep-03	Aug-04	Oct-04	Jun-05	Oct-05	Sep-06	Jul-07	Oct-07
GW Elevation (ft):	223.82	224.72	223.72	223.71	223.03	223.03	225.25	225.20	225.29
PCE (5)	8.8	8.9	11.2	20.4	23.9	24.6	11	10	12
Carbon tetrachloride (5)	0.33J	ND (0.43)	0.32J	NA	NA	NA	0.58J	ND (1)	ND (1)
Chloroform (100)	ND (0.080)	ND (0.46)	0.54J	NA	NA	NA	ND (1)	ND (1)	ND (1)
Aluminum (50)	NA	NA	ND (100)	15100	ND (100)	ND (100)	ND (50)	ND (50)	132
Arsenic (10)	NA	NA	ND (10)	3.7J	ND (10)	ND (10)	ND (1)	ND (1)	0.47 J

AP-3893

Total Depth 124.10 ft	Aug-02	Aug-04	Oct-04	May-05	Oct-05	Sep-06	Jul-07	Oct-07
GW Elevation (ft):	212.28	212.88	214.49	216.75	215.76	217.38	216.87	217.53
PCE (5)	ND (0.059)	ND (1)	NA	NA	NA	ND (1)	ND (1)	ND (1)
Carbon tetrachloride (5)	ND (0.074)	ND (1)	NA	NA	NA	ND (1)	ND (1)	ND (1)
Chloroform (100)	ND (0.092)	ND (1)	NA	NA	NA	ND (1)	ND (1)	ND (1)
Aluminum (50)	970	ND (100)	NA	NA	NA	ND (50)	ND (50)	ND (50)
Arsenic (10)	ND (17)	20.70	18.9	19.3	13.5	19	22.5	24.2

LEGEND

- September 2006 Monitored Well (Perched Aquifer)
- September 2006 Monitored Well (Unconfined Aquifer)
- Existing Well Not Monitored for this Event
- Ground Surface Elevation (meters)
- Approximate Extent of PCE Contamination
- Ground Water Elevation (feet)

Example

Well Number → AP-3468

Total Depth → Total Depth 114.7 ft

Groundwater Elevation measured in feet above mean sea level → GW Elevation (ft)

← Sampling Data

	Aug-02	Jun-03	Aug-04	Oct-04	May-05	Oct-05	Sep-06
GW Elevation (ft)	183.8	183.41	183.38	183.94	180.69	183.28	184.63
PCE (5)	30.0	99.0	80.0	83.3	93.8	59.4	72
Carbon tetrachloride (5)	0.12J	0.44J	0.32J	ND (1.0)	ND (1.0)	ND (1.0)	ND (1)
Chloroform (100)	0.36J	0.52J	0.54J	0.44J	ND (1.0)	0.320J	ND (1)

← Regulatory Exceedances in Bold Blue

← Results

Analyte and MCL in ug/L → Aluminum (50): 11,000 | NA | ND (100) | ND (100) | ND (100) | 72.8J | ND (100) | ND (50)

Arsenic (10): NA | NA | 3.5J | ND (10.0) | ND (10.0) | ND (10.0) | 0.2J

MCL

Maximum historic value indicated by box

ABBREVIATIONS

ADEC = Alaska Department of Environmental Conservation

Dup = Duplicate Sample

NA = Not Available

ND = No Analyte Detected

B = Lab Blank Contamination

J = Estimated Quantity

J+ = Analyte is present, but value may not be accurate or precise (estimated high)

J- = Analyte is present, but value may not be accurate or precise (estimated low)

MCL = Maximum Contaminant Level

PCE = Carbon Tetrachloride

NOTES

Groundwater elevation in feet above mean sea level. Previous groundwater elevations taken from archived reports.

Data prior to August 2004 and for September 2006 through the present collected by CH2M Hill.

Data from 2004 through 2005 collected by Satori Group Inc.

All non-detect values before August 2004 are reported as the Method Detection Limit (MDL).

All non-detect values starting with August/October 2004 through September 2006 are reported as the Practical Quantitation Limit (PQL)

All concentrations are measured in µg/L.

Exceedances compared against EPA 40 CFR 141/143, ADEC 18AAC80, and ADEC 18 AAC 75.345 Table C.

Regulatory Exceedances in Bold

Maximum values are indicated by a box.

August/October 2002 metals data is for total metals with the exception of well AP-4342, which is dissolved metals.

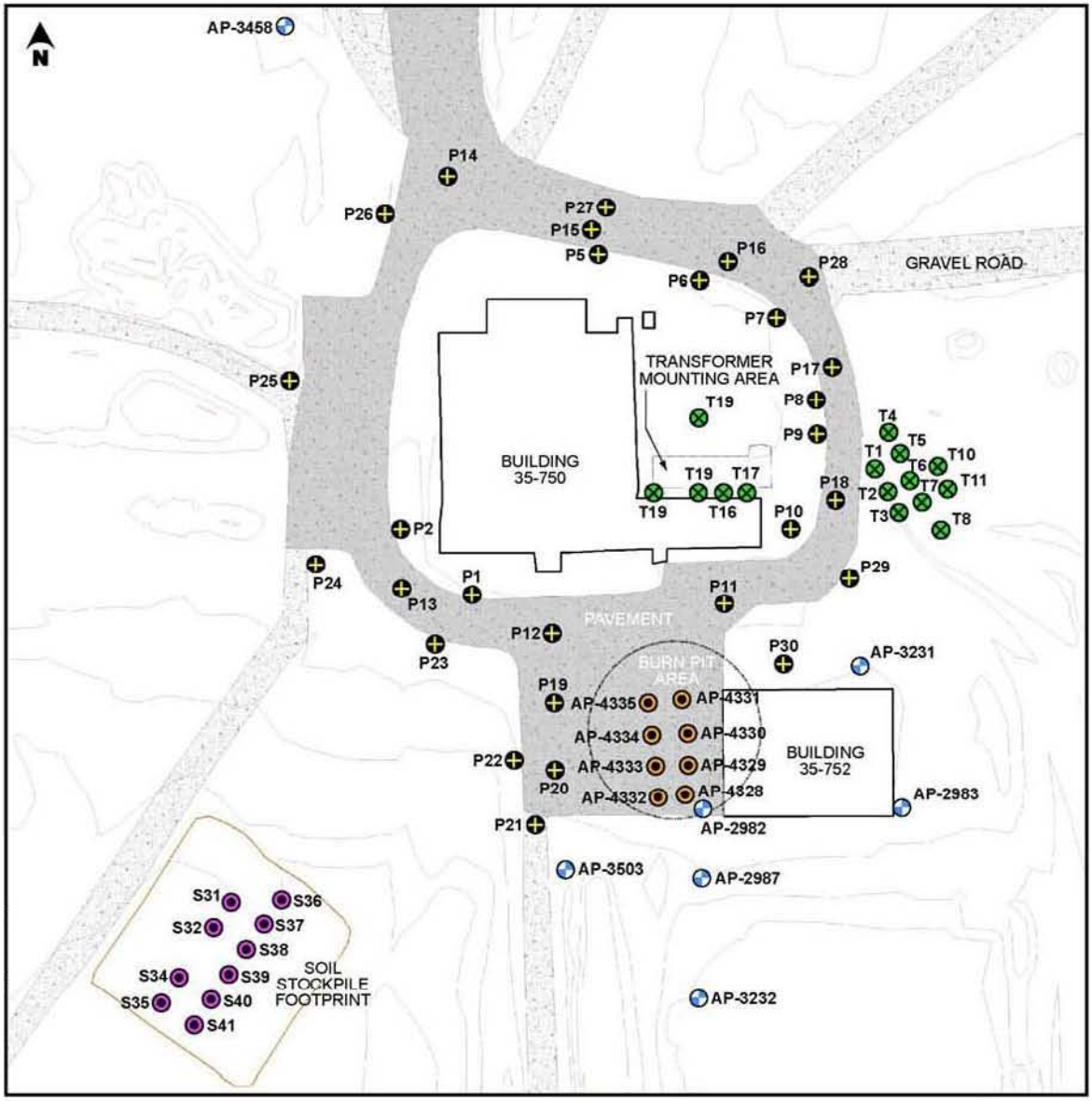
ARMY ENVIRONMENTAL CENTER

CORPS OF ENGINEERS ALASKA DISTRICT

AVMA Historic Sampling Results

Second 5 Year Review
Operable Unit E
Fort Richardson, Alaska

SOURCE:	FIGURE:	DATE:
CH2MHILL, 2008	8-4	2/08



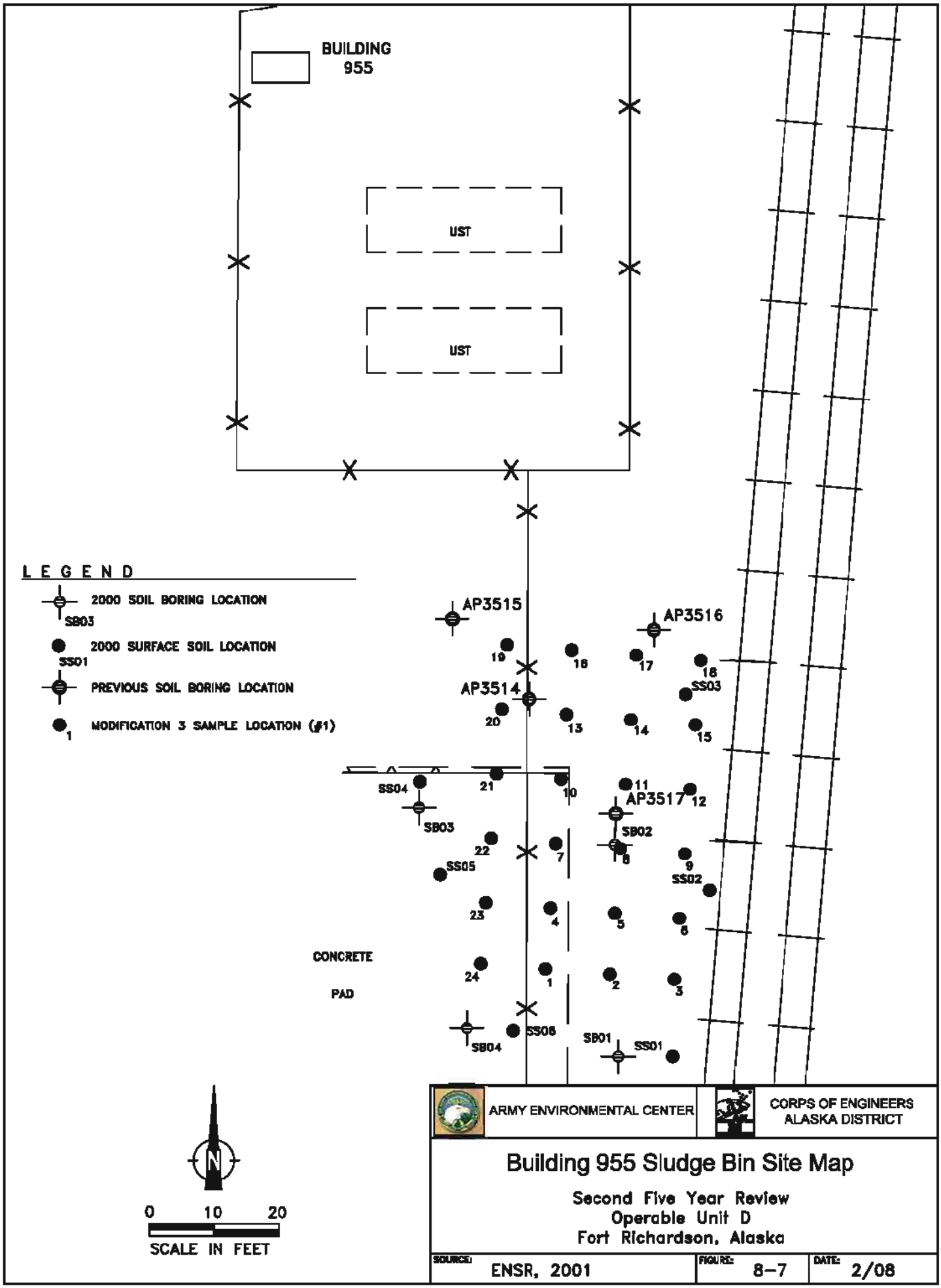
ARMY ENVIRONMENTAL CENTER

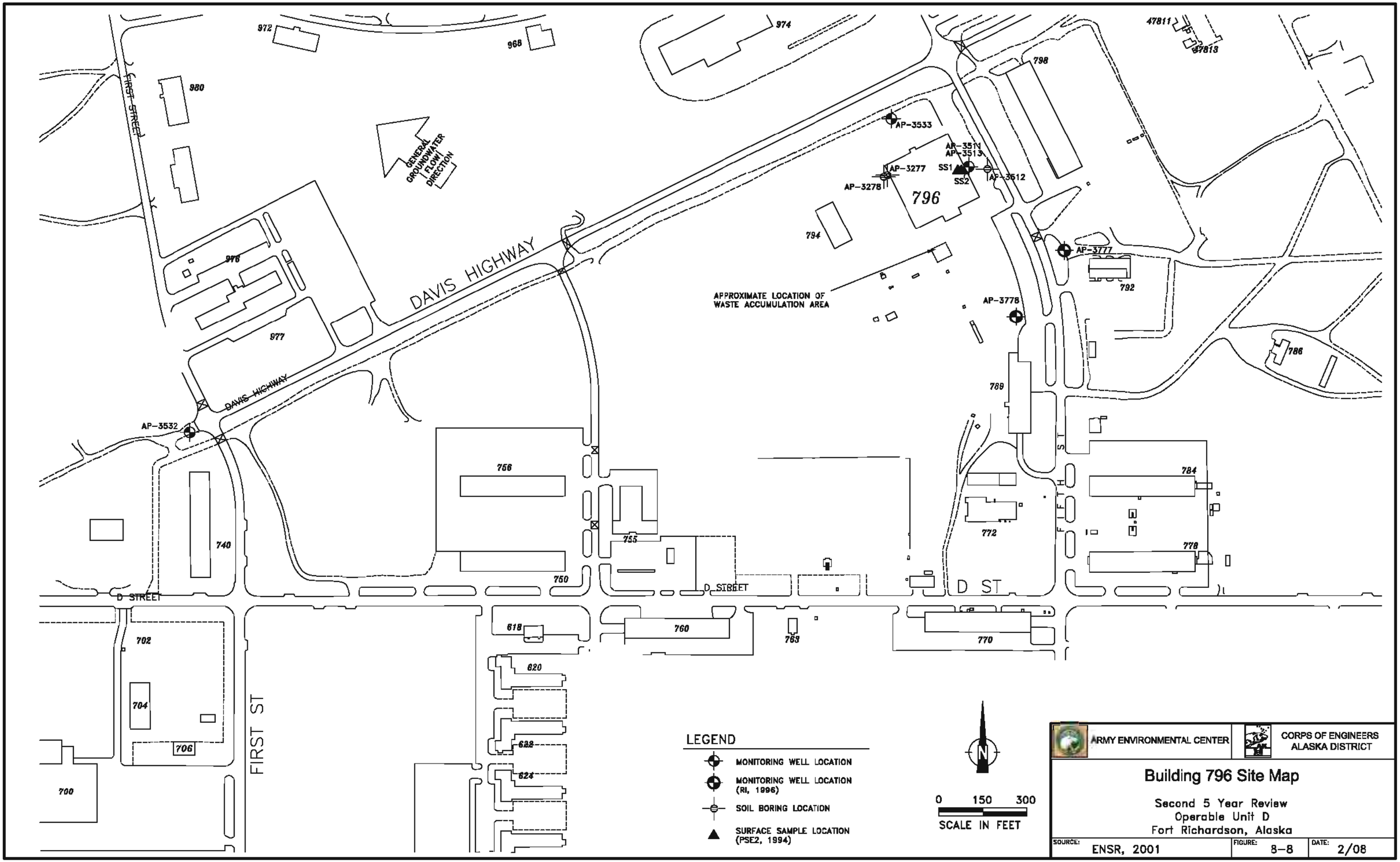
CORPS OF ENGINEERS
ALASKA DISTRICT

Building 35-752 Sample Locations

Second 5 Year Review
Operable Unit E
Fort Richardson, Alaska

SOURCE:	FIGURE:	DATE:
OUE, ROD	8–6	2/08


BUILDING
955
UST
UST
LEGEND
2000 SOIL BORING LOCATION
SB03
2000 SURFACE SOIL LOCATION
SS01
PREVIOUS SOIL BORING LOCATION
MODIFICATION 3 SAMPLE LOCATION (#1)
AP3515
AP3516
AP3514
AP3517
SB03
SB02
SB04
SB01
SS01
SS02
SS03
SS04
SS05
SS06
CONCRETE
PAD
N
0
10
20
SCALE IN FEET
ARMY ENVIRONMENTAL CENTER
CORPS OF ENGINEERS
ALASKA DISTRICT
Building 955 Sludge Bin Site Map
Second Five Year Review
Operable Unit D
Fort Richardson, Alaska
SOURCE:
ENSR, 2001
FIGURE:
8-7
DATE:
2/08



LEGEND

- MONITORING WELL LOCATION
- MONITORING WELL LOCATION (RI, 1996)
- SOIL BORING LOCATION
- SURFACE SAMPLE LOCATION (PSE2, 1994)

0 150 300
SCALE IN FEET

ARMY ENVIRONMENTAL CENTER

CORPS OF ENGINEERS ALASKA DISTRICT

Building 796 Site Map

Second 5 Year Review
Operable Unit D
Fort Richardson, Alaska

SOURCE:	FIGURE:	DATE:
ENSR, 2001	8-8	2/08

9.0 SITE-WIDE SUMMARY AND RECOMMENDATIONS

9.1 GENERAL

9.1.1 ROD Commitments are Being Met

Management of Fort Richardson NPL site remediation under the FFA has been very effective. This effectiveness translates into a good rate of progress implementing the remedial actions specified in the RODs and is in the best interest of the public and the environment. This effectiveness also translates into the best use of public resources, i.e. a greater proportion of funding for RD/RA/LTM is focused on remediation (as opposed to transactional costs) than has been the case at many other NPL sites.

9.1.2 Public Information Repositories

A status memorandum concerning inspection of the Fort Richardson public information repositories is included as an appendix of this report. Site visits found that the repositories are generally outdated or do not fully meet public needs. The site visit report includes several specific recommendations for enhancing the repositories and potentially simplifying maintenance of the administrative record at these locations (Appendix C).

9.1.3 Institutional Controls

The Army has established Standard Operating Procedures (SOP) and a Geographic Information System (GIS) based tracking system to ensure the land and use restrictions are enforced. The IC system has been incorporated into the post wide Master Plan, and compliance with ICs is reported in the Annual Monitoring Reports for each OU. The IC policy applies to all USARAK units and activities, Military and Civilian Support Activities, Tenants Organizations and Agencies and Government and Civilian Contractors. In the fall of 2001, the Institutional Control Memorandum signed by Major General Cash dated February 1999, was updated to require a Work Authorization Permit for all groundwater and soils on USARAK lands. This revised memorandum, signed by the Commanding General, includes a section on areas with ICs mandated by a Record of Decision and a section on areas where contamination is not suspected. Currently, all contracts that include intrusive activities require a Work Authorization Permit; however, the Permit was updated to clearly alert the user on procedures to follow when potential contamination is encountered. The SOP is currently being updated.

Fort Richardson instituted a post wide IC policy for all known or suspected contaminated source areas. Copies of the U.S. Army Alaska Institutional Controls Standard Operating Procedures [(APVR-RPW [200-1)], and a Memorandum on Institutional Controls [APVR-RPW-EV (200-1c)] can be found in Appendix E of this document. USARAK DPW maintains the GIS database with information on all of the contaminated source areas on Post. The DPW is responsible for ensuring compliance with ICs on Fort Richardson. ICs will remain in place as long as hazardous substances remain on site at levels that preclude unrestricted use.

Institutional Controls do not specifically address UXO hazards at OUB; therefore identifying UXO specific ICs is recommended to prevent and limit human and environmental exposure to hazardous substances.

9.1.4 Perchlorate Evaluation

The EPA has been working with federal agencies for several years to address perchlorate as an environmental contaminant. Ammonium perchlorate is a component of solid rocket fuel and is believed to be a widespread environmental contaminant. Based on the EPA's "Interim Assessment Guidance for Perchlorate", the Army initiated a program in 2002 to identify sites where solid rocket fuel had been stored or disposed, and to determine whether or not groundwater sampling had been conducted at these sites. Based on the results of the perchlorate survey, the Army has not detected perchlorate in groundwater at Ft. Richardson.

9.2 OPERABLE UNIT AND SOURCE AREA SPECIFIC

Table 9-1 summarizes the response to recommendations made in the 2003 Five-Year Review, and Table 9-2 summarizes the recommendations and follow-up actions from OU and source area sections of this report.

Table 9-1. Response to Recommendations from 2003 Five-Year Review

OU	Source Area	Recommendations / Follow-Up Actions from 2003 Five-Year Review	Action Completed	Party Responsible	Date Completed	Affects Protectiveness (Yes/No)
B	Poleline Road Disposal Area	Continue to monitor groundwater contaminant reduction and perform groundwater modeling for a trend analysis.	Ongoing	U.S. Army	Ongoing	No
		Continue analyzing groundwater samples for VOCs using methods that include the compounds not addressed in the ROD.	Ongoing	U.S. Army	Ongoing	No
		Include new wells, installed in 2002, in the long-term groundwater monitoring program.	Wells installed in 2002, 2004, and 2007	U.S. Army	July 2002	No
		Identify an IC specific to UXO buried in Areas A-1 and A-2. The IC will be included in the master plan and real estate documents, range maps, the Environmental GIS and the IC policy	Installed fence with warning signs around Areas A-1 and A-2; included ICs in the master plan and real estate documents, range maps, the Environmental GIS and the IC policy	U.S. Army	June 2003	No
C	Eagle River Flats	Evaluate recovery trends upon completion of remedial action.	Limited remediation efforts have been completed. A monitoring plan that outlines future monitoring objectives for the ERF source area is currently under development.	U.S. Army	Ongoing	No

Table 9-2. Current Recommendations and Follow-Up Actions

OU	Source Area	Recommendations / Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Current Protectiveness (Yes/No)	Affects Future Protectiveness (Yes/No)
B	Poleline Road Disposal Area	Continue to monitor groundwater contaminant reduction and perform groundwater modeling for a trend analysis.	U.S. Army	EPA/ADEC	Ongoing	No	No
		Continue analyzing groundwater samples for VOCs using methods that include compounds not addressed in the ROD	U.S. Army	EPA/ADEC	Ongoing	No	No
C	Eagle River Flats	Complete Evaluation of recovery trends upon completion of remedial action.	U.S. Army	EPA/ADEC	Ongoing	No	No
		Continue to track the progress of the EIS currently under development	U.S. Army	EPA/ADEC	Ongoing	No	To be determined
E	Armored Vehicle Maintenance Area	No operational changes are recommended at this time.					
	Institutional Controls	Perform post-wide IC inspection and evaluate protectiveness. Update restricted use boundaries in GIS as new information becomes available.	U.S. Army	EPA/ADEC	Update GIS - Ongoing	No	No
		Make SOP coverage more inclusive (i.e., apply to tenants)	U.S. Army	EPA/ADEC	Ongoing	No	No
		Update IC Policy	U.S. Army	EPA/ADEC	2008	No	No

10.0 PROTECTIVENESS STATEMENTS

Table 10-1 was developed based on the EPA Comprehensive Five-Year Review Guidance (June 2001) and summarizes OU and source area information from the preceding sections used to formulate protectiveness statements. Only OUB, OUC, and OUE source areas are included in this section since all OUA and OUD source areas were either NFA or transferred.

10.1 OUB – POLELINE ROAD DISPOSAL AREA

The remedy at OUB is expected to be protective of human health and the environment upon attainment of groundwater cleanup goals and in the interim ICs are preventing exposure to contaminated groundwater. The initial soil removal in 1993 and 1994 and subsequent treatability studies removed the most highly contaminated soil and debris. The remedy is expected to prevent and limit human and environmental exposure to hazardous substance. ICs that address the potential UXO hazards in Areas A-1 and A-2 have been implemented since the last 5-year review. Fencing with warning signs has been placed around Areas A-1 and A-2.

Long-term protectiveness of the remedial action will be verified by obtaining groundwater samples to evaluate potential migration of the contaminant plume downgradient toward Eagle River and ensure contaminant levels in groundwater are decreasing through natural attenuation. Current monitoring data indicates that the plume is not migrating and that the remedy is functioning as required. Geologic modeling at the OUB source area continues with the intent of helping to confirm that RAOs will be achieved within the timeframe required by the ROD.

10.2 OUC – EAGLE RIVER FLATS

The remedy at OUC is protective of human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled with ICs. ERF is currently an active impact area. If in the future a decision is made to close ERF, the human health risk from exposure to UXO will be addressed using the ARARs that are in place at the time.

10.3 OUE – ARMORED VEHICLE MAINTENANCE AREA & BUILDING 35-752

The remedy at OUE is expected to be protective of human health and the environment upon attainment of groundwater cleanup goals through natural attenuation. In the interim, exposure pathways that could result in unacceptable risks are being controlled and ICs are preventing exposure to, or ingestion of, contaminated groundwater.

Table 10-1. Protectiveness Statement Basis

OU	Source Area	Question A Is the remedy functioning as intended in the decision documents?	Question B Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives still valid?	Question C Has any other information come to light that could call into question the protectiveness of the remedy?	Is the remedy protective in the short term?	Is the remedy protective in the long term?
B	Poleline Road Disposal Area	Yes	Yes	No	Yes	Yes
C	Eagle River Flats	Yes	Yes	No	Yes	Yes
E	Armored Vehicle Maintenance Area	Yes	Yes	No	Yes	Yes

11.0 NEXT REVIEW

The next Fort Richardson Five-Review will be conducted in 2013, five years from the date of this review.

The next Five-Year Review will be the first full-term review for the OUE ROD.

12.0 REFERENCES

This Five-Year Review focused on understanding commitments made in the RODs, the status of remedial actions undertaken in response to the RODs, and the continued protectiveness of the remedial actions specified in the RODs. The individual RODs were the starting points for the reviews of compliance with the RODs, remediation progress to date, and protectiveness. To the extent possible, the review made use of the most recent summary documents available, augmenting the information in those summaries with information from earlier reports and, in some cases, with knowledge or information not yet included in reports. Much of the review focused on post-ROD reports, though pre-ROD documents were also consulted as needed to understand the history of contamination and remediation at the source areas. Table 2-1, in Section 2 of this Report, is a listing of the RODs and related documents and post-ROD reports available at the time of this Five-Year Review.

APPENDIX A

Appendix A: Two-Party Agreement Sites at Fort Richardson

POL Source Areas Requiring No Further Action		
Building T139	Building 789	Building 39225
Building 604	Building 798	Building 45005
Building 700	Building 812	*Building 45070*
Building 704	Building 920	Building 45580
Building 730	Building 980	Building 45726
Building 732	Building 1175	Building 47431 HOT E2, E5
Building 754	Building 8102	Building 47641
Building 756	Building 35610	Building 55295
Building 760	*Building 35620*	Building 55804
Building 772	Building 35750-UST	Building 59011
Building 778	*Building 35752**	Building 59068
Building 782	Building 35752-UST	Circle Road Drum Site
Building 784	Building 36012	UST Landfill Soil Piles
POL Source Areas Closed with Institutional Controls Only		
Building 702	Building 934	*Building 979*
*Building 710**	Building 936	Building 987-UST
Building 712	Building 944	*Building 27004*
Building 740	Building 946	Building 39600-NSS-UST
Building 750	Building 950	*Building 45590*
Building 755	Building 952	Building 47022
Building 794	Building 955-UST/OUD	Building 47203
*Building 796**	Building 956	*Building 47220*
Building 908N	Building 962	Building 47662
Building 908S	Building 968	*Building 47811*
Building 914	*Building 972*	*Black Spruce*
Building 926	*Building 974*	Roosevelt Road FTS
Building 932	Building 975	Ruff Road FTS
POL Source Areas Currently Active		
Building 762	Building 987-Spill	*Biathalon Range**
Building 770	Building 28008	Nike Site Summit (NSS)
Building 786	*Building 47431 HOT E1,E3,E5**	*Seward Rec Camp**
Building 986- Dry Well	Building 59000	

Notes: Source areas in *italics* indicate a change of status since listing in the 2003 5-Year Review.

Asterisk (*) indicates sites that have been added since the 2003 5-Year Review.

Table was revised 1/17/2008 per meeting with Louis Howard (ADEC)

APPENDIX B

Photograph 1. Security/access gate to OUB Poleline Road Disposal Area

Photograph 2. Treatment system connex at OUB Poleline Road Disposal Area

Photograph 3. Gate and security fence around Areas A-1 and A-2.

Photograph 4. Monitor well with data logger at OUB Poleline Road site.

Photograph 5. Secure Entrance at OUC Eagle River Flats

Photographs 6 and 7. Warning Signage (left) and Gate Locking System (right)
at OUC Eagle River Flats

Photograph 8. Southwest View of Eagle River Flats
area from OP Fagan Tower

Photograph 9. Security fence around OUE Building 35-752.

Photograph 10. Monitor wells AP-3468 and AP-3534 at the OUE AVMA site.

Photograph 11. Monitor wells AP-3469 and AP-4341 at the OUE AVMA site.

Five-Year Review Site Inspection Checklist

SITE INFORMATION

Site name: Poleline Road Disposal Area **Date of inspection:** 11/19/2007

Site Location: Fort Richardson, AK **Operable Unit** B ☐ **Site Map Attached**

EPA Region: 10 **EPA ID:** AK6214522157

Agency, office, or company leading the five-year review: U.S. Army Corps of Engineers

Weather/temperature: Cloudy, recent snow (8"), 20's

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
X Access controls
X Institutional controls
☐ Groundwater pump and treatment
☐ Other _____
☐ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls
☐ Surface water collection and treatment

ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

O&M manual	☐ Readily available	☐ Up to date	X N/A
As-built drawings	☐ Readily available	☐ Up to date	X N/A
Maintenance logs	☐ Readily available	☐ Up to date	X N/A

Remarks_____

Site-Specific Health and Safety Plan	☐ Readily available	☐ Up to date	X N/A
Contingency Plan/Emergency Response Plan	☐ Readily available	☐ Up to date	X N/A

Remarks_____

O&M and OSHA Training Records	☐ Readily available	☐ Up to date	X N/A

Permits and Service Agreements

Air discharge permit	☐ Readily available	☐ Up to date	X N/A
Effluent discharge	☐ Readily available	☐ Up to date	X N/A

Groundwater Monitoring Records	X Readily available	X Up to date	☐ N/A
Daily Access/Security Logs	☐ Readily available	☐ Up to date	X N/A

ACCESS AND INSTITUTIONAL CONTROLS (Show location on a site map)

Fencing damaged	X Gates secured	☐ N/A
Signs and other security measures	X In place	☐ N/A

Institutional Controls (ICs)

Implementation and enforcement

Site conditions imply ICs not properly implemented	☐ Yes	X No	☐ N/A
Site conditions imply ICs not being fully enforced	☐ Yes	X No	☐ N/A

Adequacy	X ICs are adequate	☐ ICs are inadequate	☐ N/A

Vandalism/trespassing evident	☐ Yes	X No	☐ N/A
Land use changes on site	☐ Yes	X No	☐ N/A

GENERAL SITE CONDITIONS

Roads	☐ Damaged	X Adequate	☐ N/A

GROUNDWATER/SURFACE WATER REMEDIES

Groundwater Extraction Wells, Pumps, and Pipelines

Pumps, Wellhead Plumbing, and Electrical

☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance X N/A

Surface Water Collection Structures, Pumps, and Pipelines

Collection Structures, Pumps, and Electrical

☐ Good condition ☐ Needs Maintenance X N/A

Monitoring Data

X Groundwater plume is effectively contained ☐Contaminant concentrations are generally declining

Monitored Natural Attenuation

Monitoring Wells (natural attenuation remedy)

X Properly secured/locked X Functioning X Routinely sampled X Good condition

X All required wells located ☐Needs Maintenance

Five-Year Review Site Inspection Checklist

SITE INFORMATION

Site name: Eagle River Flats **Date of inspection: November 19, 2007**

Site Location: Fort Richardson, Alaska **Operable Unit OUC** ☐ **Site Map Attached**

EPA Region: 10 **EPA ID: AK6214522157**

Agency, office, or company leading the five-year review: U.S. Army

Weather/temperature: Foggy, 20°F

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
X Access controls
X Institutional controls
☐ Groundwater pump and treatment
☐ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls
☐ Surface water collection and treatment
X Other Cap material was placed over Pond 23 (Area C) in February 2007. ERDC/CRREL personnel monitored cap integrity during the 2007 treatment season (May – Sept). The cap was not visited during the site inspection as lack of UXO support and snow prevented access to the flats.

ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

O&M manual	☐ Readily available	☐ Up to date	**X** N/A
As-built drawings	☐ Readily available	☐ Up to date	**X** N/A
Maintenance logs	☐ Readily available	☐ Up to date	**X** N/A

Remarks: Because no fieldwork was being performed during the time of site inspection on-site documents and records were not verified.

Site-Specific Health and Safety Plan	☐ Readily available	☐ Up to date	**X** N/A
Contingency Plan/Emergency Response Plan	☐ Readily available	☐ Up to date	**X** N/A

Remarks: Because no fieldwork was being performed during the time of site inspection on-site documents and records were not verified.

O&M and OSHA Training Records	☐ Readily available	☐ Up to date	**X** N/A

Permits and Service Agreements

Air discharge permit	☐ Readily available	☐ Up to date	**X** N/A
Effluent discharge	☐ Readily available	☐ Up to date	**X** N/A

Groundwater Monitoring Records	☐ Readily available	☐ Up to date	**X** N/A
Daily Access/Security Logs	☐ Readily available	☐ Up to date	**X** N/A

ACCESS AND INSTITUTIONAL CONTROLS (Show location on a site map)

Fencing damaged	**X** Gates secured	☐ N/A
Signs and other security measures	**X** In place	☐ N/A

Institutional Controls (ICs)

Implementation and enforcement

Site conditions imply ICs not properly implemented	☐ Yes	**X** No	☐ N/A
Site conditions imply ICs not being fully enforced	☐ Yes	**X** No	☐ N/A

Adequacy	**X** ICs are adequate	☐ ICs are inadequate	☐ N/A

Vandalism/trespassing evident	☐ Yes	**X** No	☐ N/A
Land use changes on site	☐ Yes	**X** No	☐ N/A

GENERAL SITE CONDITIONS

Roads	☐ Damaged	**X** Adequate	☐ N/A

GROUNDWATER/SURFACE WATER REMEDIES

Groundwater Extraction Wells, Pumps, and Pipelines

Pumps, Wellhead Plumbing, and Electrical

☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance **X** N/A

Surface Water Collection Structures, Pumps, and Pipelines

Collection Structures, Pumps, and Electrical

☐ Good condition ☐ Needs Maintenance **X** N/A

(Pumps and discharge piping not deployed at the time the site visit was conducted)

Monitoring Data

☐ Groundwater plume is effectively contained

X Contaminant concentrations are generally declining

Monitored Natural Attenuation

Monitoring Wells (natural attenuation remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐Good condition

☐ All required wells located ☐ Needs Maintenance **X** N/A

Five-Year Review Site Inspection Checklist

SITE INFORMATION

Site name: Armored Vehicle Maintenance Area (AVMA) **Date of inspection:** 11/19/07

Site Location: Fort Richardson, AK **Operable Unit** E ☐ **Site Map Attached**

EPA Region: 10 **EPA ID:** AK6214522157

Agency, office, or company leading the five-year review: U.S. Army Corps of Engineers

Weather/temperature: Cloudy, recent snow (8"), 20's

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
☐ Access controls
X Institutional controls
☐ Groundwater pump and treatment
☐ Other _____
X Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls
☐ Surface water collection and treatment

ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

O&M manual	☐ Readily available	☐ Up to date	X N/A
As-built drawings	☐ Readily available	☐ Up to date	X N/A
Maintenance logs	☐ Readily available	☐ Up to date	X N/A

Remarks_____

Site-Specific Health and Safety Plan	☐ Readily available	☐ Up to date	X N/A
Contingency Plan/Emergency Response Plan	☐ Readily available	☐ Up to date	X N/A

Remarks_____

O&M and OSHA Training Records	☐ Readily available	☐ Up to date	X N/A

Permits and Service Agreements

Air discharge permit	☐ Readily available	☐ Up to date	X N/A
Effluent discharge	☐ Readily available	☐ Up to date	X N/A

Groundwater Monitoring Records	X Readily available	X Up to date	☐ N/A
Daily Access/Security Logs	☐ Readily available	☐ Up to date	X N/A

ACCESS AND INSTITUTIONAL CONTROLS (Show location on a site map)

Fencing damaged	☐ Gates secured	X N/A
Signs and other security measures	☐ In place	X N/A

Institutional Controls (ICs)

Implementation and enforcement

Site conditions imply ICs not properly implemented	☐ Yes	X No	☐ N/A
Site conditions imply ICs not being fully enforced	☐ Yes	X No	☐ N/A

Adequacy	X ICs are adequate	☐ ICs are inadequate	☐ N/A
Vandalism/trespassing evident	☐ Yes	X No	☐ N/A
Land use changes on site	☐ Yes	X No	☐ N/A

GENERAL SITE CONDITIONS

Roads	☐ Damaged	X Adequate	☐ N/A

GROUNDWATER/SURFACE WATER REMEDIES

Groundwater Extraction Wells, Pumps, and Pipelines

Pumps, Wellhead Plumbing, and Electrical

☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance X N/A

Surface Water Collection Structures, Pumps, and Pipelines

Collection Structures, Pumps, and Electrical

☐ Good condition ☐ Needs Maintenance X N/A

Monitoring Data

X Groundwater plume is effectively contained

XContaminant concentrations are generally declining

Monitored Natural Attenuation

Monitoring Wells (natural attenuation remedy)

☐Properly secured/locked XFunctioning XRoutinely sampled XGood condition

☐All required wells located ☐Needs Maintenance

Five-Year Review Site Inspection Checklist

SITE INFORMATION

Site name: Bldg 35-752 **Date of inspection:** 11/19/07

Site Location: Fort Richardson, AK **Operable Unit** E ☐ **Site Map Attached**

EPA Region: 10 **EPA ID:** AK6214522157

Agency, office, or company leading the five-year review: U.S. Army Corps of Engineers

Weather/temperature: Cloudy, recent snow (8"), 20's

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
X Access controls
X Institutional controls
☐ Groundwater pump and treatment
☐ Other _____
☐ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls
☐ Surface water collection and treatment

ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

O&M manual	☐ Readily available	☐ Up to date	X N/A
As-built drawings	☐ Readily available	☐ Up to date	X N/A
Maintenance logs	☐ Readily available	☐ Up to date	X N/A

Remarks_____

Site-Specific Health and Safety Plan	☐ Readily available	☐ Up to date	X N/A
Contingency Plan/Emergency Response Plan	☐ Readily available	☐ Up to date	X N/A

Remarks_____

O&M and OSHA Training Records	☐ Readily available	☐ Up to date	X N/A

Permits and Service Agreements

Air discharge permit	☐ Readily available	☐ Up to date	X N/A
Effluent discharge	☐ Readily available	☐ Up to date	X N/A

Groundwater Monitoring Records	X Readily available	X Up to date	☐ N/A
Daily Access/Security Logs	☐ Readily available	☐ Up to date	X N/A

ACCESS AND INSTITUTIONAL CONTROLS (Show location on a site map)

Fencing damaged	X Gates secured	☐ N/A
Signs and other security measures	X In place	☐ N/A

Institutional Controls (ICs)
Implementation and enforcement

Site conditions imply ICs not properly implemented	☐ Yes	X No	☐ N/A
Site conditions imply ICs not being fully enforced	☐ Yes	X No	☐ N/A

Adequacy	X ICs are adequate	☐ ICs are inadequate	☐ N/A

Vandalism/trespassing evident	☐ Yes	X No	☐ N/A
Land use changes on site	☐ Yes	X No	☐ N/A

GENERAL SITE CONDITIONS

Roads	☐ Damaged	X Adequate	☐ N/A

GROUNDWATER/SURFACE WATER REMEDIES
Groundwater Extraction Wells, Pumps, and Pipelines
Pumps, Wellhead Plumbing, and Electrical
☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance X N/A

Surface Water Collection Structures, Pumps, and Pipelines
Collection Structures, Pumps, and Electrical
☐ Good condition ☐ Needs Maintenance X N/A

Monitoring Data
☐ Groundwater plume is effectively contained ☐Contaminant concentrations are generally declining

Monitored Natural Attenuation
Monitoring Wells (natural attenuation remedy)
☐Properly secured/locked XFunctioning ☐Routinely sampled XGood condition
☐All required wells located ☐Needs Maintenance

APPENDIX C

Fort Richardson Second Five-Year Review

Public Document Repository Memorandum

To ensure that the required documents for the Fort Richardson Second Five Year Review are available for public access, personnel from the U.S. Army Corps of Engineers, Alaska District (USACE) visited the following document repositories (Administrative Record) on November 19, 2007:

- Directorate of Public Works (DPW) Environmental Resources Library (Building 724, Fort Richardson, AK);
- Alaska Resources Library and Information Services (ARLIS) (3211 Providence Drive, Anchorage, AK); and
- University of Alaska, Anchorage (UAA) Consortium Library (3211 Providence Drive, Anchorage, AK).

The availability of documents in three different media (hard copy, microfiche, and CD) was checked at each repository. This memorandum summarizes the findings of the repository visits and makes recommendations to ensure that all documents in the Administrative Record are available to the public at these local repositories in the future.

Summary of Findings

The following table summarizes the availability of documents, in three different media, from the Fort Richardson Administrative Record at each of the three established repositories.

Repository	Hard Copy	Microfiche	CD's
DPW Environmental Resources Library	Available	None Available (library has capability)	Available
ARLIS	Available	Available	None Available (library has capability)
UAA Consortium Library	Available	Available	None Available (library has capability)

Library staff previously involved in the management of each document repository is no longer active. Current contact information was unavailable at the time site visits were conducted.

The document repository at the DPW Environmental Resources Library appears to be in good order. Hardcopy documents for Fort Richardson are organized by operable unit and select electronic documents are available on CD. The available CDs are not, however, located with the hardcopy documents and are not currently separated by installation or operable unit.

In 2004 ARLIS relocated to the UAA Consortium Library. Despite this, the document repositories at ARLIS and the UAA Consortium Library remain separate. The repository at ARLIS is easily accessible to the public. The repository at the UAA Consortium Library is not as documents are stored behind the main circulation desk. At both repositories documents pertaining to Fort Richardson are clearly separated from other installations. Both repositories contain a series of color-coded binders grouping hardcopy documents by operable unit. Binders typically contain work plans, remediation and monitoring reports, chemical data, memorandums, and/or correspondence. At the ARLIS repository select hardcopy documents (i.e. RI/FS Reports, Proposed Plans, Records of Decision [RODs], Site Summaries, etc.) remain unincorporated in the binder system. Each repository also contains a microfiche collection. Documents for operable units A through D are available in microfiche. No microfiche documents were available for operable unit E. Documents in microfiche are stored in a small metal box located with the hardcopy documents. Documents at the ARLIS repository and the UAA Consortium Library repository appear to be current only through July 2003.

The following table lists key documents found at each repository:

Repository	Documents
DPW Environmental Resources Library	• Remedial Investigation Report for OUA/B, OUC, OUD, and OUE • Feasibility Study Report for OUA/B, OUC, and OUD • Record of Decision for OUA/B, OUD, and OUE (OUC checked out) • Proposed Plan for Remedial Action for OUE • Interim Remedial Action Reports for OUC and OUE • Final Areawide Community Involvement Plan • Five Year Review Report (February 2003)
ARLIS	• Environmental Assessment for OUA/B • Engineering Evaluation and Cost Analysis for OUB • Site Inspection Reports for OUA/B, and OUD • Baseline Risk Assessment for OUA, OUC, and OUD • Remedial Investigation and Feasibility Study Report for OUA/B, OUC, and OUD • Proposed Plan for Remedial Action for OUA/B, OUC, and OUD • Decision Document for OUC • Record of Decision for OUA/B, OUC, and OUD • Site Summary Updates for OUA/B, OUC, and OUD • Final Areawide Community Involvement Plan • Five Year Review Report (February 2003)

Repository	Documents
UAA Consortium Library	• Environmental Assessment for OUA/B • Engineering Evaluation and Cost Analysis for OUB • Site Inspection Reports for OUA/B, and OUD • Baseline Risk Assessment for OUA, OUC, and OUD • Remedial Investigation and Feasibility Study Report for OUA/B, OUC, and OUD • Decision Document for OUC • Record of Decision for OUA/B, and OUC • Final Areawide Community Involvement Plan • Five Year Review Report (February 2003)

Recommendations

The following table summarizes recommendations for the maintenance and improvement of the Fort Richardson Administrative Record at each of the three local repositories. Some general, optional recommendations pertaining to future methods of maintaining the documents in the Administrative Record are discussed below.

It is recommended that the document repository at the UAA Consortium Library be consolidated into the document repository at ARLIS. Both document repositories are located in the same building. In this case, there is no real need for the maintenance of two separate repositories. Compared to the repository managed by the UAA Consortium Library, the ARLIS repository is slightly more complete and is more readily accessible to the public making it the ideal repository of the two.

It is also recommended that a set of CDs with the Administrative Record be provided to the Post Library in the Education Center on Fort Richardson (Building 7). The Post Library is commonly used and having the CDs available at this location would provide greater accessibility to the general public.

Pending approval by the EPA's RPM for Fort Richardson, it is recommended that the complete set of Administrative Record documents be provided solely on CD at each of the local public repositories. Making the Administrative Record documents available on CD's would simplify maintenance of the Record, reduce the use of paper and shelf space, and offer the public a more user-friendly media than microfiche. ARLIS and the UAA Consortium Library each have computers with CD-ROM's available for public use.

In addition, hard copies of key documents for each of the operable units could remain in each repository for quick reference. Another option for facilitating public access to the Administrative Record would be to post documents to the Fort Richardson internet home page. This would allow access to the documents from any computer with internet access, including the publicly available computers at ARLIS and the UAA Consortium Library.

Repository	Hard Copy	Microfiche	CD's
DPW Environmental Resources Library	Provide copies of key documents through 2007 Provide an updated Administrative Record Index for documents through 2007.	Provide a complete set of Administrative Record documents on microfiche, unless a decision is made to provide documents exclusively on CD.	Provide all documents in the Administrative Record on CD.
ARLIS	Provide copies of key documents through 2007, including: Risk Assessments for all OUs; Remedial Investigation Reports and Feasibility Study Reports for OUA/B, OUC, and OUE; the ROD for OUE; the Proposed Plan for Remedial Action for OUE; and Decision Documents for all OUs. Provide an updated Administrative Record Index for documents through 2007.	Continue to provide updated microfiche, including documents for OUE, until such time when a decision is made to provide documents exclusively on CD.	Provide all documents in the Administrative Record on CD.
UAA Consortium Library	Provide copies of key documents through 2007 for all operable units, including: Risk Assessments, Remedial Investigation and Feasibility Study Reports, RODs, Proposed Plans for Remedial Action, and Decision Documents. Provide an updated Administrative Record Index for documents through 2007.	Continue to provide updated microfiche, including documents for OUE, until such time when a decision is made to provide documents exclusively on CD.	Provide all documents in the Administrative Record on CD.

APPENDIX D

INTERVIEW FORMS AND RESPONSES

Interview forms were distributed to personnel listed in the table below during this Five-Year Review. Forms were either emailed (in both MSWord and PDF format) or sent by postage mail. The email was sent out on December 10, 2007; postal mail forms were sent on December 3, 2007. Copies of the email and distribution letter are attached. Returned forms / responses are provided in the proceeding section.

Name	Phone Number	Email Address	Delivery		Response
			Email	Postal Mail	
U.S. Army / Directorate of Public Works					
COL David Shutt	384-2175	david.shutt@us.army.mil		✓	-
Cristal Fosbrook	384-3044	cristal.fosbrook@richardson.army.mil	✓	✓	Postal Mail
Kevin Gardner	384-3331	kevin.gardner@richardson.army.mil	✓		-
Joe King		joseph.king5@us.army.mil	✓		-
Al Lucht	384-3000	allan.lucht@us.army.mil	✓		-
Dick Nenahlo	384-3295	richard.nenahlo@richardson.army.mil	✓		-
Mark Prieksat	384-3042	mprieksat@cemml.colostate.edu	✓		Email
U.S. Army Corps of Engineers					
Ken Andraschko	753-5647	ken.andraschko@poa02.usace.army.mil	✓		-
Neil Folcik	753-5657	neil.j.folcik@poa02.usace.army.mil	✓		-
Bob Glascott	753-5771	robert.a.glascott@poa02.usace.army.mil	✓		-
Scott Kendall	753-5661	scott.kendall@poa02.usace.army.mil	✓		-
Susan Pitts	753-2876	susan.c.pitts@poa02.usace.army.mil	✓		-
Marilyn Plitnik	753-2881	marilyn.a.plitnik@poa02.usace.army.mil	✓		-
JoAnn Walls	753-5608	joann.t.walls@poa02.usace.army.mil	✓		-
Cold Regions Research and Engineering Laboratory					
Beth Astley	384-0513	beth.n.astley@erdc.usace.army.mil	✓		Email
Charlie Collins	353-5180	ccollins@crrel.usace.army.mil	✓		-
Marianne Walsh	(603) 646-4666	marianne.e.walsh@erdc.usace.army.mil	✓		Email
Michael Walsh	(603) 646-4363	michael.walsh@erdc.usace.army.mil	✓		Email
Jon Zufelt	384-0511	jon.zufelt@erdc.usace.army.mil	✓		Email

Name	Phone Number	Email Address	Delivery		Response
			Email	Postal Mail	
U.S. Environmental Protection Agency					
Bill Adams	(206) 553-2806	adams.bill@epamail.epa.gov	✓		Email
Dr. Bruce Duncan	(206) 553-8086	duncan.bruce@epamail.epa.gov	✓		-
Jacques Gusmano	271-1271	gusmano.jacques@epamail.epa.gov	✓		-
Howard Orlean	(206) 553-2851	orlean.howard@epa.gov	✓		-
Alaska Department of Environmental Conservation					
Louis Howard	269-7552	louis_howard@dec.state.ak.us	✓		Email
Jennifer Roberts	269-7550	jennifer_Roberts@dec.state.ak.us	✓		-
Ft. Richardson Restoration Advisory Board					
John Hopkins (RAB Co-Chair)	694-1603	Not known		✓	Postal Mail
Jim Brown	Not known	Not known		✓	-
Maria Coleman	Not known	Not known		✓	-
William Day	Not known	Not known		✓	Email*
Pamela K.Miller	Not known	Not known		✓	-
Other Agencies					
Karen Dearborne	428-6760	karen.d.dearborn@us.army.mil	✓		-
Todd Fickel	552-7439	fickel.todd@elmendorf.af.mil	✓		-

*Renee Nelson emailed back to say that she has taken over as the new contact for the Environmental Community Relations Coordinator 3rd Wing Public Affairs Elmendorf AFB, Alaska. Because she is new to the position and unfamiliar with the site, she did not return a completed questionnaire. A copy of her email is attached.

DISTRIBUTION EMAIL

AND

TRANSMITTAL LETTER

Hazlett, Bob C POA

Subject: FW: In behalf of Marilyn Plitnik

Importance: High

Attachments: FRA Interview Questionnaire.doc

FRA Interview Questionnaire.do...

-----Original Message-----
From: Talas, Phyllis Y POA
Sent: Monday, December 17, 2007 2:50 PM
To: Zufelt, Jon E ERDC-CRREL-NH
Subject: In behalf of Marilyn Plitnik
Importance: High

The U.S. Army Corps of Engineers Alaska District has been tasked with preparing the Five-Year Review for remedial activities at the operable units on Ft Richardson, Alaska. As part of this review, we would like to get input from those that have been involved with or have had an interest in these projects. With this in mind, we have attached a copy of an interview form for you to fill out. Please go through the questionnaire and answer those questions that are applicable to you.

Please note that the interview form is provided in both MS Word, and PDF format, please use whichever format is preferable. You can return your completed questionnaire via email, fax, or mail. If you would prefer to provide your input via a personal interview, or if you have any questions or comments, please contact us at the following:

Call or Email to:
Marilyn Plitnik (Project Manager)
(907) 753-2881
Marilyn.A.Plitnik@poa02.usace.army.mil

Or

Bob Hazlett (Technical Lead)
(907) 753-2623
Bob.C.Hazlett@poa02.usace.army.mil

Fax to:
Bob Hazlett (907) 753-2820

Mail to:
U.S. Army Corps of Engineers
Alaska District
ATTN: CEPOA-PM-E (Marilyn Plitnik)
P.O. Box 6898
Elmendorf AFB, AK 99506-6898

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
P.O. BOX 6898
ANCHORAGE, ALASKA 99506-0898

REPLY TO
ATTENTION OF:

CEPOA-EN-EE-A (200-1f) 03 December 2007

The U.S. Army Corps of Engineers Alaska District has been tasked with preparing the Five-Year Review for remedial activities at the operable units on Ft Richardson, Alaska. As part of this review, we would like to get input from those that have been involved with or have had an interest in these projects. With this in mind, we have attached a copy of an interview form for you to fill out. Please go through the questionnaire and answer those questions that are applicable to you.

You can return your completed questionnaire via fax (907-753-2820) or mail (using the self-addressed envelope enclosed). If you would like to receive an electronic copy of this form, or would prefer to provide your input via a personal interview, or if you have any questions or comments, please contact me at Marilyn.A.Plitnik@poa02.usace.army.mil or (907) 753-2881.

Encls

MARILYN A. PLITNIK
Army Environmental
Project Manager

CF:

INTERVIEW FORM

RESPONSES

FORT RICHARDSON FIVE-YEAR REVIEW
INTERVIEW QUESTIONNAIRE

INTERVIEW RECORD	
Name: Cristal Fosbrook	
Title: Chief, Environmental Clean	Organization: US Army Garrison, AK
Telephone No.: 907-384-2713	E-Mail Address: Cristal.fosbrook@us.army.mil
Street Address:	City, State, Zip: Anchorage, AK 99508
Interview Date:	Site Name: Fort Richardson
Interview Type: ☐ Telephone ☐ Visit ☐ Email ☒ Questionnaire (by mail)	
Specific Site Involvement	
Operable Units(s) Worked: ☒ OUA ☒ OUB ☒ OUC ☒ OUD ☒ OUE	
Date(s) of Involvement: ~ Feb 2003 - Feb 2008	
Title / Position (with respect to sites): Lead Project Managers	

The following general questions were adapted from the EPA's Comprehensive Five-Year Review Guidance. Please answer any questions that are applicable; if you need more space, you may attach a separate sheet.

INTERVIEW QUESTIONS

1. ***What is your overall impression of the work conducted at the site? (general sentiment)***

Proactive and protective of human health and the environmental.

2. ***From your perspective, what effect have remedial operations at the site had on the surrounding community?***

Remedial actions do not effect activities outside the installation boundaries, thus no effects are noted.

3. ***Are you aware of any concerns from the local community regarding the site, operation, administration, implementation, or overall protectiveness of the remedies in the Record of Decision?***

Alaska Community Toxic on the Environment have remarked, commented and requested information on Eagle Rive Flats Cleanup.

4. ***Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities?***

No

5. ***Are you aware of any changes in land use, access, or other site conditions that have occurred since the last 5-Year Review (2003) that you feel may impact the protectiveness of the site?***

No

6. ***Were any problems or difficulties encountered after the initiation of remedial action that impacted construction progress and implementability?***

No

7. ***Are there regular on-site inspections and/or operation, maintenance and monitoring (OMM) presence at the site? What is the frequency of O&M site inspections and activities?***

All OU's are inspected or evaluated durring groundwater sampling events. Currently only OUC had operating systems, which are evaluated.

8. ***Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years?***

No

9. ***Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy?***

No

10. ***Have there been opportunities to optimize the operation, maintenance, or sampling efforts? Please describe changes, cost savings, and/or improved efficiency.***

System and monitoring activites have all been evaluated utilizing the CLOSES system. This has resulted in cost reduction in number of monitoring points and systems Operating.

11. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

No

FORT RICHARDSON FIVE-YEAR REVIEW
INTERVIEW QUESTIONNAIRE

INTERVIEW RECORD	
Name: Dr. Mark Prieksat	
Title: Assistant Director - CEMML	**Organization: Center for Environmental Management of Military Lands (CEMML), Colorado State University**
Telephone No.: 970-491-1175	**E-Mail Address: mark.prieksat@colostate.edu**
Street Address: 1490 Campus Delivery	**City, State, Zip: Fort Collins, CO 80523-1490**
Interview Date:	**Site Name:**
Interview Type: ☐ Telephone ☐ Visit X Email ☐ Questionnaire (by mail)	
Specific Site Involvement	
Operable Units(s) Worked: X OUA X OUB X OUC X OUD X OUE	
Date(s) of Involvement: Jan 2000 through Jun 2005	
Title / Position (with respect to sites): Installation Restoration Project Manager	

The following general questions were adapted from the EPA's Comprehensive Five-Year Review Guidance. Please answer any questions that are applicable; if you need more space, you may attach a separate sheet.

INTERVIEW QUESTIONS

1. ***What is your overall impression of the work conducted at the site? (general sentiment)***

   The Army has been diligent to pursue investigation and cleanup at all sites where contamination has been suspected or detected. The measures taken by the Army have been reasonable and have meet expectations as outlined in the FFA, RODs and other guidance documents.

2. ***From your perspective, what effect have remedial operations at the site had on the surrounding community?***

   The Army has been very successful at cleanup operations and the community at large does not appear to be concerned about the Army as a major source of pollution. This is evidenced by the lack of public interest in the Fort Richardson RAB and other environmental forums. Of course, there are always specific groups of activists that will continue to try to blame the Army for any and all perceived environmental related issues, but these groups have no basis in scientific fact.

3. ***Are you aware of any concerns from the local community regarding the site, operation, administration, implementation, or overall protectiveness of the remedies in the Record of Decision?***

   The RAB, and the public, have been very supportive of the Army's efforts, especially in regards to the WP cleanup at ERF. In general, there is very little interest in the cleanup efforts at Fort Rich and the public does not seem concerned with the Army's operations.

4. ***Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities?***

   There have been incidents of trespassing on Fort Richardson, but not to the degree that such incidents would represent a significant risk of exposure outside the risks identified in the RODs. There was an incident of off-road vehicles trespassing through the OUB site and an incident of an emergency airplane landing within Eagle River Flats. Neither incident compromised the cleanup efforts. The IC policy at Fort Rich works very well and all legal access in controlled through a consortium of efforts.

5. ***Are you aware of any changes in land use, access, or other site conditions that have occurred since the last 5-Year Review (2003) that you feel may impact the protectiveness of the site?***

   The Army is proposing to open ERF for training on a year-round basis, but that will not change the land use or the site conditions. The Army is developing an EIS to analyze impacts from the proposed action to open ERF for year-round firing.

6. ***Were any problems or difficulties encountered after the initiation of remedial action that impacted construction progress and implementability?***

   None.

7. ***Are there regular on-site inspections and/or operation, maintenance and monitoring (OMM) presence at the site? What is the frequency of O&M site inspections and activities?***

   NA.

8. ***Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years?***

   NA

9. ***Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy?***

   NA

10. ***Have there been opportunities to optimize the operation, maintenance, or sampling efforts? Please describe changes, cost savings, and/or improved efficiency.***

    NA

11. ***Do you have any comments, suggestions, or recommendations regarding the site's management or operation?***

    None.

FORT RICHARDSON FIVE-YEAR REVIEW
INTERVIEW QUESTIONNAIRE

INTERVIEW RECORD	
Name: Beth Astley	
Title: Research Physical Scientist	**Organization: ERDC-CRREL**
Telephone No.: 907-384-0513	**E-Mail Address: Beth.Astley@usace.army.mil**
Street Address: Bldg 724 Door 1	**City, State, Zip: Fort Richardson, AK 99505**
Interview Date: 12/6/07	**Site Name: OUB Poleline Road**
Interview Type: ☐ Telephone ☐ Visit ☐ Email ☐ Questionnaire (by mail)	
Specific Site Involvement	
Operable Units(s) Worked: ☐ OUA ☐ OUB ☐ OUC ☐ OUD ☐ OUE	
Date(s) of Involvement: 2002-2007	
Title / Position (with respect to sites): Researcher/ project manager for CRREL projects	

The following general questions were adapted from the EPA's Comprehensive Five-Year Review Guidance. Please answer any questions that are applicable; if you need more space, you may attach a separate sheet.

INTERVIEW QUESTIONS

1. ***What is your overall impression of the work conducted at the site? (general sentiment)***

   The studies conducted in the last 5 years by CRREL, the AK District, and other contractors have provided a solid foundation for understanding the complex geology and hydrology at the site. These studies generally build on one another and provide new insights on contaminant migration pathways.

2. ***From your perspective, what effect have remedial operations at the site had on the surrounding community?***

   The only impact is that the area is off-limits for military training and personal recreation.

3. ***Are you aware of any concerns from the local community regarding the site, operation, administration, implementation, or overall protectiveness of the remedies in the Record of Decision?***

   No

4. ***Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities?***

   Yes.

   The gate was vandalized a couple of years ago. One of the PVC wells installed in the wetland was broken off at ground level. On several occasions, I've stopped people from accessing the site who are using it

for recreation such as jogging on a recently established trail that is accessed via the Poleline site. One of these instances involved Fort Richardson MWR personnel who were setting up an orienteering course on the site (we were standing in front of the "Hazardous Area, Keep Out" sign at the main gate to Poleline, but they didn't think it applied to them).

5. ***Are you aware of any changes in land use, access, or other site conditions that have occurred since the last 5-Year Review (2003) that you feel may impact the protectiveness of the site?***

   Yes. Access is now monitored by Fort Richardson Range Control via official radios or cell phone contact. This has increased protectiveness.

   A new fence around the possible buried munitions portion of Poleline has increased protectiveness of that specific area.

   The trail that has been established encourages recreational users to cut through the Poleline site from the east side. Users include runners and people on ATV's and snow machines.

6. ***Were any problems or difficulties encountered after the initiation of remedial action that impacted construction progress and implementability?***

Wells at the base of the hill containing the SVE System kept freezing at the ground surface (AP-4521, AP-4522, AP-4523, and AP-4524). The system was not completely effective during the winter months due to this ice blockage.

7. ***Are there regular on-site inspections and/or operation, maintenance and monitoring (OMM) presence at the site? What is the frequency of O&M site inspections and activities?***

   Yes, CRREL performs monthly water level measurements and is on-site 2-3 days per month on average.

8. ***Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years?***

   No

9. ***Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy?***

10. ***Have there been opportunities to optimize the operation, maintenance, or sampling efforts? Please describe changes, cost savings, and/or improved efficiency.***

11. ***Do you have any comments, suggestions, or recommendations regarding the site's management or operation?***

    More signs would be useful, especially near the trailhead where it enters Poleline from the east and at the main gate. Perhaps changing the main gate to a chain-link fence (rather than steel poles that you can just crawl under or step over), would dissuade people from using it as a running trail. Extending the

fence into the woods on either side of the gate would help keep people from just walking around the gate and entering the site.

All contractors need to be informed on requirements to contact range control upon entry and exit from the site. The call-in area includes the area from the entry of Poleline road at the Davis Highway intersection all the way to PRDA. Road closures due to training exercises occasionally take place, so range control would inform the contractor if any road closures were in effect. These are SOP's that both CRREL and DPW employees were instructed to follow starting around 2005.

FORT RICHARDSON FIVE-YEAR REVIEW
INTERVIEW QUESTIONNAIRE

INTERVIEW RECORD	
Name: Marianne E. Walsh	
Title: Chemical Engineer	**Organization: CRREL**
Telephone No.: 603-646-4666	**E-Mail Address: marianne.e.walsh@erdc.usace.army.mil**
Street Address: 72 Lyme Rd	**City, State, Zip:Hanover, NH 03755-1290**
Interview Date: December 2007	**Site Name:**
Interview Type: ☐ Telephone ☐ Visit ☐ Email X Questionnaire (by mail)	
Specific Site Involvement	
Operable Units(s) Worked: ☐ OUA ☐ OUB X OUC ☐ OUD ☐ OUE	
Date(s) of Involvement: May 1990 until present	
Title / Position (with respect to sites): Investigator of the locations and concentrations of WP.	

The following general questions were adapted from the EPA's Comprehensive Five-Year Review Guidance. Please answer any questions that are applicable; if you need more space, you may attach a separate sheet.

INTERVIEW QUESTIONS

1. ***What is your overall impression of the work conducted at the site? (general sentiment)***

   Very successful at decontaminating the surface sediment of the large waterfowl-feeding ponds. Remaining white phosphorus is located in small pools within a limited area and will hopefully be capped this winter.

2. ***From your perspective, what effect have remedial operations at the site had on the surrounding community?***

   Fort Richardson could have lost a significant training range without the remedial operations.

3. ***Are you aware of any concerns from the local community regarding the site, operation, administration, implementation, or overall protectiveness of the remedies in the Record of Decision?***

   The local community has supported the remedial actions.

4. ***Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities?***

I have witnessed trespassers in Eagle River Flats. These include illegal hunters and boat traffic in the river. I have also found cartridges from shotguns within the marsh. Several years ago, an ice-coring device was stolen from the EOD shed at FP Fagan. The shed was locked, but a window was broken. Also, one of the observation huts in Area D was littered with shotgun cartridges and used MRE (meals read to eat) packages, indicating the presence of hunters.

5. ***Are you aware of any changes in land use, access, or other site conditions that have occurred since the last 5-Year Review (2003) that you feel may impact the protectiveness of the site?***

No.

6. ***Were any problems or difficulties encountered after the initiation of remedial action that impacted construction progress and implementability?***

Fewer services are provided by the government due to contracting of many support functions.

7. ***Are there regular on-site inspections and/or operation, maintenance and monitoring (OMM) presence at the site? What is the frequency of O&M site inspections and activities?***

Yes. CRREL personnel monitor the pumping equipment both on-site and through telemetry. During setup, the equipment is monitored daily on-site then three times a week until the equipment is removed at the end of the summer.

8. ***Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years?***

Helicopter services were initially provided by the army or National Guard and served as training missions at no cost. Now they cost a lot.

9. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy?

All the equipment and instrumentation is getting old and shows the wear and tear from the salt marsh environment.

10. Have there been opportunities to optimize the operation, maintenance, or sampling efforts? Please describe changes, cost savings, and/or improved efficiency.

The white phosphorus remediation at Eagle River Flats was the first of its kind. All operations were optimized over the years. The shore-based generators for the pumps have made operations and maintenance much easier. Sampling for white phosphorus has been optimized through the use of multi-increment sampling and magnetometer surveys to locate WP ordnance scrap.

11. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

Better records of ammunition fired into Eagle River Flats and of the number and locations of UXOs and low order detonations.

FORT RICHARDSON FIVE-YEAR REVIEW
INTERVIEW QUESTIONNAIRE

INTERVIEW RECORD	
Name: Michael R. Walsh, PE	
Title: Mechanical Engineer	**Organization: USA CRREL**
Telephone No.: (603) 646-4666	**E-Mail Address: mwalsh@crrel.usace.army.mil**
Street Address: 72 Lyme Road	**City, State, Zip: Hanover, NH 03755-1290**
Interview Date:	**Site Name:**
Interview Type: ☐ Telephone ☐ Visit X Email ☐ Questionnaire (by mail)	
Specific Site Involvement	
Operable Units(s) Worked: ☐ OUA ☐ OUB X OUC ☐ OUD ☐ OUE	
Date(s) of Involvement: December 1993 - Present	
Title / Position (with respect to sites): PI and Project Engineer for remediation activities	

The following general questions were adapted from the EPA's Comprehensive Five-Year Review Guidance. Please answer any questions that are applicable; if you need more space, you may attach a separate sheet.

INTERVIEW QUESTIONS

1. ***What is your overall impression of the work conducted at the site? (general sentiment)***

   As a major contributor to the field work at ERF, I feel that the work conducted at the site has been thorough, well documented, and timely. We have consistently met our goals ahead of schedule while keeping costs down. The many technical and safety hurdles have been surmounted with no lost time due to injuries or range closures.

2. ***From your perspective, what effect have remedial operations at the site had on the surrounding community?***

   The remedial operation has provided some employment for members of the local community. Otherwise, the impact has been minimal as ERF is isolated from the nearest habitations. Only the blasting of drainage ditches and sumps, a once-a-year event, may have had any unfavorable impact (noise).

3. ***Are you aware of any concerns from the local community regarding the site, operation, administration, implementation, or overall protectiveness of the remedies in the Record of Decision?***

   Other than the ACAT lawsuit, which has been settled in favor of the Army, I am unaware of any negative local concerns.

4. ***Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities?***

   There have been several cases of trespass and fuel theft at the site. We often find shotgun shells on the flats and along its edge in the spring, and one of our structures has been used as a hunting base, as

evidenced by the presence of empty MRE containers, shotgun shells, and a canoe taken from DPW Environmental and found at the site. Whoever was using the structure had keys to the locks, as none of the locks were cut but the building was open. In 2006, we recorded 1,500 gallons of fuel stolen from the site. We installed cable gates across the roads we had made to the equipment to restrict access to the fuel areas but these were cut by Range Control. The access problem was resolved by using Range Control locks.

5. ***Are you aware of any changes in land use, access, or other site conditions that have occurred since the last 5-Year Review (2003) that you feel may impact the protectiveness of the site?***

   No.

6. ***Were any problems or difficulties encountered after the initiation of remedial action that impacted construction progress and implementability?***

   We have slowly lost most of our support from elements of USARAK, USAGAK, and USANG-AK. Services that used to be provided free are now quite costly and in some cases very difficult to procure. This has driven the cost of the project up, although we have been able to control these costs through cut-backs in other areas and assuming responsibility for more of the operations. Support elements affected include helicopter services from the AK Army National Guard, USAGAK Roads and Grounds, Weldin Construction, and ERA Helicopter. Fortunately, we are ramping down operations and do not have as pressing a requirement for these services. If we were just starting out, the cost of the project would have been much greater than it has been.

7. ***Are there regular on-site inspections and/or operation, maintenance and monitoring (OMM) presence at the site? What is the frequency of O&M site inspections and activities?***

   CRREL currently conducts on-site inspections and O&M operations. These typically occur three times a week, with the frequency more often during deployments to the area. Tasks include mortality monitoring, remediation equipment O&M, and checking remote field instrumentation.

8. ***Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years?***

   See (6). Mostly, it has been having to pay the Army to work for the Army. This makes no sense to me and only seems to needlessly drive up the cost of everything we do.

9. ***Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy?***

   The equipment is getting old, and we have had serious equipment failures in the past few years that compromised remediation effectiveness. It is a harsh environment out there and the duty cycles on the equipment are difficult, so these problems were not a surprise. We have had to take over equipment maintenance due to the loss of Weldin and the rising costs of the project. We have been able to work around the problems encountered, but just barely.

10. ***Have there been opportunities to optimize the operation, maintenance, or sampling efforts? Please describe changes, cost savings, and/or improved efficiency.***

    Optimization has been the story of this project. From the remediation standpoint, we utilized the military as much as possible when they were free to hold down costs. This included helicopter and demolitions support. We have likely saved several million dollars over the years through this effort. For O&M, CRREL has been doing this for the past few years. This saves the project about $150K per year. We have also

optimized the use of helicopters and have set up the equipment so that the pumps are powered from shore-based generators, saving set-up time and helicopter costs for both ferrying the equipment around and fueling the gensets. This is currently saving us about $50K per year. We can set up and take down the equipment now in about week, where it used to take us over twice as much time.

11. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

We are ramping down now to the final stages of the operation. Active remediation is suspended, not to resume unless there is a major sustained increase in mortalities. We are currently developing contingency plans for different scenarios that may evolve due to the planned resumption of year-round firing in the flats and the possibility of renewed exposure to white phosphorus. We continue to receive excellent support from the Alaska District (JoAnn Walls and Susan Pitts), Range Control (LD Fleshman), the 716th EOD Detachment, and USAGAK Environmental (Bill Smith). The presence of a functional CRREL office at Fort Richardson has been critical to our successes over the last few years. The facilities (Bldg 992 and the connexes) and infrastructure (roads, pads, etc.) have been developed that will continue to support the project through the out years. With the integration of the year-round firing EIS into the project schedule, activity levels have risen but the combined team has been flexible enough to handle the workload without compromising the project goals. It would be nice to have a bit more funding to provide a buffer for unanticipated expenses and increased tasking. There have been several instances when we have leveraged other funding in the short term to accomplish tasks. Flexibility and quick response have been the marks of this project. It has been a challenge but quite rewarding as well.

FORT RICHARDSON FIVE-YEAR REVIEW
INTERVIEW QUESTIONNAIRE

INTERVIEW RECORD	
Name: Jon Zufelt	
Title: Research Hydraulic Engineer	**Organization: CEERD-RR-G**
Telephone No.: 907-384-0511	**E-Mail Address: jon.e.zufelt@erdc.usace.army.mil**
Street Address: PO Box 5646	**City, State, Zip: Ft. Richardson, AK 99505-0646**
Interview Date: 12/20/07	**Site Name: CRREL-Anchorage Office**
Interview Type: ☐ Telephone ☐ Visit x Email ☐ Questionnaire (by mail)	
Specific Site Involvement	
Operable Units(s) Worked: ☐ OUA ☐ OUB x OUC ☐ OUD x OUE	
Date(s) of Involvement: 2002-2007	
Title / Position (with respect to sites): CRREL DERA Program Manager	

The following general questions were adapted from the EPA's Comprehensive Five-Year Review Guidance. Please answer any questions that are applicable; if you need more space, you may attach a separate sheet.

INTERVIEW QUESTIONS

1. ***What is your overall impression of the work conducted at the site? (general sentiment)***

   Work has been conducted in a logical method of determining problems, devising alternatives to address these problems, gathering stakeholder support of a chosen alternative, and conducting remediation efforts.

2. ***From your perspective, what effect have remedial operations at the site had on the surrounding community?***

   From my perspective the efforts have been well received and there have been no complaints from the community.

3. ***Are you aware of any concerns from the local community regarding the site, operation, administration, implementation, or overall protectiveness of the remedies in the Record of Decision?***

   No.

4. ***Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities?***

   No.

5. ***Are you aware of any changes in land use, access, or other site conditions that have occurred since the last 5-Year Review (2003) that you feel may impact the protectiveness of the site?***

   No.

6. ***Were any problems or difficulties encountered after the initiation of remedial action that impacted construction progress and implementability?***

   No.

7. ***Are there regular on-site inspections and/or operation, maintenance and monitoring (OMM) presence at the site? What is the frequency of O&M site inspections and activities?***

   Yes. For the efforts that I have been involved in, there are continuing remediation efforts underway.

8. ***Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years?***

   With the OUC efforts, there have been several changes in availability of helicopter support, requiring changes in pump locations. Some additional costs due to unscheduled equipment repairs.

9. ***Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy?***

   Some changes though they were instituted to provide improved monitoring so they enhance the protectiveness.

10. ***Have there been opportunities to optimize the operation, maintenance, or sampling efforts? Please describe changes, cost savings, and/or improved efficiency.***

    Yes, see above response.

11. ***Do you have any comments, suggestions, or recommendations regarding the site's management or operation?***

    No.

FORT RICHARDSON FIVE-YEAR REVIEW
INTERVIEW QUESTIONNAIRE

INTERVIEW RECORD	
Name: Bill Adams	
Title: Project Manager	**Organization: ECL**
Telephone No.: 206-553-2806	**E-Mail Address: adams.bill@epa.gov**
Street Address: 1200 Sixth Ave. Suite 900	**City, State, Zip: Seattle, WA 98101**
Interview Date: 1-8-08	**Site Name: Ft. Richardson**
Interview Type: ☐ Telephone ☐ Visit ☐ Email X Questionnaire (by mail)	
Specific Site Involvement	
Operable Units(s) Worked: X OUA X OUB X OUC X OUD X OUE	
Date(s) of Involvement: 1999-2007	
Title / Position (with respect to sites): EPA Project Manager	

The following general questions were adapted from the EPA's Comprehensive Five-Year Review Guidance. Please answer any questions that are applicable; if you need more space, you may attach a separate sheet.

INTERVIEW QUESTIONS

1. ***What is your overall impression of the work conducted at the site? (general sentiment)***

   The work at the site has been technically and scientifically sound. The investigations have been complete and the actions taken to address any problems have been completed in a manner that is consistent with the National Contingency Plan (NCP).

2. ***From your perspective, what effect have remedial operations at the site had on the surrounding community?***

   The actions taken at the site have ensured that contaminants are not migrating off the Ft. Richardson base and are therefore protective of the surrounding community. In terms of direct effect by the actions themselves I would say there has been no impact on the surrounding community. Many of the actions involve groundwater monitoring, soil removal, or in-situ treatments that have very localized impact. Members of the local community have participated in the Restoration Advisory Board (RAB) and have been informed of the actions and had an opportunity to comment.

3. ***Are you aware of any concerns from the local community regarding the site, operation, administration, implementation, or overall protectiveness of the remedies in the Record of Decision?***

   Other than the lawsuit filed by the Alaska Coalition Action on Toxics related to Eagle River Flats I am not aware of any concerns from the local community.

4. ***Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities?***

Yes, diesel fuel was stolen from fuel tanks used to power the generator sets at Eagle River Flats. Improved security measures have been put into place to address this matter.

5. ***Are you aware of any changes in land use, access, or other site conditions that have occurred since the last 5-Year Review (2003) that you feel may impact the protectiveness of the site?***

There has been an increase in construction activity at Ft. Richardson during the last five years. Work at these sites has been conducted consistent with the institutional controls. If contamination is found during construction appropriate response actions have been taken to maintain protectiveness.

6. ***Were any problems or difficulties encountered after the initiation of remedial action that impacted construction progress and implementability?***

Other than weather delays and logistical problems in getting the necessary equipment on-site there have not been any difficulties that impacted construction progress and implementability. These delays have primarily affected OUC.

7. ***Are there regular on-site inspections and/or operation, maintenance and monitoring (OMM) presence at the site? What is the frequency of O&M site inspections and activities?***

At all OUs there are regular inspections tied to the type of activity at each site. For sites with groundwater wells there are quarterly or semi-annual monitoring. Work at ERF occurs during the spring/summer/early fall months where there is often weekly/daily presence on site. There are also quarterly RAB meetings with presentations and/or field trips describing the work on the site. Finally, there are reqular quarterly RPM meetings mandated by the FFA. There are currently no remedies in place that require regular operation and maintenance other than that related to monitoring wells.

8. ***Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years?***

None come to mind.

9. ***Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy?***

No

10. Have there been opportunities to optimize the operation, maintenance, or sampling efforts? Please describe changes, cost savings, and/or improved efficiency.

The main thing that comes to mind are changes in the number and frequency of sampling of monitoring wells as groundwater contamination decreases. It is unclear what the cost savings have been associated with these changes.

11. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

No

FORT RICHARDSON FIVE-YEAR REVIEW
INTERVIEW QUESTIONNAIRE

INTERVIEW RECORD	
Name: Louis Howard	
Title: Project Manager	**Organization: ADEC**
Telephone No.: 907-269-7552	**E-Mail Address: louis.howard@alaska.gov**
Street Address: SPAR/CS Program 555 Cordova Street	**City, State, Zip: Anchorage, AK 99501**
Interview Date: December 18, 2007	**Site Name: Fort Richardson**
Interview Type: ☐ Telephone ☐ Visit X Email ☐ Questionnaire (by mail)	
Specific Site Involvement	
Operable Units(s) Worked: X OUA X OUB X OUC X OUD X OUE	
Date(s) of Involvement: Since 1990 to present	
Title / Position (with respect to sites): Project Manager	

The following general questions were adapted from the EPA's Comprehensive Five-Year Review Guidance. Please answer any questions that are applicable; if you need more space, you may attach a separate sheet.

INTERVIEW QUESTIONS

1. ***What is your overall impression of the work conducted at the site? (general sentiment)***

Overall the cleanup effort has been effective for historical spills and releases to the environment.

2. ***From your perspective, what effect have remedial operations at the site had on the surrounding community?***

The cleanup operations have eliminated or substantially reduced the original sources of contamination which prevents off-site migration to the surrounding community.

3. ***Are you aware of any concerns from the local community regarding the site, operation, administration, implementation, or overall protectiveness of the remedies in the Record of Decision?***

I am not aware of any other community concerns regarding the environmental cleanup activities.

4. ***Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities?***

Yes, diesel fuel was stolen from fuel tanks used to power the generator sets at Eagle River Flats, however security measures have addressed this matter satisfactorily.

5. ***Are you aware of any changes in land use, access, or other site conditions that have occurred since the last 5-Year Review (2003) that you feel may impact the protectiveness of the site?***

No.

6. ***Were any problems or difficulties encountered after the initiation of remedial action that impacted construction progress and implementability?***

No.

7. ***Are there regular on-site inspections and/or operation, maintenance and monitoring (OMM) presence at the site? What is the frequency of O&M site inspections and activities?***

   Yes. These included inspections of investigations and cleanups during the field seasons, Tours for the Fort Richardson RAB, RPM meetings on site activities, review, comment and comment resolution meetings on technical documents.

8. ***Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years?***

   No.

9. ***Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy?***

   No.

10. ***Have there been opportunities to optimize the operation, maintenance, or sampling efforts? Please describe changes, cost savings, and/or improved efficiency.***

    Yes. See Administrative record for documents describing changes, cost changes and improved efficiency.

11. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

No.

FORT RICHARDSON FIVE-YEAR REVIEW
INTERVIEW QUESTIONNAIRE

INTERVIEW RECORD	
Name: John G. Hopkins, MAJ (RET.) U.S.A.	
Title:	Organization:
Telephone No.: (907) 694-1603	E-Mail Address:
Street Address: Box 770534	City, State, Zip: Eagle River, AK 99577
Interview Date:	Site Name:
Interview Type: ☐ Telephone ☐ Visit ☐ Email ☒ Questionnaire (by mail)	
Specific Site Involvement	
Operable Units(s) Worked: ☒ OUA ☒ OUB ☒ OUC ☒ OUD ☒ OUE	
Date(s) of Involvement: ? — to present (founding of RAB)	
Title / Position (with respect to sites): Co-chair Ft Richardson RAB	

The following general questions were adapted from the EPA's Comprehensive Five-Year Review Guidance. Please answer any questions that are applicable; if you need more space, you may attach a separate sheet.

INTERVIEW QUESTIONS

1. ***What is your overall impression of the work conducted at the site? (general sentiment)***

Highly Favorable, with the exception that a vital training was closed to critical training

2. ***From your perspective, what effect have remedial operations at the site had on the surrounding community?***

3. ***Are you aware of any concerns from the local community regarding the site, operation, administration, implementation, or overall protectiveness of the remedies in the Record of Decision?***

Over the years several acquaintances, (knowing of my involvement with the RAB), have consistently asked for up-dates.

4. ***Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities?***

No.

5. ***Are you aware of any changes in land use, access, or other site conditions that have occurred since the last 5-Year Review (2003) that you feel may impact the protectiveness of the site?***

No

6. ***Were any problems or difficulties encountered after the initiation of remedial action that impacted construction progress and implementability?***

No

7. ***Are there regular on-site inspections and/or operation, maintenance and monitoring (OMM) presence at the site? What is the frequency of O&M site inspections and activities?***

8. ***Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years?***

9. ***Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy?***

10. ***Have there been opportunities to optimize the operation, maintenance, or sampling efforts? Please describe changes, cost savings, and/or improved efficiency.***

11. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

Open Eagle River Flats for its intended purpose.

-----Original Message-----
From: Nelson Renee CIV 3 WG/PA [mailto:Renee.Nelson@ELMENDORF.af.mil]
Sent: Monday, January 07, 2008 1:05 PM
To: Plitnik, Marilyn A POA
Subject: Survey

I was just writing to follow up on a phone message I left last month/year while you were out. I'm new in my position and replaced Bill Day. Without any background with the local program, I don't have input for your Five-Year Review survey for remedial activities at the Fort Richardson operable units. However, please update your contact lists to show me as your new contact here.

Please feel free to contact me if you have any other questions.

Thanks,
Renée E. Nelson
Environmental Community Relations Coordinator 3rd Wing Public Affairs
Elmendorf AFB, Alaska
Phone: (907) 552-5756
DSN: 317-552-5756

APPENDIX E

DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY ALASKA
600 RICHARDSON DRIVE #5000
FORT RICHARDSON, ALASKA 99505-5000

REPLY TO
ATTENTION OF:

APVR-RPW-EV (200-1c)

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Institutional Controls

1. All organizations conducting activities on United States Army Alaska (USARAK) controlled land are responsible for complying with established Institutional Controls. Institutional controls are administrative, procedural, and regulatory measures to control human access to and usage of property. They are applicable to all known or suspected contaminated sites where contamination has been left in place.

2. These controls have been established to implement the selected remedial actions agreed upon by the U.S. Army (Army), the U.S. Environmental Protection Agency (USEPA), and the Alaska Department of Environmental Conservation (ADEC) in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendment Reauthorization Act (SARA). These controls also apply to remedial actions agreed upon under Two-Party Compliance Agreements. These agreements are concluded between USARAK and ADEC and apply to petroleum/oil/lubricants- (POL) contaminated sites.

3. Institutional controls such as limitations on access, water use, excavations, and property transfers will supplement engineering controls as appropriate for short-term and long-term management to prevent or limit human and environmental exposure to hazardous substances, pollutants, or contaminants. Specific institutional controls include, among other things: limitations on the depth and location of excavations, prohibition of or restrictions on well drilling and use of ground water, requirements for worker use of personal protective equipment, site monitoring, and prohibition of certain land uses, types of vehicles, etc.

4. Organizational units, tenants, and support/contractor organizations must obtain an Excavation Clearance Request (ECR) (see enclosure) for all soil disturbing activities impacting soils six inches or more below the ground surface. The review process for approval of an ECR begins with the identification of the current status (known or suspected hazardous waste site or "clean" site) of a work location. ECR's for work in known or suspected hazardous waste sites:

a. will include specific limitations and controls on such work;

b. will include specific institutional control procedures, and notification, monitoring, reporting, and stop work requirements;

c. may include procedures for management, characterization, and disposal of any soil or groundwater encountered or removed;

d. will identify "project managers" for both the unit/contractor requesting the work and DPW Environment Resources.

5. The DPW project manager will conduct on-site inspections of each work site (at which institutional controls apply) to determine continued compliance with the terms and conditions of the approved ECR. DPW has the authority to revoke ECR approval if the specified terms and conditions are not being met. ECR forms are available at the Customer Service Desks at:

a. Building 730 at Fort Richardson;

b. Building 3015 at Fort Wainwright;

c. Building 605 at Fort Greely.

6. USARAK has negotiated (with USEPA and/or ADEC) decision documents and/or Records of Decision (RODs) that mandate the implementation of institutional controls. USARAK Directorate of Public Works, Environmental Resources Department (PWE), maintains copies of all decision documents and RODs requiring institutional controls in its real property files. PWE provides regularly updated post maps showing all areas affected by institutional controls. These maps can easily be accessed by using an approved intranet mapping interface application. Copies of these maps will be available to each directorate, activity, and tenant organization. To ensure the effectiveness of institutional controls, all organizational units and tenant activities will be informed on an annual basis of institutional controls on contaminated soils and groundwater in effect near their facilities.

7. Institutional controls are enforceable by the U.S. Environmental Protection Agency (USEPA) and the Alaska Department of Environmental Conservation (ADEC). Failure to comply with an institutional control mandated in a decision document or ROD will violate the USARAK Federal Facility Agreement and may result in stipulated fines and penalties. This does not include the costs of corrective actions required due to violation of an established institutional control.

8. Where institutional controls are applicable to any organization, tenant, or activity, land use restrictions shall be incorporated into either a lease or memorandum of agreement, as appropriate. Costs for any and all remedial actions and fines and/or stipulated penalties levied as a result of a violation of an established institutional control shall be funded by the violating activity or organization.

Encl
Excavation Clearance Request

JAMES J. LOVELACE
Major General, USA
Commanding

DISTRIBUTION:
A

U.S. Army Alaska Institutional Controls
Standard Operating Procedures

1. References:

a. AR 200-1, Environmental Protection and Enhancement
b. AR 200-2, Army Institutional Control Program Enforcement
c. Interim Army Management Plan for Land Use Controls Associated with Environmental Restoration Activities; Memorandum, Dept. of the Army, USAEC, 17 Aug 01
d. USARAK 200-4, Environmental Quality; Hazardous Waste, Used Oil and Hazardous Materials Management
e. AR 210-20, Army Installation Master Planning
f. 40 CFR 300, National Oil and Hazardous Substances Pollution Contingency Plan.
g. 42 USC 1901 et seq. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as Amended by the Superfund Amendment and Reauthorization Act of 1986.
h. Federal Facility Agreements for Forts Richardson and Wainwright
i. Defense-State Memorandum of Agreement
j. Operable Unit Records of Decision and/or other decision documents as appropriate.

2. Purpose. These Standard Operating Procedures establish the responsibilities, policies and procedures for complying with Department of Defense (DOD), Department of the Army (DA), and US Army, Alaska (USARAK) regulations as well as Federal and State Laws for instituting, maintaining, and enforcing Institutional Controls (IC) on Federal Facilities.

These controls have been established to implement the selected remedial actions agreed upon by the U.S. Army (Army), the U.S. Environmental Protection Agency (EPA), and the Alaska Department of Environmental Conservation (ADEC) in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act as amended by the Superfund Amendment Reauthorization Act. The details of these agreements may be found in the Decision Documents (DD) and Records of Decision (RODs) which are maintained in the Public Works, Environmental Offices. These agreements have been executed in accordance with the authority cited in Section 1.

These controls also apply to remedial actions agreed upon under Two-Party Compliance Agreements. These agreements are concluded between USARAK and ADEC and apply to petroleum/oil/lubricants- (POL) contaminated sites.

Institutional Controls are legal or administrative actions designed to minimize the risk of human exposure to a hazardous substance. The establishment of IC's substantially reduces the costs of cleanup while maintaining essential health and safety requirements. Violation of IC's may significantly increase the costs of site maintenance and cleanup. Institutional Controls, including limitations and restrictions to human access, water use, and property transfer restrictions will supplement engineering controls as appropriate for short- and long-term management to prevent or limit exposure to hazardous substances. Typical controls are:

- Installation and maintenance of signs or fences to restrict access to an area;

- Patrols and enforcement of access restrictions by Military Police;

- Widespread availability of and easy access to an intranet mapping interface application which is capable of accessing Geographic Information System (GIS) data layers which contain information pertaining to contaminated sites. Such information must include the location of contaminated areas, location of water wells, water chemistry, depth to groundwater, etc.;

- Identification of contaminated areas and associated levels of contamination on real property records and land planning maps for notification of future users;

- Provide all contract agencies with construction, excavation and well installation restrictions.

These controls have been established to prohibit or limit access to, or use of, the land, surface water, and ground water and are applicable to all known or suspected contaminated sites. The following are examples of the restrictions agreed upon in the RODs:

- Prohibitions or limitations on the construction or renovation of new or existing facilities to include residential area new construction, road repair and realignment, utility work, digging, trenching, excavation, paving, or drilling of soil borings and wells.

- Recreational use of natural resources i.e., camping, fishing, hunting etc., and training activities i.e., bivouac, combat maneuvers, land navigation, construction of fighting positions, etc., can be prohibited or limited depending on the type of contaminant present.

- Groundwater restrictions prohibit the drilling of water wells for potable water, fire suppression, irrigation or other purposes.

These restrictions remain in place until EPA, ADEC. and the Army mutually decide the contamination has been reduced, through cleanup activities or natural attenuation, to levels protective of human health and the environment. In making their decision, EPA, ADEC, and the Army will consider levels specified in the ROD or other decision document. If no decision document exists, EPA, ADEC, and the Army will consider the application of maximum contaminant levels (MCLs) for potable groundwater or risk-based concentrations for soil, sediment, surface water and other uses of groundwater.

3. Scope: These Standard Operating Procedures apply to all USARAK units and activities. Military and Civilian Support Activities, Tenant Organizations and agencies, and Government and Civilian Contractors that occupy, use, build, repair or maintain facilities on USARAK controlled lands.

4. Responsibilities:

a. The **Installation Commander** or his designee shall approve all Decision Documents and Records of Decision regarding remedial actions and Institutional Controls on USARAK controlled lands in accordance with DA guidance. Installation Commander shall also require compliance with these Decision Documents and Records of Decision.

b. **Directorate of Public Works** shall execute all aspects of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in accordance with the Defense Environmental Restoration Program and as agreed upon in the Federal Facility Agreements and the Defense-State Memorandum of Agreement. Public Works shall also:

(1) Establish, maintain, and routinely update complete records of all known or suspected sites, restoration actions and Institutional Controls;

(2) Document all actions and Institutional Controls in the Installation Action Plan, environmental GIS data base (REMOTE), and Master Plan. Distribute to affected units, organizations, and tenants, at the point they are affected on annual basis.

(3) Ensure that all affected tenants and contractor organizations are informed of:

(a) Known soil and ground water contamination in their areas of operation;

(b) Institutional Controls associated with remedial activities;

(c) Potential human health risks and environmental impacts associated with violating the controls;

(d) Potential fines, penalties, and criminal implications resulting from violations of the Institutional Controls.

(4) Provide oversight and review of all Excavation Clearance Requests (ECR's) to ensure that all activities that involve disturbance of soil or use of groundwater comply with current environmental laws.

(5) Conduct on-site inspections of all projects for which Institutional Controls are indicated or specified on an approved ECR. The inspections will determine compliance with Institutional Controls and with monitoring, reporting, notification, and stop work requirements specified in the ECR or its attachments.

(6) Ensure all affected, contracting mechanisms (i.e., job order contract, military construction, in-house projects, etc.) are modified to include the appropriate environmental information to prevent violation of Institutional Controls policies and prevent potential fines, penalties, and criminal implications resulting from violations of the Institutional Controls.

USARAK Form 81-E (Excavation Clearance Request) must be appropriately annotated by DPW-Environment Resources to prevent the undertaking of work inconsistent with established Institutional Controls at a particular site. If a dispute with a subordinate activity or tenant arises due to DPW-Environment Resources' non-concurrence on Form 81-E with proposed site work because of the potential for an Institutional Controls violation, the Commander's Policy Memorandum on Institutional Controls shall provide the basis for final resolution.

On-site inspections conducted by DPW Environment Resources during the course of work will confirm whether the work is conducted in compliance with the conditions specified in the ECR and its supporting documentation. If the work is inconsistent with requirements, DPW has the authority to issue a stop-work order. USARAK will not be responsible for costs incurred as a result of a stop-work order issued as a result of a violation of an Institution Control policy.

c. **Directorate of Contracting** shall determine the necessary protocols and language to be incorporated into applicable contract mechanisms to inform potential contractors of the environmental status of USARAK Installations regarding contamination. Such language or protocols will emphasize;

(1) The need for contractors to obtain an ECR prior to conducting any soil disturbing activities anywhere on USARAK controlled lands;

(2) Required attendance at an Explosive Ordnance Disposal (EOD) briefing on unexploded ordnance (UXO);

(3) Potential fines, penalties, and criminal implications resulting from violations of the Institutional Controls;

(4) Contractor familiarity with and adherence to the requirements of USARAK 200-1 Pamphlet, Hazardous Materials and Regulated Waste Management;

(5) The need for contractors to coordinate with DPW Environmental personnel prior to conducting any soil disturbing activities or gaining access to fenced or restricted areas associated with Institutional Controls anywhere on USARAK controlled lands;

d. **Directorate of Plans, Training, Security, and Mobilization** (DPTSM) shall:

(1) Provide all troop units utilizing the training areas information regarding known and potential sources of contamination in the training areas;

(2) Provide information regarding Institutional Controls and the potential fines, penalties, and Criminal implications resulting from violations of the Institutional Controls;

(3) Provide (through the Integrated Training Area Management (ITAM) program) maps and related information regarding USARAK sites with Institutional Controls;

(4) Attend Institutional Controls status update meetings as required by the Installation Commander.

e. **U.S. Army Corps of Engineers, Alaska District** shall ensure that all contract mechanisms incorporate a complete section that provides a detailed explanation of the following information:

(1) The environmental status of the installation in question and the existence of Institutional Controls and the potential fines, penalties, and criminal implications resulting from violations of the Institutional Controls;

(2) The requirements for obtaining an ECR prior to performing any type of excavation, trenching, or disturbance of soil;

(3) The notification requirements for reporting spills, previously unknown soil or ground water contamination, and;

(4) How to dispose of hazardous and non-hazardous wastes, contaminated soil and ground water etc. from USARAK controlled lands in compliance with the requirements of USARAK 200-1 Pamphlet, Hazardous Materials and Regulated Waste Management.

f. **All DOD Personnel** responsible for initiating DA Form 4283, Work Request, are required to become familiar with the Institutional Controls within the immediate work area.

g. **Civilian Tenant Organizations** shall coordinate all work involving the disturbance of soil or installation of a well anywhere on USARAK-controlled lands with the Directorate of Public Works and obtain proper authorization prior to the commencement of work.

h. **Defense Reutilization Management Office** shall dispose of all investigation-derived waste in accordance with the appropriate laws and regulations.

5. Specific procedures and instructions will be provided by DPW Environment Resources to personnel working in areas where Institutional Controls are in place. An after-action report is required as specified in the ECR within 30 days.

6. Work in areas where Institutional Controls are not specified

If Institutional Controls are not specified on the ECR and contamination is found, the following apply:

a. If contaminated soils, drums, unexploded ordnance, or unusual debris are found on or around any work site, the organization conducting the work shall stop work immediately and notify the Fire Department or " 911 "in accordance with USARAK Pamphlet 200-1, Hazardous Materials and Regulated Waste Management. Work at the site will be suspended until the area is cleared by DPW Environment Resources. Site clearance by Range Control is required if unexploded ordnance is involved.

b. Contaminated soil or groundwater removed from the work site must meet container type, sampling and analysis for potential contamination, marking and labeling, and moving and storage requirements specified in Pamphlet 200-1 (above) or as otherwise specified by DPW Environment Resources prior to removal. Soil and groundwater shall not be removed from any part of the installation without written authorization from an authorized USARAK representative. All operations involving hazardous waste will be accomplished in accordance with USARAK Regulation 200-4, Environmental Quality: Hazardous

Waste, Used Oil and Hazardous Materials Management and USARAK Pamphlet 200-1, Hazardous Materials and Regulated Waste Management.

EXCAVATION CLEARANCE REQUEST
DIRECTORATE OF PUBLIC WORKS, FORT RICHARDSON, ALASKA

NOTE: Locates require 72-hour advance notice (except where indicated)

Request clearance to proceed with work at: _____
(specific location)

Work Order /Contract #: _____ Contractor Firm: _____

Contractor POC Name/Phone: _____

TYPE OF WORK REQUIRED: (provide brief but complete description of work to be performed. Attach additional sheets as necessary.)

Project Dates: _____ thru _____ Above Construction Checked for Conflicts with the Following:

Department	Conflict	Signing Official	Date
Utilities, Bldg. 700 384-1807 (Steam, Gas, Water)	Yes No		
Utilities, Bldg. 700 384-3677 (Elect, Alarms)	Yes No		
Utilities, Bldg. 704 384-1717 (sewer/POL)	Yes No		
Environmental, Bldg. 724 384-3042 / 3295	Yes No		
→ Institutional Controls[1]	Yes No	Source Area:	
Master Planning, Bldg. 730 384-3019	Yes No		
Engineering, Contract Mgmt., Bldg. 724 384-3054	Yes No		
Davis Hwy. Borrow Pit / Mat'l disposal site coordinator DPW Contract Mgmt., Bldg. 724	Yes No		
Fire Department, Bldg. 654 384-3130 / 3131	Yes No		
59th Signal Bn, Bldg. 652 384-0001 (communications)	Yes No		
Honeywell, Bldg. 1114, 428-1701	Yes No		

Underground Locating Service – Local Request No.: _____

278-3121 covers:	ACS	Yes No	
	ENSTAR	Yes No	
	GCI Cable	Yes No	

Explanation of Conflicts Identified Above (annotate on drawings or include additional information sheets)

If Required:

Alaska Railroad – if excavation within 100 ft. of railroad right-of-way, (907) 265-2401 (10 day advance notice required)
Ammo Storage Area A or B, Bldg. 700, Robert Holt, 384-3643 (Security only)
Provost Marshal, Bldg. 656, 384-0801 (Road closures only)
DPW Customer Service Desk, Bldg. 730, 384-3664 / 3620 (Loss of utility only)

[1] If Institutional Controls are in force in the excavation area, additional preparation, reporting, monitoring, and record-keeping requirements will apply. The unit/contractor project manager must confer with DPW Environment Resources for specific instructions including specific controls required by decision documents and Records of Decision (RODs).

Fire Department, Bldg. 654, 384-0774 (Loss of hydrant water or road closures)

GENERAL REQUIREMENTS FOR EXCAVATION / SOIL BORING WORK

In conducting excavation and/or soil boring work on Fort Richardson, the unit or contractor may uncover or expose soil and/or groundwater CONTAMINATED with hazardous waste. The unit or contractor is required to recognize the following **REQUIREMENTS** during the course of any / all work at Fort Richardson, ***regardless of location or environmental status of the work site:***

MONITORING: The unit or contractor shall monitor the excavation or boring for signs or indications of contaminated soil or water. These may include active or passive, physical or instrumental, or other methods. DPW Environment Resources may stipulate the methods or procedures for monitoring. Evidence of contamination includes (but is not limited to):

a) Chemical, hydrocarbon, or petroleum odors

b) Iridescent / petroleum sheen on water or soil surfaces

c) Free/floating non-aqueous liquids. Such liquids frequently float on water.

d) Observation of colored or off-color inclusions or concretions of non-soil material

e) Articles, materials, or containers which may contain hazardous chemicals or hazardous waste

f) Instrumental field screening (PID instrument) and/or sampling and laboratory analysis for specific chemicals or classes of chemicals

g) Other indicators as appropriate or necessary or as specified by DPW Environment Resources.

NOTIFICATION: At the first sign or indication of hazardous waste contamination in the excavated soil or purged water, the unit or contractor project manager must notify the Fire Department (384-0774) or 911. Work must cease and not resume until DPW Environment Resources has investigated the problem and authorized work to continue. Proper notification in cases of suspected contamination is a condition of continuing project approval.

STOP WORK: The unit or contractor will immediately stop work if evidence of contamination is encountered during excavation or soil boring work.

MONITORING RECORDS: The unit or contractor is required to create and maintain monitoring records during the course of the work. He may be required to provide originals or copies of monitoring records to DPW Environment Resources.

SITE INSPECTIONS: DPW Environment Resources will conduct site inspection(s) during the course of work. The unit or contractor's project manager will notify DPW Environment Resources' project manager on the first day of site work and both managers will schedule the inspection(s). The DPW Environment Resources project manager for this project is:

_____

DPW Environment Resources Project Manager's Name Phone number

GENERAL CONDITIONS OF PROJECT APPROVAL

1. This clearance authorizes commencement of excavation work only and THIS IS NEITHER A NOTICE TO PROCEED NOR A WORK AUTHORIZATION.

2. This excavation clearance is effective upon the date of signature by DPW official below: EXCAVATION SHALL COMMENCE WITHIN 30 CALENDAR DAYS.

3. Requester's Project Manager will provide two copies of required work site drawings with Excavation Clearance Request form. DPW Environment Resources will retain one copy of these drawings.

4. Requester will retain original completed Excavation Clearance Request form. DPW Customer Service Desk will retain a copy of the approved request form.

5. Boring locations must be marked on a 1/100 scale drawing.

6- All soil and/or water excavated or removed from the work site shall be disposed of in accordance with guidance from DPW Environmental Resources.

7. Obtain written instruction from Environment Resources Project Manager on procedures for sampling, analysis, soil/water containerization, storage, removal, etc.

8. An after action report concerning work at sites where institutional controls are in place shall be submitted to the project manager, DPW Environment Resources Dept. NLT 30 days following completion of work.

9. Approval of this Excavation Clearance Request is conditional upon Unit/Contractor's continued compliance with the terms and conditions of mandated Institutional Controls, environmental monitoring, notification, record-keeping, etc., requirements specified in this document and any attachments. Failure to comply with these conditions and requirements may result in immediate repeal of this approval.

APPROVED: _____

DPW Deputy Director or Department Chief / Date

_____

Unit/Contractor Project Manager's Signature Date

EXPIRATION DATE (+30 days from above approval date): _____

☐ Additional sheets/instructions attached. Number of sheets attached: _____

☐ Institutional Controls and / or additional control or monitoring requirements attached. Number of sheets attached: _____

USARAK Form 81 a
1 Mar 02

APPENDIX F

OB\OD Delayed RCRA Closure Evaluation
Fort Richardson Five-year Review

The Record of Decision for Operable Unit C, p. 9-16, requires US Army Alaska (USARAK) to evaluate no less often than during the CERCLA Five-Year Review whether delay of closure of the OB/OD Pad is still viable. The ROD stipulates three conditions under which delay of closure is no longer viable:

- The Eagle River Flats impact area (ERF) is no longer operating;
- The post (Ft. Richardson, Alaska) is being closed;
- Any other reason.

As of the time of the current Five-Year Review (February, 2008), Ft. Richardson is an operational installation quartering a number of active military units including the 501st PIR, the 4/11th Field Artillery, among others. These active military units continue to use ERF as an impact area for artillery, mortar, and aircraft (fixed-wing and rotary) training. Institutional controls regarding the type of munitions used at the site, and regarding the time of year the range may be used are still in force.

USARAK has no other information or reason to suggest that delayed closure of the OB/OD Pad is not protective or viable.