PACIFIC AIR FORCES
REGIONAL SUPPORT CENTER

CAPE ROMANZOF LRRS, ALASKA

FEASIBILITY STUDY FOR OB942

CAPE ROMANZOF LONG-RANGE RADAR SITE, ALASKA

FINAL
MAY 2015

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MAY 2015

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ACRONYMS AND ABBREVIATIONS

ADEC	Alaska Department of Environmental Conservation
ARAR	applicable or relevant and appropriate requirements
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
BMP	best management practice
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COPC	chemical of potential concern
CSE	Comprehensive Site Evaluation
cy	cubic yard
Eco-SSL	ecological soil screening level
EPA	U.S. Environmental Protection Agency
FS	Feasibility Study
HHE	human health and the environment
HHRA	human health risk assessment
IRP	Installation Restoration Program
Jacobs	Jacobs Engineering Group Inc.
LRRS	Long-Range Radar Site
LTM	Long-Term Management
LUC	Land-Use Controls
mg/kg	milligram per kilogram
MRA	munitions response area
MRS	munitions response site
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
TBC	to be considered
TI	technical impracticability
TSDF	treatment, storage, and disposal facility
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force

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EXECUTIVE SUMMARY

This Feasibility Study (FS) evaluates potential remedial technologies to address munitions debris at the OB942 Open Burn Area located at Cape Romanzof Long-Range Radar Site (LRRS), Alaska. The remedial technologies presented in this FS were screened based on site-specific effectiveness, implementability, and cost. The following alternatives were developed for addressing the debris:

- Alternative 1: No Action
- Alternative 2: Land-Use Controls (LUC)
- Alternative 3: Capping, LUCs, and Long-Term Management (LTM)
- Alternative 4: Removal and Offsite Disposal

As required by the Code of Federal Regulations (CFR) Title 40, Part 300.430(e)(6), the No Action alternative was retained as a baseline for which the other alternatives could be compared. Other remediation technologies were considered but failed to meet the threshold or balancing criteria established under the Comprehensive Environmental Response, Compensation, and Liability Act (40 CFR 300). All of the alternatives listed above were retained for detailed analysis.

Table ES-1 presents the proposed alternatives and estimated costs for comparison purposes.

Table ES-1
OB942 at Cape Romanzof LRRS Alternatives Summary

Alternative	Description	Cost Estimate
Alternative 1	No Action	$0
Alternative 2	Land-Use Controls	$429,435
Alternative 3	Capping, Land-Use Controls and Long-Term Management	$1,168,407
Alternative 4	Removal and Offsite Disposal	$1,726,536

Following final approval of this FS, the U.S. Air Force will issue a Proposed Plan for OB942 at Cape Romanzof LRRS. Comments on the Proposed Plan will be solicited from the community and state. Following receipt of comments, the alternatives will be further evaluated based on the modifying criteria (state acceptance and community acceptance), and a remedy will be selected for the site. The selected remedy will be documented in the Record of Decision.

1.0 INTRODUCTION

This Feasibility Study (FS) presents and evaluates remedial alternatives for the OB942 Open Burn Area at Cape Romanzof Long-Range Radar Site (LRRS), Alaska (Figure 1-1). This study is part of continuing efforts by the U.S. Air Force (USAF) to address contamination at the facility. The overall goal for OB942 at Cape Romanzof LRRS is to meet remedial action objectives (RAO), as described in Section 2.1. Jacobs Engineering Group Inc. (Jacobs) prepared this FS on behalf of the Air Force Civil Engineer Center under Contract No. FA8903-08-D-8773, Task Order No. 166.

This FS is necessary to address munitions debris observed during a 2011 investigation conducted to find evidence of munitions use. The 2011 Comprehensive Site Evaluation (CSE) Phase I/II focused on collecting soil samples at OB942 and analyzing them for lead and antimony (U.S. Army Corps of Engineers [USACE] 2013). No surface water or groundwater sampling was conducted. Results of the CSE concluded that both lead and antimony are present in the soil at OB942 but at concentrations below the most stringent Alaska Department of Environmental Conservation (ADEC) and U.S. Environmental Protection Agency (EPA) cleanup levels. Lead is classified as a hazardous substance under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (U.S. Code Title 42, Part 9601, et. seq.) when it is present at levels that have the potential to adversely affect human health or the environment. Munitions debris may not be a hazardous substance; however, a munitions response is still appropriate to ensure human health and the environment (HHE) are protected.

1.1 PURPOSE AND ORGANIZATION OF REPORT

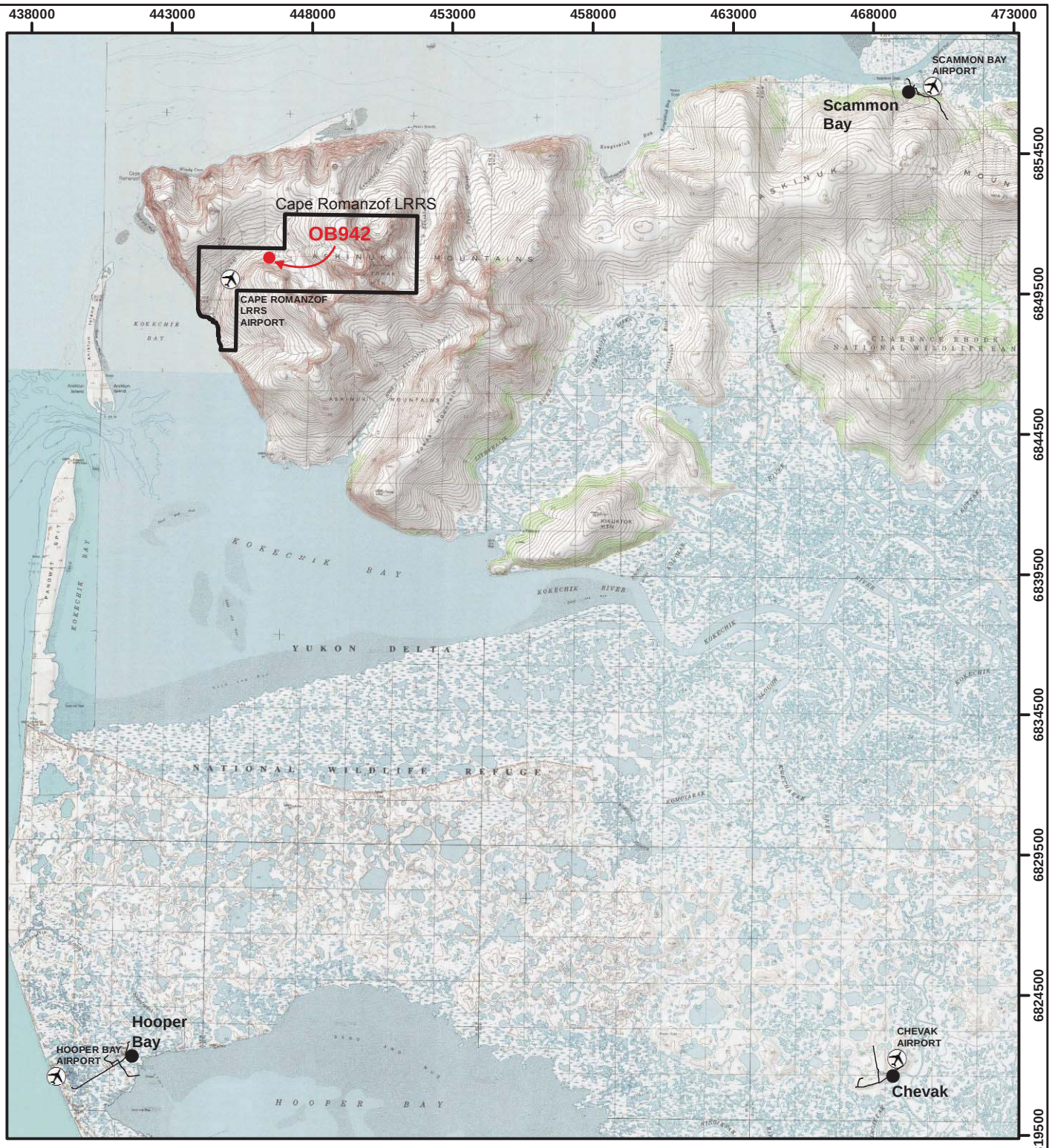
As outlined in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) [Code of Federal Regulations (CFR), Title 40, Part 300.430(e)], the objective of this FS is to develop and evaluate remedial alternatives for contamination at OB942. The specific goals of this document are the following:

- Formulate site-specific RAOs (Section 2.1)

- Identify applicable remedial technologies based on the chemicals, contaminant distribution and concentration, and local site conditions (Section 2.4.1)
- Screen the identified technologies based on effectiveness, implementability, and cost (Section 2.4.2)
- Use technologies that pass the screening process to develop alternatives that eliminate, control, and/or reduce risk to HHE at the site (Section 3.2)
- Evaluate each alternative that passes screening against the following seven NCP threshold and balancing criteria (Section 4.2):
  - Protection of HHE
  - Compliance with applicable or relevant and appropriate requirements (ARAR)
  - Long-term effectiveness and permanence
  - Reduction of toxicity, mobility, or volume through treatment
  - Short-term effectiveness
  - Implementability
  - Cost
- Present a comparative analysis to determine the relative performance of the alternatives (Section 4.4)

This report has been organized into five sections based on the outline provided in *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA 1988):

- **Section 1.0 Introduction**: Outlines report preparation and provides relevant historical and background information
- **Section 2.0 Identification and Screening of Technologies**: Introduces the technical approach and provides a description of potentially applicable remedial technologies
- **Section 3.0 Development and Screening of Alternatives**: Formulates remedial technologies into alternatives based on their applicability to OB942
- **Section 4.0 Detailed Analysis of Alternatives**: Evaluates and compares remedial alternatives established in Section 3.0
- **Section 5.0 References**: Provides a list of documents used in the preparation of this FS



N

0 2.5 5 7.5 10
Miles

0 2.5 5 7.5 10
Kilometers

WGS 1984 UTM Zone 3N, meters

LOCATION AND VICINITY MAP
CAPE ROMANZOF OPEN BURN AREA OB942

CAPE ROMANZOF LRRS, ALASKA

JACOBS	DATE:	PROJECT MANAGER:	FIGURE NO:
	26 MAR 2015	J. WEHRMANN	1-1

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1.2 BACKGROUND INFORMATION

The Cape Romanzof LRRS was established in 1953. It is located in coastal western Alaska, in the Yukon-Kuskokwim Coastal Lowland region at the western end of the Askinuk Mountains and on a small peninsula that extends into the Bering Sea. The site is approximately 560 miles west of Anchorage, 165 miles northwest of Bethel, and 170 miles southeast of Nome. USAF property at the installation encompasses about 4,900 acres situated within the boundaries of the Yukon-Kuskokwim Delta National Wildlife Refuge, a federally protected habitat area. The nearest local communities are Scammon Bay and Hooper Bay, which are located approximately 15 miles east and south of the installation, respectively. Although the communities are not connected to Cape Romanzof by road, community members walk and use off-road vehicles, boats, and snow machines to travel to, from, and throughout the Cape Romanzof area. Sections 1.2.1 through 1.2.5 provide an overview of the environmental conditions at OB942.

1.2.1 Site Description

The Cape Romanzof installation encompasses two main areas: the Lower Camp where the main camp facilities (i.e., housing, power plant, and bulk fuel storage area) are located; and the Upper Camp, situated at the top of Towak Mountain (elevation 2,250 feet above mean sea level), where the long-range radar equipment is located (Figure 1-2). The Upper Camp and Lower Camp are connected by a gravel road and former tramway service. A 1-mile-long gravel runway serving the installation is located near the beach at Kokechik Bay, approximately four miles southwest of the Lower Camp by road. Fowler (Nilumat) Creek and its tributaries run through Cape Romanzof LRRS to Kokechik Bay. There is one small lake, formed by a small dam at the head of the valley at Lower Camp (USACE 2013).

OB942 Open Burn Area is located approximately 0.6 miles east of the north end of the airstrip, approximately 100 feet south of the access road. During the CSE Phase I/II site reconnaissance, the Open Burn Area was identified as a munitions response area (MRA) due to the presence of burned .50-caliber and .30-caliber rounds (USACE 2013). The entire Open Burn Area MRA was recommended for further action; therefore, it was designated as a single

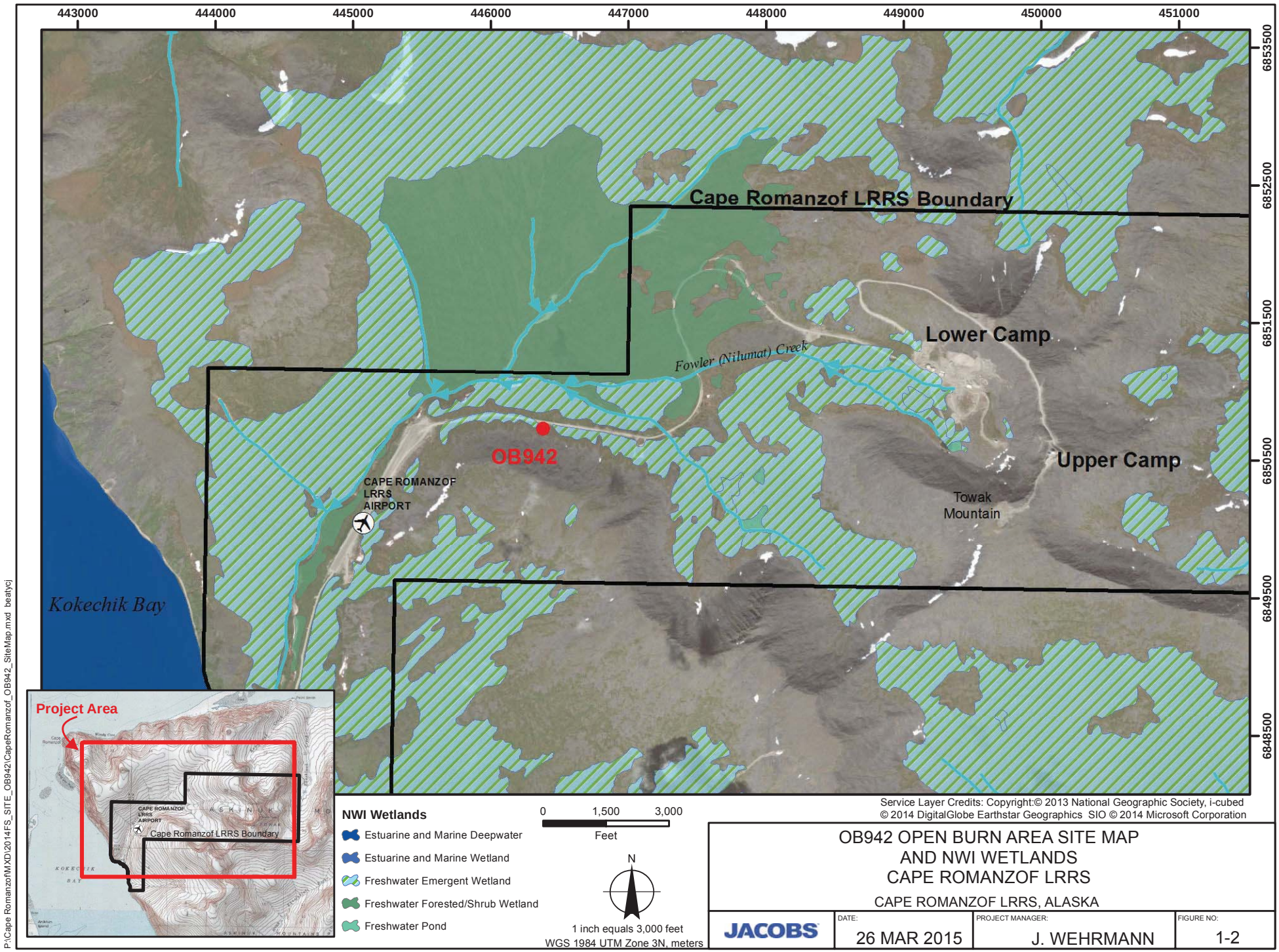
munitions response site (MRS). The 0.98-acre area is in open, rocky tundra with sparse vegetation. Features include evidence of one or more burn piles with shell casings and projectiles scattered on the open ground and among the rocks and vegetation. Several rusting metal drums are also present. Figure 1-2 presents the location of the OB942 Open Burn Area MRS.

1.2.2 Site History

Cape Romanzof was one of the original 12 Aircraft Control and Warning sites built in the 1950s in Alaska as part of an air defense communication system (USACE 2013). In 1958, a White Alice Communications Site was activated and operated until 1979. The Cape Romanzof White Alice Communications Site was deactivated and replaced by an Alascom-owned satellite earth terminal in 1979 (USACE 2013). In 1982 and 1983, the remaining military personnel were inactivated and replaced with contractor personnel to maintain the Joint Surveillance System equipment. Personnel numbers were further reduced in 1985 when the Minimally Attended Radar was activated. All unnecessary facilities were demolished by 1988. The Cape Romanzof LRRS currently serves as a Minimally Attended Radar site and is part of the Alaska Radar System managed by the 611th Air Support Group.

Cape Romanzof LRRS stored small quantities of hazardous materials, including diesel fuel, gasoline, oil, antifreeze, solvents, pesticides, and electrical transformers. Seventeen Installation Restoration Program (IRP) sites are located at the installation, three of which remain open/active: LF003 Landfill Number 2, SS010 Spill/Leak Number 4 (Wells 2 and 3), and SS016/SS017 Former Tramway. The closest IRP site to OB942 is OT005 Road Oiling (USACE 2013).

A combined CSE Phase I/II was performed at the Cape Romanzof LRRS in 2011. The CSE Phase I included a historical records review, visual reconnaissance, and interviews; the CSE Phase II included a visual survey and environmental sampling.



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OB942 OPEN BURN AREA SITE MAP AND NWI WETLANDS CAPE ROMANZOF LRRS

CAPE ROMANZOF LRRS, ALASKA

JACOBS	DATE:	PROJECT MANAGER:	FIGURE NO:
	26 MAR 2015	J. WEHRMANN	1-2

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Field observations were used to identify the OB942 Open Burn Area MRS during the CSE Phase I/II. The area is also evident in a historical aerial photograph of Cape Romanzof from 1963 (USACE 2013). The MRS may have been used to destroy ammunition that was stored for defensive purposes. It appears OB942 was used to dispose of .50-caliber and .30-caliber rounds by burning them in barrels or on the ground. No munitions and explosives of concern were anticipated or found at this site.

1.2.3 Nature and Extent of Contamination

Site-specific contaminant data can be found in the *Cape Romanzof Long-Range Radar Site Comprehensive Site Evaluation Phase I/II* (USACE 2013). The primary chemicals of potential concern (COPC) at OB942 at Cape Romanzof LRRS are metals associated with small-caliber ammunition (lead and antimony) that appear to have been burned onsite. Additional COPCs (e.g., gasoline-range organics [GRO], diesel-range organics [DRO], and polycyclic aromatic hydrocarbons [PAH]) associated with burning activities may be present at OB942, but the presence of these analytes has not yet been investigated (USACE 2013). During the CSE Phase I/II (USACE 2013), surface soil up to 12 inches below ground surface (bgs) was sampled for lead and antimony. Analytical results indicated that lead and antimony associated with activities conducted at OB942 are present in surface soil; however, results for both lead and antimony were below the ADEC Method Two soil cleanup levels (400 milligrams per kilogram [mg/kg] for lead and 41 mg/kg for antimony) (Figure 1-3). Lead concentrations ranged from 7.3 mg/kg to 13 mg/kg and antimony results were undetected.

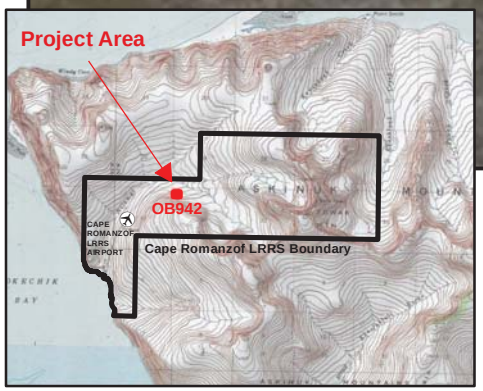
No evidence of historical use of explosives and no munitions and explosives of concern were observed during the CSE Phase I/II; only “small arms debris” was observed during the visual survey (USACE 2013). Shells were found within the apparent burn location and “kickout” debris was found nearby. The condition of some of the debris and shells indicated that intact rounds had been burned and exploded from the heat as they appeared to have been shredded or blown apart (USACE 2013). Subsurface anomalies were detected with a metal detector that could potentially indicate buried small arms munitions.

1.2.4 Contaminant Fate and Transport

Potential transport mechanisms for munitions debris include those physical processes that may result in the movement or relocation of a debris item after its original placement. If not removed, it could potentially pose a hazard to human health. Transport from its original placement could be by the following physical processes:

- Picking up or moving of munitions debris by a person(s);
- Disturbance of munitions debris during construction, excavation, or other soil moving activities; and
- Natural processes, such as erosion/deposition, uptake or frost heave, gravity, hydrological effects, or degradation.

Lead and antimony adsorb to soil and are not considered highly mobile in the environment. When lead is deposited in soil from anthropogenic sources, it does not biodegrade or decay and is not rapidly absorbed by plants; therefore, it remains in the soil at elevated levels (EPA 2001). Most lead is retained strongly in soil, and very little is transported through runoff to surface water or leaching to groundwater except under acidic conditions (EPA 1986 and National Science Foundation 1977, as cited by Agency for Toxic Substances and Disease Registry [ATSDR] 2007). Small amounts of lead may enter water bodies when soil particles containing lead are moved by rainwater. Movement of lead from soil also depends on the type of lead salt or compound, as well as on the physical and chemical characteristics of the soil. Plants and animals may bioconcentrate lead through direct contact with the source, and lead is listed as a bioaccumulative compound in ADEC *Policy Guidance on Developing Conceptual Site Models* (ADEC 2010). However, biomagnification to upper levels of the food chain is not expected (ATSDR 2007). The bioavailability of lead in soil to plants is limited because of the strong adsorption of lead to soil organic matter; however, the bioavailability increases as the pH and the organic matter content of soil are reduced (ATSDR 2007). Uptake of lead in animals may occur as a result of direct contact/inhalation or ingestion.



Lead (Pb)/Antimony (Sb) Surface Sample Location

Lead (Pb)/Antimony (Sb) Soil Boring Sample Location

Evidience of Small Arms Activity

0 30 60 90 120

Feet

1 inch equals 60 feet

WGS 1984 UTM Zone 3N, meters

N

OB942 OPEN BURN AREA
2011 ANALYTICAL LEAD AND ANTIMONY RESULTS

CAPE ROMANZOF LRRS, ALASKA

JACOBS	DATE: 26 MAR 2015	PROJECT MANAGER: J. WEHRMANN	FIGURE NO: 1-3

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The binding of antimony to soil is determined by the nature of the soil and the form of antimony deposited on the soil. Some studies suggest that antimony is fairly mobile under diverse environmental conditions (Rai and Zachara 1984, as cited by ATSDR 1992), while others suggest that it is strongly adsorbed in soil (Ainsworth 1988, Foster 1989, and King 1988, as cited by ATSDR 1992). Antimony does not appear to biomagnify from lower to higher trophic levels in the food chain (ATSDR 1992), and it is not listed as a bioaccumulative compound in *ADEC Policy Guidance on Developing Conceptual Site Models* (ADEC 2010).

Standing surface water or seeps were observed at OB942; however, no surface water, sediment, or groundwater data were collected during the CSE Phase I/II. Therefore, these are considered potential exposure pathways. Depth to groundwater at Lower Camp ranges from 1 foot to 60 feet bgs (USAF 2011, as cited by USACE 2013) and groundwater is used as the drinking water source for the Cape Romanzof LRRS (USACE 2013). OB942 Open Burn Area is located approximately 1.7 miles west of and downgradient from Lower Camp. There is no evidence that groundwater is affected; therefore, migration to groundwater is not likely a complete pathway.

1.2.5 Baseline Risk Assessment

Screening level human health and ecological risk assessments were performed as part of the CSE Phase I/II investigation. Lead and antimony were identified as COPCs. The human health and ecological risk assessments were limited to the lead and antimony soil sample data collected in 2011.

For the human health risk assessment (HHRA), none of the surface soil sample results exceeded the EPA Regional Screening Levels (residential use) for lead (400 mg/kg) or antimony (31 mg/kg). The CSE Phase I/II HHRA concluded that all exposure pathways are complete though likely insignificant and that neither lead nor antimony were retained as soil chemicals of concern (USACE 2013).

For the ecological risk assessment, neither lead nor antimony in soils are likely to result in unacceptable risks to ecological receptors at OB942 (USACE 2013). Two of the lead sample results exceeded and two lead results were equal to the EPA ecological soil screening level (Eco-SSL) value for lead (11 mg/kg). None of the antimony sample results exceeded the EPA Eco-SSL value for antimony (0.27 mg/kg). These screening values for lead and antimony are less than background values for many states; however, the levels indicate the contamination present is potentially harmful to terrestrial plants and animals (USACE 2013).

2.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

In order to provide a clear understanding of remedial options available for OB942 at Cape Romanzof LRRS, this FS followed the process outlined in the *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA 1988). This process entails the following steps:

- Develop RAOs and general response actions
- Identify and screen remedial technologies capable of obtaining the RAOs
- Develop remedial alternatives
- Screen remedial alternatives
- Perform detailed analysis of remedial alternatives

Each step is discussed in detail in this section, and the implementation of each step is discussed in Sections 3.0 and 4.0 of this document. RAOs (Section 2.1) were developed based on contaminant concentration standards established under various chemical-specific ARARs. General response actions (Section 2.2) are broad categories of action that can be undertaken to satisfy RAOs.

2.1 REMEDIAL ACTION OBJECTIVES

RAOs consist of site-specific goals for protecting HHE. In accordance with EPA guidance, the objectives are as specific as possible but not so specific that the range of alternatives that can be developed is unduly limited (EPA 1988). RAOs specify the following:

- COPCs
- Media (e.g., soil or groundwater)
- Exposure routes and receptors
- Acceptable contaminant concentrations, commonly referred to as preliminary remediation goals

The following RAOs were identified for OB942:

- Minimize or eliminate the potential for site worker exposure to munitions debris, which could present a physical hazard

- Minimize or eliminate direct ecological exposure to lead concentrations in soil above or equal to the EPA Eco-SSL

Achievement of these RAOs will be necessary to protect HHE, allowing continued use of the site for the USAF mission at Cape Romanzof LRRS. Lead and antimony concentrations onsite are already below the ADEC Method Two soil cleanup levels (400 mg/kg and 41 mg/kg, respectively, for direct contact/ingestion that are protective of human health) (ADEC 2014).

2.2 GENERAL RESPONSE ACTIONS

General response actions are broad categories of actions that can be undertaken to satisfy RAOs. An evaluation of general actions that may be effective in meeting RAOs has led to the selection of the following potential general response actions:

- No Action
- Disposal
- Containment
- Land-Use Controls (LUC)

These general response actions (Sections 2.2.1 to 2.2.4) can be combined to form an effective remedy. In situ and ex situ treatment general response actions were not considered as there are no known contaminated media at the site. Table 2-1 summarizes the general response actions and potentially applicable technologies for munitions debris and associated soil.

Table 2-1
General Response Actions and Potentially Applicable Technologies for OB942

General Response Actions	Technology Category	Potentially Applicable Technologies
No Action	None	None
Disposal	Physical	Onsite Disposal
		Offsite Disposal
Containment	Physical	Permeable Cap
		Impermeable Cap
LUCs	Physical or Regulatory	Site Controls
		Institutional Controls

Note:
LUC = land-use controls

2.2.1 No Action

The No Action general response action serves as a baseline for comparison with other general response actions.

2.2.2 Disposal

Munitions debris can be removed and disposed of onsite or offsite at a location in compliance with the Resource Conservation and Recovery Act (RCRA).

2.2.3 Containment

Containment actions reduce risks to human health and environmental receptors by limiting possible exposure to munitions debris and contaminants. Containment can prevent either direct exposure (ingestion or inhalation) or indirect exposure (migration to groundwater). Containment technologies do not reduce the toxicity or volume of contaminants, but may reduce contaminant mobility. For example, placing an impermeable cap over a landfill may be used to protect the underlying groundwater.

2.2.4 Land-Use Controls

LUCs include institutional controls and site controls. Institutional controls are legal or administrative measures taken to limit human exposure to contaminants by restricting access to—and use of—an area. Site controls include actions, such as fencing and physically blocking access to the site. Institutional controls and site controls are commonly used as temporary measures to ensure the protection of human health until remedial actions or natural attenuation are complete but can be implemented as the entire remedy or as a component of the selected remedy. When undertaken without other general response actions, LUCs attempt to protect HHE without reducing the volume or toxicity of contaminants present.

2.3 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

There are three types of ARARs: chemical-specific; location-specific; and action-specific. Chemical-specific ARARs establish health- or risk-based contaminant concentration limits for various media. Chemical-specific ARARs may set cleanup levels for specific chemicals or discharge limits. Action-specific ARARs establish controls or restrictions on the remedial activities and are triggered by the specific remedial activity rather than the contaminants present. Location-specific ARARs set limitations on remedial activities as a result of the location or characteristics.

In addition, EPA guidance documents identify items to be considered (TBC). TBCs are not considered legally enforceable but are evaluated along with ARARs as part of the risk assessment to set protective cleanup level targets. TBCs should be used in the absence of ARARs, when ARARs are not sufficiently protective to develop cleanup goals, or when multiple contaminants may be posing a cumulative risk (EPA 1987).

ARARs can be identified only on a source-specific basis and depend on the specific hazardous substances, pollutants, and contaminants at a source; the particular actions proposed as a remedy; and the characteristics of a source. ARAR identification is a necessary iterative process and the potential ARARs must be re-examined throughout the CERCLA process.

2.3.1 Chemical-Specific Applicable or Relevant and Appropriate Requirements

Chemical-specific ARARs set contaminant cleanup levels that are considered protective of HHE. The levels are media-specific. Chemical-specific ARARs may also set acceptable levels for the contaminants in discharged media if discharge occurs as part of a remedial activity. A state requirement is an ARAR only if it is more stringent than the corresponding federal requirement.

If necessary, EPA may waive attainment of ARARs. CERCLA Section 121(d)(4) specifies six reasons for waiving ARARs, including technical impracticability (TI) from an engineering perspective (a TI waiver). TI waivers usually apply to ARARs that set cleanup standards or levels. These standards are usually chemical-specific ARARs.

2.3.2 Action-Specific Applicable or Relevant and Appropriate Requirements

Action-specific requirements control or restrict the activities that are selected to accomplish the remedy, not a specific contaminant. Action-specific ARARs may establish performance levels, actions, or technologies as well as specific levels for discharged or residual contaminants.

2.3.3 Location-Specific Applicable or Relevant and Appropriate Requirements

Location-specific ARARs set restrictions on contaminant concentrations or on remedial activities because the contaminants or activities are in—or affect—specific locations, such as wetlands, flood plains, historical places, or sensitive habitats.

2.4 IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGY TYPES AND PROCESS OPTIONS

This section presents the technology identification and screening process. Remedial technologies were selected in accordance with *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA 1988). These technologies were screened based on effectiveness, implementability, and cost.

Effectiveness is the ability of the alternative to protect HHE. It includes both short-term effectiveness, such as protection of workers during remedial actions, and long-term effectiveness, such as the magnitude of residual risk. Effectiveness also includes the ability of the alternative to reduce the toxicity, mobility, and volume of contamination and the ability to meet RAOs and related ARARs. To evaluate effectiveness, each technology was screened against the following:

- Proven ability to achieve cleanup goals
- Potential impacts on HHE
- Reliability with respect to site contaminants

Implementability is the technical and administrative feasibility of the alternative, as well as the availability of the various resources that would be required. This criterion evaluates the technical and administrative feasibility of implementing the technology considering the site-specific conditions. Technical feasibility generally refers to the ability to construct and reliably operate the process until the remedial goal is achieved. This criterion accounts especially for the logistics of performing the technology relative to the remoteness and seasonal weather conditions of the site location. Administrative feasibility includes the approval of any needed permits for offsite actions, as well as the availability of required facilities, specialists, and equipment.

Cost assesses the capital and operating costs of implementing the technology, evaluating them as low, moderate, or high. The cost also includes the logistical expense of working at a remote Alaska site where all personnel, machinery, materials, and waste are transported in and out by air or barge. Rough order-of-magnitude costs for each alternative were provided for comparative purposes during screening. Remedial technologies were not eliminated from further consideration based on cost factors because these are only rough estimates at this stage of the FS process.

2.4.1 Identification and Screening of Technologies

This section describes the identification and screening of remedial technologies to address munitions debris and low levels of lead at OB942. Potentially applicable remedial technologies were identified based on Jacobs' previous experience addressing munitions debris at remote sites in Alaska; professional judgment; and technical reports, papers, and reference guides.

Remedial alternatives were developed based on the results of the technology screening. In accordance with CERCLA guidance, the range of alternatives include the No Action alternative, alternatives that focus on reducing risk by preventing exposure, and (to the extent practicable) alternatives that focus on treatment of contaminated media. Alternatives considered were generally limited by the feasibility due to the remote site location. All alternatives developed for OB942 were retained for detailed analysis.

For each general response action except No Action, all remedial technologies and associated technologies considered potentially appropriate for the site were identified (Sections 3.1.1 to 3.1.4).

Onsite/Offsite Disposal

Although the Municipality of Anchorage landfill is a Subtitle D landfill, it does not accept waste outside of the Municipality of Anchorage. Therefore, this technology requires either the development of a landfill onsite that meets the substantive regulatory requirements, or the excavation and offsite shipment of munitions debris to a licensed treatment, storage, and disposal facility (TSDF) in the contiguous United States. The cost and logistical difficulty of transportation to a TSDF would be high, as would the short-term exposure risks during remedy implementation. Offsite disposal would also include an increased volume of fossil fuels needed for the heavy machinery to remove the soil and debris and load Super Sacks, as well as the airplane/vehicles for transportation offsite.

Containment

Capping is a method of containment that minimizes the potential for exposure to contaminants by physically isolating and securing debris and contaminated soil in place using barrier materials. Caps may be permeable or impermeable. Caps do not result in the destruction or removal of debris or contaminants and are widely used to contain debris and low levels of lead contamination. The ideal area for an in situ capping is a stable, sheltered area not exposed to high erosive forces or upwelling from groundwater. Caps may be temporary or permanent and can be installed before permanent site closure to minimize contaminant migration until a better remedy is selected. Cap maintenance and inspections must occur regularly to ensure the integrity and continued protectiveness of the remedy.

Permeable Cap

A permeable cap, which could be constructed using native soil suitable for re-vegetation or gravel available onsite, effectively prevents contaminant exposure due to direct contact; however, a permeable cap will not prevent exposure due to migration of contaminants to groundwater. Low or high permeability soil can be used to control the amount of water passing through the cap to the contained contamination. Disadvantages to a permeable cap include the following:

- The cap could easily be damaged by burrowing animals, which could also be exposed to and spread, any remaining debris or contamination.
- Fill material would need to be tested to ensure that no additional contamination is introduced to the site.
- Debris and contamination would remain onsite and pose a potential future risk should the cap be compromised due to natural weathering and erosion.
- Long-term inspections, upkeep, and maintenance would be required.

Due to the remote location of OB942, limited mobility of lead, and depth to groundwater, a permeable cap is believed to be sufficient at the site.

Impermeable Cap

Impermeable caps can minimize direct contact with debris and contaminants and migration of soluble soil contaminants to groundwater. An impermeable cap can be constructed using bentonite, asphalt, concrete, or a synthetic liner. These cap materials drain water and prevent its passage to the containerized waste. Disadvantages to using an impermeable cap include the following:

- A site-specific design would be required.
- Appropriate cap material would have to be purchased and transported to the site.
- Debris and contamination would remain onsite and pose a potential future risk should the cap be compromised due to natural weathering and erosion.
- Long-term inspections, upkeep, and maintenance would be required.

Land-Use Controls

The two types of LUCs considered are institutional controls and site controls. Consideration of limited actions to address site contaminants applies to soil. The *Air Force Land Use Control (LUC) Guidance and Checklist* (USAF 2012b) should be referenced when identifying LUCs for USAF sites.

Institutional Controls

Institutional controls are legal or administrative measures designed to prevent or reduce human or environmental exposure to contamination and to prevent activities that may result in increased exposure to, or the spread of, contamination. ADEC provides guidance describing varying levels of institutional controls that are likely to be required based on the cleanup standard used at any given site. Table 2-2 presents Institutional Controls Quick Reference Guide–Soil, from the ADEC *Site Closure Policy and Procedures* (ADEC 2011).

Site Controls

Site controls are physical measures taken to prevent access to sites that may pose an unacceptable risk to human health. Site controls can also be used to prevent actions that could

cause the spread of contaminants or to prevent vehicular access. Typical site controls include signs, fences, and barricades.

2.4.2 Evaluation of Technologies and Selection of Representative Technologies

Following identification of the remedial and containment technologies appropriate for OB942, these technologies were screened based on their effectiveness, implementability, and cost. Technology screening is presented in Figure 2-1 and summarized in Table 2-3.

Table 2-2
Institutional Controls Quick Reference Guide – Soil

Description	Residual Contaminant Concentrations		
	Representative contaminant levels greater than human health levels (Method Two direct contact or inhalation) or site-specific ecological risk levels	**Representative contaminant levels between the most conservative default cleanup levels and human health levels (Method Two direct contact or inhalation); ecological risk mitigated or controlled**	**Representative contaminant concentrations below the most stringent level for the applicable precipitation zone (under 40-inch)**
Implementation Mechanism or Instrument	**Generally enforceable:** • Equitable servitude • Restrictive covenant • Management right assignment • Compliance order by consent • On-line availability of cleanup complete determination • Other decision documents and land and activity use control details • Default "reopener" and soil disposal notification conditions articulated in cleanup complete determination	**Generally informational:** • In some cases, informational controls, such as a deed notice or other informational mechanism, may be used if concerned about relocation of contaminated soil to a sensitive area • On-line availability of cleanup complete determination and any condition details • Default "reopener" and soil disposal notification conditions articulated in cleanup complete determination	**Generally no institutional controls:** • On-line availability of cleanup complete determination • Default "reopener" and soil disposal notification conditions articulated in cleanup complete determination
Monitoring and Reporting	Annual scheduled monitoring and reporting periods tracked on the ADEC database, possibly combined with ADEC inspections.	Variable monitoring and reporting requirements, based on individual site circumstances, tracked on the ADEC database; ADEC inspections infrequent or unnecessary.	Generally none.
Enforcement	Formal enforcement action discretionary for non-compliance depending on site-specific factors.	Formal enforcement action usually unnecessary but other measures, such as a site inspection or responsible party meeting, may be appropriate for non-compliance.	Generally none.

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TECHNOLOGY CATEGORY	REMEDIAL TECHNOLOGY	EFFECTIVENESS	IMPLEMENTABILITY	COST
Disposal	Onsite Disposal	Effective at containing munitions debris (MD)	Implementable: requires development of a landfill/monofill that meets the sub-tantive regulatory requirements	Moderate waste transportation cost
	Offsite Disposal	Effective at removing MD from the site	Implementable: substantial waste transportation from remote site	High waste transportation cost
Containment	Permeable Cap	Moderately effective at containing MD and preventing exposure	Implementable	Moderate cost for long-term maintenance
	Impermeable Cap *	Highly effective at containing MD, preventing exposure, and protecting groundwater	Implementable	Moderate cost to import liner material and for long-term maintenance
Land-Use Controls	Institutional Controls	Moderately effective at preventing exposure	Implementable; must be maintained over the long-term	Moderate cost for long-term management and maintenance
	Site Controls	Moderately effective at preventing exposure	Implementable; must be maintained over the long-term	Moderate cost for long-term management and maintenance

Indicates a technology option that will not be further evaluated as a primary technology for the site

* Due to the remote location of OB942 at Cape Romanzof LRRS and depth to groundwater, a permeable cap is believed to be sufficient at the site.

TECHNOLOGY SCREENING PROCESS FOR MUNITIONS DEBRIS AT OB942
CAPE ROMANZOF LRRS. ALASKA

JACOBS	DATE: 27 MAY 2015	PROJECT MANAGER: J. Wehrmann	FIGURE NO: 2-1

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Table 2-3
OB942 Technology Screening for Munitions Debris

General Response Action	Technology Process Option	Effectiveness	Implementability	Cost	Technology Screening
No Action	No Action	○	●	●	Retained[1]
Disposal	Onsite Disposal	◐	◐	◐	Retained
	Offsite Disposal	●	◐	◐	Retained
Containment	Permeable Cap	◐	●	●	Retained
	Impermeable Cap	◐	◐	◐	Eliminated[2]
LUCs	Institutional Controls	◐	●	●	Retained
	Site Controls	◐	●	●	Retained

Notes:
[1] This is retained to establish baseline conditions
[2] Due to the remote location of OB942, depth to groundwater, and the fact that the contaminants are not readily mobile, a permeable cap is believed to be sufficient at the site.

● Highly effective, easy to implement, or low cost
◐ Somewhat effective, difficult to implement, or moderate cost
○ Not effective, very difficult to implement, or high cost

(intentionally blank)

3.0 DEVELOPMENT AND SCREENING OF ALTERNATIVES

Remedial alternatives were developed based on the results of the technology screening. In accordance with CERCLA guidance (EPA 1988), the range of alternatives include the No Action alternative, alternatives that focus on reducing risk by preventing exposure, and (to the extent practicable) alternatives that focus on treatment of contaminated media.

The following alternatives were developed for treatment of munitions debris at OB942:

- Alternative 1: No Action
- Alternative 2: LUCs
- Alternative 3: Capping, LUCs, and LTM
- Alternative 4: Removal and Offsite Disposal

3.1 DEVELOPMENT OF REMEDIAL ALTERNATIVES FOR OB942

To develop a remedial strategy for munitions debris at OB942, a conceptual understanding of the volume and location of the munitions debris is needed. Based on the documentation provided in the CSE Phase I/II, it is estimated that approximately 3 cubic yards (cy) of munitions debris, including crushed drums, remain at the site. For Alternatives 3 and 4, it is assumed that the munitions debris will be collected along with the top 3 inches of soil for an approximate total of 418 cy (approximately 627 tons). An estimated density of the soil and debris of 1.5 tons per cy was used to convert volume estimates to weight estimates.

3.1.1 Alternative 1: No Action

Under the No Action alternative, no activities would be undertaken to treat or remove the munitions debris or to otherwise prevent exposure to the debris. No monitoring would be conducted. A No Action alternative is required for consideration under the NCP and serves as a baseline against which other alternatives can be compared.

3.1.2 Alternative 2: Land-Use Controls

Under this alternative, LUCs would be implemented to restrict invasive and residential activities and protect human health from exposure to munitions debris. LUCs would include dig restrictions and the USAF would file a notice of contamination with the Air Force real property office. CERCLA five-year reviews would be required to evaluate the long-term protectiveness of the remedy (indefinitely).

3.1.3 Alternative 3: Capping, Land-Use Controls, and Long-Term Management

Under this alternative, munitions debris at the site would be consolidated into a smaller area and capped with a minimum 2-foot soil cap to create an onsite solid waste monofill. The cap and LUCs would be implemented to restrict invasive activities and protect HHE from exposure to munitions debris and associated soil. LUCs would include dig restrictions, deed restrictions, and signage. In addition, the USAF would file a notice of contamination with the Air Force real property office. LTM would be implemented to ensure the integrity of the cap and inspections would occur once a year for the first five years, then every five years thereafter, indefinitely.

A permeable cap would be appropriate at this location because offsite migration through groundwater is not likely. The debris would be consolidated into one pile and then capped. Based on the estimated extent of debris coverage and assuming the top 3 inches of soil would be collected along with the debris into one pile, the cap would need to cover approximately 5,625 square feet and would be constructed with 2 feet of locally available gravel.

The NCP requires that remedial actions that result in any hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure be reviewed every five years to ensure protection of HHE. Therefore, CERCLA five-year reviews would be required to evaluate the long-term protectiveness of the remedy (indefinitely).

3.1.4 Alternative 4: Removal and Offsite Disposal

Under this alternative, munitions debris, along with the top 3 inches of soil, would be removed, staged, manifested, and transported for disposal to a RCRA-permitted Subtitle D landfill capable of managing munitions debris. Debris and soil would be removed and staged onsite prior to transport. The drums would be crushed and placed into Super Sacks. Approximately 400 cy of munitions debris and soil would be removed from the site; when removed, the amount of debris and soil to be disposed equates to approximately 480 cy of debris and soil when adjusting for bulk factor (see Appendix B).

The following logistical coordination and manifesting activities would be required for excavating, staging, transporting, and disposing of soil at a licensed TSDF:

- Loading munitions debris and soil into Super Sacks for transport from OB942 to the barge landing
- Chartering a barge from Cape Romanzof LRRS to Anchorage
- Staging Super Sacks in containers in Anchorage for transport to the TSDF
- Barging containers from Anchorage to Seattle, then trucking containers to a TSDF in the contiguous United States

Under this alternative, the site would be restored for unlimited exposure/unrestricted use. CERCLA five-year reviews would not be required with this alternative.

3.2 SCREENING OF ALTERNATIVES FOR OB942

Table 3-1 compares the effectiveness, implementability, and cost of the screened alternatives.

Table 3-1
Screening of Alternatives for OB942

Remedial Alternative	Effectiveness	Implementability	Cost	Retained for Detailed Analysis?[1]
1: No Action	○	○	●	Yes
2: Land-Use Controls	◐	●	●	Yes
3: Capping, Land-Use Controls, and Long-Term Management	◐	◐	◐	Yes
4: Removal and Offsite Disposal	●	◐	◐	Yes

Notes:
[1] These alternatives will be further evaluated in the Proposed Plan for OB942.

● Highly effective, easy to implement, or low cost
◐ Somewhat effective, difficult to implement, or moderate cost
○ Not effective, very difficult to implement, or high cost

4.0 DETAILED ANALYSIS OF ALTERNATIVES

Remedial alternatives for munitions debris and associated uncontaminated soil at OB942 have been developed for detailed and comparative evaluation in this FS based on the RAOs and general response actions identified, and on the screening of potential remedial technologies described in Section 2.0. Alternatives considered were generally limited by the feasibility due to the remote site location. All the alternatives developed for OB942 were retained for detailed analysis.

Remedial options in this section are evaluated assuming approximately 3 cy of munitions debris and approximately 400 cy of debris mixed with the top 3 inches of soil at the site. Based on the screening presented in Section 3.2, all the alternatives were retained for detailed analysis. These include the following:

- Alternative 1: No Action
- Alternative 2: LUCs
- Alternative 3: Capping, LUCs, and LTM
- Alternative 4: Removal and Offsite Disposal

Section 4.1 presents the criteria for evaluating the acceptability of an alternative and Section 4.2 presents the detailed analyses for each retained alternative. Section 4.3 provides a discussion of site-specific factors that may have an effect on remedy implementation, and Section 4.4 presents a comparison of the alternatives and their ability to achieve NCP criteria.

Although not included in the NCP as part of any criteria, additional risk to the environment includes potential harm where increased fossil fuels and greenhouse gas emissions are required for remedy implementation (ITRC 2011). This risk will be evaluated alongside the evaluating criteria.

4.1 CRITERIA CATEGORIES

The NCP (40 CFR 300) presents nine criteria for evaluating the acceptability of a given alternative; these nine criteria comprise two threshold criteria, five primary balancing criteria, and two modifying criteria.

4.1.1 Threshold Criteria

Threshold criteria represent the minimum requirements that each alternative must meet to be eligible for selection. Failure to achieve each threshold criterion will eliminate the alternative from further consideration. The two threshold criteria are as follows:

- Overall protection of HHE
- Compliance with ARARs

Overall Protection of Human Health and the Environment

This criterion assesses the overall effectiveness of an alternative and focuses on whether that alternative achieves adequate protection and risk reduction, elimination, or control. This criterion overlaps with considerations under compliance with ARARs, as well as with some primary balancing criteria, such as long-term and short-term effectiveness.

Compliance with Applicable or Relevant and Appropriate Requirements

This criterion assesses whether an alternative complies with all federal and state ARARs or whether a waiver would be required and would be justified under CERCLA and NCP [42 USC 9621(d)(4); 40 CFR 300.430(f)(1)(ii)(C)], such as for TI. ARARs include chemical-specific requirements such as risk-based levels established for safe drinking water (e.g., maximum contaminant levels); location-specific requirements such as protection of wetlands; and action-specific requirements such as post-closure requirements. Other potential requirements that are not necessarily laws or promulgated regulations, such as EPA Regional Screening Levels, are TBCs that can be treated as ARARs, particularly when no other specific laws or regulations are available as ARARs. Appendix A presents ARARs for OB942.

4.1.2 Primary Balancing Criteria

Primary balancing criteria form the basis for comparing alternatives in light of site-specific conditions. The five primary balancing criteria are as follows:

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

Long-Term Effectiveness and Permanence

This criterion assesses the destruction or removal of contaminants, the magnitude of residual risks remaining at the conclusion of remedial activities, and the adequacy and reliability of controls to be used to manage residual risk at the site after the selected remedy has been implemented.

The following factors of the criterion are addressed for each alternative:

- **Magnitude of residual risk.** This factor assesses the risk from residual COPCs (and at OB942, this includes munitions debris) at the conclusion of the proposed activities. The characteristics of the residual COPCs will be considered to the degree that they remain hazardous, and the evaluation will account for volume, toxicity, mobility, and propensity to bioaccumulate.
- **Adequacy and reliability of controls.** This factor assesses the adequacy and suitability of controls, if any, that are used to manage COPCs that remain at the site. It also assesses the long-term reliability of management controls for providing continued protection from residual COPCs, and includes an assessment of potential needs for replacement of technical and engineered components of the alternative.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Section 9621 of CERCLA (Cleanup Standards) states: “Remedial actions in which treatment permanently and significantly reduces the volume, toxicity, or mobility of the hazardous

substances, pollutants, and contaminants is a principle element, are to be preferred over remedial actions not involving such treatment."

This criterion addresses the capacity of the alternative to reduce principle risks through destruction of contaminants, reduction in the total mass of contaminants, irreversible reduction in contaminant mobility, or reduction in the total volume of contaminated media through treatment.

This evaluation focuses on these specific factors:

- Treatment processes employed and the materials and COPCs treated
- Amount of hazardous materials destroyed or treated, including how the principle threats will be addressed
- Degree of expected reduction in toxicity, mobility, or volume through treatment as measured as a percentage of reduction
- Degree to which the treatment will be irreversible
- Type and quantity of treatment residuals remaining after treatment
- If the alternative will satisfy the statutory preference for treatment as a principle element

Short-Term Effectiveness

This criterion addresses the effects of the alternative during construction and operation until RAOs are met. Each alternative is evaluated with respect to its potentially negative effects on community health, worker safety, and environmental quality during the course of remedial actions. This criterion also addresses the time required by each alternative until RAOs are achieved.

Implementability

The implementability criterion is used to assess the technical and administrative feasibility of implementing an alternative. Technical issues include the reliability of the technology under consideration, potential construction difficulties, and the availability of required services, materials, and equipment, preferably from multiple sources. Administrative issues include

permitting for offsite actions and access for construction and monitoring.. Factors addressed include the following:

- Whether the technology is proven under the site-specific conditions
- What administrative requirements and relative difficulties associated, such as requirements for permits for offsite actions
- Whether skilled workers are required and are available locally
- Whether materials are available locally or would require transportation, as transportation of materials may include risk from transport of the materials. Other factors, such as cost of transport, would be addressed under the cost evaluation.

Cost

A detailed cost analysis of each alternative involves estimating the cost required to complete each measure through the entire life cycle, which includes capital costs and annual operation and maintenance costs. Cost estimates include equipment, materials, construction-related labor, and site development. The cost estimates provided are preliminary and were developed in accordance with *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study* (EPA 2000). More detailed and accurate cost estimates will be developed as the CERCLA process progresses. Cost estimates included in this document are intended for comparative purposes only. They intentionally emphasize comparability (a key factor in the decision-making process) versus accuracy.

Annual operation and maintenance costs of each alternative are presented as a present worth cost using a 5 percent rate of return over 30 years (consistent with EPA guidance [EPA 2000]). Cost estimates for each alternative are based on site-specific conceptual designs and are expressed in 2014 dollars. Cost estimates were prepared using data available from the 2011 CSE Phase I/II (USACE 2013) and are intended to provide an accuracy of between +50 and –30 percent. Details of the cost estimates are provided in Appendix B.

Present worth costs for each alternative provided in this FS include the following components:

- Estimates of the volume of contaminated soil to be addressed

- Capital costs including design, planning, permitting for offsite actions, work plans, procurement, and construction
- Annual operation and maintenance costs, if applicable
- A 10 percent contingency on construction capital costs to account for unforeseen project complexities such as adverse weather, unexpected subsurface conditions, increased standby times, etc.

The cost estimates include consistent assumptions and methodologies such that potential unit cost, quantity, or other biases will have an equal impact on each cost estimate. Consequently, the cost estimates should be proportionally affected and the relative difference for comparative analysis maintains the ranking of relative cost. The cost estimate, however, is not adequate for budgetary planning purposes. Budgetary cost estimates may subsequently refine these comparative analysis cost estimates as more information becomes available. Key assumptions used to estimate project costs are presented in Section 4.3.

4.1.3 Modifying Criteria

The two modifying criteria are state acceptance and community acceptance, and will be addressed when final decisions are made and decision documents prepared. Alternatives are not evaluated against modifying criteria in this document.

State Acceptance

State acceptance evaluates the technical and administrative issues related to each alternative, as well as regulatory concerns.

Community Acceptance

Community acceptance evaluates the issues and concerns that the public may have regarding each of the alternatives. In accordance with EPA guidance (EPA 1988), modifying criteria will be evaluated following the regulatory comment and public response period that will occur after the Proposed Plan has been distributed.

4.1.4 Comparative Analysis

A rating system based on the definitions provided in 40 CFR 300.430(e)(9)(iii) was developed for this document to evaluate and summarize the ability of the alternatives to meet the criteria (Table 4-1). A pass or fail determination was used for each threshold criterion; failure to pass either threshold criteria eliminated the alternative from further evaluation. Except for cost, a number between 0 and 5 was assigned to each of the primary balancing criterion, as follows:

- Criterion was fully met (5)
- Criterion was partially met (1 through 4, depending on the degree to which the criterion is satisfied)
- Criterion was not met (0)

Table 4-1
Remedial Alternative Evaluation System

Category	Evaluation Criteria	Standard	Value
Threshold Criteria	Overall Protection of Human Health and the Environment	Protective; provides adequate risk reduction.	Pass or Fail
	Compliance with Applicable or Relevant and Appropriate Requirements	Complies with ARARs.	Pass or Fail
Primary Balancing Criteria	Long-Term Effectiveness and Permanence	Contaminants are destroyed or removed; no recurrence is possible.	5
		Some contaminants destroyed, removed, or contained.	1 to 4
		Contaminants not removed or contained.	0
	Reduction of Toxicity, Mobility, or Volume through Treatment	Significantly reduces toxicity, mobility, or volume through treatment; no residuals remaining after treatment.	5
		Somewhat reduces toxicity, mobility, or volume through treatment; some residuals remaining after treatment.	1 to 4
		Does not reduce toxicity, mobility, or volume through treatment; significant residuals remaining after treatment.	0
	Short-Term Effectiveness	Protective of community and workers during remediation; no environmental impacts; rapidly meets RAOs.	5
		Somewhat protective of community and workers during remediation; limited environmental impacts; meets RAOs over a period of years to decades.	1 to 4
		Not protective of community and workers during remediation; significant environmental impacts; will not meet RAOs in the near future.	0
	Implementability	Proven, reliable technologies; little or no difficulty in obtaining needed approval, equipment, personnel, and materials. Technical difficulties are expected to be minimal.	5
		Somewhat unproven technologies; potentially more difficulty in obtaining needed approval, equipment, personnel, and materials. Technical difficulties may be significant.	1 to 4
		Unproven technologies; obtaining needed approval, equipment, personnel, and materials could be very difficult. Technical difficulties could prevent implementation.	0
	Cost	Estimated present worth cost is listed for each alternative.	Estimate
Modifying Criteria[1]	State Acceptance	To be determined.	N/A
	Community Acceptance	To be determined.	N/A

Notes:
[1] State and community acceptance will be evaluated following public comment on the Proposed Plan and addressed when the Record of Decision is prepared.
N/A = not applicable
For additional definitions, see the Acronyms and Abbreviations section.

Numerical values were assigned subjectively, according to professional judgment, and used only as a means of weighing the trade-offs involved. The highest total numerical score does not indicate that an alternative was preferred.

Consideration of modifying criteria (Section 4.1.3) is not within the scope of this document and can only be evaluated after state and community review of the alternatives to provide information about acceptance; these criteria will be considered in the Record of Decision.

4.2 INDIVIDUAL ANALYSIS OF ALTERNATIVES

Remedial alternatives for munitions debris and associated soil at OB942 have been developed for detailed and comparative evaluation based on the RAOs, general response actions identified for OB942, and the screening of potential remedial alternatives described in Section 3.2. Feasibility of the alternatives considered was generally limited due to the site's remote location. All the alternatives developed for OB942 were retained for detailed analysis. No alternatives were screened out, and the process was streamlined, as explained in Chapter 4 (Section 4.1.2.1) of the EPA Guidance (1988).

Sections 4.2.1 through 4.2.4 present the detailed analysis for each selected alternative. Section 4.4 presents a comparison of the alternatives and their ability to achieve NCP criteria.

4.2.1 Alternative 1: No Action

Under the No Action alternative, no activities would be undertaken to treat or remove the munitions debris or contamination present or to otherwise prevent or minimize the potential for exposure to the contamination. No monitoring would be conducted. Table 4-2 summarizes the ability of this alternative to meet the NCP criteria; values are based on the rating system described in Section 4.1. The rationale for the values listed in Table 4-2 is presented in the following subsections.

Table 4-2
Evaluation of Alternative 1 (No Action)

Evaluation Criteria	Value
Overall Protection of Human Health and the Environment	Fail
Compliance with Applicable or Relevant and Appropriate Requirements	Fail
Long-Term Effectiveness and Permanence	0
Reduction in Toxicity, Mobility, and Volume through Treatment	0
Short-Term Effectiveness	0
Implementability	0
Cost	$0

Overall Protection of Human Health and the Environment

This alternative would not be protective of human health or the environment. The potential for unacceptable human or environmental exposure to munitions debris and site contaminants would remain for as long as contaminant concentrations remain at the site. This alternative does not include institutional or site controls to prevent or minimize the potential for human contact with the contamination.

Therefore, the No Action alternative would not be protective of human health or the environment in the short or long term because the munitions debris would remain onsite providing a potential exposure pathway for human and ecological receptors. Consequently, the No Action alternative would not meet this threshold criterion and would not be an acceptable alternative.

Compliance with Applicable or Relevant and Appropriate Requirements

There is a risk of human exposure to munitions debris and of ecological exposure to site contaminants at concentrations above the Eco-SSL value for lead because no action of any kind would be taken to mitigate the risks that have been identified at this site. Thus, this alternative fails to comply with chemical-specific ARARs (Appendix A).

Because the No Action alternative fails to achieve either threshold criteria, it was eliminated from further consideration.

4.2.2 Alternative 2: Land-Use Controls

Table 4-3 summarizes the ability of Alternative 2 to satisfy the objectives established by the NCP; values are based on the rating system described in Section 4.1. The rationale for the values listed in Table 4-3 is presented in the following subsections.

Table 4-3
Evaluation of Alternative 2 (Land-Use Controls)

Evaluation Criteria	Value
Overall Protection of Human Health and the Environment	Pass
Compliance with Applicable or Relevant and Appropriate Requirements	Pass
Long-Term Effectiveness and Permanence	2
Reduction in Toxicity, Mobility, and Volume through Treatment	0
Short-Term Effectiveness	3
Implementability	4
Cost (in millions)	$0.43

Overall Protection of Human Health and the Environment

This alternative would leave munitions debris and low levels (i.e., less than the ADEC cleanup level) of lead in soil at the site in place. After implementing LUCs, this alternative effectively protects human health under a recreational land-use scenario but does not allow for unrestricted use of the site. The human health RAO would be achieved by providing notice of the presence of munitions debris and lead at the site. It is also presumed that the ecological RAO would be achieved due to the de minimus volume of lead. The area at OB942 with lead greater than or equal to the EPA Eco-SSL is extremely small when compared to the home range of the EPA's indicator species (birds) from which this screening level was derived. Lead concentrations at the site have been determined to be otherwise protective of human health and the environment.

Compliance with Applicable or Relevant and Appropriate Requirements

This alternative would comply with all chemical-, location-, and action-specific ARARs (Appendix A). It would achieve chemical-specific ARARs at the site by limiting exposure to

munitions debris and ecological exposure to site contaminants at concentrations above the Eco-SSL value for lead. This alternative would be implemented with appropriate controls to comply with any location-specific and/or action-specific ARARs. Therefore, this alternative would meet this threshold criterion and would be an acceptable alternative.

Long-Term Effectiveness and Permanence

The long-term effectiveness of this alternative is highly dependent on maintenance of LUCs. The site-specific risk assessment shows that concentrations of lead at the site are protective of human health under a recreational land-use scenario but are not protective of the environment. Because LUCs are the primary means of preventing exposure to the contamination, they must be enforced and monitored to allow this alternative to be effective. If implemented, contamination at concentrations above the RAOs would remain onsite for more than five years; therefore, CERCLA five-year reviews would be required.

Reduction of Toxicity, Mobility, or Volume Through Treatment

The goal of this alternative would be to prevent exposure to, rather than treat, munitions debris. This alternative would not satisfy the statutory preference for treatment as a principal element.

Short-Term Effectiveness

Implementation of this alternative would not involve intrusive activities. Implementation would have no negative impacts on community or worker health and safety, or environmental quality. However, natural processes would not reduce the munitions debris or lead to concentrations below those presented in the RAOs within a reasonable timeframe.

Implementability

Implementation of this alternative is straightforward. Because LUCs are the primary means of preventing exposure to the munitions debris, they must be enforced and monitored. Munitions debris will remain onsite for more than five years; therefore, CERCLA five-year reviews

would be required. Administrative approval should be possible, though more challenging than containment or complete removal because munitions debris remains onsite. The effectiveness of this remedy is dependent upon adequate enforcement, and continued protectiveness must be verified through regular monitoring.

Cost

Cost estimates for this alternative assume that LUCs would need to be maintained indefinitely. This alternative would cost approximately $429,435 to implement (Appendix B). Costs include the maintenance of LUCs at the site. The costs for this alternative have been developed based on the assumption that CERCLA five-year reviews would be required

4.2.3 Alternative 3: Capping, Land-Use Controls, and Long-Term Management

Table 4-4 summarizes the ability of Alternative 3 to satisfy the objectives established by the NCP; values are based on the rating system described in Section 4.1. The rationale for the values listed in Table 4-4 is presented in the following subsections. Although not part of the NCP's criteria, another consideration for Alternative 3 includes greenhouse gas emissions. An increased volume of fossil fuels will be needed and released into the environment as a result of both the heavy machinery used to construct the cap and the airplane, barge, and vehicles for transportation offsite.

Table 4-4
Evaluation of Alternative 3 (Capping, Land-Use Controls, and Long-Term Management)

Evaluation Criteria	Value
Overall Protection of Human Health and the Environment	Pass
Compliance with Applicable or Relevant and Appropriate Requirements	Pass
Long-Term Effectiveness and Permanence	3
Reduction in Toxicity, Mobility, and Volume Through Treatment	0
Short-Term Effectiveness	3
Implementability	3
Cost (in millions)	$1.17

Overall Protection of Human Health and the Environment

This alternative proposes to cap munitions debris and associated soil from the Open Burn Area, effectively protecting HHE. RAOs would be achieved by limiting access and exposure to the site via the cap.

Compliance with Applicable or Relevant and Appropriate Requirements

This alternative would comply with all chemical-, location-, and action-specific ARARs (Appendix A). It would achieve chemical-specific ARARs at the site by limiting exposure to munitions debris and ecological exposure to site contaminants at concentrations above the Eco-SSL value for lead. This alternative would be implemented with appropriate controls to comply with any location-specific and/or action-specific ARARs. Therefore, this alternative would meet this threshold criterion and would be an acceptable alternative.

Long-Term Effectiveness and Permanence

The long-term effectiveness of this alternative is dependent on maintenance of the permeable cap and LUCs. The soil cover may require periodic maintenance. Munitions debris will remain onsite for more than five years; therefore, CERCLA five-year reviews would be required.

Reduction of Toxicity, Mobility, or Volume Through Treatment

The goal of this alternative would be to prevent exposure to, rather than treat, munitions debris. This alternative would not satisfy the statutory preference for treatment as a principal element.

Short-Term Effectiveness

This alternative would require an estimated 32 days of onsite work. This alternative would be moderately protective of the community and site workers during the remedial action. Because of the munitions debris, there is a possible risk of short-term exposure to workers associated

with construction of the cap. Short-term risks associated with cap maintenance may also present an exposure concern for future site workers. Natural processes would not eliminate the debris; it would remain indefinitely.

Implementability

Implementation of this alternative would provide a moderate challenge. Equipment and personnel are not readily available in the area; therefore, mobilization to the installation would be required. Mobilization and demobilization of personnel and supplies to the site would require transportation via air transport. Air transport would include a chartered aircraft to Cape Romanzof LRRS. Mobilization and demobilization of equipment would require transportation via barge. Once barged to Cape Romanzof LRRS, equipment would need to be transported along an unmaintained road.

OB942 is between two wetlands, and surface water has been observed at the site. Best management practices (BMP), such as silt fences and polyethylene plastic sheeting, should be utilized to prevent damage to surrounding wetlands.

Munitions debris would remain onsite for more than five years; therefore, CERCLA five-year reviews would be required. Administrative approval should be possible, though more challenging because munitions debris remains onsite.

Cost

Cost estimates for this alternative are based on the assumption that 517 cy (775 tons) of soil would be required to cap the munitions debris with an approximate 75- by 75-foot soil cover. This alternative would cost approximately $1,168,407 to implement (Appendix B). Costs include the addition of a 2-foot soil cover and the maintenance of LUCs at the site. The costs for this alternative have been developed based on the following assumptions:

- This alternative would require an estimated 32 days of onsite work to mobilize, consolidate the munitions debris and top 3 inches of soil into one pile, and install 2 feet of soil cover over the volume of munitions debris located at OB942.

- Personnel in Anchorage would be air-transported to and from the Cape Romanzof LRRS.
- Equipment in Anchorage would be barged to and from the Cape Romanzof LRRS.
- LTM and cap inspections would occur annually for the first five years, then every five years thereafter, indefinitely.
- CERCLA five-year reviews would be required.

4.2.4 Alternative 4: Removal and Offsite Disposal

Table 4-5 summarizes the ability of Alternative 4 to satisfy the objectives established by the NCP; values are based on the rating system described in Section 4.1. The rationale for the values listed in Table 4-5 is presented in the following subsections. Although not part of the NCP's criteria, another consideration for Alternative 4 includes greenhouse gas emissions. An increased volume of fossil fuels will be needed under this alternative for the heavy machinery to remove the soil and debris and load Super Sacks, as well as the airplane, barge, and vehicles for transportation offsite.

Table 4-5
Evaluation of Alternative 4 (Removal and Offsite Disposal)

Evaluation Criteria	Value
Overall Protection of Human Health and the Environment	Pass
Compliance with Applicable or Relevant and Appropriate Requirements	Pass
Long-Term Effectiveness and Permanence	5
Reduction in Toxicity, Mobility, and Volume through Treatment	0
Short-Term Effectiveness	2
Implementability	3
Cost (in millions)	$1.73

Overall Protection of Human Health and the Environment

This alternative proposes to remove munitions debris and associated surface soil from the facility, effectively protecting HHE. RAOs would be achieved at project completion.

Compliance with Applicable or Relevant and Appropriate Requirements

Alternative 4 could be implemented in a manner that complies with all chemical-, location-, and action-specific ARARs (Appendix A). This alternative would achieve chemical-specific ARARs by removing the munitions debris and the site contaminants at concentrations above the Eco-SSL value for lead in accordance with the RAOs. This alternative would be implemented with appropriate controls to comply with any location-specific and/or action-specific ARARs. Therefore, this alternative would meet this threshold criterion and would be an acceptable possible alternative.

Long-Term Effectiveness and Permanence

This alternative has the potential to be highly effective for addressing site contamination. Munitions debris and associated soil would be removed from the site for a high degree of long-term effectiveness.

Reduction of Toxicity, Mobility, or Volume Through Treatment

No munitions debris would remain at the site, but the excavated debris and soil would not be treated. Instead, excavated soil and munitions debris would be sent to a TSDF (RCRA-regulated, when necessary) for ultimate disposal. This alternative would not satisfy the statutory preference for treatment as a principal element.

Short-Term Effectiveness

This alternative would require an estimated 24 days of onsite work. Removal of munitions debris and associated soil would be highly effective in a short time. The estimated 96 round trips between OB942 and the barge landing required to implement this alternative pose a significant risk to workers due to dangers associated with the road condition between OB942 and the barge landing at the Cape Romanzof LRRS. Debris removal and containerization would expose site workers to the debris and soil, as well as to hazards associated with working around heavy equipment. These hazards would be addressed by instituting Occupational Safety and Health Administration/Hazardous Waste Operations and Emergency

Response requirements. This alternative poses greater risk of exposure or potential release through the long and complex transportation chain from the Cape Romanzof LRRS to an appropriately permitted TSDF in the contiguous United States, as described in Section 3.1.4.

Implementability

Implementation of this alternative would be logistically challenging. Equipment and personnel are not readily available in the area; therefore, mobilization to the installation would be required. Mobilization of supplies and personnel could be achieved through air transport to the Cape Romanzof LRRS. Mobilization of equipment would be achieved through transportation via barge. All would require transport along an unmaintained road.

OB942 is located between two wetlands and surface water has been observed at the site. BMPs, such as silt fences and polyethylene plastic sheeting, would be utilized to prevent damage to surrounding wetlands.

Demobilization of equipment, personnel, and surplus supplies would be handled similarly to mobilization. Munitions debris and soil would be barged from Cape Romanzof LRRS to Anchorage and then barged to the TSDF in the contiguous United States. Care would be taken to avoid spreading soil and debris during excavation and containerization activities. No additional activities would be required for munitions debris or soil if this alternative were implemented. Administrative approval should be easily attained.

Cost

Cost estimates for this alternative were based on the assumption that 400 cy (approximately 480 cy or 720 tons with bulk factor) of debris and soil would require removal and offsite disposal. This alternative would cost approximately $1,726,536 to implement (Appendix B). Costs include removal, containerization, shipment, and disposal of munitions debris and soil. The costs for this alternative have been developed based on the following assumptions:

- This alternative would require an estimated 24 days of onsite work to establish work areas and address the total volume of munitions debris located at the site.

- Removal of the top 3 inches of soil at OB942 would include all munitions debris and associated soil.
- Personnel in Anchorage would be air-transported to and from the Cape Romanzof LRRS.
- Equipment in Anchorage would be barged to and from the Cape Romanzof LRRS.
- Munitions debris and soil would be excavated and loaded into 1-cy Super Sacks, each holding approximately 0.5 ton. Five Super Sacks would be placed on a flatbed for transport to the barge landing.
- Approximately 96 trips between the OB942 and the barge landing would be made to transfer munitions debris and soil (720 tons, 7.5 tons per outgoing trip).
- Super Sacks staged at the barge landing would be placed on a barge for transport to Anchorage and would include two barge trips for all waste.
- Five waste characterization samples will be collected from the soil for disposal purposes.

4.3 ASSUMPTIONS AND LIMITATIONS

The following is a list of assumptions and limitations used during development of the cost analysis for each alternative (Appendix B):

- All personnel and supplies will mobilize and demobilize to and from Cape Romanzof LRRS via air transport (Alternatives 2, 3, and 4).
- All equipment will mobilize and demobilize to and from Cape Romanzof LRRS via barge (Alternatives 3 and 4).
- All personnel will stay at the Cape Romanzof LRRS facility (Alternatives 2, 3, and 4).
- No road maintenance or improvements will occur (Alternatives 2, 3, and 4).
- The munitions debris at the site is safe and does not present an explosive hazard; approval will be granted to ship the debris (Alternative 4).
- Super Sacks with soil and debris will be barged from Cape Romanzof LRRS during demobilization (Alternative 4).
- A local borrow pit will be available for source material for the cap (Alternative 3).
- The occurrence of LTM and cap inspections will follow the precedence set by the selected remedies at other IRP sites at Cape Romanzof LRRS (USAF 2012a); inspections will occur annually for the first five years, then once every five years thereafter, indefinitely. CERCLA five-year reviews will be conducted to review the results of the inspections (Alternative 3).

4.4 COMPARISON OF REMEDIAL ALTERNATIVES FOR OB942

Table 4-6 summarizes the four alternatives that received detailed analysis according to their ability to comply with NCP criteria.

4.4.1 Threshold Criteria

Alternative 1 fails to comply with the threshold criteria. Because this alternative lacks both LUCs and active treatment, humans could be exposed to munitions debris and lead at concentrations above the Eco-SSL level. The remaining alternatives are protective of HHE and could be implemented in a manner that complies with all chemical-, location-, and action-specific ARARs.

Because Alternative 1 fails to attain the threshold criteria, it will not be considered further.

Table 4-6
Comparison of Alternatives for OB942

Evaluation Criteria	Alternative 1: No Action	Alternative 2: LUCs	Alternative 3: Capping, LUCs, & LTM	Alternative 4: Removal & Offsite Disposal
Overall protection of human health and the environment	Fail	Pass	Pass	Pass
Compliance with Applicable or Relevant and Appropriate Requirements	Fail	Pass	Pass	Pass
Long-term effectiveness and permanence	0	2	3	5
Reduction in toxicity, mobility, and volume through treatment	0	0	0	0
Short-term effectiveness	0	3	3	2
Implementability	0	4	3	3
Cost (in millions)	$0	$0.43	$1.17	$1.73

Note:
For definitions, see the Acronyms and Abbreviations section.

4.4.2 Primary Balancing Criteria

Alternatives 2 through 4 would be effective. Alternatives 2 and 3 would require extra costs due to the indefinite maintenance of LUCs. In contrast, Alternative 4 would not require any LUCs or LTM. Although not included in the NCP as part of the balancing criteria, Alternative 4 results in greater greenhouse gas emissions relative to the other alternatives due to the use of heavy machinery to remove the soil and debris and load Super Sacks as well as the airplane, barge, and vehicles for offsite transportation. Alternative 4 is the most effective but has higher difficulties in implementability and cost. Alternative 2 is the easiest to implement but does not significantly lower risk compared to Alternatives 3 and 4.

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5.0 REFERENCES

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APPENDIX A

Applicable or Relevant and Appropriate Requirements

APPENDIX A

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS OB942 CAPE ROMANZOF LRRS, ALASKA

This appendix presents the potential Applicable or Relevant and Appropriate Requirements (ARAR) for OB942 at the Cape Romanzof Long-Range Radar Site (LRRS), Alaska. Under the Comprehensive Environmental Response, Compensation, and Liability Act, three types of ARARs are considered:

- Chemical-specific
- Location-specific
- Action-specific

Each ARAR has been assessed based on its applicability to the site, and categorized as applicable or relevant and appropriate. Table A-1 presents chemical-specific ARARs. These standards have been used to select cleanup levels appropriate to the site. Table A-2 presents location-specific ARARs. Table A-3 presents action-specific ARARs.

ACRONYMS AND ABBREVIATIONS

A	applicable
AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
ARAR	applicable or relevant and appropriate requirement
CFR	code of federal regulations
LRRS	long-range radar site
mg/kg	milligrams per kilogram
RA	relevant and appropriate
RCRA	Resource Conservation and Recovery Act
RSL	regional screening level
TBC	to be considered
USC	United States Code
USFWS	U.S. Fish and Wildlife Service

CHEMICAL-SPECIFIC ARARS

Chemical-specific ARARs provide numerical cleanup values that establish acceptable contaminant concentrations that may remain following a remedial response (Table A-1). The Alaska Administrative Code (AAC), Title 18, Chapter 75, Article 3, *Oil and Hazardous Substances Pollution Control Regulations - Discharge Reporting, Cleanup, and Disposal of Oil and Other Hazardous Substances,* Method Two soil cleanup criteria (18 AAC 75.341[c] and [d]) – Tables B1 and B2) establish the applicable chemical-specific soil cleanup values (ADEC 2014). The regulation lists soil cleanup criteria for lead and antimony. The standards applicable at the Cape Romanzof LRRS are for sites located in a non-arctic zone with annual precipitation of less than or equal to 40 inches.

Human exposure can occur directly (via direct contact, ingestion, or inhalation) or indirectly (via migration from contaminated soil to groundwater). Different cleanup criteria are presented for each of three exposure routes: direct contact or ingestion, inhalation, and migration to groundwater. Depth to groundwater at the Lower Camp ranges from one to 60 feet below ground surface (USACE 2013); therefore, migration to groundwater is not likely a complete pathway.

Table A-1
Chemical-Specific Applicable or Relevant and Appropriate Requirements

Regulation	Description	A or RA	Rationale
RCRA of 1976 as amended by the hazardous and solid waste amendments of 1984, Subtitles C and D, other than corrective action requirements (U.S. Code, Title 42, Section 6901 [42 USC 6901])	Establishes protections and protocols for the creation and recycling of waste including cradle to grave manifesting.	A	Excavated materials designated as waste (e.g., contaminated soils) are subject to the requirements of RCRA.
Alaska Oil and Other Hazardous Substance Pollution Control regulations (18 AAC 75)	Governs discharge of oil and hazardous substances and state cleanup requirements. Also establishes soil cleanup levels.	A	Cleanup levels for soil (18 AAC 75.340-341); methods for determination and application of cleanup levels. The site is known to be affected by a release of metals constituents. Alternative soil cleanup levels may be applied.
U.S. Environmental Protection Agency Regional Screening Levels for Chemical Contaminants at Superfund Sites (Code of Federal Regulations, Title 20, Section 141.61 [20 CFR 141.61])	RSLs for residential soil.	TBC	Possible screening and/or cleanup goals to use in the absence of ADEC values for specific contaminants
U.S. Environmental Protection Agency Ecological Soil Screening Levels (Eco-SSL) Office of Solid Waste and Emergency Response (OSWER) Directives 9285.7-70 and 9285.7-61	Ecological soil screening levels.	TBC	Concentrations of contaminants in soil that are protective of ecological receptors that commonly come into contact with and/or consume biota that live in or on soil. Lead levels exceeded the Eco-SSL at OB942.

Note:
For definitions, see the Acronyms and Abbreviations section.

LOCATION-SPECIFIC ARARS

Location-specific ARARs are restrictions developed on the conduct of activities at specific locations (Table A-2). These ARARs may restrict or preclude certain remedial actions, or they may apply only to certain portions of an installation. Location-specific factors that may require the identification of ARARs include sensitive habitats, floodplains, wetlands, endangered species habitat, fault locations, and historic or archeological resources.

Table A-2
Location-Specific Applicable or Relevant and Appropriate Requirements

Regulation	Description	A or RA	Rationale
Bald and Golden Eagle Protection Act (16 USC 668-668c) Migratory Bird Act of 1972 (50 CFR Title Sections 10, 20 and 21)	Protects bald and golden eagles/habitat in the area and provides for permitted activities.	TBC	Bald or golden eagles have not been identified in the project area, but the possibility for their presence exists.
Protection of Fish and Game (AS 16.05.870; 5 AAC 95.010)	Provides for Alaska Department of Fish & Game consultation on actions affecting fish and wildlife.	RA	Considered for possible impacts to wildlife at Cape Romanzof LRRS.
Fish and Wildlife Coordination Act (16 USC 661)	Provides for USFWS consultation on actions affecting fish and wildlife.	TBC	Considered for possible impacts to wildlife at Cape Romanzof LRRS.
Migratory Bird Treaty Act (37 Stat. 878, Ch. 45; 16 USC 703-712 (§709 has been omitted); 50 CFR Parts 10, 20, 21)	Prohibits taking or possession of any migratory bird listed, including parts, nests, or products.	A	Considered for possible impacts to birds at Cape Romanzof LRRS.
Clean Water Act – Section 404 (33 USC 1344; 40 CFR 230: Section 404(b)(1))	Establishes a program to regulate the discharge or dredged and fill material into waters of the United States, including wetlands.	A	Considered for possible impacts to wetlands at Cape Romanzof LRRS. According to the NWI Wetlands Mapper, OB942 is between two freshwater emergent wetlands and surface water has been observed at the site. Several wetland areas are also located along the road from Lower Camp to the airstrip.
Alaska Solid Waste Management Regulations (18 AAC 60)	Lists the requirements for location standards of storage of solid wastes.	RA	Applicable if excavation options require solid waste storage locations onsite.

Note:
For definitions, see the Acronyms and Abbreviations section.

ACTION-SPECIFIC ARARS

Action-specific ARARs are requirements that apply to specific investigative or remedial actions (Table A-3). Action-specific requirements do not in themselves determine remedial alternatives; they indicate how a selected alternative must be achieved. Action-specific ARARs are refined during remedial design as specific information becomes available.

Table A-3
Action-Specific Applicable or Relevant and Appropriate Requirements

Regulation	Description	A or RA	Rationale
Alaska Spill Reporting and Notification (18 AAC 75)	Alaska Department of Environmental Conservation (ADEC) has authority for specifying soil, surface water, and groundwater cleanup levels resulting from the discharge of oil or a hazardous substance. ADEC has authority for specifying soil, surface water, and groundwater cleanup levels resulting from the discharge of oil or a hazardous substance. ADEC has authority for specifying institutional controls for residual soil, surface water, and groundwater left in excess of cleanup levels resulting from a discharge of oil or a hazardous substance.	A	18 AAC 75.355 lists requirements for sampling and analysis. 18 AAC 75.360 lists requirements for cleanup work plans. 18 AAC 75.375 lists requirements for institutional controls. 18 AAC 75.380 lists requirements for reporting.
Alaska Air Quality Control Regulations (18 AAC 50, 15) and Clean Air Act (40 CFR 230, 33 CFR 320-330)	Regulations governing identification, prevention, abatement, and control of air pollution.	A	Cleanup methods will require the use of heavy machinery and trucks for transporting soil.
U.S. Department of Transportation Regulations (49 CFR 170-199; 40 CFR 263) Alaska Hazardous Waste Regulations (18 AAC 62)	Governs the packaging, marking, labeling, recordkeeping, transportation, and transporters of hazardous materials.	A	Monitoring and/or confirmation of samples and potential waste are transported from the project area.
Solid Waste Management Regulations (40 CFR 257, 40 CFR 264, 49 CFR 265, 40 CFR 266, 40 CFR 268, 40 CFR 270, 40 CFR 261, 40 CFR 262) Alaska Solid Waste Management Regulations (18 AAC 60)	Governs the management of solid wastes generated during remedial activity. Specifies restrictions on land disposal of specific types of hazardous waste based on levels achievable by current technology.	A	Excavated soils and monitoring samples may be generated from the project area. Remedial alternatives may create contaminated media to be removed from the site. 18 AAC 60.010 lists requirements for accumulation, storage, and treatment of solid wastes and monofill construction requirements. 18 AAC 60.015 lists requirements for transport of solid wastes.

Table A-3
Action-Specific Applicable or Relevant and Appropriate Requirements (Continued)

Regulation	Description	A or RA	Rationale
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities – Closure and Post-Closure 40 CFR 264.111 and 117	Closure performance standard and care requirements; maintenance and monitoring of waste containment systems.	RA	May be applicable if containment alternative is selected for OB942.

Note: For definitions, see the Acronyms and Abbreviations section.

APPENDIX B

Cost Estimates

Cape Romanzof OB942
Feasibility Study Cost Analysis Summary Table

Alternative	Alternative Description	Estimated Debris/ Soil Quantity Removed Offsite (CY)	Estimated Duration of Remedial Action Activities Onsite (Days)	Estimated Present Worth Cost for Alternative (+50% / -30%)
Alternative 1	No Action.	0	0	$0
Alternative 2	Land-Use Controls (LUCs) would be implemented to restrict invasive activities and protect human health and the environment from exposure to munitions debris. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) five-year Reviews would be required to evaluate the long-term protectiveness of the remedy.	0	0	$429,435
Alternative 3	Munitions debris at the site would be consolidated into a smaller area and capped with a minimum 2-foot soil cap to create an onsite solid waste monofill. LUCs would be implemented to restrict invasive activities and protect human health and the environment from exposure to munitions debris. Long-term management (LTM) would be implemented to ensure the integrity of the cap and CERCLA five-year reviews would be required to evaluate the long-term protectiveness of the remedy.	0	32	$1,168,407
Alternative 4	Munitions debris would be excavated, containerized, and removed for offsite disposal at a Resource Conservation and Recovery Act (RCRA) Subtitle D permitted landfill. It is anticipated that removal activities will focus on munitions in the top 3-inches of the site. Under this alternative, the site would be restored for unlimited use/unrestricted exposure (UU/UE). CERCLA five-year reviews would not be required with this alternative.	480	24	$1,726,536

Note:

Costs are based on subcontractor quotes, remedial investigation figures, and engineering estimates

Cape Romanzof OB942
Cost Analysis for Alternative 2

Land-Use Controls (LUCs) would be implemented to restrict invasive activities and protect human health and the environment from exposure to munitions debris. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) five-year Reviews would be required to evaluate the long-term protectiveness of the remedy.

Task	Category	Item	Unit	Unit Cost	QTY	Cost
CAPITAL COSTS						
All Tasks						
	Office/Offsite Labor	Administrator	HR	$ 80.00	0	$ -
	Field Labor	Project Manager	HR	$ 154.22	0	$ -
		Site Manager / SSHO	HR	$ 125.00	0	$ -
		Project Engineer / CQC	HR	$ 94.15	0	$ -
		Lead Sampler	HR	$ 94.15	0	$ -
		Field Sampler	HR	$ 94.15	0	$ -
Excavation						
	Mobilization	Mobilization (see tab)	LS	$ 18,905	0	$ -
		Supervising for Safety	LS	$ 9,227	0	$ -
	Subcontractor	Site Superintendent	ST	$ 64.26	0	$ -
			OT	$ 80.13	0	$ -
		Operator (3 ea)	ST	$ 59.63	0	$ -
			OT	$ 74.36	0	$ -
		Laborer 1 (2 ea)	ST	$ 51.57	0	$ -
			OT	$ 64.31	0	$ -
	Additional Equipment	Excavator, 30,000 lb class	WK	$ 1,725.00	0	$ -
		Excavator Frost Bucket	WK	$ 262.14	0	$ -
		Loader w/blade and forks 25,000 lb class	WK	$ 1,840.00	0	$ -
		Flat bed truck	WK	$ 1,055.12	0	$ -
		Crew Truck (2 ea)	MO	$ 3,780.00	0	$ -
		5 CY End Dump Truck	DY	$ 950.00	0	$ -
		Misc. Tools and Materials	LS	$ 500.00	0	$ -
		PID	WK	$ 132.00	0	$ -
		GPS/RTK	WK	$ 1,200.62	0	$ -
	Clear and Grub	Clearing and Grubbing	SF	$ 2	0	$ -
	Per Diem	ARS FY14 Costs	DY	$ 228.00	0	$ -
	Additional Sub Costs	General and Administrative Expense	%	15%	1	$ -
		Subcontractor Fee	%	10%	1	$ -
Materials						
	Non-Consumables	Fencing	EA	$ 768.00	0	$ -
	Consumables	PPE	MD	$ 50.00	0	$ -
		Fuel	GAL	$ 7.00	0	$ -
		Super Sacks	EA	$ 25.62	0	$ -
Land Use Controls and Five-Year Reviews						
	Details provided in LUCs sheet (Present Worth Cost)					$ 261,838
				Subtotal		$ 261,838
Project Management			%	10%		$ 26,183.75
Contractor Fee			%	10%		$ 26,183.75
SUBTOTAL, CAPITAL COSTS						$ 314,205
				10% Estimating Contingency		$ 31,421
TOTAL ESTIMATED CAPITAL COSTS						**$ 345,626**

Cape Romanzof OB942
Cost Analysis for Alternative 2

Land-Use Controls (LUCs) would be implemented to restrict invasive activities and protect human health and the environment from exposure to munitions debris. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) five-year Reviews would be required to evaluate the long-term protectiveness of the remedy.

Task	Category	Item	Unit	Unit Cost	QTY	Cost
ANNUAL COSTS						
Inspection (Conducted once every five years during Five-Year Review over 30 years)						
	Site Inspection					
		Planning and Procurements	HR	$ 94	20	$ 1,883.00
		Mobilization Costs	TRIP	$ 19,817	1	$ 19,817.06
		Site Visit	HR	$ 125	40	$ 5,000
		Documentation	HR	$ 94	20	$ 1,883
		Project Management	HR	$ 154	10	$ 1,542
TOTAL ESTIMATED ANNUAL COSTS						**$30,125**

Alternative 2 Cost Summary (+50% / - 30%)	
Total Estimated Capital Costs	$ 345,626
Total Estimated Annual Costs	$30,125
Present Worth of Annual Costs, 5% Rate of Return	$83,809
Total Capital Cost with Present Worth Annual Costs	**$ 429,435**

Cape Romanzof OB942
Cost Analysis for Alternative 3

Munitions debris at the site would be consolidated into a smaller area and capped with a minimum 2-foot soil cap to create an onsite solid waste monofill. LUCs would be implemented to restrict invasive activities and protect human health and the environment from exposure to munitions debris. Long-term management (LTM) would be implemented to ensure the integrity of the cap and CERCLA five-year reviews would be required to evaluate the long-term protectiveness of the remedy.

Task	Category	Item	Unit	Unit Cost	QTY	Cost
All Tasks						
	Office/Offsite Labor	Administrator	HR	$ 80.00	32	$ 2,560
	Field Labor	Project Manager	HR	$ 154.22	192	$ 29,610
		Site Manager / SSHO	HR	$ 125.00	384	$ 48,000
		Project Engineer / CQC	HR	$ 94.15	0	$ -
		Lead Sampler	HR	$ 94.15	0	$ -
		Field Sampler	HR	$ 94.15	0	$ -
Excavation						
	Mobilization	Mobilization (see tab)	LS	$ 59,844	1	$ 59,844
		Supervising for Safety	LS	$ 9,227	1	$ 9,227
	Subcontractor	Site Superintendent	ST	$ 64.26	256	$ 16,450
			OT	$ 80.13	64	$ 5,128
		Operator	ST	$ 59.63	256	$ 15,265
			OT	$ 74.36	64	$ 4,759
		Laborer 1	ST	$ 51.57	256	$ 13,202
			OT	$ 64.31	64	$ 4,116
		Driver 1	ST	$ 55.38	103	$ 5,677
			OT	$ 69.06	26	$ 1,770
	Equipment	Excavator, 30,000 lb class	WK	$ 1,725.00	0	$ -
		Excavator Frost Bucket	WK	$ 259.50	0	$ -
		Skid Steer Loader (Track)	WK	$ 1,067.00	9	$ 9,959
		Dozer Blade	WK	$ 470.00	0	$ -
		Crew Truck (2 ea)	MO	$ 3,780.00	2	$ 7,560
		5 CY End Dump Truck	WK	$ 2,475.00	9	$ 23,100
		Misc. Tools and Materials	LS	$ 500.00	1	$ 500
		GPS/RTK	WK	$ 1,172.48	5	$ 6,253
	Clear and Grub	Clearing and Grubbing	SF	$ 2	0	$ -
	Per Diem	ARS FY14 Costs	DY	$ 228.00	160	$ 36,480
	Additional Sub Costs	General and Administrative Expense	%	15%	1	$ 17,061
		Subcontractor Fee	%	10%	1	$ 11,374
Permeable Cap (2 ft Soil Cover)						
	Backfill material		CY	$ 30	517	$ 15,500
Materials						
	Non-Consumables	Fencing	EA	$ 778.50	1	$ 779
	Consumables	PPE	MD	$ 50.00	77	$ 3,840
		Fuel	GAL	$ 7.00	1920	$ 13,440
		Super Sacks	EA	$ 25.62	0	$ -
Land Use Controls and Five-Year Reviews						
	Details provided in LUCs sheet (Present Worth Cost)					$ 261,838
Waste Disposal						
	Out-of-state disposal	See Disposal tab				$ -
Laboratory						
	Analytical	See Analytical tab				$ -

Cape Romanzof OB942
Cost Analysis for Alternative 3

Munitions debris at the site would be consolidated into a smaller area and capped with a minimum 2-foot soil cap to create an onsite solid waste monofill. LUCs would be implemented to restrict invasive activities and protect human health and the environment from exposure to munitions debris. Long-term management (LTM) would be implemented to ensure the integrity of the cap and CERCLA five-year reviews would be required to evaluate the long-term protectiveness of the remedy.

Task	Category	Item	Unit	Unit Cost	QTY	Cost
				Subtotal		$ 623,290
Planning, Regulatory Requirements, Design, Work Plans, Project Management			%	20%		$ 124,658
Contractor Fee			%	10%		$ 62,329
SUBTOTAL, CAPITAL COSTS						$ 810,277
				10% Estimating Contingency		$ 81,028
TOTAL ESTIMATED CAPITAL COSTS						**$ 891,305**
ANNUAL COSTS						
Cap Inspection (Once a year for first five years, every 5 years thereafter for next 25 years)						
	Site Inspection					
		Planning and Procurements	HR	$ 94	20	$ 1,883
		Mobilization Costs	TRIP	$ 19,817	1	$ 19,817
		Site Visit	HR	$ 125	40	$ 5,000
		Documentation	HR	$ 94	20	$ 1,883
		Project Management	HR	$ 154	10	$ 1,542
Cap Maintenance (over 30 years)						
	Mobilization, Labor and Materials					$5,625
TOTAL ESTIMATED ANNUAL COSTS						**$35,750**

Alternative 3 Cost Summary (+50% / - 30%)	
Total Estimated Capital Costs	$ 891,305
Total Estimated Annual Costs	$35,750
Present Worth of Annual Costs over 30 years, 5% Rate of Return	$277,102
Total Capital Cost with Present Worth Annual Costs Over 30 Years	**$ 1,168,407**

Cape Romanzof OB942
Cost Analysis for Alternative 4

Munitions debris would be excavated, containerized, and removed for offsite disposal at a Resource Conservation and Recovery Act (RCRA) Subtitle D permitted landfill. It is anticipated that removal activities will focus on munitions in the top 3-inches of the site. Under this alternative, the site would be restored for unlimited use/unrestricted exposure (UU/UE). CERCLA five-year reviews would not be required with this alternative.

Task	Category	Item	Unit	Unit Cost	QTY	Cost
All Tasks						
	Office/Offsite Labor	Administrator	HR	$ 80.00	24	$ 1,920
	Field Labor	Project Manager	HR	$ 154.22	288	$ 44,415
		Site Manager / SSHO	HR	$ 125.00	288	$ 36,000
		Project Engineer / CQC	HR	$ 94.15	288	$ 27,115
		Lead Sampler	HR	$ 94.15	0	$ -
		Field Sampler	HR	$ 94.15	0	$ -
		UXO 3	HR	$ 124.36	20	$ 2,487
Excavation						
	Mobilization/Planning	Mobilization (see tab)	LS	$ 748,289	1	$ 748,289
		Supervising for Safety	LS	$ 9,227	1	$ 9,227
	Subcontractor	Site Superintendent	ST	$ 64.26	192	$ 12,337
			OT	$ 80.13	48	$ 3,846
		Operator (1 ea)	ST	$ 59.63	192	$ 11,449
			OT	$ 74.36	48	$ 3,569
		Laborer 1 (1 ea)	ST	$ 51.57	192	$ 9,901
			OT	$ 64.31	48	$ 3,087
		Driver 1 (1 ea)	ST	$ 55.38	192	$ 10,633
			OT	$ 69.06	48	$ 3,315
	Equipment	Excavator, 30,000 lb class	WK	$ 1,725.00	0	$ -
		Excavator Frost Bucket	WK	$ 259.50	0	$ -
		Skid Steer Loader (Track)	WK	$ 1,067.00	8	$ 8,536
		Dozer Blade	WK	$ 470.00	0	$ -
		Loader 2500lb class	WK	$ 1,840.00	8	$ 14,720
		Flat bed truck	WK	$ 1,055.12	8	$ 8,441
		Crew Truck (2 ea)	MO	$ 3,780.00	1	$ 3,780
		5 CY End Dump Truck	WK	$ 2,475.00	0	$ -
		Misc. Tools and Materials	LS	$ 1,500.00	1	$ 1,500
		GPS/RTK	WK	$ 1,172.48	4	$ 4,690
	Clear and Grub	Clearing and Grubbing	SF	$ 2	0	$ -
	Per Diem	ARS FY14 Costs	DY	$ 228.00	144	$ 32,832
	Additional Sub Costs	General and Administrative Expense	%	15%	1	$ 14,971
		Subcontractor Fee	%	10%	1	$ 9,980
Backfill						
	Backfill material		CY	$ 30	0	$ -
Materials						
	Non-Consumables	Fencing	EA	$ 778.50	1	$ 779
	Consumables	PPE	MD	$ 50.00	58	$ 2,880
		Fuel	GAL	$ 7.00	2160	$ 15,120
		Super Sacks	EA	$ 25.62	480	$ 12,298
Waste Disposal						
	Out-of-state disposal	See Disposal tab				$ 148,060

Cape Romanzof OB942
Cost Analysis for Alternative 4

Munitions debris would be excavated, containerized, and removed for offsite disposal at a Resource Conservation and Recovery Act (RCRA) Subtitle D permitted landfill. It is anticipated that removal activities will focus on munitions in the top 3-inches of the site. Under this alternative, the site would be restored for unlimited use/unrestricted exposure (UU/UE). CERCLA five-year reviews would not be required with this alternative.

Task	Category	Item	Unit	Unit Cost	QTY	Cost
Laboratory						
	Analytical	See Analytical tab			$	1,190
				Subtotal	$	1,207,368
Planning, Permitting, Design, Work Plans, Project Management			%	20%	$	241,474
Contractor Fee			%	10%	$	120,737
SUBTOTAL, CAPITAL COSTS					$	1,569,578
				10% Estimating Contingency	$	156,958
TOTAL ESTIMATED CAPITAL COSTS					**$**	**1,726,536**
ANNUAL COSTS						
Annual Costs						**$0**
TOTAL ESTIMATED ANNUAL COSTS						**$0**

Alternative 5 Cost Summary (+50% / - 30%)	
Total Estimated Capital Costs	$ 1,726,536
Total Estimated Annual Costs	$0
Present Worth of Annual Costs over 30 years, 5% Rate of Return	$0
Total Capital Cost with Present Worth Annual Costs Over 30 Years	**$ 1,726,536**

Cape Romanzof OB942
Land-Use Controls and Five-Year Reviews

All Tasks		Units	Unit Cost	Qty	# of Resources	Cost
CAPITAL COSTS						
Office/Offsite Labor	Administrator	HR	$ 80.00	5	1	$ 400
Field Labor	Site Manager / SSHO	HR	$ 125.00	24	1	$ 3,000
Site Controls						
Planning		HR	$ 77.85	60	2	$ 9,342
Survey						
Mobilization		TRIP	$ 19,589	1	3	$ 58,767
Labor		HR	$ 125.00	20	2	$ 5,000
Documentation		HR	$ 77.85	80	2	$ 12,456
SUBTOTAL CAPITAL COSTS						**$ 88,965**
ANNUAL COSTS						
Five-Year Reviews (Conducted once every five years)						
Community Involvment and Notification		HR	$ 94.15	30	2	$ 5,649
Document Review		HR	$ 94.15	80	2	$ 15,064
Data Review and Analysis		HR	$ 94.15	40	1	$ 3,766
Interviews		HR	$ 94.15	20	2	$ 3,766
Protectiveness Determination		HR	$ 94.15	180	2	$ 33,894
SUBTOTAL ANNUAL COSTS						**$62,139**

LUCs Cost Summary	
Subtotal Capital Costs	$ 88,965
Subtotal Annual Costs	$ 62,139
Present Worth of Annual Costs over 30 years, 5% Rate of Return	$ 172,872
Total Capital Cost with Present Worth Annual Costs Over 30 Years	**$ 261,838**

Duration Estimates

Alternative 2

Estimated Vol. Excavated For Offsite Disposal (cy)	# of Super Sacks	Cap Vol. (cy)	Time to Fill Sacks (hours)	Backfill (hours)	Misc. Time (hours)	Construct 2-foot cap (hours)	Days	Work Hours	Barge Loading Days	Notes
0	0	0	0	0	0	0	0	0	0	

Alternative 3

Estimated Vol. to Consolidate Onsite (cy)	# of hours to Relocate and Consolidate Material Onsite	Cap Vol. (cy)	Time to Fill Sacks (hours)	Backfill (hours)	Misc. Time (hours)	Construct 2-foot cap (hours)	Days	Work Hours	Barge Loading Days	Notes
418	42	517	0	103	44	128	32	320	0	Consolidated area within the footprint of site where munitions are present.

Alternative 4

Estimated Vol. Excavated For Offsite Disposal (cy)	# of Super Sacks	Cap Vol. (cy)	Time to Fill Sacks (hours)	Super Sack Haul Time (hours)	Misc. Time (hours)	Construct 2-foot cap (hours)	Days	Work Hours	Barge Loading Days	Notes
480	480	0	120	68	51	0	24	240	5	Debris removal using a skid steer concurrent with filling Super Sacks. No confirmation samples required.

Assumptions

1. Assume 1-cy Super Sacks.
2. For Alternative 4, removal of munitions debris to be performed using a skid steer. Top 3 inches of material be removed and disposed.
3. Hauling Sacks to barge landing is concurrent for entire duration of project (from time between filling sack to demobilization).
4. For Alternative 4, loader with forks will follow truck and unload at the barge landing.
5. No compactor required to achieve hard durable surface of backfill.
6. Road is accessible by trucks and no improvements to the access road is needed.
7. Use a local borrow source material for cap and excavation backfill consisting of gravel and sand, gravel pit located within 1 mile of site.
8. One 5-cy dump truck for earthwork activities, and skid steer used load backfill material into dump truck and to place cap at site.
9. For Alternative 4, use flat bed truck to transport SuperSack and drums to barge landing.
10. Assume 100 Super Sacks can be loaded onto a barge per day.

Misc. Additional Time (hours)	
Tailgate	2
Mobilization	12
Demobilization	12
Site Setup	12
Seeding	6
Ramp Const.	2
Moving around site	2
Bin Issues	3

Constants		
Backfill Round Trip	1	hours
Dump Truck Capacity	5	cy
Time to fill 1 1-cy Super Sack with Skid Steer	0.25	hour
Additional Backfill to account load factor and compaction	24%	
Number 1-cy Super Sacks per Flatbed Load	5	each
Round trip to barge landing area with full Super Sacks Load	0.71	hours
Duration to relocate and consolidate of material onsite	0.1	hours/cy

Out-of-State Disposal

Alternative 4	QTY Soil (cy):	480	QTY Soil (tons):	720

Description	Units	Estimated QTY	Unit Price	Sub Total	Notes
Waste Documentation and Management					
Pre-shipment Preparation and Submittals	LS	1	$ 558.84	$ 558.84	
Prepare and Submit Complete Manifest Packages	EACH	2	$ 56.45	$ 135.49	Total # of bins. Bins contain sacks and drums
Waste Container Management and Tracking	LS	1	$ 558.84	$ 558.84	
Waste-Specific Transportation and Disposal/Recycle Activities					
Contaminated Soil/Sediment and/or Concrete (Non-Hazardous) - Transportation	TON	720	$ 73.38	$ 52,833.48	
Metals-Contaminated Soils/Sediments and/or Concrete (Nonhazardous) - Disposal	TON	720	$ 90.32	$ 65,028.10	
Contaminated Soil/Sediment (Hazardous) - Transportation	TON	0	$ 90.32	$ -	
Metals-Contaminated Soils/Sediments and/or Concrete (Hazardous) - Disposal	TON	0	$ 286.65	$ -	
Contaminated Purge/Decontamination Water (non-Hazardous) - Transportation	DRUM	0	$ 73.39	$ -	55-gal drums
Metals-Contaminated Water (Nonhazardous) - Disposal	DRUM	0	$ 169.35	$ -	55-gal drums
Sampling Waste - Transportation	TON	0	$ 73.38	$ -	
Sampling Waste - Disposal	TON	0	$ 90.32	$ -	
3.0 Optional Waste Containers					
Rear-Load 20-foot Intermodal Container Rental	Month	48	$ 416.18	$ 19,976.63	Assume 1 month per container, 10 sacks per connex.
Chassis 20-foot	WEEK	0	$ 197.57	$ -	
Liner (suitable for Hazardous Waste)	EACH	48	$ 16.94	$ 812.97	
4.0 Other					
Fuel Surcharge on transportation of containers	LS	1	$ 2,641.67	$ 2,641.67	
Mark up on Fuel	LS	10%	$ 2,641.67	$ 264.17	
Bond Cost	LS	1	$ 5,250.00	$ 5,250.00	
Total				**$148,060.19**	

Assumptions

Basis of rates is based on rates for work performed elsewhere in Alaska, with 2.4% inflation rate for 2014 cost

1.5 cubic yards of soil per ton of soil

Transportation costs only include Anchorage to final TSDF

Cost Estimates for Sampling and Analysis

Alternative	# pre and/or post samples	# waste samples	Total Samples	Unit Price (per sample)[1]	Total Esitmated Cost
Alternative 1	0	0	0	$238.00	$0
Alternative 2	0	0	0	$238.00	$0
Alternative 3	0	0	0	$238.00	$0
Alternative 4	0	5	5	$238.00	$1,190

Laboratory Pricing

Method	TAT	Price	Del. Chrg.[2]	Total
TCLP by SW1311/SW6010C	3 day	$126.36		$126.36
Total Metals by SW6020A	14 day	$111.64		$111.64
			Total	$238.00

1 - includes labor for sample collection and shipping
2 - assumes shipping is on the air charter (cost already incurred)

Volume Estimates

Alternative Volume Breakdowns

Alternative	Cap Footprint Area (ft^2)	Volume of Excavation (bank cy)[4]	Excavated Volume After Fluff Factor (cy)[1]	Off-site Disposal (cy)	Hazardous Waste (cy)	Non-Hazardous Waste (cy)	Cap Volume (cy)[2,3]
Alternative 2	0	0	0	0	0	0	0
Alternative 3[5]	5625	348	418	0	0	0	517
Alternative 4[6]	0	400	480	480	0	480	0

Notes:

1 A 20% fluff factor is assumed for excavated soils and debris
2 Assume use of local gravel pit material as backfill, compacted 24%
3 Assume no backfill material needed for Alternative 4
4 For Alt 3 and 4, assumed top 3 inches of debris and soil over an area approx. 43,005 ft^2
5 For Alt 3, assumed top 3 inches of debris and soil be relocated and consolidated in a 2-foot high pile onsite.
6 For Alt 4, assumed top 3 inches of debris and soil be removed for disposal

Contsants

Factor	Value
Fluff Factor	20%

Cost Estimates for Mobilization and Demobilization to Cape Romanzof OB942
Required for all Alternatives

Personnel Flights

Item/Task	Quantity	Units	Cost per unit[1]	Total Estimated Cost
Travel between Anchorage and Cape Romanzof	1	Round Trip	$ 18,905.06	$ 18,905.06
			TOTAL	$ 18,905.06

Sercurity Aviation 2014 quote - round trip air charter between Anchorage and Cape Romanzof; 9 PAX + 1700# gear

Barge Rates

Item/Task	Units	Cost per unit	Mobe Duration (weeks)
Barge from Anchorage to Cape Romanzof	Square Foot	$ 82.90	2
Barge from Cape Romanzof to Anchorage	Square Foot	$ 82.90	2

Barge Transport Costs (Soil and Equipment)

Alternative	cy soil/debris	# Super Sacks	Total Sack Footprint (ft^2)[1]	Heavy Equipment Footprint (ft^2)	Transport ANC-Cape Romanzof[2]	Transport Cape Romanzof-ANC[3]
Alternative 2	0	0	0	0	$ -	$ -
Alternative 3	0	0	0	247	$ 20,469.39	$ 20,469.39
Alternative 4	480	480	7680	445	$ 36,903.49	$ 673,575.49

Assumptions
1 - Assume Super Sack has 4' x 4' footprint.
2 - Equimpent mobe cost
3 - Soil and equipment demobe cost

Equipment Dimensions

Type	Length (ft)	Width (ft)	Weight (lbs)
Tracked Skid Steer (Bobcat T190 or similar)	11.8	6.5	9702
Wheel Loader (938g or similar)	23.6	8.4	30818
Dump Truck (5 cy)	20	8.5	14400
Flatbed Truck	28	8.5	14000

APPENDIX C

Response to Comments

REVIEW COMMENTS	PROJECT: DRAFT FEASIBILITY STUDY OB942	LOCATION: CAPE ROMANZOF LRRS, ALASKA	
ADEC	**DATE: 21 April 2015** **REVIEWER: Louis Howard** **PHONE: 907-269-7552**	**ACTION TAKEN ON COMMENT BY: Jacobs Engineering Group Inc.**	
Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**CONTRACTOR RESPONSE**	**ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
1.	Section 1.2.3, page 1-9	**Nature and Extent of Contamination** The text states: "The primary chemicals of potential concern (COPC) at OB942 at Cape Romanzof LRRS are metals associated with small-caliber ammunition (lead and antimony) that appear to have been burned onsite." The act of burning the ammunition at OB942 most likely involved petroleum-based accelerants, such as gasoline or diesel. The CSE Phase I/II Investigation[1] did not sample for PAHs, GRO, DRO, or BTEX associated with burning activities. This fact appears to have been dropped from the 2013 CSE Phase I/II Investigation and the draft 2015 Feasibility Study for OB942. As noted in various places in the CSE Phase I/II Investigation text: "COPCs (e.g. PAHs, Diesel and Gasoline Range Organics) associated with the burning activities may be present within the Open Burn Area MRS *and will be evaluated during subsequent munitions response activities* because sampling criteria for these activities were not included in the approved work plan or the UFP-QAPP for MC sampling." (See Sections: 5.1, 6.1.2, 6.1.8, 7.3, footnote to Table 7-1, and 13.2) ADEC requests this text from the CSE Phase I/II Investigation be added to this document and include DRO,	Although the CSE Phase I/II recommended the evaluation of additional COPCs (PAHs, DRO, and GRO) in soil, fuel and fuel-associated contaminants are not considered as munitions and would not be covered under the USAF MMRP. This site is currently considered an MMRP site. However, the USAF plans to collect soil samples in concert with other remedial activities planned for Cape Romanzof in FY15. If petroleum constituents are detected in concentrations exceeding ADEC cleanup levels, the site will be moved from MMRP to ERP and an amendment to the FS will be prepared. Text will be added to Section 1.2.3 stating the following: "Additional COPCs (e.g. gasoline-range organics [GRO], diesel-range organics [DRO], and polycyclic aromatic hydrocarbons [PAH]) associated with burning activities may be present at OB942, but the presence of these analytes has not yet been investigated (USACE 2013)."	A

[1] Comprehensive Site Evaluation Phase I/II Final Report USAF Military Munitions Response Program (October 2013)

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		GRO, PAHs, and BTEX as COPCs for OB942 in addition to lead and antimony as part of any subsequent remedial alternative involving confirmation sampling (e.g. Alternative 4). The total extent of petroleum contamination present in the soil may or may not be collocated with the munitions debris at OB942.		
2.	Section 2.4, page 2-6	**Identification and Screening of Remedial Technology Types and Process Options** **Implementability** The text states: "This criterion evaluates the viability of implementing the technology considering the site-specific conditions." ADEC requests the text state instead: "This criterion evaluates the technical and administrative feasibility of implementing the technology considering the site-specific conditions." Since the text is referring to the "technical feasibility" and "administrative feasibility" of implementing a technology. Also, the requested text is what was approved in the final Feasibility Study for SR018 at Cape Romanzof. <u>Last Sentence</u> The text states: "Administrative feasibility includes the approval of any needed permits, and the availability of required facilities, specialists, and equipment." If pursuing a remedial action on-site under CERCLA, no permit is required[2]. Only the substantive requirements of	Accepted. The text will be changed to read: "This criterion evaluates the technical and administrative feasibility of implementing the technology considering the site-specific conditions." Accepted. The text will be changed to read: "Administrative feasibility includes the approval of any needed permits for off-site actions, and the availability of required facilities, specialists, and equipment."	A

[2] (e) Permit requirements.

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		the permit must be met under CERCLA. Permits are required for any remedial action conducted off-site. ADEC requests the text state instead: "Administrative feasibility includes the approval of any needed permits for off-site actions, and the availability of required facilities, specialists, and equipment."		
3.	Section 2.4.1, page 2-7	**Onsite/Offsite Disposal** The text states: "Therefore this technology requires either the development of an appropriately permitted landfill onsite, …" Federal, state or local permits are not required for onsite CERCLA actions pursuant to 40 CFR 300.400(e). However, the substantive provisions of the State and Federal regulations must be met. For example: An onsite discharge from a CERCLA site to surface waters must meet the substantive NPDES requirements, but need not obtain an NPDES permit nor comply with the administrative requirements of the permitting process, consistent with CERCLA section 121(e)(l). On the other hand, an off-site discharge from a CERCLA site to surface waters is required to obtain an NPDES permit and to meet both the substantive and the administrative NPDES requirements. Any discharge from a CERCLA site to a POTW is considered an off-site activity. It is, therefore, subject to both the substantive and	Accepted. The text will be changed to read: "Therefore this technology requires either the development of a landfill onsite which meets the substantive regulatory requirements, …"	A

(1) No federal, state, or local permits are required for on-site response actions conducted pursuant to CERCLA sections 104, 106, 120, 121, or 122. The term on-site means the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of the response action.
(2) Permits, if required, shall be obtained for all response activities conducted off-site.

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Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	CONTRACTOR RESPONSE	ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
		administrative requirements of the national pretreatment program, and to all applicable State and local pretreatment regulations.[3] ADEC requests the text state: "Therefore this technology requires either the development of an landfill onsite which meets the substantive regulatory requirements, …" ADEC requests the following text be struck from the document: "The permitting process for an onsite facility could prove difficult depending on the concentrations of residual contamination. For munitions debris without the explosive component, the permitting process for an onsite landfill or monofill could be fairly simple (18 AAC 60)." Permits are not required for onsite CERCLA actions.	Accepted. The text will be removed from the document as suggested.	
4.	Figure 2-1	**Technology Screening Process for Munitions Debris at OB942** **Disposal** **Onsite Disposal** **Implementability** The text states: "Implementable: would require development of permitted landfill/monofill" ADEC requests the text state: "Implementable: would require development of landfill/monofill that meets the substantive regulatory requirements"	Accepted. The text will be changed to read: "Implementable: would require development of a landfill/monofill that meets the substantive regulatory requirements"	A
5.	Section 3.1.2, page 3-2	**Alternative 2: Land Use Controls** The text states: "Under this alternative, LUCs would be implemented to restrict invasive and residential activities	Accepted. The AF does not intend to include fencing as a LUC. The term "controlled access" will be deleted throughout the document.	A

[3] EPA Publication 9234.2-06/FS CERCLA Compliance with CWA and SDWA (February 1990).

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Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	CONTRACTOR RESPONSE	ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
		and protect human health from exposure to munitions debris. Land-use controls (LUCs) would include controlled access and dig restrictions." ADEC requests clarification on whether or not the term "controlled access" means fencing will be used. If not, there is no LUC to control access, there is only notice (which does not "control access").		
6.	Section 3.1.3, page 3-2	**Alternative 3: Capping, Land Use Controls, and Long-Term Management** The text states: "LUCs would include controlled access, dig restrictions, deed restrictions, and signage." See Comment #5 above regarding clarification for LUCs. ADEC requests clarification on whether this property still owned by Air Force. If so, the Air Force has never before done a deed restriction, so ADEC requests additional information on whether the Air Force really planning to start deed restrictions on their property now. Perhaps, the Air Force meant to state there will be a "Notice of Environmental Contamination" instead. The text states: "The land would continue to be held by USAF under Section 121 of CERCLA, as amended by the Superfund Amendments and Reauthorization Act." The land isn't held by the USAF under CERCLA, CERCLA is not a property ownership statute. ADEC is unsure on what this sentence is intended to say by the Air Force. Further clarification is requested.	Accepted. The terms "controlled access" will be deleted throughout the document. Accepted. The AF is not authorized to place deed restrictions on federal land. "Deed restrictions" will be removed from the document. The following sentence will be added: "In addition, the Air Force would file a notice of contamination with the AF real property office." Accepted. The sentence "The land would continue to be held by USAF under Section 121 of CERCLA, as amended by the Superfund Amendments and Reauthorization Act." will be removed from the document.	A

ADEC	DATE: 21 April 2015 REVIEWER: Louis Howard PHONE: 907-269-7552	ACTION TAKEN ON COMMENT BY: Jacobs Engineering Group Inc.

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	CONTRACTOR RESPONSE	ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
7.	Section 3.1.4, page 3-3	**Alternative 4: Removal and Offsite Disposal** The text states: "…disposal to an RCRA-permitted Subtitle D landfill capable of managing munitions debris." Instead the text should state: "…disposal to a RCRA-permitted Subtitle D landfill capable of managing munitions debris." The text states: "…400 cy of munitions debris and soil would be removed from the site; the amount of debris and soil to be disposed equates to approximately 480 cy of debris and soil when adjusting for bulk factor (see Appendix B)." If the soil is actually contaminated soil[4], then add the word "contaminated" to several places so text reads: "…400 cy of munitions debris and contaminated soil would be removed from the site; the amount of debris and contaminated soil to be disposed equates to approximately 480 cy of debris and contaminated soil when adjusting for bulk factor (see Appendix B)."	Accepted. "An" will be changed to "a". Based on soil sampling conducted during the CSE Phase I/II, soil at OB942 is not contaminated. Under Alternative 4, soil would be removed as part of the debris removal. The removal is not targeting the soil.	A
8.	Section 4.0, page 4-1	**Detailed Analysis of Alternatives** Remedial alternatives for munitions debris and associated soil at OB942 have been developed for detailed and comparative evaluation in this FS…" ADEC requests clarification on the term "associated soil" and whether the soils are contaminated or not.	Accepted. The text will be updated to read "Remedial alternatives for munitions debris and associated uncontaminated soil…"	A

[4] 18 AAC 75.990 (23) "contaminated soil" means soil containing a concentration of a hazardous substance that exceeds the applicable cleanup level determined under the site cleanup rules.

ADEC		**DATE: 21 April 2015** **REVIEWER: Louis Howard** **PHONE: 907-269-7552**	**ACTION TAKEN ON COMMENT BY: Jacobs Engineering Group Inc.**	
Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**CONTRACTOR RESPONSE**	**ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
9.	Section 4.1.2, pages 4-3, 4-4, & 4-5	**Primary Balancing Criteria** **Page 4-3** **Reduction of Toxicity, Mobility, or Volume Through Treatment** The text states: "…reduction in the total volume of contaminated media." Add text so it reads: "…reduction in the total volume of contaminated media through treatment." **Page 4-4** **Short-Term Effectiveness** The text states: "Although not included in the NCP as part of this balancing criterion, additional risk to the environment includes potential harm where increased fossil fuels and greenhouse gas emissions are required for remedy implementation (ITRC 2011)." ADEC is unaware changes to NCP (40 CFR 300) and the "Nine Criteria for Evaluation": specifically, the primary balancing criteria of Short-Term Effectiveness to include a review of potential harm to the environment from increased fossil fuels and greenhouse gas emissions. Identify where in EPA guidance that EPA has said that this emissions should be considered under this criteria. It can be discussed in general, but is not a primary balancing criteria. The NCP defines Short-Term Effectiveness as: "The *short-term impacts* of alternatives shall be assessed considering the following: (1) Short-term risks that might be posed to the	Accepted. The text on page 4-3 will be changed to read: "…reduction in the total volume of contaminated media through treatment." Agreed. EPA guidance does not state that emissions should be considered under this criterion. Our intention was to include greenhouse gases released into the environment as an additional risk to the environment, based on a risk management technical memorandum (ITRC 2011) and USAF concerns. Text concerning greenhouse gases will be removed from the Short-Term Effectiveness sections. The following sentence will be added to the end of Section 4.0 on page 4-1: "Although not included in the NCP as part of any criteria, additional risk to the environment includes potential harm where increased fossil fuels and greenhouse gas emissions are required for remedy implementation (ITRC 2011). This risk will be evaluated alongside the nine criteria."	A

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		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." 6.2.3.6 Short Term Effectiveness EPA RI/FS Guidance (October 1988) states: "This evaluation criterion addresses the effects of the alternative during the construction and implementation phase until remedial response objectives are met (e.g., a cleanup target has been met). Under this criterion, alternatives should be evaluated with respect to their effects on human health and the environment during implementation of the remedial action. The following factors should be addressed as appropriate for each alternative: ! Protection of the community during remedial actions – This aspect of short-term effectiveness addresses any risk that results from		

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		implementation of the proposed remedial action, such as dust from excavation, transportation of hazardous materials, or air-quality impacts from a stripping tower operation that may affect human health. ! Protection of workers during remedial actions – This factor assesses threats that may be posed to workers and the effectiveness and reliability of protective measures that would be taken. ! **Environmental impacts** – This factor addresses the potential adverse environmental impacts that may results from the construction and implementation of an alternative and evaluates the reliability of the available mitigation measures in preventing or reducing the potential impacts. ! Time until remedial response objectives are achieved – This factor includes an estimate of time required to achieve protection for either the entire site or individual elements associated with specific site areas or threats. **Analysis Factor** **Environmental impacts** **Basis for Evaluation During Detailed Analysis** ! What environmental impacts are expected with the construction and implementation of the alternative? ! What are the available mitigation measures to be		

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		used and what is their reliability to minimize potential impacts? ! What are the impacts that cannot be avoided should the alternative be implemented? **Implementability** The text states: "Administrative issues include permitting and access for construction and monitoring." ADEC requests the text state: "Administrative issues include permitting for off-site actions and access for construction and monitoring." 2nd Bullet The text states: "The administrative requirements and relative difficulties associated, such as requirements for permits." ADEC requests the text state: "The administrative requirements and relative difficulties associated, such as requirements for permits for off-site actions." **Page 4-5** **Cost** The text states: "Capital costs including design, planning, permitting, work plans, procurement, and construction." ADEC requests the text state: "Capital costs including design, planning, permitting for off-site actions, work plans, procurement, and construction."	Accepted. The text will be changed to read: "Administrative issues include permitting for off-site actions and access for construction and monitoring." Accepted. The text will be changed to read: "The administrative requirements and relative difficulties associated, such as requirements for permits for off-site actions." Accepted. The text will be changed to read: "Capital costs including design, planning, permitting for off-site actions, work plans, procurement, and construction."	
10.	Section 4.2.1, pages 4-9 &	**Alternative 1: No Action** **Table 4-2**		A

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	4-10	**Evaluation of Alternative 1 (No Action)** The table shows Implementability with a value of 5. Technically, if it doesn't meet the first two threshold criteria[5] it is not evaluated further and would thus not have an implementability score. **Long-Term Effectiveness** As said above, technically no need to go through modifying criteria since didn't fulfill threshold requirements. **Reduction of Toxicity, Mobility, or Volume Through Treatment** The text states: "This alternative would not treat, remove, or immobilize munitions debris or contamination." Delete word "treat" as it is covered in the end clause which is added. The text would read instead as follows: "This alternative would not remove or immobilize munitions debris or contamination through treatment."	Accepted. The implementability score will be changed to 0. Accepted. The text included in the Primary Balancing Criteria subsections will be deleted for the No Action Alternative. The following sentence will be added after the Compliance with ARARs subsection on page 4-9: "Because the No Action alternative fails to achieve either threshold criteria, it was eliminated from further consideration."	
11.	Section 4.2.2, page 4-11	**Alternative 2: Land-Use Controls** **Overall Protection of Human Health and the Environment** The text states: "This effectively protects human health under a recreational land-use…" Instead the text should read: "After implementing land use	Accepted. The paragraph will be changed to read: "This alternative proposes to leave munitions debris and low levels (i.e., less than the ADEC cleanup level) of lead in soil at the site in place. After implementing LUCs, this alternative effectively protects human health under a recreational land-use scenario but does not allow for unrestricted use of the site. The human health RAO would be achieved by providing notice of the presence of munitions debris and	A

[5] Threshold criteria. Overall protection of human health and the environment and compliance with ARARs (unless a specific ARAR is waived) are threshold requirements that each alternative MUST meet in order to be eligible for selection.

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		controls, this alternative effectively protects human health..." The text states: "RAOs would be achieved by limiting access and thus exposure to munitions debris and lead at the site." See Comment #5 above regarding clarification for LUCs. Unless fencing is being used to limit access, the Air Force is not "limiting access" and merely providing notice.	lead at the site. It is also presumed that the ecological RAO would be achieved due to the de minimus volume of lead. The area at OB942 with lead greater than or equal to the EPA Eco-SSL is extremely small when compared to the home range of the EPA's indicator species (birds) from which this screening level was derived. Lead concentrations at the site have been determined to be otherwise protective of human health and the environment."	
12.	Section 4.2.3, pages 4-13 & 4-14	**Alternative 3: Capping, Land Use Controls, and Long-Term Management** **Page 4-13** **Overall Protection of Human Health and the Environment** The text states: "RAOs would only be achieved by limiting access—and thus exposure—to the site." See Comment #5 above regarding clarification for LUCs. Unless fencing is being used to limit access, the Air Force is not "limiting access" and merely providing notice. **Page 4-14** **Short-Term Effectiveness** The text states: "An increased volume of fossil fuels will be needed and released into the environment as a result of both the heavy machinery to construct the cap and the airplane, barge, and vehicles for transportation offsite." Please provide EPA guidance showing that the greenhouse gasses released into the environment should be considered	The text will be changed to state "RAOs would be achieved by limiting access and exposure to the site via the cap." Alternative 3 also includes signage. Please see the response to Comment #9. The text will be deleted from the Short-Term Effectiveness section on page 4-14. The following text will be added to the end of the first paragraph in Section 4.2.3: "Although not part of the NCP's criteria, another consideration for Alternative 3 includes greenhouse gas emissions. An increased volume of fossil fuels will be needed and released into the environment as a result of both the heavy machinery to construct the cap and the	A

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		in the short-term effectiveness criteria.	airplane, barge, and vehicles for transportation offsite."	
13.	Section 4.2.4, page 4-17	**Alternative 4: Removal and Offsite Disposal** **Short-Term Effectiveness** The text states: "An increased volume of fossil fuels will be needed under this alternative for the heavy machinery to remove the soil and debris and load Super Sacks as well as the airplane, barge, and vehicles for transportation offsite." See Comment #12 above regarding documentation for greenhouse gasses released into the environment as a short-term criteria.	Please see the responses to Comments #9 and #12. The text will be deleted from the Short-Term Effectiveness section on page 4-17. The following text will be added to the end of the first paragraph in Section 4.2.4: "Although not part of the NCP's criteria, another consideration for Alternative 4 includes greenhouse gas emissions. An increased volume of fossil fuels will be needed under this alternative for the heavy machinery to remove the soil and debris and load Super Sacks as well as the airplane, barge, and vehicles for transportation offsite."	A
14.	Table 4-6, page 4-20	**Comparison of Alternatives for OB942 (Continued)** Delete value for Implementability for Alternative 1: No Action. Once the alternative doesn't meet the threshold, it isn't further evaluated	Accepted. The implementability score will be changed to 0.	A
15.	Section 4.4.2, page 4-20	**Primary Balancing Criteria** The text states: "Alternative 4 results in greater greenhouse gas emissions relative to the other alternatives due to the use of heavy machinery to remove the soil and debris and load Super Sacks as well as the airplane, barge, and vehicles for offsite transportation." See Comment #12 above regarding documentation for greenhouse gasses released into the environment as a short-term criteria	Please see response to comment #12. The third sentence in Section 4.4.2 will be changed to read: "In contrast, Alternative 4 would not require any LUCs or LTM. Although not included in the NCP as part of the balancing criteria, Alternative 4 results in greater greenhouse gas emissions relative to the other alternatives due to the use of heavy machinery to remove the soil and debris and load Super Sacks as well as the airplane, barge, and vehicles for offsite transportation."	A
16.	Appendix A, Table A-1, page A-2	**Chemical-Specific Applicable or Relevant and Appropriate Requirements** **Regulation** U.S. Environmental Protection Agency Regional Screening Levels for Chemical Contaminants at Superfund	Accepted. The text will be changed to read: "Possible screening and/or cleanup goals to use in the absence of ADEC values for specific contaminants"	A

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		Sites (Code of Federal Regulations, Title 20, Section 141.61 [20 CFR 141.61]) Rationale The text states: "Used as a more conservative guideline for delineating potential lead and antimony contamination" ADEC requests the text state: "Possible screening and/or cleanup goals to use in the absence of ADEC values for specific contaminants"		
17.	Appendix A, Table A-3, page A-6	**Action-Specific Applicable or Relevant and Appropriate Requirements** **Rationale** 18 AAC 60 also has monofill construction requirements, including cover requirements. Please mention this in the Rationale section of the table.	Accepted. Monofill construction requirements will be added to the "Rationale" column for 18 AAC 60 as follows: "18 AAC 60.010 lists requirements for accumulation, storage, and treatment of solid wastes and monofill construction requirements."	A
18.	Appendix B, Page 82 of the PDF	**Cost Analysis for Alternative 3** **Task** The text mentions "Permitting" as part of the capital costs for onsite solid waste monofill. See Comment #3 above regarding Federal, state or local permits not being required for onsite CERCLA actions pursuant to 40 CFR 300.400(e). However, the substantive provisions of the State and Federal regulations must be met for the remedial action as if a permit were required.	Accepted. This line for Capital Costs will be changed to read: "Planning, Regulatory Requirements, Design, Work Plans, Project Management"	A
19.	Appendix B, Page 88 of	**Cost Estimates for Sampling and Analysis** **Laboratory Pricing**	Please see response to Comment #1. The USAF plans to collect soil samples from OB942 and analyze them for the petroleum-related	A

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	the PDF	**Method** ADEC will require analysis for GRO by AK101, DRO by AK102, PAHs[6] by either 8270D or 8310, BTEX by either 8021B or 8260C. The number of soil samples will be higher than those listed in the table for confirmation samples and required field quality control samples as required by the May 2010 Draft Field Sampling Guidance (Table 3 – Minimum Quality Control Requirements). Petroleum contamination associated with the burning activities was not conducted during the CSE Phase I/II Investigation[7].	constituents identified by ADEC concurrent to other FY15 Cape Romanzof remedial action activities.	

[6] PAHs must include acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, fluoranthene, flourene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene.

[7] COPCs (e.g. PAHs, Diesel and Gasoline Range Organics) associated with the burning activities may be present within the MRS and will be evaluated during subsequent munitions response activities because sampling criteria for these activities were not included in the approved work plan or the UFP-QAPP for MC sampling (6.1.8 Sampling and Analysis Results, PAH Sampling and Analysis Results. CSE Phase I/II Final Report October 2013).