United States Army
Corps of Engineers

Formerly Used Defense Sites Program

Decision Document

Hazardous, Toxic, and Radioactive Waste (HTRW)
Project # F10AK096903
Northeast Cape Formerly Used Defense Site (FUDS)
St. Lawrence Island, Alaska

January 2009

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<u>**Acronyms and Abbreviations**</u>

AAC	Alaska Administrative Code
ACM	Asbestos-containing material
ADEC	Alaska Department of Environmental Conservation
ARARs	Applicable or Relevant and Appropriate Requirements
AST	Aboveground storage tank
BTEX	Benzene, toluene, ethylbenzene, and xylene
bgs	Below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Contaminant of concern
CSM	Conceptual site model
DOD	Department of Defense
DRO	Diesel Range Organics
E&E	Ecology and Environment, Inc.
EPA	United States Environmental Protection Agency
FS	Feasibility Study
FUDS	Formerly Used Defense Site
GRO	Gasoline-range organics
LUCs	Land Use Controls
mg/kg	milligram per kilogram
mg/L	milligram per liter
MOC	Main Operations Complex (Sites 10, 11, 13, 15, 19, 27)
MW	monitoring well
MWH	Montgomery Watson Harza
NCP	National Contingency Plan
NFA	No Further Action
OSCI	Oil Spill Consultants, Inc.
POL	Petroleum, oil, and lubricants
ppm	Parts per million
PAHs	Polyaromatic (or Polycyclic) Hydrocarbons
PCBs	Polychlorinated biphenyls
POL	Petroleum, Oil, & Lubricants
Priority Pollutant Metals	Antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc.
RRO	Residual Range Organics
RAB	Restoration Advisory Board
RAO	Remedial Action Objectives
RI	Remedial Investigation
TSCA	Toxic Substances Control Act
TRPH	Total recoverable petroleum hydrocarbons
USACE	United States Army Corps of Engineers

UCL Upper Confidence Level
UST Underground storage tank
VOCs Volatile organic compounds
WACS White Alice Communications Station

PART 1: DECLARATION

1.1 SITE NAME AND LOCATION

The Northeast Cape Formerly Used Defense Site (FUDS), project number F10AK096903, is located on St. Lawrence Island in the western portion of the Bering Sea, approximately 135 air miles southwest of Nome, Alaska. The Alaska Department of Environmental Conservation (ADEC) contaminated sites record key (reckey) number for the overall Northeast Cape site is 198532X917901. Individual sites are also tracked with separate reckey numbers. The U.S. Environmental Protection Agency identification number is AK9799F2999. The Northeast Cape site is not listed on the National Priorities List.

The Village of Savoonga is the closest community; located 60 miles northwest of the site. The Northeast Cape site, at 63º19' North, 168º58' West, is 9 miles west of the northeastern cape of St. Lawrence Island. The Northeast Cape site originally encompassed 4,800 acres (7.5 square miles). The site is bounded by Kitnagak Bay to the northeast, Kangighsak Point to the northwest, and the Kinipaghulghat Mountains to the south (see Figure 2).

1.2 STATEMENT OF BASIS AND PURPOSE

This Decision Document presents the U.S. Army Corps of Engineers (USACE)-selected remedy for Northeast Cape, St. Lawrence Island, Alaska, chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the maximum extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based upon the Administrative Record for this site, including the results of a phased remedial investigation which was conducted from 1994 to 2006, and several interim removal actions. The accompanying decision document summarizes these activities. Petroleum, oil, and lubricants (POL)-contaminated sites fall under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) petroleum exclusion and are therefore being addressed under the authority of the Defense Environmental Restoration Program (DERP), United States Code, Title 10, Section 2701, et seq.. The DERP provides authority to cleanup petroleum contamination when it may pose an imminent and substantial endangerment to public health, welfare or the environment. Alaska's Site Cleanup Rules (18 AAC 75 Article 3) are risk based and indicative of when an imminent and substantial endangerment to the public health or welfare or the environment has been mitigated. Accordingly, although not required by law, the petroleum contamination will be cleaned up consistent with Alaska's Site Cleanup Rules. The State of Alaska, through the Department of Environmental Conservation, concurs with the selected remedy.

Detailed information supporting the selected remedial action is also contained in the Administrative Record for this site, located at the U.S. Army Corps of Engineers Alaska District Office on Elmendorf Air Force Base, AK, and the Information Repositories located at the Alaska Resource Library and Information Services in Anchorage, the Sivuqaq Lodge in Gambell, the Savoonga City Hall in Savoonga, and the University of Alaska Fairbanks Northwest Campus Library in Nome.

1.3 ASSESSMENT OF SITE

The response action selected in this Decision Document is necessary to protect the public health and welfare or the environment from actual or threatened releases of hazardous substances into the environment, including polychlorinated biphenyls (PCBs) in soil; as well as environmental damage caused by the release of petroleum-related contaminants that present an imminent and substantial endangerment to public health and welfare in the environment. Various impacted media have been identified, and not all contaminants of concern are present at each site.

Soil cleanup levels were developed based on the Human Health and Ecological Risk Assessment (2004) and are protective of future residential use. Sediment cleanup levels are protective of potential future human and ecological receptors. Groundwater cleanup levels are based on promulgated levels from 18 Alaska Administrative Code (AAC) 75, Table C. Surface water cleanup levels are also based on State of Alaska regulations 18 AAC 70. The cleanup levels for identified contaminants of concern in various media at Northeast Cape include:

Table 1 Cleanup Levels

Contaminants of Concern	SOIL (mg/kg)	SEDIMENT (mg/kg)	GROUNDWATER [e] (mg/L)	SURFACE WATER (mg/L)
Inorganics				
Arsenic	11 [d]	93 [a]	0.01	
Chromium		270 [a]		
Lead		530 [a]	0.015	
Zinc		960 [a]		
Organics				
Benzene	2 [g]		0.005	
Ethylbenzene			0.7	
Polychlorinated Biphenyls (PCBs)	1 [f]	0.7 [a, b]		
Polycyclic Aromatic Hydrocarbons (PAHs)				
2 –methylnaphthalene		0.6 [a]		
Acenaphthene		0.5 [a]		
Benzo(g,h,i)perylene		1.7 [b]		
Fluoranthene		2.0 [b]		
Fluorene		0.8 [a]		
Indeno(1,2,3-cd)pyrene		3.2 [b]		
Naphthalene	120 [g]	1.7 [a]		
Phenanthrene		4.8 [a]		
Total LPAH [1]		7.8 [a]		
Total HPAH [2]		9.6 [a]		
Petroleum Hydrocarbons				
Diesel Range Organics (DRO)	9,200 [g]	3,500 [c]	1.5	*no sheen

Gasoline Range Organics (GRO)			1.3	*no sheen
Residual Range Organics (RRO)	9,200 [g]	3,500 [c]	1.1	*no sheen
Total Aromatic Hydrocarbons (TAH) [3]				0.01
Total Aqueous Hydrocarbons (TAqH) [4]				0.015

[1] LPAH are low molecular weight PAHs
[2] HPAH are high molecular weight PAHs
[3] TAH is the sum of benzene, toluene, ethylbenzene, and xylenes.
[4] TAqH is the sum of BTEX and polycyclic aromatic hydrocarbons (PAHs).
[a] Washington State Administrative Code WAC 173-204-520, Table III, Sediment Minimum Cleanup Level (WAC, 1995)
[b] MacDonald et al, consensus-based Probable Effects Concentration (USEPA, 2002)
[c] Protective of human health, based on future residents, incidental ingestion/dermal contact route, exposure frequency 90 days/year, and a target hazard quotient of 0.1
[d] Site-specific background value
[e] 18 AAC 75, Table C (as updated 9 October 2008)
[f] 18 AAC 75, Table B1 (as updated 9 October 2008)
[g] 18 AAC 75, Method 4, risk-based residential cleanup level (USACE, 2007).

The former military installation operated from about 1952 until 1972 as an Aircraft Control and Warning Station and a White Alice Communications System station. The property is currently owned jointly by the two local native corporations, Sivuqaq, Inc., in Gambell and Kukulget, Inc., in Savoonga.

Environmental investigations and cleanup activities at Northeast Cape began in the mid 1980's. Remedial investigations (RI) were initiated at Northeast Cape during the summer of 1994. Additional sampling was performed during subsequent investigations: Phase II RI (1996 and 1998); Phase III RI (2001 and 2002); and Phase IV RI (2004). Demolition of the buildings and all other structures was completed under multiple USACE contracts between 1999 and 2005. The runway, gravel roads, and concrete foundations of some of the structures remain intact.

1.4 DESCRIPTION OF SELECTED REMEDY

The response action selected in this Decision Document is protective of public health, welfare, and the environment.

The selected remedy entails the following major components:

- No Further Action at Sites 2, 4, 5, 12, 14, 17, 18, 20, 22, 23, 24, 25, 26, 33, and 34
- Excavation and removal of petroleum-contaminated soils at Site 1 Airstrip
- Excavation and removal of petroleum-contaminated soils at Site 3 Fuel Pumphouse
- Excavation and removal of petroleum-contaminated soils at Site 6 Former Drum Field
- Excavation and removal of petroleum-contaminated soils at Site 32 Lower Tramway
- Excavation and removal of PCB-contaminated soils at Sites 13, 16, 21, and 31
- Excavation and removal of arsenic-contaminated soil at Site 21 Wastewater Treatment Tank

- Excavation and removal of petroleum, metals, and PCB-contaminated sediment at Site 28 Drainage Basin, including removal of near-surface sediments from the narrow channel upgradient of the Suqitughneq River
- Construction of sedimentation pond or other appropriate controls at Site 28 Drainage Basin
- Monitored Natural Attenuation of petroleum-contaminated sediment at Site 8 POL Spill Site
- Capping of the Site 9 Housing and Operations Landfill.
- Chemical oxidation at the Main Operations Complex, with contingency remedy of monitored natural attenuation for groundwater, excavation and removal of petroleum-contaminated soils to a depth of 15 feet at Sites 10, 11, 13, 15, 19 and 27, and land use controls.
- Land use controls to limit future drinking water uses for groundwater at the Main Complex (Sites 10-22, 26, 27), designate areas not suitable for drinking water (Sites 3, 4, 6, 7, 9), prevent construction of buildings on top of landfills, and manage potential future excavation and movement of soils above state cleanup levels.
- 5-Year Reviews at sites with hazardous substances remaining above cleanup levels, e.g. the Main Complex, as necessary until cleanup levels are met. Periodic reviews of POL-only contaminated sites (e.g., Site 8) with residual contamination will be included in conjunction with evaluation of the Main Complex.
- Periodic visual monitoring of the capped area at the Site 9 Housing and Operations Landfill and Site 7 Cargo Beach Road Landfill for settlement and erosion for 5 years. Additional visual monitoring, up to 30 years, may be conducted if deemed necessary based on the results of the site inspections.
- Removal of dangerous poles, wires, and other miscellaneous debris from tundra areas site-wide where clearly identified.
- Removal of partially submerged debris from streams in the vicinity of Site 9 Housing and Operations Landfill and Site 29 Suqitughneq River.

Site 7 Cargo Beach Road Landfill is not being specifically addressed under this Decision Document. A separate decision document will summarize the final determination for this site. However, land use controls will be implemented site-wide to include Site 7. Site 30 is not a contaminated site; it is the Corps designation for background areas that were studied during the remedial investigation.

Land Use Controls will be implemented for sites identified with residual contamination above the residential cleanup levels. The landowners will be provided with detailed maps showing contamination locations. The Native Village of Savoonga IRA indicated they were developing a Land Department that will eventually be capable of keeping electronic maps. The Corps will provide electronic maps to the IRA when that capability is established. Areas designated as non-drinking water sources will be surveyed and an informational deed notice placed in the property records and with the Alaska Department of Environmental Conservation. Community education will be provided by the Savoonga IRA, with assistance from the Army Corps of Engineers, to ensure residents are informed of safe drinking water sources, temporary restrictions on installing wells within the contaminated area of the Main Complex, and proper procedures for potential future excavation of soil with residual contamination.

1.5 STATUTORY DETERMINATIONS

The Department of Defense (DoD) is authorized to carry out a program of environmental restoration at former military sites according to 10 United States Code (USC) 2701(a). The Defense Environmental Restoration Program (DERP) was set up to accomplish this task. The cleanup of Formerly Used Defense Sites (FUDS) is a part of this program. FUDS are those properties that the DoD once owned or used, but no longer controls. These properties range from privately owned farms to National Parks. They also include residential land, schools, and industrial areas. The FUDS program includes former Army, Navy, Marine, Air Force, and other defense properties. Over 600 FUDS properties have been identified in Alaska.

The DoD can remediate releases of petroleum where the release poses an imminent and substantial endangerment to the public health or welfare or to the environment per 10 USC 2701(b)(2). Although the majority of the areas of concern identified at this site do not include CERCLA-regulated hazardous substances, the preparation of this Decision Document follows CERCLA guidance as a matter of administrative policy.

The selected remedies are protective of human health and the environment, comply with federal and state requirements that are applicable or relevant and appropriate (ARARs) (for CERCLA hazardous substances) or pertinent risk-based standards for petroleum hydrocarbons, are cost effective, and utilize permanent solutions to the extent practicable.

Five-year reviews are required for selected sites (Main Operations Complex). Hazardous substances, pollutants, or contaminants will remain on-site at levels that do not allow for unlimited use and unrestricted exposure, until site cleanup goals are met in the future.

Chemical oxidation, excavation and disposal/treatment of contaminated soil satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment).

Authorizing Signature

This Decision Document presents the selected remedial actions of chemical oxidation, excavation/disposal/treatment, monitored natural attenuation and land use controls at the Northeast Cape site, St. Lawrence Island, Alaska. The U.S. Army Corps of Engineers is the lead agency under the Defense Environmental Restoration Program at the Northeast Cape Formerly Used Defense Site (F10AK0969), and has developed this Decision Document consistent with the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan. This document, presenting a selected remedy with a present worth cost estimate of more than $10 million, is approved by the undersigned, pursuant to Memorandum, DAIM-ZA, September 9, 2003, Subject: Policies for Staffing and Approving Decision Documents, and to Engineer Regulation 200-3-1, Formerly Used Defense Sites Program Policy.

Craig E. College (signature) Date 9/3/09

for ROBERT WILSON
Lieutenant General, GS
Assistant Chief of Staff
for Installation Management

PART 2: DECISION SUMMARY

This Decision Summary provides an overview of the conditions at the Northeast Cape site. It summarizes the data from the remedial investigation phase, describes the remedial alternatives considered, and analyzes those alternatives compared to the criteria set forth in the National Contingency Plan (NCP). The Decision Summary explains the rationale for selecting the remedies, and how the remedy satisfies the statutory requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), if applicable.

2.1 SITE NAME, LOCATION, AND BRIEF DESCRIPTION

The Northeast Cape site, FUDS project # F10AK096903, is located on St. Lawrence Island, Alaska, about 135 air miles southwest of Nome in the Bering Sea (see Figure 1), and 60 miles southeast of Savoonga. The State of Alaska, Department of Environmental Conservation (ADEC) tracks the entire site with reckey # 198532X917901. The EPA identification number for Northeast Cape is AK9799F2999. Northeast Cape is located at latitude 63º19’60” North, and longitude 168º58’26” West. The site is not connected via road to other permanent communities on the island, and is only accessible by air, water, or all-terrain vehicle trails.

Figure 1 Site Vicinity Map

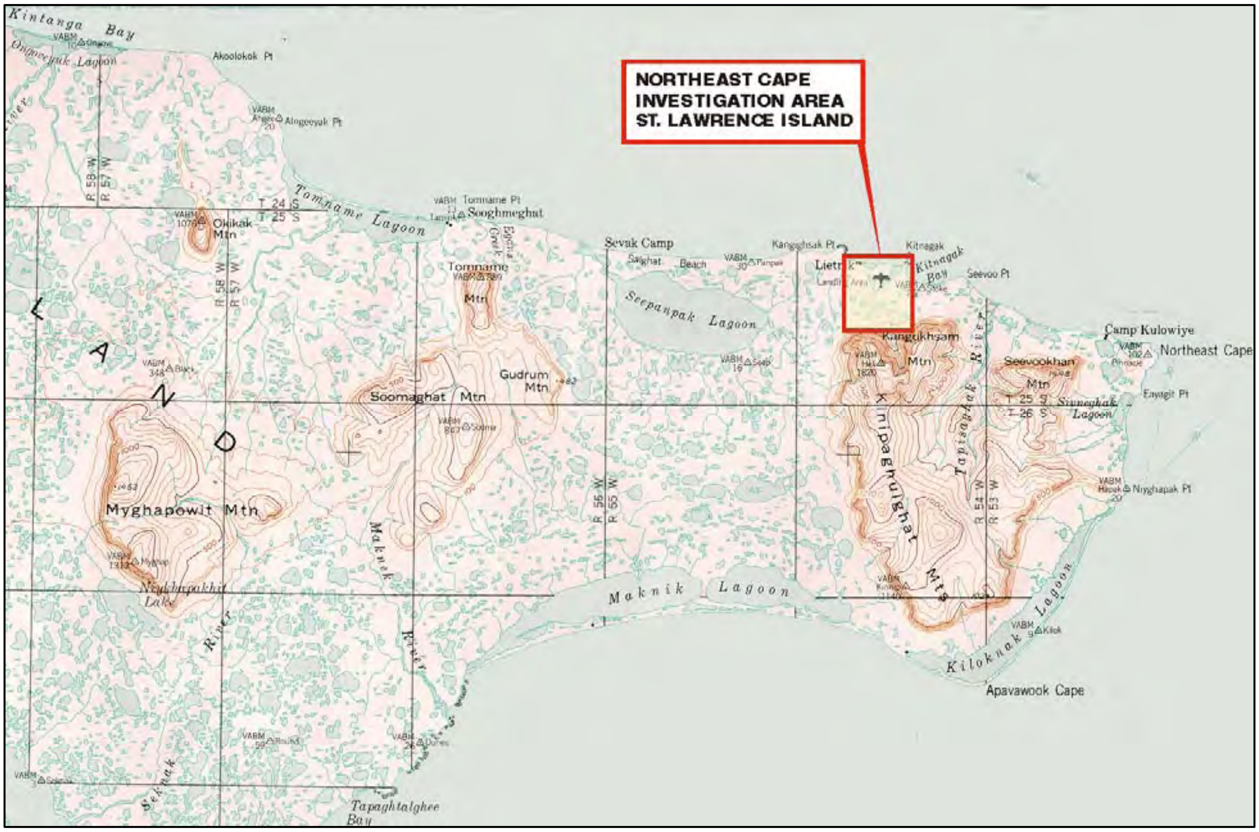

Figure 2 Site Location Map

2.2 SITE HISTORY

The U.S. Air Force (USAF) constructed an Aircraft Control and Warning Station (AC&WS) at Northeast Cape during 1950 and 1951, and activated the facility in 1952. In 1954, a White Alice Communications System (WACS) station was added, composed of four large parabolic antennas and a building housing the electronic equipment. The original installation supported 212 people. The Northeast Cape site provided radar coverage and surveillance for the Alaskan Air Command, and later for the North American Air Defense Command, as part of an Alaskan early warning system constructed to reduce vulnerability to bomber attack across the polar regions.

The AC&WS and WACS operations were terminated in 1969 and 1972, respectively. The majority of the military personnel were removed from the Northeast Cape site by the end of 1969. The buildings, and the majority of furnishings and equipment, were abandoned in place due to the high cost of off-island transport. In 1982, the Navy obtained the former White Alice property (26 acres), but did not utilize the site as a communications site. The land transfer was later deemed invalid and property ownership reverted to Sivuqaq, Inc., and Savoonga Native Corporation (now known as Kukulget, Inc.). Demolition of the buildings and the majority of other structures has been completed under multiple U.S. Army Corps of Engineers (USACE) contracts. The runway, improved gravel roads, and concrete slabs of some of the former structures remain intact.

2.3 INVESTIGATION AND REMEDIAL ACTION HISTORY

Environmental investigations and cleanup activities at Northeast Cape began in the mid 1980’s. The goals of the investigations were to locate and identify areas of contamination and to gather enough information to develop a cleanup plan. Remedial investigations (RI) were initiated at Northeast Cape during the summer of 1994. Additional sampling was performed during subsequent investigations: Phase II RI (1996 and 1998); Phase III RI (2001 and 2002); and Phase IV RI (2004). The studies divided the concerns among 34 separate sites. The results of the remedial investigation showed that contaminants were present at some but not all sites.

2.3.1 Preliminary Assessment

In 1985, URS Corporation conducted an Environmental Assessment of the Northeast Cape facility. The assessment consisted of a file search and preliminary reconnaissance of the facility, which included an inventory of materials left by the military, and a collection of a limited number of soil and water samples. In 1991 and 1992, Ecology and Environment, Inc. (E&E) conducted an additional site reconnaissance and interviewed personnel who had resided at the Northeast Cape complex when it was active. In 1993, E&E prepared a Chemical Data Acquisition Plan (CDAP) to further investigate areas of concern.

2.3.2 Phase I Remedial Investigation

In 1994, Montgomery Watson Harza Americas, Inc. (MWH) performed a Phase I Remedial Investigation (RI) in accordance with the CDAP. Soil, sediment, groundwater, and surface water samples were collected and documented in a Remedial Investigation report.

2.3.3 Phase II Remedial Investigation

In 1996, MWH performed a Phase II RI that included collection of soil, water, and biological samples; characterization of liquids in storage tanks and subterranean structures; a radiological survey; and public disclosure of potential asbestos hazards. Results of the 1996 Phase II RI/Feasibility Study (FS) and a Human Health and Ecological Risk Assessment were documented in a draft Phase II RI/FS report. Because of unresolved technical questions, MWH collected additional data in September 1998 before completion of the Final Phase II RI/FS.

In 1999, MWH conducted additional sampling at selected sites to assist in assessing the impact to human health and the environment, determine the extent and transport of contaminants, and help select appropriate remedial technologies. This data was used in the Final Human Health and Ecological Risk Assessment completed in 2004.

2.3.4 Phase III Remedial Investigation

During the 2001 and 2002 field seasons, MWH conducted additional sampling as part of the phased remedial investigation. Phase III field work included sampling of surface water, groundwater, sediment, surface and subsurface soils, vegetation (plants), and fish. Phase III RI work was intended to fill data gaps revealed by public commentary, confirm previous results, and provide data for updated Human Health and Ecological Risk Assessments.

2.3.5 Phase IV Remedial Investigation

Shannon & Wilson, Inc., performed soil sampling at various locations during the summer field season of 2004 to address data gaps identified by the state regulator and community. Sample results from the 2004 sampling event were used to establish PCB-contaminated soil excavation sites for the 2005 field season.

2.3.6 Feasibility Study

USACE completed a Feasibility Study in March 2007. The feasibility study summarized the historical sampling results for each site or area of concern at Northeast Cape, summarized previous removal activities applicable to particular sites, and evaluated a range of alternatives according to the criteria prescribed by the Comprehensive Environmental Response, Compensation, and Liability Act. A total of 33 individual sites were investigated and characterized at Northeast Cape; background sampling locations were included to assess natural conditions. Sites were grouped geographically into 8 areas for further evaluation of alternatives. Depending on the particular site characteristics and affected media, the alternatives evaluated include no action, land use controls, natural attenuation, land farming, phytoremediation, thermal treatment, off-site treatment and disposal, capping, reactive matting, reactive walls, constructed wetlands, and chemical oxidation.

2.3.7 Removal Actions

Several non-time-critical interim removal actions were performed to address the removal of containerized hazardous/toxic waste items, buildings and miscellaneous debris, and hotspots of contaminated soils.

In 1990, the Navy, assisted by URS Corporation, conducted a removal action at the White Alice and Radome portion of the site and removed transformers, drums, tanks, fire extinguishers, and other containerized hazardous wastes.

In 1994, Northwest Enviro Service, Inc., was contracted by USACE to remove all electrical transformers and their contents from Northeast Cape.

In 1997, Montgomery Watson conducted mitigation of physical hazards caused by communication wire and cable on the tundra.

In 1999, USACE contracted Nugget Construction, Inc. (Nugget) to perform building demolition and debris removal, and removal of containerized hazardous and toxic wastes. Fieldwork began during the 2000 field season; Nugget gathered and crushed 6,099 fifty-five gallon drums, collected antenna poles, lines, and other miscellaneous non-hazardous debris (approximately 60 tons), removed containerized hazardous wastes from buildings, cleaned 19 above ground storage tanks (ASTs), and removed a fuel pipeline.

During the 2001 field season, Nugget cleaned 17 additional tanks, decommissioned 3 underground storage tanks (USTs), demolished and packaged 3,303 tons of building demolition debris including steel beams, asbestos-containing materials (ACM), and Toxic Substances Control Act (TSCA)-regulated materials. Nugget excavated 25 tons of polychlorinated biphenyl (PCB)-contaminated soil and 1,643 tons of petroleum/oil/lubricant (POL)-contaminated soil, decommissioned 4 potable water wells, and gathered additional containerized hazardous wastes and miscellaneous debris. Nugget demolished approximately 50% of the buildings in the Air Force Station main operations area.

In 2002, Bristol Environmental and Engineering Services Corporation was hired to conduct additional removal actions to reduce hazards to human health and the environment posed by containerized hazardous wastes, deteriorating building and miscellaneous debris. Fieldwork began during the 2003 field season. Bristol demolished and removed the remaining 30 buildings, other structures and the utilidor system. Over 300 drums and tanks of hazardous waste, including a large septic tank at the main operations area and 12 ASTs were removed or decommissioned. Over 500 power and communications poles and 60 miles of wires and cables were gathered for disposal; 650 feet of fuel lines were transported off-island. Bristol's activities occurred at both the upper and lower mountain areas. Over 5,000 tons of waste and debris were shipped off-island for disposal.

Due to funding constraints, demolition of the tram line including the towers and associated cables and wires was delayed.

During the 2005 field season, Bristol demolished and removed the tramway towers and wire. Additionally, more than 200 metal and wooden poles, approximately 25 miles of power and communications wire and cable, 26 tons of debris from two debris fields located on Kangukhsam Mountain, and over 160 tons of PCB-contaminated concrete and 290 tons of PCB-contaminated soil were removed. Bristol sorted and packaged approximately 1,500 tons of waste for transport off-island; 370 tons of non-creosote treated and un-painted wood was burned on-island, with the ash removed for disposal off-island.

2.4 ENFORCEMENT HISTORY

Remedial investigation and removal work at Northeast Cape has been carried out under the Defense Environmental Restoration Program (DERP) FUDS program. There have been no enforcement activities or notices of violation pertaining to the Department of Defense activities at the Northeast Cape site.

2.5 COMMUNITY RELATIONS ACTIVITIES

Public participation has been an important component of the CERCLA process at the Northeast Cape site. A Community Relations Plan was developed for the project in March 1996 and updated in April 2002. The Community Relations Plan describes the measures used to meet the community relations goal of keeping Savoonga and Gambell residents and other interested people informed about project activities. It provided a means for local residents to share their knowledge about the Northeast Cape area and its history with the project team. It further allowed the residents and other interested persons to provide their feedback and comments on project activities, and gave everyone an opportunity to become involved in the project.

A Restoration Advisory Board (RAB) comprised of community members and other interested parties was established in January 2000. RAB meetings are held approximately 3 times per year to keep the public informed of ongoing project activities. Detailed meeting minutes are recorded and distributed after each meeting. The RAB is served by a technical advisor, under the Technical Assistance for Public Participation (TAPP) program, to provide technical guidance and comments on workplans, reports, proposed remedies, and potential environmental and human health impacts.

The opportunity for public review and commentary on project documents has been made available throughout all phases of the project. Detailed responses to comments are available in the correspondence file at the Information Repositories or in appendices of the final documents. All comments received are documented in the administrative record file.

Project documentation, reports, and other materials are available at four Information Repositories - the Sivuqaq Lodge in Gambell, the Savoonga City Hall in Savoonga, the University of Alaska Fairbanks Northwest Campus Library in Nome, and the Alaska Resource Library and Information Services in Anchorage.

Information Repositories

Sivuqaq Corporation Building (Lodge)
P.O. Box 101
Gambell, Alaska 99742
Phone: (907) 985-5826

Savoonga City Hall
Savoonga, Alaska 99769
Phone: (907) 984-6414

UAF Northwest Campus Library
Nome, Alaska 99762
Phone: (907) 443-2201

Alaska Resource Library and Information Services (ARLIS)
UAA Consortium Library
Anchorage, Alaska 99508
Phone: (907) 272-7547

2.6 SCOPE AND ROLE OF RESPONSE ACTION

The CERCLA process is intended to identify solutions to contamination issues where they exist. The remedial action described in this Decision Document addresses threats to human health and the environment posed by contamination at the Northeast Cape Site. The RI/FS Reports defined these threats as soil, sediment, and groundwater contaminants. Surface soil contaminants that pose a potential threat to the public health or the environment, and that cannot be effectively remediated on site, will be removed, transported, and disposed in an appropriate facility.

The remedial actions are intended to proceed sequentially over an estimated 5 field seasons. Implementation of the chemical oxidation Phase I should be conducted contemporaneously with the proposed remediation of the Cargo Beach Road Landfill - a separate containerized hazardous waste project (F10AK096905), to minimize site mobilization costs.

2.7 SITE CHARACTERISTICS

This section provides an overview of the Northeast Cape site, including geographical information, hydrology, ecological resources, and land use.

2.7.1 Conceptual Site Model

The Conceptual Site Model for Northeast Cape describes potential sources, release mechanisms, transport media, exposure routes, and human and ecological receptors. The primary sources of contaminants are releases to surface soils. Transport or receiving media include soil, sediment, groundwater, surface water, air, flora, or fauna.

The primary contaminants of concern at Northeast Cape are chemicals associated with petroleum hydrocarbon releases, metals, and polychlorinated biphenyls (PCBs). These compounds have low aqueous solubilities and high sorbing efficiencies onto carbon present in environmental media. Thus, these compounds have a high degree of retention in soils and sediments.

Figures 3 and 4 present graphical conceptual site models (CSM) for Northeast Cape. These graphical representations show potential sources, release mechanisms, transport media, exposure routes, and human and ecological receptors. Human receptors are expected to include site visitors, seasonal subsistence users, and future permanent residents. Several potential exposure scenarios were identified in the conceptual site model:

- incidental ingestion of soil/sediment
- dermal contact with soil/sediment/surface water
- inhalation of dust from soil or volatile organic compounds in groundwater
- ingestion of surface water or groundwater
- consumption of subsistence food items

The potentially affected biological resources evaluated included vegetation, birds, fish, shellfish, terrestrial mammals, marine mammals, and special status species. The ecological risk evaluation focused on three selected indicator receptors, the tundra vole, cross fox, and glaucous-winged gull.

2.7.2 Geographical and topographic information

The Native Village of Savoonga is located on St. Lawrence Island, in the western portion of the Bering Sea, approximately 164 air miles southwest of Nome, Alaska (see Figure 1). Savoonga has a subarctic maritime climate with some continental influences during the winter. Summer temperatures average 40 to 51; winters average -7 to 11. Temperature extremes from -34 to 67 have been recorded. Average precipitation is 10 inches annually, with 58 inches of snowfall. The island is subject to prevailing winds, averaging 18 miles per hour. Freeze-up on the Bering Sea occurs in mid-November, with break-up in late May.

The area occupied by the former installation consists mainly of rolling tundra which rises from the Bering Sea towards the base of the Kinipaghulghat Mountains. The Kinipaghulghat Mountains rise abruptly to an elevation of approximately 1,800 feet above sea level roughly 3 miles from the coastline. The installation activities spanned from the beach to the mountain summit. The main area of operation, termed the Main Operations Complex (MOC), is located at about 100 feet in elevation, just north of a glacier carved valley that opens to the tundra. The former installation layout is shown in Figure 5.

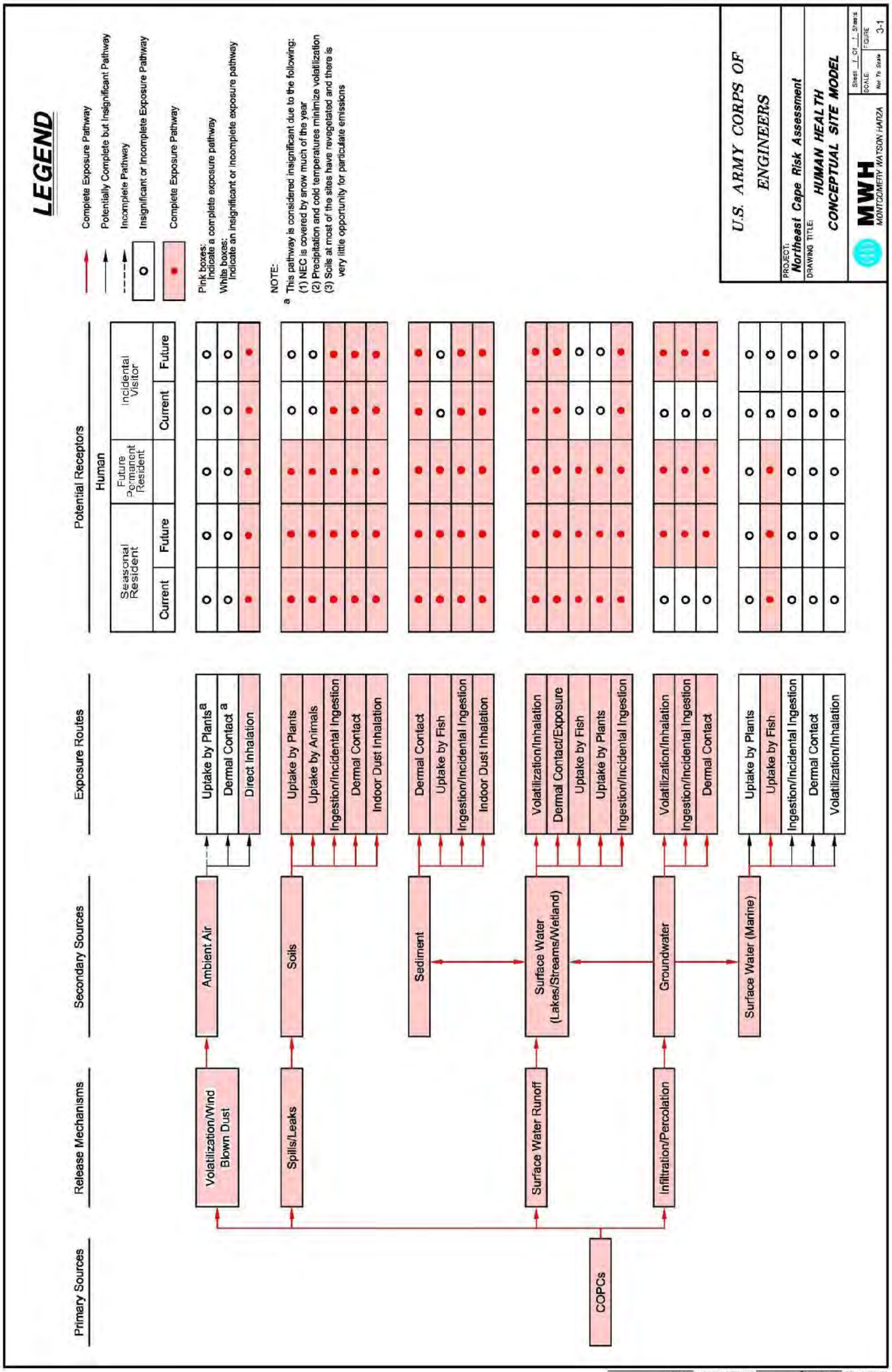

Figure 3. Human Health Conceptual Site Model

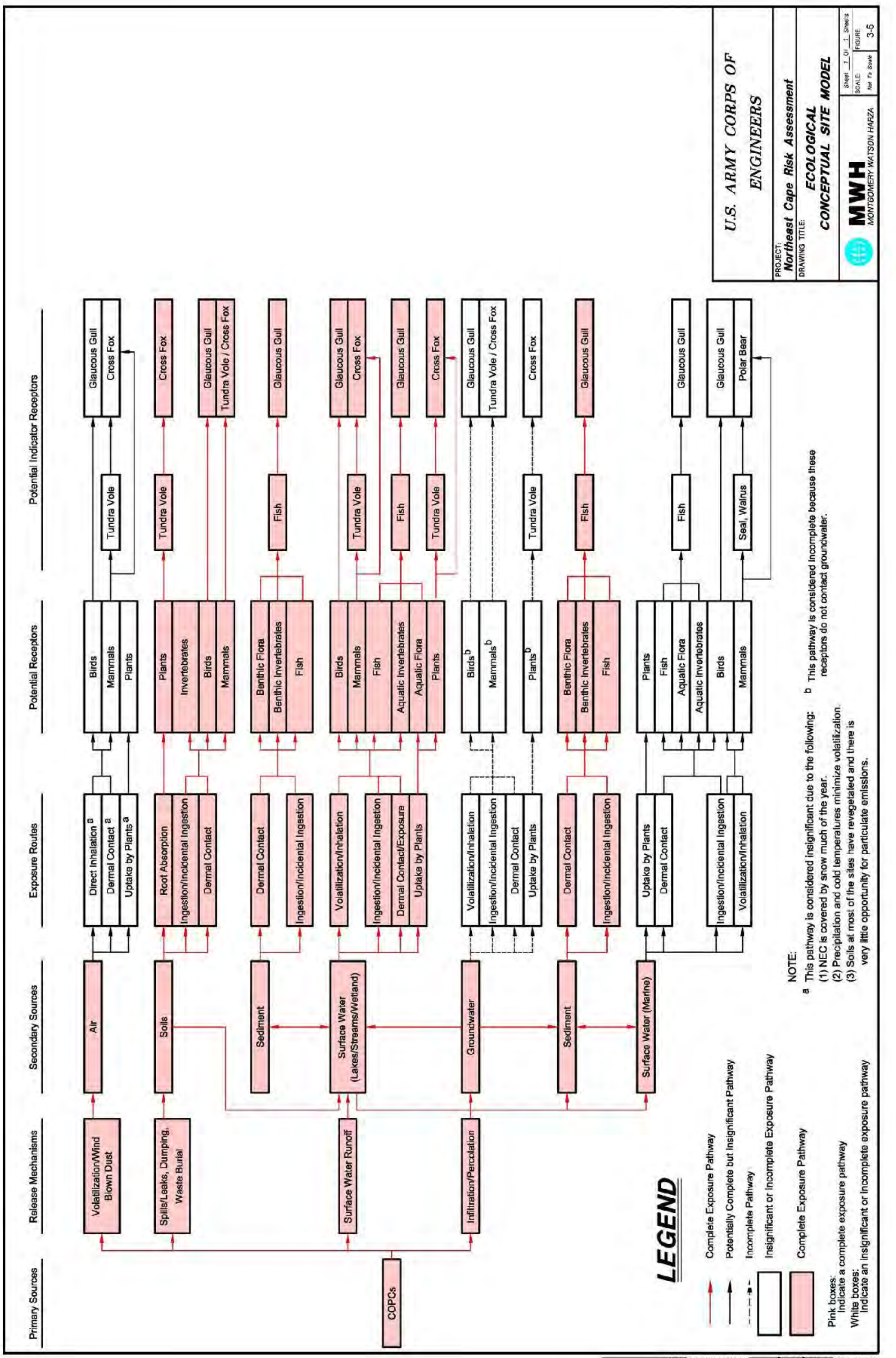

Figure 4 Ecological Conceptual Site Model

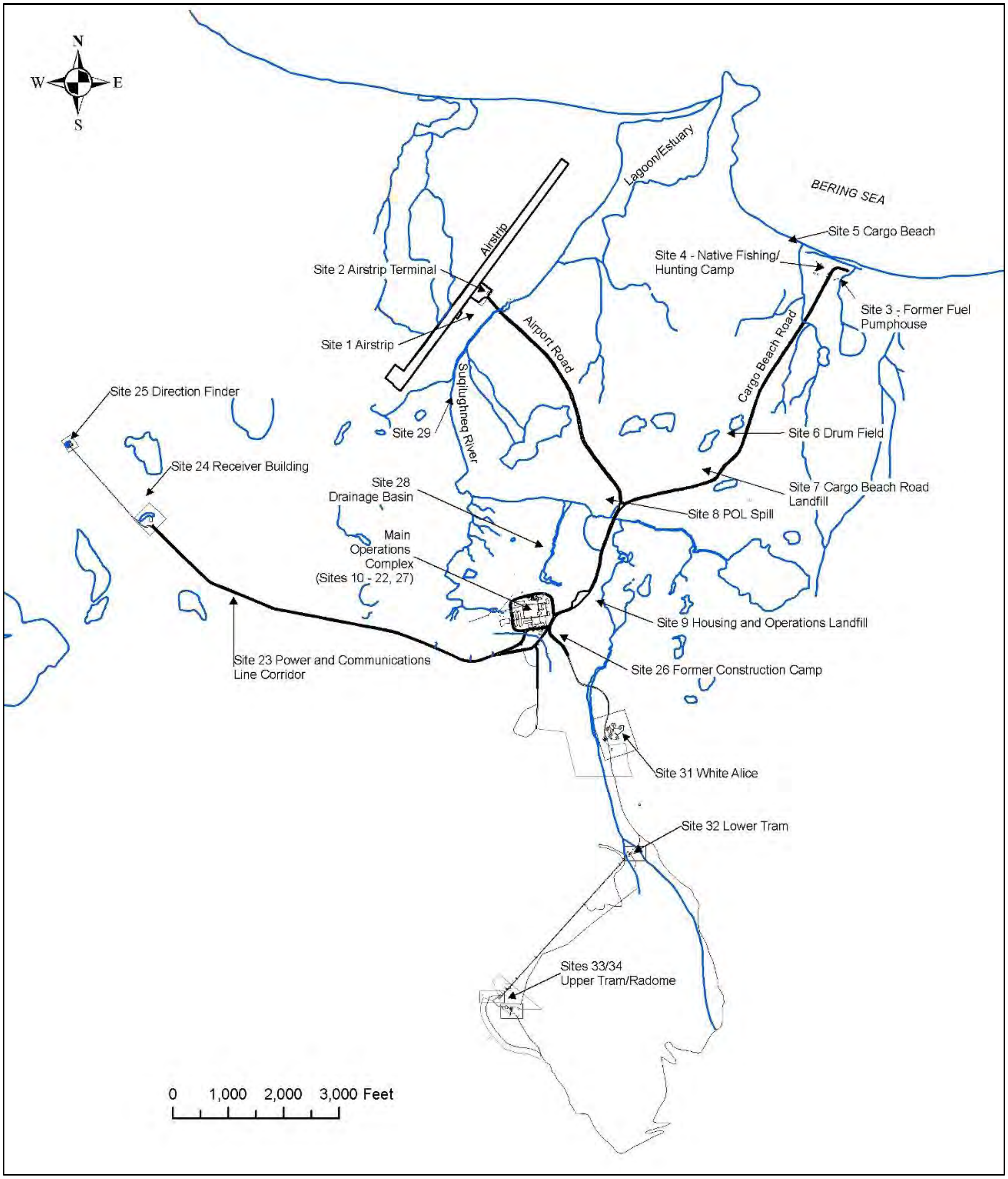

Figure 5 Northeast Cape Site Layout

2.7.3 Geology

St. Lawrence Island consists of isolated bedrock highlands of igneous, metamorphic, and older sedimentary rocks surrounded by unconsolidated surficial deposits overlying a relatively shallow erosional bedrock surface. In the immediate Northeast Cape Installation vicinity, shallow unconsolidated surficial materials overlie quartz monzonitic rocks of the Kinipaghulghat Pluton (Patton and Csejtey, 1980). The Pluton forms the mountainous area south of the Northeast Cape Installation, which includes Kangukhsam Mountain. Immediately south of the Northeast Cape Installation, an unnamed drainage in the Kinipaghulghat Pluton has created an erosional valley and alluvial fan of unconsolidated sediments. The primary areas of the former military site are located on this alluvial fan, which progrades north from the mountain front toward the Bering Sea. Granitic bedrock materials are exposed at the coast north of the site at Kitnagak Bay, suggesting that quartz monzonitic bedrock underlies the unconsolidated materials at a relatively shallow depth on a wave-cut erosional platform.

In general, the native soil stratigraphy at Northeast Cape is characterized by silts near the surface, overlying more sand-dominated soils at depth. The silt contains varying quantities of clay/sand/gravel, and varies from zero to 10 feet in thickness. The silt is dark brown to dark green, and sometimes exhibits a mottled texture. In some areas, the silt exhibits an aqua green or blue color. Dark brown silts are observed in outcrops. The sand at depth contains varying degrees of silt/gravel/cobbles, and ranges from 2 feet to greater than 20 feet in thickness. These deeper, coarse-grained materials are generally unsorted and are likely to be of glaciofluvial origin. The depth to bedrock at the Northeast Cape Installation is unknown.

2.7.4 Ecological and Biological Resources

St. Lawrence Island supports habitats for the following endangered or threatened species: the polar bear (threatened), spectacled eider (endangered), Steller’s eider (threatened), and Steller sea lion. Walrus are protected under the Marine Mammal Protection Act.

The ocean surrounding the Northeast Cape area was used extensively for subsistence hunting of whales, walrus, seals, sea birds, and fish. Subsistence harvests have reportedly dropped off considerably since the major fuel spill (30,000 gallons) in 1967.

2.7.5 Sampling Strategy

Field sampling activities occurred primarily during RI activities in 1994, 1996, 1998, 2001, 2002, and 2004. The primary objectives of the RI activities were to define the horizontal and vertical extent of hydrocarbon and other contamination at the site, document the concentration of remaining contamination in areas of soil excavation, and provide data for comparison of background soil, sediment, and fish tissue with similar onsite media. During the phased investigation activities, over 400 samples were collected from various media, including surface soil, subsurface soil, sediments, groundwater, fish, and plant tissues. Information obtained from the RI was evaluated in a human health and ecological risk assessment, completed in 2004.

2.7.6 Known or Suspected Sources of Contamination

The primary sources of contamination at the site were the ASTs, USTs, and associated piping that contained fuel products; the secondary source of contamination was residual subsurface fuel contaminated soil resulting from historic spills and leaks. Other sources of contamination include electrical transformers, 55-gallon drums, and other miscellaneous activities during facility operations. The largest documented spill was 30,000 gallons of fuel from POL tank #2 in 1967 (USACE, 2001). There are undocumented reports of much larger spills from the same large ASTs.

2.7.7 Types of Contamination and the Affected Media

Analytes detected in each area of concern were compared to background concentrations and the most conservative ADEC Method Two cleanup levels to determine the contaminants of concern (COCs). Chemical analyses were conducted for petroleum-related compounds, volatile organic compounds, semi-volatile organic compounds, metals, pesticides, and PCBs. Based on the results of the phased Remedial Investigations, contaminants exceeding action levels in the soil were DRO, RRO, PCBs, arsenic, benzene, and naphthalene. Certain sites contain contaminants in large enough quantities and with high enough concentrations to warrant further action.

2.7.8 Location and Extent of Contamination at Sites Recommended for No Further Action

The environmental investigation process determined that 16 sites at Northeast Cape have no contamination or de-minimus amounts of contamination remaining above the pertinent risk-based cleanup levels. Cleanup levels are based on 18 AAC 75 Table B1 ingestion or inhalation soil cleanup levels, Method 4 alternate cleanup levels for sediment and POL, or site-specific background concentrations. These sites have been selected for the No Further Action alternative and are presented in Table 2.

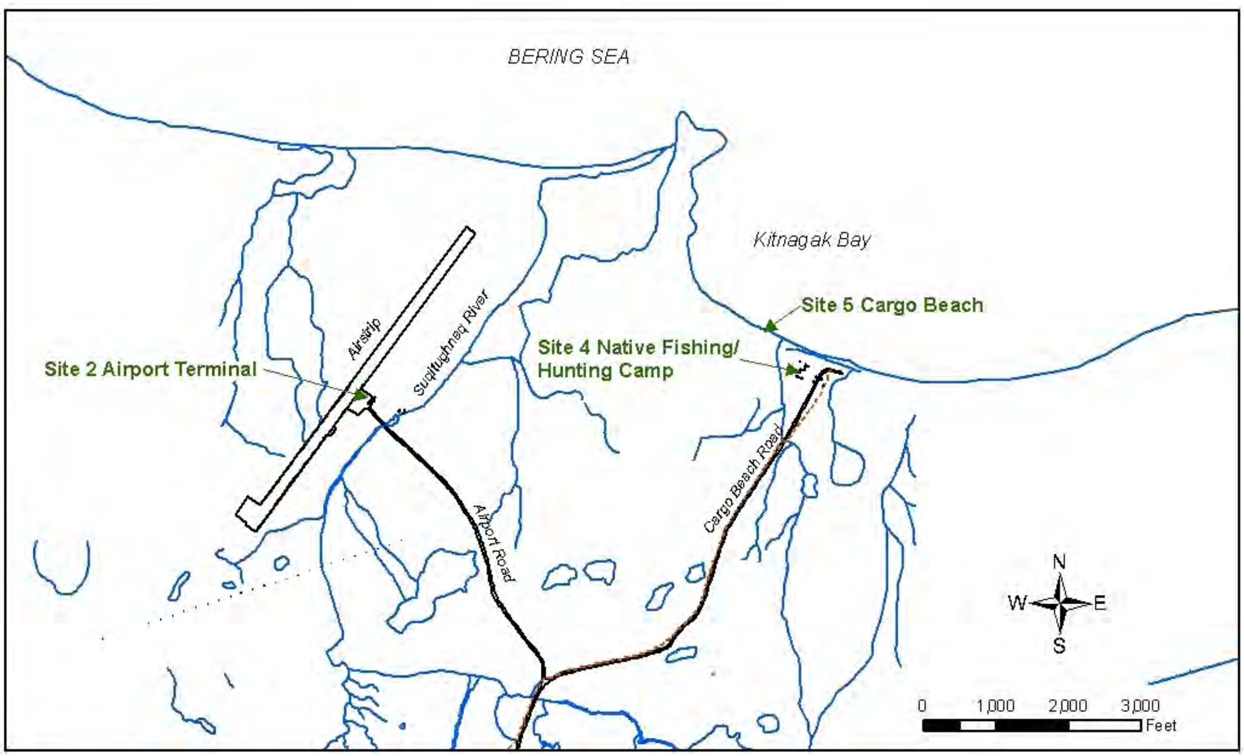

Figure 6 Location of Sites Recommended for No Further Action (northern)

Table 2 Sites Recommended for No Further Action

Site	Description	COPCs	Media	Cleanup Level [a] (mg/kg or mg/L)	Maximum (mg/kg or mg/L)	# Samples Exceeding Cleanup Level	Rationale
2	Airport Terminal and Landing Strip	DRO RRO	Soil Soil	9,200 9,200	376 120	0/5 0/2	Site meets risk-based cleanup levels.
4	Native Fishing and Hunting Camp	DRO RRO	Soil Soil	9,200 9,200	1,400 14,000 (6,950 average of triplicate results)	0/5 1/3	Site meets risk-based cleanup levels. De-minimus quantity of impacted soils, no unacceptable risk to human health or the environment.
		DRO RRO	Groundwater Groundwater	1.5 1.1	2.0 6.5	1/3 3/3	Shallow, tundra groundwater is not a potential future drinking water source.
5	Cargo Beach	None	--	--	--		No contamination
12	Gasoline Tank Area	DRO RRO	Soil Soil	9,200 9,200	140 560	0/6 0/6	Site meets risk-based cleanup levels.
14	Emergency Power/Operations Building	PCBs	Soil	1	0.206	0/13	Site meets risk-based cleanup levels.
17	General Supply Warehouse and Mess Hall Warehouse	None	--	--	--		No contamination
18	Housing Facilities and Squad Headquarters	None	--	--	--		No contamination
20	Air Force Aircraft Control Warning Building	None	--	--	--		No contamination
22	Water Wells and Water Supply Building	DRO	Soil	9,200	6,370	0/34	Site meets risk-based cleanup levels.
		DRO RRO	Groundwater Groundwater	1.5 1.1	ND (0.34) ND (0.568)	0/3 0/2	Site meets Table C cleanup levels.
23	Power and Communication Line Corridors	PCBs	Soil	1	1.28	1/1	De-minimus quantity of impacted soils, no unacceptable risk to human health or the environment.

Table 2 Sites Recommended for No Further Action (continued)

Site	Description	COPCs	Media	Cleanup Level [a] (mg/kg or mg/L)	Maximum (mg/kg or mg/L)	# Samples Exceeding Cleanup Level	Rationale
24	Receiver Building Area	DRO Antimony	Soil Sediment	9,200 41	4,250 70	0/7 1/3	Site does not pose unacceptable risk to human health or the environment. De-minimus quantity of metals in sediment.
		DRO	Sediment	9,200	4,600	0/3	
		DRO	Groundwater	1.5	1.5	0/4	Site meets Table C cleanup levels.
25	Direction Finder Area	DRO	Soil	9,200	1,100	0/2	Site meets risk-based cleanup levels.
		DRO	Sediment	9,200	300	0/1	
		DRO	Surface Water	--	0.22	0/1	
26	Former Construction Camp	DRO	Groundwater	1.5	0.0812	0/2	Site meets Table C cleanup levels.
29	Suqitughneq River and Estuary	DRO RRO Naphthalene PCBs Chromium Lead Zinc	Sediment Sediment Sediment Sediment Sediment Sediment Sediment	3,500 3,500 1.7 0.7 270 530 960	25,000 4,060 J ND (0.695) 0.452 27 24 69	1/37 1/32 0/31 0/37 0/16 0/16 0/16	Anomalous DRO result not duplicated in subsequent sampling. Site does not pose risk to human health or the environment and meets risk-based cleanup levels.
33	Upper Tram Terminal	DRO RRO PCBs	Soil Soil Soil	9,200 9,200 1	660 2,100 ND	0/3 0/3 0/3	Site meets risk-based cleanup levels.
34	Upper Camp	DRO RRO PCBs	Soil Soil Soil	9,200 9,200 1	1,100 1,200 1.06	0/13 0/13 1/11	De-minimus quantity of impacted soils, no unacceptable risk to human health or the environment.

[a] Cleanup levels based on 18 AAC 75.341(c), Table B1, and 18 AAC 75.340(f) Method 4 risk assessment.
Units of mg/kg used for soil/sediment, mg/L for groundwater/surface water.

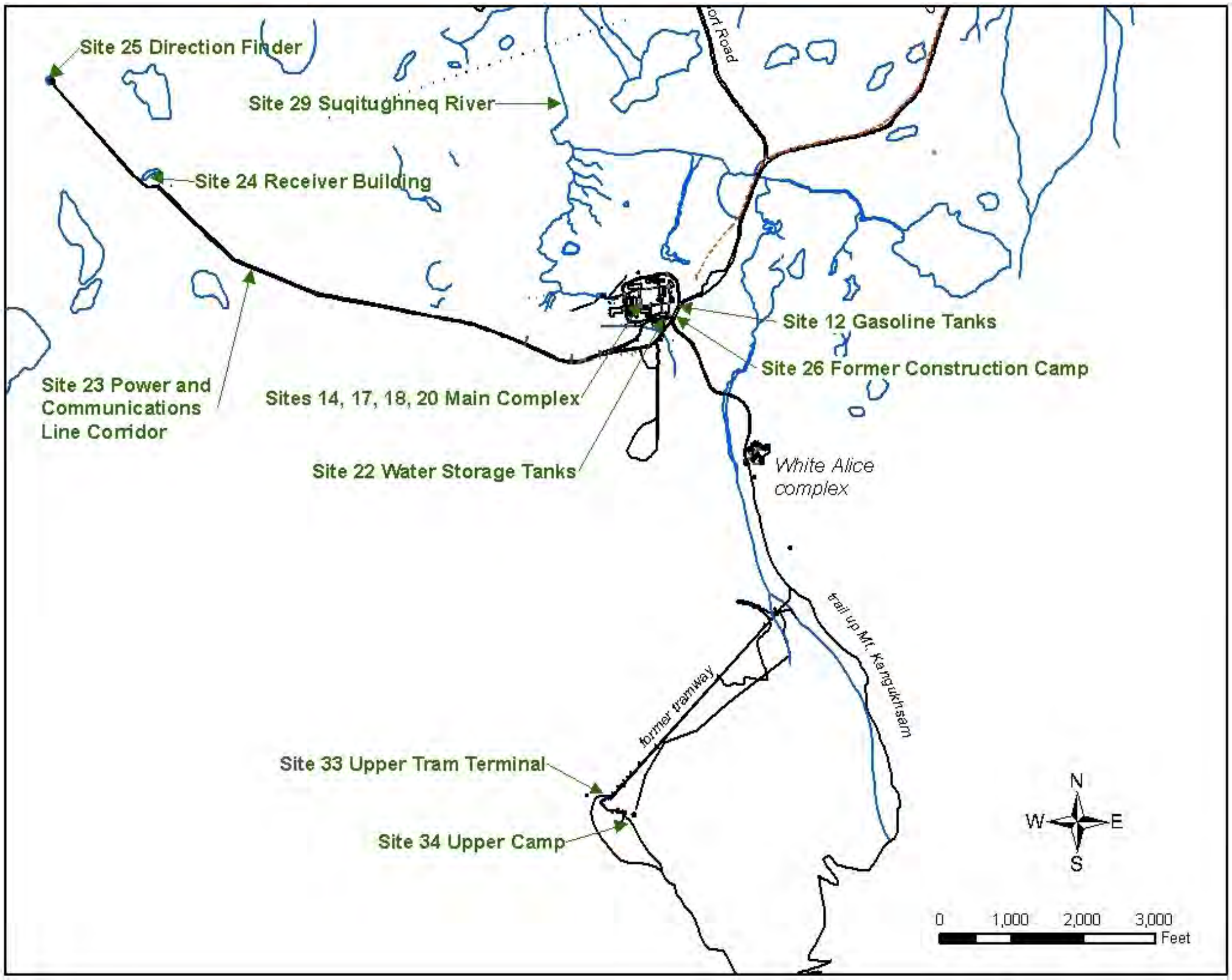

Figure 7 Location of Sites Recommended for No Further Action (southern)

2.7.8.1 Site 2 Airport Terminal and Landing Strip

The airport terminal area consisted of two buildings, an operations/control tower and transformer shed, and the gravel apron pad located on the southeast side of the airstrip. An above ground storage tank (AST) was also located at the southeast corner of the tower building.

The terminal building and other miscellaneous debris were removed in 2003; including 44 tons of inert waste, 3 tons of scrap metal, and 2 tons of asbestos-containing materiel (ACM). The AST (1,000-gallon) was removed in 2000 by Nugget Construction. The transformers were removed in 1995 by Northwest Enviroservices.

Soil samples were collected during the 1994 and 1998 remedial investigation and analyzed for benzene/toluene/ethylbenzene/xylenes (BTEX), fuels, metals, PAHs, and polychlorinated biphenyls (PCBs). DRO ranged from 8.2 to 376 mg/kg, whereas RRO ranged from 45 to 120 mg/kg. No other compounds were detected above screening levels. See Figure 8 for historical sampling locations. Additional sampling was conducted in close proximity to Site 2 during 2001 and 2004 but is associated with Site 1 Airstrip, or Site 29 Suqitughneq River, not the former terminal building.

The detected contaminants do not exceed the established risk-based cleanup levels, and do not pose a risk to human health or the environment. No further action is selected for Site 2.

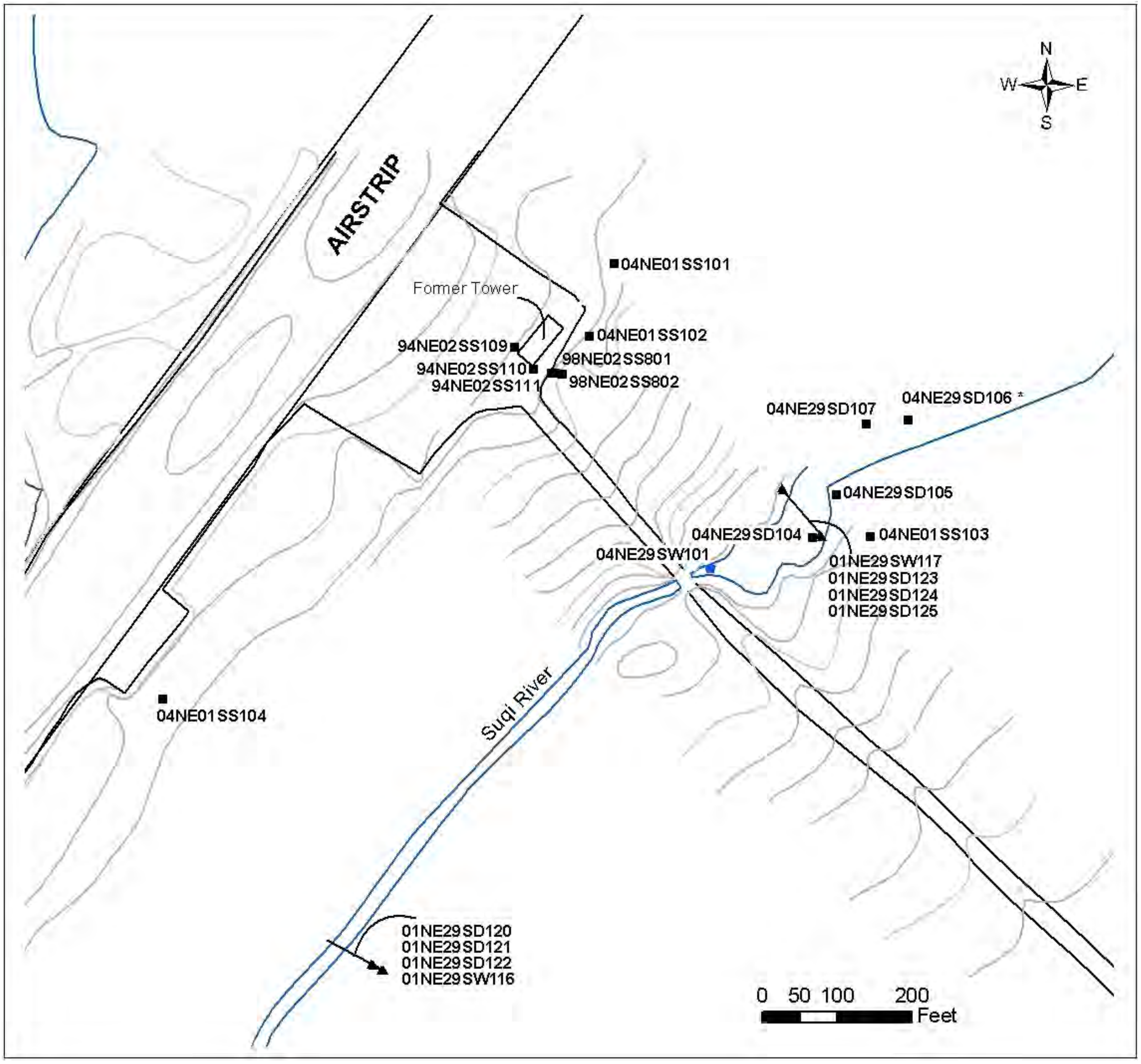

Figure 8 Site 1 Airport Terminal and Landing Strip

2.7.8.2 Site 4 Native Fishing and Hunting Camp

A native fishing and hunting camp is located southwest of the Cargo Beach barge landing area. The site includes wood frame structures originally constructed as housing for the native civilian employees of the base. Three structures are currently used by local residents for part of the year; the other structures are in disrepair due to inclement weather. Former sources of contamination at the site include abandoned vehicles, drums, and two ASTs used for water storage.

The debris, drums, ASTs, and stained soils were removed under a previous removal action in 2000-2001. Approximately 1.21 tons of petroleum contaminated soils were excavated and disposed off-site.

Soil sampling was conducted during the 1994 remedial investigation and one surface soil sample (94NE04SS108) contained DRO at 5,300 mg/kg. The contaminated soil was an isolated occurrence and covered a small area. This area of stained soil is presumed to correspond to the soil excavation performed in 2001 at the AST area. A soil confirmation sample (EXC-CS-04-NB-01-001) analyzed in triplicate (primary, QC, QA) from the removal action demonstrated that DRO in remaining soils ranged from 388 to 1,400 mg/kg from the bottom of the excavation; RRO concentrations ranged from 2,380 to 14,000 mg/kg from the same location. The average concentrations of DRO and RRO in the post-excavation sample were 773 and 6,950 mg/kg, respectively. The average residual soil contamination does not exceed the identified cleanup levels. Historical sampling locations are shown in Figure 18.

Shallow groundwater samples were collected in 1998 and 2001. During the 1998 field investigation, DRO and RRO were detected at concentrations of 3.7 and 6.5 mg/L, respectively. In 2001, an additional 3 well points were installed downgradient of the original well point. The well points were installed to the maximum depth feasible, 3 to 6 feet below ground surface during the 2001 investigation, in saturated ground. The 2001 sampling results indicated levels of DRO ranging from 0.96 to 2.0 mg/L; RRO levels ranged from 2.6 to 6.5 mg/L. Only one location, 01NE04WP103, exceeded the ADEC Table C groundwater cleanup level for DRO of 1.5 mg/L. However, all the 2001 DRO results were qualified as “VB - analyte detected in sample and associated blank indicating a possible false-positive result”. All 3 locations exceeded the Table C groundwater cleanup level for RRO. The shallow groundwater present in the tundra surrounding this site is not considered a potential future drinking water source, based on the unreliable volume of water available, extremely slow recharge ability, and potential for salt water intrusion.

No further action is selected for Site 4.

2.7.8.3 Site 5 Cargo Beach

The Cargo Beach area is immediately north of the hunting and fishing camp and extends west and east from the Cargo Beach Road. The area was used for barge off loading operations.

Bristol Environmental removed exposed debris at the Cargo Beach site during the 2003 and 2005 field seasons. A total of 26 tons of inert waste were transported off-island for disposal in 2003. Additional piles of miscellaneous debris and scrap metal were removed in 2005.

Chemical contamination has not been detected at this site. No further action is selected for Site 5.

2.7.8.4 Site 12 Gasoline Tank Area

This site contained two ASTs (approximately 30,000 and 15,000 gallons) used for gasoline storage and a fuel pump inside a shed immediately east of the two tanks.

During the 1994 investigation, no evidence of spills or leaks was observed around the tanks. Site 12 was sampled during the Phase II remedial investigation, to verify the ASTs had not contributed to contamination of the surrounding gravel soils. Six soil samples were collected in 1999 and analyzed for petroleum hydrocarbons and BTEX. The sampling results indicated DRO concentrations ranged from 29 to 140 mg/kg, RRO ranged from 230 to 560 mg/kg, and benzene was not detected. The soil does not pose a potential risk to human health or the environment and does not exceed the proposed cleanup levels. The tanks were removed in 2000. See Figure 9 for historical sampling locations.

No further action is selected for Site 12

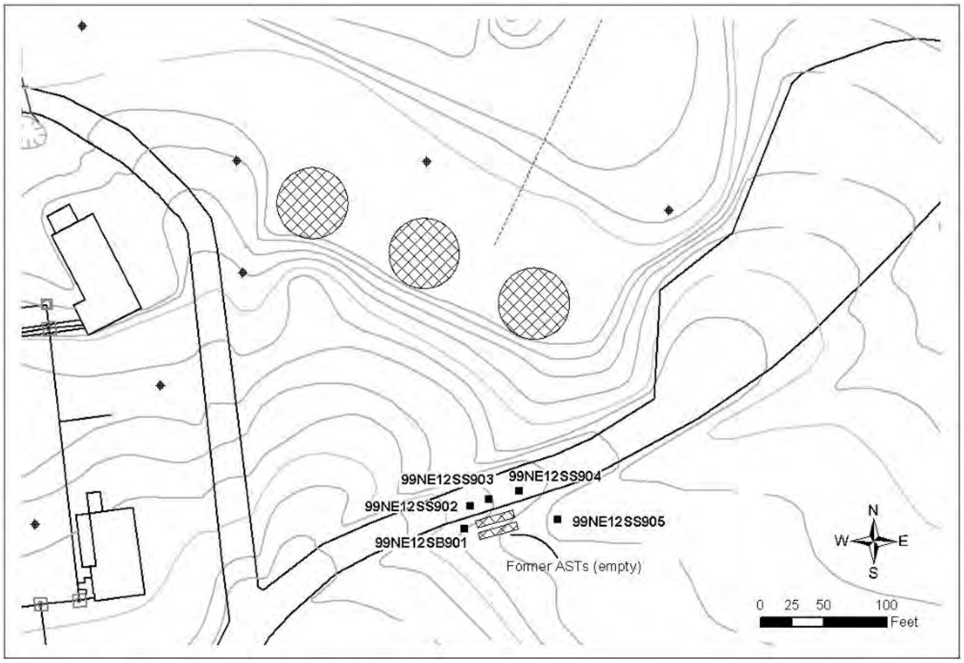

Figure 9 Site 12 Gasoline Tank Area

2.7.8.5 Site 14 Emergency Power/Operations Building

This site includes Building 98 and the immediately adjacent area. A 5,000-gallon AST was located on the south side of the building, as well as a transformer pad. The primary contaminant of concern is PCBs in soil.

The building and tank were removed in 2001. PCB-contaminated soils, approximately 7.2 tons, were also excavated and disposed offsite during the 2005 field season. Historical soil sampling (1998 and 2001) indicated PCBs were present near the former concrete transformer pad area at concentrations ranging from 0.2 to 19 mg/kg. Two discrete areas of contaminated soil were identified and excavated during the 2005 field season to a depth of 1.5 and 3.0 feet below ground surface. Soil confirmation samples were collected from the bottom of each excavation and verified that no PCBs remain above 1 mg/kg. The concentration of PCBs at the bottom of each excavation was 0.206 and 0.0526 mg/kg, respectively. See Figure 10 for historical sampling locations.

No further action is selected for Site 14.

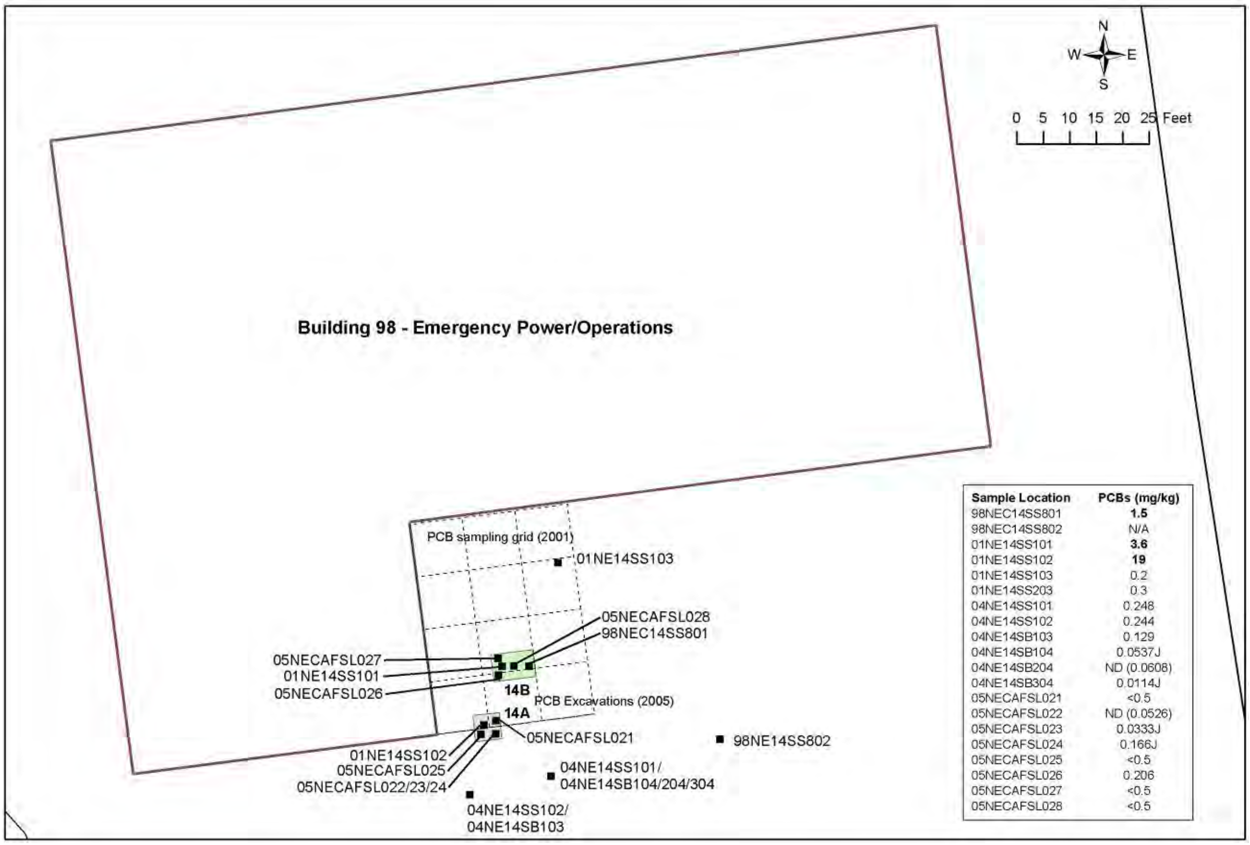

Figure 10 Site 14 Emergency Power/Operations Building

2.7.8.6 Site 17 General Supply and Mess Hall Warehouses

This site included Buildings 107 and 111 at the Main Complex. The warehouses were used to store miscellaneous materials required for general base operations. The buildings were demolished and removed during the 2001 and 2003 field seasons. See Figure 11 for site layout.

No sources of contamination were identified during the remedial investigation. No further action is selected for Site 17.

2.7.8.7 Site18 Housing Facilities and Squad Headquarters

This site included Buildings 99, 100, 101, 102, 104, 105, 106, 125 and 130, as well as the connecting utilidors and immediate surrounding area (see Figure 11). The buildings were investigated for the presence of hazardous substances such as lead-based paint and asbestos-containing materials (ACM).

All structures were demolished and disposed off-site during 2001 and 2003. No contamination was identified during the remedial investigation. No further action is selected for Site 18.

2.7.8.8 Site 20 Air Force Aircraft Control Warning Building

Site 20 included Building 103 at the housing and operations complex. The building was inspected for ACM, demolished, and disposed offsite during the 2003 removal action.

No contamination was identified in the immediate vicinity of this structure. See Figure 11 for site layout. No further action is selected for Site 20.

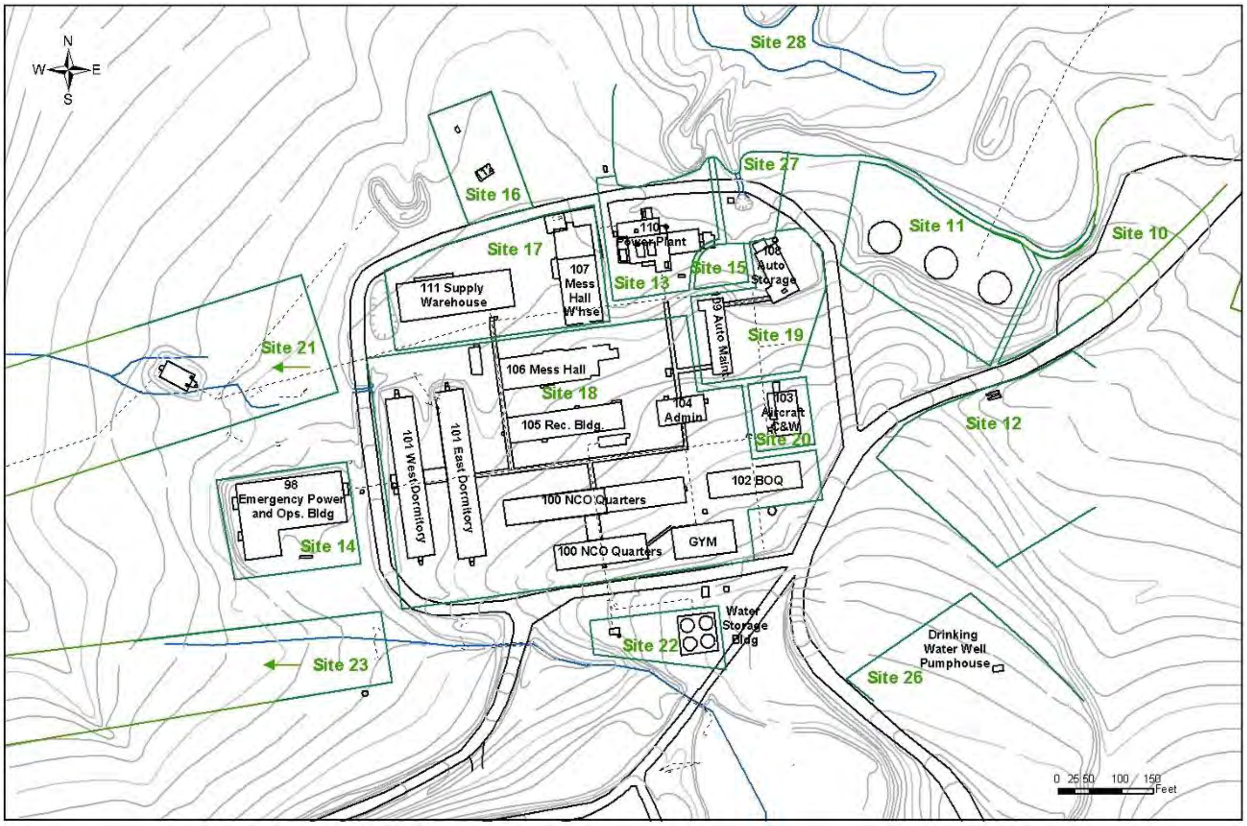

Figure 11 Main Operations Complex, No Further Action Sites

2.7.8.9 Site 22 Water Wells and Water Supply Building

This site included the water storage building, the pumphouse, and four water wells. The water storage building held four 20-foot diameter and 26-foot high water storage tanks. An underground storage tank (UST) was located adjacent to the pumphouse.

The buildings were demolished, the UST was removed, and the water wells were decommissioned during the 2001 field season. Approximately 18 cubic yards of soil were removed from the tank excavation. A small area of stained soil from within the water supply storage building was also excavated. All containerized wastes were removed from the buildings prior to demolition.

The water wells were sampled prior to decommissioning; residual range organics were detected in one water sample (PW#2) above the cleanup level. Diesel range organics were also detected in subsurface soils from the bottom of the tank excavation, but did not exceed the risk-based cleanup levels.

Sampling data demonstrates that source removal of the UST successfully reduced the potential for migration of contamination to the groundwater. In 2004, two monitoring wells were installed downgradient of the former pumphouse and water storage building. The sampling results confirmed that the shallow groundwater is not impacted by fuel contamination. Soil borings surrounding the UST excavation also demonstrated that contamination has not migrated laterally or vertically. See Figure 12 for historical sampling locations.

No further action is selected for Site 22.

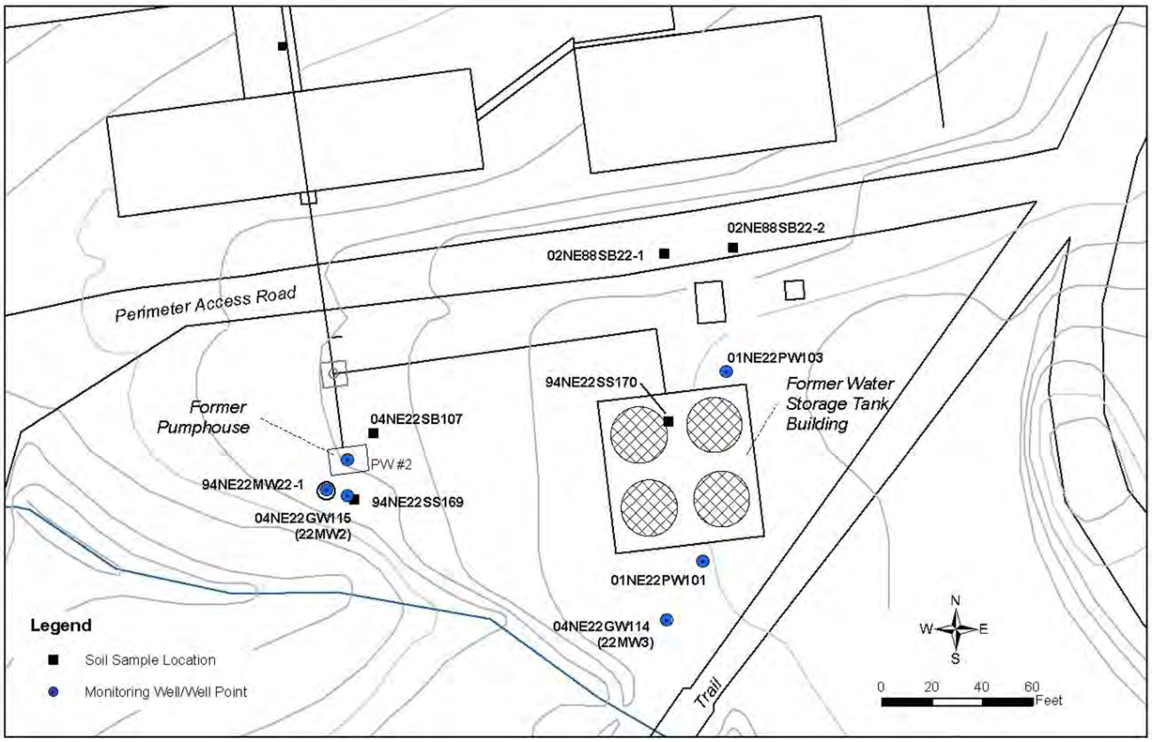

Figure 12 Site 22 Water Wells and Water Supply Building

2.7.8.10 Site 23 Power and Communication Line Corridors

The power and communications line corridors extended from the main complex to the outlying facilities west along the access road.

During the 2003 and 2005 field seasons, debris was removed from the corridors in conjunction with the removal action at Sites 24 and 25. Two discrete areas along the corridor were investigated during 1994 based on field observations of potential contaminant sources. Soil samples were collected and analyzed for metals, PAHs, SVOCs and/or PCBs. Some low level PCBs (1.28 mg/kg) were detected at a single sample location (94NE23SS162), but the quantity of impacted soils was de-minimus and does not pose an unacceptable risk to human health or the environment. An additional 7 samples collected from the adjacent Site 24 did not contain PCBs above cleanup levels. All potential sources of contamination have been removed. See Figure 13 for historical sampling locations.

No further action is selected for Site 23.

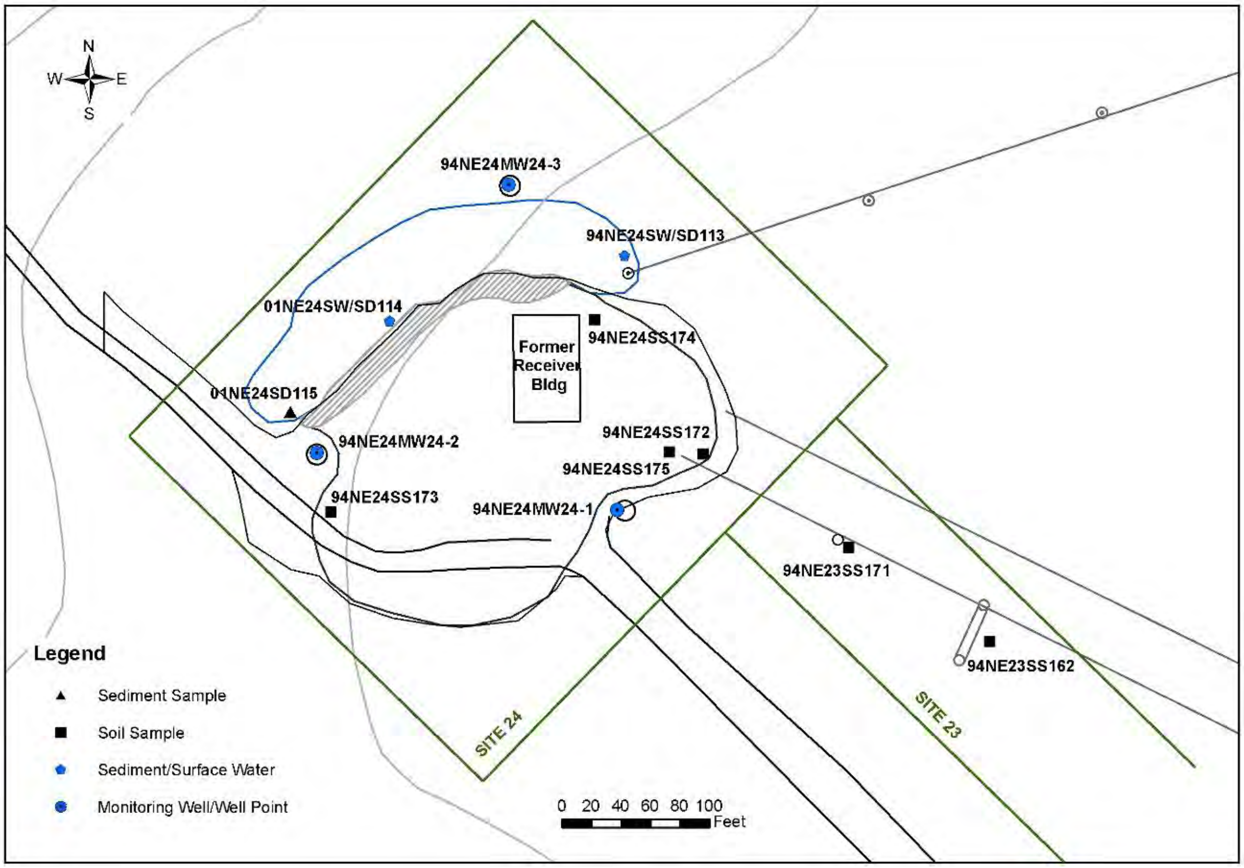

Figure 13 Site 23 Power and Communications Line Corridor and Site 24 Receiver Building

2.7.8.11 Site 24 Receiver Building Area

The receiver building area was located approximately 1.5 miles west of the main operations complex. It consisted of a reinforced concrete building on concrete pillars. The equipment associated with the building was removed during deactivation of the installation. The gravel pad is suspected to consist of empty drums covered with gravel, based on field observations and general building practices by the military during installation operation.

The concrete building was demolished (49 tons) and used as backfill in low areas at the main operations complex during the 2003 removal action. Miscellaneous debris (i.e., inert waste and scrap metal) was also removed from Site 24 and the connecting corridor, extending back to the main operations complex and Site 25, during the 2003 field season. A total of 15 tons of solid waste and 4 tons of scrap metal debris were removed near Site 24 in addition to the building itself.

During the 1994 remedial investigation, soil, water, and sediment samples were collected and analyzed for petroleum compounds, volatile organics, PAHs, PCBs, and metals. The primary contaminant of concern was diesel range organics. The maximum detected concentration of DRO was 4,250 mg/kg in tundra soils. Surface water and shallow groundwater samples did not exceed 1.5 mg/L DRO.

In 2001, two additional sediment samples and one surface water sample were collected. The surface water sample did not contain any contaminants of concern. One sediment sample contained DRO at 4,600 mg/kg, which does not exceed the risk-based soil cleanup level of 9,200 mg/kg. Antimony was also detected in the sediment (01NE24SD114) at a maximum concentration of 70 mg/kg, compared to the ADEC soil cleanup of 41 mg/kg. The soil, sediment, and water samples collected in 1994 were analyzed for antimony; all results were non detect. Since the 2001 detection was isolated, and potential sources of contamination (e.g., debris) have been removed, the antimony does not pose a significant risk to human health and the environment. See Figure 13 for historical sampling locations.

The primary human exposure pathway is ingestion or dermal contact with soil or sediment. The observed shallow groundwater at this location is not a reasonably expected potential drinking water source. Sampling data has demonstrated that contaminants were not detected above ADEC drinking water standards in the groundwater or surface water. The concentrations of petroleum hydrocarbons in soil/sediment do not exceed the risk-based cleanup levels.

No further action is selected for Site 24.

2.7.8.12 Site 25 Direction Finder Area

This site originally contained a small building with radio equipment. The building had been burned and the debris pushed to the sides of the gravel pad when the installation was deactivated.

Scattered drums on or near the gravel pad, as well as an estimated 5 tons of incidental stained soils were removed during the 2000 removal action. Miscellaneous debris (13 tons) was also removed from Site 25 and the connecting corridor extending back to the main operations complex during the 2003 field season.

Soil, sediment, and surface water were sampled during the Phase 1 remedial investigation. DRO concentrations in soil ranged from 190 to 1,100 mg/kg. Stained surface soils were excavated and removed during the 2001 field season. Surface water did not contain DRO above 1.5 mg/L. See Figure 14 for historical sampling locations.

This site does not pose a risk to human health and the environment and meets all cleanup levels.

No further action is selected for Site 25

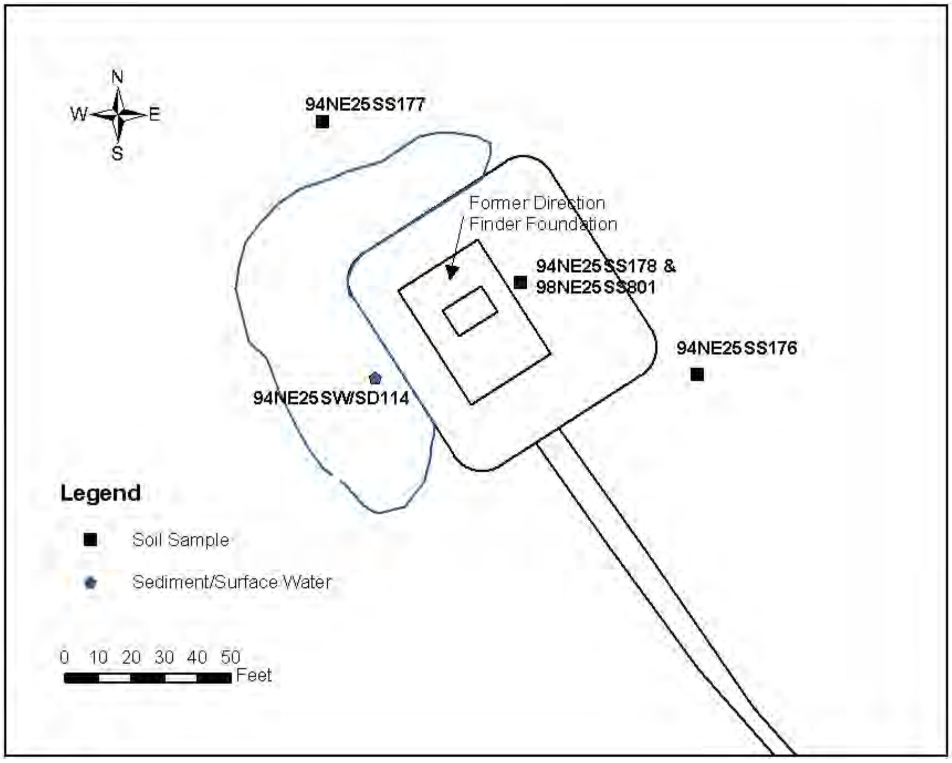

Figure 14 Site 25 Direction Finder Area

2.7.8.13 Site 26 Former Construction Camp

The former Construction Camp area was located adjacent to and upgradient of the Main Operations complex, southeast of the perimeter access road. The site consisted of a flat gravel pad area and a pumphouse shed. There were no other existing structures or debris at this location.

The pumphouse shed was demolished and removed in 2001. A water supply well (PW#4) at this site was also decommissioned in 2001. The former water supply well was sampled before being decommissioned. The groundwater sample was analyzed for fuels, metals, and volatile organic compounds (VOCs). No contaminants of potential concern were detected. In 2004, a new monitoring well (26MW-1) was installed at Site 26 to further evaluate the groundwater and provide an upgradient monitoring well for the Main Operations Complex. A second monitoring well (26MW-3) was installed downgradient of the site, northeast of the main complex along the beach access road south of the Suqitughneq River bridge. No contaminants of concern were identified in the groundwater samples. See Figure 15 for historical sampling locations.

There are no contaminants of concern in the groundwater at this location. The existing well may serve as an upgradient monitoring well for the Main Operations Complex.

No further action is selected for Site 26.

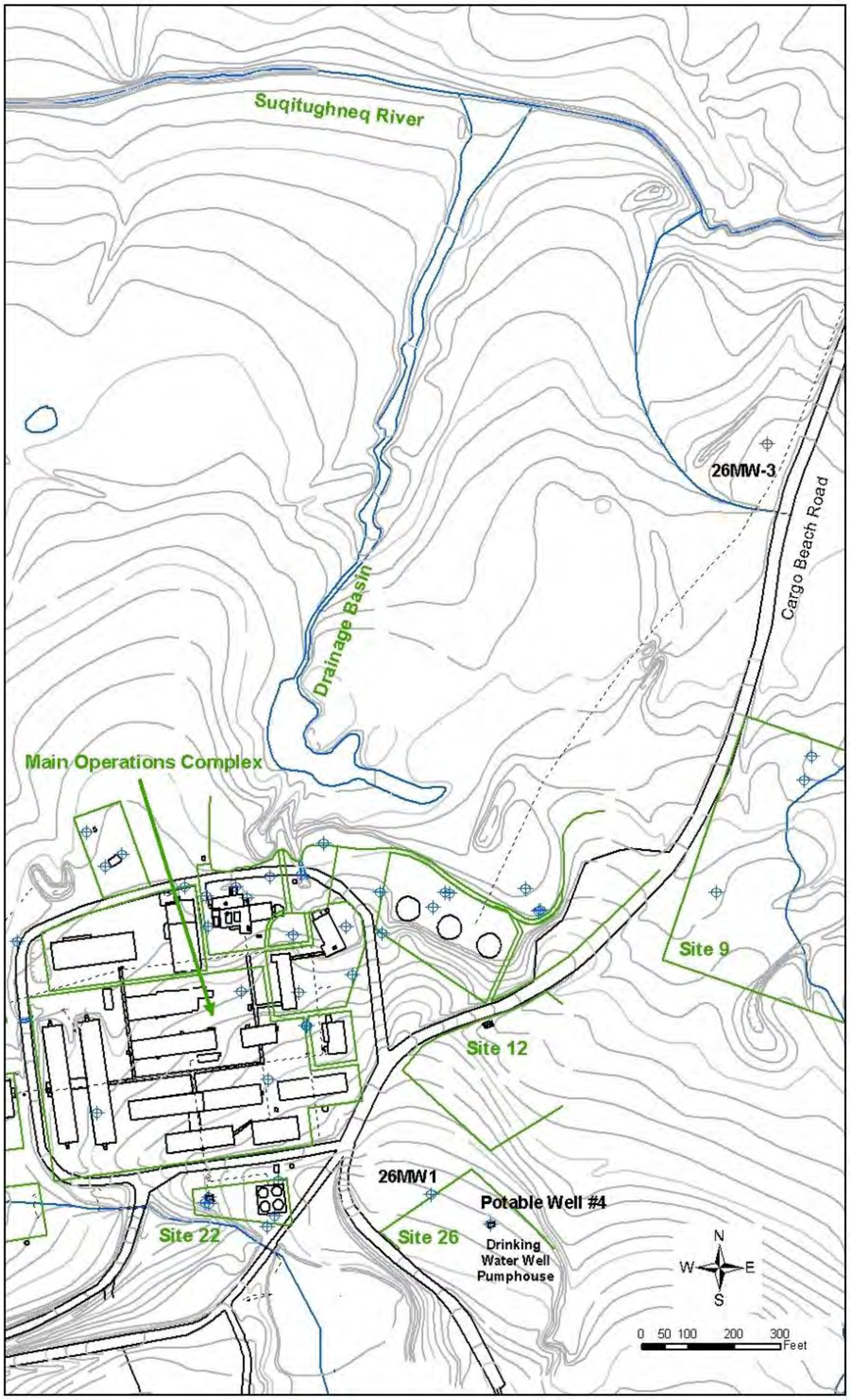

Figure 15 Site 26 Former Construction Camp and vicinity

2.7.8.14 Site 29 Suqitughneq River and Estuary

The Suqitughneq River flows north from the Kinipaghulghat Mountains, originating south of the main complex. The Suqitughneq River flows through tundra to a lagoon and estuary located east of the Northeast Cape airstrip where it drains into the Bering Sea. The lagoon and estuary are separated from the Bering Sea by a sand berm that forms at the beach and occasionally breaches.

Several smaller tributaries, including the Site 28 Drainage Basin, contribute flow to the Suqitughneq River.

Remedial investigations of the Suqitughneq River were conducted between 1996 and 2004. The primary contaminant of concern is DRO. In 1996, five sediment samples were collected; DRO concentrations ranged from non-detect to a maximum of 25,000 mg/kg at one location (96NE29SW/SD111) about 850 feet downgradient of the drainage basin. Subsequent sampling events could not duplicate or substantiate the anomalous hit of diesel. In 1998, four sediment samples were collected; DRO ranged from 11 to 2,200 mg/kg. In 2001, sediment samples were collected from 4 cross sections, as well as two locations upstream of the drainage basin, and two within the estuary. DRO concentrations ranged from 15 to 1,400 mg/kg. During the 2004 investigation, six sediment samples were collected from the estuary. The concentration of DRO ranged from 157 to 988 mg/kg, which does not exceed the sediment cleanup level of 3,500 mg/kg. PAHs were detected at low levels during the 2004 investigation, but do not exceed ecological screening levels based on consensus-based probable effects concentrations.

PCBs have not been detected in the Suqitughneq River sediments, with the exception of one sample (04NE29SD105) collected downstream of the airport road bridge in 2004. PCBs were detected at 0.452 mg/kg, which does not exceed the sediment cleanup level of 0.7 mg/kg. PCBs were also analyzed for but not detected in sediment samples collected in 1996, 1998, and 2001.

All surface water sampling results from the Suqitughneq River have been within drinking water standards. Early PCB sampling data, with its high detection limits, served only to indicate that the water was not grossly contaminated. The most recent sampling results from 2004 confirm that PCBs are not present in the Suqitughneq River above detection limits ranging from 0.105 to 0.115 ug/L (primary lab) and 0.5 ug/L (QA lab), compared to the ADEC Table C cleanup level of 0.5 ug/L. See Figure 16 for historical sampling locations.

The concentrations of petroleum hydrocarbons and PAHs in sediment do not exceed human health risk-based standards or ecological risk-based screening levels. The risk assessment also evaluated the consumption of fish from the vicinity of Suqi River and indicated potential future carcinogenic risks due arsenic, PCBs, and PAHs. Further evaluation by the Agency for Toxic Substances and Disease Registry in a health consultation concluded that consumption of fish from the waters of NE Cape is not likely to result in adverse health effects.

No further action is selected for Site 29. However, incidental debris located in the stream channel that poses an inherent hazard will be removed during sitewide cleanup activities.

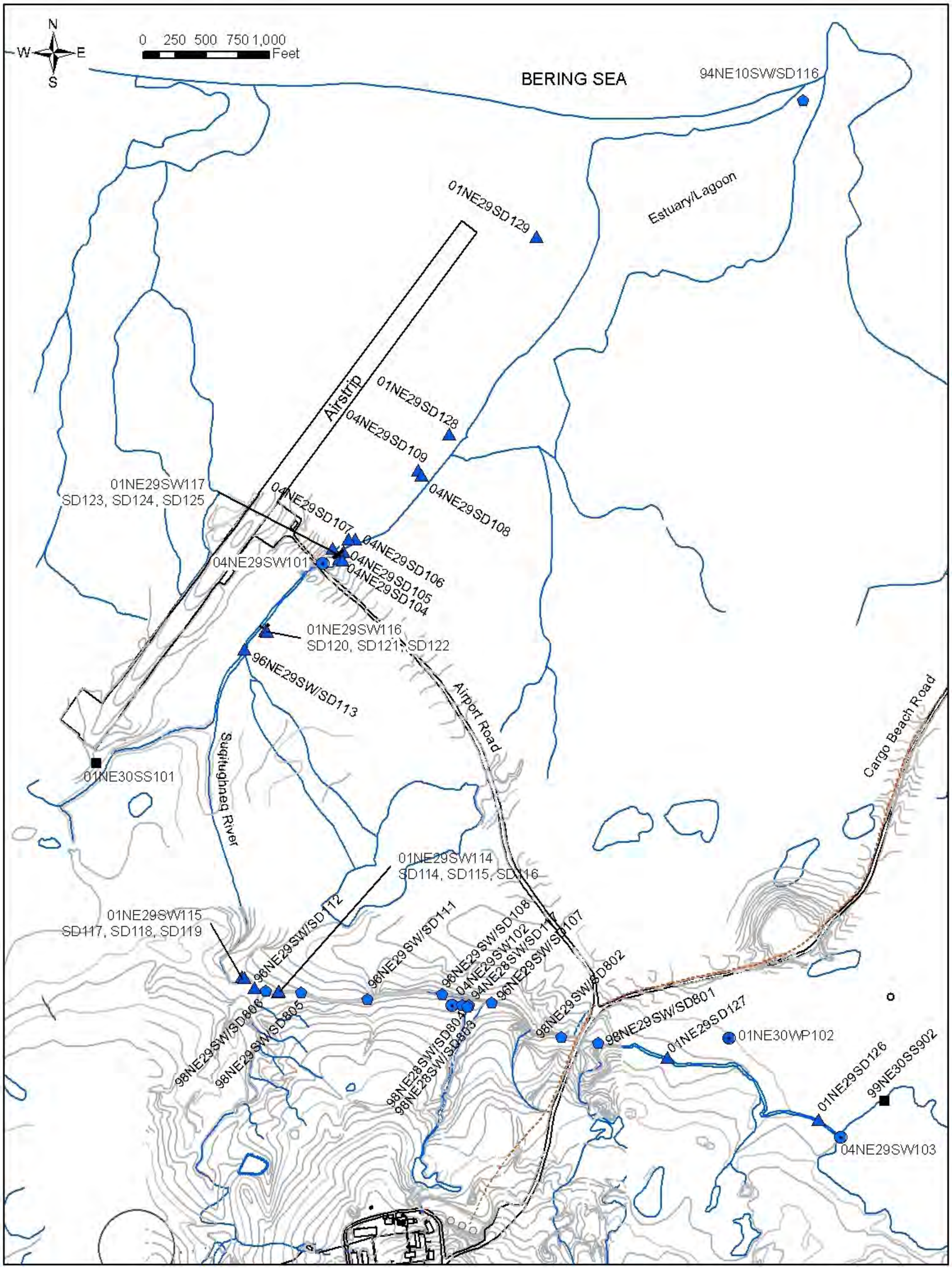

Figure 16 Site 29 Suqitughneq River

2.7.8.15 Site 33 Upper Tram Terminal

A tramway linked the lower tram terminal building with the radome area, located on top of Mt. Kangukhsam. The site consisted of a tram terminal building connected to the Upper Camp by an enclosed track man-lift.

The structures and tram towers were demolished and removed during the 2003 and 2005 field seasons. During the 2001 remedial investigation, surface soil samples were collected from stained soil areas outside the upper tram bay. DRO concentrations ranged from ND to 660 mg/kg. RRO was below screening levels and PCBs were not detected. See Figure 17 for sampling locations.

No further action is selected for Site 33.

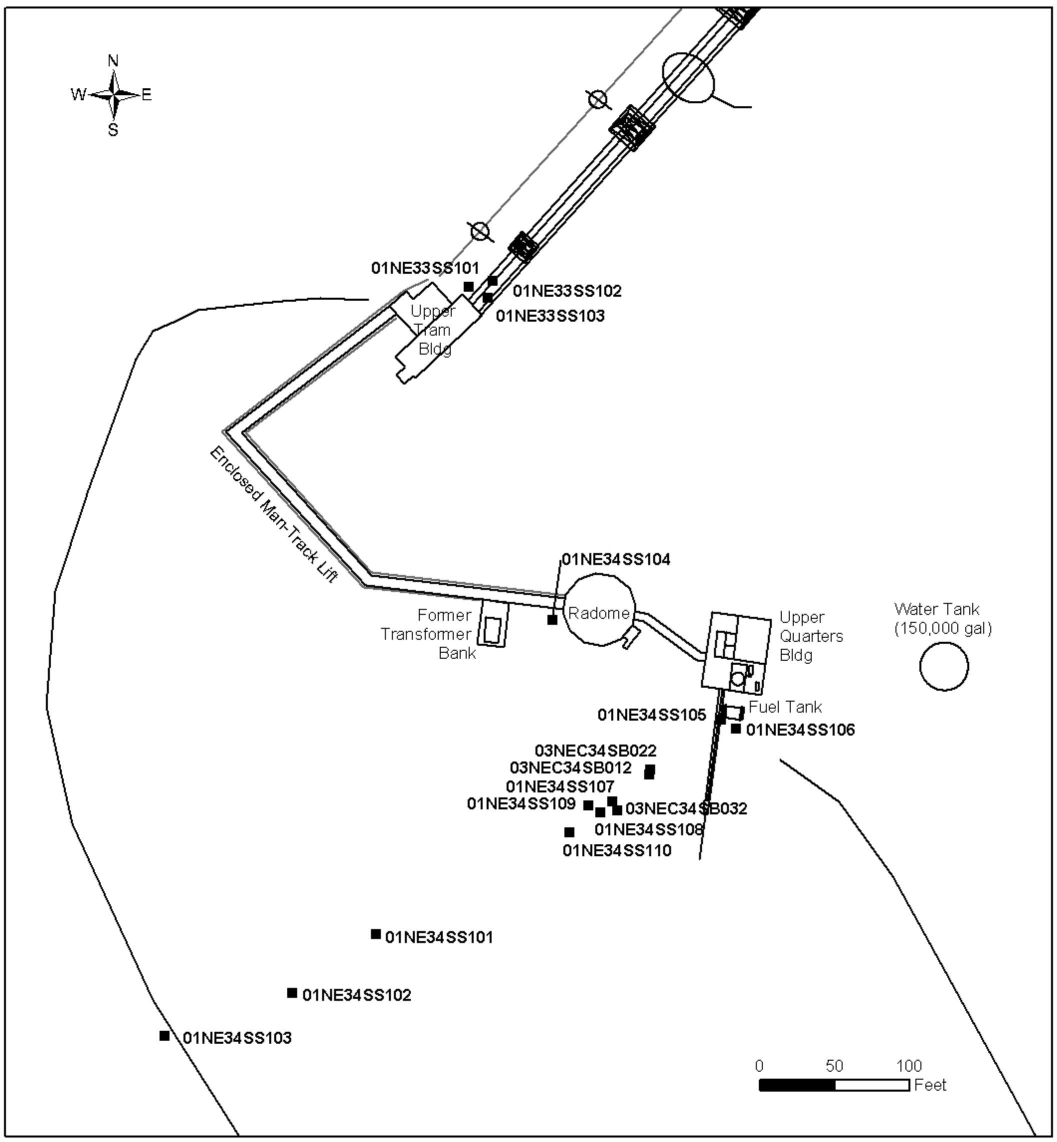

Figure 17 Site 33 Upper Tram Terminal and Site 34 Upper Camp

2.7.8.16 Site 34 Upper Camp

The Upper Camp is located at the top of Mt. Kangukhsam and consisted of a substation transformer pad, two ASTs, a radome building, and the upper quarters building.

Scattered drums were removed during a previous removal action. The site structures and ASTs were demolished and removed during the 2003 field season.

Historical soil sampling indicated the presence of PCBs at a maximum concentration of 1.4 mg/kg in soil adjacent to the concrete transformer pad. During the 2001 investigation, additional surface soil samples were collected from a grid around the former pad. PCBs were detected at a maximum concentration of 1.06 mg/kg.

Soil samples were also collected and analyzed for fuels and/or PCBs and PAHs from various locations near the ASTs, an outfall pipe, the former drum field, and background locations. DRO was detected at concentrations ranging from ND to 1,100 mg/kg. RRO was not detected above screening levels. PCBs and PAHs were not detected. See Figure 17 for historical sampling locations.

The DRO and PCBs detected do not pose a potential risk to human health or the environment. No further action is selected for Site 34.

2.7.9 Location and Extent of Contamination at Sites with Remedial Action Planned

Contamination remains at several other areas of concern within Northeast Cape. Various sites have petroleum, metals, or PCB-contaminated soils. The maximum detected concentrations of contaminants of concern in soil are presented in Table 4. Shallow groundwater at the Main Complex is also contaminated with petroleum hydrocarbons (diesel and residual range organics). Table 6 summarizes the historical groundwater data at the Main Complex. The Drainage Basin contains contaminated sediments; the maximum concentrations of COCs are presented in Table 7. The Site 9 Housing and Operations Landfill does not pose an unacceptable risk to human health and the environment based on historical soil/water sampling data. Capping of the remaining debris will address concerns regarding exposure to solid wastes. Long term monitoring will be conducted to ensure contaminants of concern are not migrating into the surrounding area. Community concerns regarding debris remaining in streams surrounding/within Site 9 as well as Site 29 Suqitughneq River will also be addressed as incidental to the other planned remedial actions at Northeast Cape. Exposed debris which is visible in streams at Northeast Cape is inherently hazardous (ER 200-3-1, Sec. 3-2.4.5) and violates the intent of a 1951 agreement between the Department of Defense and the Native Village of Savoonga. The cost to remove this debris concurrently with other site remediation at Northeast Cape is very minor. Table 3 lists the selected remedies and major components for each site.

Table 3 Summary of Remedial Actions by Site

1	Airstrip	Excavation and removal of petroleum-contaminated soils to established cleanup levels.
3	Fuel Pumphouse	Excavation and removal of petroleum-contaminated soils to established cleanup levels.
6	Former Drum Field	Excavation and removal of petroleum-contaminated soils to established cleanup levels.
8	POL Spill Site	Monitored natural attenuation of petroleum-contaminated sediment; periodic reviews, as necessary
9	Housing and Operations Landfill	Capping of the debris site with 2 feet of gravel fill, removal of partially submerged or exposed debris from flowing streams, long term monitoring, and periodic visual monitoring of the cap for settlement and erosion for 5 years.
MOC (10, 11, 13, 15, 27)	Main Operations Complex	Chemical oxidation treatment of groundwater and soils to established cleanup levels; monitored natural attenuation of groundwater based on chemical oxidation results; 5-year reviews, as necessary.
MOC (10, 11, 13, 15, 27)	Main Operations Complex	Contingency remedy if implementation and use of chemical oxidation technology is determined ineffective at the site after an initial evaluation period: Excavation and removal of petroleum-contaminated soils to established cleanup levels; monitored natural attenuation of groundwater and 5-year reviews, as necessary.
13, 16, 21, 31	Main Operations Complex, Wastewater Treatment Tank, White Alice Site	Excavation and removal of PCB-contaminated soils to established cleanup levels.
21	Wastewater Treatment Tank	Excavation and removal of arsenic-contaminated soil to established cleanup levels.
28	Drainage Basin	Excavation and removal of petroleum, metals, and PCB-contaminated sediment to established cleanup levels, including removal of near-surface sediments from the narrow channel upgradient of the Suqitughneq River
29	Suqitughneq River	Removal of partially submerged or exposed debris
32	Lower Tramway	Excavation and removal of petroleum-contaminated soils to established cleanup levels.
Various	Site-wide	Land use controls to limit groundwater use at Main Complex until cleanup levels are achieved, designate non-drinking water source areas, prevent construction of buildings on top of landfills, and manage movement of soils above state cleanup levels.
Various	Site-wide	Removal of dangerous poles, wires, and other miscellaneous debris from tundra areas

Table 4 Summary of Soil Sampling Results at Sites Where Remedial Action is Planned

Sample Location	**COCs**	**Media**	**Cleanup Level [a] (mg/kg)**	**# Exceeds**	**Depth (feet)**	**Maximum (mg/kg)**
Site 1 Airstrip	RRO	Surface Soil	9,200	3/6	0.5 – 0.7	**19,300**
Site 3 Pumphouse	DRO	Surface Soil	9,200	2/15	2.5	**20,500**
	RRO	Sediment	9,200	2/2	0.8	**28,500**
Site 6 Gravel Pad	DRO	Surface Soil	9,200	9/32	0-2	**102,000**
Site 8 POL Spill	DRO	Sediment	9,200	1/4	0-2	**19,500**
Site 9 Housing and Operations Landfill	DRO	Soil	9,200	0/12	0.5	375
	Arsenic	Soil	11	2/11	0.5	30
Main Operations Complex (Site 10, 11, 13, 15, 19, 27)						
Site 10 Buried Drums	DRO	Surface Soil	9,200	4/22	0 - 0.5	**26,500**
Site 11 Fuel Tanks	DRO	Surface Soil	9,200	1/5	0 - 0.5	**69,100**
	DRO	Subsurface Soil	9,200	1/4	9.5 - 11.5	**22,000**
Site 13 Heat and Power Plant	DRO	Surface Soil	9,200	0/6	0 - 0.5	7,610
	DRO	Subsurface Soil	9,200	4/41	10 – 12	**13,000**
	Benzene	Subsurface Soil	2	0/41	10 – 12	0.062
	PCBs	Surface Soil	1	2/29	1.5	**37.1**
Site 15 Fuel Pipeline	DRO	Surface Soil	9,200	0/3	0 – 0.5	4,860
	DRO	Subsurface Soil	9,200	1/3	6 – 8	**16,000**
Site 19 Auto Maintenance	DRO	Surface Soil	9,200	0/4	0 – 0.5	1,240
	DRO	Subsurface Soil	9,200	1/16	9.5 – 11.5	**13,300**
Site 27 Diesel Fuel Pump	DRO	Surface Soil	9,200	6/13	0 – 0.5	**37,900**
	DRO	Subsurface Soil	9,200	14/37	7 - 9	**51,000**
	Benzene	Surface Soil	2	0/43	4	0.79
	Naphthalene	Surface Soil	120	1/28	4	**191**
Site 16 Paint and Dope Storage	PCBs	Surface Soil	1	1/18	0.5	**1.4**
Site 21 Wastewater Tank	Arsenic	Surface Soil	11	1/30	0.5	**170**
	PCBs	Surface Soil	1	2/30	0 – 0.5	**4.2**
	PCBs	Subsurface Soil	1	1/8	5	**1.7**
Site 31 White Alice Communications	PCBs	Surface Soil	1	3/37	2	**7.09**
Site 32 Lower Tram	DRO	Surface Soil	9,200	3/18	0 – 2	**13,000**

[a] Cleanup levels based on 18 AAC 75.341(c), Table B1, and 18 AAC 75.340(f) Method 4 risk assessment. Surface soils considered 0 – 2 feet depth, subsurface soils > 2 ft depth.

2.7.9.1 Site 1 Airstrip

An area near the airstrip was reportedly used as a burn pit or perhaps for fire training. Field observations and sampling in the vicinity have not revealed any evidence of these activities. The airstrip is located on a low, flat ridge parallel to the lower Suqitughneq River drainage. The airstrip appears to have been constructed by plowing back the active layer of peaty soil to frozen ground, placing rocky fill on the frozen ground, and grading the surface with gravel and sand.

Miscellaneous debris consisting of wires/cables between the airstrip and main complex were removed from the tundra by Bristol Environmental Engineering and Construction Services, Inc. during the 2005 field season.

Four soil samples (plus QA/QC samples) were collected in 2004 during the Phase IV remedial investigation and analyzed for fuel constituents and Resource Conservation and Recovery Act (RCRA) metals. See Figure 8 for sample locations. The contaminants of potential concern are DRO and RRO. DRO concentrations ranged from 387 to an estimated 1,870 mg/kg. RRO concentrations ranged from 4,550 to an estimated 19,300 mg/kg.

Assuming future residential use at Site 1, the primary exposure pathway is incidental ingestion/contact with contaminated soils. The soil cleanup levels are 9,200 mg/kg DRO and 9,200 mg/kg RRO.

RRO is the only contaminant of concern that exceeded the proposed cleanup level at two locations (04NE01SS103 and 104). The isolated detections of RRO do not exceed the ADEC’s maximum allowable concentration of 22,000 mg/kg in 18 AAC 75 Table B2. The area affected is very limited in extent.

Excavation and removal of approximately 60 cubic yards (cy) of soils is planned for Site 1.

2.7.9.2 Site 3 Pumphouse

The site is located just south of Cargo Beach on Kitnagak Bay. A 4-inch welded pipeline was used to transfer diesel fuel from the pumphouse to the bulk storage facilities at the housing and operations area (Main Complex). The former pumphouse was situated on a gravel pad, near the local subsistence hunting camp structures. The site topography generally slopes north-northeast towards the beach. The area between the pumphouse and the beach consists of former dunes covered with tundra. The area south of the gravel pad contains unconsolidated deposits, likely of glacial origin, with a thick tundra mat cover. Permafrost and ice-rich soil underlie the tundra.

The fuel pumphouse, fuel and water ASTs, abandoned vehicles, drums, batteries, miscellaneous debris, stained soils, and the fuel pipeline were removed during the 2000, 2001, and 2003 field seasons.

Two areas of petroleum-stained soils were excavated and disposed off-site during 2001. A total of 14 tons of contaminated soil were removed from the former fuel pumphouse gravel pad and from a former AST located west of Cargo Beach Road.

Soil, sediment and shallow groundwater sampling were conducted as part of the remedial investigations between 1994 and 2004. Petroleum hydrocarbons have been detected in soils near the former pumphouse, outlying sediments, and in shallow groundwater downgradient of the pumphouse along the former fuel pipeline (see Figure 18).

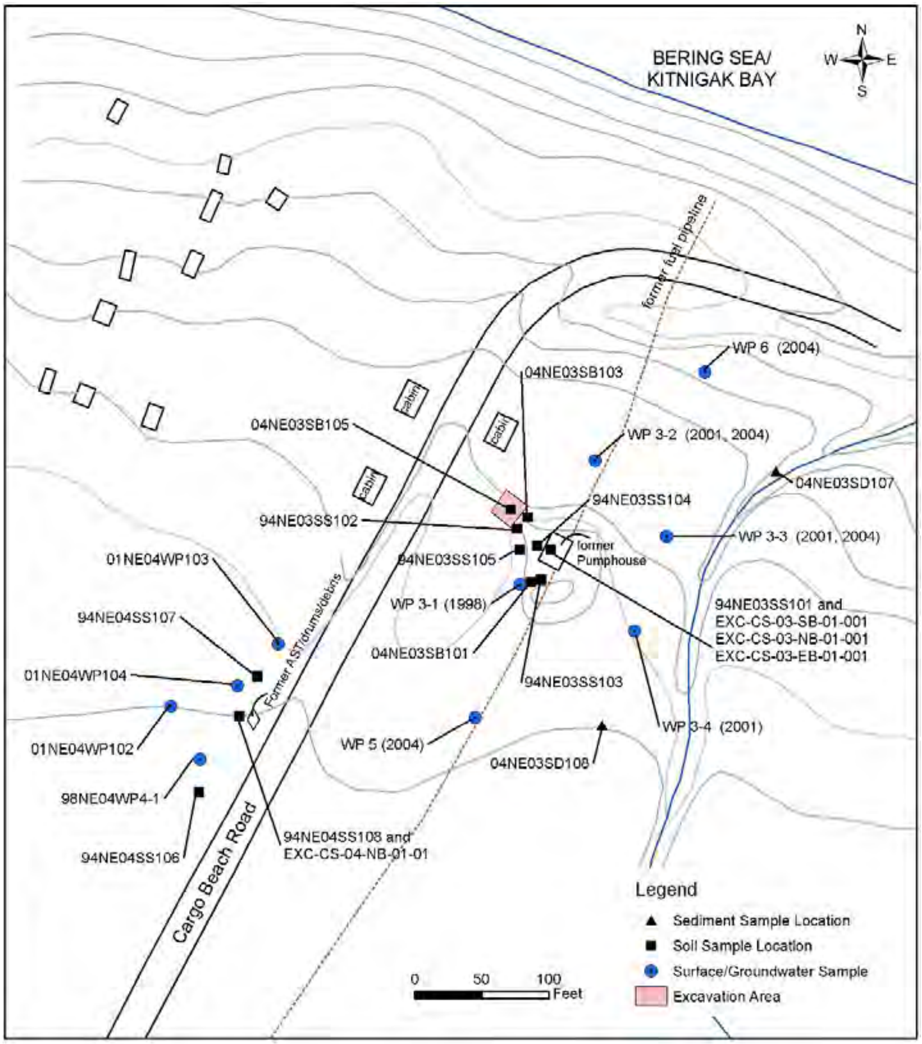

Figure 18 Site 3 Fuel Pumphouse and Pipeline

Stained soils were excavated from the pumphouse gravel pad in 2001. Soil samples collected from the bottom of the gravel pad excavation (EXC-CS-03-xx) had DRO levels ranging from non-detect to 2,280 mg/kg and RRO levels from 245 to 393 mg/kg.

Additional sampling was conducted in 2004. Concentrations of DRO in gravel soil at the former pumphouse ranged from 126 to an estimated 20,500 mg/kg (04NE03SB105); RRO ranged from 1,150 to an estimated 6,120 mg/kg. DRO and RRO were also measured in tundra soil/sediment located near the former pumphouse in 2004 (04NE03SD107 and 108). Estimated DRO levels ranged from 2,610 to 3,720 mg/kg in sediment; RRO was estimated at 17,300 to 28,500 mg/kg in sediment. Samples collected from media such as tundra soil/sediment often contain high levels of naturally occurring organic compounds which are reported as residual range petroleum hydrocarbons. The tundra/sediment locations will be resampled following the ADEC Technical Memorandum 06-001 Biogenic Interference and Silica Gel Cleanup (ADEC, 2006a). If RRO levels remain above site-specific cleanup levels, additional excavation will be considered.

Petroleum hydrocarbons have been detected in shallow groundwater above ADEC drinking water standards during various phases of investigation, but the groundwater at this site is not considered a potential future drinking water source. The most recent sampling results (2004) showed DRO concentrations ranging from 0.433 mg/L to 3.4 mg/L. RRO in shallow groundwater ranged from 0.641 mg/L to 3.4 mg/L. The higher concentrations of RRO were detected in well points placed in the tundra, not the gravel pad.

Table 5 Groundwater Results at Sites with Remedial Action Planned

Site	Description	COCs	Cleanup Level [a] (mg/L)	# Exceeds	Year	Maximum (mg/L)
3	Fuel Pumphouse and Pipeline	DRO	1.5	6/8	1998	**14.0**
		RRO	1.1	6/7	2001	**8.1**
6	Cargo Beach Road Drum Field	DRO	1.5	1/10	2004	0.385
		RRO	1.1	0/8	2004	0.728
		GRO	1.3	0/10	1994	0.08
		Arsenic	0.01	3/7	2004	**0.0678**
		Barium	2.0	1/7	2004	**2.98**
		Beryllium	0.004	1/2	2001	0.004
		Cadmium	0.005	1/8	2004	**0.006**
		Chromium	0.1	3/8	2001	**1.22**
		Copper	1.3	0/2	1994	0.27
		Lead	0.015	4/8	1994	**0.23**
		Lead, dissolved	0.015	0/1	1994	0.002
		Manganese	--		2001	1.58
		Nickel	0.1	2/2	2001	**1.68**
		Thallium	0.002	0/2	2001	0.002
		Vanadium	0.26	0/1	2001	0.153
		Zinc	11	1/2	2001	**17.7**
		Zinc, dissolved	11	0/1	1994	0.06
9	Housing and Ops Landfill	Arsenic	0.01	3/5	1994	**0.025**
		Lead	0.015	5/5	2001	**0.3**
		DRO	1.5	3/8	1998	**7.7**
		RRO	1.1	1/2	2001	**4.2**

Site	Description	COCs	Cleanup Level [a] (mg/L)	# Exceeds	Year	Maximum (mg/L)
16	Paint/Dope Storage Bldg	Cadmium	0.005	1/3	1994	**0.06**
		Lead	0.015	5/6	1994	**0.67**
		Trichloroethene	0.005	1/7	1994	0.0033
21	Wastewater Treatment Tank	Arsenic	0.01	2/2	1994	**0.072** [b]
		Chromium	0.1	1/2	1994	**0.23** [c]
		Lead	0.015	2/2	1994	**0.26** [d]
		Nickel	0.1	1/2	1994	**0.18** [d]

[a] 18 AAC 75.345 Table C Groundwater cleanup levels, for drinking water source
[b] Arsenic detected at maximum of 0.002 mg/L in downgradient surface water (4 samples).
[c] Lead detected at maximum of 0.004 mg/L in downgradient surface water (4 samples).
[d] Chromium and nickel not detected in downgradient surface water samples (4 samples).

The selected alternative for Area of Concern A Fuel Pump house and Pipeline is excavation and treatment/disposal of an estimated 60 cubic yards of diesel-contaminated soils at the gravel pad. The close proximity of this site to the subsistence hunting camp slightly increases the potential for human exposure to the contaminated soil. However, the potential for significant impacts to human or ecological receptors is limited due to the nature of the contamination.

2.7.9.3 Site 6 Gravel Pad

The Cargo Beach Road Drum Field site is located west of Cargo Beach Road, approximately 0.6 mile south of the former fuel pumphouse, and north of the Cargo Beach Road landfill. The site was used to dispose of empty drums which had contained petroleum-oil-liquid (POL) products used during operation of the installation. The site consists of relatively fine grained soils with exposed cobbles. The areas to the west-northwest and south contain boulders and large cobbles. Over 1,500 drums, an empty 500-gallon water storage tank, battery, and miscellaneous metal debris were removed during removal actions in 2000 and 2001.

Soil, sediment, shallow groundwater, and surface water samples were collected during the 1994 remedial investigation. The results showed that diesel fuel compounds were present at the site. Additional soil sampling was conducted in 1998. In order to verify the extent of petroleum contamination detected in 1994 and 1998, additional soil, sediment, shallow groundwater, and surface water samples were collected in 2001 and analyzed for fuel-related compounds, benzene, toluene, ethylbenzene, xylenes (BTEX), metals, PCBs.

The primary contaminant of concern is DRO in soil. Metals were detected at low levels, but did not exceed cleanup levels. The maximum detected concentration of DRO in surface soils (0-2 feet) was 102,000 mg/kg; Subsurface soils contained DRO up to 3,000 mg/kg (2-5 feet); and up to 358 mg/kg (5-15 feet). The average concentration of DRO is 28,000 mg/kg.

Several metals (aluminum, arsenic, lead, nickel, and zinc) were detected in unfiltered samples of shallow ground-water to the west and northwest of the gravel pad area. It is common to detect metals in water samples that have not been filtered to remove suspended sediments. The concentration of aluminum ranged from not analyzed to 78.3 mg/L; arsenic ranged from non-detect to 0.068 mg/L; lead ranged from 0.005 to 0.23 mg/L; nickel ranged from non-detect to 1.68 mg/L; and zinc ranged from 0.1 to 17.1 mg/L. Aluminum, arsenic and zinc are not considered contaminants of concern because they did not exceed cleanup levels for a non drinking water source.

Metals have not been detected above cleanup levels in up-gradient shallow groundwater monitoring wells, or adjacent surface water. Metals were detected at low levels in soil samples collected during various phases of investigation, but did not exceed cleanup levels. The source of the anomalous metals in shallow groundwater is either localized or due to suspended sediments in the water column and not the result of military impacts.

Two areas of contaminated soil exceed the proposed DRO cleanup level of 9,200 mg/kg. A small surface soil stain with a DRO concentration of 14,300 mg/kg was documented in 1994 at the eastern edge of the pad. More recent sampling did not detect fuels at depth (10-15 ft bgs). The stained area is about 400 square feet and 2 feet in depth.

A larger area of stained soil exists at the western portion of the pad, but sampling results have shown varying levels of contamination. Surface soil samples collected in 1994 from the edges of the gravel pad contained DRO ranging from 17,900 to 102,000 mg/kg. In 1998, a surface soil sample from the stained gravel pad area contained DRO at 9,200 mg/kg. Two test pits were excavated in 2001 and the maximum DRO concentration was 3,000 mg/kg at 5.3 ft.

The estimated volume of contaminated soil is 2,700 cy, assuming excavation to an average depth of 5 feet.

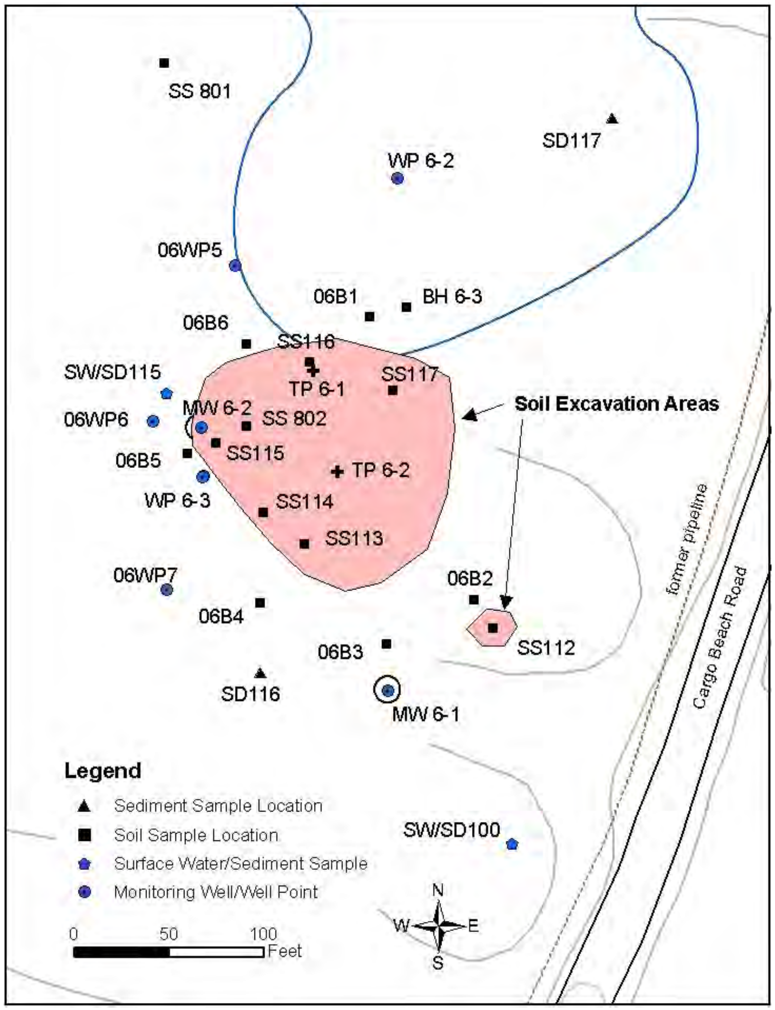

Figure 19 Site 6 Cargo Beach Road Drum Field

2.7.9.4 Site 8 POL Spill

The Pipeline Break Site is located southwest of the intersection of Cargo Beach Road and the Airport Access Road. A fuel pipeline extended from the pumphouse at Cargo Beach to the bulk storage tanks at the main operations complex. A reported break in the pipeline was located on the west side of the main road embankment and north of the Suqitughneq River. The fuel pipeline was drained and removed in 2000.

The site is a wetland with thick surface vegetation, typical of locations along roads and the airstrip where the tundra mat was removed before construction. The wetland slopes southward toward the Suqitughneq River. The wetland narrows as it approaches the river and a spring of flowing water is present. The vegetation does not appear stressed or petroleum stained according to field observations. The wetland consists of dense, grassy vegetation and roots with little soil or peat development. Some sand is present between cobbles under the vegetation mat.

Two sediment and one surface water sample were collected in 2004 to assess possible fuel impacts at the site. DRO was detected in the sediment at concentrations ranging from 6,700 to 19,500 mg/kg. No contaminants were detected in the surface water. The two sediment samples were spaced 50 feet apart. The pipeline break was 50 feet upgradient of the first sample, based on field observations. The roughly 40-foot wide wetland slopes southward for approximately 300 feet toward the Suqitughneq River.

The high organic carbon content of the sediment promotes binding with the fuel components and minimizes the potential for contaminant migration. The abundant vegetation also helps naturally break down the diesel range organics. Given the limited surface area potentially affected by DRO and the lack of stressed vegetation, the potential for significant adverse effects to either human or ecological receptors is low.

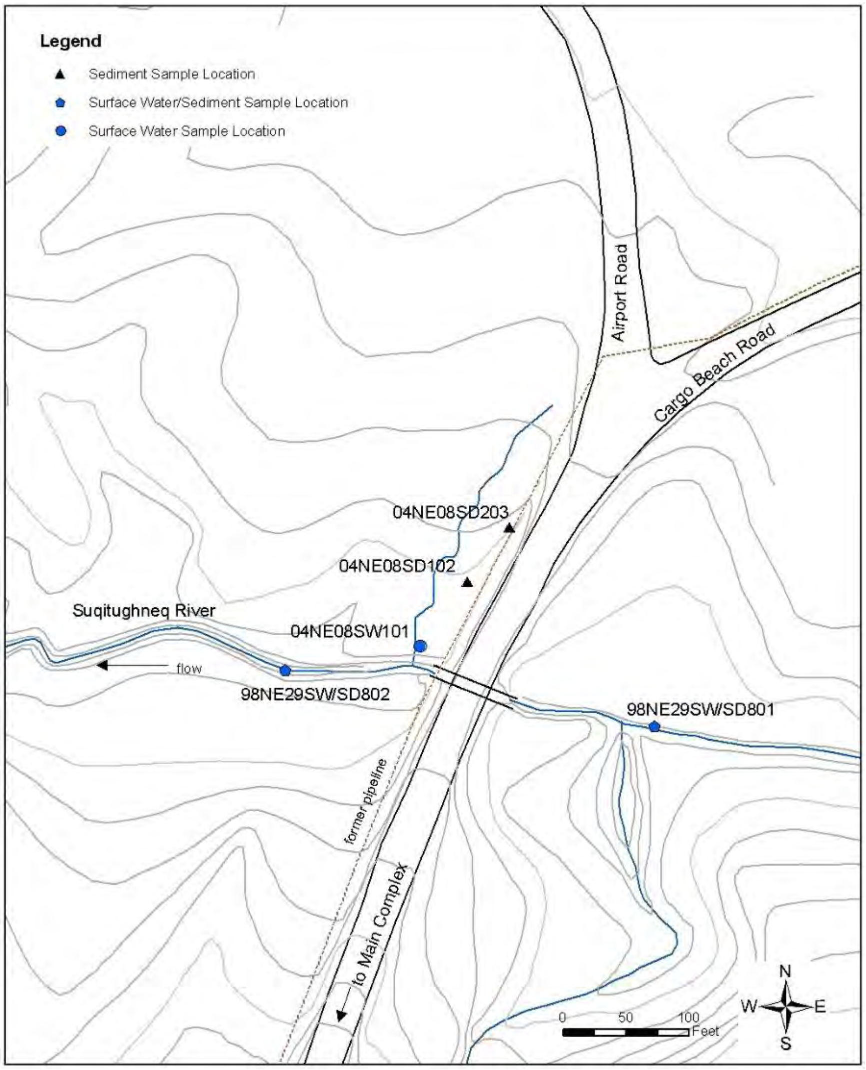

Figure 20 Site 8 POL Spill

2.7.9.5 Site 9 Housing and Operations Landfill

A dump area was located 500 feet northeast of the Main Operations Complex in a marshy area east of Cargo Beach Road. This dump site is known as the Site 9 Housing and Operations Landfill, which covers an estimated 1.9 acres. Several surface water drainages flow through the site and enter the Suqitughneq River about 1/4 mile to the north (Figure 21). This site served as a waste disposal area from 1952 until 1965 and contains miscellaneous metal debris, drums and other trash. All exposed drums, debris, and batteries were removed from the site and surrounding vicinity in 2001 and 2005.

Environmental sampling activities at Site 9 have included the collection of soil, sediment, surface, and shallow groundwater samples (see Figure 21). The remedial investigation activities demonstrate that no significant contamination exists surrounding or migrating from the site.

Metals and DRO were identified as contaminants of potential concern in soil. The maximum concentration of DRO in soil was 375 mg/kg and does not exceed the site cleanup level. Arsenic concentrations in soil ranged from 3.6 to 30 mg/kg, with a 95%UCL of 17 mg/kg. During the 1994 investigation, one sampling location (SS141; two of three triplicate results) exceeded the established site-specific background level of 11 mg/kg. The arsenic detections are within the range of ambient arsenic concentrations in Alaska soils. Arsenic was eliminated as a contaminant of concern in soil. The shallow groundwater surrounding Site 9 is not a current or reasonably expected potential drinking water source. Shallow groundwater samples were collected to evaluate the potential for contaminant migration away from the site.

DRO, RRO, and lead are the contaminants of concern in shallow groundwater at Site 9. Elevated levels of DRO were detected at one monitoring well (MW9-3) during the 1994 and 1998 investigations, ranging from 0.51 to 7.7 mg/L. Elevated levels of RRO were measured in one well point (WP102) during the 2001 investigation at a concentration of 4.2 mg/L. Subsequent sampling of MW9-3 in 2001 showed non-detectable level of fuels. The concentrations of DRO and RRO exceed the state drinking water cleanup levels. Lead was consistently detected above screening levels at all sampling locations, ranging from 0.019 mg/L to a maximum of 0.30 mg/L. Metals are commonly detected in poorly developed monitoring well samples. The observed lead concentrations may represent suspended sediments in the water column.

Surface water samples have also been collected from the ephemeral ponds surrounding Site 9 and lead has either not been detected or did not exceed the drinking water criteria. No other contaminants of concern were detected above cleanup levels in the surface water samples collected down-gradient and within the landfill during the 2001 investigation.

The extent of remaining buried debris was surveyed in 2001 and corresponds to an area of 1.9 acres. Although exposed large surface debris was removed in 2005, additional debris is still present. Debris also remains submerged in ephemeral ponds and streams surrounding Site 9. The submerged debris in active stream channels which poses an inherent hazard will be removed during the site remediation activities. The remainder of the buried debris will be capped with 2 feet of fill and closed in place. Gravel fill materials are available at the base of Kangukhsam Mountain. Capping will provide containment by reducing water infiltration and minimizing vertical movement of contaminants and preventing human exposure to the waste materials. After placement of the fill materials and site re-vegetation, the landfill cap will be periodically visually monitored for settlement and erosion for 5 years. Additional visual monitoring, up to 30 years, may be conducted if deemed necessary based on the results of the site inspections. Long term monitoring will also be performed once every 5 years, up to 30 years, to evaluate downgradient migration of contaminants and a steady-state plume.

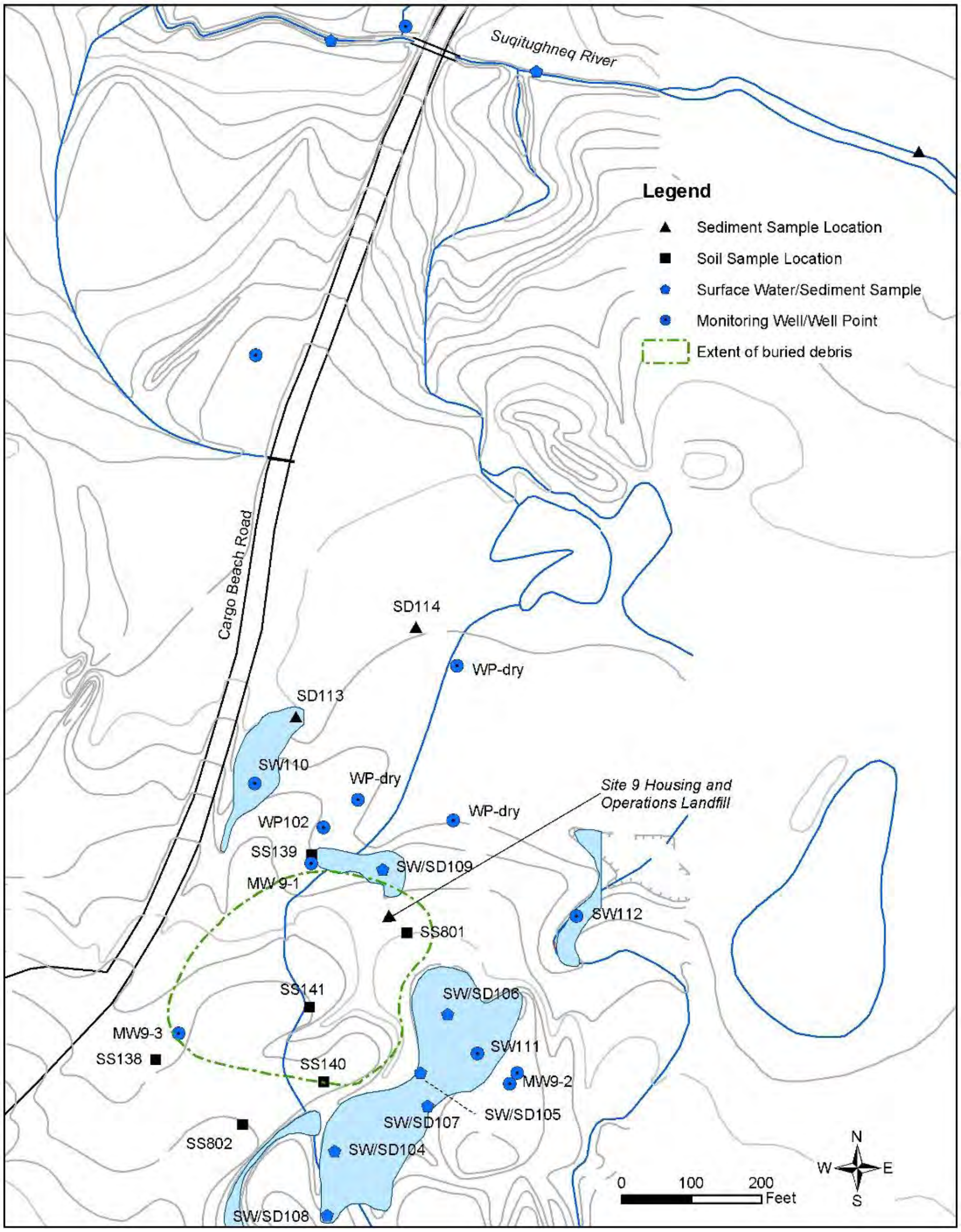

Figure 21 Site 9 Housing and Operations Landfill

2.7.9.6 Main Operations Complex (Site 10, 11, 13, 15, 19, 27)

The Main Operations Complex at the Northeast Cape installation included the majority of the site infrastructure including buildings, heat and power supply, fuel storage tanks, maintenance, and housing quarters. Individual sites were grouped together to evaluate an overall response action for the known contamination. These sites are located on the northeast portion of the main complex gravel pad and include Sites 10, 11, 13, 15, 19, and 27. See Figure 22 for site locations.

All of the main complex structures have been demolished. Tanks and piping have been removed. Contaminated concrete, PCB-contaminated soils, and fuel stained soils were also excavated and transported off-site during removal actions from 2000 to 2005.

The primary contaminant of concern in soil at the Main Operations Complex is DRO. Surface and subsurface soils are contaminated with petroleum at depths up to 16 feet below ground surface. The fuel contamination is assumed to have created a smear zone along the shallow groundwater interface. An estimated 18,000 cubic yards of contaminated soil exists at the Main Complex.

Shallow groundwater is also contaminated throughout the northeast portion of the site, over an area of approximately 175,000 square feet. The primary contaminants of concern in groundwater are DRO, GRO, RRO, benzene, and naphthalene. The depth to groundwater across the northeast portion of the main complex varies from 10 to 25 feet below ground surface, and averages 15 feet deep.

Remedial investigations were conducted in 1994, 1996, 1998, 2001, 2002, and 2004. The sampling results demonstrate that soils and groundwater contain petroleum compounds at elevated levels. Surface and subsurface soil sampling results at each site are summarized in Table 4. Table 6 summarizes groundwater sampling results at the Main Complex. No measureable free product was observed in the monitoring wells during the various phases of remedial investigation.

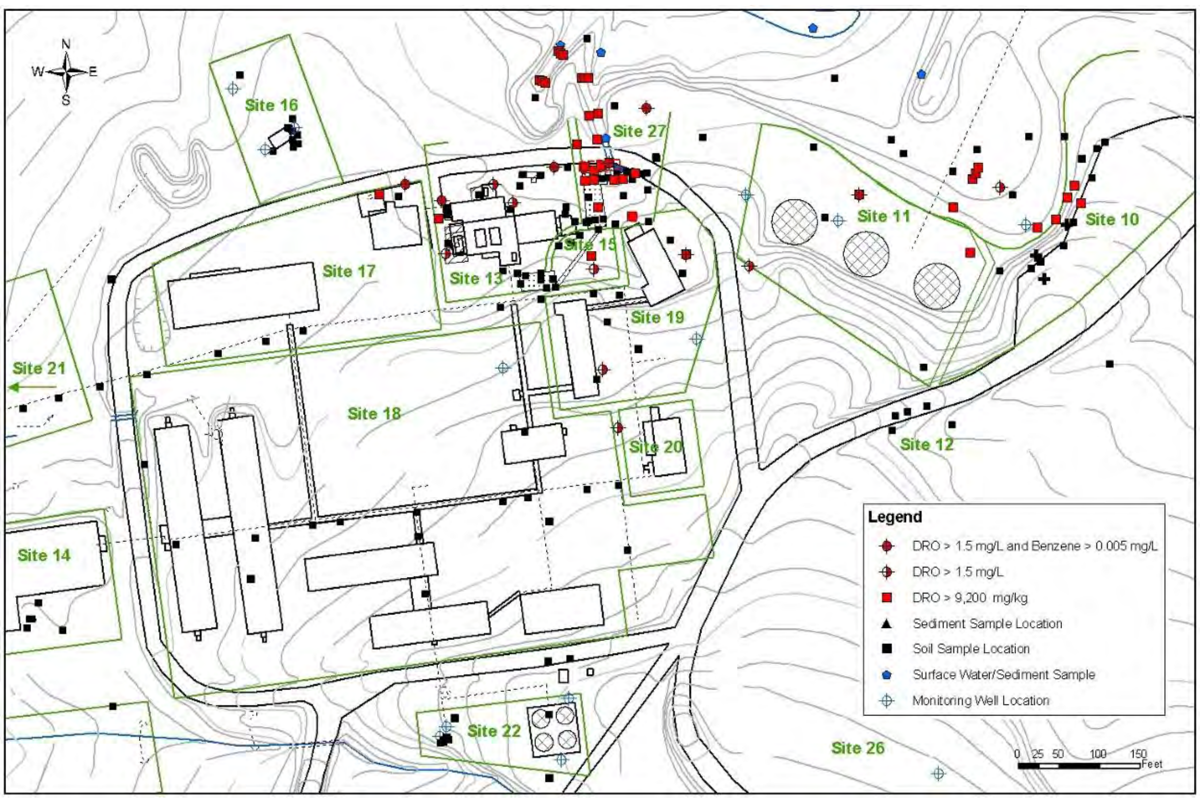

Figure 22 Main Operations Complex – Sites 10, 11, 13, 15, 19, and 27

Table 6 Main Complex Groundwater Results (Sites 10, 11, 13, 15, 19, 27)

Sample Location	COCs	Cleanup Level (mg/L)	# Exceeds	Year	Maximum (mg/L)
Main Operations Complex [a]	DRO	1.5	10/14	1994	**34**
			7/12	1998	**960**
			8/11	2002	**72**
			7/12	2004	**15.2**
	GRO	1.3	5/12	1994	**6.1**
			1/11	2002	**1.5**
			1/12	2004	**1.5**
	RRO	1.1	8/12	1994	**190**
			1/12	1998	**3.8**
			6/11	2002	**2.3**
			3/12	2004	**2.28**
	Benzene	0.005	4/12	1994	**0.12**
			4/11	2002	**0.03**
			4/12	2004	**0.033**
	Lead	0.015	9/10	1994	**0.68**
			2/12	2004	**0.546**

[a] No measurable free product noted during any remedial investigations.

2.7.9.7 Site 10 Buried Drums

Site 10 is a wide gravel area that is level with the road. The gravel extends westward and drops off approximately 8 feet to a shallow wetland basin at the base of an embankment. The embankment on the northwest side has a few pieces of decomposing drums exposed. The site was reportedly used as a drum storage area for a variety of petroleum products.

An area of surface soil contamination was documented in 1994 along the western edge of the gravel pad. The maximum concentration of DRO was 26,500 mg/kg. Additional surface soil samples were collected in 1996 and the maximum DRO was 17,000 mg/kg. Soil borings were completed in 2004 and demonstrated that subsurface soils are not significantly impacted; the maximum DRO result was 619 mg/kg.

2.7.9.8 Site 11 Fuel Tanks

Site 11 included three large above ground fuel storage tanks (400,000 gallons each) located between the perimeter access road and Site 10. The tanks were situated on a constructed gravel pad, and the gravel embankment drops to a shallow tundra drainage basin to the northeast. The center tank was punctured during snow removal activities in the late 1960's and released a large amount of fuel. The tanks were dismantled in 2000 and the area was reseeded with grass in 2005.

Visibly stained soil exists within the footprint of each of the dismantled fuel storage tanks. The circular pads measure approximately 50 feet in diameter. The total depth of contamination is unknown. Adjacent soil borings outside the tank footprints contained DRO ranging from 358 mg/kg at 4 ft depth to 22,000 mg/kg at 11.5 ft depth. Immediately downgradient of the tank footprints, DRO was detected in surface soils up to 69,100 mg/kg.

2.7.9.9 Site 13 Heat and Power Plant

Site 13 consisted of the Heat and Electrical Power Building (Building 110). Several ASTs, USTs, diesel generators, and power transformers were formerly located at this site. PCB-contaminated soils (141 tons) were previously excavated and removed from Site 13.

Surface and subsurface soil samples were collected during the 1994 investigation. Surface soils contained DRO ranging from 398 to 7,610 mg/kg. Additional soil borings were completed in 2002 and 2004. The maximum DRO concentration in subsurface soils was 13,000 mg/kg (10-12 ft). The maximum GRO concentration was 513 mg/kg (5-6.5 ft); the maximum RRO concentration was 3,400 mg/kg (1-3 ft). Benzene in soil ranged from non-detect to 0.062 mg/kg; naphthalene in soil ranged from non-detect to 23 mg/kg.

Surface and subsurface soil samples were also collected over several years to evaluate the extent of PCB contamination surrounding Building 110 and the transformer pads. Soil screening and laboratory confirmation samples following the 2005 removal action indicate residual PCB concentrations up to 37.1 mg/kg at one location (excavation 13B-2). Figure 23 shows the previous soil excavation and sampling locations at Site 13.

Soil samples collected during the 2003 demolition of the wooden utilidor corridor south of Building 110 indicated two discrete hits of PCBs ranging from 2.4 to 16.9 mg/kg, at depths of 4 to 5 feet below ground surface. The utilidor trenches were backfilled with clean fill.

The three excavations conducted north of Building 110 (13C, 13D, and 13E) during the 2005 field season successfully removed PCB contamination to below 1 mg/kg at these locations.

An estimated 150 cubic yards of soil remain with PCBs above the cleanup level of 1 mg/kg.

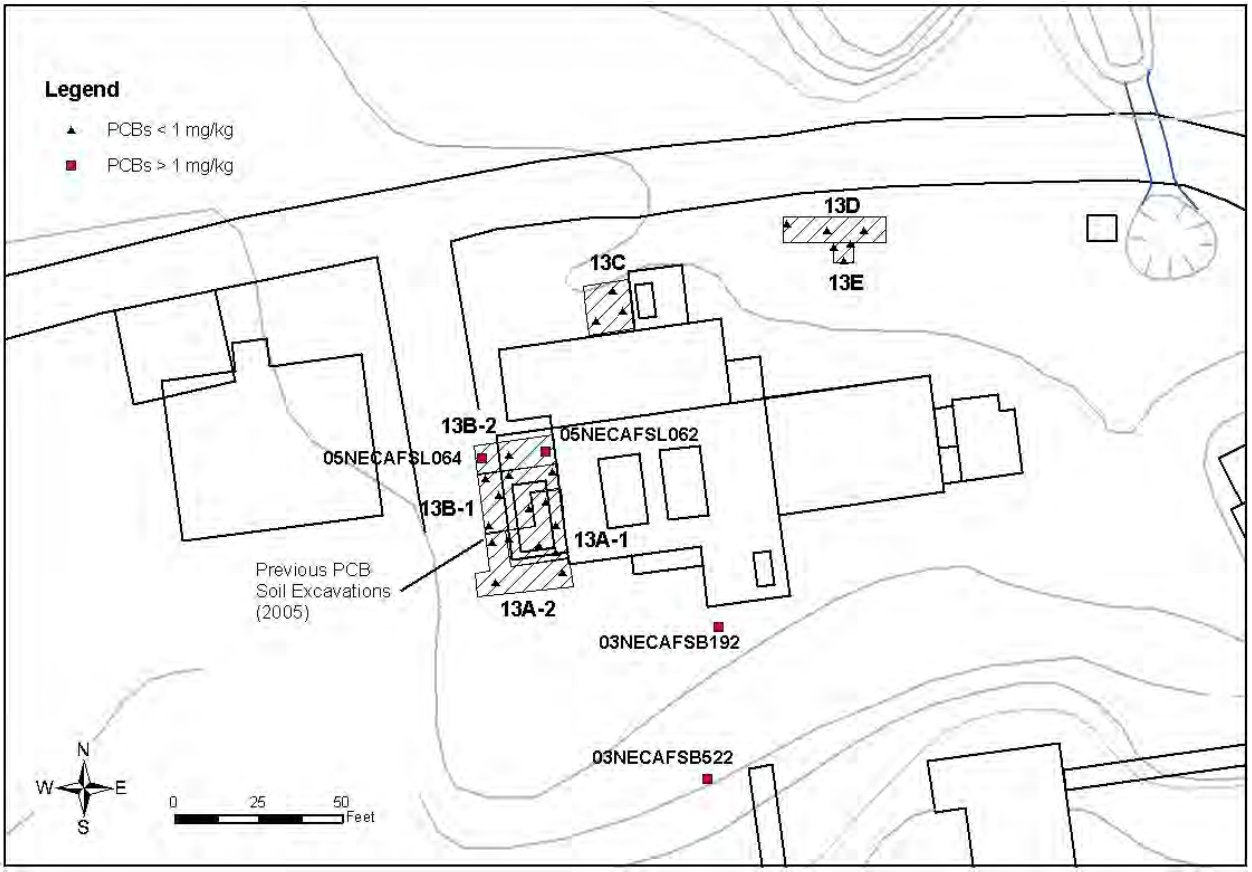

Figure 23 Site 13 Heat and Power Plant – PCB excavations and sampling locations

2.7.9.10 Site 15 Fuel Pipeline

Site 15 is adjacent to the eastside of Building 110 and included the pipeline corridor connecting to the diesel fuel pump island at Site 27. A break in this fuel line resulted in a diesel fuel spill. The pipeline and surrounding stained soil were removed in 2001. During the 2002 investigation, DRO was detected at a maximum concentration of 16,000 mg/kg in subsurface soils (6-8 ft).

2.7.9.11 Site 19 Auto Maintenance

Site 19 consisted of the Auto Maintenance (Bldg 109) and Auto Storage (Bldg 108) buildings, which were constructed with concrete floors and floor drains.

During the 1994 investigation, DRO was detected at a maximum concentration of 1,240 mg/kg in surface soils (0-0.5 ft) and 13,300 mg/kg in subsurface soils (9.5-11.5 ft). One soil boring also contained GRO at a maximum concentration of 6,650 mg/kg (4-6 ft). Subsequent soil borings completed in 2002 indicated the maximum concentration of DRO was 5,000 mg/kg (15.5-17.5 ft); and GRO was 51 mg/kg (16-18 ft). One additional soil boring was completed in 2004; the maximum concentration of DRO was 3,590 mg/kg and GRO was 91.6 mg/kg at 12-13.5 ft.

2.7.9.12 Site 27 Diesel Fuel Pump

Site 27 included the diesel fuel pump island that was originally used to refuel heavy equipment and vehicles. The site consisted of a small shed and concrete valve box, and a buried pipeline from the bulk fuel storage tanks at Site 11. The pipeline and surrounding stained soils were removed during the 2001 field season.

Surface soil sampling in 1994 indicated DRO at a maximum concentration of 37,900 mg/kg. In 2001, soil samples were collected from the bottom of the UST and piping excavations and indicated fuel-contaminated soil remains in subsurface soils at depths between 4-7 feet bgs. The concentrations of DRO and naphthalene in the subsurface soils exceeded the risk-based cleanup levels, RRO and benzene were also detected. DRO concentrations ranged from 144 to 36,500 mg/kg; RRO ranged from 313 to 9,100 mg/kg; benzene ranged from non-detect to 0.79 mg/kg; naphthalene ranged from non-detect to 191 mg/kg.

Five soil borings were completed around Site 27 in 2002. The subsurface soil sample results indicated DRO concentrations ranged from 20 to 51,000 mg/kg (7-9 ft), RRO ranged from 16 to 6,000 mg/kg; benzene ranged from non-detect to 0.37 mg/kg; and naphthalene ranged from 0.0011 to 81 mg/kg.

Ten groundwater monitoring wells were installed in 1994. The wells were sampled again in 1998. An additional 10 monitoring wells were installed in 2002, and sampled a second time in 2004. Petroleum hydrocarbons have been detected throughout the northeast corner of the Main Complex area. DRO concentrations ranged from 0.71 to 960 mg/L in the monitoring wells. GRO concentrations ranged from 0.42 to 6.1 mg/L. RRO concentrations ranged from 0.22 to 190 mg/L. Benzene was detected above the proposed cleanup level (0.005 mg/L) in six MWs at concentrations ranging from 0.01 to 0.12 mg/L. Lead also exceeded the cleanup level of 0.015 mg/L at eight locations. Table 6 summarizes the maximum shallow groundwater sampling results.

2.7.9.13 Site 16 Paint and Dope Storage

This site consisted of a wood-framed building located on the north side of the perimeter access road surrounding the main operations complex. The site was originally a flammable liquids storage facility. The building, miscellaneous debris, 3 tons of stained soils, and an AST were removed in 2001.

Environmental sampling activities for Site 16 included the collection of soil and shallow groundwater samples. The primary contaminants of concern in soil were arsenic, antimony, lead, and PCBs. The detected arsenic and antimony levels were attributable to naturally occurring background levels. The maximum concentration of PCBs was 1.4 mg/kg in one surface soil sampling location (SS163) adjacent to the building foundation in 1994 (see Figure 24); all 7 other sampling results were less than 1 mg/kg. The average PCB concentration is 0.78 mg/kg.

Lead was detected above the residential cleanup level of 400 mg/kg at two locations in 1994 (SS159 and SS161). Three soil borings and 8 surface soil locations were sampled for lead in 1994. The concentrations of lead ranged from 18 to 822 mg/kg in surface soil; and from 18 to 157 mg/kg in subsurface soils. Two additional samples were collected in 2001, the concentration of lead ranged from 42 to 240 mg/kg. The lead exceedances are isolated in extent. It is assumed the lead was removed with the stained soils.

The primary contaminants of concern in shallow groundwater identified during the 1994 investigation were cadmium and trichloroethene (TCE). Follow up groundwater sampling was conducted in 1998 and TCE was not detected. The presence of TCE was an isolated occurrence and did not exceed the USEPA maximum contaminant level (MCL), or the ADEC Table C groundwater cleanup level of 0.005 mg/L. The MCLs for groundwater are protective of human health. Cadmium and lead were detected in 1994 above screening levels in the shallow groundwater. However, metals were not detected in the dissolved phase, after filtering of the water samples. The metals therefore, were due to suspended sediment particles in the water column.

Shallow groundwater at Site 16 is intermittent in nature. Additional groundwater sampling was attempted in 2004, but not completed due to insufficient water in the monitoring wells. Given the intermittent nature of the shallow groundwater at Site 16, it is very unlikely a future drinking water supply could be established and utilized over an entire year. The risk assessment results are within the risk management range set by the USEPA. The concentration of TCE in shallow groundwater is below MCLs, was not confirmed in subsequent sampling, and the detections of cadmium and lead were isolated and due to suspended sediments in the water column.

The isolated area with historical PCBs above 1 mg/kg will be excavated and removed.

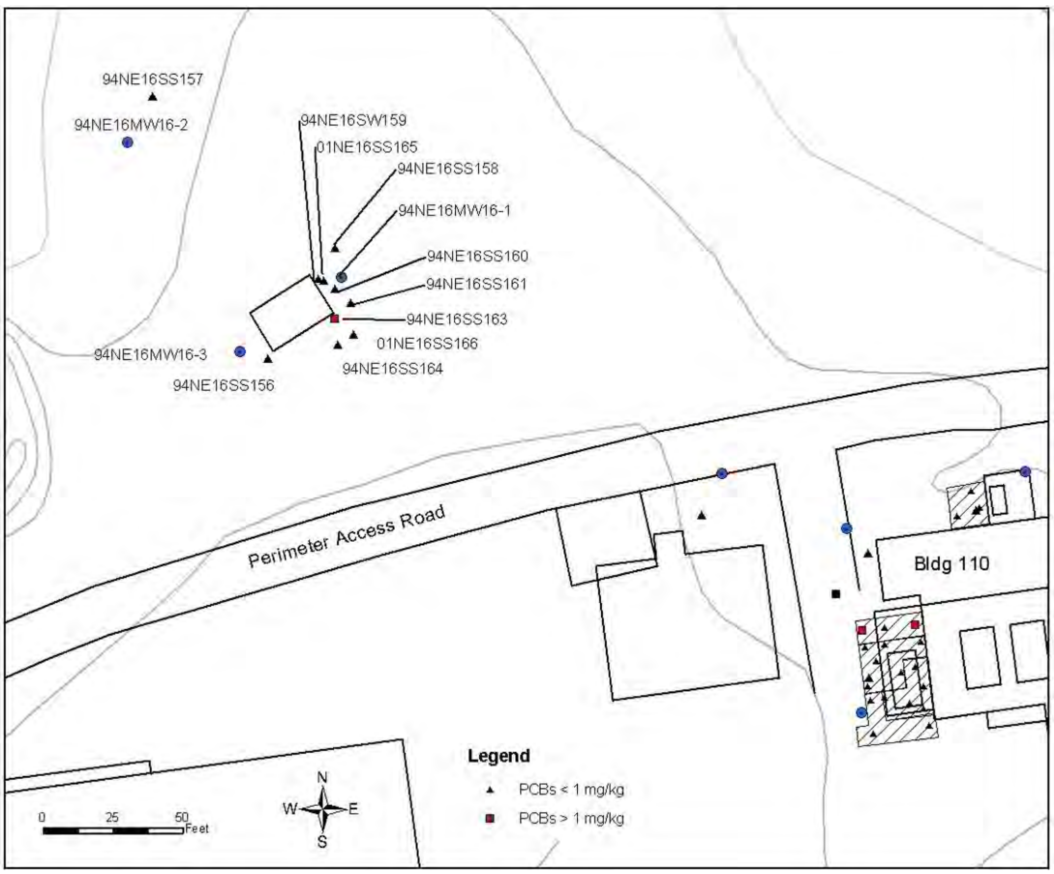

Figure 24 Site 16 Paint/Dope Storage Building – Historical Sampling Locations

2.7.9.14 Site 21 Wastewater Tank

Site 21 included the wastewater treatment system for the Main Housing and Operations complex. The facility was located west of the perimeter road and consisted of a concrete septic settling tank which discharged via an 8” insulated cast iron pipe to the wetland area approximately 450 feet to the west.

The septic tank compartments were cleaned and decommissioned during the 2003 removal action. The utilidor corridor from the main complex to the septic tank and the wooden utilidor outfall line were also removed in 2003. Soil confirmation samples were collected from underneath the inlet and outfall lines, adjacent to and below the lowest level of the septic tank, and from beneath the wooden utilidor corridor. The concrete sidewalls and floor of the tank were also sampled prior to demolition. All PCB sampling results from the concrete were equal to or less than 1 mg/kg. The concrete tank was broken up and buried in place.

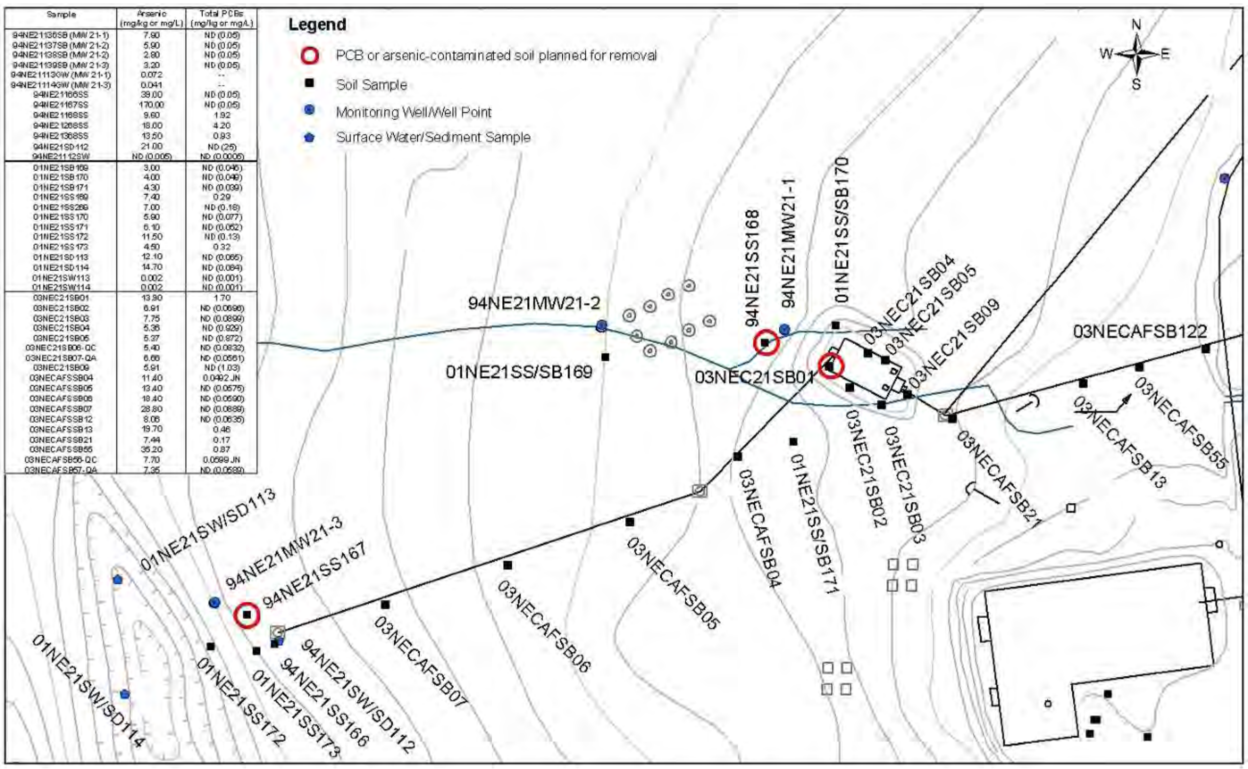

Figure 25 Site 21 Wastewater Treatment Tank – Historical Sampling Locations

Soil, sediment, surface water, and shallow groundwater samples were collected at Site 21 throughout the various phases of remedial investigation. Arsenic and PCBs were identified as primary contaminants of concern during the investigations.

During the 1994 investigation, PCBs were detected in surface soils at one location (SS168) due west of the septic tank. The sample was analyzed in triplicate and the results ranged from 0.93 to 4.2 mg/kg. PCBs were not detected in the other soil or sediment samples. Sludge from within the septic tank was sampled in 1999 and contained total PCBs at a concentration of 120 mg/kg.

Additional samples were collected from soils surrounding the tank and outfall pipe in 2001 and PCB were detected at a maximum concentration of 0.18 mg/kg.

Confirmation samples were collected in 2003 after decontamination and decommissioning of the septic tank. The sampling results demonstrated that PCBs had not migrated through the concrete. A total of 17 samples were collected from beneath the concrete tank, beneath the outfall pipe adjacent to the tank, and from the bottom of the wooden utilidor corridor. PCBs were not detected in the samples collected from beneath the concrete tank and the wooden utilidor. PCBs were detected at 1.7 mg/kg in only one sample (03NEC21SB01), collected immediately beneath the outfall piping adjacent to the septic tank.

Arsenic was detected at a single location (SS170) at an anomalous concentration of 170 mg/kg in surface soil downgradient of the septic tank outfall during the 1994 investigation. Other surface soil and subsurface soil samples collected in 1994 at Site 21 contained arsenic at levels ranging from 2.8 to 39 mg/kg. Additional surface soil and sediment samples were collected from the surrounding tundra near the septic tank outfall in 2001 and arsenic concentrations ranged from 4.5 to 14.7 mg/kg and were within the range of ambient levels for the Northeast Cape site. During the 2003 removal action, arsenic was detected in tundra soil samples collected from immediately beneath the demolished utilidor corridor and concentrations ranged from 11.4 to 35.2 mg/kg. The arsenic detections are likely attributable to naturally occurring minerals in the tundra soils. There is no other known source for the detected arsenic.

Chromium was identified as a potential contaminant of concern during the remedial investigation, but did not exceed ambient levels established for Northeast Cape. The maximum detected concentration of chromium in soil during the remedial investigation was 42 mg/kg, compared to the ambient level of 48 mg/kg for the site. Soil confirmation samples collected during the 2003 removal action along the utilidor corridor and adjacent to the septic tank bottom also contained chromium at concentrations ranging from 21.3 to 109 mg/kg. Chromium in soil exists predominantly in the trivalent state, and the levels do not pose a potential risk to residents.

The primary contaminant of potential concern in shallow groundwater is arsenic. Arsenic was detected above cleanup levels during the 1994 investigation at one location. Surface water samples collected downgradient of the monitoring wells did not contain arsenic above action levels. The arsenic detected in the shallow groundwater was likely due to sediments in the water column, and arsenic was thus eliminated as a contaminant of concern.

The two isolated locations with PCBs above 1 mg/kg and one location with arsenic at 170 mg/kg will be excavated and removed, an estimated 10 cubic yards.

2.7.9.15 Site 28 Drainage Basin

The Drainage Basin lies north of the Main Operations Complex and flows north into the Suqitughneq River. This site has been impacted by fuel releases from the bulk fuel storage tanks, other spills and releases. Surface water run-off and subsurface water seeps from the Main Operations Complex gravel pad drain into this tundra/wetland area.

Three discrete drainages originate from the Main Operations Complex gravel pad and contribute flow to the Drainage Basin. The eastern drainage flows from the area adjacent to Sites 10/11, the middle drainage originates from a culvert which directs flow from the Site 27 former diesel fuel pump island, and the western drainage is adjacent to Site 13. The eastern drainage is a vegetated area north of the former fuel tanks. Soil staining has been observed near the head of this drainage and downgradient of the tank footprints.

The middle drainage originates as a small swale south of the perimeter access road. Surface water runoff from the Main Operations Complex is routed under the road via a culvert to this swale. An area of ponded water periodically exists immediately north of the culvert outlet. Stained soils exist on the banks of this drainage swale. The area is generally heavily vegetated with grasses.

The western drainage originates from a manhole and small concrete supporting structure just north of the perimeter access road, which emptied into an artificially created swale. The manhole likely served as the drain for Building 110 Heat and Electric Power. The drainage swale is approximately 10 feet wide and 40 feet long. The presence of standing surface water is intermittent, depending on seasonal rainfall. Sediments in this area have been noted as stained dark brown and black, and produce a sheen when disturbed. Stained soils have also been observed along the drainage embankment. Grassy vegetation currently grows throughout the drainage.

The drainage basin has been investigated since 1994. Sediment, soil, surface water, and shallow groundwater samples have been collected and analyzed for various constituents. Sampling activities occurred in 1994, 1996, 1998, and 2001.

The primary contaminants of potential concern in sediment are chromium, lead, zinc, PCBs, PAHs, DRO, and RRO. The highest concentrations of these compounds are predominantly located upgradient and closest to the edge of the main complex. Figure 26 highlights the sampling locations with concentrations of DRO above the proposed cleanup level of 9,200 mg/kg. A summary of the maximum detected concentrations of all contaminants of concern in sediment is shown in Table 7. The extent of metal-contaminated sediments is limited to 2 discrete locations. The maximum concentrations of chromium, lead, and zinc were detected in 2001 in a single sample from the head of the western drainage, near the culvert. Zinc was also elevated at one location approximately 1,450 feet downstream.

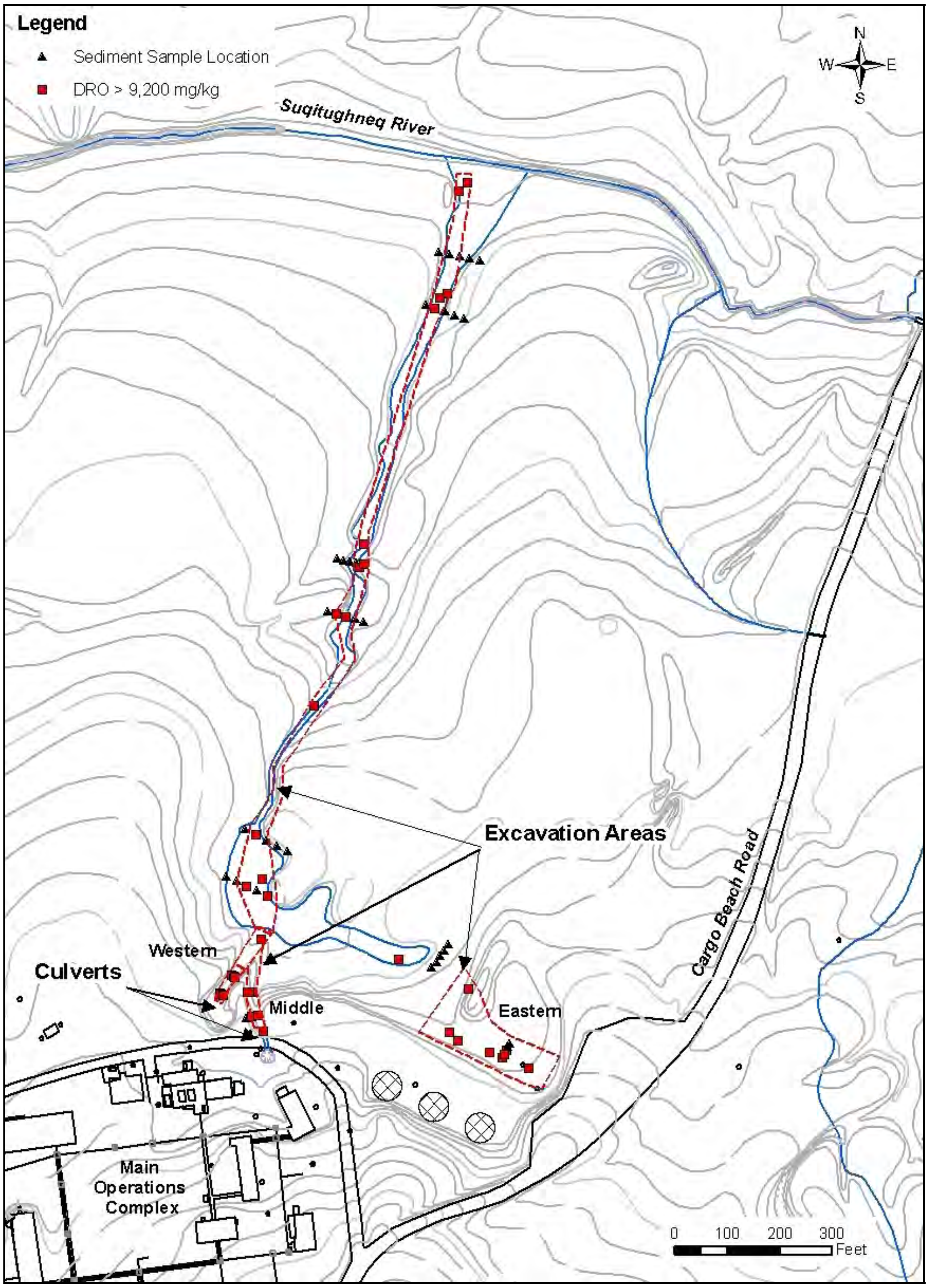

Figure 26 Site 28 Drainage Basin – Historical Sampling Locations

Surface water samples were collected in the drainage basin in 1994, 1996, and 2001. Concentrations of DRO, TRPH (total recoverable petroleum hydrocarbons), PCBs, and lead were elevated in 1994. Surface water samples were collected in 2001 and analyzed for DRO, RRO, and PCBs. The samples were not analyzed for lead. DRO was detected at concentrations ranging from 0.39 to 2.3 mg/L. PCBs and RRO were not detected.

The shallow groundwater was also investigated during the 1994 investigation. Two monitoring wells were installed within the eastern drainage of the drainage basin. The 1994 sampling results indicated the potential for DRO and lead contamination. Subsequent sampling in 2001 demonstrated the levels of DRO and lead were below groundwater cleanup levels. No contaminants of concern were retained for the shallow groundwater.

The most heavily contaminated areas of the drainage basin are found immediately below two culverts, located in the western and middle drainages. The highest concentrations of most contaminants of concern are located within this zone. The proposed approach includes excavation of an estimated 2,600 cubic yards of sediments to a depth of 1 to 2 feet, including a narrow channel (~4 feet wide) from the ponded area to the confluence with the Suqi River . The ends of the culverts would also be cleaned out and may be removed or plugged to prevent direct outflows of upgradient residual sources of contamination.

Table 7 Sediment Sampling Results – Site 28 Drainage Basin

COCs	Cleanup Level (mg/kg)	# Exceeds	Maximum (mg/kg)
Chromium [a]	270	1/85	**649**
Lead [a]	530	1/85	**4,590**
Zinc [a]	960	2/86	**4,810**
PCBs [a,b]	0.7	7/95	**5.4**
Methylnaphthalene, 2 [a]	0.6	52/88	**500**
Acenaphthene [a]	0.5	32/87	**14**
Fluoranthene [a]	2	5/88	**14**
Fluorene [a]	0.8	33/88	**20**
Naphthalene [a]	1.7	36/88	**220**
Phenanthrene [a]	4.8	9/88	**21**
DRO [c]	3,500	59/98	**150,000**
RRO [c]	3,500	13/82	**14,000**

Notes: [a] MacDonald et al, Consensus-based Probable Effects Concentration (PEC) (USEPA, 2002)
[b] Value shown is dry-weight basis, normalized for organic carbon content, assuming sediments contains 1% total organic carbon.
[c] protective of human health, future residents based on the incidental ingestion/dermal contact routes, exposure frequency 90 days/year, and a target HQ of 0.1

2.7.9.16 Site 31 White Alice Communications

The White Alice Complex is located southeast and uphill from the main operations complex in a glacial valley at the base of Mt. Kangukhsam. The site included four large billboard antennas, a central main electronics building, other supporting structures, and seven ASTs.

The antennas, buildings, and ASTs were demolished and removed during the 2003 field season. A total of 118 tons of PCB-contaminated soil was excavated south and west of the former Main Electronics Building (Bldg 1001) adjacent to a former transformer pad, and at the septic tank outfall during the 2005 field season. PCB-contaminated concrete (79 tons) was also removed from portions of the Building 1001 foundation.

Surface and subsurface soil samples have been collected to evaluate the extent of petroleum hydrocarbon contamination associated with former fuel tanks and piping, and the extent of PCB contamination near transformer pads and a septic outfall.

At the White Alice Complex, soil samples were collected in 2001, 2003, and 2004. Surface water samples were collected in 2001 and no contaminants of concern were identified. Soil samples were collected from beneath fuel pipelines, fuel tanks, and tank impoundments.

After final building demolition and debris removal activities, including removal of contaminated concrete and excavation of PCB-contaminated soils, additional soil confirmation samples were collected in 2005.

DRO was initially detected at concentrations ranging from 310 to 3,400 mg/kg near the ASTs and fuel tank impoundment during the 2001 field season.

During the 2003 removal action, soil samples were collected along the former fuel pipeline corridors. The sampling results indicated DRO at concentrations ranging from 42.9 to 5,400 mg/kg. RRO concentrations ranged from ND to 11,000 mg/kg at one location beneath a fuel tank valve.

Additional soil samples were collected in 2004. The sampling results indicated the maximum concentration of DRO was 1,280 mg/kg, and RRO was an estimated 474 mg/kg.

Surface and subsurface soil samples were also collected over several years to evaluate the extent of PCB contamination near transformer pads and a septic outfall. Additional soil confirmation samples were collected in 2005 after the removal of PCB-contaminated concrete and soils. Figure 27 shows the soil excavation and sampling locations at Site 31.

PCBs were identified at a possible sewage outfall and adjacent to the main electronics building transformer pad. In 2005, PCB-contaminated soils were excavated from three locations, the septic tank outfall (31C, 13 tons), west of the main electronics building (31B, 50 tons), and adjacent to the former transformer pad (31A-1,31A-2, 55 tons).

Soil confirmation samples from one of the three excavations indicate PCBs still remain at concentrations above 1 mg/kg adjacent to the former transformer pad only. PCBs remain in soils at concentrations ranging from 1.53 to 7.09 mg/kg. The two excavations at the septic tank outfall and west of the building successfully removed all PCB contamination to below 1 mg/kg.

An estimated 110 cubic yards of PCB-contaminated soils will be excavated and removed.

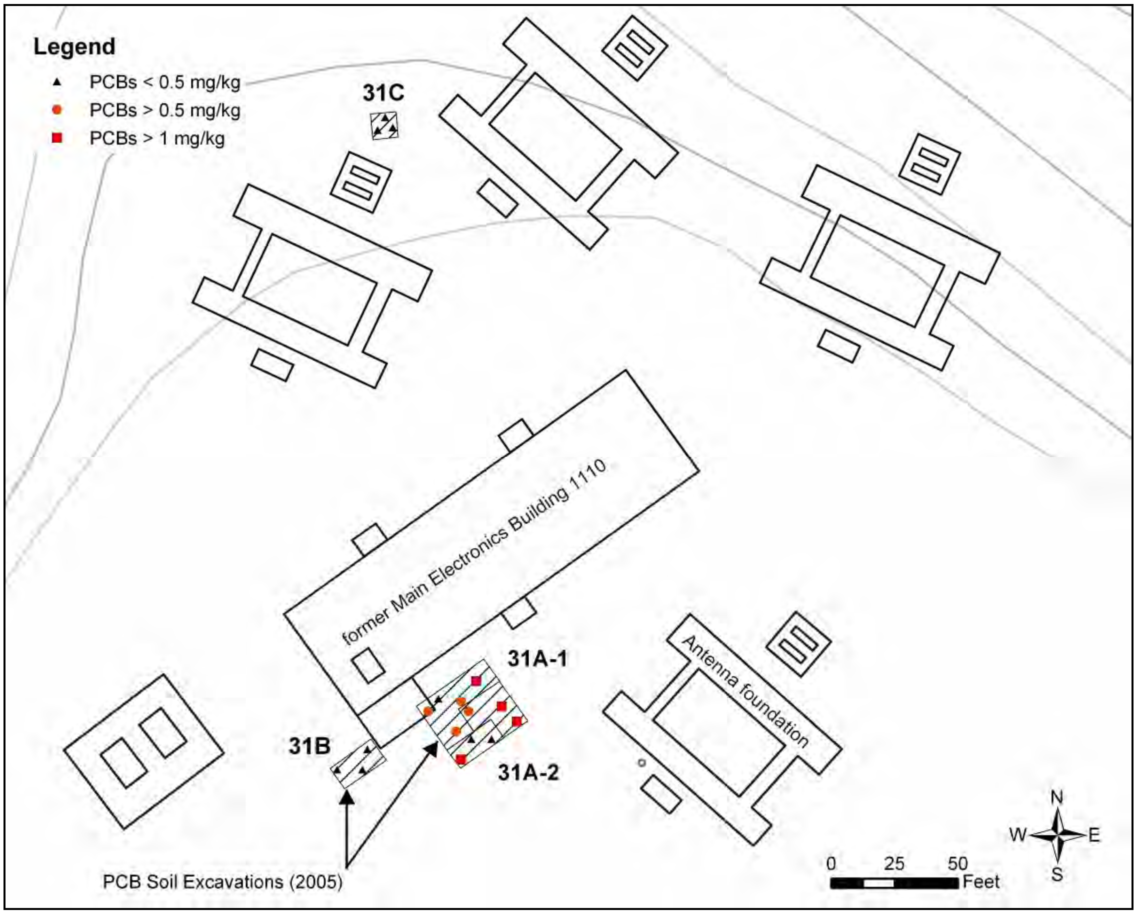

Figure 27. Site 31 White Alice Communications – Historical sampling locations and PCB excavations

2.7.9.17 Site 32 Lower Tram

The lower tram terminal (Site 32) was located south of the White Alice Site at the northern base of Mt. Kangukhsam. The site consisted of a tram terminal building, substation transformer bank, two ASTs, a water well and anchor pit for the aerial tram line. The buildings, ASTs, and tram structures were demolished and removed during the 2003 and 2005 field seasons.

Soil samples were collected during the 2001 investigation. The primary contaminant of concern is DRO. DRO concentrations ranged from 230 to 13,000 mg/kg. The highest results were associated with an area of heavy soil staining beneath the valve of the exterior AST. The anchor pit also contained DRO at a concentration of 11,000 mg/kg. RRO concentrations ranged from non-detect to 3,600 mg/kg.

Soil confirmation samples were collected in 2003 following the building demolition activities and removal of the AST outside the tram terminal building. DRO concentrations ranged from 1,150 to 10,400 mg/kg surrounding the former AST. DRO was also detected from 374 to 2,350 mg/kg in soils surrounding concrete transformer pad CTP-2. See Figure 28 for historical sampling locations. No other contaminants (BTEX, lead, PCBs, PAHs) were detected above screening levels. An estimated 15 cubic yards of POL-contaminated soils will be excavated and removed.

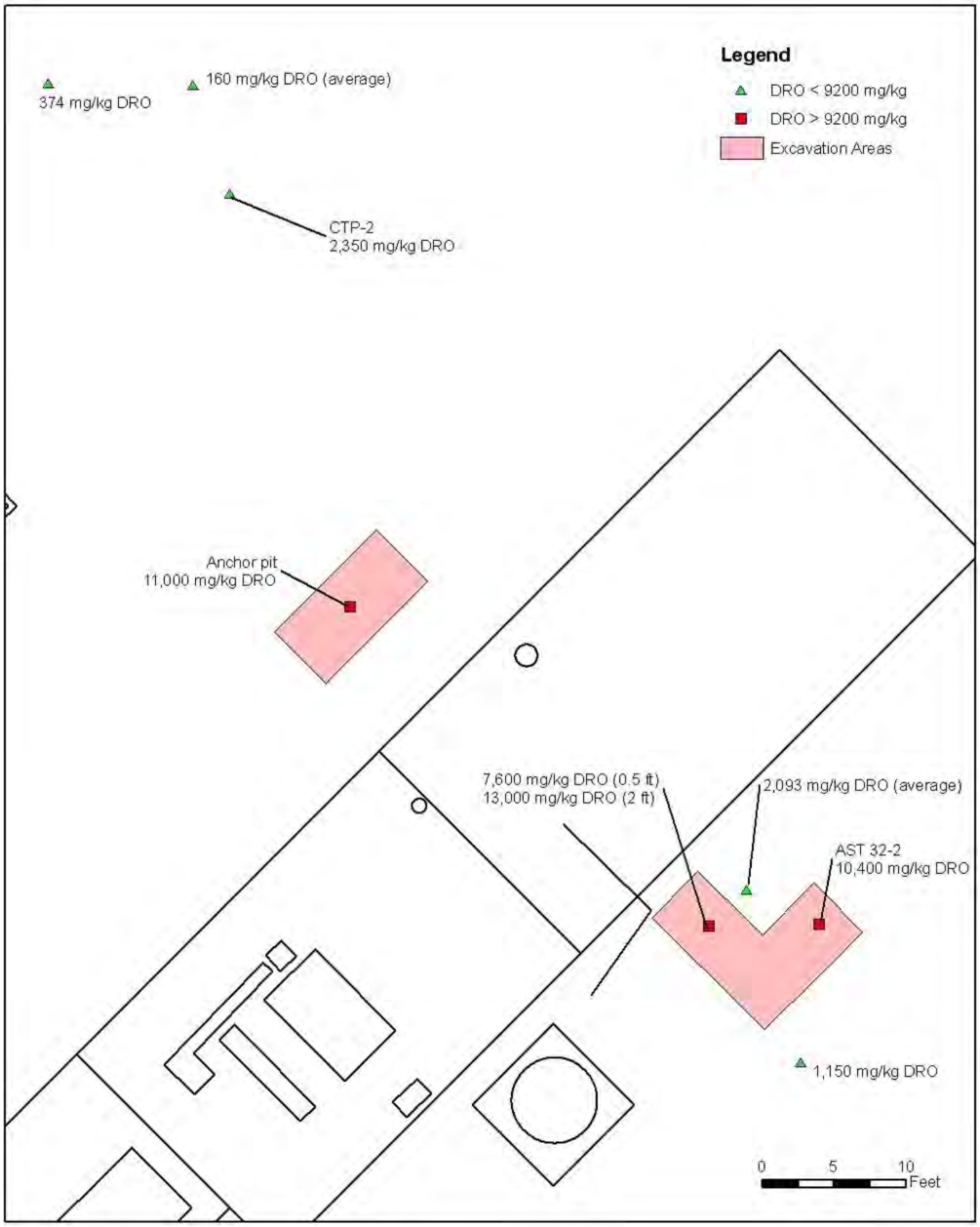

Figure 28 Site 32 Lower Tramway - Historical Sampling Locations

2.8 CURRENT AND POTENTIAL FUTURE LAND USES

St. Lawrence Island is owned jointly by two local native corporations, Kukulget, Inc., in Savoonga, Alaska, and Sivuqaq, Inc., in Gambell, Alaska. Non-Native land on St. Lawrence Island is limited to State land used for airstrips and related facilities in Gambell and Savoonga. The Native Village of Savoonga and the Native Village of Gambell are the federally recognized tribes in the vicinity. Savoonga and Gambell are inhabited primarily by Native St. Lawrence Island Yupik people, who lead a subsistence-based lifestyle.

Savoonga is located approximately 60 miles northwest of the former Northeast Cape Installation.

There are no roads connecting these locations and local residents travel via boat or all-terrain vehicle on beach trails to access the site. Savoonga has a population of 712 people according to the 2006 Alaska Department of Commerce, Community, and Economic Development. The population of Savoonga has been slowly increasing since 1990 (2 percent per year growth); this trend is expected to continue.

2.8.1 Land Use

Current land use at the Northeast Cape site is seasonal subsistence camps, recreational, and open space or undeveloped. The surrounding lands are primarily used for subsistence hunting and gathering. St. Lawrence Island residents harvest food from areas in and around the Northeast Cape Installation during the summer months (i.e., mid-June through mid-September), and others occasionally visit the area both in summer and winter. No people currently reside permanently at, or in the vicinity of, the former Northeast Cape Installation. Individuals from Savoonga and Gambell visit Northeast Cape during the year to engage in subsistence fishing, hunting, and gathering. Food harvests consist of fish, animals, and plants.

Future land use is anticipated to be residential with the immediate and surrounding areas used for recreation and subsistence hunting, fishing, or gathering. Local residents state that additional fishing/hunting camps may be built, and a permanent residential scenario is possible at some sites. In particular, representatives of the tribal government, the Native Village of Savoonga, desire to re-establish a permanent community at Northeast Cape in the future. The local residents assert the village is running out of space to build homes and strongly believe Northeast Cape is a desirable location for another village, especially since historically there was a village there and it was a prime hunting/gathering area for subsistence items. The area is not utilized as frequently anymore due to concerns over contamination. A future residential scenario was not considered for low lying wet tundra areas including the Drainage Basin and Suqi River (Sites 28 and 29) due to physical conditions that would limit future residential construction.

2.8.2 Hydrology and Groundwater Use

The hydrogeology of the Northeast Cape installation is influenced by many variables including fractured bedrock, depositional materials, manmade gravel pads, areas of permafrost, and saturated tundra. Groundwater moving through bedrock fractures is likely to be significant close to the mountains. Beyond the mountain front, shallower groundwater occurs in the depositional materials. These shallow waters are influenced by permafrost and active seasonal thawing. The shallow groundwater likely consists of percolated rainfall and seasonally-thawed water in the active layer of the shallow tundra soils. Shallow subsurface water has been observed perched on ice-rich frozen ground in boggy, tundra areas. There is a relatively shallow (2 to 4 feet) active layer due to the insulating effects of thick tundra vegetation and peat. In areas of thin soil and exposed cobbles and boulders, heat conduction is greater, the active layer appears to be significantly deeper, and permafrost may be discontinuous.

White Alice Site

Groundwater upgradient (south) of the main complex has not been impacted by operations of the former military facility. Granitic bedrock occurs shallower in drill holes the farther south they are drilled from the Main Complex area. Fractured bedrock may be the primary aquifer near the base of the Kinipulghat Mountains (e.g., between the White Alice complex and the Main Complex).

Main Complex

Several wells were installed during the 2004 field season to evaluate the groundwater at the Main Complex. Well data and drainage patterns in the MOC indicate that shallow subsurface water flows north and northwest toward the Suqitughneq River. The water table is about 12 feet deep in the contaminated area of the Main Operations Complex, becoming very shallow into the Drainage Basin wetlands to the north. Hydraulic conductivity (K) typically ranges between 0.12 and 24 feet/day, perhaps averaging 6 ft./day. The thickness of the water table in the Main Complex varies between 3 and 7 feet. The groundwater is slightly acidic (5.4 - 6.6).

Tundra Areas

The shallow groundwater in tundra areas is intermittent both spatially and temporally. Monitoring wells installed in tundra areas are extremely slow to recharge. The shallow groundwater is only available seasonally and during the summer months the quantity of water is unreliable and insufficient to support its use as a permanent potable water supply.

The shallow groundwater within specific areas of the Northeast Cape Installation is not a current or reasonably expected potential future drinking water source. These areas are characterized by low-lying tundra and include the vicinity of the Fuel Pumphouse at Cargo Beach (Sites 3, 4), and the Drum Field and Landfills (Sites 6, 7, 9), as shown on Figure 29. The polygons comprising each site are delineated by the coordinates in Table 8. The shallow groundwater is not consistently encountered, exists in insufficient quantities, and is of poor quality. The groundwater exposure pathway at these areas is incomplete because the shallow groundwater does not produce a sufficient quantity of water to be considered a reasonably expected potential future drinking water source.

Table 8 Non-Drinking Water Area Site Polygons

CORNER	SITE	X COORDINATE	Y COORDINATE
NE Corner	3/4	1815671.6059	3409754.3393
NW Corner	3/4	1815298.6637	3409897.7786
SE Corner	3/4	1815442.1030	3409226.9240
SW Corner	3/4	1815047.0933	3409383.6039
NE Corner	6/7	1814396.9151	3406834.2223
NW Corner	6/7	1813488.1144	3407359.2389
SE Corner	6/7	1813374.5143	3405296.0157
SW Corner	6/7	1812324.4811	3405971.4757
NE Corner	9	1811988.7300	3404301.2234
NW Corner	9	1811431.1158	3404472.3432
SE Corner	9	1811714.3484	3403513.4827
SW Corner	9	1811186.2376	3403755.4105

Notes: coordinates shown in Alaska State Plane, NAD83, Zone 9, feet

Figure 29 Northeast Cape – Locations of Areas Designated as Non-Drinking Water Sources

Drinking Water Sources

Four wells at the southeast portion of the Main Complex (Site 22) supplied the installation with potable drinking water during operation of the facility. These wells were pulled and decommissioned during previous remedial actions at the site in 2002. This area is absent of groundwater contamination and suitable for drinking water wells.

The Suqitughneq River may be used as a temporary or potential future drinking water source. The existing analytical results for surface water collected from the Suqitughneq River indicate contamination is below water quality standards. The indication is that contaminants in the shallow groundwater are not transported to the river in quantities sufficient to cause the river to exceed water cleanup levels.

A deeper aquifer may also be present beneath the Main Operations Complex and further to the north where it could be tapped as a potential source of drinking water. A map of test pits & future development from a series of installation planning drawings (USACE, 1950) indicated artesian conditions were encountered during drilling north of the Main Complex near the Suqitughneq River (DH-53). Permafrost may confine and isolate this suspected aquifer in the wetlands north of the Main Complex. Groundwater was identified here, above permafrost, during 2004 drilling efforts to duplicate the indicated artesian conditions. Deeper drilling at this location was aborted in 2004 due to fears that the permafrost might be permanently breached and an avenue might be opened to contaminate a deeper aquifer.

2.8.3 Surface Water Use

Local residents who utilize the subsistence fishing and hunting camp adjacent to Cargo Beach typically gather water from the surface waters of the Suqitughneq River, upstream of the intersection of the Airport and Cargo Beach Road. Surface water samples collected from the Suqitughneq River do not exhibit levels of contaminants above ADEC regulatory criteria.

2.9 SUMMARY OF SITE RISKS

A baseline risk evaluation estimates the risks posed by contaminants remaining at the site if no action were taken. It provides the basis for taking action and identifies the contaminants of concern and potential exposure pathways that need to be addressed by the selected remedial action. This section of the Decision Document summarizes the results of the baseline risk evaluation for Northeast Cape. An assessment of the risks to human health involves a four-step process: identification of contaminants of potential concern, an assessment of contaminant toxicity, an exposure assessment for the population at risk, and a quantitative characterization of the risk.

Contaminants of concern were identified during the Remedial Investigation by comparison to federal and state risk-based screening levels and cleanup criteria and site-specific background values for inorganics. Screening levels were based on the most stringent Alaska Department of Environmental Conservation (ADEC) soil and groundwater cleanup levels promulgated in 18 Alaska Administrative Code (AAC) 75.340 and 345. The cleanup levels established by the ADEC are based on an estimate of the reasonable maximum exposure expected to occur under current and future site conditions and are designed to be protective of human health and the environment.

The objective of an exposure assessment is to identify potential contaminant exposure scenarios by which the contaminants remaining in site media could be contacted by humans and to quantify the intensity and extent of that exposure. The assessment considers current and potential future uses of the site, potentially exposed populations, exposure pathways, and potential intake of each COC from each contributing medium for the population at risk. The potentially exposed populations identified included visitors, current seasonal subsistence users, and future permanent residents. Exposure point concentrations (EPCs) were estimated as either the maximum detected contaminant concentration or the 95 percent upper confidence limit (95% UCL) on the arithmetic mean concentration detected. If the calculated 95% UCL was greater than the maximum value, then the maximum value was assumed as the EPC; otherwise, the 95% UCL was used.

Toxicity information was provided in the risk assessment for the chemicals of potential concern (COPCs). In general, cancer risks are calculated using toxicity factors known as slope factors (SFs), while noncancer risks are assessed using reference doses (RfDs).

For carcinogens, risks are estimated as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the specific carcinogen. Excess lifetime cancer risk is calculated by multiplying the slope factor by the quantitative estimate of exposure, the "chronic daily intake." These risks are probabilities generally expressed in scientific notation (e.g., $1x10^{-6}$). For example, an excess lifetime cancer risk of $1x10^{-6}$ indicates that an individual has a one in a million (1:1,000,000) chance of developing cancer as a result of site-related exposure to a carcinogen under the specific exposure conditions assumed.

The potential for noncarcinogenic effects is evaluated by comparing an exposure level over a specified time period (30 years) with a reference dose derived for a similar exposure period. The ratio of exposure to toxicity is called a hazard quotient (HQ). Hazard quotients are calculated by dividing the exposure by the specific RfD. By adding the hazard quotients for all contaminants of concern that affect the same target organ (liver, nervous system, etc), the hazard index (HI) can be calculated.

2.9.1 Summary of Human Health Risk Evaluation

The Final Human Health and Ecological Risk Assessment (MWH, 2004) for the Northeast Cape installation evaluated the potential risks associated with exposure to soil, sediment, shallow subsurface water, groundwater, and subsistence food consumption. The risk assessment included incidental ingestion, dermal contact, and dust inhalation as components of the human exposure for soil. The ingestion of groundwater was evaluated directly and not with the modeled migration to groundwater pathway for soils. The risk assessment also evaluated the subsistence consumption of fish and plants harvested from impacted areas of the Northeast Cape site and from locations in the vicinity of the installation that are not impacted by site activities.

Under a future permanent resident scenario, complete exposure pathways include the incidental ingestion and contact with soils or sediment, dust inhalation, and ingestion or contact with surface or subsurface waters. Potential future human health risks depend upon the specific site inhabited and the source of potable water.

Potential sources of drinking water include shallow groundwater beneath the main complex, groundwater upgradient of the main complex, or fresh surface water obtained from the Suqitughneq River.

Subsistence food sources for future seasonal or permanent residents could include plants and fish collected from the site or surrounding locations. The consumption of fish collected from the Suqitughneq River as well as other nearby locations was further evaluated by the Agency for Toxic Substances and Disease Registry (ATSDR, 2005) and they concluded no adverse health effects are likely to result from ingestion of the subsistence-caught fish species.

The State of Alaska considers a cumulative cancer risk of 1×10^{-5} and noncancer HI of 1 as the point of departure for making risk management decisions concerning a site. Sites with soil-related carcinogenic risk or noncarcinogenic hazard estimates for future permanent residents in excess of the point of departure criteria include: Sites 1, 3, 6, 10, 11, 13, 15, 16, 19, 21, 27, 28, 31 and 32. The primary soil contaminants associated with risk or hazard estimates include arsenic, DRO, RRO, and PCBs (Aroclor-1260).

The risk assessment concluded that the shallow groundwater beneath the Main Operations Complex (Sites 10, 11, 13, 15, 16, 21 and 27) may pose a potential risk to future permanent residents if used as a drinking water supply. The contaminants of concern associated with cancer risk or non cancer hazard estimates in excess of ADEC's point of departure criteria include arsenic, benzene, DRO, GRO and RRO.

Contaminants of concern in sediment at the Site 28 Drainage Basin contributing to cumulative risk or hazard estimates in excess of risk criteria also include PAHs and PCBs.

2.9.2 Summary of Ecological Risk Evaluation

The potentially affected biological resources evaluated included vegetation, birds, fish, shellfish, terrestrial mammals, marine mammals, and special status species. The ecological risk evaluation focused on three selected indicator receptors, the tundra vole, cross fox, and glaucous-winged gull. These species were utilized in the risk characterization, which integrated exposure dose analysis and effect assessment and compared these values to ecological toxicity reference values to calculate a chemical-specific hazard quotient for each site.

Ecological hazard estimates were calculated for three ecological indicator receptors based on modeled exposure to chemicals in site soil, sediment, surface, or shallow subsurface water, as appropriate for a given site.

The ecological risk assessment indicated several sites may pose unacceptable risks to the environment. The ecological hazard estimates for the cross fox slightly exceeded ADEC's point of departure criterion of 1.0 for combined Sites 6 and 7 only. However, exceedence of the ADEC ecological criterion at this location was attributable to aluminum, which was present within the range of ambient concentrations. Ecological hazard estimates for the tundra vole exceeded ADEC's point of departure criterion for: Sites 6, 7, 21, 28, 31 and 32. The primary contaminants associated with ecological hazard estimates in excess of ADEC's point of departure criterion include DRO, PCBs (Aroclor 1254) and metals (e.g., aluminum, barium and zinc). Metals concentrations were within normal background ranges for the area.

Further evaluation of ecological risks indicates the potential for adverse environmental impacts to occur within the Site 28 Drainage Basin based on maximum PAH concentrations. The potential for ecological risks from petroleum hydrocarbon fractions is more difficult to quantify. Overall, the data indicate a low potential for adverse ecological effects to higher trophic level receptors based on the maximum sediment concentrations. Higher trophic level receptors do not spend as much time in one particular location, have a larger home range relative to the impacted area, and thus are not exposed for a long enough duration to predict potential impacts. Aquatic and terrestrial receptors may come into contact with surface water and sediment; however, the contaminated region is relatively small in comparison to the home ranges of the target terrestrial ecological receptor habitats. Comparisons of sediment contaminant concentrations to related benchmarks indicate that adverse effects to sediment-dwelling marine organisms are not expected.

2.9.3 Basis for Response Action

The investigations completed at the site verified that contaminated soil, sediment, and groundwater may present an unacceptable risk to human health. The response actions selected in this Decision Document are necessary to protect the public health from actual or threatened releases of hazardous substances into the environment.

2.10 REMEDIAL ACTION OBJECTIVES

The remedial goals of the DERP-FUDS Program are to reduce the risk resulting from past Department of Defense activities to safe levels, in a timely, cost-effective manner. Specific remediation alternatives were developed and evaluated for contaminants of concern (COCs) at the Northeast Cape site. The remedial action objectives (RAOs) are:

Site-wide

- Prevent current and future exposure to humans by ingestion, inhalation, and dermal contact with contaminated soils at levels above ARARs (for polychlorinated biphenyls) or pertinent risk-based standards for petroleum hydrocarbons.
- Prevent exposure to ecological receptors by direct contact with contaminated soils/sediment above risk-based cleanup levels
- Prevent ingestion of groundwater containing contaminants at levels above state drinking water standards and pertinent risk-based standards for petroleum hydrocarbons.

Main Complex Area

- Prevent ingestion of groundwater containing contaminants at levels above state drinking water standards and pertinent risk-based standards for petroleum hydrocarbons.
- Mitigate potential future risk to human health from the ingestion, inhalation, and dermal contact with soil exposure pathways. Meet risk-based cleanup levels in soils to a depth of 15 feet. Reduce concentrations of petroleum hydrocarbons and other contaminants to below pertinent risk-based standards.

Drainage Basin

- Mitigate potential future risk to human health from the ingestion, inhalation, and dermal contact with soil/sediment exposure pathways. Meet pertinent risk-based cleanup levels in sediments.
- Prevent migration of contaminants into the Suqitughneq River above risk-based cleanup levels.

The primary COCs for soil at Northeast Cape are polychlorinated biphenyls (PCBs), petroleum hydrocarbons and their constituents (diesel and residual range organics, benzene, naphthalene).

Chemical-specific applicable regulations for Northeast Cape include regulations promulgated by the State of Alaska in the Oil and Other Hazardous Substances Pollution Control Regulations, Title 18 Alaska Administrative Code, Chapter 75. Under these regulations, groundwater cleanup levels are specified in 18 AAC 75.345 Table C. The ADEC regulations also allow alternate cleanup levels for soil and sediment to be developed based on site-specific conditions or a risk assessment, following methods specified in 18 AAC 75.340. Alaska Statute (AS) 16.05.871(a) also requires notification of the Alaska Department of Fish and Game prior to initiating construction or use activities that affect an anadromous-fish bearing stream (e.g., the Suqitughneq River).

The cleanup levels for soil, sediment, groundwater, and surface water at Northeast Cape are discussed below. A secondary remedial action objective is to prevent migration of contaminants in soils to surrounding surface waters. Remedial actions will minimize impacts to sensitive areas (e.g., wetlands).

SOIL

Site-specific soil cleanup levels are protective of future permanent residents with an assumed lifetime exposure to contaminated soils through incidental ingestion (e.g., eating soil), inhalation (e.g., dust), or dermal (skin) contact. The soil cleanup level for arsenic is based on a site-specific background study which determined the 95% background upper tolerance limit for ambient or naturally occurring values. The soil cleanup levels for benzene, naphthalene, DRO, and RRO are based on a site-specific Human Health and Ecological Risk Assessment (MWH, 2004). These soil cleanup levels are protective of human health and the environment. The cleanup levels are listed in Table 9.

Table 9 Soil Cleanup Levels

Contaminant of Concern	Cleanup Level (mg/kg)
Arsenic	11 [a]
Benzene	2 [c]
Naphthalene	120 [c]
Polychlorinated Biphenyls (PCBs)	1 [b]
Diesel Range Organics (DRO)	9,200 [c]
Residual Range Organics (RRO)	9,200 [c]

[a] site-specific background level
[b] 18 AAC 75, Table B1, Over 40 inch Zone, direct contact pathway
[c] risk-based cleanup level derived from site-specific risk assessment, ingestion/inhalation pathways, future residential use.

GROUNDWATER

Groundwater cleanup levels apply to shallow groundwater in the vicinity of the Main Operations Complex only, as this location is considered a potential future drinking water source. The shallow groundwater at low-lying tundra areas of the Northeast Cape site (Sites 3, 4, 6, 7, and 9) is not a current or reasonably expected potential future drinking water source. The groundwater cleanup levels are shown in Table 10.

Table 10 Groundwater Cleanup Levels

Contaminant of Concern	Cleanup Level [a] (mg/L)	Contaminant of Concern	Cleanup Level [a] (mg/L)
Arsenic	0.01	Diesel Range Organics (DRO)	1.5
Lead	0.015	Gasoline Range Organics (GRO)	1.3
Benzene	0.005	Residual Range Organics (RRO)	1.1
Ethylbenzene	0.7		

Notes: [a] Table C of 18 AAC 75.345 (as revised 9 October 2008)

SURFACE WATER

Surface water cleanup levels are the same as the Main Complex groundwater cleanup levels, assuming the water is used as a drinking water source. In addition, surface water must meet water quality standards as promulgated by the State of Alaska in 18 AAC 70. The water quality criteria for petroleum hydrocarbons, oil, and grease are set out in regulation at 18 AAC 70.020(b) and stipulate these compounds may not cause a visible sheen upon the surface of the water. In addition, the regulations contain surface water quality levels of 0.010 milligrams per Liter (mg/L) total aromatic hydrocarbons (TAH) and 0.015 mg/L total aqueous hydrocarbons (TAqH). TAH is the sum of concentrations of benzene, toluene, ethylbenzene, and xylenes, commonly called BTEX. TAqH is the sum of concentrations of TAH (BTEX) plus the polycyclic aromatic hydrocarbons (PAH).

SEDIMENT

Sediment cleanup levels are only applicable to continuously submerged sediments. Several areas at Northeast Cape contain predominantly continuously submerged sediments, including the Suqitughneq River and Estuary (Site 29), portions of the Drainage Basin (Site 28), and the Pipeline Break (Site 8). Sediments that are intermittently submerged (i.e., ephemeral ponds, wet tundra) are considered soil.

The cleanup levels for continuously submerged sediments are shown in Table 11. The sediment cleanup levels are risk-based numbers protective of biological resources (including acute and chronic effects) and represent no significant health risk to humans.

Table 11 Sediment Cleanup Levels

Contaminant of Concern	Cleanup Level (mg/kg)	Contaminant of Concern	Cleanup Level (mg/kg)
2 –methylnaphthalene [a]	0.6	PCBs [a,b]	0.7
Acenaphthene [a]	0.5	Chromium [a]	270
Benzo(g,h,i)perylene [b]	1.7	Lead [a]	530
Fluoranthene [b]	2.0	Zinc [a]	960
Fluorene [a]	0.8	DRO [c]	3,500
Indeno(1,2,3-cd)pyrene [b]	3.2	RRO [c]	3,500
Naphthalene [a]	1.7		
Phenanthrene [a]	4.8		
Total LPAH [a]	7.8		
Total HPAH [a]	9.6		

Notes: [a] MacDonald et al, Consensus-based Probable Effects Concentration (PEC) (USEPA, 2002)
[b] Value shown is dry-weight basis, normalized for organic carbon content, assuming sediments contains 1% total organic carbon.
[c] protective of human health, future residents based on the incidental ingestion/ dermal contact routes, exposure frequency 90 days/year, and a target HQ of 0.1
HPAH – high molecular weight PAHs
LPAH – low molecular weight PAHs

2.11 DESCRIPTION OF ALTERNATIVES

The Corps of Engineers considered the following remedial alternatives for each applicable site or group of sites:

2.11.1 Alternative 1 - No Further Action

No further action (NFA) is the appropriate response action when no additional remedial actions are necessary to protect human health and the environment, based on established cleanup levels and regulatory standards. NFA is required to be used as a baseline to compare all other responses.

2.11.2 Alternative 2 - Land Use Controls

Land use controls make use of restrictions to minimize exposure to contaminants at a site. The restrictions can be physical, such as erecting a fence, or take the form of land management practices, such as requiring special building permits or not allowing new wells in a particular area.

2.11.3 Alternative 3 - Natural Attenuation

Natural subsurface processes are allowed to continue to reduce contaminant concentration to acceptable levels. Natural attenuation can significantly limit the migration of contaminants resulting from releases of petroleum hydrocarbons. Biodegradation by indigenous subsurface microorganisms appears to be one of the primary mechanisms for natural attenuation.

2.11.4 Alternative 4 - Long Term Monitoring

Soil and/or water samples are collected from impacted sites and analyzed for the contaminants of concern on an established time schedule. Analytical results are used to evaluate the contaminant degradation or check on the mobility.

2.11.5 Alternative 5 - Landfarming

Landfarming aerates contaminated soil, sediment, or sludge by placing the excavated soil into lined beds, and periodically turning or tilling the soil. Soil conditions are often controlled to optimize the rate of contaminant degradation. Conditions normally controlled include: moisture content (usually by irrigation or spraying), aeration (by tilling and mixing), pH (buffered near neutral pH by adding crushed limestone or agricultural lime), and other amendments (e.g., soil bulking agents, nutrients, etc.)

Contaminated media is usually treated in lifts that are up to 18 inches thick. When the desired level of treatment is achieved, the lift is removed and a new lift is constructed. The site would be managed properly to prevent both on-site and off-site problems with ground water, surface water, air, or food chain contamination. Adequate monitoring and environmental safeguards would be required.

2.11.6 Alternative 6 - Phytoremediation

Phytoremediation is a process that uses plants to remove, transfer, stabilize, and destroy contaminants in soil, sludge, sediment, and groundwater. Growing and, in some cases, harvesting plants grown on contaminated soil is a remediation method that can be used to clean sites with shallow contamination. Phytoremediation of deeper soils may be performed by excavation and building phytoremediation cells. Phytoremediation may be applicable for the remediation of metals, pesticides, solvents, petroleum products, PAHs, and landfill leachates. The effectiveness of phytoremediation depends on the chemical nature of the contaminants

Microbial communities in the rhizosphere (e.g., plant root system) can biodegrade a wide variety of organic contaminants. Arctared fescue and annual ryegrass planted together in soil containing crude oil or diesel fuels have been shown to reduce the concentration of petroleum hydrocarbons in soils. Benefits of phytoremediation include limited environmental disturbance and lower costs. Phytoremediation is particularly well-suited to treatment of large areas of surface contamination. Phytoremediation is slower than ex situ methods, typically requiring several seasons for site clean-up. The time required to achieve clean-up standards may be particularly long for hydrophobic pollutants that are tightly bound to soil particles.

2.11.7 Alternative 7 - Thermal Treatment

Thermal processes use heat to increase the volatility (separation); burn, decompose, destruct; or melt the contaminants. Separation technologies include thermal desorption and hot gas decontamination. Destruction technologies include incineration, and pyrolysis. Vitrification immobilizes inorganics and destroys some organics. Thermal treatments offer quick cleanup times but are typically the most costly treatment group. These treatments are typically done in ex situ applications; in-situ applications are more costly. Cost is driven by energy and equipment costs and is both capital and operations and maintenance (O&M) intensive.

The main advantage of ex situ treatments is that they generally require shorter time periods, and there is more certainty about the uniformity of treatment because of the ability to screen, homogenize, and continuously mix the soils. Ex situ processes, however, require excavation of soils leading to increased costs and engineering for equipment, possible permitting, and materials handling worker safety issues.

2.11.8 Alternative 8 – Excavation/Offsite Treatment/Disposal

Excavation using conventional earthmoving equipment is the common method of extracting contaminated soil at and below the ground surface. Excavation methods are typically not affected by waste types or technical requirements at sites.

2.11.9 Alternative 9 - Chemical Oxidation

Chemical oxidation is an in-situ treatment process for either soil and/or groundwater. This option chemically converts hazardous contaminants to non-hazardous or less toxic compounds that are more stable, less mobile, and/or inert. The oxidizing agents most commonly used are ozone, hydrogen peroxide, hypochlorites, chlorine, and chlorine dioxide. The chemical oxidants most commonly employed include peroxide, ozone, and permanganate. These oxidants have been able to cause the rapid and complete chemical destruction of many toxic organic chemicals; other organics are amenable to partial degradation as an aid to subsequent bioremediation. Field applications have clearly affirmed that matching the oxidant and in situ delivery system to the contaminants of concern and the site conditions is the key to successful implementation and achieving performance goals.

2.11.10 Alternative 10 - Reactive Walls

A permeable reactive wall is installed across the flow path of a contaminant plume, allowing the water portion of the plume to passively move through the wall. These barriers allow the passage of water while prohibiting the movement of contaminants by employing such agents as zero-valent metals, chelators (ligands selected for their specificity for a given metal), sorbents, microbes, and others.

The contaminants will either be degraded or retained in a concentrated form by the barrier material. The wall could provide permanent containment for relatively benign residues or provide a decreased volume of the more toxic contaminants for subsequent treatment. Passive treatment walls are generally intended for long-term operation to control migration of contaminants in ground water. Target contaminant groups for passive treatment walls are VOCs, semi-volatile organic carbons (SVOCs), and inorganics. The technology may be less effective in treating some fuel hydrocarbons.

2.11.11 Alternative 11 - Capping

Capping provides containment by minimizing vertical movement of contamination and reducing the likelihood of human and animal contact with contamination. Capping consists of covering the contaminated area with a low-permeability cover to prevent the infiltration of surface water, a drain layer above the cap to direct precipitation, and a vegetative covering that prevents erosion and restores the area's native vegetation.

2.11.12 Alternative 12 - Reactive Matting

A reactive core mat is an aqueous permeable composite of geotextiles and reactive core materials that adsorb oils and similar organics, heavy metals, and other inorganic materials from water and contaminated sediment.

2.11.13 Alternative 13 - Constructed Wetlands

The constructed wetlands-based treatment technology uses natural geochemical and biological processes inherent in an artificial wetland ecosystem to accumulate and remove metals, explosives, and other contaminants from influent waters. The process can use a filtration or degradation process. Although the technology incorporates principal components of wetland ecosystems; including organic soils, microbial fauna, algae, and vascular plants; microbial activity is responsible for most of the remediation.

Influent waters with high metal concentrations and low pH flow through the aerobic and anaerobic zones of the wetland ecosystem. Metals are removed through ion exchange, adsorption, absorption, and precipitation with geochemical and microbial oxidation and reduction. Ion exchange occurs as metals in the water contact humic or other organic substances in the wetland. Wetlands constructed for this purpose often have little or no soil instead they have straw, manure or compost. Oxidation and reduction reactions catalyzed by bacteria that occur in the aerobic and anaerobic zones, respectively, play a major role in precipitating metals as hydroxides and sulfides. Precipitated and adsorbed metals settle in quiescent ponds or are filtered out as water percolates through the medium or the plants.

Influent water with contaminants flows through and beneath the gravel surface of a gravel-based wetland. The wetland, using emergent plants, is a coupled anaerobic-aerobic system. The anaerobic cell uses plants in concert with natural microbes to degrade the contaminant. The aerobic, also known as the reciprocating cell, further improves water quality through continued exposure to the plants and the movement of water between cell compartments. Wetland treatment is a long-term technology intended to operate continuously for years.

2.12 COMPARATIVE ANALYSIS OF ALTERNATIVES

The Feasibility Study provided a detailed analysis of the various site-specific alternatives considered including: natural attenuation, phytoremediation, landfarming, thermal treatment, in-situ chemical oxidation, reactive barriers, and/or excavation with off-site disposal.

The Corps of Engineers evaluated the remedial alternatives based on the nine evaluation criteria established under CERCLA. Each alternative must meet the threshold criteria of overall protection of human health and the environment and compliance with ARARs (for CERCLA-regulated compounds only) or pertinent risk-based standards (for petroleum hydrocarbons). Five balancing criteria are used to analyze the alternatives: long-term effectiveness and permanence, reduction in toxicity, mobility, or volume through treatment, short-term effectiveness, implementability, and cost. Two additional modifying criteria, state acceptance and community acceptance, are evaluated based on public comments on the Proposed Plan.

2.12.1 Overall Protection of Human Health and the Environment

This criterion addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, and/or informational land use controls.

<u>No Further Action (Sites 2, 4, 5, 12, 14, 17, 18, 20, 22, 23, 24, 25, 26, 29, 33, and 34)</u>
Alternative 1 No Further Action is protective of human health and the environment and complies with ARARs (for CERCLA-regulated compounds only) or pertinent risk-based standards (for petroleum hydrocarbons).

<u>Petroleum-Contaminated Soils (Sites 1, 3, 6, Main Operations Complex, and 32)</u>
Alternative 1 (NFA) would not reduce the chemical risk posed to human health and the environment since no actions would be taken to address the petroleum hydrocarbon or arsenic contaminated soils.

Alternative 2 (LUCs) is protective of current and potential future users, by preventing access and exposure to contaminated soils. Alternatives 3 and 4 (Natural Attenuation, LTM) are protective of current visitors, but less protective in the near term of future permanent residents, unless interim administrative controls are implemented to prevent exposure until cleanup levels are achieved in the long term. Alternatives 5, 6, 7 (Landfarming, Phytoremediation, Thermal Treatment) are protective of current and future receptors exposed to petroleum hydrocarbons by treating soil to below the soil cleanup levels. Alternative 8 (Excavation/Offsite Disposal) is protective of current and future receptors and reduces risk by removal of the contaminated soils to below the soil cleanup levels. Alternative 9 (Chemical Oxidation) is protective of current and future receptors and reduces risks by treatment of contaminated soils.

PCB-Contaminated Soils (Sites 13, 16, 21, and 31)
Alternative 1 (NFA) would not provide overall protection of human health and the environment since no actions would be taken to address the PCB-contaminated soils.

Alternative 2 (LUCs) is protective of current and potential future users, by preventing access and exposure to contaminated soils. Alternative 11 (Capping) would reduce risks to human health and the environment by preventing exposure to the contaminated soils.

Alternative 8 (Excavation/Offsite Disposal) reduces risk by removal of the contaminated soils to below the applicable cleanup level and provides the greatest degree of protection for future receptors because the contaminants would be treated and/or disposed off-site.

Sediments (Site 8)
Alternative 1 (NFA) would not reduce the chemical risk posed to human health and the environment since no actions would be taken to address the petroleum-contaminated sediments.

Alternative 2 (LUCs) is protective of current and potential future users, by preventing access and exposure to the contaminated sediments. Alternatives 3 and 4 (Natural Attenuation, LTM) are protective of current visitors, but less protective in the near term of future permanent residents, unless interim administrative controls are implemented to prevent exposure until cleanup levels are achieved in the long term. Alternatives 5 and 6 (Landfarming, Phytoremediation) are protective of current and future receptors exposed to petroleum hydrocarbons over the long term. Alternative 8 (Excavation/Offsite Disposal) reduces risk by removal of the contaminated sediments to below the applicable cleanup levels in the short term. Alternative 12 (Reactive Matting) is protective by controlling exposure to the contaminated sediments.

Sediments (Site 28)
Alternative 1 (NFA) would not reduce the chemical risk posed to human health and the environment since no actions would be taken to address the petroleum and PCB-contaminated sediments.

Alternative 2 (LUCs) is protective of current and potential future users, by preventing access and exposure to the contaminated sediments. Alternatives 3 and 4 (Natural Attenuation, LTM) are protective of current visitors, but less protective in the near term of future permanent residents, unless interim administrative controls are implemented to prevent exposure until cleanup levels are achieved in the long term. Alternatives 5 and 6 (Landfarming, Phytoremediation) are protective of current and future receptors exposed to petroleum hydrocarbons over the long term. Alternative 8 (Excavation/Offsite Disposal) reduces risk by removal of the contaminated sediments to below the applicable cleanup levels. Alternative 12 (Reactive Matting) is protective by controlling exposure to the contaminated sediments. Alternative 13 (Constructed Wetlands) is protective by preventing impacts to the Suqitughneq River but does not reduce risks in the short term.

Groundwater (Main Operations Complex)
Alternative 1 (NFA) would not reduce potential future risks posed to human health and the environment since no actions would be taken to address the petroleum hydrocarbon contaminated groundwater at the Main Operations Complex. The shallow groundwater may pose a potential risk if used for drinking water purposes by future seasonal or permanent residents. The groundwater is not currently used by site visitors or seasonal residents.

Alternative 2 (LUCs) is protective of current and potential future users, by preventing installation of wells or use of the groundwater as a drinking water source. Alternatives 3 and 4 (Natural Attenuation, LTM) are protective of current visitors, but less protective in the near term of future permanent residents, unless interim administrative controls are implemented to prevent exposure until cleanup levels are achieved. Natural attenuation processes would reduce risks to human health and the environment over the long term.

Alternatives 5, 6, 7, and 8 (Landfarming, Phytoremediation, Thermal Treatment, Excavation/ Offsite Disposal) would remove the major source of groundwater contaminants by removal /treatment of contaminated soils. Soil removal would not address the existing groundwater contamination in the short term.

Alternative 9 (Chemical Oxidation) is protective of human health and the environment and reduces risk by treatment of contaminated groundwater and soils. Alternative 10 (Reactive Walls) reduces risks to human health and the environment by treatment of the contaminated groundwater.

Housing and Operations Landfill (Site 9)
Alternative 1 (NFA) would not reduce potential future risks posed to human health and the environment since no actions would be taken to provide information to the public about the remaining debris.

Alternative 2 (LUCs) is protective of current and potential future users, by informing the landowners that future excavation or building construction is not recommended in the immediate vicinity of the buried debris. Land use controls provide an effective means of limiting access and exposure to the buried landfill materials. Alternative 3 (Natural Attenuation) meets the remedial action objectives. Natural attenuation processes would continue to reduce risks to human health and the environment over the long term. Alternative 4 (LTM) is protective of human health and the environment by ensuring shallow groundwater does not impact adjacent surface waters.

Alternative 8 (Excavation/Offsite Disposal) is protective of human health and the environment by removing potential future sources of contamination. Alternative 11 (Capping) is protective of human health and the environment.

2.12.2 Compliance with Applicable or Relevant and Appropriate Requirements

This criterion addressed whether each alternative meets the action-specific, chemical-specific, and location-specific ARARs (for CERCLA-regulated compounds only) at the site. POLs are not regulated under CERCLA. Therefore, CERCLA requirements as well as state legal authorities are not considered ARARs with respect to the response action for POL. Pertinent risk-based standards for petroleum hydrocarbons may be met incidental to the CERCLA cleanup action, however they are not evaluated in this section. Site-specific cleanup levels for petroleum hydrocarbons are discussed under the Remedial Action Objectives in Section 2.10.

No Further Action (Sites 2, 4, 5, 12, 14, 17, 18, 20, 22, 23, 24, 25, 26, 29, 33, and 34)
Alternative 1 No Further Action complies with ARARs (for CERCLA-regulated compounds only).

Petroleum-Contaminated Soils (Sites 1, 3, 6, Main Operations Complex, and 32)
Alternative 1 (NFA) does not comply with ARARs for metal contaminated soils. Alternative 2 (LUCs) generally complies with ARARs for metal contaminated soils. Alternatives 3 and 4 (Natural Attenuation, LTM) may meet ARARs over the long term. Alternatives 5, 6, 7 (Landfarming, Phytoremediation, Thermal Treatment) complies with ARARs over the long term. Alternative 8 (Excavation/Offsite Disposal) meets the ARARs and provides the greatest degree of protection for future receptors because the contaminants would be treated and/or disposed off-site. Alternative 9 (Chemical Oxidation) may comply with ARARs by treatment of contaminated soils.

PCB-Contaminated Soils (Sites 13, 16, 21, and 31)
Alternatives 1 and 2 (NFA, LUCs) do not comply with the state or federal cleanup level for PCB-contaminated soils. Alternative 11 (Capping) complies with ARARs, if implemented in conjunction with appropriate land use controls. Alternative 8 (Excavation/Offsite Disposal) meets the applicable PCB cleanup level and provides the greatest degree of protection for future receptors because the contaminants would be treated and/or disposed off-site.

Sediments (Site 8)
All Alternatives comply with ARARs for CERLCA-regulated compounds at this site.

Sediments (Site 28)
Alternative 1 (NFA) does not comply with ARARs since no actions would be taken to address the PCB-contaminated sediments.

Alternative 2 (LUCs) does not comply with ARARs for PCBs. Alternatives 3 and 4 (Natural Attenuation, LTM) may comply with ARARs over time. Alternatives 5 and 6 (Landfarming, Phytoremediation) will comply with ARARs over the long term. Alternative 8 (Excavation/Offsite Disposal) complies with ARARs in the short term. Alternative 12 (Reactive Matting) complies with ARARs by eliminating exposure pathways. Alternative 13 (Constructed Wetlands) may comply with ARARs over time.

Groundwater (Main Operations Complex)
Alternative 1 (NFA) does not comply with ARARs. Alternative 2 (LUCs) does not comply with ARARs but prevents exposure to drinking water. Alternatives 3 and 4 (Natural Attenuation, LTM) should comply with ARARs over time.

Alternatives 5, 6, 7 (Landfarming, Phytoremediation, Excavation/Treatment) do not comply with ARARs in the short term, but could be achieved in the long term in combination with natural attenuation processes.

Alternative 9 (Chemical Oxidation) complies with ARARs over time. Alternative 10 (Reactive Walls) complies with ARARs downgradient of the Main Complex.

Housing and Operations Landfill (Site 9)
Alternative 1 (NFA) complies with ARARs. Alternative 2 (LUCs) prevents exposure to buried debris, but does not comply with ADEC solid waste regulations regarding closure of unpermitted dump sites. Alternatives 3 and 4 (Natural Attenuation, LTM) comply with ARARs over time. Alternative 8 (Excavation/Offsite Disposal) removes the potential future source of contaminants and complies with ARARs. Alternative 11 (Capping) complies with ARARs and prevents exposure to buried debris.

2.12.3 Long-Term Effectiveness and Permanence

The evaluation of alternatives under this criterion addresses the results of a remedial action in terms of the risk remaining at the site after response objectives have been met.

Petroleum-Contaminated Soils (Sites 1, 3, 6, Main Operations Complex, and 32)
Long-term effectiveness and permanence at the site would be greatest for Alternative 8 (Excavation/Offsite Disposal). Alternative 2 (LUCs) have lesser long term effectiveness, since the ability of the landowners to continue implementation of community education and building restrictions is uncertain. Alternatives 3 and 4 (Natural Attenuation, LTM) have medium/high long-term effectiveness. Alternatives 5 and 6 (Landfarming, Phytoremediation,) have medium/high long term effectiveness, but may be dependant on site-specific conditions. Alternative 7 (Thermal Treatment) has higher permanence because the contaminated soils can be used as fill at the site. Alternatives 8 and 9 (Excavation/Offsite Disposal, Chemical Oxidation) have the greatest long term effectiveness because the source of contamination is removed or treated.

PCB-Contaminated Soils (Sites 13, 16, 21, and 31)
Alternative 2 (LUCs) has some long term effectiveness, but depends on site conditions and ability of the landowner to maintain effective communication/education. Alternative 11 (Capping) has relatively high long term effectiveness but would require occasional maintenance of the cap. Alternative 8 (Excavation/Offsite Disposal) has the highest degree of long term effectiveness because the contaminants would be treated and/or disposed off-site.

Sediments (Site 8)
Alternative 2 (LUCs) can be effective over the long term, but are dependant on site conditions and the ability of the landowner to maintain effective communication/education. Alternatives 3 and 4 (Natural Attenuation, LTM) can be effective over the long term for petroleum hydrocarbons. Alternatives 5 and 6 (Landfarming, Phytoremediation) are slightly more effective over the long term because active measures are utilized to promote achievement of the cleanup levels. Alternative 8 (Excavation/Offsite Disposal) has the highest long term effectiveness because contaminants are removed immediately and disposed offsite. Alternative 12 (Reactive Matting) has slightly lower long term effectiveness because the ability of the matting to withstand arctic conditions is unknown.

Sediments (Site 28)

Alternative 2 (LUCs) can be effective over the long term, but are dependant on site conditions and the ability of the landowner to maintain effective communication/education. Alternatives 3 and 4 (Natural Attenuation, LTM) can be effective over the long term for petroleum hydrocarbons, but are not effective for PCBs. Alternatives 5 and 6 (Landfarming, Phytoremediation) are slightly more effective over the long term because active measures are utilized to promote achievement of the cleanup levels. Alternative 8 (Excavation/Offsite Disposal) has the highest long term effectiveness because contaminants are removed immediately and disposed offsite. Alternative 12 (Reactive Matting) has slightly lower long term effectiveness because the ability of the matting to withstand arctic conditions is unknown. Alternative 13 (Constructed Wetlands) has slightly lower long term effectiveness because periodic maintenance or removal of accumulated materials may be required.

Groundwater (Main Operations Complex)
Long-term effectiveness and permanence at the site would be greatest for Alternatives 8 and 9 (Excavation/Offsite Disposal, Chemical Oxidation) because the source of contamination is removed or treated. Alternative 2 (LUCs) have lesser long term effectiveness, since the ability of the landowners to continue implementation of community education and drinking water restrictions is uncertain. Alternatives 3 and 4 (Natural Attenuation, LTM) have medium/high long-term effectiveness. Alternatives 5 and 6 (Landfarming, Phytoremediation,) have medium/high long term effectiveness, but may be dependant on site-specific conditions. Alternative 7 (Thermal Treatment) has higher permanence because the contaminated soils can be used as fill at the site.

Housing and Operations Landfill (Site 9)
Alternative 2 (LUCs) has some long term effectiveness, but depends on site conditions and ability of the landowner to maintain effective communication/education. Alternatives 3 and 4 (Natural Attenuation, LTM) have medium/high long-term effectiveness. Alternative 11 (Capping) has relatively high long term effectiveness but may require occasional maintenance of the cap. Alternative 8 (Excavation/Offsite Disposal) has the highest degree of long term effectiveness because the buried debris and potential contaminants would be treated and/or disposed off-site.

2.12.4 Reduction in Toxicity, Mobility, and Volume through Treatment

This evaluation focuses on the ability of the remedial alternatives to reduce the toxicity, mobility, or volume of contaminants.

Petroleum-Contaminated Soils (Sites 1, 3, 6, Main Operations Complex, and 32)
Reduction in toxicity, mobility and volume through treatment would be greatest for Alternatives 7, 8 and 9 (Thermal Treatment, Excavation/Offsite Disposal, Chemical Oxidation). Excavated soil will be processed onsite to reduce concentrations of petroleum quicker in the soil matrix under Alternatives 5 and 6 (Landfarming, Phytoremediation). Alternatives 2, 3, and 4 (LUCs, Natural Attenuation, LTM) will achieve the slowest reduction in contamination through natural attenuation processes.

PCB-Contaminated Soils (Sites 13, 16, 21, and 31)
Alternative 8 (Excavation/Offsite Disposal) has the highest degree of reduction in toxicity, mobility, and volume of contamination because the contaminants would be treated and/or disposed off-site. Alternative 11 (Capping) reduces the mobility of the contaminants by preventing water

infiltration but does not affect the toxicity. Alternative 2 (LUCs) does not reduce the toxicity, mobility, or volume of PCB-contaminated soils.

Sediments (Site 8)

Alternative 8 (Excavation/Offsite Disposal) has the highest reduction in toxicity, mobility, and volume of contamination because sediments will be removed and disposed offsite. Alternatives 5 and 6 (Landfarming, Phytoremediation) also reduce the toxicity, mobility, and volume of contaminants by using active measures to promote breakdown of the contaminants. Alternatives 3 and 4 (Natural Attenuation, LTM) also reduce the toxicity for petroleum hydrocarbons over time. Alternative 2 (LUCs) does not reduce the toxicity, mobility, or volume of contaminated sediments. Alternative 12 (Reactive Matting) reduces the mobility of contaminated sediments and toxicity of the sediment pore water by filtration, but does not reduce the overall toxicity of the underlying materials.

Sediments (Site 28)

Alternative 8 (Excavation/Offsite Disposal) has the highest reduction in toxicity, mobility, and volume of contamination because sediments will be removed and disposed offsite. Alternatives 5 and 6 (Landfarming, Phytoremediation) also reduce the toxicity, mobility, and volume of contaminants by using active measures to promote breakdown of the contaminants. Alternatives 3 and 4 (Natural Attenuation, LTM) have some reduction of toxicity for petroleum hydrocarbons, but are less effective for PCBs. Alternative 2 (LUCs) does not reduce the toxicity, mobility, or volume of contaminated sediments. Alternative 12 (Reactive Matting) reduces the mobility of contaminated sediments and toxicity of the sediment pore water by filtration, but does not reduce the overall toxicity of the underlying materials. Alternative 13 (Constructed Wetlands) reduces the toxicity, mobility, and volume of contamination migrating to downstream areas by natural geochemical and biological processes such as filtration and biodegradation.

Groundwater (Main Operations Complex)

Reduction in toxicity, mobility, and volume of contaminants would be greatest for Alternatives 7, 8 and 9 (Thermal Treatment, Chemical Oxidation, Excavation/Offsite Disposal,) because the source of contamination is removed or treated. Alternatives 2, 3 and 4 (LUCs, Natural Attenuation, LTM) have medium reduction in toxicity, mobility, or volume of contaminants via natural degradation processes. Alternatives 5 and 6 (Landfarming, Phytoremediation,) have medium/high reduction in toxicity, mobility, and volume of contaminants using more active measures to promote biodegradation.

Housing and Operations Landfill (Site 9)

Alternative 8 (Excavation/Offsite Disposal) has the highest degree of reduction in toxicity, mobility, and volume of contamination because the buried debris and unknown contaminants would be treated and/or disposed off-site. Alternative 11 (Capping) reduces the mobility of the contaminants by preventing water infiltration but may not affect the near surface movement of shallow groundwater flowing through the buried materials. Alternative 2 (LUCs) does not reduce the toxicity, mobility, or volume of debris. Alternatives 3 and 4 (Natural Attenuation, LTM) have medium reduction in toxicity, mobility, or volume of contaminants via natural degradation processes.

2.12.5 Short-Term Effectiveness

This criterion evaluates the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during construction and operation of the remedy until cleanup levels are achieved. Workers conducting remedial actions are required to wear protective clothing and equipment as appropriate to minimize potential exposure.

Petroleum-Contaminated Soils (Sites 1, 3, 6, Main Operations Complex, and 32)
Short term effectiveness at the site would be greatest for Alternative 8 (Excavation/Offsite Disposal). Alternative 2 (LUCs) have short term effectiveness, but the ability of the landowners to continue implementation of community education and building restrictions is uncertain. Alternatives 3 and 4 (Natural Attenuation, LTM) have medium short term effectiveness. Alternatives 5 and 6 (Landfarming, Phytoremediation,) have medium/high short term effectiveness because several field seasons will be necessary to achieve cleanup levels. Alternative 7 (Thermal Treatment) has higher short term effectiveness because the contaminated soils can be treated in one field season and reused as fill at the site. Alternative 8 (Excavation/Offsite Disposal) has the greatest short term effectiveness because the contamination is immediately removed or treated. Alternative 9 has the medium short term effectiveness, and will likely take several field seasons or longer to achieve the cleanup levels.

PCB-Contaminated Soils (Sites 13, 16, 21, and 31)
Alternative 2 (LUCs) is effective in the short term, but depends on site conditions and ability of the landowner to maintain effective communication/education. Alternative 11 (Capping) has relatively high short term effectiveness but would require occasional maintenance of the cap. Alternative 8 (Excavation/Offsite Disposal) has the higher degree of short term effectiveness because the contaminants would be immediately treated and/or disposed off-site.

Sediments (Site 8)
Alternative 2 (LUCs) are effective over the short term, but are dependant on site conditions and the ability of the landowner to maintain effective communication/education. Alternatives 3 and 4 (Natural Attenuation, LTM) are less effective in the short term for petroleum hydrocarbons. Alternatives 5 and 6 (Landfarming, Phytoremediation) are slightly more effective over the short term because active measures are utilized to promote achievement of the cleanup levels. Alternative 8 (Excavation/Offsite Disposal) has the highest short term effectiveness because contaminants are removed immediately and disposed offsite. Alternative 12 (Reactive Matting) has slightly lower short term effectiveness because the ability of the matting to withstand arctic conditions is unknown.

Sediments (Site 28)
Alternative 2 (LUCs) are effective over the short term, but are dependant on site conditions and the ability of the landowner to maintain effective communication/education. Alternatives 3 and 4 (Natural Attenuation, LTM) are less effective in the short term for petroleum hydrocarbons, and not effective for PCBs. Alternatives 5 and 6 (Landfarming, Phytoremediation) are slightly more effective over the short term because active measures are utilized to promote achievement of the cleanup levels. Alternative 8 (Excavation/Offsite Disposal) has the highest short term effectiveness because contaminants are removed immediately and disposed offsite. Alternative 12 (Reactive Matting) has slightly lower short term effectiveness because the ability of the matting to

withstand arctic conditions is unknown. Alternative 13 (Constructed Wetlands) has slightly lower short term effectiveness because periodic maintenance or removal of accumulated materials may be required.

<u>Groundwater (Main Operations Complex)</u>
Short-term effectiveness and permanence at the site would be greatest for Alternatives 8 (Excavation/Offsite Disposal) because the source of contamination is removed or treated. Alternative 9 also has high short term effectiveness, because the source of contamination is treated, but for a longer time period than immediate removal under Alternative 8. Alternative 2 (LUCs) are effective in the short term, especially since the groundwater is not currently used as a drinking water source. The ability of the landowners to continue implementation of community education and drinking water restrictions is uncertain. Alternatives 3 and 4 (Natural Attenuation, LTM) have medium short-term effectiveness. Alternatives 5 and 6 (Landfarming, Phytoremediation,) have medium short term effectiveness, and may be dependant on site-specific conditions. Alternative 7 (Thermal Treatment) has higher short term effectiveness because the contaminated soils can be treated in one field season and used as fill at the site.

<u>Housing and Operations Landfill (Site 9)</u>
Alternative 2 (LUCs) is effective in the short term, but depends on site conditions and ability of the landowner to maintain effective communication/education. Alternative 11 (Capping) has relatively high short term effectiveness but may require occasional maintenance of the cap. Alternative 8 (Excavation/Offsite Disposal) has the higher degree of short term effectiveness because the buried debris would be removed and disposed off-site.

2.12.6 Implementability

This criterion evaluates the technical and administrative feasibility of implementation of each alternative from design through construction and operation. Factors associated with implementability include the ease of construction, the availability and capacity of materials and/or facilities, and logistical and/or administrative practicability.

<u>Petroleum-Contaminated Soils (Sites 1, 3, 6, Main Operations Complex, and 32)</u>
Alternative 2 (LUCs) may be somewhat difficult to implement and depends on the ability and willingness of landowners to accept and implement the controls. Implementation of Alternative 3 (Natural Attenuation) is somewhat complicated logistically due to remote location and lack of permanent facilities. Alternative 4 (LTM) has similar logistical issues due to the remote location, lack of onsite facilities, and several site visits would be required. Alternatives 5 and 6 (Landfarming, Phytoremediation,) have average implementability, with typical remote site logistics, barge arrangements, and periodic maintenance by an onsite worker. Alternative 6 (Phytoremediation) has slightly less maintenance once soils are excavated and seeded. Alternative 7 (Thermal Treatment) is slightly more difficult to implement, but uses standard technologies, has more equipment to be mobilized, longer time spent onsite, cold temps may affect performance, and an onsite power source is required. Alternative 8 (Excavation/Offsite Disposal) is slightly more difficult to implement, with typical remote site logistics and advance barge transportation arrangements, but involves the most amount of equipment and offsite transportation of contaminated materials. The excavation activities themselves are fairly straightforward, but may

require dewatering measures. Alternatives 5, 6, 7, and 8 present similar challenges in coordinating available transportation and reaching the site based on unpredictable weather and sea conditions.

PCB-Contaminated Soils (Sites 13, 16, 21, and 31)

Alternative 2 (LUCs) may be somewhat difficult to implement and depends on the ability and willingness of landowners to accept and implement the controls. Alternative 11 (Capping) has average implementability, but remote site logistics challenges still apply to transport of equipment and materials. Alternative 8 (Excavation/Offsite Disposal) is slightly more difficult to implement due to remote site logistics and volume of materials to be transported to the lower 48 for disposal.

Sediments (Site 8)

Alternative 2 (LUCs) may be somewhat difficult to implement and depends on the ability and willingness of landowners to accept and implement the controls. Implementation of Alternative 3 (Natural Attenuation) is somewhat complicated logistically due to remote location and lack of permanent facilities. Alternative 4 (LTM) has similar logistical issues due to the remote location, lack of onsite facilities, and several site visits would be required. Alternatives 5 and 6 (Landfarming, Phytoremediation,) have average implementability, with typical remote site logistics, barge arrangements, and periodic maintenance by an onsite worker. Alternative 8 (Excavation/Offsite Disposal) is the most difficult to implement, due to excavating in a wetland environment, and more complicated dewatering measures. Alternative 12 (Reactive Matting) utilizes materials which are unproven in Alaska environment and implementation issues may be difficult in a wetland with abundant vegetation.

Sediments (Site 28)

Alternative 2 (LUCs) may be somewhat difficult to implement and depends on the ability and willingness of landowners to accept and implement the controls. Implementation of Alternative 3 (Natural Attenuation) is somewhat complicated logistically due to remote location and lack of permanent facilities. Alternative 4 (LTM) has similar logistical issues due to the remote location, lack of onsite facilities, and several site visits would be required. Alternatives 5 and 6 (Landfarming, Phytoremediation,) have average implementability, with typical remote site logistics, barge arrangements, and periodic maintenance by an onsite worker. Alternative 8 (Excavation/Offsite Disposal) is the most difficult to implement, with challenging site logistics, excavation in a wetland environment, and more complicated dewatering measures. Alternative 12 (Reactive Matting) utilizes materials which are unproven in Alaska environment and implementation issues may be difficult in a wetland with abundant vegetation. Alternative 13 (Constructed Wetlands) is also difficult to implement based on permitting requirements, construction of access roads on the tundra, and periodic maintenance or removal of accumulated materials may be required.

Groundwater (Main Operations Complex)

Alternative 2 (LUCs) may be somewhat difficult to implement and depends on the ability and willingness of landowners to accept and implement the controls. Alternatives 3 and 4 (Natural Attenuation) have average implementability, but remote site logistics challenges still apply to transport of equipment and materials. Alternatives 5 and 6 (Landfarming, Phytoremediation,) have average implementability, with typical remote site logistics, barge arrangements, and periodic maintenance by an onsite worker. Alternative 7 (Thermal Treatment) is more difficult to implement, uses standard technologies, but cold temperatures and water content of the sediments may adversely affect performance. Alternative 8 (Excavation/Offsite Disposal) is also difficult to implement, with challenging site logistics and advance barge transportation arrangements. Alternative 9 (Chemical Oxidation) is more complex to implement and requires a pilot study to determine viable delivery and treatment methods for the site. This alternative would require greater logistics planning and chemical handling due to the remoteness of the St. Lawrence Island site and with a limited field season of 90-120 days.

Housing and Operations Landfill (Site 9)
Alternative 2 (LUCs) may be somewhat difficult to implement and depends on the ability and willingness of landowners to accept and implement the controls. Alternative 11 (Capping) has average implementability, but remote site logistics challenges still apply to transport of equipment and materials. Alternative 8 (Excavation/Offsite Disposal) is slightly more difficult to implement due to remote site logistics and volume of materials to be transported to the lower 48 for disposal. Excavation may be more challenging due to numerous drainage streams running through or adjacent to the former landfill site and the possibility of adverse impacts to the wetland environment.

2.12.7 Costs

This criterion evaluates the relative costs associated with implementation of each alternative, including design, construction, and operation. Costs for the various alternatives ranged from a low of $186,000 for Alternative 2 (Land use controls) to a high of $12.3 million for Alternative 8 (Excavation/Offsite Disposal) for Petroleum Contaminated Soils. Table 12 shows a comparison of the costs for each group of sites/media evaluated. These comparison costs were estimated during development of the Feasibility Study (2006-2007). The actual estimated costs for the selected remedies presented in this Decision Document are updated values using a standard parametric estimating program.

Table 12 Comparison of Feasibility Study Remedial Alternative Costs

Alternatives		Sediments (Site 8)	Housing & Operations (Site 9)	Ground-water (MOC)	Sediments (Site 28)	POL-Soils (Sites 1, 3, 6, MOC, 32)	PCB-Soils (Sites 13, 16, 21, 31)
Alternative 1	No Further Action	$0	$0	$0	$0	$0	$0
Alternative 2	Land use controls	**$186,000**	**$290,000**	**$186,000**	**$186,000**	**$186,000**	$186,000
Alternative 3	Natural Attenuation	$126,000	$236,000	$212,000	$207,000	$212,000	N/A
Alternative 4	LTM	$188,000	**$352,000**	$631,000	$415,000	$1,629,000	N/A
Alternative 3&4	Natural Attenuation and LTM	**$314,000**	$588,000	$843,000	$622,000	$1,841,000	N/A
Alternative 5	Landfarming	$1,320,000	N/A	N/A	$2,210,000	$8,153,000	N/A
Alternative 6	Phytoremediation	$1,310,000	N/A	N/A	$2,220,000	$8,246,000	N/A
Alternative 7	Thermal Treatment	N/A	N/A	N/A	N/A	$8,749,000	N/A
Alternative 8	Excavation/ Offsite Disposal	$1,040,000	$8,400,000	N/A	**$2,540,000**	**$12,317,000**	**$1,200,000**
Alternative 9	Chemical Oxidation	N/A	**N/A**	**$4,000,000**	N/A	see Notes	N/A
Alternative 10	Reactive Walls	N/A	N/A	$8,200,000	N/A	N/A	N/A
Alternative 11	Capping	N/A	**$1,200,000**	N/A	N/A	N/A	$1,035,000
Alternative 12	Reactive Matting	$840,000	N/A	N/A	$1,900,000	N/A	N/A
Alternative 13	Constructed Wetlands	N/A	N/A	N/A	**$1,100,000**	N/A	N/A

Notes: The comparison costs above were developed in the Feasibility Study (USACE, 2007) and include one mobilization per group of sites. Actual costs for the selected remedies have been updated using parametric cost-estimating software, with yearly adjustments to rates and also reflect more detailed breakdown of fieldwork over multiple seasons. N/A - Not Applicable. Chemical oxidation costs were estimated for groundwater, and assumed to address contaminated soil simultaneously at the Main Operations Complex.
Bold values indicate selected remedies, however costs have changed since initial estimates were developed during the Feasibility Study. For example, excavation of POL-contaminated soils only includes Sites 1, 3, 6, and 32 (not the MOC). The estimated costs for this Decision Document were then revised using a more detailed approach.

2.12.8 State Acceptance

This criterion evaluates whether the State of Alaska agrees with the analysis and recommendations resulting from the field investigations and the Proposed Plan. ADEC has fully participated throughout the process at this site and concurs with the selected remedies.

2.12.9 Community Acceptance

Based on the written feedback on the Proposed Plan, many stakeholders disagreed with the Alaska District's original analysis and recommendations for preferred alternatives. Over 100 pages of comments were received from members of the community, environmental groups, or local government representatives that questioned the selection of one or more of the preferred alternatives at various Areas of Concern or sites proposed for No Further Action. The Alaska District evaluated all comments submitted and made some changes to the final selected remedial approach. The Responsiveness Summary (Part III) contains detailed responses to all submitted comments. A summary of significant changes made since the Proposed Plan was released can be found in Section 2.14.5 Statutory Determinations.

2.13 PRINCIPAL THREAT WASTE

The NCP establishes an expectation that treatment will be used to address the principal threats posed by a site wherever practicable (Title 40, Section 300.430[a][1][iii][A] of the Code of Federal Regulations) (EPA 2004). Identifying principal threat wastes combines both hazard and risk. In general, principal threat wastes are those considered to be highly toxic or highly mobile and which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Conversely, non-principal threat wastes are those source materials that generally can be reliably contained and that would only present a low risk in the event of exposure. Principal threat wastes exclude petroleum and any fraction thereof. No principal threat waste is associated with the Northeast Cape site, since petroleum hydrocarbons are the primary COCs.

2.14 SELECTED REMEDIES

The Corps of Engineers determines No Further Action is appropriate for Sites 2, 4, 5, 12, 14, 17, 18, 20, 22, 23, 24, 25, 26, 33, and 34. No further action (NFA) is a response action selected when no additional remedial actions are necessary to protect human health and the environment, based on established cleanup levels and regulatory standards. The selected remedy satisfies the requirements under Section 121 of CERCLA and the NCP. For sites with groundwater contamination above drinking water cleanup levels, informational land use controls will be implemented for all sites designated as non-drinking water sources, which includes Sites 3, 4, 6, 7, and 9.

Excavation and Treatment/Disposal of contaminated soils was chosen as the selected remedy for Sites 1, 3, 6, 16, 21, 31, and 32. Although off-site disposal of the contaminated soil is preferred/assumed, on-site treatment may be implemented based on demonstrated effectiveness and cost efficiency. Monitored natural attenuation and land use controls was selected as the remedy for Site 8. Capping and land use controls was selected as the remedial action for the Site 9 Housing and Operations Landfill. Additional hazardous debris removal will also be conducted incidental to implementation of the selected remedies at Sites 9, 29, and various tundra areas site-wide. Construction of sedimentation ponds and excavation/removal of contaminated sediments was selected for Site 28 Drainage Basin. At the Main Operations Complex, the selected remedy is chemical oxidation. If chemical oxidation is determined to be ineffective after initial implementation of Phase I, a contingency plan will be implemented to conduct excavation and treatment/disposal of contaminated soils above the risk-based cleanup levels and conduct monitored natural attenuation of groundwater. Land use controls will be necessary in the short term to prevent installation of drinking water wells within the contaminated plume.

2.14.1 Summary of Rationale for the Selected Remedies

The selected remedies meet the criteria of overall protection of human health and the environment and compliance with ARARs. Selection of these alternatives for each site considers the other evaluation criteria presented and assessed in Section 2.12.

Alternative 1 (No Further Action) is the selected remedy only for those sites that do not have contamination in the soil exceeding the risk-based soil cleanup levels (see Table 9). No risk is identified at these sites, so no further action is appropriate to avoid unnecessary remedial actions that could cause unintended risk to workers and the environment.

Alternative 2 (Land Use Controls) and Alternative 3 (Natural Attenuation) are the selected remedies for Site 8 POL Spill which has sediment contamination in excess of the risk-based soil cleanup levels, but has no completed exposure pathways and therefore presents no unreasonable risks under the present land use. Land use controls will be implemented by conducting a survey to delineate the location and extent of residual sediment contamination, providing a detailed map of the site to the landowner, and recording a deed notice that this area should not be used for residential land use without additional investigation and/or cleanup. The Native Village of Savoonga IRA has agreed to be an information repository and distribution center for these land issues. The landowner will be notified that remaining contaminated sediments need to be managed in accordance with applicable state regulations if excavated in the future.

Natural attenuation parameters and levels of petroleum hydrocarbons will be monitored for a period of 3 years. Additional monitoring will then occur at 5 year intervals for a period of up to 30 years or until cleanup levels are achieved. This option will provide long-term and permanent protection while short-term risks are eliminated and costs are minimized. This combination of alternatives prevents potential for unintended risk to workers and the environment through destruction of a functional wetland area. Because contaminants remain onsite at concentrations above those applicable for unrestricted future land use, periodic reviews of the remedy will be conducted every 5 years from the date of final signature on this Decision Document, until cleanup levels are met. In addition, any change in land use will trigger a review. These reviews will focus on ensuring the remedy remains protective. The landowner will be requested to provide, on a five year basis, confirmation of existing land use. The landowner will also be requested to provide immediate notification to ADEC in the event of actual land use change in order to appropriately manage existing residual contamination.

Alternatives 2 (Land Use Controls), 4 (Long Term Monitoring), and 11 (Capping) are the selected remedies for the buried debris and shallow groundwater at the Site 9 Housing and Operations Landfill. Three monitoring events will be implemented to verify that the contaminants of concern in shallow groundwater are not migrating downgradient and impacting surface waters. An additional 6 long term monitoring events spaced 5 years apart will be conducted to demonstrate the shallow groundwater meets the remedial action objectives for a non-drinking water source. Periodic visual monitoring of the landfill cap for settlement and erosion will be conducted for 5 years. Additional visual monitoring, up to 30 years, may be conducted if deemed necessary based on the results of the site inspections. A deed notice will be prepared to document the debris site capped boundaries, including a detailed map of the site, and provide information to the landowner that the shallow groundwater is not a reasonable potential future drinking water source. The land use controls will also inform the landowners that future building construction or excavation is not recommended in the immediate vicinity of the site. Kikulget and Sivuqaq, Inc have a general land use policy for overall management of their lands. Tribal GIS/mapping capability is being pursued, and a survey the entire island is in progress.

The removal of exposed debris from the flowing streams adjacent to the Site 9 Housing and Operations Landfill and Site 29 Suqitughneq River will also be conducted incidental to the remediation of the other sites at Northeast Cape. Removal of partially submerged debris also complies with the intent of an agreement between the Air Force and the Savoonga Tribal Council signed 7April 1951 and incorporated into Public Land Order No. 790 (16 Jan 1952) which states the use of the lands by the Department of the Air Force shall be subject to the following conditions: "…That no refuse or garbage be dumped into the streams or near the beach".

Alternative 8 (Excavation and Treatment/Disposal) and 13 (Constructed Wetlands) are the selected remedies for petroleum and PCB-contaminated sediments at the Site 28 Drainage Basin. Limited excavation combined with a sedimentation basin provides short term effectiveness by removing the most highly contaminated materials closest to the main complex, and long term effectiveness by controlling downgradient migration of suspended sediments. Additional sediment removal from the narrow drainage channel and ponded area in the lower half of the drainage basin will also be conducted using a minimally invasive sediment removal technique such as suction dredging to remove the top 6-12 inches of silty/sandy sediment. Traditional sediment excavation or dredging techniques should be avoided in the lower drainage basin based on logistical access challenges and increased potential for ecological damage. The combination of alternatives is cost effective and protective of human health and the environment.

Alternative 8 (Excavation and Treatment/Disposal) is the selected remedy for sites with petroleum-contaminated soils (Sites 1, 3, 6, and 32) that require further remedial actions because contamination remains and poses an unacceptable future risk to human health and the environment. Excavation of contaminated soils is a permanent remedy providing long-term effectiveness while minimizing the short-term risks and damages associated with the remedial activities. Alternative 8 can be implemented reasonably easily to reduce the toxicity, mobility, and volume of residual contamination onsite.

Alternative 9 (Chemical Oxidation) is also selected for implementation at the Main Operations Complex (Sites 10, 11, 13, 15, 19, 27), to achieve the cleanup levels and treat the contaminated soil and groundwater in the short term. If an initial evaluation (Phase I) determines that chemical oxidation is not an effective or viable technology for this site, a contingency plan will be implemented. The contingency plan involves the excavation and treatment/disposal of petroleum-contaminated soils at the MOC to a depth of 15 feet. The groundwater would be monitored for natural attenuation parameters, and land use controls implemented to prevent use of the aquifer for drinking water purposes until cleanup levels are met.

Alternative 8 (Excavation and Offsite Treatment/Disposal) is the selected remedy for sites with PCB and/or arsenic-contaminated soils (Sites 13, 16, 21, and 31). Further remedial actions are necessary because contamination remains and pose an unacceptable future risk to human health and the environment.

2.14.2 Description of the Selected Remedies

The selected remedy entails the following major components:

- No Further Action at Sites 2, 4, 5, 12, 14, 17, 18, 20, 22, 23, 24, 25, 26, 33, and 34
- Excavation and removal of petroleum-contaminated soils at Site 1 Airstrip
- Excavation and removal of petroleum-contaminated soils at Site 3 Fuel Pumphouse
- Excavation and removal of petroleum-contaminated soils at Site 6 Former Drum Field
- Excavation and removal of petroleum-contaminated soils at Site 32 Lower Tramway
- Excavation and removal of PCB-contaminated soils at Sites 13, 16, 21, and 31
- Excavation and removal of arsenic-contaminated soil at Site 21 Wastewater Treatment Tank
- Excavation and removal of petroleum, metals, and PCB-contaminated sediment at Site 28 Drainage Basin, including removal of near-surface sediments from the narrow channel upgradient of the Suqitughneq River
- Construction of sedimentation pond or other appropriate controls at Site 28 Drainage Basin
- Monitored natural attenuation of petroleum-contaminated sediment at Site 8 POL Spill Site
- Capping, long term monitoring, and land use controls at the Site 9 Housing and Operations Landfill.
- Chemical oxidation at the Main Operations Complex. with contingency remedy of monitored natural attenuation for groundwater, excavation and removal of petroleum-contaminated soils to a depth of 15 feet at Sites 10, 11, 13, 15, 19, and 27, and land use controls.
- Land use controls to limit future drinking water uses for groundwater at the Main Complex (Sites 10-22, 26, 27), designate areas not suitable for drinking water (Sites 3, 4, 6, 7, 9), prevent construction of buildings on top of landfills, and manage potential future excavation and movement of soils above state cleanup levels
- 5-Year Reviews at sites with hazardous substances remaining above cleanup levels, e.g. the Main Complex, as necessary until cleanup levels are met. Periodic reviews of POL-only contaminated sites (e.g., Site 8) with residual contamination will be included in conjunction with evaluation of the Main Complex.
- Periodic visual monitoring of the capped area at the Site 9 Housing and Operations Landfill and Site 7 Cargo Beach Road Landfill for settlement and erosion for 5 years. Additional visual monitoring, up to 30 years, may be conducted if deemed necessary based on the results of the site inspections.
- Removal of dangerous poles, wires, and other miscellaneous debris from tundra areas site-wide where clearly identified
- Removal of partially submerged debris from streams in the vicinity of Site 9 Landfill and Site 29 Suqitughneq River

2.14.3 Summary of Estimated Remedy Costs

The estimated cost for the remedial alternatives described above is $31 million. The costs include remedial design, mobilization/demobilization, field work, long term monitoring, implementation of land use controls, community relations, and five year reviews. Based on anticipated costs and reasonable funding levels, a four-year field effort is assumed. The estimate assumes PCB-contaminated soils will be transported off-site for treatment and disposal. Petroleum-contaminated soils will be treated in-situ using chemical oxidation techniques, or excavated and may be treated onsite and used as clean fill, or transported offsite for disposal. Long term monitoring assumes 6 separate events, once every 5 years up to 30 years. LTM and site closeout costs are an estimated $2.75 million. A detailed breakdown of the estimated costs by field season is provided in Table 13.

Table 13 Estimated Costs of Selected Remedies

Remedial Design	$135,000
Field Work Year 1	
Community Relations	$79,000
Chemical Oxidation Phase I at Main Operations Complex (Sites 10, 11, 13, 15, 19, 27)	$965,000
Field Work Year 2	
Mobilization/Demobilization	$2,320,000
Community Relations	$106,000
Chemical Oxidation Phase II at Main Operations Complex	$3,250,000
Installation of groundwater monitoring wells at Main Operations Complex	$297,000
Field Work Year 3	
Mobilization/Demobilization	$2,320,000
Community Relations	$106,000
Excavate/Dispose PCB and/or arsenic-contaminated soils (Sites 13, 16, 21 and 31)	$661,000
Land Use Controls Set-Up and Implementation (site-wide)	$508,000
Capping Site 9 Housing and Operations Landfill	$326,000
Field Work Year 4	
Mobilization/Demobilization	$2,320,000
Community Relations	$106,000
Excavate/Dispose Contaminated Sediments and Construct Sedimentation Basin (Site 28)	$5,150,000
Debris Cleanup (Sites 9, 24, 25, 29)	$53,000
Field Work Year 5	
Mobilization/Demobilization	$2,320,000
Community Relations	$106,000
Excavate/Dispose Petroleum-Contaminated soils (Sites 1, 3, 6, 32)	$2,650,000
Subtotal - YEAR 1	**$1,179,000**
Subtotal - YEAR 2	**$5,973,000**
Subtotal - YEAR 3	**$3,921,000**
Subtotal - YEAR 4	**$7,629,000**
Subtotal - YEAR 5	**$5,076,000**
TOTAL COSTS RA-C	**$23,778,000**
RA-O Monitored Natural Attenuation (Site 8)	$680,000
RA-O Chemical Oxidation Phase III (Main Operations Complex & MWs)	$3,800,000
Long Term Monitoring & 5 Year Reviews & Site Closeout	$2,750,000
TOTAL COSTS RA-O, LTM, PCO	**$7,230,000**
TOTAL PRESENT WORTH	**$31,008,000**

The information in this cost estimate summary table is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record file, an Explanation of Significant Differences or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

2.14.4 Expected Outcomes of the Selected Remedies

After successful implementation of the preferred alternatives, the Northeast Cape site will be available for continued seasonal and future permanent residential use as long as the residual soil and groundwater contamination is managed in accordance with applicable regulations. Long-term groundwater monitoring at the Main Operations Complex will demonstrate the effectiveness of the contaminated soil source removals.

No Further Action Sites
Protection of human health and the environment would be achieved for those sites where contamination is already below risk-based cleanup levels. Protection of human health and the environment would be achieved at these sites because the contamination that remains does not pose an unacceptable risk to human health or the environment due to a de minimis volume of contamination and/or the remoteness of the site.

Excavation and Treatment/Disposal of Petroleum-Contaminated Soils – Sites 1, 3, 6, 32
Protection of human health and the environment would be achieved by removing the source of contamination to below pertinent risk-based soil cleanup levels. Toxicity, mobility, and volume of onsite contamination would all be eliminated by this alternative.

Excavation and Treatment/Disposal of PCB-Contaminated Soils – Sites 13, 16, 21, 31
Protection of human health and the environment would be achieved by removing the source of contamination to below applicable soil cleanup levels. Toxicity, mobility, and volume of onsite contamination would all be eliminated by this alternative.

Monitored Natural Attenuation and Land Use Controls – Site 8
Protection of human health and the environment would be achieved by periodic monitoring and evaluation of natural attenuation in the wetlands environment. A 5-year review of the monitoring program's results would be conducted to determine if the program should be continued or reevaluated. Under current uses, the site does not pose a risk to seasonal residents or visitors. Information land use controls would be implemented to educate the public about potential future risks under a residential scenario.

Capping and Land Use Controls – Site 9
Protection of human health and the environment would be achieved by capping the remaining buried debris, implementing land use controls, and periodic monitoring of the shallow groundwater. The groundwater is not a reasonably expected potential future drinking water source. A 5-year review of the cap integrity and groundwater monitoring results will be conducted

to determine if the program should be continued or reevaluated. Information land use controls would be implemented to educate the public about future risks under a residential scenario.

Excavation and Sedimentation Ponds – Site 28 Drainage Basin
Protection of human health and the environmental would be achieved by removing the major source of contaminated sediments, closest to the main complex area. Additional benefits would be achieved by removing silty/sandy sediments using a minimally invasive technique, such as suction dredging, in the lower portion of the drainage basin. Potential downgradient impacts to the Suqitughneq River would be mitigated using a sedimentation pond approach and control of suspended sediment flows. Informational land use controls would be developed and maintained to inform potential future landowners of the nature and extent of residual sediment contamination.

Chemical Oxidation, Monitored Natural Attenuation and Land Use Controls – Main Operations Complex Soil/Groundwater
Protection of human health and the environment would be achieved by treating contaminants in soil and groundwater using a chemical oxidation technology. If chemical oxidation (Phase I) proves ineffective, a contingency remedial action will be implemented to excavate and treat/dispose of the contaminated soils (0-15 ft). The groundwater will be monitored to assess migration of contaminants to the Suqitughneq River and evaluate natural attenuation parameters. Informational land use controls would be developed and maintained as an effective notification tool, incorporating a deed notice into land records to inform potential future landowners of the nature and extent of remaining soil contamination and the requirements for handling, if encountered. A restriction on installation of drinking water wells in the contaminated zone would also be recommended to the landowners until the groundwater meets cleanup levels. The deed notice would be filed with the Nome Recording District and copies distributed to both landowners.

2.14.5 Statutory Determinations

Under CERCLA Section 121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with legal requirements (unless a statutory waiver is justified), are cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element as well as a bias against offsite disposal of untreated wastes. The following subsections discuss how the selected remedy meets these statutory requirements.

Protective of Human Health and the Environment
The selected remedy is protective of human health and the environment. The current and future exposure pathways are incidental ingestion of contaminated soil by local residents and consumption of groundwater as drinking water. The selected remedy achieves the risk-based cleanup levels in soil and implements land use controls to control potential future exposures to groundwater.

Applicable or Relevant and Appropriate Requirements
The chemical-specific applicable or relevant and appropriate requirements (ARARs) for CERCLA-regulated compounds are based on 18 Alaska Administrative Code 75.341 and 345.

Cost Effectiveness
The selected remedies are considered cost-effective with respect to the level of protection of human health and the environment and the cost of the selected remedies. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness" (NCP Section 300.430(f)(1)(ii)(D)). This was accomplished by evaluating the overall effectiveness of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and were ARAR-compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness).

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable
The selected remedies represent the maximum extent to which permanent solutions and treatment technologies can be used in a practicable and cost-effective manner at the site. Of those alternatives that are protective of human health and the environment and comply with ARARs or pertinent risk-based standards for petroleum hydrocarbons, USACE and ADEC have determined that the selected remedies provides the best balance of tradeoffs in terms of the nine criteria.

For Site 8 POL Spill, the selected remedy of land use controls and monitored natural attenuation will provide protection of human health and the environment by informing the landowner of the contamination to prevent unanticipated future exposure to sediment contamination. The naturally occurring grasses here indicate a healthy wetland and suggest that phytoremediation may already be making gains in treating the contamination here. Additionally, the potential for disturbance of the environment to remove or treat the contaminated sediments at depth would outweigh the benefit of removal. Furthermore, the cost of treatment for this limited volume of contaminated sediments would outweigh the potential benefit.

For sites with petroleum or PCB contaminated soils, the selected remedy of excavation and treatment/disposal provides a permanent reduction in the toxicity, mobility, and volume of contamination. While the excavated PCB-contaminated soils would be disposed of offsite, alternative onsite treatments would be logistically difficult and cost prohibitive. Treatment of petroleum-contaminated soils may be conducted onsite to the extent practicable if deemed cost effective by the contractor. Excavation and treatment/disposal maximizes the onsite benefits while balancing the trade-offs with risks and costs.

For contaminated sediments in the Site 28 Drainage Basin, the selected remedy of limited excavation and creation of a sedimentation basin provides a permanent reduction in the toxicity, mobility, and volume of contamination. Alternative treatment technologies for the sediments would be logistically difficult because of the remoteness of St. Lawrence Island, weather conditions, and the lack of onsite resources. Additional sediment removal throughout the remainder of the drainage basin (up to the confluence with the Suqitughneq River only) will be attempted using a minimally invasive technique, to reduce the potential for significant ecological damage and reduce logistical challenges associated with operating heavy excavating equipment on the tundra. The combination of alternatives is cost effective and protective of human health and the environment.

The selected alternatives provide a long-term and permanent solution to the residual contamination, particularly because of the remoteness of the site, the infrequency of visitors, and the present and anticipated future land use. Consequently, the selected alternatives would maximize the permanence of the solution and best balance the trade-offs with more aggressive removal and/or treatment options.

Preference for Treatment as a Principal Element
Although the selected alternative for the contaminated soils relies upon off-site disposal and treatment instead of on-site treatment; USACE has determined that this remedy represents the maximum extent to which permanent solutions and treatment technologies can be used in a cost effective manner at the Northeast Cape site.

State Acceptance
The State of Alaska, through the Department of Environmental Conservation (DEC), concurs with the selected remedial actions at the Northeast Cape Air Force Station Formerly Used Defense Site (FUDS). The decision may be reviewed and modified in the future if new information becomes available that indicates the presence of contamination or exposures that may cause unacceptable risk to human health or the environment. Where LTM and/or natural attenuation is not required, sites will be listed as Cleanup Complete – Institutional Controls in the DEC Contaminated Sites Database. At sites with LTM or natural attenuation requirements, cleanup complete determinations will be delayed.

Community Acceptance
Comments were received from local residents, community stakeholders, and the RAB's technical advisor during the public comment period. The community remains concerned that inadequate site characterization was conducted at the Northeast Cape site, and inadequate hydrology studies have been conducted. The community has requested additional assurances that sites won't pose a future threat due to changing climate conditions, melting of permafrost, undetected contaminants, and contaminant migration. The remedial investigation results do not support the need for further study. This decision may be reviewed and modified in the future if new information becomes available that indicates the presence of contamination or exposures that may cause unacceptable risk to human health or the environment.

Documentation of Significant Changes Since the Proposed Plan
The Proposed Plan for Northeast Cape, St. Lawrence Island, Alaska (USACE 2007) was released for public comment in July 2007 and identified Alternatives 1, 2, and 8 as the preferred alternatives for specific sites at Northeast Cape. The public was given 60 days to provide comments pertaining to the selected remedial alternatives. Public meetings were held on 24-25 July and 19-20 September 2007. Modifications to the remedies, as originally identified in the Proposed Plan, have been determined to be necessary or appropriate based on public review and comment. The proposed remedies have been modified as follows:

1. Chemical oxidation (Phase I) will be initiated to evaluate the effectiveness of active remediation of petroleum-contaminated soil and groundwater at the Main Operations Complex. Phase II of chemical oxidation will be implemented based on the detailed results

of the initial phase. If chemical oxidation techniques are determined ineffective or not viable to implement at the Main Operations Complex, a contingency remedy will be implemented to excavate and dispose the POL-contaminated soils to a depth of 15 feet.

2. Based on reports of hazardous debris remaining such as exposed wires and poles, additional debris removals will be conducted in tundra areas site-wide where such hazardous debris is clearly identified. Debris reported in streams and drainages associated with the Site 9 Housing and Operations Landfill and Site 29 Suqitughneq River will also be removed incidental to the site remediation work.
3. The Site 9 Housing and Operations Landfill will be capped with 2 feet of gravel fill in accordance with state regulations for unpermitted solid waste disposal areas.
4. Additional sediment removal from the narrow drainage channel and ponded area in the lower half of the Site 28 Drainage Basin will also be conducted using a minimally invasive sediment removal technique such as suction dredging to remove the top 6-12 inches of silty/sandy sediment. Sedimentation ponds will be constructed in the Site 28 Drainage Basin instead of the originally proposed weirs system.
5. Petroleum-contaminated soils which exceed the risk-based cleanup level for RRO will be excavated at Site 1.
6. Petroleum-contaminated soils which exceed the risk-based cleanup levels for DRO/RRO will be excavated at Site 3.
7. PCB-contaminated soils which exceed the cleanup level of 1 mg/kg will be excavated at Site 16
8. PCB and arsenic-contaminated soils which exceed selected cleanup levels will be excavated at Site 21.

PART 3: RESPONSIVENESS SUMMARY

A Proposed Plan for Northeast Cape was distributed to interested stakeholders and residents of St. Lawrence Island for review in July 2007. The original review period ended on 31 August 2007 and was extended to 30 September 2007. The review and comment period was then extended through early October 2007. Public meetings were held on 24 July 2007 at the new IRA Building in Savoonga and on 25 July 2007 at the City Hall Building in Gambell to review the previous remedial and investigation actions, discuss the proposed remedies, and answer questions from the public. Two additional public meetings were held on 19-20 September 2007 in Savoonga and Gambell to receive oral public comments on the proposed plan. Over two hundred twenty specific comments were received from at least 25 people during the public review period and meetings.

Since that time, additional discussions with the community, tribal leadership, and state regulators have been held, resulting in some modifications to the original responses. A Restoration Advisory Board (RAB) Meeting was held on 8 January 2008 to provide a status update on Northeast Cape and discuss preliminary responses to comments. Private meetings were also held with the leadership of Savoonga and Gambell on 8-9 January 2008. A formal response to comments was distributed on 21 February 2008. Another RAB meeting was held on 25 June 2008 to discuss ongoing project activities at Northeast Cape and Gambell. A meeting with USACE representatives, tribal leadership, and other community members was held in Anchorage on 22 October 2008 to discuss concerns over the proposed cleanup at Northeast Cape.

The comments were grouped into categories for response. General responses were provided for major areas of concern: the main complex area petroleum contamination, use of chemical oxidation, additional debris removals, Site 28 Drainage Basin, and land use controls. Tabulated responses were also provided each specific comment. The comments raised concerns about drinking water sources and groundwater, potential impacts to the Suqitughneq River, leaving sediment contamination in the drainage basin and spill site, use of weirs, isolated sample locations with PCBs, various sites proposed for no further action, additional dangerous debris or wires/poles remaining in streams and tundra, specifics for land use controls, site restoration, and long term monitoring plans.

MAIN OPERATIONS COMPLEX

The Corps of Engineers received multiple comments regarding the proposed remediation of impacts at the main complex area and available drinking water at Northeast Cape. The Proposed Plan recognized that contaminants in shallow groundwater at the Main Complex contribute to potential human health risks if the water is utilized as a permanent future drinking water supply. However, the shallow groundwater at the Main Operations Complex is not currently utilized as a drinking water source. Thus, the proposed remedy was limited excavation of surface soils to a depth of 5 feet, natural attenuation of subsurface soils and shallow groundwater, long term groundwater monitoring, and land use controls.

Many concerns were raised that groundwater at the main complex gravel pad is the most likely source of drinking water for a future community at the site. Groundwater upgradient of the southern edge of the main complex has not been impacted from the contamination, and is a viable potential future drinking water source. Additionally, a water intake structure existed in the streambed at Site 32 in the valley above and southwest of the main complex. The intake was used during facility operation. This location is viewed as a potential drinking water source to a residential development at lower elevations. The Suqitughneq River is also a current and likely future drinking water source.

The ADEC also raised concerns about the ability of natural attenuation to meet cleanup goals in a timely manner for subsurface soils between 5 and 15 feet below ground surface. Land use controls and landowner concurrence would be necessary to leave contamination in place.

Based on the various comments received, a more aggressive approach was selected to address the shallow groundwater and contaminated soils. The groundwater at the main complex has been significantly impacted and chemical oxidation techniques will be undertaken to remediate this potential future drinking water source. However, in the interim, clear communication of the groundwater situation to future residents and developers is the most important action that will be needed before remediation goals are achieved. Therefore a drinking water well should not be installed in the contaminated area of the main complex in the short term.

Many comments asserted that the main complex groundwater may be a continuing source of impact to the Suqitughneq River. The first potential pathway is migration of petroleum as surface water into the upper drainage basin, then downflow to the Suqitughneq River. The second potential pathway is migration of petroleum as dissolved-phase petroleum in groundwater in the northerly direction toward the Suqitughneq River.

Regarding surface water migration, a water seep at the main complex produces a visible sheen during high groundwater periods. This water drains down-slope toward the upper drainage basin. The remedial actions includes excavation of the petroleum contaminated sediment at the seep which is the source of the sheen. Additionally, the remediation approach will utilize water retention and vegetation, as additional protection/treatment against migration of impacted surface water to the Suqi River. Water retention/settling ponds and vegetated swales/ditches are common techniques used in stormwater management to address suspended sediment and hydrocarbons in storm runoff. The existing drainage basin between the Suqitughneq River and the main complex lends itself well to this water management concept.

The potential for contaminant migration to the Suqitughneq River via groundwater is low. The Suqitughneq River is approximately 1,700 feet from the main complex. This is a long distance for subsurface migration of petroleum contamination, including non-aqueous phase liquid (NAPL; e.g., undiluted diesel fuel or gasoline) and dissolved phase petroleum. NAPL migration over time is affected by water table fluctuation, and it depends on the availability of significant NAPL head to overcome down-gradient soil pore-water pressure. In most cases, NAPL initially stops migrating a short time (days to weeks) after the end of a spill or leak. As the groundwater table drops over the course of its annual fluctuation cycle, NAPL may migrate further. However, after numerous years of fluctuation and yearly minimums, the potential for further migration of NAPL becomes low. In this case, about 40 years have passed. Measuring free product thickness in monitoring wells within the plume is one way of estimating the potential for NAPL migration. A layer of free product has not been observed in monitoring wells within the plume at the main complex, which supports the hypothesis that NAPL migration from the main complex to the Suqi River is not a realistic concern. Based on petroleum fate and transport concepts, the maximum extent of NAPL migration from the main complex was likely reached long ago.

The most likely exposure pathways are ingestion/inhalation of vadose zone contamination, above the interval of seasonal groundwater table fluctuation. The likelihood of significant contaminant contribution to groundwater from the material that resides above the smear zone is low compared to the smear zone itself, especially after 40 years of weathering.

The migration of dissolved-phase contamination from the main complex to the Suqitughneq River via groundwater is similarly a low probability. In general, dissolved-phase contamination extends some distance beyond the down-gradient edge of the NAPL plume. Over time and distance, the migrating petroleum compounds attenuate by natural processes. These processes may include dispersion, diffusion, sorption, dilution, volatilization, and biodegradation. Different compounds in a diesel fuel mixture will reach varying distances down-gradient, depending on their physical properties and viability for biodegradation. For example, benzene is a common component of arctic diesel fuel. Benzene is highly soluble, and often migrates down-gradient beyond the front edge of a NAPL plume. However, benzene is also highly volatile, and has a short carbon chain. Benzene molecules are lost to the soil gas above the water table. Other benzene molecules are biodegraded by indigeneous microorganisms, and some sorb (become attached) to organic carbon in the soil matrix. As a result of these and other processes, dissolved phase benzene plumes don’t typically extend more than a few hundred feet past the edge of the NAPL plume.

Additional monitoring wells will be placed across the area down-gradient from the main complex (e.g., within the drainage basin), to fully evaluate the effectiveness of the upgradient treatment of groundwater. However, previous attempts at installing monitoring wells in the tundra areas at Northeast Cape have met little success. Well points driven by hand and small mechanical means have encountered refusal within a short distance. Little or no water has been obtained from the well points that were successfully installed.

The remediation strategy involves construction of a gravel trail from the main complex to the drainage basin confluence with the Suqitughneq River. Approximately 6 groundwater monitoring wells will be installed in the down-gradient tundra area. These wells will enable delineation of down-gradient dissolved-phase contamination and provide a means to conduct long-term monitoring.

CHEMICAL OXIDATION

Public comments on the Proposed Plan also supported the use of advanced oxidative processes as the preferred remedial technology for the site. Chemical oxidation was evaluated in the Feasibility study, but USACE concluded that significant uncertainties existed regarding implementation at a remote, northern location. However, USACE has considered the potential that advanced oxidative processes, if effective, could reduce the petroleum contamination at Northeast Cape for less money than other more invasive and more expensive approaches such as excavation and treatment of the POL-contaminated soils.

Therefore, a chemical oxidation technique will be implemented at the Main Operations Complex of Northeast Cape using a phased approach. Phase I will evaluate delivery methods and reagents. After Phase I, chemical oxidation Phase II and III will be implemented across the main complex assuming the technology is proven viable. The initial phase will also be used to determine if the technology can be effective for more extensive use at Northeast Cape.

Northeast Cape is a very expensive place to conduct work due to the lack of local accommodations and utilities, the difficult weather and access logistics, and the fact that it is not on a road system. Monitoring is impractical, if not impossible, year round. Remediation effectiveness at Northeast Cape may be difficult to measure. For the Drainage Basin immediately below the Main Complex and the narrow channel to the confluence with the Suqitughneq River, the shallow contaminated sediments will be excavated and treated/disposed instead of attempting additional chemical oxidation in a wet, highly organic environment.

The remote location and climate-limited window available for work each year at Northeast Cape, hampers remediation planning. These location/climate factors dictate that the Corps achieve major advancements each season in order to keep mobilization costs from becoming excessive. Mobilization costs will be minimized by conducting the fewest number of field seasons.

As a contingency plan in the event that chemical oxidation techniques are not viable, excavation and treatment/disposal of contaminated soils at the main complex will be conducted to address the ingestion/inhalation exposure pathways at the main complex. Contamination in soils to a maximum excavation depth of 15 feet would be removed.

DEBRIS, SITE 9

Several comments related to debris that remains at the site. Efforts in removing debris must be tied to the reduction of significant risk. The Proposed Plan did not include removal of debris from flowing streams and the Suqitughneq River. According to FUDS policy, inherently hazardous debris must present a clear danger, likely to cause, or having already caused, death or serious injury to a person exercising ordinary and reasonable care. The selected remedy includes the removal of additional debris such as exposed wires and frost-jacked poles that pose a potential hazard. Many commenters also expressed concern over debris found in the Suqi River or ponds at Northeast Cape. The comments pointed to conditions imposed on the Air Force for use of the withdrawn lands for military purposes at Northeast Cape as published in Public Land Order 790 signed by the Acting Secretary of the Interior in January 1952, which stated: "…no refuse or garbage be dumped into the streams or near the beach". Debris such as metal siding, drums, and other miscellaneous items is also present in streams flowing through Site 9 and the Site 29 Suqitughneq River. This submerged and exposed debris is inherently hazardous to young children playing in the water while accompanying their parents during subsistence harvest activities. Young children could be seriously injured by sharp pieces of metal that are not visible because of turbid water after certain rainfall events. Removal of additional debris from tundra areas and streams at Northeast Cape will alleviate some tribal concerns and improve community relations. Therefore, a limited debris removal action will be conducted as an incidental requirement to the overall HTRW project at Northeast Cape.

Furthermore, comments expressed concern that buried debris at the Site 9 Housing and Operations Landfill should be fully removed. The ADEC recommended capping the landfill, with associated institutional controls, to comply with solid waste regulations for unpermitted waste disposal sites. Based on a reanalysis of the potential costs associated with monitored natural attenuation over 30 years versus a gravel cap using predominantly local materials, the cost of capping was determined more economical.

The Native Village of Savoonga or Native Village of Gambell may also report debris or other impacts to the Native American Lands Environmental Mitigation Program (NALEMP), using the online reporting tool Native American Management System for Environmental Impacts (NAMSEI) found at www.namsei.com. The USACE Project Manager can also assist the tribes in reporting specific impacts.

SITE 28 DRAINAGE BASIN

The Proposed Plan presented the concept of installing weirs at two locations along the tributary between the MOC and the Suqi River. Sediments suspended in the creek waters may be contaminated in this tributary. The primary objective of the weir concept was to reduce water energy to help suspended sediments settle out of the creek waters. The reduced flows would in turn protect the Suqi River from future suspended sediment influx from this tributary. The comments suggested that a weir on an incised channel during high flow may cause water, with suspended sediment, to spread laterally and impact previously non-impacted area. The commenters recommended complete excavation or the use of an excavated sedimentation basin as an alternative to the weirs. Excavation combined with a sedimentation basin provides short term effectiveness by removing the most highly contaminated materials closest to the main complex, and long term effectiveness by controlling downgradient migration of suspended sediments. Additional sediment removal from the narrow drainage channel and ponded area in the lower half of the drainage basin will also be conducted using a minimally invasive sediment removal technique such as suction dredging to remove the top 6-12 inches of silty/sandy sediment. Traditional sediment excavation or dredging techniques should be avoided in the lower drainage basin based on logistical access challenges and increased potential for ecological damage. The combination of alternatives is cost effective and protective of human health and the environment.

LAND USE CONTROLS OR INSTITUTIONAL CONTROLS CONTROLS)

Comments submitted on the Proposed Plan rejected the use of land use controls as an adequate remedy. The goals of the FUDS program is to achieve protection of human health and the environment. In situations where environmental cleanup costs are anticipated to be very high, federally-funded cleanup actions typically rely on scientifically-derived risk assessments to provide the rationale for cleanup decisions. On many projects, the resultant risk-based cleanup levels exceed generic, non site-specific, State cleanup levels. For this reason, the State will require that land-use controls (LUC), or Institutional Controls (IC), be implemented to protect the public from conducting non-ordinary activities that have the potential to cause harm, such as digging up dirt around a property and hauling it elsewhere. In this type of situation, an informational IC is needed to educate property owners about safe environmental practices for future development or building at a site.

Other types of ICs are sometimes necessary to safeguard people from coming in contact with residual contamination in either soils or water.

According to ADEC cleanup regulations (18 AAC 75.375), the ADEC will, after consultation with each landowner of the site, determine if the use of an institutional control is necessary, on a site-specific basis, to ensure protection of human health, safety, or welfare, or the environment. Landowner concurrence with the enactment of LUC/IC is required in certain situations.

Land use controls necessary at the Northeast Cape site include a deed notification to record the location of residual contamination or capped debris areas, informational measures to inform the landowners and community about areas designated as non-drinking water sources, future management of soils, and recommendations for future building locations.

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Alaska District Corps of Engineers
Staff / Action Sheet

Please intial concur or non & date

S: 4 Feb 2009

Division	Concur	Non	Date
DDC STONE	[signature]		2/10/09
DP Smith	[signature]		2/11/09
OC ~~Vanagel~~ [illegible]	[signature]		2/4/09
ESP Jaeger	cj		2/2/09
PM-ESP Andraschko	[signature]		2/2/09
EN-EE Geist	JKG		1/30/09

SUBJECT: Date: 29 Jan 2009

Memorandum thru POD to HQUSACE seeking approval for Decision Document on HTRW Project, NE Cape FUDS Property, F10AK0699-03,

RECOMMENDATION:

DDC signature on memorandum

DISCUSSION:

This Decision Document is for the HTRW project at Northeast Cape on St. Lawrence Island. The estimated cost for remediation is ~~$30~~ $31 cj Million. Since the cost is greater than $10 Million, this Decision Document must be signed by the ACSIM at Headquarters USACE.

The ADEC project manager has reviewed and commented on the draft version of this decision document. ADEC concurs with the remediation plan in this document.

The USACE OC and PAO, and USACE POD have reviewed the draft version of this decision document. The CX reviewed and commented on the draft version of this decision document Their comments were helpful, and have been addressed.

This Decision Document outlines a multi-pronged remediation plan for the DRO and PCB contamination at NE Cape. It utilizes both conventional (excavation and haul away) and innovative (in-situ chemical oxidation) technologies to accomplish the mission. Land use controls and monitored natural attenuation are also key aspects of this remediation effort.

APPROVAL AUTHORITY'S COMMENTS:

Approval ✓ Disapproval ___ See Me ___

[signature]

Carey Cossaboom
FUDS Project Manager
X 2689

POC: Carey Cossaboom

Div/Branch Chief's Signature for Release: Clare Jaeger

Phone #: X 2855

POA FORM 305a, REVISED NOV 00

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
P.O. BOX 6898
ELMENDORF AFB, ALASKA 99506-0898

REPLY TO
ATTENTION OF:

CEPOA-DE (200-1f)

FEB 2 0 2009

MEMORANDUM THRU Commander, Pacific Ocean Division, Attn: CEPOD-PDM (Hudson W. Kekaula), Building 525, Fort Shafter, HI 96858-5440

MEMORANDUM FOR Commander, HQUSACE, Attn: CEMP-DE (Stacey Hirata), 441 G Street N.W., Washington, DC 20314-1000

SUBJECT: Approval of the Decision Document (DD) for the Formerly Used Defense Site (FUDS) Northeast Cape HTRW Project on St. Lawrence Island, Alaska (F10AK0969-03)

1. Enclosed are five copies of the DD, which determines the remedial actions to be performed at the FUDS Northeast Cape property, HTRW project. The DD has been reviewed by the required Geographic Military District personnel and HTRW CX as noted on the enclosed Staffing Matrix for Decision Documents. USACHPPM coordination was satisfied when they reviewed the Human Health and Ecological Risk Assessment in 2004. All comments were addressed. The Alaska Department of Environmental Conservation, (ADEC), the lead regulatory agency, has also reviewed the DD. We addressed their concerns and expect their concurrence with our DD.

2. Because this DD details costs in excess of $10 Million, it should be forwarded to Headquarters, Department of the Army, ACSIM, ATTN: DAIM-EDC, 600 Army Pentagon, Washington, D.C. 20310-0600.

3. A copy of the DD was sent to HQUSACE and ODEP via e-mail on January 29 in order to initiate the HQUSACE staffing process.

4. Please contact Mr. Carey Cossaboom at (907) 753-2689, FUDS Project Manager, if there are any questions.

James R. Stone
LTC, EN
Acting Commander

Encl (7)
5 DD
1 Executive Summary
1 Staffing Matrix

F10AK096903_05.01_0008_P

O:\ESP\Private\FUDS_Properties\NE Cape F10AK0969\HTRW-03\NE Cape Memo to HQ for ACSIM approval Jan 09.doc

CONCUR:
EN-EE-(GEIST)
PM-ESP-FUDS- (ANDRASCHKO)
PM-ESP - (JAEGER)
OC-(VANAGEL)
DP - (SMITH)
DDC - (STONE)
DC - (STONE)

Decision Document
Northeast Cape FUDS, HTRW Project
St. Lawrence Island, Alaska

January 2009

U.S. Army Engineer District, Alaska
P.O. Box 6898
Elmendorf AFB, Alaska 99506-0898

EXECUTIVE SUMMARY

SELECTED RESPONSE ACTION

This Decision Document outlines the U.S. Army Corps of Engineers (USACE) selected remedy for the Northeast Cape HTRW Project (F10AK0969-03) located on St. Lawrence Island, Alaska. These remediation efforts are planned in conjunction with the Decision Document for the Northeast Cape CON/HTRW Project (F10AK0969-05), also known as the Site 7 Cargo Beach Road Landfill. These planned responses were preceded by multiple removal actions (mostly BD/DR) which took place between 1994 and 2005.

The remedial actions are chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the maximum extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

The response action entails both conventional and innovative technologies to achieve site-specific cleanup goals (Feasibility Study, 2007) that were based on a Human Health and Ecological Risk Assessment completed in 2004. Sixteen individual sites within the project area were selected for No Further Action. Excavation and removal of petroleum-contaminated soils was selected at four sites. Excavation and removal of PCB-contaminated soils was selected at four sites. Chemical oxidation is the preferred remediation technology at the Main Operations Complex, with a contingency remedy of monitored natural attenuation for groundwater, and excavation and removal of petroleum-contaminated soils to a depth of 15 feet. Excavation and removal of petroleum, metals, and PCB-contaminated sediment was selected at the Site 28 Drainage Basin, including removal of near-surface sediments from the narrow channel up gradient of the Suqitughneq River and construction of a sedimentation pond. Monitored Natural Attenuation of petroleum-contaminated sediment was selected at the Site 8 POL Spill Site. Dermal (soil) capping was selected for the Site 9 Housing and Operations Landfill. Excavation and removal of arsenic-contaminated soil was selected at the Wastewater Treatment Tank area. In addition, dangerous poles, wires, and other miscellaneous debris will be removed from tundra areas site-wide, where clearly identified, including removal of partially submerged debris from streams in the vicinity of the Site 9 Housing and Operations Landfill and the Suqitughneq River.

Land use controls are essential at many sites to designate areas not suitable for drinking water, prevent construction of buildings on top of landfills, and manage potential future excavation and movement of soils above state cleanup levels. 5-Year Reviews will be conducted, as necessary, at sites where hazardous substances remain above cleanup levels, until cleanup levels are met. Periodic reviews will be conducted at POL-only contaminated sites and at the capped areas of the Site 7 Cargo Beach Road Landfill and Site 9 Housing and Operations Landfill.

DEGREE OF RISK REDUCTION

The response actions selected in this Decision Document are necessary to protect the public health from actual or threatened releases of hazardous substances into the environment. Current land use at the Northeast Cape site is seasonal subsistence fishing, hunting, and plant gathering. Future land use is anticipated to be residential; the tribal government of the Native Village of Savoonga, desires to re-establish a permanent community at Northeast Cape.

The primary soil/sediment contaminants associated with risk or hazard estimates include arsenic, DRO, RRO, PAHs, and PCBs (Aroclor-1260). The primary groundwater contaminants are arsenic, benzene, DRO, GRO and RRO. The response actions will prevent current and future exposure to humans and ecological receptors by ingestion, inhalation, and dermal contact with contaminated soils at levels above ARARs for PCBs or applicable risk-based standards for petroleum hydrocarbons. The response actions will prevent ingestion of groundwater containing contaminants at levels above state drinking water standards and applicable risk-based standards for petroleum hydrocarbons. Source contaminant removal should also lessen migration of contaminants into the Suqitughneq River.

COST

The cost to complete the selected response action for the Northeast Cape HTRW Project is estimated at $31 million. The HTRW response actions make up the majority of the costs necessary to complete full remediation on the property ($35.6 million).

FISCAL YEARS FOR DESIGN AND CONSTRUCTION

Fiscal Year 1: $1.2 million for design and construction
Fiscal Year 2: $6.0 million for design and construction
Fiscal Year 3: $3.9 million for construction
Fiscal Year 4: $7.6 million construction
Fiscal Year 5: $5.1 million construction

DURATION OF REMEDIAL ACTION – OPERATIONS

Remedial Action-Operations (RA-O) at Northeast Cape comprise Monitored Natural Attenuation at the Site 8 POL Spill Site and continued chemical oxidation treatment beyond the initial installation of injection point wells at the Main Operations Complex. Therefore, RA-O at the Site 8 POL Spill Site ($680,000) will last 3 years beginning in Fiscal Year 2.

RA-O at the Main Operations Complex ($3.8 million) will include one year of chemical oxidation treatment beginning in Fiscal Year 3. Once the RA-O phase is complete, these sites will be subject to Long Term Monitoring (LTM; $2.8 million total) every 5 years, as necessary.

LAND USE CONTROLS REQUIRED

The State of Alaska requires that land-use controls (LUC), or Institutional Controls (IC), be implemented to protect the public from conducting non-ordinary activities that have the potential to cause harm. Informational ICs are needed to educate property owners about safe environmental practices for future development or building at a site. According to Alaska Department of Environmental Conservation (ADEC) cleanup regulations (18 AAC 75.375), the ADEC will, on a site-specific basis and after consultation with each landowner, determine if the use of an institutional control is necessary. Landowner concurrence with the enactment of LUC/IC is required in certain situations.

Land use controls necessary at the Northeast Cape site include a deed notification to record the location of residual contamination or capped debris areas, and informational measures to inform the landowners and community about areas designated as non-drinking water sources, future management of contaminated soils, and recommendations for future building locations. The Native Village of Savoonga pledged their assistance to serve as an information repository for land use controls at Northeast Cape.

POTENTIAL REMEDIES CONSIDERED

The Corps of Engineers considered the following remedial alternatives for each applicable site or group of sites:

Alternative 1 - No Further Action

Alternative 2 - Land Use Controls

Alternative 3 - Natural Attenuation

Alternative 4 - Long Term Monitoring

Alternative 5 - Landfarming

Alternative 6 - Phytoremediation

Alternative 7 - Thermal Treatment

Alternative 8 – Excavation/Offsite Treatment/Disposal

Alternative 9 - Chemical Oxidation

Alternative 10 - Reactive Walls

Alternative 11 - Capping

Alternative 12 - Reactive Matting

Alternative 13 - Constructed Wetlands

Worksheet C-1
Staffing Matrix for Records of Decision/Decision Documents/Action Memoranda [1]

Decision Document Title: Northeast Cape HTRW (FUDS), St. Lawrence Island, Alaska January 2009						
Organization	**Staff Activity**	**POC Name**	**Office Symbol**	**Phone Number**	**FAX Number**	**Email Address**
Geographic Military District	FUDS Program Mgr.	Ken Andraschko	CEPOA-PM-ESP	907-753-5647	907-753-5647	kenneth.r.andraschko@usace.army.mil
	Counsel	Greg Vanagel	CEPOA-OC	907-753-5529	907-753-2530	gregory.w.vanagel@usace.army.mil
	PAO	Tom Findtner	CEPOA-PA	907-753-2522	907-753-5598	tom.findtner@usace.army.mil
HTRW Design District/ MM Design Center/Centers of Expertise	Technical/environmental	Sam Bass	CEHNC-CX-EG	402-697-2654		don.b.bass@usace.army.mil
	HTRW CX	Sam Bass	CEHNC-CX-EG	402-697-2654		don.b.bass@usace.army.mil
	MM CX	N/A				
	USATCES [2]	N/A				
	USACHPPM [3]	Dennis Druck	MCHB-TS-REH	410-436-2953		
Geographic Military Division	FUDS Program Mgr.	Hudson Kekaula Stacy Hirata	CEPOD-PDM CE	808-438-6962	Acting Chief of Environmental ~~Prog~~ Programs	hudson.w.kekaula@usace.army.mil
HQUSACE	CEMP-DE	~~Janet Wright~~	CEMP-~~DE~~	202-761-1863		janet.s.wright@usace.army.mil
	Counsel	Phil Steffen	CECC-E	202-761-0026		phillip.j.steffen@usace.army.mil
	PAO	Nancy Sticht Candace Walters	CESAJ-CC-P	904-232-1667		nancy.j.sticht@usace.army.mil
HQDA	ODEP					
	TJAG					
	Army Public Affairs					
	OTSG					
	ODASA (ESOH)					
	Army Safety Office					

Directorate of Military Programs

F10AK096903_05.01_0009_p

DEPARTMENT OF THE ARMY

OFFICE OF THE ASSISTANT CHIEF OF STAFF FOR INSTALLATION MANAGEMENT

RECEIVED: 2 Sep 09 **SUSPENSE:** 9 Sep 09	**CLASSIFICATION** FOUO	**TASKING NUMBER:** 90910273

SUBJECT: Final Decision Document for Remedial Actions at Northeast Cape Formerly Used Defense Site (FUDS), St Lawrence Island, Alaska

PREPARER: ____ **Iwaner** ✓ **Angela** .... ____ **Donna**	**ACTION AND RETURN**
✓ **CG**________ **EDIT CNTL**________ ✓ **DACSIM** C ✓ **ACSIM XO**________ ✓ **AXO**________ ✓ **DACSIM XO** DWN	**IT** **(IS)** **OD** **RD** **ZBT** **ZMS** **ZSI** **AEC** **F&MWRC** **IMCOM**

REMARKS:

RECOMMENDATION:

✓ **FOR ACSIM APPROVAL**

____ **FOR ACSIM INFORMATION**

CIRCLE ONE **DISPATCH**	**BY:**	**DATE OUT:**
CALL AO	**Return to:**	**AO:** Bryan Frey
OTHER	**Hand carries to:**	**Phone:** 703-601-1590

OACSIM FORM 79A-R. Jan 09

ARMY STAFFING FORM For use of this form, see DA Memo 25-52; the proponent agency is AASA.	1. TRACKING NUMBER 90910273	2. TODAY'S DATE (YYYYMMDD) 20090810	3. SUSPENSE DATE (YYYYMMDD) 20090909
4. OFFICE SYMBOL DAIM-ISE	5. SUBJECT Final Decision Document for Remedial Actions at Northeast Cape Formerly Used Defense Site (FUDS), St. Lawrence Island, Alaska		

6. ROUTING: (ECC USE ONLY)	Initial	Date	ECC POC Name (Rank, Name, Phone) DIR, ECC
SA			COMMENTS:
CSA			
USA			
VCSA			
AASA			
DAS			
SMA			
DUSA			
VDAS			

7. **EXECUTIVE SUMMARY / ACTION MEMORANDUM**

Key Points

- The Northeast Cape FUDS is a former US Air Force aircraft control and communications facility that operated from 1952 to 1972.
- This Decision Document presents the remedial actions necessary to address risks in accordance with applicable Federal and State of Alaska environmental regulations.
- Total cost of the remedy is estimated at $31M, to be funded from the Environmental Restoration, FUDS account; adequate funding (current and future years) is available to support the action.

Ref: E-mail request for ACSIM approval of Northeast Cape FUDS Decision Document from Headquarters, US Army Corps of Engineers (HQUSACE) dated 06 Aug 09

Encl: TAB A: Northeast Cape FUDS Decision Document (including signature page)
TAB B: Information Paper for the Northeast Cape FUDS Decision Document
TAB C:

1. Purpose:
To obtain ACSIM approval of the Decision Document at TAB A.

2. Discussion:
a. Northeast Cape FUDS is located on St. Lawrence Island, Alaska, in the western portion of the Bering Sea.
b. DoD operations at the property from 1952 to 1972 resulted in the release of hazardous substances to environmental media.
c. Sampling verified contamination is present at concentrations that pose an unacceptable risk.
d. The proposed remedy is designed to reduce the risk resulting from the past DoD activities to safe levels in a timely, cost-effective manner.
e. The State of Alaska, through the Alaska Department of Environmental Conservation, concurs with the selected remedial actions. The Army has coordinated extensively with the community, including tribal leaders.
f. Estimated total cost for the remedy is $31M. This action will be funded from the OSD funded Environmental Restoration, FUDS (ER,F) account; adequate funding is available.
g. By Army policy, the ACSIM is the approval authority for all decision documents with a present net worth cost greater than $10M.

3. Recommendation:
ACSIM approve this action and sign the Decision Document at TAB A.

APPROVED ____ **DISAPPROVED** ____ **NOTED** ____ **SEE ME** ____ **COMMENT** ____

8. LEAD AGENCY STAFF COORDINATION			TRACKING NUMBER:
TITLE	INITIAL	TYPE OR PRINT NAME	DATE (YYYYMMDD)
D CH ISE	Kg	Mr. Krishna Ganta	20090819
CH, ISE	[signature]	COL Greg Wright	20090819
D Dir, ISR	[signature]	COL Patricia Figures	2009 0820
Dir, IS	ukm	Ms. Kathleen Marin	20090820
DACSIM	[signature]	Dr. Craig College	20090903
PRINCIPAL	[signature]	LTG Robert Wilson	20090903
ACTION OFFICER (Name/Title/Phone Number/E-mail)		FREY.BRYAN.M.1264749286 Bryan Frey / Environmental Engineer / 703-601-1590 / bryan.m.frey@us.army.mil	20090812
FILE LOCATION:			
SACO's NAME (Name/Title/Phone Number/E-mail)		Thomas Bennett / 703-692-9210 / tom.bennett@us.army.mil	
RECOMMENDATION FOR STAFF PRINCIPAL:			

9. STAFF COORDINATION

CONCUR	NON-CONCUR	AGENCY	NAME (TITLE, LAST NAME)	PHONE	DATE (YYYYMMDD)	REMARKS
☒	☐	DAIM-ISE	Mr. George Cushman	703-601-0274	20090812	
☒	☐	SAIE-ESOH	Mr. John Tesner	703-697-1987	20090810	
☒	☐	DASG-PPM	COL Clark Weaver	703-681-3017	20090819	
☒	☐	SAPA-SCD	Mr. Jim Hill	703-697-4122	20090813	
☒	☐	CEMP-CE	Mr. Stacey Hirata	202-761-5642	20090806	
☒	☐	CECC-E	Mr. Phil Steffen	202-761-0026	20090806	
☒	☐	CEPA-MP	Ms. Candy Walters	202-528-4285	20090806	
☒	☐	MCHB-TS	Mr. Dennis Druck	410-436-2953	20090806	
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10. REMARKS BY ECC: ☐ RETURNED REQUESTING ADDITIONAL INFORMATION/CLARIFICATION

INFORMATION PAPER

DAIM-ISE
31 August 2009

SUBJECT: Decision Document for Remedial Actions at Northeast Cape Formerly Used Defense Site (FUDS), St. Lawrence, Alaska

1. Purpose: To summarize the Northeast Cape FUDS Decision Document.

2. Facts:

a. This Decision Document defines the remedy for the Northeast Cape Formerly Used Defense Site (FUDS), St. Lawrence Island, Alaska. The Northeast Cape FUDS was an Aircraft Control and Warning Station that operated from 1952 to 1972.

b. Department of Defense (DoD) operations resulted in the release of hazardous substances to soil, surface water, sediment, and groundwater. Investigations conducted since 1985 indicate that releases occurred at as many as 34 sites and that the contaminants are present in concentrations that pose a current and future exposure risk to humans and ecological receptors. The selected remedy will prevent exposure to contaminants and will reduce the potential for off-site migration of contaminants.

c. The proposed actions were chosen in accordance with applicable Federal and State of Alaska environmental regulations and include both conventional and innovative technologies to and the lead environmental regulator, the Alaska Department of Environmental Conservation, has concurred with the selection.

d. Current land use at the Northeast Cape site is seasonal subsistence fishing, hunting, and plant gathering. Future land use desired by local tribal government is residential. In order to support the desired future land use, institutional controls will be put in place to designate areas not suitable for drinking water, prevent construction of buildings on landfills, and manage potential future excavation and movement of soils.

e. Total cost of the remedy is $31 million, to be paid from the OSD funded Environmental Restoration, FUDS (ER,F) account. Adequate funding is available.

3. Conclusions: The proposed remedy, which was concurred with by the lead environmental regulator, is designed to reduce risk resulting from past DoD activities to safe levels in a timely, cost effective manner. The Army has coordinated extensively with the local community, including tribal leaders. Recommend the ACSIM approve this action and sign the Decision Document.

Bryan Frey / (703) 601-1590
APPROVED BY: COL Wright

This signature sheet documents the decision made for the Northeast Cape Formerly Used Defense Site (FUDS), St. Lawrence Island, Alaska. The Alaska Department of Environmental Conservation (ADEC) agrees that the Corps of Engineers' selected remedy complies with CERCLA and state law. However, ADEC does not agree with all of the wording in the Decision Document. A letter to the Alaska District Corps of Engineers, dated December 31, 2009, elaborates on this issue.

This decision may be reviewed and modified in the future if new information becomes available that indicates the presence of contamination or waste that may cause unacceptable risk to human health, safety, welfare or the environment.

______________________________ Date 12/31/2009

JOHN HALVERSON
Alaska Department of Environmental Conservation
Department of Defense Cleanup Unit Lead

STATE OF ALASKA

DEPT. OF ENVIRONMENTAL CONSERVATION

DIVISION OF SPILL PREVENTION AND RESPONSE
CONTAMINATED SITES PROGRAM

SEAN PARNELL, GOVERNOR

555 Cordova Street
Anchorage, AK 99501
PHONE: (907) 269-7545
FAX: (907) 269-7649
www.dec.state.ak.us

File: 475.38.013

December 31, 2009

US Army Engineer District, Alaska
Attn: CEPOA-PM-C (FUDS) (Andraschko)
PO Box 6898
Elmendorf AFB, Alaska 99506-6898

Re: Northeast Cape FUDS HTRW Decision Document, January 2009

Dear Mr. Andraschko:

Thank you for submitting the decision document referenced above for signature by the Alaska Department of Environmental Conservation (DEC). The document was developed with DEC review and input; we had reached agreement with the Alaska District on the wording. Subsequently, it was routed up through the US Army Corps of Engineers (Corps) and the Army and was signed in September. It was then forwarded to DEC for signature; however, revisions were made to some of the wording and DEC does not agree with all of the changes. We do still agree that proper implementation of the selected remedies will comply with State cleanup requirements. I understand revising and re-routing the document for Army signature would be problematic. Therefore, I revised the DEC signature page by adding a reference to this letter and signed it.

In Section 1.2, on page 8, it states, "Accordingly, although not required by law, the petroleum contamination will be cleaned up consistent with Alaska's Site Cleanup Rules." DEC does not agree with the Corps position that State cleanup laws do not apply to FUDS cleanup projects. We have agreed to disagree on this point and be silent on it in decision documents; as long as cleanup actions are conducted consistent with the State cleanup rules it will not be an issue.

Also, in the last sentence of the first paragraph in Section 1.2, and elsewhere in the document, DEC had agreed to the following wording, "ADEC agrees that the remedy selected complies with CERCLA and state law."

In Section 2.7.4, on page 24, it refers to "...the major fuel spill (30,000 gallons) in 1967." Information in our records indicates the major fuel spill was estimated in the range of 130,000 – 180,000 gallons.

In Section 2.10, on page 74, Remedial Action Objectives for the Main Complex Area and the Drainage Basin should include prevent migration of contaminants into surface water bodies at concentrations above risk based cleanup levels or the Alaska water quality standards.

In Section 2.14.5, on page 99, under Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable, it should state, "...USACE has determined that the selected remedies provide the best balance of tradeoffs in terms of the nine criteria." Since the Corps is selecting the remedy, ADEC should not be included in the statement.

On page 106, under Land Use Controls or Institutional Controls, the details on implementing institutional controls still need to be worked out in agreement between the landowners, Corps and DEC.

We look forward to working with you in completing the necessary cleanup work at the Northeast Cape FUDS. If you have any questions regarding this letter or other site related issues, please feel free to contact me at 269-7545.

Sincerely,

John Halverson
Environmental Program Manager

Enclosure: NE Cape HTRW Decision Document – DEC signature page

cc (electronic copy only):
Carey Cossaboom, AK District
Curtis Dunkin, DEC
Jennifer Currie, DOL