

FINAL

**Record of Decision
Nine Installation Restoration Program Sites
Fort Greely, Alaska**

The Declaration

Fort Greely and the Alaska Department of Environmental Conservation are determining the final activities to close out nine Installation Restoration Program (IRP) Sites at Fort Greely, AK, in accordance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and in accordance with State of Alaska cleanup requirements in 18 Alaska Administrative Code (AAC) 75.300 through 18 AAC 75.396. The nine sites and proposed actions (detailed descriptions provided in the Decision Summary) include:

1. Former Landfill #1 (BRAC Site 31) – Dig Restrictions, Land Use Restrictions, Five-Year Reviews, and Annual Inspection Until First Five-Year Review
2. Former Landfill #2 (BRAC Site 32) – Dig Restrictions, Land Use Restrictions, Five-Year Reviews, and Annual Inspection Until First Five-Year Review
3. Former Landfills #4 & #5 (BRAC Site 88) – Limited Groundwater Monitoring, Dig Restrictions, Land Use Restrictions, Five-Year Reviews, and Annual Inspection Until First Five-Year Review
4. Former Building 157 Laundry Facility (BRAC Site 103) – No Further Remedial Action Planned (Unrestricted Use)
5. SM-1A Nuclear Reactor Wastewater Pipeline, East (BRAC Site 90) – No Further Remedial Action Planned (Unrestricted Use)
6. SM-1A Nuclear Reactor Wastewater Pipeline, West (BRAC Site 132) – No Further Remedial Action Planned (Unrestricted Use)
7. SM-1A Nuclear Reactor Wastewater Pipeline Station 21+25 – No Further Remedial Action Planned with Dig Restrictions, Land Use Restrictions, and Five-Year Reviews
8. Former Waste Accumulation Area at Building 626 (BRAC Site 48) – No Further Remedial Action Planned (Unrestricted Use)
9. Former Refuse Burn Pit (BRAC Site 89) – Lead and Dioxin/Furan Hot-Spot Soil Removal, Off-Site Transport & Disposal of Excavated Contaminated Soil, Confirmation Sampling, Placement of Cap and Gravel Apron, Dig Restrictions, Land Use Restrictions, and Five-Year Reviews

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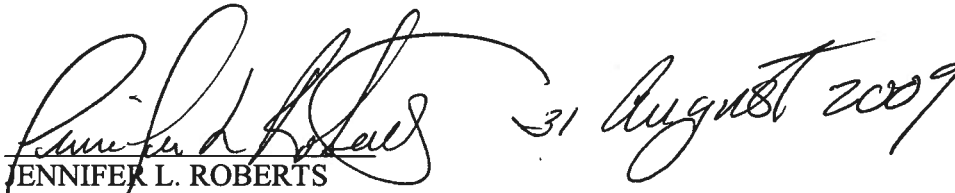
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The response actions selected are necessary to protect human health and the environment from actual releases of hazardous substances at these sites. The selected remedies are protective of human health and the environment, comply with Federal and State requirements that are applicable or relevant and appropriate to the remedial action, are cost effective, and utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. The remedies selected do not satisfy the statutory preference for treatment as a principal element of the remedy as off-site disposal and engineering controls were deemed to be substantially more cost effective. Because some of the remedies will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedies are, and will be, protective of human health and the environment.

The decision may be reviewed and modified in the future if new information becomes available that indicates the presence of contaminants or exposures that may cause unacceptable risk to human health or the environment. If additional contaminants are discovered, Fort Greely and DEC will determine the compliance levels for soil and groundwater cleanup actions.



CHRIS W. CHRONIS
Lieutenant Colonel, U.S. Army
Garrison Commander



JENNIFER L. ROBERTS
Alaska Department of Environmental Conservation
Contaminated Sites Program
Section Manager



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
INSTALLATION MANAGEMENT COMMAND
DEPARTMENT OF PUBLIC WORKS, UNITED STATES ARMY GARRISON
P. O. BOX 31310
FORT GREELY, ALASKA 99731

ADEC File No.

August 25, 2009

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Jennifer L. Roberts
Alaska Department of Environmental Conservation
Contaminated Sites Program/Section Manager
555 Cordova Street
Anchorage, AK 99501-2617

AUG 31 2009

DEPT. OF ENVIRONMENTAL
CONSERVATION

Dear Ms. Roberts:

Enclosed herein is the Final Record of Decision (ROD) for Nine Installation Restoration Program (IRP) Sites at Fort Greely, Alaska. The ROD has been approved by Fort Greely's Installation Commander LTC Chris Chronis and his signature appears on the Declaration Page (Page iii).

The ROD has been coordinated with Ms. Tana Robert of ADEC's Fairbanks office. When the Alaska Department of Environmental Conservation concurs with the document, please sign on the declaration page and forward original signature page to:

US Army Space and Missile Defense Command
SMDC-ENV-C (Glen Shonkwiler)
PO Box 1500
Huntsville, AL 35807

The ROD with the original signature page will be incorporated into the Administrative Record. Please keep a copy for your records.

Point of Contact for this action is Mr. Glen Shonkwiler at glen.shonkwiler@us.army.mil or (256) 955-2190. Thank you for ADEC's cooperation in completing the ROD finalizing the closeout actions for these 9 IRP sites.

Sincerely,

Wayne Tolliver
Wayne Tolliver
Environmental Coordinator

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Record of Decision

Nine Installation Restoration Program Sites

Fort Greely, Alaska

August 2009

Prepared for:
US Army Garrison, Fort Greely, Alaska

Prepared by:
US Army Space and Missile Defense Command
Huntsville, Alabama

And

Teledyne Solutions, Inc
Huntsville, Alabama

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Record of Decision Nine Installation Restoration Program Sites Fort Greely, Alaska

The Declaration

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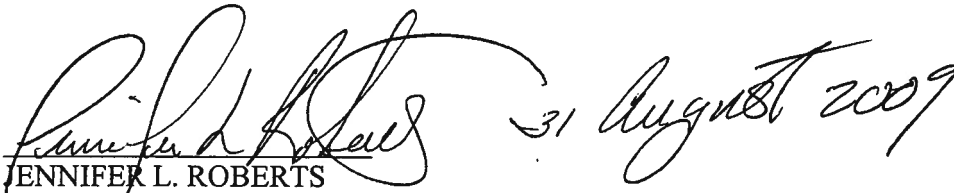
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The decision may be reviewed and modified in the future if new information becomes available that indicates the presence of contaminants or exposures that may cause unacceptable risk to human health or the environment. If additional contaminants are discovered, Fort Greely and DEC will determine the compliance levels for soil and groundwater cleanup actions.



CHRIS W. CHRONIS
Lieutenant Colonel, U.S. Army
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JENNIFER L. ROBERTS
Alaska Department of Environmental Conservation
Contaminated Sites Program
Section Manager

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Acronyms and Abbreviations

AAC	Alaska Administrative Code
ACL	Alternative Cleanup Levels
ADEC	Alaska Department of Environmental Conservation
AK	Alaska
ARAR	Applicable or Relevant and Appropriate Requirements
ASTS	Arctic Slope Technical Services, Incorporated
bgs	Below Ground Surface
BRAC	Base Realignment and Closure
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
COPC	Contaminant of Potential Concern
Cs-137	Radioactive isotope of Cesium with a mass number of 137
DRO	Diesel Range Organics
EPA	U.S. Environmental Protection Agency
FGA	Fort Greely, Alaska
FS	Feasibility Study
GRO	Gasoline Range Organics
HTRW CX	Hazardous, Toxic, Radioactive Waste Center of Expertise
LRI	Limited Remedial Investigation
IRP	Installation Restoration Program
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
mg/kg	Milligrams per Kilogram
mrem/yr	Millirem per Year
ND	Non-detect
NFA	No Further Action
NFRAP	No Further Remedial Action Planned
O&M	Operations and Maintenance
PAH	Polycyclic Aromatic Hydrocarbons
pCi/g	Pico-Curies per gram, a measurement of radioactivity
ppm	Parts per Million
PQL	Practical Quantitation Limit
PRG	Preliminary Remediation Goal
RCRA	Resource Conservation Recovery Act
RI	Remedial Investigation
RI/FS	Remedial Investigation / Feasibility Study
RAB	Restoration Advisory Board
RME	Reasonable Maximum Exposure
RRO	Residual Range Organics
SARA	Superfund Amendments and Reauthorization Act

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Acronyms and Abbreviations (Cont)

SM-1A	Designation for nuclear reactor at Fort Greely; S is for stationary; M is for medium sized reactor; and the 1A designation is because it is of similar design of the former SM-1 reactor at Fort Belvoir, VA
SMDC	U.S. Army Space and Missile Defense Command
Sr-90	Radioactive isotope of Strontium with mass number of 90
SVOC	Semi-volatile Organic Compound
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Total Equivalent
TPH	Total Petroleum Hydrocarbons
UCL	Upper Confidence Limit
UIC	Underground Injection Control Program
U.S.	United States
USACE	U.S. Army Corps of Engineers, Alaska District
UST	Underground Storage Tank
UTL	Upper Tolerance Limit
VOC	Volatile Organic Compound
WAA	Waste Accumulation Area

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1.0 Introduction

Fort Greely, Alaska (FGA) has prepared this Record of Decision (ROD) for the closeout of nine Installation Restoration Program (IRP) sites. Fort Greely investigates and remediates IRP sites in accordance with the Comprehensive, Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and under the State of Alaska Oil and Hazardous Substances Control regulations [18 Alaska Administrative Code (AAC) 75]. With this ROD, Fort Greely and the Alaska Department of Environmental Conservation (ADEC) will determine the final actions to be taken at the following nine IRP sites:

- Former Landfill #1 (Site 31)
- Former Landfill #2 (Site 32)
- Former Landfills #4 & #5 (Site 88)
- Former Laundry Facility at former Building 157 (Site 103)
- Three sites on the SM-1A Nuclear Reactor Wastewater Pipeline
 - SM-1A Nuclear Reactor Wastewater Pipeline, East (BRAC Site 90) and associated dilution well and removal action laydown yard
 - SM-1A Nuclear Reactor Wastewater Pipeline, West (BRAC Site 132)
 - Suspected fuel spill at SM-1A Nuclear Reactor Wastewater Pipeline Station 21+25
- Waste Accumulation Area at Building 626 (Site 48)
- Refuse Burn Pit (Site 89)

Site locations can be found below in Figure 1.

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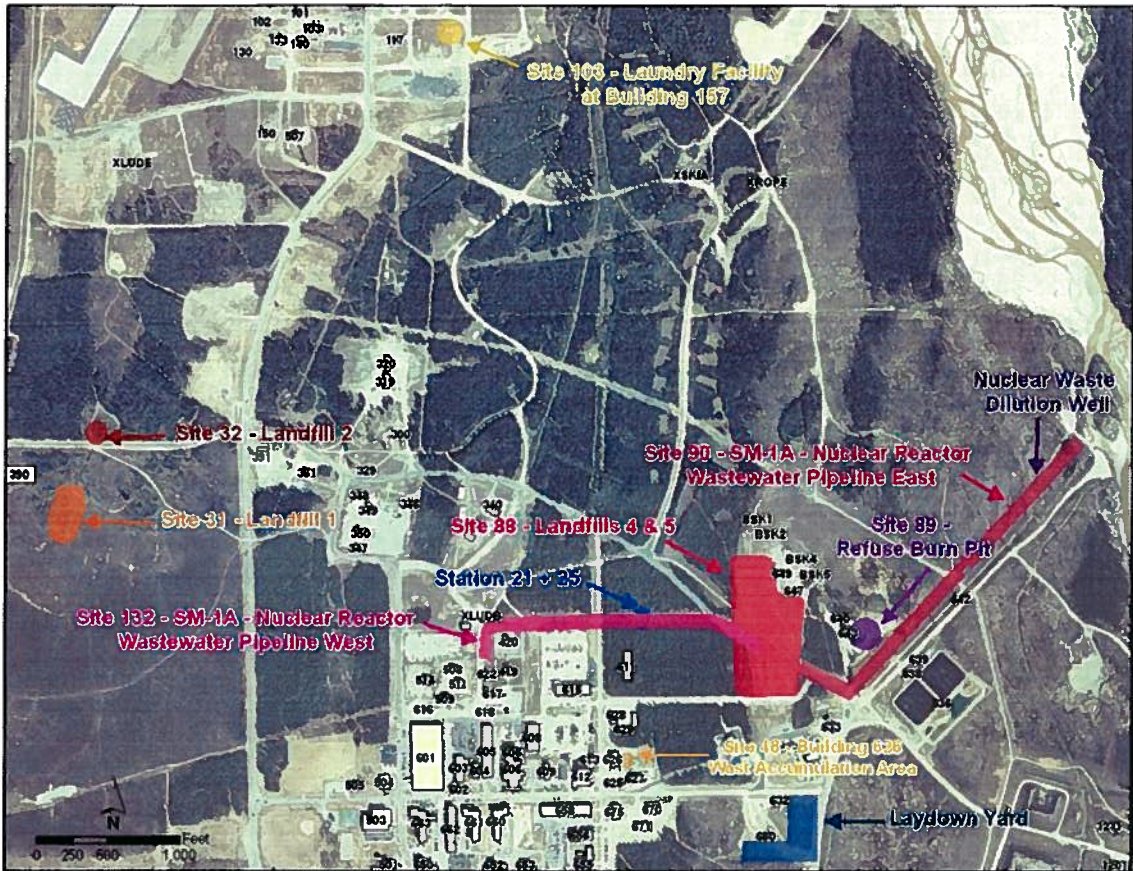


Figure 1 – Location of Sites

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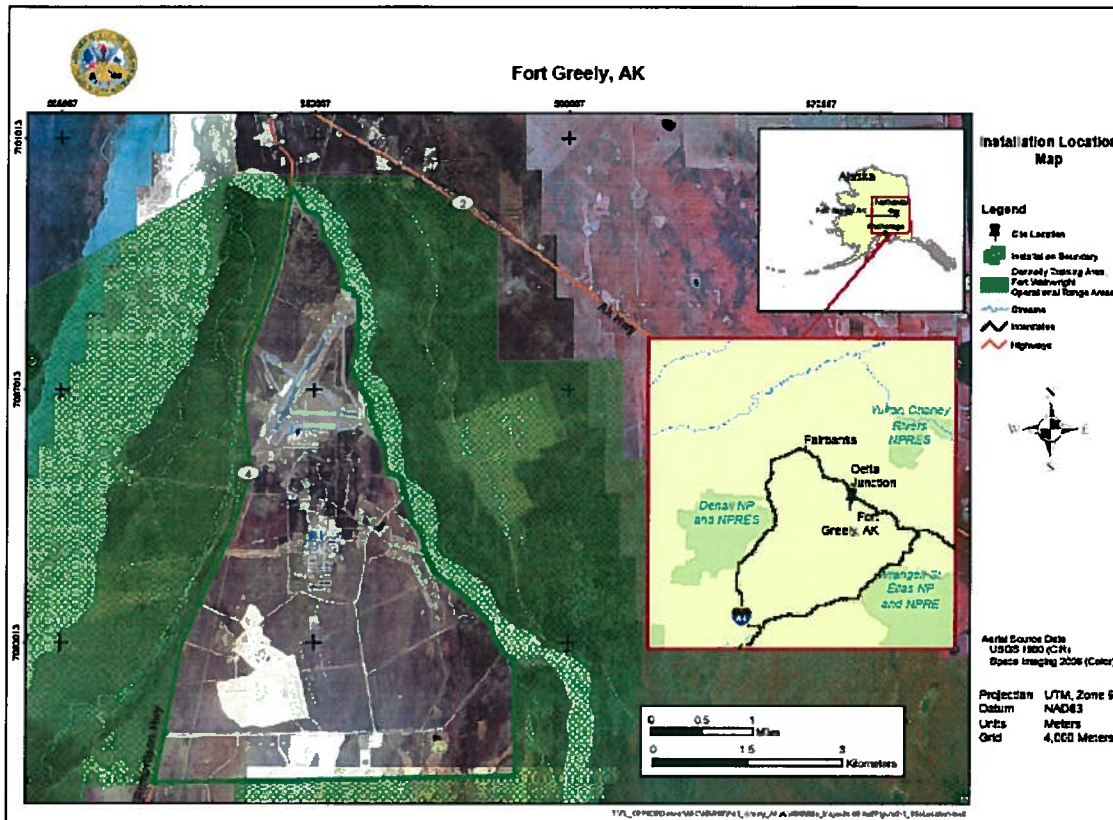


Figure 2 – Present Day Boundary of Fort Greely

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2.0 Fort Greely Background

Fort Greely was established in 1942 as an Army Air Corp base that served as a staging area for aircraft being ferried over to Russia during World War II. Fort Greely was deactivated in 1945 but was reactivated in 1947 as an army post for United States (U.S.) army troops. In 1949, the Army established a cold regions testing center to test how all types of Army equipment performed in extremely cold regions. A nuclear reactor was built in the early 1960s and it provided the post's power until 1972. Until recently, Fort Greely was comprised of almost 630,000 acres; most of it used for land maneuvers training.

The 1995 Base Realignment and Closure (BRAC) commission listed Fort Greely as an installation to be realigned and partially closed. The training maneuvers land was directed to become part of Fort Wainwright and most of the main post area was to be closed and handed over to the City of Delta Junction. To prepare for the handover of the main cantonment area, the post was broken into parcels (each known as a BRAC Site #) and each parcel was investigated to determine if any environmental issues would preclude the transfer of the property from the Army. An aggressive remediation program was initiated to clean up portions of Fort Greely scheduled for transfer. The BRAC closure process was stopped at Fort Greely in 2002 when the Missile Defense Agency selected Fort Greely as one of the locations to deploy a ground-based missile defense system. The U.S. Army Space and Missile Defense Command (SMDC) stood Fort Greely back up as an active installation and continued the installation restoration process. Fort Greely's training ranges were transferred to Fort Wainwright as part of the BRAC realignment and Fort Greely is now about 7,000 acres in size. SMDC transferred Fort Greely to the Installation Management Command (IMCOM) in 2004. See Figure 2 for a map of present day Fort Greely.

Past and on-going remediation efforts at Fort Greely have removed some of the known sources of contamination. Numerous assessments conducted in the 1990s revealed over 132 sites with possible contamination. In June 2005, 73 of these sites were closed by the Army, ADEC and the U.S. Environmental Protection Agency (EPA) in the Fort Greely Environmental Sites Decision Document (TSI, 2005). These 73 sites require no further action unless site conditions change. Additional investigations have been conducted or are underway on 28 of the remaining 59 sites. The goal of the investigations is to assess the extent of contamination and determine if remediation is required. Since 2005, interim removal actions have been initiated at five sites to cleanup known contamination. The contaminants at Fort Greely mainly consist of fuel or fuel byproducts (typically from spills of these fuels). Additional contaminants of concern (COC) include chlorinated solvents, pesticides, dioxins, and metals. Soil sampling has revealed pesticide, dioxin, and metals contamination that could be the result of improper storage and disposal practices, burning of solid wastes, and other historical practices.

Fort Greely seeks to clean up each contaminated site according to ADEC Method 2 or Method 3 (18 AAC 75.340-341) standards for industrial areas. These standards are protective of human health and specify maximum concentrations of COCs that are permitted to remain in place.

Fort Greely keeps the public informed of the remediation efforts and the overall strategy for cleaning up the installation through periodic meetings of a Restoration Advisory Board (RAB) and an information repository maintained at the RAB website at <http://www.smdcen.us/rabfga>.

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3.0 Strategy for Selecting Clean Up Alternatives for Fort Greely

3.1 Description of Evaluation criteria

Fort Greely strives to provide a safe environment for all residents, workers, and wildlife on FGA. The standards for a safe environment are taken from Federal, State of Alaska, and Department of the Army laws and policies. Since the first groundwater bearing zone (water table aquifer) is used as the drinking water source on Fort Greely (and in the surrounding areas), groundwater quality is measured against federal drinking water standards [40 Code of Federal Regulations (CFR) 141.61-141.66] and state cleanup levels (18 AAC 70.020 and the *Alaska Water Quality Criteria for Toxic and Other Deleterious Organic and Inorganic Substances*, dated May 15, 2003). The groundwater must meet drinking water standards for it to be considered to meet cleanup criteria (18 AAC 75.345, Table C). Contaminants of concern in the soil are measured against accepted safe exposure levels found in State of Alaska regulations for inhalation, ingestion, and migration to groundwater (18 AAC 75.340). The Alaska regulations include Method 2 general screening and cleanup criteria as well as a process for developing site-specific Alternative Cleanup Levels (ACLs) by Method 3 calculations. The State's standards and Method 3 calculation processes are protective of sensitive populations (i.e. the young, elderly, sick, etc.) and are therefore conservative in nature.

The CERCLA cleanup process requires alternatives to be analyzed against 9 criteria to determine the best alternative to the site. These nine criteria are broken into three groups, which include threshold criteria, balancing criteria, and modifying criteria. Threshold criteria must be met or the alternative is not considered protective. Balancing criteria are used to compare tradeoffs for the various alternatives. Modifying criteria are stakeholders' inputs that may alter the implementation of the alternatives.

3.2 Threshold Criteria

Overall protection of Human health and the Environment

Alternatives shall be assessed to determine whether they can adequately protect human health and the environment from unacceptable risks posed by hazardous substances, pollutants, or contaminants present at the site. These risks can be short- or long-term, and protection can take place through eliminating, reducing, or controlling exposures to levels established during development of remediation goals consistent with CERCLA, see 40 CFR 300.430(e)(2)(i). Overall protection of human health and the environment draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with Applicable or Relevant and Appropriate Requirements (ARARs) as explained in the next paragraph.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

The alternatives shall be assessed to determine whether they attain applicable or relevant and appropriate requirements under federal environmental laws and state environmental or facility siting laws or provide grounds for invoking one of the waivers under 40 CFR 300.430 (f)(1)(ii)(C).

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The State of Alaska Soil Cleanup Levels in 18 AAC 75.340 are considered ARARs under this proposed plan. The State of Alaska Soil Cleanup Levels include several tiers or “Methods” of cleanup levels that are considered protective of human health and the environment. The ADEC Method 2 cleanup levels are non-site specific, conservative contaminant concentrations designed to protect the public from exposure that may increase the risk of cancer or other harmful effects. ADEC Method 3 alternative calculations are allowed by regulation in order to develop site specific cleanup levels based on the level of potential exposure at a particular site.

In general, compliance with the State of Alaska Oil and Hazardous Substance Pollution Control regulations found in 18 AAC 75 are considered ARARs under this proposed plan. The State of Alaska Soil Cleanup Levels in 18 AAC 75.340 – 75.396, which includes the use of Institutional Controls (ICs), to protect human health and the environment are applicable to this proposed plan. Site-specific exposure concerns dictate the use of ICs to protect human health and the environment. ICs are broadly defined in 18 AAC 75.375 and 18 AAC 78.625 to include requirements for and maintenance of physical and engineering measures, such as signs, caps, covers, or fences.

Federal drinking water standards and state cleanup levels are used to determine protectiveness of groundwater since the groundwater is used as the primary drinking water source for the area. Residual contamination must not cause a violation of 18 AAC 70 water quality standards. In addition, movement or use of contaminated soil in a manner that results in a violation of 18 AAC 70 water quality standards is unlawful. Prior approval by ADEC is required to dispose of contaminated soil or groundwater as defined in 18 AAC 75.325(i) or 18 AAC 78.600(h).

Additional specific ARARs applicable to this proposed plan are contained within 18 AAC 60.396, 18 AAC 60.815, and 18 AAC 60.860 which address post closure care and corrective action requirements related to the requested closure of unpermitted landfills.

3.3 Primary Balancing Criteria

Short-term effectiveness (any adverse effects during implementation)

The short-term impacts of alternatives shall be assessed considering the following:

- (1) Short-term risks that might be posed to the community during implementation of an alternative;
- (2) Potential impacts on workers during remedial action and the effectiveness and reliability of protective measures;
- (3) Potential environmental impacts of the remedial action and the effectiveness and reliability of mitigative measures during implementation; and
- (4) Time until protection is achieved.

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Long-term effectiveness and permanence

Alternatives shall be assessed for the long-term effectiveness and permanence they afford, along with the degree of certainty that the alternative will prove successful. Factors that shall be considered, as appropriate, include the following:

- (1) Magnitude of residual risk remaining from untreated waste or treatment residuals remaining at the conclusion of the remedial activities. The characteristics of the residuals should be considered to the degree that they remain hazardous, taking into account their volume, toxicity, mobility, and propensity to bioaccumulate.
- (2) Adequacy and reliability of controls such as containment systems and institutional controls that are necessary to manage treatment residuals and untreated waste. This factor addresses in particular the uncertainties associated with land disposal for providing long-term protection from residuals; the assessment of the potential need to replace technical components of the alternative, such as a cap, a slurry wall, or a treatment system; and the potential exposure pathways and risks posed should the remedial action need replacement.

Implementability (ease of construction and operation, and availability of resources)

The ease or difficulty of implementing the alternatives shall be assessed by considering the following types of factors as appropriate:

- (1) Technical feasibility, including technical difficulties and unknowns associated with the construction and operation of a technology, the reliability of the technology, ease of undertaking additional remedial actions, and the ability to monitor the effectiveness of the remedy.
- (2) Administrative feasibility, including activities needed to coordinate with other offices and agencies and the ability and time required to obtain any necessary approvals and permits from other agencies (for off-site actions);
- (3) Availability of services and materials, including the availability of adequate off-site treatment, storage capacity, and disposal capacity and services; the availability of necessary equipment and specialists, and provisions to ensure any necessary additional resources; the availability of services and materials; and availability of prospective technologies.

Cost

The types of costs that shall be assessed include the following:

- (1) Capital costs, including both direct and indirect costs;
- (2) Annual operation and maintenance costs; and
- (3) Net present value of capital and operations and maintenance (O&M) costs.

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Reduction in toxicity, mobility, or volume through treatment

The degree to which alternatives employ recycling or treatment that reduces toxicity, mobility, or volume shall be assessed, including how treatment is used to address the principal threats posed by the site. Factors that shall be considered, as appropriate, include the following:

- (1) The treatment or recycling processes the alternatives employ and materials they will treat;
- (2) The amount of hazardous substances, pollutants, or contaminants that will be destroyed, treated, or recycled;
- (3) The degree of expected reduction in toxicity, mobility, or volume of the waste due to treatment or recycling and the specification of which reduction(s) are occurring;
- (4) The degree to which the treatment is irreversible;
- (5) The type and quantity of residuals that will remain following treatment, considering the persistence, toxicity, mobility, and propensity to bioaccumulate of such hazardous substances and their constituents; and
- (6) The degree to which treatment reduces the inherent hazards posed by principal threats at the site.

3.4 Modifying Criteria

State Acceptance

Assessment of state concerns may not be completed until comments on the Remedial Investigation/ Feasibility Study (RI/FS) are received but may be discussed, to the extent possible, in the proposed plan issued for public comment. The state concerns that shall be assessed include the following:

- (1) The state's position and key concerns related to the preferred alternative and other alternatives; and
- (2) State comments on ARARs or the proposed use of waivers.

Community Acceptance

This assessment includes determining which components of the alternatives interested persons in the community support, have reservations about, or oppose. This assessment may not be completed until comments on the proposed plan are received.

4.0 Coordination of the Proposed Plan

The *Draft Proposed Plan for Nine Installation Restoration Program Sites, Fort Greely, Alaska*, was prepared and provided to ADEC for comment early in 2008. ADEC's comments were incorporated and the document was released for public comment on May 1, 2008. The comment period ended on June 15, 2008. The document released for public comment can be found at

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<http://www.smdcen.us/rabfga/pages/documents.asp>. Comments were received from one individual and those comments and responses are included as Appendix A.

5.0. Decision Summary

5.1 Former Landfills

The former landfills proposed for closeout were non-permitted landfills used in the 1950s and 1960s. The landfills have been investigated and have not shown any degradation to the groundwater or surrounding soil.

5.1.1 Landfill 1, BRAC Site 31

Landfill 1 was operational from the early days of FGA through 1953. The size of the landfill is approximately 1.8 acres but the exact borders of the landfill are not known (estimated based on historical aerial photos). The landfill is located on the western side of FGA in an area that is isolated from the populated portions of FGA. Figure 3 shows the approximate location of Landfill 1. FGA personnel presume that the landfill was used primarily for municipal solid waste and construction and demolition waste.

The site was visually inspected and in 1999 three groundwater monitoring wells were installed in the vicinity to determine if the landfill impacted groundwater. No contaminants above the State's groundwater cleanup levels or EPA's Maximum Contaminant Limits (MCLs), or safe drinking water standards, have been detected in semi-annual sampling of BRAC Site 31 monitoring wells since 1999 (USACE AK District, 2003 and ASTS, 2008b). The thickness of the cap over the landfill is not known but no debris is visible on the surface or protruding out of the soil. The area is vegetated with low brush and small trees and is mostly level except for a few depressions. The landfill cover is not subjected to significant surface runoff (due to arid region and flat topography) and no evidence of erosion has been found.

In October of 2006 (ASTS, 2008b), eight near-surface soil samples were taken from the perimeter of the landfill. The samples were analyzed for metals, pesticides, semi-volatile organic compounds (SVOC), and volatile organic compounds (VOC). Two metals, arsenic and chromium, exceeded cleanup levels, but are within normal background concentrations (Table 1). A 1999 soil study (Jacobs, 2000) determined background soil levels of arsenic ranged from 4 milligrams per kilogram (mg/kg) to 40 mg/kg and chromium ranged from 8 mg/kg to 43 mg/kg. Sample concentrations in 2006 for arsenic were all below the 95% upper confidence level (UCL) for background levels. The range of arsenic concentrations in the 2006 samples was 10.6 mg/kg to 23.1 mg/kg. Chromium levels were all close to the UCL of 25.11 mg/kg with three samples exceeding the cleanup level of 26 mg/kg. The highest level reported was 30.2 mg/kg but that is within the upper tolerance level (UTL) of background conditions (43 mg/kg).

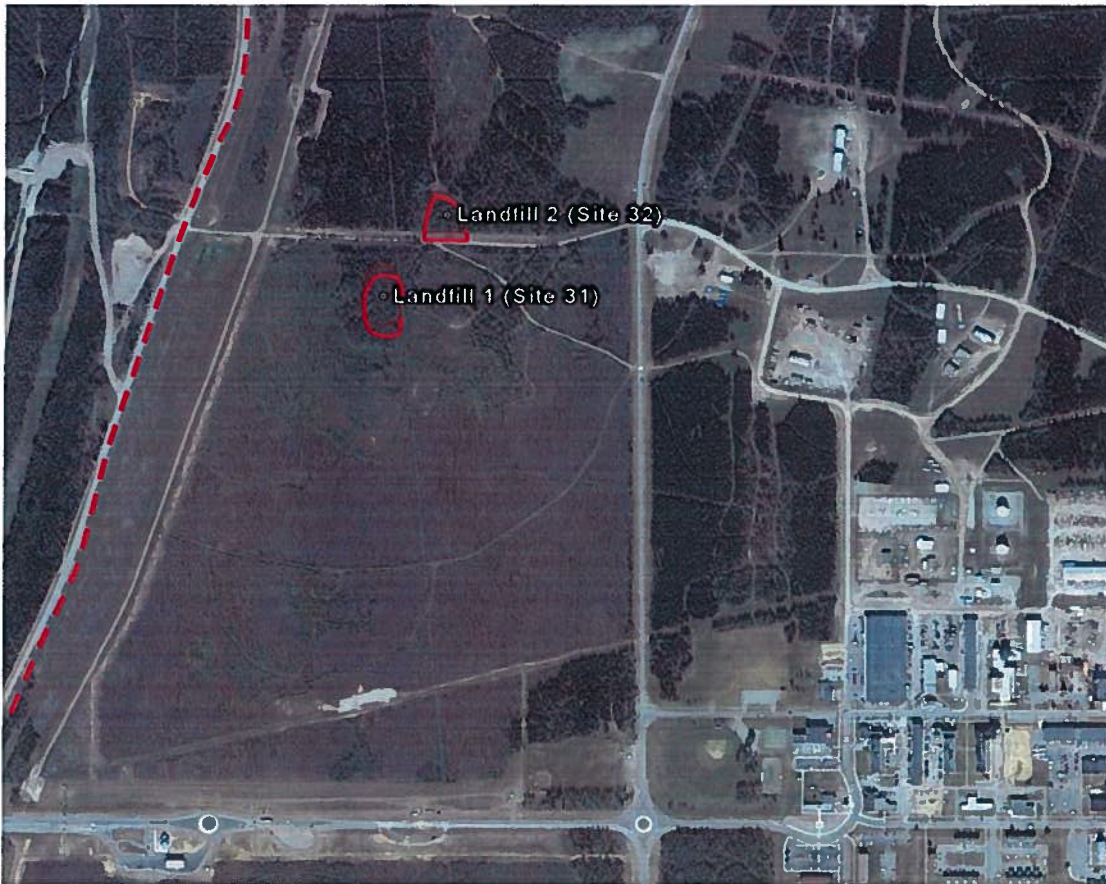


Figure 3 – Landfill 1 (Site 31) & Landfill 2 (Site 32)

Table 1 – Landfill 1 (Site 31) Soil Concentrations

Compound/ Element	Sample Date	Depth (ft)	Max Conc. (mg/kg)	Background Conc. Range (mg/kg)	Lowest Method 2 Cleanup Level (mg/kg)
Arsenic	Oct 06	1	23.1	4 to 40	2 – Migration to GW
Chromium	Oct 06	1	30.2	8 to 43	26 – Migration to GW

Bold = concentration exceeds ADEC Method 2 Cleanup levels

5.1.1.1 Alternatives Considered in Proposed Plan

Alternative 1: No Action Alternative

The no action alternative is considered as the baseline alternative. The alternative would discontinue all actions on the site. The alternative would be considered protective (and therefore meet the threshold criteria) as no contaminants have been discovered above Method 2/Method 3 cleanup levels (as discussed above). The alternative would be effective for the short-term, but would have unknown long-term effectiveness and permanence since no dig restrictions, land use

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controls, or five-year reviews would be implemented to ensure long-term effectiveness. The no action alternative would be easiest to implement, have the lowest cost, and would not reduce the toxicity, mobility, or volume of any remaining contaminants.

Alternative 1 Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - None
- Engineering Controls
 - Existing soil cap
- Five-Year Reviews
 - None
- Groundwater Monitoring
 - None
- Remedial Actions
 - None

Alternative 2: Dig Restrictions, Land Use Restrictions, and Five-Year Reviews (Preferred Alternative in Proposed Plan)

Alternative 2 would utilize the Fort Greely administrative controls database to control sub-surface intrusions into the landfill and prevent the land usage from changing (preventing construction on the plot of land). Site information would be added into the database. Fort Greely's dig control process requires approval from the environmental office prior to conducting any subsurface activities. The environmental office's review process would include consulting the administrative controls database to determine if the proposed activities violate any of the land use restrictions placed on the property or if digging is restricted due to potential subsurface contamination. Five-Year reviews would be conducted in accordance with EPA's *Comprehensive Five-Year Review Guidance* to ensure dig restrictions and land use controls are effective. The Five-Year review report will be submitted to ADEC for review and comment. The final Five-Year review report will be included in the administrative record and copies provided to ADEC and EPA. An annual inspection will be conducted until the first Five-Year review to confirm that the site is not deteriorating. A Letter of Finding will be provided to ADEC to document the inspection. This alternative would have better long-term effectiveness, would still be easily implementable, have minimal costs, and would not reduce the toxicity, mobility, or volume of any remaining contaminants.

Alternative 2 Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - No Sub-surface intrusion or construction without coordination with ADEC and remediation if required.

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- Restrictions maintained in Ft. Greely's Administrative Control GIS Database and Master Plan
- Dig Permits Required
- No water wells to be installed within or immediately downgradient of site
- Engineering Controls
 - Existing soil cap
- Five-Year Reviews
 - Dig restriction effectiveness
 - Land-use control effectiveness
 - Report
- Annual Visual Inspection until first Five-Year Review
 - Letter of Findings
- Groundwater Monitoring
 - None
- Remedial Actions
 - None

Alternative 3: Groundwater Monitoring, Dig Restrictions, Land Use Restrictions, and Five-Year Reviews

Alternative 3 is the same as alternative 2, except the current program of groundwater monitoring would continue. Groundwater samples for volatile organic contaminants are currently collected during the spring and fall of even numbered years. This groundwater monitoring would add additional assurances that the contents of the landfill are not migrating downward. The costs of the groundwater monitoring (including reporting) is currently about \$3,000 per well per event. Therefore, the sampling of three wells twice a year on even numbered years would cost approximately \$18,000 every two years until the groundwater monitoring is discontinued. All other evaluation criteria would be similar to Alternative 2. The top of the groundwater aquifer is approximately 200 feet below the ground surface and the area is considered arid (less than 40 inches of precipitation per year). Considering these two factors which hinder contaminants from reaching the groundwater and the fact that the landfill has been closed for more than 50 years, Fort Greely personnel believe sufficient groundwater monitoring downgradient of the landfill has been completed (monitoring from 1999-2007 has shown no contaminants above MCLs or state cleanup levels).

Alternative 3 Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - No Sub-surface intrusion or construction without coordination with ADEC and remediation if required

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- Restrictions maintained in Ft. Greely's Administrative Control GIS Database and Master Plan
- Dig Permits Required
- No water wells to be installed within or immediately downgradient of site
- Engineering Controls
 - Existing soil cap
- Five-Year Reviews
 - Dig restriction effectiveness
 - Land-use control effectiveness
 - Report
- Annual Visual Inspection until first Five-Year Review
 - Letter of Findings
- Groundwater Monitoring
 - Number of wells to be sampled – 3
 - Sampling frequency – Twice a year, on even numbered years, until monitoring is discontinued
 - Report
- Remedial Actions
 - None

5.1.1.2 Selected Alternative and Responsiveness Summary

The Selected Alternative is Alternative 2 (see above for details): Dig Restrictions, Land Use Restrictions, and Five-Year Reviews

After evaluation of comments received, the Army (with ADEC concurrence) has decided to proceed with Alternative 2. The comment received essentially agreed with the preferred alternative (stating that dig restrictions were warranted but groundwater monitoring was not warranted). Five-Year reviews would be used to confirm that Dig Restrictions and Land Use Restrictions remain effective. Five-Year reviews and its subsequent reports will be in accordance with EPA's *Comprehensive Five-Year Review Guidance*. The Five-Year review report will be submitted to ADEC for review and comment. The final Five-Year review report will be included in the administrative record and copies provided to ADEC and EPA. Dig Restrictions and Land Use restrictions would consist of denoting the site in the Administrative Controls GIS Database. The Administrative Controls GIS Database is used by the Fort Greely Department of Public Works (DPW) to evaluate dig permits (any activity requiring ground penetration) and is used by the Master Planner in planning future activities. DPW staff would evaluate if the proposed dig activity or change in land use would increase potential exposure to contaminants. Increased exposure to contaminants would not be allowed without engineering controls to mitigate exposure. Change in land use and digging would not necessarily be

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prohibited, but potential exposure must be evaluated prior to the dig activity or change in land use. An annual inspection will be conducted until the first Five-Year review to confirm that the site is not deteriorating. A Letter of Finding will be provided to ADEC to document the inspection. The letter would include site identification, date of visual inspection, personnel performing the visual inspection, a brief summary describing site condition, and photographs supporting the summary.

Selected Alternative Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - No Sub-surface intrusion or construction without coordination with ADEC and remediation if required
 - Restrictions maintained in Ft. Greely's Administrative Control GIS Database and Master Plan
 - Dig Permits Required
 - No water wells to be installed within or immediately downgradient of site
- Engineering Controls
 - Existing soil cap
- Five-Year Reviews
 - Dig restriction effectiveness
 - Land use control effectiveness
 - Site Visit and Site Walk
 - Report
- Annual Visual Inspection until first Five-Year Review
 - Letter of Findings
 - Brief statement of site conditions
 - Pictures
- Groundwater Monitoring
 - None
- Remedial Actions
 - None

5.1.2 Landfill 2, BRAC Site 32

Little is known about Landfill 2 but it was closed prior to 1953. Landfill 2 is located just about 200 yards northeast of Landfill 1 (see Figure 2). The accurate size (estimated from historical aerial photography) and start date of the landfill are unknown, but the landfill probably occupied roughly 1 acre of land. The landfill is believed to have accepted sanitary wastes.

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Landfill 2 was investigated in 1999 at the same time as Landfill 1. The two landfills utilize the same monitoring wells due to their proximity.

Four near-surface soil samples were taken from the downgradient side (northeast) of Landfill 2 in October of 2006 (ASTS, 2008b). Table 2 highlights the results. The arsenic and chromium results fall within established background results for Fort Greely and are not considered contaminants from anthropogenic sources. Only one sample out of the four soil samples collected contained benzo(a)pyrene and dibenzo(a,h)anthracene at levels of 3.41 and 1.81 mg/kg which is above ADEC Method 2 cleanup level of 1 mg/kg for both compounds. A duplicate sample was taken from this same location and results were similar (3.73 mg/kg benzo(a)pyrene and 1.74 mg/kg dibenzo(a,h)anthracene). These compounds are polycyclic aromatic hydrocarbons (PAH) that are byproducts from the incomplete combustion of organic materials. These compounds are believed to be a result of ash and soot deposition from the forest fire that swept through Fort Greely in 1999.

Table 2 – Landfill 2 (Site 32) Soil Concentrations

Compound/ Element	Sample Date	Depth (ft)	Max Conc. (mg/kg)	Background Conc. Range	Lowest Method 2 Cleanup Level (mg/kg)
Arsenic	Oct 06	1	21.7	4 to 40 mg/kg	2 – Migration to GW
Chromium	Oct 06	1	27.8	8 to 43 mg/kg	26 – Migration to GW
Benzo(a) pyrene	Oct 06	1	3.73*	NA	1 – Ingestion 3 – Migration to GW
Dibenzo(a,h) anthracene	Oct 06	1	1.81**	NA	1 – Ingestion 6 – Migration to GW

* = Value exceeds Method 2 Cleanup Levels for both Migration to Groundwater and Ingestion

** = Estimated value that falls below the practical quantitation limit (PQL), but is greater than the method detection limit (MDL).

5.1.2.1 Alternatives Considered in Proposed Plan

Alternative 1: No Action Alternative

The no action alternative is considered as the baseline alternative. The alternative would discontinue all actions on the site. The alternative would be considered protective (and therefore meet the threshold criteria) as no contaminants have been discovered above Method 2/Method 3 cleanup levels (as discussed above). The alternative would be effective for the short-term, but would have unknown long-term effectiveness and permanence since no dig restrictions, land use controls, or five-year reviews would be implemented to ensure long-term effectiveness. The no action alternative would be easiest to implement, have the lowest cost, and would not reduce the toxicity, mobility, or volume of any remaining contaminants.

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Alternative 1 Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - None
- Engineering Controls
 - Existing soil cap
- Five-Year Reviews
 - None
- Groundwater Monitoring
 - None
- Remedial Actions
 - None

Alternative 2: Dig Restrictions, Land Use Restrictions, and Five-Year Reviews (Preferred Alternative)

Alternative 2 would utilize the Fort Greely administrative controls database to control subsurface intrusions into the landfill and prevent the land usage from changing (preventing construction on the plot of land). Site information would be added into the database. Fort Greely's dig control process requires approval from the environmental office prior to conducting any subsurface activities. The environmental office's review process would include consulting the administrative controls database to determine if the proposed activities violate any of the land use restrictions placed on the property or if digging is restricted due to potential subsurface contamination. An annual inspection will be conducted until the first Five-Year review to confirm that the site is not deteriorating. Five-Year reviews would be conducted in accordance with EPA's *Comprehensive Five-Year Review Guidance* to ensure dig restrictions and land use controls are effective. The Five-Year review report will be submitted to ADEC for review and comment. The final Five-Year review report will be included in the Administrative record and copies provided to ADEC and EPA. This alternative would have better long-term effectiveness, would still be easily implementable, have minimal costs, and would not reduce the toxicity, mobility, or volume of any remaining contaminants.

Alternative 2 Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - No Sub-surface intrusion or construction without coordination with ADEC and remediation if required
 - Restrictions maintained in Ft. Greely's Administrative Control GIS Database and Master Plan
 - Dig Permits Required
 - No water wells to be installed within or immediately downgradient of site

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- Engineering Controls
 - Existing soil cap
- Five-Year Reviews
 - Dig restriction effectiveness
 - Land-use controls effectiveness
 - Report
- Annual Visual Inspection until first Five-Year Review
 - Letter of Findings
- Groundwater Monitoring
 - None
- Remedial Actions
 - None

Alternative 3: Groundwater Monitoring, Dig Restrictions, Land Use Restrictions, and Five-Year Reviews

Alternative 3 is the same as alternative 2, except the current program of groundwater monitoring would continue. Groundwater samples for volatile organic contaminants are currently collected during the spring and fall of even numbered years. This groundwater monitoring would add additional assurances that the contents of the landfill are not migrating downward. The costs of the groundwater monitoring (including reporting) is currently about \$3,000 per well per event. Therefore, the sampling of three wells twice a year on even numbered years would cost approximately \$18,000 every two years until the groundwater monitoring is discontinued. Landfill #1, BRAC Site 31, and Landfill #2, BRAC Site 32, have shared groundwater monitoring wells. Therefore, if Alternative #3 were selected for both sites, groundwater monitoring for both sites would cost \$18,000 every two years. An annual inspection will be conducted until the first five-year review to confirm that the site is not deteriorating. All other evaluation criteria would be similar to Alternative 2. The top of the groundwater aquifer is approximately 200 feet below the ground surface and the area is considered arid (less than 40 inches of precipitation per year). Considering these two factors which hinder contaminants from reaching the groundwater and the fact that the landfill has been closed for more than 50 years, Fort Greely personnel believe sufficient groundwater monitoring downgradient of the landfill has been completed (monitoring from 1999-2007 has shown no contaminants above MCLs or state cleanup levels). Therefore, Fort Greely personnel do not believe further monitoring is warranted.

Alternative 3 Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - No Sub-surface intrusion or construction without coordination with ADEC and remediation if required

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- Restrictions maintained in Ft. Greely's Administrative Control GIS Database and Master Plan
- Dig Permits Required
- No water wells to be installed within or immediately downgradient of site
- Engineering Controls
 - Existing soil cap
- Five-Year Reviews
 - Dig restriction effectiveness
 - Land-use controls effectiveness
 - Report
- Annual Visual Inspection until first Five-Year Review
 - Letter of Findings
- Groundwater Monitoring
 - Number of wells to be sampled – 3
 - Sampling frequency – Twice a year, on even numbered years, until monitoring is discontinued
 - Report
- Remedial Actions
 - None

5.1.2.2 Selected Alternative and Responsiveness Summary

The Selected Alternative is Alternative 2 (see above for details): Dig Restrictions, Land Use Restrictions, and Five-Year Reviews

After evaluation of comments received, the Army and ADEC have agreed to proceed with Alternative 2. The comment received essentially agreed with the preferred alternative (stating that dig restrictions were warranted but groundwater monitoring was not warranted). Dig Restrictions and Land Use restrictions would consist of denoting the site in the Administrative Controls GIS Database. The Administrative Controls GIS Database is used by the Fort Greely Department of Public Works (DPW) to evaluate dig permits (any activity requiring ground penetration) and is used by the Master Planner in planning future activities. DPW staff would evaluate if the proposed dig activity or change in land use would increase potential exposure to contaminants. Increased exposure to contaminants would not be allowed without engineering controls to mitigate exposure. Change in land use and digging would not necessarily be prohibited, but potential exposure must be evaluated prior to the dig activity or change in land use. Five-Year reviews would be used to confirm that Dig Restrictions and Land Use Restrictions remain effective. Five-Year reviews and its subsequent reports will be in accordance with EPA's *Comprehensive Five-Year Review Guidance*. The Five-Year review report will be submitted to ADEC for review and comment. The final Five-Year review report

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will be included in the Administrative record and copies provided to ADEC and EPA. An annual inspection will be conducted until the first Five-Year Review to confirm that the site is not deteriorating. A letter of finding will be provided to ADEC to document the inspection. The letter would include site identification, date of visual inspection, personnel performing the visual inspection, a brief summary describing site condition, and photographs supporting the summary.

Selected Alternative Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - No Sub-surface intrusion or construction without coordination with ADEC and remediation if required
 - Restrictions maintained in Ft. Greely's Administrative Control GIS Database and Master Plan
 - Dig Permits required
 - No water wells to be installed within or immediately downgradient of site
- Engineering Controls
 - Existing soil cap
- Five-Year Reviews
 - Dig restriction effectiveness
 - Land use controls effectiveness
 - Site Visit and Site Walk
 - Report
- Annual Visual Inspection until first Five-Year Review
 - Letter of Findings
 - Brief statement of site conditions
 - Pictures
- Groundwater Monitoring
 - None
- Remedial Actions
 - None

5.1.3 Landfills 4 & 5, BRAC Site 88

Landfills 4 and 5 are adjacent to each other and are considered one site. They were utilized in the 1960s. The site is located northeast of the main cantonment area of FGA and occupies approximately 6 acres as shown on Figure 4. These landfills are believed to have accepted sanitary wastes, metals, and ash, which were buried in trenches. Landfill #4 was closed in 1969

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and Landfill #5 was closed prior to 1962. Currently, the northern portion of the area serves as a picnic area and a skeet shooting range.

The site was investigated in 1997 by Jacobs Engineering Group (Jacobs, 1998). Soil samples taken just outside the perimeters of the landfills, as part of the site investigation, contained no contaminants above ADEC Method 2 cleanup levels. Table 3 contains the results of the investigation.

Three groundwater monitoring wells were installed in 1999 to determine if the landfill leachate was impacting the groundwater. In 1999 bis(2ethylhexyl)phthalate (suspected of being a laboratory contaminant in this sampling event) exceeded ADEC groundwater cleanup level but all other analyte detections were less than ADEC groundwater cleanup levels (Jacobs, 2000). Subsequent to the 1999 sampling event, no contaminants have been detected above MCLs during semi-annual sampling events. (ASTS, 2008b)



Figure 4 – Landfills 4 & 5 (Site 88)

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Table 3 – Landfills 4 & 5 (Site 88) Soil Concentration

Compound/Element	Sample Date	Depth (ft)	Max Conc. (mg/kg)	Lowest Method 2 Cleanup Level (mg/kg)
DRO	Sep 97	12.5 – 32	<4.3	250 – Migration to GW
GRO	Sep 97	12.5 – 14.5	4.6	300 – Migration to GW
Aldrin	Sep 97	10 – 16.4	0.002	0.5 – Ingestion
4,4 - DDT	Sep 97	10 – 31.8	0.003	24 – Ingestion
Chloroform	Sep 97	17.5 – 19.5	0.0011	0.34 – Migration to GW
Bis(2ethylhexyl)phthalate	Sep 99	NA	0.01 (mg/L)	0.006 (mg/L)

In 2004, 10 passive soil gas modules were placed on the northern (downgradient) side of the landfills to confirm that no contamination was migrating offsite. None of the modules detected Total Petroleum Hydrocarbons (TPH) or VOCs at levels of significant magnitude or frequency.

5.1.3.1 Alternatives Considered in Proposed Plan

Alternative 1: No Action Alternative

The no action alternative is considered as the baseline alternative. The alternative would discontinue all actions on the site. The alternative would be considered protective (and therefore meet the threshold criteria) as no contaminants have been discovered above Method 2/Method 3 cleanup levels (as discussed above). The alternative would be effective for the short-term, but would have unknown long-term effectiveness and permanence since no dig restrictions, land use controls, or five-year reviews would be implemented to ensure long-term effectiveness. The no action alternative would be easiest to implement, have the lowest cost, and would not reduce the toxicity, mobility, or volume of any remaining contaminants.

Alternative 1 Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - None
- Engineering Controls
 - Existing soil cap
- Five-Year Reviews
 - None
- Groundwater Monitoring
 - None

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- Remedial Actions
 - None

Alternative 2: Dig Restrictions, Land Use Restrictions, and Five-Year Reviews

Alternative 2 would utilize the Fort Greely administrative controls database to control subsurface intrusions into the landfill and prevent the land usage from changing (preventing construction on the plot of land). Dig restrictions, well installation restrictions, and land use controls are in place to prevent exposing the contents of the former landfills. Future land use will be restricted to industrial or “green space” (no usage, or uses that do not have intrusions into the subsurface like the current skeet range usage). Land use restrictions are also in place to prevent installation of drinking water wells in the groundwater immediately downgradient of the landfills. A review will be conducted every five years to ensure that the restrictions and protection programs are being maintained properly and that site conditions have not changed. Five-Year reviews and its subsequent report will be in accordance with EPA’s *Comprehensive Five-Year Review Guidance*. The Five-Year review report will be submitted to ADEC for review and comment. The final Five-Year review report will be included in the Administrative record and copies provided to ADEC and EPA. Fort Greely’s dig control process requires approval from the environmental office prior to conducting any subsurface activities. The environmental office’s review process would include consulting the administrative controls database to determine if the proposed activities violate any of the land use restrictions placed on the property or if digging is restricted due to potential subsurface contamination. An annual inspection will be conducted until the first Five-Year Review to confirm that the site is not deteriorating. A letter of finding will be provided to ADEC to document the inspection. The letter would include site identification, date of visual inspection, personnel performing the visual inspection, a brief summary describing site condition, and photographs supporting the summary. This alternative would have better long-term effectiveness, would still be easily implementable, have minimal costs, and would not reduce the toxicity, mobility, or volume of any remaining contaminants.

Alternative 2 Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - No Sub-surface intrusion or construction without coordination with ADEC and remediation if required
 - Restrictions maintained in Ft. Greely's Administrative Control GIS Database and Master Plan
 - Dig Permits Required
- Engineering Controls
 - Existing soil cap
- Five-Year Reviews
 - Dig restriction effectiveness
 - Land-use control effectiveness

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- Report
- Annual Visual Inspection until first Five-Year Review
 - Letter of Findings
- Groundwater Monitoring
 - None
- Remedial Actions
 - None

Alternative 3: Limited Groundwater Monitoring, Dig Restrictions, Land Use Restrictions, and Five-Year Reviews (Preferred Alternative)

Alternative 3 is the same as Alternative 2, except downgradient groundwater monitoring wells would be sampled at the first Five-Year review. Results of the groundwater monitoring at the first five-year review would be used to determine if groundwater monitoring would be discontinued at that time. This groundwater monitoring would add additional assurances that the contents of the landfill are not migrating downward. The costs of the groundwater monitoring (including reporting) is currently about \$3,000 per well per event. Therefore, the sampling of two wells during a five-year reviews would cost approximately \$6,000 every five-year review until the groundwater monitoring is discontinued. An annual inspection will be conducted until the first five-year review to confirm that the site is not deteriorating. All other evaluation criteria would be similar to Alternative 2. The top of the groundwater aquifer is approximately 200 feet below the ground surface and the area is considered arid (less than 40 inches of precipitation per year). Considering these two factors which hinder contaminants from reaching the groundwater and the fact that the landfill has been closed for more than 40 years, Fort Greely personnel believe sufficient groundwater monitoring downgradient of the landfill has been completed (monitoring from 1999-2007 has shown no contaminants above MCLs or state cleanup levels). However, due to previous detections of some contaminants at low levels, sampling at the first five-year review is warranted to confirm contaminants are not impacting the aquifer.

Alternative 3 Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - No Sub-surface intrusion or construction without coordination with ADEC and remediation if required
 - Restrictions maintained in Ft. Greely's Administrative Control GIS Database and Master Plan
 - Dig Permits Required
- Engineering Controls
 - Existing soil cap
- Five-Year Reviews
 - Dig restriction effectiveness

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- Land-use controls effectiveness
- Report
- Annual Visual Inspection until first Five-Year Review
 - Letter of Findings
- Groundwater Monitoring
 - Number of wells to be sampled – 2
 - Sampling frequency – At first Five-Year Review, subsequent sampling based on results
 - Reporting
- Remedial Actions
 - None

5.1.3.2 Selected Alternative and Responsiveness Summary

The Selected Alternative is Alternative 3 (see above for details): Limited Groundwater Monitoring, Dig Restrictions, Land Use Restrictions, and Five-Year Reviews

After evaluation of comments received, the Army and ADEC have agreed to proceed with Alternative 3. The comment received partially agreed with the preferred alternative (stating that dig restrictions were warranted but groundwater monitoring was not warranted). ADEC has requested that one additional round of groundwater monitoring be completed at the first Five-Year review due to the historical detections of low levels of solvents in the monitoring wells downgradient of Landfills 4 & 5. Dig Restrictions and Land Use restrictions would consist of denoting the site in the Administrative Controls GIS Database. The Administrative Controls GIS Database is used by the Fort Greely Department of Public Works (DPW) to evaluate dig permits (any activity requiring ground penetration) and is used by the Master Planner in planning future activities. DPW staff would evaluate if the proposed dig activity or change in land use would increase potential exposure to contaminants. Increased exposure to contaminants would not be allowed without engineering controls to mitigate exposure. Change in land use and digging would not necessarily be prohibited, but potential exposure must be evaluated prior to the dig activity or change in land use. An annual inspection will be conducted until the first Five-Year Review to confirm that the site is not deteriorating. A letter of finding will be provided to ADEC to document the inspection. The letter would include site identification, date of visual inspection, personnel performing the visual inspection, a brief summary describing site condition, and photographs supporting the summary. Five-Year reviews would be used to confirm that Dig Restrictions and Land Use Restrictions remain effective. Five-Year reviews and its subsequent reports will be in accordance with EPA's *Comprehensive Five-Year Review Guidance*. The Five-Year review report will be submitted to ADEC for review and comment. The final Five-Year review report will be included in the Administrative record and copies provided to ADEC and EPA. The first Five-Year review will also include the groundwater sampling of the two downgradient wells during the month of September.

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Selected Alternative Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - No Sub-surface intrusion or construction without coordination with ADEC and remediation if required
 - Restrictions maintained in Ft. Greely's Administrative Control GIS Database and Master Plan
 - Dig Permits Required
- Engineering Controls
 - Existing soil cap
- Five-Year Reviews
 - Dig restriction effectiveness
 - Land use controls effectiveness
 - Site Visit and Site Walk
 - Report
- Annual Visual Inspection until the first Five-Year Review
 - Letter of Findings
 - Brief statement of site conditions
 - Pictures
- Groundwater Monitoring
 - Number of wells to be sampled – 2
 - Sampling frequency – At first Five-Year Review, subsequent sampling based on results
- Remedial Actions
 - None

5.2 Former Laundry Facility at Former Building 157, BRAC Site 103

Building 157 was the laundry facility for FGA until sometime in the 1960s. The building was located in the Old Post area of FGA and was torn down some time in the late 1960s. Figure 5 shows the location of Building 157 in 1957. Figure 6 shows the site as it was in 2007.

Building 157 was investigated from 1997 to 2000 due to old underground storage tanks (USTs), known as Tank 398 and Tank 400, that had been left at the site after Building 157 had been torn down.

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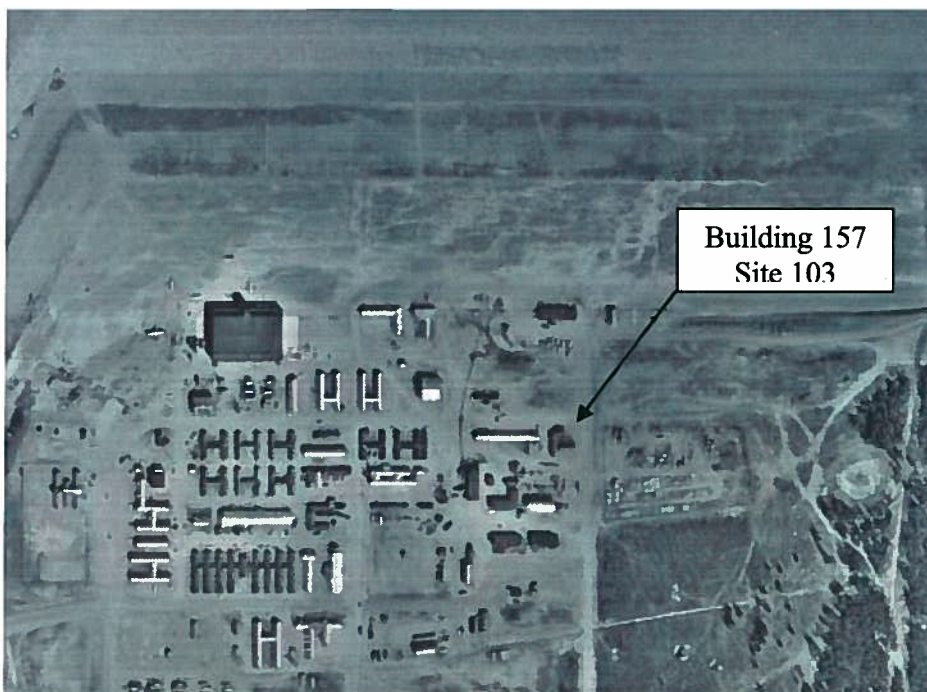


Figure 5 – 1957 Aerial Photo of Building 157 (Site 103)

The initial 1997 investigation involved a geophysical survey and sampling from depths of 2 to 4 feet beneath the two USTs (Jacobs, 1998). Samples from soils associated with Tank 400 were analyzed for VOCs to assess the potential impact of former dry cleaning operations. Two VOC constituents were detected: trichlorofluoromethane at 0.04 mg/kg, and methylene chloride at 0.32 mg/kg. See Table 4. No cleanup values are available in the regulations for trichlorofluoromethane (commonly called R-11 or Freon-11). The methylene chloride detections were above ADEC Method 2 Cleanup levels but were concluded to be a result of laboratory contamination after the 1997 laboratory data had been finalized (Jacobs, 1998).

In May 1998, the two tanks were removed by Rockwell. Diesel contaminated soils [136 cubic yards (CY)] associated with the excavation of Tank 400 was moved to a location adjacent to the Fort Greely landfill for landfarm treatment. Clean soils associated with the excavation of Tank 398 were backfilled.



Figure 6 – 2007 Aerial Photo of Site of Former Building 157 (Site 103)

After removal of the tanks, soil samples were collected from the base of the excavation area. Samples were analyzed for Diesel Range Organics (DRO), Gasoline Range Organics (GRO), Residual Range Organics (RRO), Polycyclic Aromatic Hydrocarbons (PAHs), and Benzene, Toluene, Ethylbenzene, and Xylene (BTEX). Additionally, Tank 398 confirmation sampling also included analysis for chlorinated hydrocarbons using EPA Method 8260. At the site of Tank 400, the highest level of contamination was DRO at 2700 mg/kg at 7' bgs and 2180 mg/kg at 12' bgs (three of five samples were above ADEC Method 2 criteria). See Table 4. Further investigation was required to delineate the lateral and vertical extent of impacted soils associated with former Tank No. 400 (Rockwell, 1992). No contamination above screening levels was discovered below Tank 398.

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Table 4 – Building 157 (BRAC Site 103) Soil Concentrations from 1998 RI

Compound/Element	Sample Date	Depth (ft)	Max Conc. (mg/kg)	Lowest Method 2 Cleanup Level (mg/kg)
Trichlorofluoromethane (Tank 400)	Aug 97	12.5 – 32	0.04	250 – Migration to GW
Methyl Chloride (Tank 400)	Aug 97	12.5 – 14.5	0.32	300 – Migration to GW
DRO	Aug 97	10 – 12	2700 (T-400)	250 – Migration to GW
	May 98	7	2700 (T-400)	
	May 98	12	2180 (T-400)	
	Sep 98	35 – 36	160 (T-400)	
Chlorinated Hydrocarbons (EPA Method 8260 - Tank 398)	May 98	12-13	ND (<0.046)	varies
DRO (Tank 398)	May 98	12-13	36.3	250 – Migration to GW
GRO (Tank 398)	May 98	12-13	1.29	300 – Migration to GW
Benzene (Tank 398)	May 98	12-13	ND (<0.04)	0.025 – Migration to GW
Toluene (Tank 398)	May 98	12-13	ND (<0.04)	6.9 – Migration to GW
Ethylbenzene (Tank 398)	May 98	12-13	ND (<0.04)	6.5 – Migration to GW
Xylenes, Total (Tank 398)	May 98	12-13	0.053	63 – Migration to GW

Bold = concentration exceeds ADEC Method 2 Cleanup levels

Follow-up soil sampling at the Tank 400 excavation area in September 1998 (See Table 4) did not detect contamination above ADEC Method 2 cleanup levels. Three borings were installed at depths that ranged from 30 to 41 feet bgs. Three samples from corresponding depths with the highest volatile headspace readings were submitted for laboratory analysis. The highest DRO concentration recorded was 160 mg/kg. Low levels of PAHs and RRO were detected, but well under ADEC Method 2 cleanup levels (Jacobs, 1999). Conditions at the Tank 398 excavation area did not warrant further investigation.

In 2004 the site was part of a large passive soil gas survey. Modules were placed on a 50 foot grid over the former building location and the surrounding area. Relatively low levels of TPH and VOCs in the modules confirmed that this site did not warrant further investigation (ASTS, 2005). Confirmation sample results from the Tank 400 removal are considered isolated and not indicative of general soil contaminant levels since the follow-up investigation did not reveal contaminants above ADEC Method 2 cleanup levels.

After the release of the Proposed Plan for public comment, the Army prepared the 2008 *Underground Injection Control Closure Plan, Building 157 (BRAC 103) Dry Well, Fort Greely,*

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Alaska, and submitted the plan to EPA Region X's UIC Office in Seattle, WA. Tank 398 had been included in Fort Greely's dry well inventory registered with EPA. EPA issued a closure letter for Tank 398 in November 2008 and the letter is included in Appendix B.

5.2.1 Alternatives Considered in Proposed Plan

Alternative 1: No Further Action Alternative

The no action alternative is considered as the baseline alternative. The alternative would discontinue all actions on the site. Follow-up investigations after the UST removals at the former laundry facility have not revealed any remaining contamination above ADEC Method 2 cleanup levels. Site 103, Building 157 will be closed as a No Further Remedial Action Planned (NFRAP) site since the tank removal in 1998 appears to have removed majority of contamination (except for isolated removal confirmation sample results mentioned above). The alternative would be considered protective (and therefore meet the threshold criteria) as general soil conditions are below Method 2/Method 3 cleanup levels (as discussed above). Notations would be added to the Fort Greely Administrative Controls GIS database indicating diesel contamination has been found in this area (and still a possibility) but follow-up investigations did not confirm remaining contamination. The alternative would be effective for the short-term, but would have unknown long-term effectiveness and permanence since no dig restrictions, land use controls, or five-year reviews would be implemented to ensure long-term effectiveness. The no action alternative would be easiest to implement, have the lowest cost, and would not reduce the toxicity, mobility, or volume of any remaining contaminants.

Alternative 1 Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - None except notation in Fort Greely's Administrative Controls GIS database that possibility of diesel contamination still remains
- Engineering Controls
 - None
- Five-Year Reviews
 - None
- Remedial Actions
 - None

Alternative 2: No Further Remedial Action with Five-Year Reviews

Alternative 2 would be similar to Alternative 1 except Five-Year Reviews would be conducted to ensure long-term effectiveness. The Five-Year Reviews would be conducted periodically to determine whether site conditions have changed (i.e. new contamination revealed). Five-Year reviews and its subsequent reports will be in accordance with EPA's *Comprehensive Five-Year Review Guidance*. The Five-Year review report will be submitted to ADEC for review and comment. The final Five-Year review report will be included in the Administrative record and copies provided to ADEC and EPA. Five-Year Reviews would consist of a site visit/site walk

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and records review of Fort Greely Department of Public Works' work orders and dig permits/dig permit process. The site visit and records reviews would be used to confirm new contaminants have not been discovered. Five-Year Reviews would have minimal costs every five years. These Five-Year Reviews would insure the alternative remains protective.

- Land Use Restrictions and Institutional Controls
 - None except notation in Fort Greely's Administrative Controls GIS database that possibility of diesel contamination still remains
- Engineering Controls
 - None
- Five-Year Reviews
 - Records Review
 - Work Orders
 - Dig Permits
 - Dig Permit Process
 - Site Visit/Site Walk
 - Reporting
- Remedial Actions
 - None

Alternative 3: No Further Remedial Action with Dig Restrictions, Land Use Restrictions, and Five-Year Reviews (Preferred Alternative)

Alternative 3 is similar to Alternative 2, but would also utilize the Fort Greely administrative controls database to control sub-surface intrusions into the location of the former laundry and prevent the land usage from changing (preventing construction on the plot of land). Site notices would be placed into the dig restriction database (denoting the investigations of past activities did reveal isolated contamination and there still remains a potential for contamination to be encountered at these locations). Dig restrictions and land use controls would be put in place to prevent subsurface intrusion. Future land use will be restricted to industrial or "green space" (no usage). A review will be conducted every five years to ensure that the restrictions and protection programs are being maintained properly and that site conditions have not changed. Five-Year reviews and its subsequent reports will be in accordance with EPA's *Comprehensive Five-Year Review Guidance*. The Five-Year review report will be submitted to ADEC for review and comment. The final Five-Year review report will be included in the Administrative record and copies provided to ADEC and EPA. Fort Greely's dig control process requires approval from the environmental office prior to conducting any subsurface activities. The environmental office's review process would include consulting the administrative controls database to determine if the proposed activities violate any of the land use restrictions placed on the property or if digging is restricted due to potential subsurface contamination. This alternative would have better long-term effectiveness, would still be easily implementable, have minimal costs (but

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slightly more than Alternatives 1 and 2), and would not reduce the toxicity, mobility, or volume of any remaining contaminants.

Alternative 3 Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - No Sub-surface intrusion or construction without coordination with ADEC and remediation if required
 - Restrictions maintained in Ft. Greely's Administrative Control GIS Database and Master Plan
 - Dig Permits Required
- Engineering Controls
 - None
- Five-Year Reviews
 - Dig restriction effectiveness
 - Land-use control effectiveness
 - Report
- Remedial Actions
 - None

5.2.2 Selected Alternative and Responsiveness Summary

The Selected Alternative is Alternative 1 (see above for details): No Further Remedial Action Planned

After evaluation of comments received and receipt of Underground Injection Control Program closure letter from EPA, the Army and ADEC have agreed to proceed with Alternative 1. The comment received essentially agreed that further action was not warranted. The commenter did state dig restrictions could be used if needed. However, since follow-up investigations did not find contaminants above Method 2 cleanup levels, the Army has determined that dig restrictions, land use controls, and Five-Year reviews are not necessary.

Selected Alternative Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - None except notation in Fort Greely's Administrative Controls GIS database that possibility of diesel contamination still remains
- Engineering Controls
 - None

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- Five-Year Reviews
 - None
- Remedial Actions
 - None

5.3 SM-1A Nuclear Reactor Wastewater Pipeline

This Record of Decision includes planned closeout activities for the 3 sites that make up the former SM-1A Nuclear Reactor Wastewater Pipeline. These 3 sites include:

1. SM-1A Nuclear Reactor Wastewater Pipeline, East (BRAC Site 90) – this site also includes the dilution well and the 1999 removal action laydown yard.
2. SM-1A Nuclear Reactor Wastewater Pipeline, West (BRAC Site 132)
3. Suspected Fuel Spill on Station 21+25 on the SM-1A Nuclear Reactor Wastewater Pipeline

5.3.1 SM-1A Nuclear Reactor Wastewater Pipeline (BRAC Sites 90 and 132)

The Fort Greely SM-1A reactor pipeline was operated from 1962 through 1967. This shallow waste pipeline was used to transport low-level radioactive liquid wastewater from the reactor complex to a dilution station (where it was mixed with water to dilute it until concentrations of contaminants were below discharge levels) before being discharged into Jarvis Creek. At the dilution station, groundwater was pumped to the surface from a dilution water well and mixed with the pipeline wastewater until contaminants were sufficiently diluted to meet discharge levels. The diluted wastewater was then discharged to Jarvis Creek. The pipeline route and dilution well location are shown in Figure 7. The pipeline reportedly froze and ruptured several times during winter months, resulting in contamination of adjacent soil. The former SM-1A pipeline extended from the reactor north, then east, then southeast between landfills 4 and 5, and then northeast to the outfall at Jarvis Creek. The SM-1A pipeline and associated contaminated soil were removed in 1997-1999 (Jacobs, 2002a). A laydown yard was utilized to consolidate material prior to off-site shipment. The laydown yard was located near the intersection of Arctic Avenue and Landfill Road (see Figure 7). Soil with contamination above the determined cleanup levels was removed in 1999, staged at the laydown yard until 2001, and disposed of in Richland, Washington, in 2002. The contaminated components of the dilution station (well house, concrete floor, well pump, 2.5 cubic feet of sediment at the bottom of the well, etc.) were removed in 1998. During the pipeline removal action, the dilution well was sampled to determine if the well could be closed. Although the dilution well was not used to inject wastewater into the aquifer, a small amount of radioactive contaminated sediment was discovered in the well casing of the dilution water supply well. Sediment had apparently fallen into the well during either the 1973 dilution station abandonment or the 1998 dilution station demolition activities. Groundwater samples taken in the well had strontium concentrations up to 49.9 pCi/L. The well was re-developed and subsequent groundwater sampling indicated the groundwater met safe drinking water criteria. Following 4 quarters of groundwater monitoring, the well was plugged with bentonite in the screened interval and with grout for the remaining

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portions of the well casing. The top 15 feet of well casing and the soil below the dilution station down to 15 feet below ground surface was also removed and disposed off-site.

Following completion of removal actions in September 2000, U.S. Army Corps of Engineers, Alaska District (USACE) performed a verification survey to confirm that the criteria for release for unrestricted use had been achieved.

Since no specific cleanup levels exist in ADEC's Method 2 lists for the radioactive contaminants of potential concern (COPC), unrestricted use soil criteria for the radiological CPOCs were developed by the BRAC Cleanup Team (Army, EPA, and ADEC) using a conservative exposure scenario and an all pathways total effective dose limit of 15 mrem/yr. Maximum known concentrations before the removal action were 517 pCi/g Cs-137 and 255 pCi/g Total Sr (FGA, n.d.). See Table 5. The Army used the RESRAD (Residual Radiation) dose modeling code to derive cleanup levels of 10 pCi/g Cs-137 and 4 pCi/g Sr-90. Following removal activities, the cancer risk from residual radioactive materials was analyzed and determined to meet ADEC's target risk level of 1×10^{-5} (Jacobs, May 2002a; Jacobs, May 2002b; USACE HTRW CX, Aug 2004a; USACE HTRW CX, Aug 2004b).

Table 5 – Pipeline Soil Concentrations Prior to Removal

Compound/Element	Sample Date	Depth (ft)	Max Conc.	Lowest Method 2 Cleanup Level
DRO	Jul 98	.5	53* mg/kg	250 mg/kg – Migration to GW
GRO	Jul 98	.5	1* mg/kg	300 mg/kg – Migration to GW
RRO	Jul 98	.5	170 mg/kg	10,000 mg/kg – Migration to GW
Benzene	Jul 98	.5	ND	0.02 mg/kg – Migration to GW
Toluene	Jul 98	.5	ND	5.4 mg/kg – Migration to GW
Ethylbenzene	Jul 98	.5	ND	5.5 mg/kg – Migration to GW
Xylenes	Jul 98	.5	ND	78 mg/kg – Migration to GW
Cs-137	Jun 97	**	517 pCi/g	10 pCi/g***
Total Sr	Jun 97	**	255 pCi/g	4 pCi/g for Sr-90***

* Value is less than the laboratory's reporting limit but greater than the minimum detection level

** Samples pulled from excavated material stockpiles (FGA, n.d.)

*** ADEC does not have a contaminant specific cleanup level for these radionuclides. Target cleanup level derived by BRAC Cleanup Team using RESRAD dose modeling code.

ND = Not Detected



Figure 7 – Nuclear Waste Pipeline, BRAC Sites 90 & 132 and Laydown Yard

In 2004, the United States Army Corp of Engineers (USAEC) conducted a risk assessment with a reverse risk calculation; where the exposure concentrations are calculated from the verification survey sample concentrations and compared to EPA risk based preliminary goals (or risk-based concentrations) to determine the carcinogenic risk (USACE, 2004a). See Table 6.

The carcinogenic risk from each radionuclide of concern is calculated independently by dividing the appropriate reasonable maximum exposure (RME) soil concentration by the corresponding residential soil preliminary remediation goal (PRG) then multiplying by the target risk of 1×10^{-5} . This calculation estimates the total carcinogenic risk to a residential receptor from all pathways considered in the derivation of the PRG. Because the PRG calculator does not provide a breakdown of the cancer intake for each pathway, other methods are needed if risk contributions from individual pathways are required. However, from the previous modeling performed during the derivation of the dose-based cleanup criteria, it is the ingestion of Sr-90 contaminated plants and the external exposure to radiation from Cs-137 that contribute a majority of the risk to the residential soil receptor. Table 6 presents the calculated risks for each radionuclide and the total carcinogenic risk to the future adult/child resident (USACE, 2004a).

The total risk (averaged along the entire length of the pipeline) was calculated to be below ADEC carcinogen risk value of 1×10^{-5} , as indicated in Table 6. ADEC determined it did not

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seem conservative to calculate an average risk across the entire length of the pipeline and requested evaluating the risk at specific locations along the pipeline to see if there were any specific location exceedances of the 1×10^{-5} risk value. The risk was then calculated at each sampling location along the pipeline. At each sample location, risk was calculated by using the maximum remaining radionuclide concentration, as requested by ADEC. For this point-by-point calculation, most locations had risks below 1×10^{-5} , but at four locations, risks ranged from 1.3×10^{-5} to 1.1×10^{-5} . However, ADEC only uses one significant digit for carcinogenic cumulative risk (ADEC, 2002) and rounding the risk at these locations brings the risk to 1×10^{-5} .

Table 6 – Human Risk Characterization

Exposure Routes	Radionuclide of Concern	RME Soil Concentration (pCi/g)	Soil PRG (pCi/g)	Ratio of RME/PRG	PRG Target	Cancer Risk
Soil Ingestion	Sr-90	0.58	2.31	0.25	1×10^{-5}	2.5×10^{-6}
Food Ingestion						
Inhalation	Cs-137	0.22	0.60	0.38	1×10^{-5}	3.8×10^{-6}
External Exposure						
Total Future Resident Receptor Risk						6.2×10^{-6}

(USACE, 2004a)

5.3.1.1 Alternatives Considered in Proposed Plan

Alternative 1 - No Further Action Alternative (Preferred Alternative)

The no further action alternative is considered as the baseline alternative. Radionuclides were evaluated and found to be within ADEC's target risk level of 1×10^{-5} for cancer. Therefore, the alternative would be considered protective (and therefore meet the threshold criteria). The alternative would be effective for the short-term, but would have unknown long-term effectiveness and permanence since no dig restrictions, land use controls, or five-year reviews would be implemented to ensure long-term effectiveness (if unknown contamination revealed in the future). For this reason, Fort Greely's Administrative Controls GIS Database will continue to carry notations concerning the former presence of the radioactive wastewater pipeline, its removal using unrestricted use cleanup levels, and the possibility that undiscovered contamination remains. The no action alternative would be easiest to implement, have the lowest cost, and would not reduce the toxicity, mobility, or volume of any remaining contaminants.

Alternative 1 Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - None except notation in Fort Greely's Administrative Controls GIS database that site previously contained the wastewater pipeline which was removed with unrestricted

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use cleanup levels. However, the possibility of undiscovered radioactive contamination still remains

- Engineering Controls
 - None

- Five-Year Reviews
 - None

- Remedial Actions
 - None

Alternative 2 – No Further Remedial Action with Five-Year Reviews

Alternative 2 would be similar to Alternative 1 except Five-Year Reviews would be conducted to ensure long-term effectiveness. The Five-Year Reviews would be conducted periodically to determine whether site conditions have changed (i.e. new contamination revealed). Five-Year reviews and its subsequent reports will be in accordance with EPA's *Comprehensive Five-Year Review Guidance*. The Five-Year review report will be submitted to ADEC for review and comment. The final Five-Year review report will be included in the Administrative record and copies provided to ADEC and EPA. Five-Year Reviews would have moderate costs every five years. These Five-Year Reviews would insure the alternative remains protective.

Alternative 2 Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - None except notation in Fort Greely's Administrative Controls GIS database that site previously contained the wastewater pipeline which was removed with unrestricted use cleanup levels. However, the possibility of undiscovered radioactive contamination still remains

- Engineering Controls
 - None

- Five-Year Reviews
 - Site Visit/Site Walk
 - Records Review
 - Reporting

- Remedial Actions
 - None

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Alternative 3 – No Further Remedial Action, Dig Restrictions, Land Use Restrictions, and Five-Year Reviews –

Alternative 3 is similar to Alternative 2, but would also utilize the Fort Greely administrative controls database to control sub-surface intrusions into the location of the former nuclear wastewater pipeline and prevent the land usage from changing (preventing construction on the land). Site notices placed into the dig restriction database (denoting the investigations of past activities did not reveal any remaining contamination, but there still remains a potential for contamination to be encountered at these locations). Dig restrictions and land use controls would be used to prevent subsurface intrusion. Future land use will be restricted to industrial or “green space” (no usage). A review will be conducted every five years to ensure that the restrictions and protection programs are being maintained properly and that site conditions have not changed. Five-Year reviews and its subsequent reports will be in accordance with EPA’s *Comprehensive Five-Year Review Guidance*. The Five-Year review report will be submitted to ADEC for review and comment. The final Five-Year review report will be included in the Administrative record and copies provided to ADEC and EPA. Fort Greely’s dig control process requires approval from the environmental office prior to conducting any subsurface activities. The environmental office’s review process would include consulting the administrative controls database to determine if the proposed activities violate any of the land use restrictions placed on the property or if digging is restricted due to potential subsurface contamination. This alternative would have better long-term effectiveness, would still be easily implementable, have minimal costs, and would not reduce the toxicity, mobility, or volume of any remaining contaminants.

Alternative 3 Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - No Sub-surface intrusion or construction without coordination with ADEC and remediation if required
 - Restrictions maintained in Ft. Greely Administrative Control GIS Database
 - Dig Permits Required
- Engineering Controls
 - None
- Five-Year Reviews
 - Dig restriction effectiveness
 - Land-use controls effectiveness
 - Report
- Remedial Actions
 - None

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5.3.1.2 Selected Alternative and Responsiveness Summary

SM-1A Nuclear Reactor Wastewater Pipeline (BRAC Sites 90 and 132)– Alternative 1 (see above for details) No Further Remedial Action Planned

After evaluation of comments received, the Army and ADEC have agreed to proceed with Alternative 1 for the Wastewater Pipeline (BRAC Sites 90 and 132). Dig restrictions, land use restrictions, and Five-Year reviews are not necessary since ADEC has concurred that the pipeline removal in 1999 met the 1×10^{-5} cancer risk cleanup criteria for unrestricted use.

Selected Alternative Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - None except notation in Fort Greely's Administrative Controls GIS database that site previously contained the wastewater pipeline which was removed with unrestricted use cleanup levels. However, the possibility of undiscovered radioactive contamination still remains
- Engineering Controls
 - None
- Five-Year Reviews
 - None
- Remedial Actions
 - None

5.3.2 Fuel Spill at Nuclear Wastewater Pipeline Station 21+25

Prior to the 1997 removal of a reactor wastewater pipeline, the excavation crew encountered strong fuel odors in the vicinity of pipeline station 21+25. The site is located along a fire break bisecting a large wooded area northeast of the main area of Fort Greely (Figure 8). Soil samples were taken by the excavation crew prior to removal of the wastewater pipeline and DRO results exceeded ADEC Method Two cleanup levels in 2 of the 10 samples taken (highest 2600 mg/kg DRO). One sample revealed GRO contamination above ADEC Method Two cleanup levels. The site history did not identify any past activities that would result in fuel contamination other than installation of the pipeline. The contamination might also be associated with pipeline maintenance or removal activities. Historical records are unclear as to whether these samples were taken before or after pipeline removal, so it is unknown if these soils were removed during the pipeline removal. A 1998 limited remedial investigation consisting of three test pits did not find any contaminants above ADEC Method 2 cleanup levels. A follow up investigation in 2006 consisting of 3 borings and 9 samples did not detect any contaminants above Method 2 cleanup levels. Table 7 documents the highest concentrations encountered in the 2006 investigation. Fort Greely believes the contaminants detected in 1997 above Method 2 cleanup levels were remediated along with the wastewater pipeline. If this contaminated soil was not removed, then the contaminants are isolated and are not reflective of the overall site conditions since two follow-up investigations failed to find any contaminants above ADEC Method 2 cleanup levels.

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Cleanup of the radioactive wastewater pipeline is documented in the *Removal of SM-1A Radioactive Pipeline Closure Report* completed in 2002 (Jacobs, 2002).

5.3.2.1 Alternatives Considered in Proposed Plan

Alternative 1 - No Further Action Alternative –

The no further action alternative is considered as the baseline alternative. Follow-up investigations at the Fuel Spill site and verification surveys after the pipeline removal have not revealed any remaining contamination above ADEC Method 2/Method 3 cleanup levels. If the 2600 mg/kg DRO contaminated soil mentioned above remains at the site, it is not indicative of general soil contaminant levels since two follow-up investigations did not find any contaminants above ADEC Method 2 cleanup levels. Therefore, the alternative would be considered protective (and therefore meet the threshold criteria). The alternative would be effective for the short-term, but would have unknown long-term effectiveness and permanence since no dig restrictions, land use controls, or five-year reviews would be implemented to ensure long-term effectiveness (if unknown contamination revealed in the future). The no action alternative would be easiest to implement, have the lowest cost, and would not reduce the toxicity, mobility, or volume of any remaining contaminants.

Alternative 1 Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - None
- Engineering Controls
 - None
- Five-Year Reviews
 - None
- Remedial Actions
 - None



Figure 8 – Fuel Spill at Station 21+25

Table 7 – Fuel Spill at Station 21+25 Soil Concentrations In Follow-Up Investigation

Compound/Element	Sample Date	Depth (ft)	Max Conc. (mg/kg)	Lowest Method 2 Cleanup Level (mg/kg)
GRO	Sep 06	17	ND	300 – Migration to GW
DRO	Sep 06	7	6.3	250 – Migration to GW
Benzene	Sep 06	7	ND	0.02 – Migration to GW
Toluene	Sep 06	7	ND	5.4 – Migration to GW
Ethylbenzene	Sep 06	7	ND	5.5 – Migration to GW
Xylenes	Sep 06	7	ND	78 – Migration to GW

Alternative 2 – No Further Remedial Action with Five-Year Reviews –

Alternative 2 would be similar to Alternative 1 except Five-Year Reviews would be conducted to ensure long-term effectiveness. The Five-Year Reviews would be conducted periodically to determine whether site conditions have changed (i.e. new contamination revealed). Five-Year reviews and its subsequent reports will be in accordance with EPA’s *Comprehensive Five-Year Review Guidance*. The Five-Year review report will be submitted to ADEC for review and

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comment. The final Five-Year review report will be included in the Administrative record and copies provided to ADEC and EPA. Five-Year Reviews would have moderate costs every five years. These Five-Year Reviews would insure the alternative remains protective.

Alternative 2 Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - None
- Engineering Controls
 - None
- Five-Year Reviews
 - Site Visit/Site Walk
 - Report
- Remedial Actions
 - None

Alternative 3 – No Further Remedial Action, Dig Restrictions, Land Use Restrictions, and Five-Year Reviews (Preferred Alternative) –

Alternative 3 is similar to Alternative 2, but would also utilize the Fort Greely administrative controls database to control sub-surface intrusions into the location of the former nuclear wastewater pipeline Station 21+25 and prevent the land usage from changing (preventing construction on the land). Site notices placed into the dig restriction database (denoting the investigations of past activities did not reveal any remaining contamination, but there still remains a potential for contamination to be encountered at these locations). Dig restrictions and land use controls would be used to prevent subsurface intrusion. Future land use will be restricted to industrial or “green space” (no usage). A review will be conducted every five years to ensure that the restrictions and protection programs are being maintained properly and that site conditions have not changed. Five-Year reviews and its subsequent reports will be in accordance with EPA’s *Comprehensive Five-Year Review Guidance*. The Five-Year review report will be submitted to ADEC for review and comment. The final Five-Year review report will be included in the Administrative record and copies provided to ADEC and EPA. Fort Greely’s dig control process requires approval from the environmental office prior to conducting any subsurface activities. The environmental office’s review process would include consulting the administrative controls database to determine if the proposed activities violate any of the land use restrictions placed on the property or if digging is restricted due to potential subsurface contamination. This alternative would have better long-term effectiveness, would still be easily implementable, have minimal costs, and would not reduce the toxicity, mobility, or volume of any remaining contaminants.

Alternative 3 Remedy Summary:

- Land Use Restrictions and Institutional Controls

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- No Sub-surface intrusion or construction without coordination with ADEC and remediation if required
- Restrictions maintained in Ft. Greely's Administrative Control GIS Database and Master Plan
- Dig Permits required
- Engineering Controls
 - None
- Five-Year Reviews
 - Dig restriction effectiveness
 - Land-use controls effectiveness
 - Report
- Remedial Actions
 - None

5.3.2.2 Selected Alternative and Responsiveness Summary

The Selected Alternatives is Alternative 3 (see above for details) No Further Remedial Action, Dig Restrictions, Land Use Restrictions, and Five-Year Reviews (Preferred Alternative)

After evaluation of comments received, the Army and ADEC have agreed to proceed with Alternative 3 for the Wastewater Pipeline (Station 21+25 Spill Site). The Fort Greely administrative controls database would be utilized to control sub-surface intrusions into the location of the former nuclear wastewater pipeline and prevent the land usage from changing (preventing construction on the land). Dig restrictions and land use controls would be used to prevent subsurface intrusion. Future land use will be restricted to industrial or "green space" (no usage). A review will be conducted every five years to ensure that the restrictions and protection programs are being maintained properly and that site conditions have not changed. Five-Year reviews and its subsequent reports will be in accordance with EPA's *Comprehensive Five-Year Review Guidance*. The Five-Year review report will be submitted to ADEC for review and comment. The final Five-Year review report will be included in the Administrative record and copies provided to ADEC and EPA. Fort Greely's dig control process requires approval from the environmental office prior to conducting any subsurface activities. The environmental office's review process would include consulting the administrative controls database to determine if the proposed activities violate any of the land use restrictions placed on the property or if digging is restricted due to potential subsurface contamination. This alternative would have better long-term effectiveness, would still be easily implementable, have minimal costs, and would not reduce the toxicity, mobility, or volume of any remaining contaminants.

Selected Alternative Remedy Summary:

- Land Use Restrictions and Institutional Controls

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- No Sub-surface intrusion or construction without coordination with ADEC and remediation if required
- Restrictions maintained in Ft. Greely's Administrative Control GIS Database and Master Plan
- Dig Permits required
- Engineering Controls
 - None
- Five-Year Reviews
 - Dig restriction effectiveness
 - Land-use controls effectiveness
 - Report
- Remedial Actions
 - None

5.4 Waste Accumulation Area at Building 626, BRAC Site 48

Building 626, shown in Figure 9, houses an automobile craft shop where residents and employees of Fort Greely can work on their personal vehicles. A fenced Waste Accumulation Area (WAA) was located outside the back of the building on the east side until it was removed in the mid 1990s. The fence was removed from the east and south sides and was joined with the parking lot for recreational type vehicles north of Building 627. The WAA contained drums of used oil and grease as well as other used automotive fluids awaiting transfer to a waste facility. The EPA issued a Notice of Noncompliance for the WAA in September 1992 for waste storage drums in poor conditions. The leaking drums were disposed of and Fort Greely was required to develop a closure plan for the WAA. FGA submitted closure implementation information in October 1993. After implementation actions were completed, EPA issued a letter, dated March 1996, verifying receipt of FGA's engineering certifications demonstrating complete implementation of the RCRA Closure Plans (C2HM, 1994) for Building 626. Engineering certifications and the EPA letter verifying closure is included in Appendix C.

The closure investigation conducted in 1995 consisted of soil sampling inside the fenced area. Soil samples were collected from 6 borings down to a depth of 4.5 feet. At 5 of the 6 sample locations, DRO concentrations were above ADEC Method 2 Cleanup levels in the top 4 inches of the soil, with lower levels of contamination down to 2.5 feet bgs. The lab data showed that diesel and heavy grease type contamination was present near the surface. No other contaminant was detected above regulatory limits and only surface samples exceeded DRO cleanup levels. (USACE, 1995). See Table 8.

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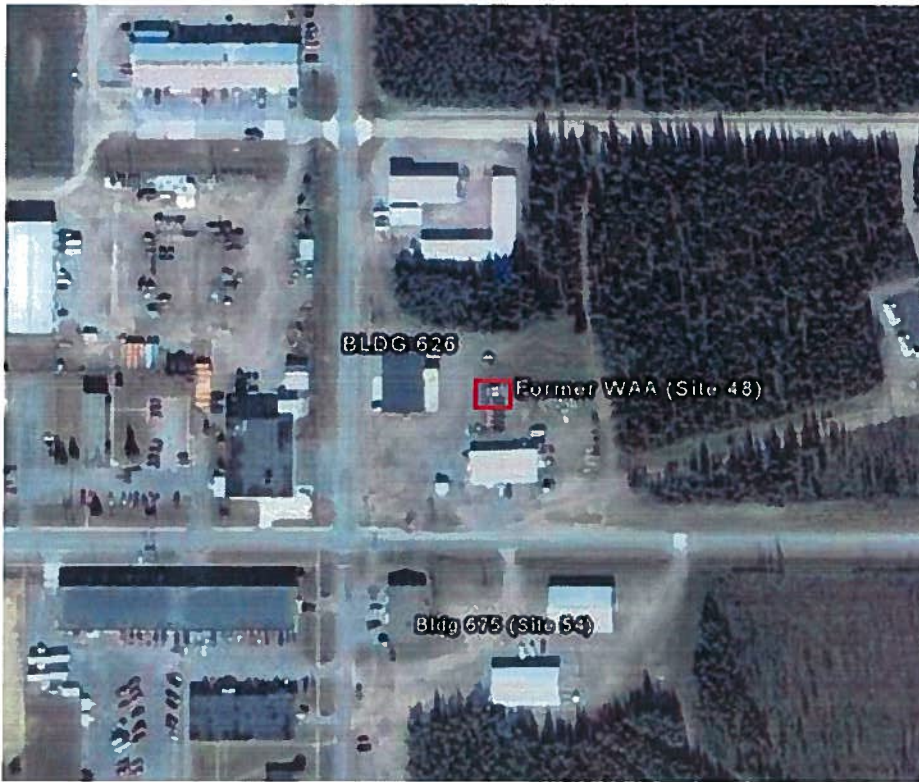


Figure 9 – Building 626 Waste Accumulation Area (Site 48)

Table 8 – Building 626 Waste Accumulation Area (Site 48) Soil Concentrations

Compound/Element	Sample Date	Depth	Max Conc. (mg/kg)	Lowest Method 2 Cleanup Level (mg/kg)
DRO	May 95	1 in	21000	250 – Migration to GW
	Sep 06	4 ft	85.5	
GRO	Sep 06	4 ft	ND	250 – Migration to GW
Benzene	Sep 06	4 ft	ND	0.02 – Migration to GW
Toluene	Sep 06	4 ft	ND	5.4 – Migration to GW
Ethylbenzene	Sep 06	4 ft	ND	5.5 – Migration to GW
Xylenes	Sep 06	4 ft	ND	78 – Migration to GW

In September 2006, Fort Greely excavated the top 4 feet of soil in contaminated areas. Six samples were taken from the bottom of the excavation and revealed low levels of DRO contamination. DRO concentrations ranged from 6.63 mg/kg to 85.5 mg/kg, all below ADEC Method 2 cleanup levels. The excavated soil was hauled to the South Tank Farm bioremediation

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treatment area located on Fort Greely. Clean fill dirt was hauled in to backfill the excavation (ASTS, 2008b).

5.4.1 Alternatives Considered in the Proposed Plan

Alternative 1: No Further Action Alternative

The no further action alternative is considered as the baseline alternative. Fort Greely recommends this site be closed as a NFRAP site. Investigations at Building 626, Waste Accumulation Area, BRAC Site 48, and confirmation samples following the removal action have not revealed any remaining contamination above ADEC Method 2 cleanup levels. Therefore, the alternative would be considered protective (and therefore meet the threshold criteria). The alternative would be effective for the short-term, but would have unknown long-term effectiveness and permanence since no dig restrictions, land use controls, or five-year reviews would be implemented to ensure long-term effectiveness (if unknown contamination revealed in the future). The no action alternative would be easiest to implement, have the lowest cost, and would not reduce the toxicity, mobility, or volume of any remaining contaminants.

Alternative 1 Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - None
- Engineering Controls
 - None
- Five-Year Reviews
 - None
- Groundwater Monitoring
 - None
- Remedial Actions
 - None

Alternative 2: No Further Remedial Action with Five-Year Reviews (Preferred Alternative)

Alternative 2 would be similar to Alternative 1 except Five-Year Reviews would be conducted to ensure long-term effectiveness. The Five-Year Reviews would be conducted periodically to determine whether site conditions have changed (i.e. new contamination revealed). Five-Year reviews and its subsequent reports will be in accordance with EPA's *Comprehensive Five-Year Review Guidance*. The Five-Year review report will be submitted to ADEC for review and comment. The final Five-Year review report will be included in the Administrative record and copies provided to ADEC and EPA. Five-Year Reviews would have moderate costs every five years. These Five-Year Reviews would insure the alternative remains protective.

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Alternative 2 Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - None
- Engineering Controls
 - None
- Five-Year Reviews
 - None
- Remedial Actions
 - None

Alternative 3: Dig Restrictions, Land Use Restrictions, and Five-Year Reviews

Alternative 3 would utilize the Fort Greely administrative controls database to control subsurface intrusions into the location of the former waste storage area and prevent the land usage from changing (preventing construction on the land). Site notices placed into the dig restriction database (denoting the investigations of past activities did not reveal any remaining contamination, but there still remains a potential for contamination to be encountered at these locations). Dig restrictions and land use controls would be used to prevent subsurface intrusion. Future land use will be restricted to industrial or “green space” (no usage). A review will be conducted every five years to ensure that the restrictions and protection programs are being maintained properly and that site conditions have not changed. Five-Year reviews and its subsequent reports will be in accordance with EPA’s *Comprehensive Five-Year Review Guidance*. The five-year review report will be submitted to ADEC for review and comment. The final Five-Year review report will be included in the Administrative record and copies provided to ADEC and EPA. Fort Greely’s dig control process requires approval from the environmental office prior to conducting any subsurface activities. The environmental office’s review process would include consulting the administrative controls database to determine if the proposed activities violate any of the land use restrictions placed on the property or if digging is restricted due to potential subsurface contamination. This alternative would have better long-term effectiveness, would still be easily implementable, have minimal costs, and would not reduce the toxicity, mobility, or volume of any remaining contaminants. Fort Greely personnel do not believe restrictions on land usage are necessary at this site since a removal action has been conducted and no contaminants are known to exist above State cleanup levels.

Alternative 3 Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - No Sub-surface intrusion or construction without coordination with ADEC and remediation if required
 - Restrictions maintained in Ft. Greely's Administrative Control GIS Database and Master Plan
 - Dig Permits required

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- Engineering Controls
 - None
- Five-Year Reviews
 - Dig restriction effectiveness
 - Land-use control effectiveness
 - Report
- Remedial Actions
 - None

5.4.2 Selected Alternative and Responsiveness Summary

The Selected Alternative is Alternative 1 (see above for details): No Further Remedial Action

After evaluation of comments received, the Army and ADEC agree with the commenter that this site has met ADEC Method 2 cleanup criteria and therefore dig restrictions, land use controls, and Five-Year reviews are unnecessary.

Selected Alternative Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - None
- Engineering Controls
 - None
- Five-Year Reviews
 - None
- Remedial Actions
 - None

5.5 Refuse Burn Pit, BRAC Site 89

The Refuse Burn Pit (Figure 10) operations started in 1971. Burn cages are used to burn combustible garbage for waste volume reduction prior to disposal into the FGA landfill. Paint, oily sludge from oil/water separators, contaminated soils and sorbents, and aerosol cans have reportedly been burned in the burn pit in the past. Trucks remove ash from the burn pits and transport it to the landfill. The area just northeast of the burn pit has documented lead contamination above risk-based industrial cleanup levels. Contamination in the Refuse Burn Pit area is likely the result of ash falling from trucks, use of ash as fill material for low spots, or surface drainage from the burn pit.

BRAC Site 89 was initially investigated in 1997 during the first phase of the Remedial Investigation (RI). Initial sampling results are documented in the *1998 Remedial Investigation*

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Report, Fort Greely, Alaska (Jacobs, 1999) and the *1999 Remedial Investigation Report/Removal Action, Fort Greely, Alaska* (Jacobs, 2000). The sampling program is summarized in Table 9. Figure 11 illustrates sampling locations. Note that the number of samples with exceedances listed in the table below is based on comparison of historical data with current ADEC Method Two cleanup criteria.

Investigation activities at BRAC Site 89 during the 1997 Limited Remedial Investigation (LRI) included the excavation of three test pits (TPs). Samples from the TPs were analyzed for DRO, RRO, semivolatile organic compounds (SVOCs), Resource Conservation Recovery Act (RCRA) metals and VOCs. Two of the test pits (TP-844 and TP-845) produced sample results of all parameters having concentrations below ADEC Method Two cleanup levels. However, in TP-846 located approximately 100 feet northeast of the incinerator facility within the refuse burn pit, concentrations of arsenic, cadmium, chromium, and lead exceeded screening levels and ADEC Method Two cleanup criteria. Two soil samples from TP-846 contained total lead concentrations of 2,650 mg/kg and 15,200 mg/kg; both exceed ADEC Method Two cleanup criteria for ingestion and inhalation of 400 mg/kg. The same two samples from TP-846 were tested for lead by toxicity characteristic leaching procedure (TCLP), and the results of 10.4 mg/L and 17.7 mg/L respectively both exceed the RCRA standard for toxicity characteristic hazardous waste.

Table 9 – Refuse Burn Pit (Site 89) Soil Concentrations

Compound/ Element	Sample Date	Depth (ft)	Max Conc.	Lowest Method 2 Cleanup Level (Industrial)
Lead	Sep 97 (TP-846)	5 – 5.5	15,200 mg/kg	800 mg/kg
	Aug/Sep 98 (AP-880)	5 – 7	270 mg/kg	
	Sep 06	2	1960 mg/kg	
Lead (TCLP)	Sep 97 (TP-846)	5 – 5.5	17.7 mg/L	5 mg/L ¹
	Aug/Sep 98 (AP-880)	5 – 7	2.1 mg/L	
Dioxin/Furan	Aug/Sep 98 (AP-880)	5 – 7	55 ng/kg (TEQ)	160 ng/kg (direct contact)
	Sep 06	2	74 ng/kg (TEQ)	

¹40 CFR 261.24 – Toxicity Characteristic

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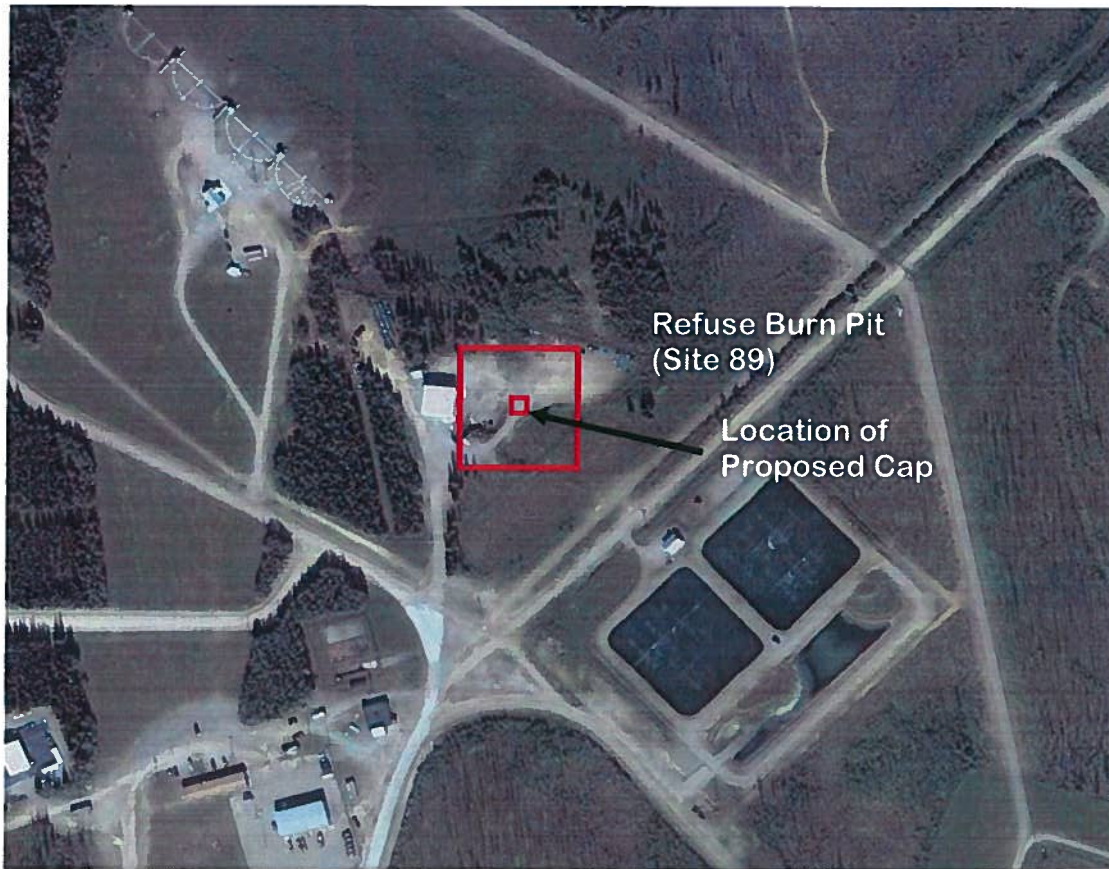


Figure 10 – Refuse Burn Pit (Site 89)

In 1998, four soil borings (AP-880, AP-881, AP-882, and AP-883) were advanced and ten samples collected in an effort to delineate the lateral and vertical extent of constituents detected in samples from TP-846 and to investigate the potential presence of dioxins and furans contamination. The samples were analyzed for RCRA metals (totals) and lead (TCLP). Dioxin and furan analyses were also conducted. Concentrations of barium, cadmium, chromium, lead, mercury and selenium exceeded the highest background levels established for FGA prior to 1998. The concentrations of all metals except arsenic and chromium were below risk-based project screening levels. The arsenic concentration was below background levels. Total lead concentrations in samples from AP-880 were detected at levels up to 270 mg/kg, which is below current ADEC Method Two cleanup criteria. Soil samples from AP-880 were analyzed for lead by TCLP and the highest resulting concentration was 2.1mg/L, which is below the RCRA hazardous waste standard of 5.0 mg/L. Dioxins and furans were detected in two samples from depths of 0-2 and 5-7 feet bgs in boring AP-880 with total equivalents (TEQ) concentrations of 74 ng/kg and 55 ng/kg respectively. Both TEQ concentrations are below ADEC's Cleanup Level of 160 ng/kg.

Based on screening data collected in the 1998 RI, additional background sampling and an evaluation of metals was conducted in 1999. Elevated concentrations of arsenic, cadmium, and chromium from 1997 were resolved as background and dropped as compounds of potential concern (COPCs). Lead and dioxin/furan remained as COPCs. Additional sampling in 2005 and

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2006 was performed to delineate the areal extent of the lead and dioxin contamination and those results can be found in the *Final 2005 Remedial Investigation BRAC Sites 54, 89, 85N/85S, 133, and South Tank Farm, Feb 1, 2008*, and the *Final 2006 Remedial Investigation Report BRAC Sites 31, 32, 41, 48, 89, 133, SM-1A 21+25 Spill Site, Tar & Asphalt Disposal Area, and the South Tank Farm, Feb 1, 2008*.

In 2005 (ASTS, 2008a), two boreholes were drilled at the Refuse Burn Pit, directly north and east of previous sampling locations where dioxins and furans were detected in an effort to better define the lateral extent of the area with elevated dioxins. Each of the 2005 boreholes was sampled at depths of five feet and 10 feet bgs. Samples were analyzed for lead, PCBs, pesticides; and dioxins/furans. Analytical data results indicate levels of PCBs and dioxins/furans to be undetectable.

In 2006 (ASTS, 2008b), lateral extent of contamination needed to be clearly indicated due to expense of disposal of lead and dioxins. A detailed sampling and analysis effort was planned for the area within the Refuse Burn Pit where dioxin and lead concentrations were shown to exceed screening levels. An area of approximately 500 square feet of soil near the center of the Refuse Burn Pit area was extensively sampled and analyzed in sequential batches to define the limits of the contaminated area. Twenty-six soil borings were sampled for total lead and dioxins/furans. Of the 26 borings tested for dioxins/furans, three borings (SB06, SB07, and SB10) exceeded risk-based soil cleanup levels for dioxins/furans for residential land use (47 ng/kg) in Alaska; none exceeded industrial cleanup levels (160 ng/kg). Five borings (SB05, SB06, SB10, SB13, and SB28) contained total lead concentrations in excess of ADEC Method Two migration to groundwater cleanup levels for residential land use; one location exceeded industrial location exceeded industrial cleanup levels for lead. Toxicity characteristic leaching procedure (TCLP) results from the sample with the highest lead concentration (1,960 mg/Kg) showed a soil leachate level of 4.3 mg/L.

5.5.1 Alternatives Considered in the Proposed Plan

Alternative 1: No Action Alternative

Alternative 1 would include no further activities at the site. Alternative 1 would not be considered protective and does not meet the threshold criteria due to the documented contamination present at the site above ADEC residential and industrial cleanup criteria.

Alternative 1 Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - None
- Engineering Controls
 - None
- Five-Year Reviews
 - None

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- Remedial Actions
 - None Required

Alternative 2: Placement of Asphalt & Gravel Cap, Dig Restrictions, Land Use Restrictions, and Five-Year Reviews

Alternative 2 would include a 5200 square foot pavement cap would be placed over the contaminated area. A 30 foot-wide gravel apron will surround the paved cap to provide further protection and dust control. See Figure 11. This alternative would also utilize the Fort Greely administrative controls database to control sub-surface intrusions into the capped area and prevent the land usage from changing (preventing construction on the plot of land). Site notices would be placed into the dig restriction database (denoting the presence of residual contamination). Future land use will be restricted to industrial or “green space” (no usage). A review will be conducted every five years to ensure that the restrictions and protection programs are being maintained properly and that site conditions have not changed. Five-Year reviews and its subsequent reports will be in accordance with EPA’s *Comprehensive Five-Year Review Guidance*. The Five-Year review report will be submitted to ADEC for review and comment. The final Five-Year review report will be included in the Administrative record and copies provided to ADEC and EPA. Fort Greely’s dig control process requires approval from the environmental office prior to conducting any subsurface activities. The environmental office’s review process would include consulting the administrative controls database to determine if the proposed activities violate any of the land use restrictions placed on the property or if digging is restricted due to potential subsurface contamination. This alternative would have good long-term effectiveness, would be easily implementable, have costs of approximately \$200,000, and would reduce mobility of remaining contaminants (by containment), but not the toxicity or the volume.

Alternative 2 Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - No Sub-surface intrusion or construction without coordination with ADEC and remediation if required
 - Restrictions maintained in Ft. Greely's Administrative Control GIS Database and Master Plan
 - Dig Permits Required
- Engineering Controls
 - Asphalt and Gravel Cap
- Five-Year Reviews
 - Dig restriction effectiveness
 - Land-use control effectiveness
 - Reporting

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- Remedial Actions
 - Asphalt and Gravel Cap placement

Alternative 3: Lead and Dioxin/Furan Hot-spot Soil Removal, Transport & Disposal of Excavated Contaminated Soil, Confirmation Sampling, Placement of Asphalt Cap and Gravel Apron, Dig Restrictions, Land Use Restrictions, and Five-Year Reviews (Preferred Alternative)

Alternative 3 would involve excavating approximately 125 square feet down to a depth of approximately five feet (removing the highest lead contaminated soil). The excavated soil would be hauled to an authorized landfill for disposal. The area would then be filled with clean backfill and a 5200 square foot pavement cap would be centered on top to the clean backfill. A 30 foot-wide gravel apron will surround the paved cap to provide further protection and dust control. See Figure 11. This alternative would utilize the Fort Greely administrative controls database to control sub-surface intrusions into the capped area and prevent the land usage from changing (preventing construction on the plot of land). Site notices would be placed into the dig restriction database (denoting the presence of residual contamination). Future land use will be restricted to industrial or “green space” (no usage). A Corrective Action Plan will be developed by the Army and approved by ADEC. A review will be conducted every five years to ensure that the restrictions and protection programs are being maintained properly and that site conditions have not changed. Five-Year reviews and its subsequent reports will be in accordance with EPA’s *Comprehensive Five-Year Review Guidance*. The five-year review report will be submitted to ADEC for review and comment. The final Five-Year review report will be included in the Administrative record and copies provided to ADEC and EPA. Fort Greely’s dig control process requires approval from the environmental office prior to conducting any subsurface activities. The environmental office’s review process would include consulting the administrative controls database to determine if the proposed activities violate any of the land use restrictions placed on the property or if digging is restricted due to potential subsurface contamination. This alternative would have even better long-term effectiveness (since highest contaminants removed), would still be easily implementable, cost approximately \$275,000, and would reduce the toxicity, mobility, and volume of remaining contaminants (by removal and containment).

Alternative 3 Remedy Summary:

- Land Use Restrictions and Institutional Controls
 - No Sub-surface intrusion or construction without coordination with ADEC and remediation if required
 - Restrictions maintained in Ft. Greely's Administrative Control GIS Database and Master Plan
 - Dig Permits required
- Engineering Controls
 - Asphalt and Gravel Cap

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- Five-Year Reviews
 - Dig restriction effectiveness
 - Land-use control effectiveness
 - Report
- Remedial Actions
 - Lead and Dioxin/Furan Hot-spot soil removal, transport and disposal of excavated contaminated soil, confirmation sampling, and placement of asphalt/gravel cap

5.5.2 Selected Alternative and Responsiveness Summary

The Selected Alternative is Alternative 3 (see above for details): Lead and Dioxin/Furan Hot-spot Soil Removal, Transport & Disposal of Excavated Contaminated Soil, Confirmation Sampling, Placement of Asphalt Cap and Gravel Apron, Dig Restrictions, Land Use Restrictions, and Five-Year Reviews

After evaluation of comments received, the Army and ADEC agree to proceed with Alternative 3. The commenter believes a fabric cap would be sufficient and does not specifically comment on the proposed soil removal. Fort Greely and ADEC believe soil removal is needed at the highest lead concentrations to eliminate the potential exposure to these contaminants to humans or ecological receptors in the future. The soil removal will use commercial ADEC cleanup standards for lead (800 mg/kg) and dioxin (160 ng/kg) as found in 18 AAC 75.341 Table B1 and Table B1 notes. A cap is needed to prevent dust erosion and inadvertent access to the contaminants by site workers. A Corrective Action Plan will be developed by the Army and approved by ADEC. The Army will seek to economically construct a cap following the soil removal which will be acceptable to ADEC, be able to withstand truck traffic through the area, and be able to hold up to the extreme winter conditions and freeze/thaw cycles at Fort Greely. Dig restrictions and land use controls will be used to prevent damage to the cap. Dig Restrictions and Land Use restrictions would consist of denoting the site in the Administrative Controls GIS Database. The Administrative Controls GIS Database is used by the Fort Greely Department of Public Works (DPW) to evaluate dig permits (any activity requiring ground penetration) and is used by the Master Planner in planning future activities. DPW staff would evaluate if the proposed dig activity or change in land use would increase potential exposure to contaminants. Increased exposure to contaminants would not be allowed without engineering controls to mitigate exposure. Additionally, ADEC would be notified prior to activities that may encounter contaminated soil or land use changes that would change exposure scenarios. Change in land use and digging would not necessarily be prohibited, but potential exposure must be evaluated prior to the dig activity or change in land use. Five-Year reviews and its subsequent reports will be in accordance with EPA's *Comprehensive Five-Year Review Guidance*. The five-year review report will be submitted to ADEC for review and comment. The final Five-Year review report will be included in the Administrative record and copies provided to ADEC and EPA.

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Selected Alternative Remedy Summary:

- **Land Use Restrictions and Institutional Controls**
 - No Sub-surface intrusion or construction without coordination with ADEC and remediation if required
 - Restrictions maintained in Ft. Greely's Administrative Control GIS Database and Master Plan
 - Dig Permits required
- **Engineering Controls**
 - Asphalt and Gravel Cap
- **Five-Year Reviews**
 - Dig restriction effectiveness
 - Land-use control effectiveness
 - Engineering control effectiveness
 - Site Visit and Site Walk
 - Report
- **Remedial Actions**
 - Lead and Dioxin/Furan Hot-spot soil removal, transport and disposal of excavated contaminated soil, confirmation sampling, and placement of asphalt/gravel cap

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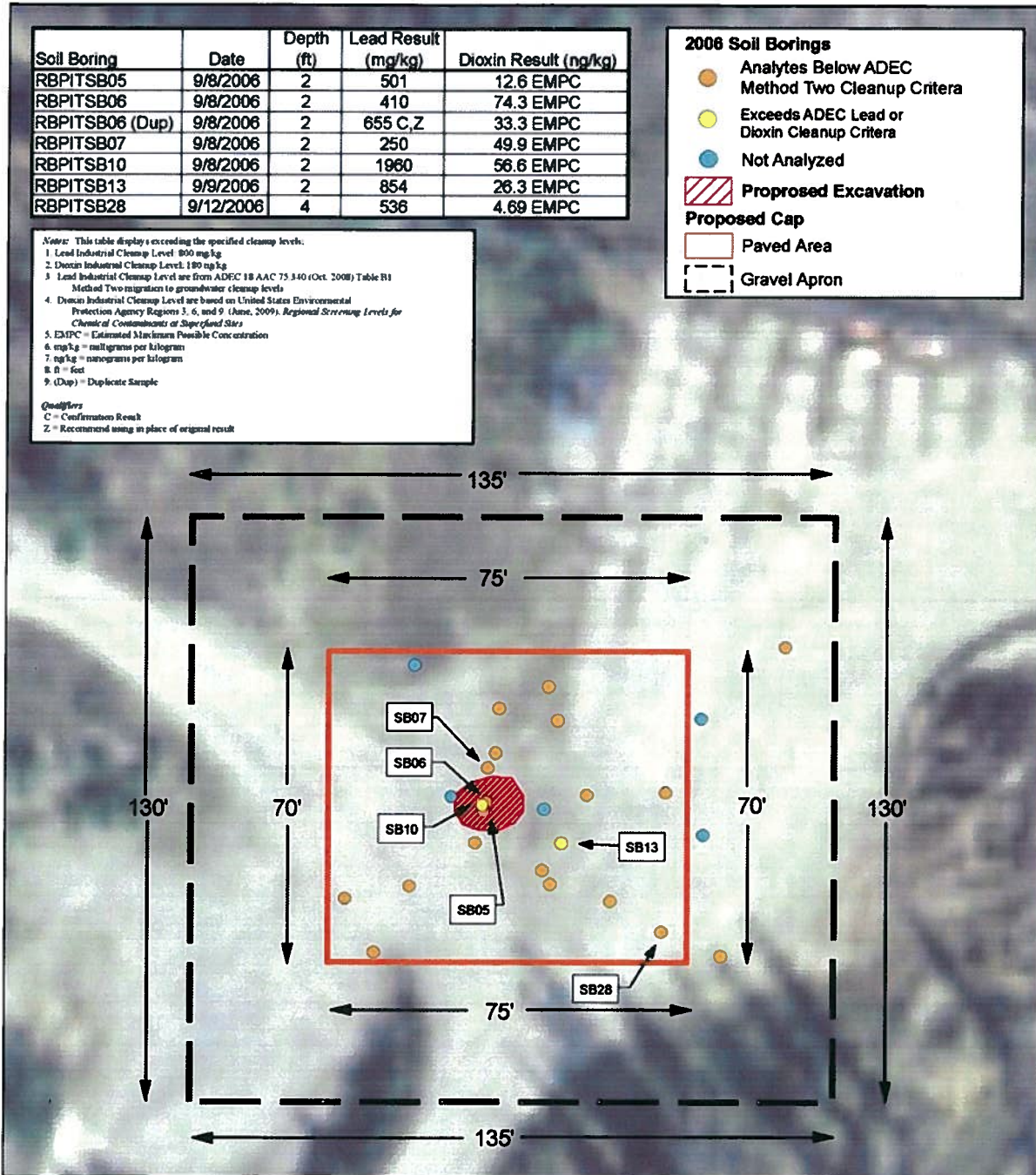


Figure 11 – Refuse Burn Pit (BRAC Site 89) Proposed Cap

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6.0 RI/FS activities and public/administrative record

Further information on investigative activities can be found in the documents section on the Restoration Advisory Board website, <https://www.smdcen.us/rabfga/>. The administrative record for remediation activities from 1992 to present is located in the administrative record file in the documents section. The website contains maps, current events, and notices for public involvement.

7.0 Decision Summary

Fort Greely and ADEC are agreeing to the final actions to be taken to close out 9 IRP sites. The detailed proposed action for each site was presented in a Proposed Plan released for public comment from May 1 through June 15, 2008. Six comments from one individual were received and the comments and responses are included as Appendix A. Based on successful implementation of the selected remedies, the nine sites will not pose an unacceptable risk to human health and the environment. The site investigations and remediation projects began in 1991 and have continued over the last 16 years. Many safeguards are in place to ensure that these sites will not pose any threat to future generations.

Selected remedies are as follows:

1. Former Landfill #1 (BRAC Site 31) – Dig Restrictions, Land Use Restrictions, Five-Year Reviews, and Annual Inspection Until First Five-Year Review
2. Former Landfill #2 (BRAC Site 32) – Dig Restrictions, Land Use Restrictions, Five-Year Reviews, and Annual Inspection Until First Five-Year Review
3. Former Landfills #4 & #5 (BRAC Site 88) – Limited Groundwater Monitoring, Dig Restrictions, Land Use Restrictions, Five-Year Reviews, and Annual Inspection Until First Five-Year Review
4. Former Building 157 Laundry Facility (BRAC Site 103) – No Further Remedial Action Planned (Unrestricted Use)
5. SM-1A Nuclear Reactor Wastewater Pipeline, East (BRAC Site 90) – No Further Remedial Action Planned (Unrestricted Use)
6. SM-1A Nuclear Reactor Wastewater Pipeline, West (BRAC Site 132) – No Further Remedial Action Planned (Unrestricted Use)
7. SM-1A Nuclear Reactor Wastewater Pipeline Station 21+25 – No Further Remedial Action, Dig Restrictions, Land Use Restrictions, and Five-Year Reviews
8. Former Waste Accumulation Area at Building 626 (BRAC Site 48) – No Further Remedial Action Planned (Unrestricted Use)
9. Former Refuse Burn Pit (BRAC Site 89) – Lead and Dioxin/Furan Hot-Spot Soil Removal, Transport & Disposal of Excavated Contaminated Soil, Placement of Cap, Dig Restrictions, Land Use Restrictions, and Five-Year Reviews

The response actions selected are necessary to protect public health or the environment from actual releases of hazardous substances at these sites. The selected remedies are protective of human health and the environment, comply with Federal and State requirements that are

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applicable or relevant and appropriate to the remedial action, are cost effective, and utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. The remedies selected do not satisfy the statutory preference for treatment as a principal element of the remedy as off-site disposal and engineering controls were deemed to be substantially more cost effective. Because some of the remedies will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedies are, and will be, protective of human health and the environment.

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- U.S. Environmental Protection Agency (EPA, 2001), Comprehensive Five-Year Review Guidance, June..

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Appendix A

Proposed Plan Public Comments Received and Responses

COMMENT FORM

COMMENTS: Mike Murphy	ORGANIZATION OF COMMENTER: Restoration Advisory Board	DATE: 6/15/2008
TITLE OF DOCUMENT: Draft Proposed Plan for Nine Installation Restoration Program Sites at Fort Greely, AK		DATE OF DOCUMENT: April 2008

ITEM NO.	PAGE NO.	SECT. NO.	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES <i>(Exact wording of suggested change)</i>	COMMENT RESPONSE
1	10-15	4.1.1 4.1.2			BRAC Site 31, Landfill 1 and BRAC Site 32, Landfill 2 Closeout could easily be implemented by placing the two areas in permanent "no excavation permitted" status. Additional actions would be unnecessary and certainly no further environmental monitoring down gradient of these sites is warranted.	Fort Greely agrees with the comment and therefore has selected Alternative 2 (Dig Restrictions, Land Use Restrictions, and Five Year reviews) as the remedy. Five Year reviews would be used to confirm dig restrictions and land use restrictions remain effective.
2	15-17	4.1.3			BRAC Site 88, Landfills 4 and 5 Closeout could easily be implemented by placing the two contiguous areas in permanent "dig only after complete soils investigation" status. The last sentence of 4.1.3.2, Alternative 3 on page 17 seems inconsistent with the narrative at first paragraph on page 16. Further groundwater monitoring isn't needed (unless you're looking for laboratory contaminates). Use as skeet range and recreation area is appropriate.	Fort Greely agrees with the comment, but ADEC has requested at least one additional groundwater monitoring event to confirm low levels of solvents previously detected are not still potentially migrating from the landfill. Therefore, Alternative 3 with limited groundwater monitoring downgradient of the landfill has been selected and groundwater monitoring will be discontinued after the first five year review as long as there is not evidence of solvent migration.
3	17-20	4.2			BRAC Site 103, Building 157 Former Laundry Closeout could easily be implemented by placing small portion of the site (at the spot of the spill) in permanent "no excavation permitted" status. FGA BRAC parcel status report of 2 Jan 01 (attached) list this parcel as "NFA Signed", presumably by all involved authorities. One five year review period has occurred and no more are warranted.	Fort Greely agrees with the comment except on the discontinuation of five year reviews. Five Year reviews would be completed to ensure dig restrictions and land use restrictions remain effective.

COMMENT FORM

4	21-25	4.3		<p>BRAC Sites 90 and 132, SM-1A Wastewater Pipeline, Dilution Well, and Removal Action Laydown Yard</p> <p>Only one area of concern remains regarding this whole remediation project. In the POL yard, north of SM-1A, the section of wastewater pipeline route beneath the concrete POL unloading stand was not investigated for remaining pipe and/or radioactive contaminated soils.</p> <p>The SM-1A pipeline remediation was conducted in order to release the property to the City of Delta Junction through the BRAC process and remediation was successfully completed. FGA land records should reflect locations of the radioactive wastewater pipeline route, dilution well and laydown yard, but that's all that really needs to be done.</p> <p>Enter the 21+25 site in the "no excavation permitted" listing as a place where digging might encounter some fuel-contaminated soils.</p>	<p>Page 4-3 of the May 2002 Closure Report Removal of SM-1A Radioactive Pipeline, Fort Greely, Alaska, (administrative record document AR102 found at http://www.smdcen.us/rabfga/docs/adminrecords.aspx) indicates that the POL pipeline was not found in the POL yard during the pipeline removal action in 1999. The pipeline through the POL yard was believed to have been previously removed. Sampling during the pipeline removal in 1999 did not indicate levels of concern for radioactive contaminants for soil samples taken at or near the POL yard. During the POL yard upgrades in 2008, soil sampling was performed by USACE and no evidence of radioactive contamination above levels of concern was found.</p> <p>Fort Greely agrees with the balance of the comment and has selected dig restrictions, land use controls, and five year reviews for the petroleum spill at Station 21+25 portion of the site and no further action for the balance of the site</p>
5	25-27	4.4		<p>BRAC Site 48, Building 626 Waste Accumulation Area</p> <p>No further action is warranted. This site is on the summer 2004 list of unrestricted use sites (attached).</p>	<p>Fort Greely agrees with the comment and has selected No further action as the alternative for this site.</p>
6	27-31	4.5		<p>BRAC Site 89, Refuse Burn Pit</p> <p>For a number of years, the burn pit was used effectively for waste volume reduction of all garbage/trash picked up from dumpsters throughout the cantonment area. It shouldn't be surprising that sometimes burning was incomplete, leaving charred tin cans, tire carcass particles, partially burned anything, etc., to be discovered during an environmental cleanup investigation.</p> <p>Were the samples taken from AP-880 truly soils or soils/burned garbage conglomerates?</p> <p>I confess to not knowing the significance of total equivalent (TEQ), but I'm happy with my ignorance and don't need an explanation.</p> <p>What is mg/kg? parts per trillion?</p> <p>Present the 2005 and 2006 sampling results in this document; don't reference other documents that are available who knows where.</p> <p>Re 4.5.2 Closure Alternatives. This area is fenced which is appropriate for a contaminated site. Use administrative controls to avoid subsurface intrusions. Placement of fabric covered with a foot or two of fill over the area of concern would have the same effect as asphalt cap and should be significantly less costly.</p>	<p>Samples were collected from both soils and what appears to be ash.</p> <p>Mg/kg is parts per million.</p> <p>The document will continue to refer to sampling results located in the 2005 and 2006 Remedial Investigation Reports found on the RAB website at https://smdcen.us/rabfga/pages/documents.asp due to the extent of the sampling results. Sampling results are summarized within the Proposed Plan and Record of Decision.</p> <p>Fort Greely will cap the area in the most economical fashion accepted by ADEC and able to withstand the truck traffic and winter conditions.</p>

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Appendix B

EPA UIC Program Closure Letter Building 157 Dry Well



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, Washington 98101-3140**

November 13, 2008

Reply To: OCE-082

Glen Shonkwiler
U.S. Army Space and Missile Defense Command
SMDC-EN-VE
P. O. Box 1500
Huntsville, Alabama 35807-3801

Re: Removal of Class V Injection Well at Building 157, Fort Greely, Alaska
(UIC ID# AK240F5-02-13278)

Dear Mr. Shonkwiler:

The Underground Injection Control (UIC) Program at the U.S. Environmental Protection Agency, Region 10 (EPA) is in receipt of information submitted on your behalf by ASTS, Inc. on October 8, 2008, regarding the removal of a dry well at Building 157, Fort Greely, Alaska. The dry well is a Class V injection well that is classified as an industrial well by the EPA Class V UIC Program.

The information provided to EPA about this site is summarized as follows:

1. Building 157 was the former post laundry facility. The building was torn down in the 1960's. A dry well consisting of a recycled pressure vessel with holes cut into the bottom and all bungs opened was discovered during a site investigation in 1997. The dry well was used for disposal of an unknown quantity of spent chemicals associated with dry cleaning activities in Building 157.
2. The dry well was excavated and removed from the site in 1998. Confirmatory soil samples were collected from the base of the excavation and analyzed for gasoline range organics, diesel range organics, residual range organics, volatile organic compounds, arsenic, cadmium, chromium, lead, and polychlorinated biphenyls. The excavated soil was backfilled into the excavation area.

The UIC Program file for this facility has been updated to show that the Class V industrial well has been permanently removed from the site. If additional information becomes available indicating that the injection well closure activities at this site were inadequate, Fort Greely is required to provide the additional information to EPA and further efforts may be required in the future. You are also advised that the U.S. Army is responsible for compliance with all other federal, state, or local laws and regulations.

Thank you for providing the information about the removal of the dry well at Building 157, Fort Greely, Alaska. If you have any questions or if you would like to discuss any other injection wells owned and operated by Fort Greely, please contact Jennifer Parker of my staff at (206) 553-1900.

Sincerely,

A handwritten signature in black ink, appearing to read "Peter Contreras", written over a circular stamp or mark.

Peter Contreras, Manager
Ground Water Unit

cc: Deborah Williams, ADEC Contaminated Sites Program

FINAL

Appendix C

EPA RCRA Closure Certification Building 626



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

March 1, 1966

Reply To
Attn Of: HW-104

U.S. Army, Fort Richardson
Colonel Albert J. Kraus, Director of Public Works
600 Richardson Drive #6000
Fort Richardson, AK 99505-6000

Re: Fort Greely RCRA Closure Certifications
AK1 21002 2155

Dear Colonel Kraus:

~~We have received your December 5, 1995,~~ engineering certifications demonstrating complete implementation of the Resource Conservation Recovery Act (RCRA) Closure Plans for the following Fort Greely sites:

~~Building #626.~~

Building #615.

Washington Range Open Burning/Open Detonation Area.

Based upon the information provided, we are very pleased to accept these certifications, and consider all actions pursuant to Fort Greely's March 29, 1991, Federal Facility Compliance Agreement to have been addressed.

Should you have any questions, please contact Kurt Eilo at (907) 271-5083.

Sincerely

A handwritten signature in cursive script, appearing to read "Mike A. Bussell".

Mike A. Bussell, Director
Office of Waste & Chemicals Management

cc: G. Kany, Alaska Dept. of Environmental Conservation, Juneau
R. Sundet, Alaska Dept. of Environmental Conservation,
Anchorage



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY GARRISON, ALASKA
600 RICHARDSON DRIVE # 6000
FORT RICHARDSON, ALASKA 99505-6000



Directorate of Public Works

December 5, 1995

FILE COPY

Chuck Clarke
Regional Administrator
United States Environmental Protection Agency
Region 10
1200 Sixth Avenue (SO-141)
Seattle, Washington 98101

Dear Mr. Clarke:

Per 40 CFR 265.115, which requires notifying the Regional Administrator by registered mail, enclosed are certifications stating that the following Fort Greely, Alaska locations have been closed in accordance with the specifications in the approved closure plans:

- Building 626
- Building 615
- Washington Range Open Burn / Open Detonation (OB/OD) Site

With the submission of these closure plans and our multi-year positive EPA and ADEC RCRA inspections, we feel we have met the provisions specified in the Fort Greely Federal Facility Compliance Agreement dated March 29, 1991.

ALBERT J. KRAUS
Colonel, U. S. Army
Director of Public Works

CF: Mr. Randall Smith, EPA
Mr. Kurt Eilo, EPA
Mr. Dan Garcia, ADEC



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY GARRISON, ALASKA
600 RICHARDSON DRIVE # 6000
FORT RICHARDSON, ALASKA 99505-6000



Directorate of Public Works

December 5, 1995

FILE COPY

Mr. Randall Smith
U.S. Environmental Protection Agency
Region 10
Hazardous Waste Division
1200 Sixth Avenue
Seattle, Wa. 98101

Dear Mr. Smith:

Per 40 CFR 265.115, enclosed are certifications stating that the following Fort Greely, Alaska locations have been closed in accordance with the specifications in the approved closure plans:

- Building 626
- Building 615
- Washington Range Open Burn / Open Detonation (OB/OD) Site

With the submission of these closure plans and our multi-year positive EPA and ADEC RCRA inspections, we feel we have met the provisions specified in the Fort Greely Federal Facility Compliance Agreement dated March 29, 1991.

The point of contact for this project is Mr. Jim Miller, Environmental Scientist, at (907) 384-3075.

ALBERT J. KRAUS
Colonel, U. S. Army
Director of Public Works

CF: Kurt Eilo, EPA
Geoffrey Kany, ADEC
Dan Garcia, ADEC



DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
P.O. BOX 898
ANCHORAGE, ALASKA 99506-0898

REPLY TO
ATTENTION OF:

Technical Engineering Section

OCT 26 1995

FILE COPY

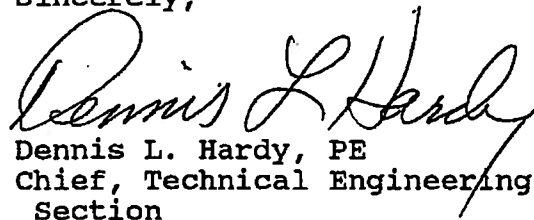
Mr. Randall Smith
Environmental Protection
Agency
Region X
Hazardous Waste Division
1200 Sixth Avenue
Seattle, WA 98101

Dear Mr. Smith:

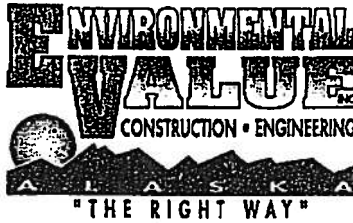
In accordance with the approved closure plan for Fort Greely Building 626, I certify there is no RCRA Hazardous Waste contaminating the site. This determination fulfills the requirements in the RCRA Compliance Agreement between the Army and EPA for RCRA site closure.

Petroleum fuel contamination is present at the site and exceeds the Alaska Department of Conservation's (ADEC) action levels. The Building 626 site should be addressed under an Army-ADEC Two-Party Agreement.

Sincerely,


Dennis L. Hardy, PE
Chief, Technical Engineering
Section





FILE COPY

430 SUNDEW LANE
FAIRBANKS AK 99712-1323

November 20, 1995

Mr. Randall Smith
Environmental Protection
Agency
Region X
Hazardous Waste Division
1200 Sixth Avenue
Seattle, Wa 98101

Dear Mr. Smith:

According to 40 CFR 265.115, as an independent registered professional environmental engineer, I have reviewed the data and the approved closure plan for Fort Greely Building 626.

The remaining site contamination is below EPA action limits, meeting the closure performance standard, 40 CFR 265.111.

I concur with the Fort Greely Building 626 Approved Closure Plan and certify that the site is closed accordingly. Post-closure monitoring does not appear to be warranted.

Although petroleum hydrocarbons exceed the ADEC action limits, there is little likelihood that surface or ground water will be adversely effected. There will be no noticeable sheen, taste or odor.

Sincerely,

Fredrick L. Walter
IL 62-025007