



**US Army Corps
of Engineers**
Alaska District

Proposed Plan for Remedial Action GAMBELL FORMERLY USED DEFENSE SITE St. Lawrence Island, Alaska

July 2004

Introduction

The United States Army Corps of Engineers (USACE) and the **Alaska Department of Environmental Conservation (ADEC)** request your comments on this **Proposed Plan**. The Proposed Plan covers 38 sites. The sites are shown on Figure 1.

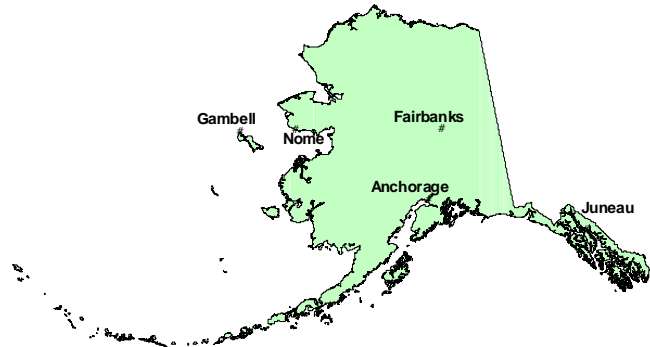
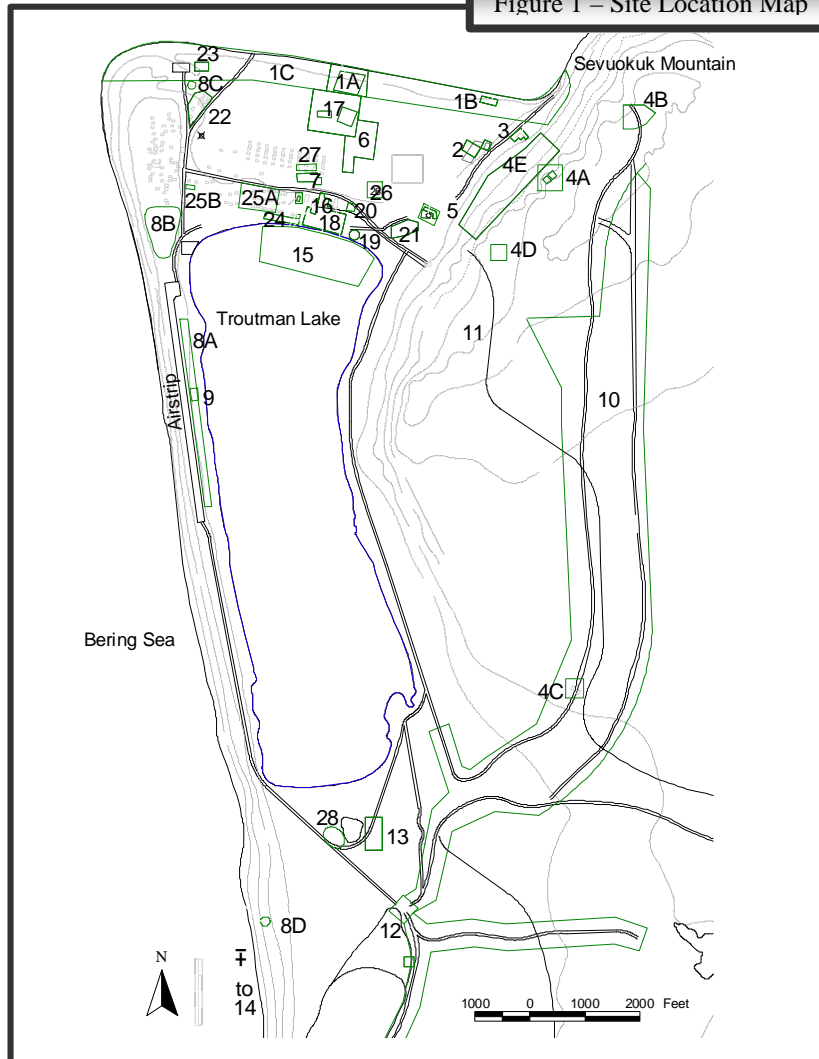


Figure 1 – Site Location Map



The purpose of this Proposed Plan is to:

- Describe the environmental conditions at each site.
- Describe the cleanup levels for the sites.
- Describe the cleanup alternatives that were considered.
- Present the recommended cleanup alternative for each site.
- Request public comment on the preferred alternatives.
- Provide information on how the public can be involved in final cleanup decisions.

Final decisions on the preferred alternatives will not be made until all comments submitted by the end of the public comment period, have been reviewed and considered. Changes to the preferred

alternatives may be made if public comments or additional data indicate that such changes would result in more appropriate solutions. After considering all public comments, USACE will prepare a **Decision Document** which describes the final selected remedy. The Decision Document will include responses to all significant public comments received in a section called the **Responsiveness Summary**.

Preparation of this **Proposed Plan** and the associated public comment period is required under Section 117(a) of the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)**, also known as "Superfund". Although the sites described in this Proposed Plan are not CERCLA sites, this project follows CERCLA guidance.

The Department of Defense (DoD) is tasked with correcting environmental damage caused by past military activities. 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 Department of Defense once owned or used, but no longer controls. These properties range from privately owned farms to National Parks. They also include residential areas, schools, colleges, and industrial areas. The FUDS program includes former Army, Navy, Marine, Air Force, and other defense properties. Over 600 FUDS have been identified in Alaska.

A **Glossary of Terms** is located at the end of this document.

Site Location and Background

The Native Village of Gambell is located on St. Lawrence Island, in the western portion of the Bering Sea, approximately 200 air miles southwest of Nome, Alaska (see Figure 2). The village is situated on a gravel spit that projects north and westward from the island, at an elevation of 30 feet above mean sea level. St. Lawrence Island is currently owned jointly by Sivuqaq,

Sites:

- 1A North Beach
- 1B Army Landing Area
- 1C Air Force Landing Area
- 2 Military Burial Site
- 3 Communications Facility
- 4A Air Force Radar Site
- 4B Former Quonset Huts
- 4C Discarded Drums
- 4D Former Transformers
- 4E Western Face of Sevuokuk Mtn
- 5 Tramway Site
- 6 Military Landfill
- 7 Military Power Facility
- 8A Marston Matting
- 8B Buried Debris
- 8C Navy Landfill
- 8D Ammunition Beach Burial
- 9 Asphalt Drums
- 10 Army/Air Force Trails
- 11 Communication Cable Route
- 12 Nayvaghat Lakes Disposal Site
- 13 Radar Power Station
- 14 Navy Plane Crash Site
- 15 Troutman Lake Disposal Site
- 16 Municipal Building Site
- 17 Army Landfills
- 18 Main Camp
- 19 Diatomaceous Earth
- 20 Schoolyard
- 21 Toe of Sevuokuk Mountain
- 22 Former CAA Housing
- 23 Debris from High School
- 24 South of Municipal Building
- 25A Gambell South Housing Units
- 25B Low Drainage Area
- 26 Possible Debris Burial Site
- 27 Drum Storage Area
- 28 Disturbed Ground

Alaska Department of Environmental Conservation (ADEC): The state agency responsible for protecting public health, safety, welfare, and the environment from adverse effects of environmental contamination.

CERCLA: The Comprehensive Environmental Response, Compensation, and Liability Act (also known as Superfund). The federal law that guides cleanup of hazardous waste sites.

Formerly Used Defense Site Program (FUDS): A Department of Defense program to correct environmental damage caused by past military activities.

Proposed Plan: A document informing Tribes, community leaders, and the public about contaminated sites, cleanup alternatives that were considered, and which alternatives were identified as the preferred alternatives.

Decision Document: Identifies the selected remedy for a site, the rationale for its selection, and includes responses to public comments.

Inc., in Gambell, Alaska, and the Savoonga Native Corporation in Savoonga, Alaska. Non-Native land on St. Lawrence Island is limited to state land used for airstrips and related facilities in Gambell and Savoonga. During the 1950s, the military constructed and operated facilities in Gambell as part of a surveillance and intelligence gathering network.



Gambell is inhabited primarily by Native St. Lawrence Island Yupik people, who lead a subsistence-based lifestyle. The Gambell area supports habitat for a variety of seabirds, waterfowl, and mammals that either breed in or visit the area. The area surrounding the top of Sevuokuk Mountain, above the Village of Gambell, supports a large bird rookery. The birds and bird eggs serve as a subsistence food source for local inhabitants. The ocean surrounding the Gambell area is used extensively for subsistence hunting of whales, walrus, seals, sea birds, and fish.

Environmental Investigation and Cleanup History

Environmental investigations and cleanup activities at Gambell have been ongoing since the mid 1980's. The actions presented in this Proposed Plan are based largely on the investigations from 1994 to the present. The investigations have been performed in many phases, with each new phase building on the previous phases. The goals of the investigations were to locate and identify areas of contamination and to gather enough information to develop a cleanup plan.

The results of the studies are summarized in this Proposed Plan. The original documents can be found in the **Administrative Record** located at the USACE Office on Elmendorf Air Force Base or at the **Information Repositories** located in Gambell, Savoonga, Nome, and Anchorage.

Administrative Record: A collection of historical documents such as reports, studies, and maps which support the final cleanup decision for a site.

Feasibility Study (FS): A study to develop and evaluate options for remedial action, using data gathered during the RI. The study defines the objectives of the response action, develops remedial action alternatives, and conducts an initial screening and detailed analysis of the alternatives.

Geophysical Survey: A method used to delineate underground features such as metallic debris.

Information Repository: A publicly accessible location where historical documents are stored.

Remedial Investigation (RI): A process to determine the nature and extent of contamination. The RI emphasizes data collection and site characterization, includes sampling and monitoring, as necessary.

Removal/Remedial Actions (RA): Actions taken to abate, prevent, minimize, stabilize, mitigate, or eliminate the release or threat of release.

The first major environmental study, the **remedial investigation**, was performed at Gambell in 1994. The study separated the area into 18 sites. The results of the remedial investigation showed that contaminants were present at some but not all sites.

In 1996, Phase II of the remedial investigation was performed. In this study, additional soil and groundwater samples were collected from Sites 1A, 1B, 2, 3, 4B, 4D, and 5. The study

objectives were to further delineate the extent of contamination, estimate amounts of debris, and conduct a **geophysical survey**.

In 1997, Montgomery Watson removed all visible surface debris from the island. After this **removal action**, frost jacking brought additional debris to surface. During the 1999 field season, Oil Spill Consultants, Inc. (OSCI) performed additional cleanup activities at various sites in Gambell. OSCI removed a total of 26.8 tons of hazardous and non-hazardous containerized wastes such as asphalt drums, paint, generators, batteries, empty drums, and transformer carcasses; removed 71 tons of exposed metal debris such as runway matting, cable, fuel tanks and equipment parts; and excavated 72 tons of contaminated soil.

In 2000 and 2001, the Army Engineering and Support Center (Huntsville) conducted extensive research and investigations to locate possible ordnance and explosives materials left behind by the military. During the field surveys, very little ordnance waste was found, consisting primarily of highly weathered 30-caliber small arms ammunition at a beach burial pit southwest of Troutman Lake.

A supplemental remedial investigation was conducted by Montgomery Watson Harza during the 2001 field season, to investigate the nature and extent of contamination at four newly identified sites, and verify previously collected confirmation data. The summary report recommended further action at several sites, and no further action for others.

REMEDIAL ACTION OBJECTIVES AND CLEANUP CRITERIA

As part of the remedial investigation process, the level of contaminants are compared to risk-based **screening levels** and applicable regulatory **cleanup levels**. The Alaska Department of Environmental Conservation (ADEC) regulates cleanup of contaminated sites, and has established soil and groundwater cleanup levels (18 AAC 75). The soil cleanup levels for the majority of sites in Gambell are the ADEC Table B cleanup levels, based on the Under 40 Inch Zone, Ingestion pathway. The ADEC concurs with the selection of Ingestion cleanup levels.

The soil cleanup levels for Sites 5 and 12 only are the ADEC Table B cleanup levels, based on the Migration to Groundwater pathway. The groundwater cleanup levels for Sites 5 and 12 are the ADEC Table C cleanup levels. Table 1 lists the cleanup levels for the Gambell sites. The selected soil and groundwater cleanup levels for all sites are risk based and designed to be protective of human health and the environment.

Screening Level: A number used for comparison with data collected during a remedial investigation. Screening levels can be the most conservative ADEC Table B cleanup level (migration to groundwater pathway) or a risk-based level published by the US EPA.

Cleanup Level: A site-specific number, selected based on the most relevant exposure pathway.

Cleanup levels based on the migration to groundwater pathway were not selected for sites other than Sites 5 and 12 because in general, continuous permafrost acts as a barrier for soil contaminant migration to a groundwater zone. However, migration of contaminants can occur via seasonal groundwater present in the active lens above the permafrost layer (suprapermafrost groundwater). Suprapermafrost groundwater has been sporadically documented within the village of Gambell (i.e. in the vicinity of Sites 6, 7, 16, 17, 18). The groundwater flow direction from these areas is north, towards the Bering Sea, a distance of about 1,200 feet away. The groundwater aquifer that

supplies drinking water to the community is located at the base of Sevuokuk Mountain, approximately 1,500-2,000 feet east of the village.

The sites located at the top of Sevuokuk Mountain – Sites 4A and 4B – are situated on bedrock. Very little soil is found at the top of Sevuokuk Mountain and groundwater is expected to run off the side of the mountain or enter bedrock fractures. It is unlikely that groundwater from Sites 4A and 4B could impact the drinking water aquifer at the base of the mountain.

All Sites			Sites 5 and 12		
Soil			Soil		
DRO	10,250	mg/kg	DRO	250	mg/kg
RRO	10,000	mg/kg	GRO	300	mg/kg
Antimony	41	mg/kg	RRO	11,000	mg/kg
Arsenic	5.5	mg/kg	Arsenic	2.0	mg/kg
Beryllium	200	mg/kg	Cadmium	5	mg/kg
Cadmium	100	mg/kg	Chromium	26	mg/kg
Chromium	300	mg/kg	Lead	400	mg/kg
Copper	4,060	mg/kg			
Lead	400	mg/kg	Groundwater		
Mercury	18	mg/kg	DRO	1.5	mg/L
Nickel	2,000	mg/kg	GRO	1.3	mg/L
Selenium	510	mg/kg	RRO	1.1	mg/L

Groundwater from the central gravel spit is not suitable as a source of drinking water. Groundwater in the gravels is often saline, difficult to recover in useable quantities, and located in an active lens over permafrost. Drinking water wells installed in the gravel have been abandoned in the past. Groundwater encountered at the site has been limited in quantity, and only intermittently detected. Permafrost in Gambell is commonly encountered at depths ranging from 3 to 15 feet below the ground surface. The village water supply is located at the base of Sevuokuk Mountain, on the far eastern edge of the gravel spit (see Figure 4). According to a State of Alaska hydrogeological investigation report (Ireland, 1994), the Gambell aquifer is canoe-shaped, originating along the front of the steep bluff of Sevuokuk Mountain, and continuing down the hydrological gradient across a highly permeable gravel bar towards the ocean. The aquifer appears to be a thaw bulb in the permafrost, and as the permafrost expands or recedes, the aquifer dimensions vary. The influence of warm recharge water from Sevuokuk Mountain has produced the thaw bulb effect on the area permafrost. The majority of the water recharging the aquifer originates from two springs that flow from the steep bluffs of the mountain into the gravel. Shallow groundwater across the gravel spit does not appear to be continuous because of the presence of shallow permafrost (Munter and Williams, 1992).

Site contaminant levels were compared to the selected cleanup levels. The US Environmental Protection Agency (EPA) recommends calculating the **95% upper confidence limit (UCL)** for site-specific datasets. The 95%UCL represents a reasonable estimate of the maximum concentration likely to be contacted over time.

95% Upper Confidence Limit (UCL): the value at which there is a 95% likelihood that 95% of the dataset is below this value (e.g. the upper boundary). The UCL is also considered a reasonable estimate of the maximum exposure concentration.

Aerial view of Gambell



REMEDIAL ALTERNATIVES

The Corps of Engineers considered the following remedial alternatives for each site:

No Further Action. 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. NFA is also used as a baseline to compare other responses.

Institutional Controls. Institutional 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 installation of new wells in a particular area.

Site-specific Actions. A feasibility study (FS) evaluated alternatives for Sites 4A, 4B, 6, 7, 8, and 12. The FS provided a detailed analysis of four alternatives for Sites 8 and 12.

- No Action
- Debris Removal Only
- Debris and Lead-Contaminated Soil Removal
- Debris Removal and In-situ Treatment of Lead-Contaminated Soil

The Corps of Engineers evaluated remedial alternatives based on the nine evaluation criteria established under CERCLA, as shown in Table 2.

Table 2. Nine Criteria for Evaluation of Alternatives Under CERCLA	
<i>Criteria</i>	<i>Definition</i>
Overall Protection of Human Health and the Environment	How well does the alternative protect human health and the environment through elimination, reduction, or control of contaminated areas?
Compliance with Applicable or Relevant and Appropriate Requirements	Does the alternative meet cleanup standards and comply with applicable state and federal laws?
Short-term effectiveness	Are there potential adverse effects to either human health or the environment during construction or implementation of the alternative?
Long-term effectiveness and Permanence	How well does the alternative protect human health and the environment after cleanup, and are there any risks remaining at the site?
Reduction of Toxicity, Mobility, and Volume through Treatment	Does the alternative effectively treat the contamination to significantly reduce the toxicity, mobility, and volume of the hazardous substance?
Implementability	Is the alternative both technically and administratively feasible? Has the technology been used successfully at similar areas?
Cost	What are the capital and operating and maintenance costs of the alternative?
Community Acceptance	What are the community's comments or concerns about the alternatives considered and about the preferred alternative? Does the community generally support or oppose the preferred alternative?
State Acceptance	Does the state regulatory agency (ADEC) support or oppose the preferred alternative?

SITE SUMMARIES

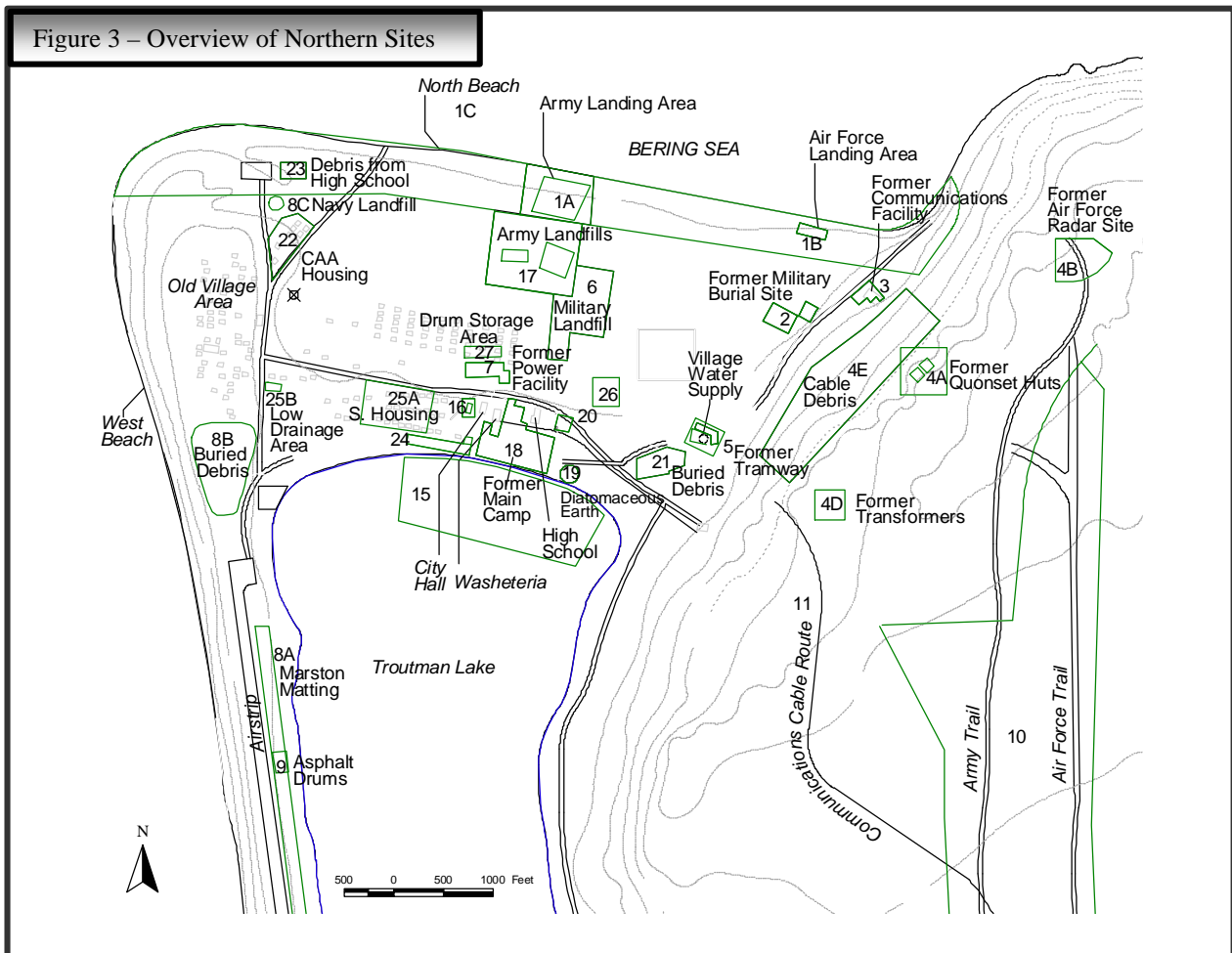
The following sections provide physical descriptions, investigative histories and preferred alternatives for each site. The general location of sites in the northern portion of Gambell is shown in Figure 3.

Site 1A – North Beach, Army Landing Area

Site Description: This site is located in the central portion of the North Beach, where two well-established all-terrain vehicle (ATV) trails intersect. The Army landing area was located east of an area that is currently used by local residents to land or launch whaling boats. The site consisted of exposed surface debris including engine pieces, marston matting, weasel tracks, steel cables, a partially buried 100-foot crane, and other buried metallic debris which are periodically exposed and reclaimed by shifting gravels along the beach area.

Cleanup Actions to Date: In 1997, Montgomery Watson removed all visible surface debris from Site 1A (5,545 pounds) and the surrounding beach area (3,630 pounds), including corrugated roofing material, piping, marston matting, weasel tracks, protruding parts of a buried crane, engines, cables, and other miscellaneous debris.

Investigation Summary: The site was investigated during the 1994 Phase I remedial investigation, including a geophysical survey to delineate landfill boundaries, installation of five



monitoring wells, and collection of subsurface soil, surface soil, and groundwater samples. Several soil and groundwater samples were collected in 1994. One surface soil sample was collected and analyzed for total recoverable petroleum hydrocarbons (**TRPH**), **BNAs**, **PCBs**, and **priority pollutant metals**. Subsurface soil samples were analyzed for petroleum hydrocarbons (**DRO**, **GRO**, **TRPH**), **VOCs**, **PCBs**, and priority pollutant metals. Groundwater samples were analyzed for petroleum hydrocarbons (**DRO**, **GRO**, **TRPH**), **VOCs**, **PCBs**, and priority pollutant metals. Arsenic concentrations in soil ranged from 1 to 9 mg/kg. The average concentration (95% UCL) for arsenic is 5.0 mg/kg, which does not exceed the cleanup level of 5.5 mg/kg. No other contaminants were detected in soil or groundwater above screening levels.

Cleanup Objective: ADEC Table B soil cleanup levels based on the Ingestion pathway.

Preferred Alternative: No further action. There are no contaminants which exceed the selected cleanup levels. In addition, Site 1A meets the more stringent ADEC cleanup levels based on the Migration to Groundwater pathway. All dangerous surface debris was removed in 1997. Buried debris is not eligible for further action under FUDS.

BNAs: base, neutral, and acid compounds (includes PAHs)
DRO: diesel range organics
GRO: gasoline range organics
PAHs: polynuclear aromatic hydrocarbons
PCBs: polychlorinated biphenyls
priority pollutant metals: antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, zinc.
RRO: residual range organics
SVOCs: semi-volatile organic compounds
TRPH: total recoverable petroleum hydrocarbons
VOCs: volatile organic compounds

Site 1B – North Beach, Air Force Landing Area

Site Description: This site is located west of Sevuokuk Mountain, and approximately 1,900 feet east of the Army Landing Area on North Beach. The site contained exposed surface debris, rust-stained gravel, and a patch of tar-stained gravel. Additionally, buried debris may be periodically exposed as the gravel beach deposits shift or frost jacking occurs. This area receives a large amount of ATV traffic due to its proximity to the bird rookeries on Sevuokuk Mountain visited by local residents and tourists.

Cleanup Actions to Date: In 1997, Montgomery Watson removed all visible surface debris from Site 1B (105 pounds) and the surrounding beach area (2,865 pounds), including marston matting, empty drums, sheet metal, steel cables, and other miscellaneous debris.

Investigation Summary: Site 1B was investigated during the 1994 Phase I remedial investigation, including a geophysical survey to delineate buried debris, installation of monitoring wells, and collection of surface soil, subsurface soil, and groundwater samples.

In 1994, three monitoring wells were installed at Site 1B, to a maximum depth of 20.5 feet. Groundwater was encountered between 10 and 14.5 feet below ground surface. Subsurface soil and groundwater samples were collected from the three borings and analyzed for petroleum hydrocarbons (**GRO**, **DRO**, **TRPH**), **VOCs**, **PCBs**, and priority pollutant metals. One surface soil sample was collected from the rust-stained soil and analyzed for **TRPH**, **BNA**, **PCBs**, and priority pollutant metals. Petroleum hydrocarbons and lead were detected in soil, but did not exceed screening levels. Arsenic was also detected in soil at concentrations ranging from 2 to 7 mg/kg. The average concentration (95% UCL) of arsenic is 4.8 mg/kg, which does not exceed

the cleanup level of 5.5 mg/kg. No other chemicals were detected in soil or groundwater above screening levels.

Cleanup Objective: ADEC Table B soil cleanup levels based on the Ingestion pathway.

Preferred Alternative: No further action. There are no contaminants which exceed the selected cleanup levels. In addition, Site 1B meets the more stringent ADEC cleanup levels based on the Migration to Groundwater pathway. Therefore, no additional actions are proposed. All dangerous surface debris was removed in 1997. Buried debris is not eligible for further action under FUDS.

Site 1C – North Beach

Site Description: This site covers the entire length of North Beach and consists of underwater metallic debris located just offshore. The majority of the debris is thought to be marston matting used to construct the two military landing areas. North Beach is the primary area used by local residents for launching and landing boats.

Cleanup Actions to Date: In 1997, Montgomery Watson removed all visible surface debris (10,105 pounds) from the entire length of the North Beach, including corrugated roofing material, piping, marston matting, empty drums, heavy machinery parts, metal cables, and other miscellaneous debris.

Preferred Alternative: No further action. The remaining underwater debris is not eligible for further action under FUDS.

Site 2 – Former Military Housing/Operations Burial Site

Site Description: Site 2 is located approximately 1,000 feet south of the former Air Force Landing Area on North Beach, and just west of the base of Sevuokuk Mountain (see Figure 3). Facilities associated with military housing/operations, and a power plant, were reportedly demolished and buried at this site. Ordnance may have been buried here as well. Exposed debris was observed at the site, including remnants of a rock fireplace, partially buried concrete pad, burned wood, scattered metal debris/gear, and discolored gravel.

Cleanup Actions to Date: In 1997, Montgomery Watson removed 100 pounds of miscellaneous debris from Site 2, and a large quantity (total of 1,740 pounds) of cable spools, wheel rims, corrugated metal, and marston matting from the vicinity of Site 2 (between Sites 1A and 3). Oil Spill Consultants, Inc (OSCI) removed the remaining exposed debris in 1999, but attributed all quantities of debris removed to Site 3. OSCI also removed 24,982 pounds (12.5 cubic yards) of petroleum-stained soils from near Site 2. The actual location of the stained soil was adjacent to a large rock at the base of Sevuokuk Mountain, approximately 450 feet south of the Bering Sea/ North Beach. This location was identified by Montgomery Watson as between Site 1A and 3.

Investigation Summary: During the 1994 Phase I remedial investigation, a geophysical survey was conducted, as well as installation of groundwater monitoring wells, and collection of surface soil, subsurface soil, groundwater, and asbestos samples.

Three monitoring wells were installed at the site during the 1994 investigation; subsurface soil samples were collected and analyzed for VOCs, GRO, DRO, TRPH, priority pollutant metals, PCBs, and explosives. Groundwater samples were collected and analyzed for VOCs, GRO, DRO, TRPH, priority pollutant metals, and explosives. Surface soil samples were also collected and analyzed for TRPH, BNA's, and priority pollutant metals.

Table 3. Sampling Results at Site 2				
Chemical	Screening Level ^a	Results (1994)	Results (1996)	Average (95% UCL)
Soil (mg/kg)				
DRO	250	ND - 28	--	
TRPH	NA	ND - 710	--	
Arsenic	2	3 - 11	--	6.5
Chromium	26	3 - 391	--	82 - 165 ^b
Lead	400	1 - 749	3.6-63	206
Water (mg/L)				
TRPH	NA	0.5	--	
Notes: NA not available, ND not detected				
^a 18AAC75, Table B, Under 40 Inch Zone, Migration to Groundwater (August 8, 2003)				
^b range of values based on non-parametric methods				

Low levels of fuels were detected in the soil. Elevated levels of metals were also detected in one surface soil sample above screening levels. Low levels of total hydrocarbons were detected in the groundwater sample, but did not exceed ADEC cleanup levels. No other analytes were detected in the groundwater or soil. No asbestos was detected in the fibrous material. Sampling results are summarized in Table 3.

Only one sample from 1994 exceeded the screening levels for chromium and lead. The 12 other soil samples contained low levels of chromium (ND to 21 mg/kg) and lead (1 to 70 mg/kg). Chromium was not considered a contaminant of concern following the 1994 investigation. During 1996, further soil sampling was conducted to determine the extent of lead contamination. Eight surface soil samples were collected and analyzed for lead only. Sampling results are shown in Table 3. The 1996 results were significantly lower, indicating the 1994 sample was an isolated occurrence. The average lead concentration at the site does not exceed the ADEC cleanup levels. The maximum chromium concentration is considered an outlier. See Table 3 for a summary of the Phase II results. Although the detected arsenic concentrations exceed the ADEC cleanup level, the levels are consistent across many sites in Gambell, and do not appear associated with past military activity.

In 1999, OSCI collected a pre-excavation sample to characterize the stained soils for disposal purposes; the sample contained gasoline and diesel range organics at 309 and 6,440 mg/kg, respectively. The concentration of petroleum hydrocarbons in the removed soils did not exceed ADEC cleanup level based on the Ingestion pathway. No PCBs, VOCs, SVOCs, pesticide/herbicides, or **leachable metals** were detected. After OCSI removed a large quantity of stained soils, the Corps of Engineers stopped further excavation because the intent of the removal action was to remove limited stained soils associated with drums and other debris. The contamination was more extensive than previously indicated. In addition, the petroleum-stained soils were later reported to originate from draining oil from locally owned ATVs. No post-excavation samples were collected, because the Corps determined the stained soil was erroneously included in the scope of work.

Leachable metals: Metals tested using the toxicity characteristic leaching procedure (TCLP).

Earth Tech, Inc. conducted two geophysical surveys at Site 2 during July and September 2000, to determine the presence or absence of buried ordnance. First, the field team visually surveyed the area and removed metallic scrap and debris from the surface. Next, metal detectors were used map the location of subsurface anomalies over three site grids. Each target location was then

further investigated, excavated and searched for the source of the metallic anomaly. No evidence of any ordnance was found during the investigation.

Cleanup Objective: ADEC Table B soil cleanup levels based on the Ingestion pathway.

Preferred Alternative: No further action. There are no contaminants of concern present above the selected cleanup levels. The arsenic concentrations are attributable to background, and the single chromium exceedance is considered an outlier. Furthermore, the observed petroleum contamination may be the result of more recent oil spills that are not related to former DoD activities. The partially buried concrete pad is not eligible for further action under FUDS.

Site 3 – Former Communications Facility Burial Area

Site Description: Site 3 is located approximately 700 feet south of the North Beach, near the base of Sevuokuk Mountain (see Figure 3). The preliminary assessment indicated the possible burial of Jamesway huts, power plant generators, transformers, oils, batteries, and sulfuric acid. Exposed above-ground debris included metal debris (weasel tracks, marston matting), some pipe, empty drums, and anchors for guy wire.

Cleanup Actions to Date: In 1997, Montgomery Watson removed 1,740 pounds of debris from the vicinity of Site 3, including cable spools, corrugated metal, marston matting, and cable wires. In 1999, Oil Spill Consultants removed an additional 3,030 pounds of surface debris, including weasel tracks, 3 empty fuel storage tanks, marston matting and drums.

Investigation Summary: During the Phase I investigation in 1994, Montgomery Watson completed a geophysical survey to determine the extent of buried debris, installed two monitoring wells, and collected subsurface soil and groundwater samples.

The geophysical survey identified two discrete areas with suspected buried material. The monitoring wells encountered groundwater at depths of 8 to 9 feet below ground surface. An analysis of the groundwater gradient indicated a northerly flow direction. Subsurface soil samples were collected at depths of 2.5 and 5 feet, and analyzed for petroleum hydrocarbons, VOCs, priority pollutant metals, PCBs, sulfate/sulfur, and pH. A low level of DRO was detected. No VOCs or PCBs were detected. Several metals were detected in the soil, including arsenic, beryllium, cadmium, mercury, selenium, and thallium. Beryllium and thallium exceeded initial screening levels, and further sampling was conducted during the Phase II investigation. Table 4 summarizes the sampling results from Site 3.

Table 4. Sampling Results at Site 3			
Chemical	Cleanup Level	Results (1994)	Results (1996)
Soil (mg/kg)			
DRO	10,250 ^a	522	
Arsenic	5.5 ^a	3-6	
Beryllium	200 ^a	6	ND (2.52)
Cadmium	100 ^a	7	
Mercury	18 ^b	11	
Selenium	510 ^a	13	
Thallium	5.5 ^d	15	ND (0.28)
Water (mg/L)			
Lead	0.015 ^c	0.045	
Lead, dissolved		ND (0.002)	
Notes:			
^a 18AAC75, Table B, Under 40 Inch Zone, Ingestion (August 8, 2003)			
^b 18AAC75, Table B, Under 40 Inch Zone, Inhalation (August 8, 2003)			
^c 18AAC75, Table C (August 8, 2003)			
^d US EPA Region 3, Risk-Based Concentration Table (April 4, 2004)			

Lead was detected in groundwater from MW10 at a concentration which exceeds the ADEC Table C groundwater cleanup value. However, a filtered sample from this well did not contain

any dissolved lead. A second monitoring well, MW09, located immediately downgradient of MW10 did not contain detectable levels of lead in the groundwater. Both monitoring wells are located downgradient of the village drinking water supply well. Lead was not identified as a contaminant of concern, and no further groundwater sampling was performed at Site 3 after the Phase I investigation.

Additional investigation for beryllium and thallium was conducted during the 1996 Phase II investigation. Four surface soil samples were collected; the results were all below detection limits. The thallium results from 1994 were determined to be anomalous and spatially limited.

Cleanup Objective: ADEC Table B soil cleanup levels based on the Ingestion pathway.

Preferred Alternative: No further action. There are no contaminants of concern present above the cleanup levels. All dangerous surface debris has been removed. The buried debris is not eligible for further action under FUDS.

Site 4A – Former Quonset Huts near USAF Radar Station

Site Description: Site 4A consisted of collapsed Quonset Huts frames and transformer casings located on the top of Sevuokuk Mountain.

Cleanup Actions to Date: In 1997, Montgomery Watson removed the three empty transformer carcasses. In 1999, OSCI removed 14,772 pounds (7.4 tons) of debris, including two collapsed Quonset hut frames, metal siding, drums, and associated stained soil (1,877 pounds).

Investigation Summary: This area was studied during the 1994 investigation. Three surface soil samples were collected adjacent to the fallen transformers and analyzed for PCBs. Asbestos samples were also taken around the fallen Quonset huts. No PCBs or asbestos-containing material (ACM) were detected in the soils.



OSCI collected confirmation soil samples from within and outside of the two Quonset hut footprints following the removal action. The samples were analyzed for petroleum hydrocarbons (DRO/RRO/GRO), VOCs, SVOCs, PCBs, pesticides, and Resource Conservation and Recovery Act (RCRA) metals.

RCRA metals: arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver.

The 1999 confirmation samples contained some elevated diesel range organics and metals. Arsenic, chromium, and lead were detected at concentrations exceeding the ADEC cleanup levels. A supplemental investigation was done in 2001 at Site 4A to verify the previous confirmation sampling results. Four samples were collected based on field screening results and analyzed for petroleum hydrocarbons and RCRA metals. All chemicals were below ADEC cleanup levels. Table 5 summarizes the confirmation soil sampling results from Site 4A. No significant volume of contaminated soil remains at the site. The area consists of large boulders on top of bedrock with small amounts of soil.

Table 5. Confirmation Sampling Results at Site 4A			
Chemical	Cleanup Level ^a	Highest Concentration (1999)	Highest Concentration (2001)
<i>Soil (mg/kg)</i>			
Arsenic	5.5	8.3	3.9
Chromium	300	391	12.1
Lead	400	422	44
DRO	10,250	1,310	970
Notes: ^a 18AAC75, Table B, Under 40 Inch Zone, Ingestion (August 8, 2003)			

Cleanup Objective: ADEC Table B soil cleanup levels based on the Ingestion pathway.

Preferred alternative: No Further Action. All hazardous debris and contaminated soil were removed during the 1997 and 1999 field seasons. Site 4A has been cleaned up to extent feasible, as there is minimal soil above bedrock.

Site 4B – Former USAF Radar Station

Site Description: Site 4B was a US Air Force (USAF) radar station, located on top of Sevuokuk Mountain. The site covered an area approximately 375 feet by 500 feet. The radar station consisted of buildings that burned and caused ordnance to explode and scatter debris.

Cleanup Actions to Date: In 1999, OSCI excavated 52 tons of contaminated soil to a depth of 24 inches; and removed 1.4 tons of miscellaneous metal debris from Site 4B. The excavation area was approximately 29 by 37 feet, partly covered by boulders, with localized heavy staining and an oily substance.

Investigation Summary: During the first phase of investigation in 1994, soil samples were collected and analyzed for petroleum hydrocarbons (TRPH), PCBs, priority pollutant metals, BNAs, and dioxin/furans. The Phase I sampling results identified elevated concentrations of metals and dioxins. During the 1996 Phase II investigation, four additional surface soil samples were collected from the edges of the stained soil area to delineate the extent of metals contamination. Samples were analyzed for antimony, arsenic, cadmium, copper, and lead. The results were significantly lower than those detected during the Phase I. See Table 6 for a comparison of results.

Confirmation samples collected after the 1999 soil excavation were analyzed for petroleum hydrocarbons (DRO/RRO/GRO), VOCs, SVOCs, PCBs, pesticides, metals (antimony, arsenic, cadmium, copper and lead), and dioxin/furans. Sampling results are shown in Table 6. The concentration of dioxins decreased significantly as a result of removing the soils.

In 2001, supplemental RI fieldwork was done at Site 4B to verify the 1999 confirmation sampling results because the referenced latitude and longitude coordinates were not documented

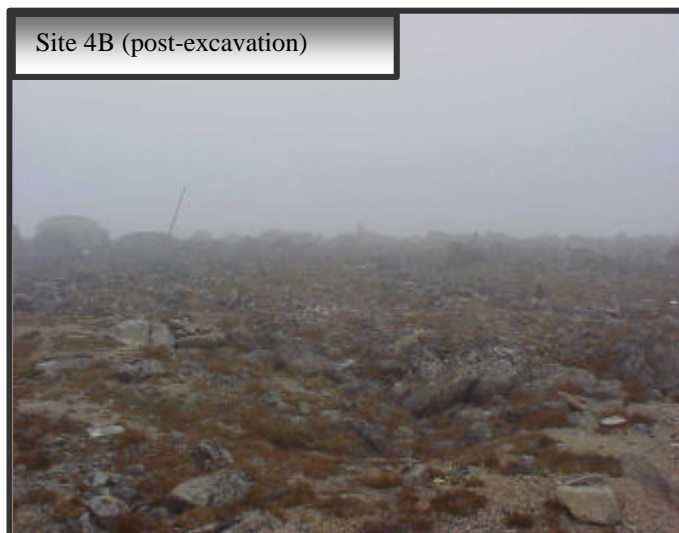
Chemical	Units	1994 results	1996 results	1999 pre-excavation results	1999 post-excavation results	2001 post-excavation results	ADEC cleanup level ^a
Antimony	mg/kg	130	ND (15)	--	3.3	--	41
Arsenic	mg/kg	38	17	--	1.6	4.3	5.5
Cadmium	mg/kg	52	6	--	1.8	0.4	100
Copper	mg/kg	26,600	1,900	--	6,940	--	4,060 ^b 7,000 ^c 7,800 ^d
Lead	mg/kg	3,249	840	11.7 mg/L (TCLP)	396	96	400
Total Dioxins (TEQ)	µg/kg	51.2	--	262	34	--	NA
Diesel Range Organics (DRO)	mg/kg	--	--	469	13,900	10,000	10,250
Residual Range Organics (RRO)	mg/kg	--	--	2,110	905	200	10,000
TRPH	mg/kg	690	--	--	--	--	NA

Notes:
 ND – non detect, TEQ – total dioxin/furan equivalent, TCLP – toxicity characterization leaching procedure, NA – not available
^a 18AAC75, Table B, Under 40 Inch Zone, ingestion pathway (August 8, 2003)
^b Additional Cleanup Levels, ADEC Technical Memorandum 01-007 (November 24, 2003), ingestion pathway
^c Additional Cleanup Levels, ADEC Technical Memorandum 01-007 (November 24, 2003), migration to groundwater pathway
^d U.S. EPA, Region 3, Risk-Based Concentration Table (April 14, 2004), residential soil

by OSCI. Soil samples were collected and analyzed for petroleum hydrocarbons (DRO/RRO/GRO) and RCRA metals. The results are shown in Table 6. Antimony and copper were not analyzed for in 2001 because they are not part of the standard set of 8 RCRA metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver).

The 1999 results showed only 1 out of 6 samples exceeded the ADEC Table B cleanup level of 4,060 mg/kg for copper, based on the ingestion pathway. The highest concentration of copper in the remaining samples was 65.7 mg/kg. However, the maximum concentration of copper does not exceed the ADEC Table B cleanup level of 7,000 mg/kg based on the migration to groundwater pathway, or a risk-based concentration of 7,800 mg/kg for residential soil published by the US EPA, Region 3. The 1999 sample with elevated copper also contained lead. Further sampling in 2001 indicated lead at much lower levels, but copper was not included in the analytical suite.

Cleanup Objective: The Feasibility Study evaluated remedial action objectives for Site 4B. Site 4B is located at the top of Sevuokuk Mountain, and is situated on bedrock. Very little soil is found at the top of Sevuokuk Mountain and groundwater is expected to run off the side of the mountain or enter bedrock fractures. It is unlikely that water from Site 4B would impact the aquifer at the base of the mountain. Therefore, the ADEC Table B soil cleanup levels based on the Ingestion pathway were selected.



Preferred Alternative: No further action. No contaminants of concern remain above cleanup levels. The elevated copper is an isolated occurrence, and de-minimus quantities of soil remain at Site 4B. The contamination does not pose a potential threat to the public drinking water supply located southwest of the Site at the base of Sevuokuk Mountain, because the predominant drainage pathway is north towards the Bering Sea.

Site 4C – Sevuokuk Mountain

Site Description: Site 4C is located at the south end of Sevuokuk Mountain, and contained discarded drums along an ATV trail.

Cleanup Actions to Date: Scattered drums were collected from along ATV trails and the surrounding tundra at the southern end of Sevuokuk Mountain by OSCI during the 1999 field season. OSCI removed a total of 12,516 pounds of drums and drum parts from the Army Trails (Site 10), which included the drums identified at Site 4C.

Investigation Summary: Samples were collected and analyzed for PCBs during the Phase I remedial investigation. No PCBs were detected.

Preferred Alternative: No further action. All hazardous debris was removed during the 1999 field season.

Site 4D – Sevuokuk Mountain

Site Description: At this site near the top of Sevuokuk Mountain, three empty transformer casings and miscellaneous debris were observed in a mountainside drainage above the pump house.

Cleanup Actions to Date: In 1999, Oil Spill Consultants removed the three empty transformers from Site 4D. Wipe samples collected from inside each transformer carcass did not contain any PCBs.

Investigation Summary: During the 1994 investigation, one soil and four sediment samples were collected and analyzed for PCBs. No PCBs were detected in the samples collected adjacent to the empty transformers. A background sample collected upgradient contained 0.194 mg/kg PCBs. In 1996, groundwater from a former infiltration gallery just downslope of Site 4D was sampled and analyzed for BTEX and PCBs. No contaminants were detected in the groundwater.

Preferred Alternative: No further action. All hazardous debris was removed during the 1999 field season.

Site 4E – Western Face of Sevuokuk Mountain

Site Description: Various types of cable and wire are present on the ground surface along the sloped western face of Sevuokuk Mountain. The Native Village of Gambell identified this area as an impacted site during preparation of a strategic project implementation plan for the Native American Lands Environmental Mitigation Program (NALEMP).

Preferred Alternative: No further action. The debris is not eligible for further action under FUDS. However, NALEMP plans to address the remaining debris at this site.

Site 5 – Former Tramway Site

Site Description: Site 5 is located at the base of Sevuokuk Mountain, northeast of Troutman Lake and near the Village water supply. The site was suspected to contain buried tram cables or transformers.

Cleanup Actions to Date: In 1997, the two geophysical anomalies were excavated. One anomaly contained debris from an abandoned Quonset hut and a battery, which were removed by Montgomery Watson and shipped off-site for disposal. The second anomaly contained seven 55-gallon drums filled with gravel and wrapped with wire cable, apparently used as anchors for the former tram system. No soil contamination was evident. The drum anchors were left in place and reburied.

Investigation Summary: Geophysical surveys were conducted in 1994, 1996, and 1998. During the Phase I investigation (1994), four soil borings and two monitoring wells were installed at Site 5. Soil samples were analyzed for petroleum hydrocarbons (DRO, GRO, TRPH), priority pollutant metals, and PCBs. Groundwater samples were analyzed for petroleum hydrocarbons and PCBs.

The Phase I investigation results indicated DRO was present above screening levels in soil from one monitoring well (MW16). Trace levels of DRO and TRPH were also detected in the groundwater from this monitoring well, but did not exceed ADEC cleanup levels. Table 7 summarizes the sampling results, and Figure 4 shows the monitoring well locations.

Table 7. Sampling Results at Site 5										
	Cleanup Level ^a	MW16 (1994)	MW16 (1996)	Village Water Supply (1997)	MW28 (1998)	MW29 (1998)	MW30 (1998)	MW31 (1998)	MW32* (1998)	Village Water Supply (1998)
Soil (mg/kg)										
DRO	250	1,160 to 1,800	--	--	8.7	9.7	ND(4.1)	ND(4.1)	ND(4.1)	--
GRO	300	ND(5)	--	--	0.87	ND(5.2)	ND(5.2)	1.3	ND(5.2)	--
RRO	11,000	--	--	--	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	--
TRPH	NA	800 to 1,430	--	--	--	--	--	--	--	--
Groundwater (mg/L)										
DRO	1.5	0.105	0.58	0.124 and 0.103	ND (0.1)	ND (0.1)	ND (0.1)	1.9	0.11	ND (0.1) to 0.07
GRO	1.3	ND (0.05)	--	ND (0.04)	ND (0.1)	ND (0.1)	0.054	0.026	ND (0.1)	ND (0.05-0.1)
RRO	1.1	--	--	ND (1.49)	ND (0.25)	ND (0.25)	ND (0.25)	ND (0.25)	ND (0.25)	ND (0.2-1.0)
TRPH	NA	0.4	--	--	--	--	--	--	--	--
Notes: ND non detect, NA not available, * MW32 is a replacement for MW16										
^a 18 AAC 75, Table B, Under 40 Inch Zone, Migration to Groundwater or Table C (August 8, 2003)										

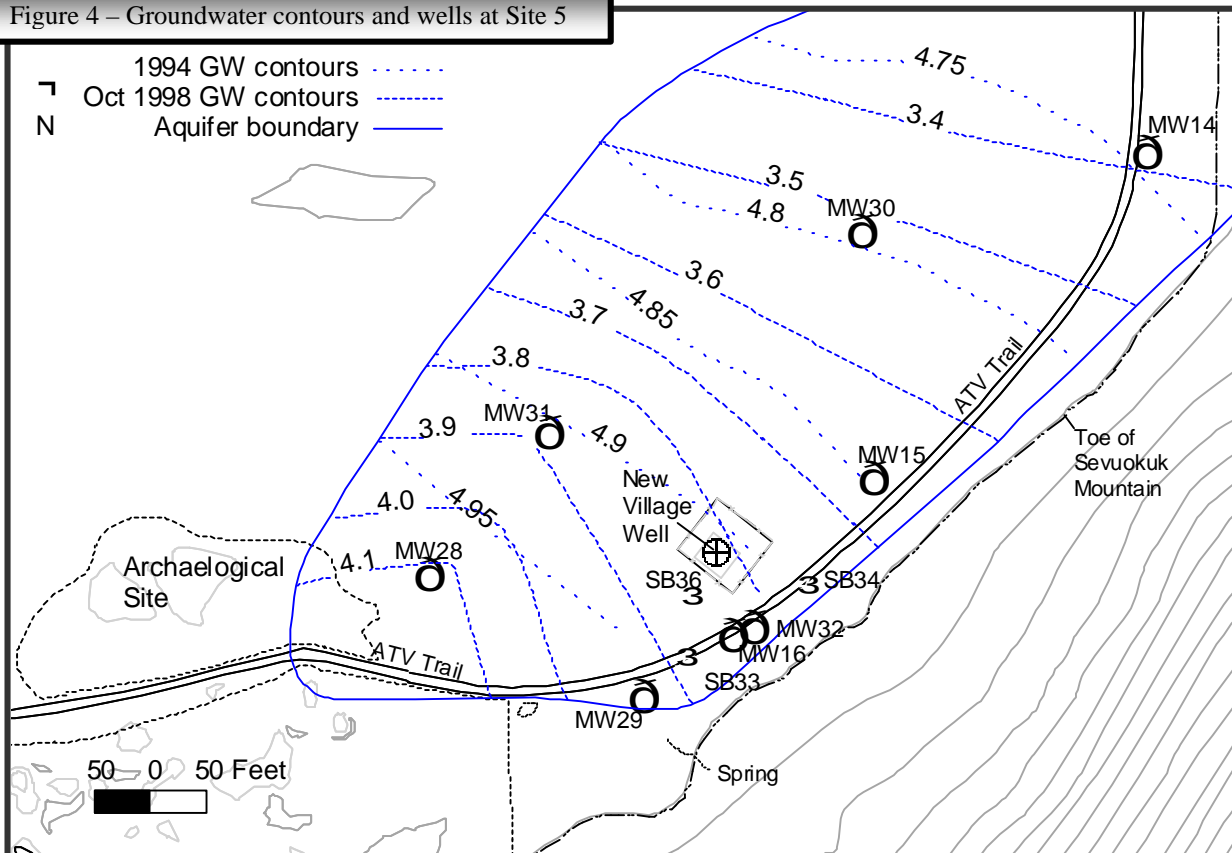
A second phase of investigation was conducted from 1996-1998, due to concerns about possible impacts to the local water supply well. In 1996, groundwater from the two original monitoring wells (MW15 and MW16) was resampled and analyzed for DRO and VOCs. DRO was detected in MW16. Sampling results are shown in Table 7. A geophysical survey also identified two anomalies which indicated the presence of buried metallic debris at Site 5.

In 1997, groundwater samples were collected from the Village water supply well before and after the excavation activities. Very low concentrations of DRO were detected in the water well; RRO, GRO, PCBs, and BTEX were not detected. Sampling results are shown in Table 7.

In 1998, five additional monitoring wells and four soil borings were completed. Groundwater and soil samples were collected and analyzed for DRO, GRO, RRO, BTEX, and PAHs. DRO was detected in two monitoring wells, MW31 and MW32 (a replacement for MW16). PAHs, RRO and BTEX were not detected in any of the groundwater samples. DRO was detected in soil at low levels in two locations, MW28 and MW29. Sampling results are shown in Table 7. Although DRO exceeded the ADEC groundwater cleanup level of 1.5 mg/L at MW31, there is no known source of contamination. No contamination was found above cleanup levels in the soil at MW31, or in either the soil or groundwater at an upgradient monitoring well (MW28) or the Village Water Supply well. All the soil sampling results indicated contaminants were below ADEC regulatory levels.

Monitoring well MW31 is located 185 feet cross-gradient (northwest) from the Village water supply well, near the edge of the local aquifer. During monitoring well water measurements taken in December 1998, the groundwater in this well was frozen, confirming its location at the fringe of the aquifer. The water depth at MW31 was 12 feet below ground surface, compared to

Figure 4 – Groundwater contours and wells at Site 5



about 18 feet below ground surface for the village water well intake, demonstrating that MW31 is located in the shallower portion of the aquifer. Groundwater gradients measured on 5 occasions during 1994 and 1998 all indicate the flow is northeast towards the Bering Sea. Figure 4 shows the groundwater flow direction at Site 5.

The DRO detected in soils at MW16 in the earliest phase of investigation has not been substantiated by subsequent sampling, and appears to be an isolated occurrence which is not impacting the local water supply. The Village water supply well has been sampled on multiple occasions and has not contained significant DRO contamination.

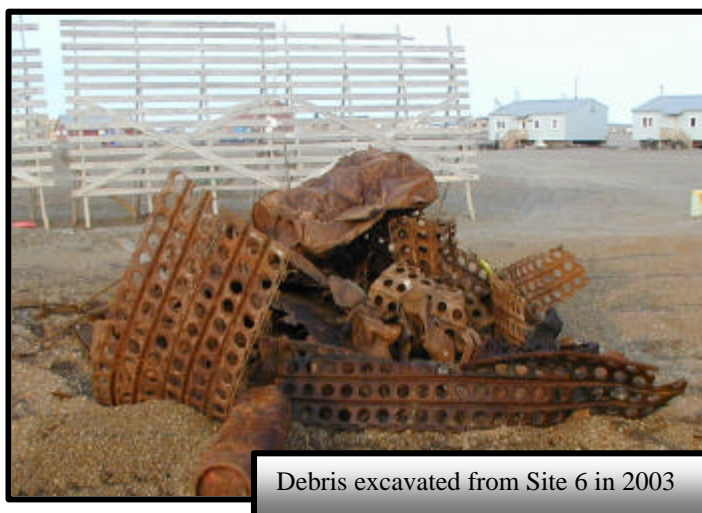
Cleanup Objective: ADEC Table B soil cleanup levels based on the Migration to Groundwater pathway, and the ADEC Table C groundwater cleanup levels.

Preferred Alternative: No further action. However, one additional round of groundwater sampling will be conducted to confirm groundwater does not exceed ADEC Table C cleanup levels. Existing monitoring wells at Site 5 will be sampled at upgradient and downgradient locations to verify that diesel range organics are not impacting the Village water supply well.

Site 6 – Military Landfill

Site Description: Site 6 is located north of the Gambell High School and east of the new housing area. This landfill was used to dispose of building materials, vehicles, machinery, drums of latrine waste, and miscellaneous debris.

Cleanup Actions to Date: In 1999, OSCI removed exposed drums (7,897 pounds) and other metal debris (1,748 pounds).



Debris excavated from Site 6 in 2003

In 2003, NALEMP funded a removal action at Site 6. Montgomery Watson Harza (MWH) excavated and removed buried debris at the site, including empty 55-gallon drums used to containerize latrine waste, engine parts, vehicle parts, marston matting, metal spikes, piping, tin cans, miscellaneous household garbage, and used oil filters. According to the final report (MWH, 2004), approximately 1,000 drums and other debris, and 2.5 tons of fuel-contaminated soils were excavated. There was no notable evidence of fuel contamination associated with the buried debris.

Table 8. Sampling Results at Site 6		
Chemical	Results (1994)	Screening Level ^a
Groundwater (mg/L)		
DRO	0.46 to 0.75	1.5
Arsenic	0.03 to 0.05	0.05
Beryllium	0.007	0.004
Cadmium	0.007 to 0.008	0.005
Chromium	0.107 to 0.364	0.1
Chromium, dissolved	0.006	
Lead	0.12 to 0.172	0.015
Lead, dissolved	0.008	
Nickel	0.08 to 0.153	0.1
Notes: ^a 18AAC75, Table C (August 8, 2003)		

Investigation Summary: In 1994, a Phase I investigation was performed, including a geophysical survey to delineate the extent of buried debris, and collection of groundwater samples. Five borings were drilled at Site 6; two borings encountered melted porewater which

was sampled through the auger. The groundwater samples were analyzed for petroleum hydrocarbons (DRO, GRO, TRPH), VOCs, metals, sulfate, biological oxygen demand (BOD), coliform, and total suspended solids/total dissolved solids (TSS/TDS). Low levels of diesel range organics and several metals were detected in the groundwater. Table 8 summarizes the sampling results. Metals were mostly detected in unfiltered water samples, and attributed to naturally occurring levels of metals in soil particles suspended in the water column. The suprapermafrost groundwater at Site 6 is not considered a likely source of drinking water.

After removing surface debris from the site in 1999, OSCI collected a confirmation soil sample from beneath the removed drum stockpile. The soil contained no metals, fuels, solvents, PCBs, or pesticides above ADEC cleanup levels.

Table 9. Sampling Results at Site 6				
Chemical	Cleanup Level ^a	Confirmation Sample (1999)	Confirmation Samples (2001)	Soil Borings (2001)
<i>Soil (mg/kg)</i>				
Arsenic	5.5	5.3	6-7.7	3.7-13.2
Antimony	41			7.3
Chromium	300	1.33	3-6.3	59
Nickel	2,000			120
DRO	12,250	ND(9.35)	ND(0.5) -21	ND(5)-1,200
Notes: ND non detect.				
^a 18 AAC 75, Table B, Under 40 Inch Zone, Ingestion (August 8, 2003)				

In 2001, a supplemental investigation was conducted to verify the OSCI sampling results and to further define the nature and extent of soil and groundwater contamination. Two surface soil samples were collected from the approximate location of the 1999 confirmation sample, and analyzed for GRO, DRO, RRO, and RCRA metals. Sampling results are shown in Table 9.

Five soil borings were also advanced to frozen soil during the 2001 field effort. Groundwater was not encountered in any of the soil borings. Soil samples were collected and analyzed for GRO, DRO, RRO, VOCs, and **target analyte list (TAL) metals**. Sampling results are summarized in Table 9. The detected arsenic concentrations exceeded the ADEC cleanup level. The average arsenic concentration was 7.5 mg/kg. The observed arsenic concentrations are consistent across many sites in Gambell, and do not appear associated with past military activity. No other analytes were detected in the soil samples at concentrations exceeding the applicable ADEC soil cleanup levels.

target analyte list (TAL) metals: aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, zinc

Cleanup Objective: ADEC Table B soil cleanup levels based on the Ingestion pathway.

Preferred Alternative: No further action. The observed arsenic concentrations in soil are consistent with background levels and do not appear associated with a point source of contamination. Groundwater has not



Excavation of drums at Site 6 in 2003

always been present at Site 6 and detections of metals appear related to suspended sediment particles. The major source of potential contamination has been removed at Site 6.

Site 7 – Former Military Power Facility

Site Description: Site 7 is located north of the Gambell Municipal Building, and west of the Gambell School. A military power facility was reportedly demolished and buried in this location. A military motor pool building was also believed to be located in this vicinity. The site contained a concrete pad and surface debris.

Cleanup Actions to Date: During 2003, MWH removed the concrete pad, underlying support timbers, a buried 55-gallon drum, and 1 cubic yard of incidental contaminated soils through the Native American Lands Environmental Mitigation Program (NALEMP).

Investigation Summary: A Phase I remedial investigation was conducted during 1994, which included a geophysical survey to locate possible buried debris, and collection of soil and groundwater samples. In 1999, OCSI verified that no measurable quantities of surface debris remained at the site. MWH collected additional soil samples in 2001.



The 1994 geophysical survey revealed no major anomalies indicative of large amounts of buried debris. Five soil borings were drilled to permafrost (6.5 to 15.0 feet below ground surface) and four were completed as monitoring wells. Two surface soil samples were collected and analyzed for VOCs, GRO, DRO, TRPH, and priority pollutant metals. Subsurface soil samples were also analyzed for PCBs. Groundwater samples were analyzed for VOCs, GRO, DRO, TRPH, priority pollutant metals, and PCBs. Figure 5 depicts the Site 7 sampling locations.

The 1994 investigation results indicated DRO and TRPH were present in surface and subsurface soil. The DRO concentrations did not exceed the ADEC cleanup level. There are no ADEC cleanup levels for TRPH. Table 10 summarizes the sampling results. No other analytes were present at concentrations exceeding the ADEC cleanup levels.

Three monitoring wells (MW24, MW25, MW27) were also installed into perched groundwater present at Site 7, but they were essentially dry wells. A sufficient quantity of water could not be withdrawn from MW27, and the sample was only submitted for analysis of VOCs, DRO, and priority pollutant metals. Groundwater was not encountered in MW24, but a monitoring well was installed by drilling down into the ice to create a reservoir which would collect melted groundwater. A fourth well (MW26) was abandoned without collecting a groundwater sample due to lack of water. Suprapermafrost groundwater was collected from the three wells. DRO, GRO and TRPH were detected in the groundwater. Benzene was also detected in monitoring well MW24. The DRO and benzene results exceed the ADEC Table C groundwater cleanup

levels. Table 10 summarizes the soil and groundwater results collected from the Site 7 monitoring wells.

Additional soil borings were drilled in 2001 to further investigate the nature and extent of soil and suprapermafrost groundwater

contamination, and to address continuing community concerns regarding Site 7. Three soil borings (SB7-18, SB7-19, SB7-20) were drilled to permafrost (6.2, 7.2 and 10.0 feet bgs); but groundwater was not encountered in any of the soil borings. The soil samples were analyzed DRO, RRO, PCBs, and TAL metals. Sampling locations are shown on Figure 5.

The 2001 investigation results showed DRO in one soil sample at a maximum concentration of 710 mg/kg, which does not exceed the ADEC ingestion cleanup level of 10,200 mg/kg. Arsenic was detected at concentrations ranging from 4.5 to 10.2 mg/kg, with an average concentration of 7.8 mg/kg. Six of the eleven arsenic results exceeded the ADEC Table B arsenic ingestion cleanup level of 5.5 mg/kg. Although the detected arsenic concentrations exceed the ADEC cleanup level, the levels are consistent across many sites in Gambell, and do not appear associated with past military activity. PCBs were not detected in any Site 7 samples. No other

Table 10. Sampling Results at Site 7 during 1994 investigation					
Chemical	MW24	MW25	MW26	MW27	ADEC Level ^a
Soil (mg/kg)					
DRO	20-941	20-271	18-1,840	ND	10,250
GRO	ND	ND	ND	ND	1,400
TRPH	13-180	400-1,300	115-13,000	ND-162	NA
Benzene	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	150
Groundwater (mg/L)					
DRO	18.4	19.4	--	1.18	1.5
GRO	0.844	--	--	0.103	1.3
TRPH	4.2	--	--	1.1	NA
Benzene	0.019	ND (0.0005)	--	ND (0.0005)	0.005

Notes: NA not available, ND not detected, -- not analyzed for
^a 18AAC75 Table B, Under 40 Inch Zone, Ingestion, or Table C cleanup levels (August 8, 2003)

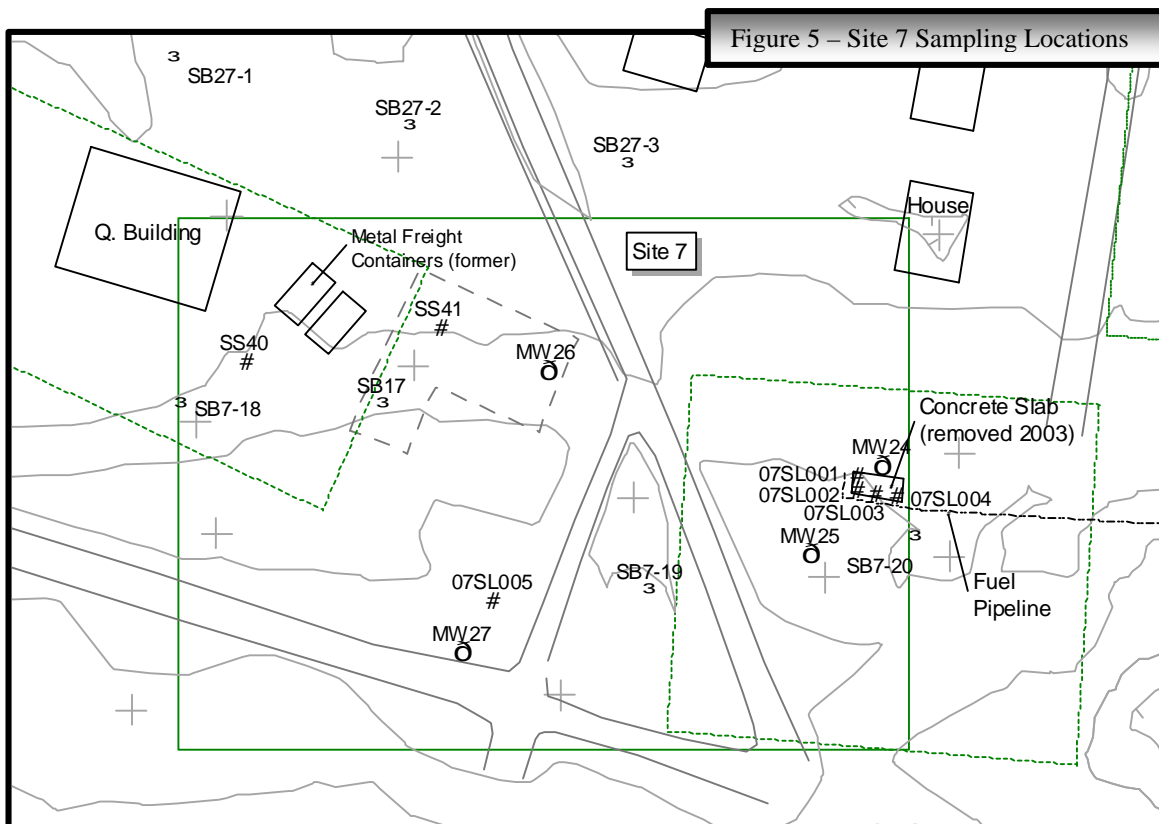


Figure 5 – Site 7 Sampling Locations

analytes were detected in the soil samples at concentrations exceeding the cleanup levels.

The supplemental investigation demonstrated that the groundwater at Site 7 is ephemeral, and soil contamination is below cleanup levels. The risk of contaminant migration east towards the aquifer located at the base of Sevuokuk Mountain is extremely low. MWH abandoned monitoring well MW24 during the 2003 NALEMP removal action. It is highly unlikely the other two monitoring wells (MW25, MW27) are still functional.

After the 2003 removal action, MWH collected five confirmation soil samples from the edges of the concrete pad excavation and one sample from beneath the excavated drum. The five samples near the concrete pad contained arsenic levels ranging from 4.2 to 34.9 mg/kg, which exceeds the ADEC ingestion cleanup level of 5.5 mg/kg, and may correspond to leached preservative from the treated timbers used as a form surrounding the concrete pad. One sample also contained DRO at 570 mg/kg, which does not exceed the ADEC ingestion cleanup level of 10,200 mg/kg. This fuel may correspond to leakage from a community fuel pipeline present at edge of pad.



Removal of concrete pad at Site 7 in 2003

Cleanup Objective: ADEC Table B soil cleanup levels based on the Ingestion pathway.

Preferred Alternative: Excavate arsenic-contaminated soil from around the edges of the former concrete pad location. Dispose of soil at an off-site landfill. Collect confirmation samples and analyze for arsenic. This alternative is protective of human health and the environment because it permanently reduces the risk posed by the soil containing elevated arsenic. The no further action alternative was rejected because it would not meet established regulatory criteria, or reduce the toxicity, mobility, or volume of contaminated soil. Implementation of institutional controls or access restrictions are infeasible for the site because it is located in a high-traffic, residential area of town.

Sites 8A, 8B, 8C, 8D – West Beach Area

Site Description: Site 8 includes the area surrounding the airstrip from west beach (north of the airfield), east to the western edge of Troutman Lake, and south to the northern shore of North Nayvaghut Lakes. Marston matting (8A) is located along the eastern side of the airstrip. Buried miscellaneous metallic debris (8B) has been reported south of the old village area, including numerous 55-gallon drums and a Jeep. A Navy Landfill (8C) is located northwest of the former Civil Aeronautics Administration (CAA) housing area and south of the village landfill. The Navy reportedly constructed this landfill during their utilization of the former CAA housing area.

The Navy landfill may have asbestos-containing materials (ACM). Small-arms ammunition rounds (0.30-caliber) are also located along the beach (8D) southwest of Troutman Lake. An Army landfill was also reportedly located northwest of the Nayvaghut Lakes area.

Cleanup Actions to Date: In 1999, Oil Spill Consultants, Inc. removed surface debris from the area, including scattered metal, small quantities of wood and concrete, and an exposed layer of marston matting approximately 30 feet wide and 4,500 feet long along the eastern side of the airstrip. OSCI did not complete the planned removal of the marston matting because buried electrical lines interfered with the excavation. Approximately 1,820 feet of metal marston landing mat remains at Site 8A. Earth Tech, Inc. recovered approximately 800 small arms rounds from Site 8D in July 2000, and shipped the material off-site to a facility in Colfax, Louisiana for disposal. Additional rounds remain in about 100 cubic yards of soil.

Investigation Summary: In 1994, a remedial investigation was completed at Site 8 which included a geophysical survey to determine the extent of buried debris at the reported Army landfill, installation of one monitoring well, and collection of soil and groundwater samples.

The 1994 investigation results indicated that all detected analytes in soil/groundwater were below ADEC cleanup levels. The geophysical survey results also indicated no significant anomalies, confirming the reported Army landfill was not present.

In 2000, Earth Tech, Inc. surveyed Site 8D using metal detectors to locate possible ordnance and explosive materials. Highly weathered small arms rounds were documented in a beach burial pit southwest of Troutman Lake.

Cleanup Objective: ADEC Table B soil cleanup levels based on the Ingestion pathway.



Preferred Alternative: No further action at areas 8B and 8C. These sites also meet the more stringent ADEC soil cleanup levels based on the Migration to Groundwater pathway. The buried debris is not eligible for further action under FUDS. Remove exposed marston matting along the east side of the runway (8A) and remove small caliber ammunition from the beach dump site south of the airport runway (8D). Transport the debris to an off-site landfill or recycling facility. This alternative will involve sifting and/or hand-picking the ammunition rounds from the gravelly soils, and consolidating the marston matting. The Alaska Department of Transportation and Public Facilities will be coordinated with during removal of the exposed debris to ensure airport operations are not disrupted. This alternative effectively reduces the long-term physical hazard posed by the debris.

Other alternatives were considered and rejected during the feasibility study phase. The exposed debris would continue to pose a physical hazard to local residents if no further action is taken. Site controls such as installation of fencing near the runway at Site 8A would require coordination with and approval from the landowner, the Alaska Department of Transportation

and Public Facilities. Construction of fencing may adversely affect maintenance of airport lighting/ navigation aids or snow removal activities. Installation of fencing around Site 8D would also impede snow machine travel during the winter, when obstacles are difficult to observe in poor weather conditions. Thus, access restrictions were not retained for further evaluation.

Site 9 – Asphalt Barrel Cache

Site Description: This site is located on the east side of the local airport runway. Drums leaking tar were observed in two areas. A debris inventory prepared by Montgomery Watson in 1997 indicated drums containing asphalt (6,200 estimated pounds) and empty drums (900 pounds) were located within Site 8, which includes the area referred to as Site 9. The asphalt drums were initially attributed to non-military activities during the Phase I investigation and not investigated further.

Cleanup Actions to Date: Oil Spill Consultants overpacked and removed nine drums of asphalt (4,458 pounds) and associated stained soils (4,790 pounds) from east of the runway during the 1999 removal action activities. All empty drums were also removed.

Investigation Summary: OSCI collected one confirmation soil sample after removing the asphalt drums and stained soil. The sample was analyzed for petroleum hydrocarbons (DRO, GRO, RRO), VOCs, SVOCs, PCBs, pesticides, and metals. The results indicated that all analytes were below the cleanup levels or not detected.

In 2001, two additional samples were collected to verify the 1999 results. The samples were analyzed for petroleum hydrocarbons (DRO, GRO, RRO), and RCRA metals. Arsenic was detected at concentrations of 5.3 and 6.8 mg/kg, which exceeds the ADEC cleanup level of 5.5 mg/kg. However, the levels are consistent across many sites in Gambell, and do not appear associated with past military activity. All other analytes were below the cleanup levels or not detected.

Cleanup Objective: ADEC Table B soil cleanup levels based on the Ingestion pathway.

Preferred Alternative: No further action. All hazardous debris and contaminated soil have been removed from the site. Site 9 also meets the more stringent ADEC cleanup levels based on the Migration to Groundwater pathway.

Site 10 – Sevoukuk Mountain Trail

Site Description: A trail system originates at the southeast end of Troutman Lake and separates into individual trails to the north, south, and east. Two trails lead to the top of Sevoukuk Mountain. Empty 55-gallon drums located approximately 250 feet apart marked the trails. Other debris at the site included marston matting and weasel tracks.

Cleanup Actions to Date: In 1999, Oil Spill Consultants, Inc., removed all the scattered drums (12,516 pounds), miscellaneous metallic debris (1,388 pounds), and a small amount (540 pounds) of stained soils.

Investigation Summary: During the 1994 remedial investigation, no staining or stressed vegetation was observed and the drums were either empty or contained gravel.

Preferred Alternative: No further action. All hazardous materials and debris have been removed from the site.

Site 11 – Communications Cable Route

Site Description: Site 11 contained a sonar cable going up Sevuokuk Mountain, abandoned cable spools, and a remnant of braided metal cable on top of the mountain. During the 1994 investigation, the only evidence of sonar cables were some cable spools near Site 4D.

Cleanup Actions to Date: OSCI removed the debris at Site 4D during the 1999 removal action.

Preferred Alternative: No further action. The remaining debris is not eligible for further action under FUDS.

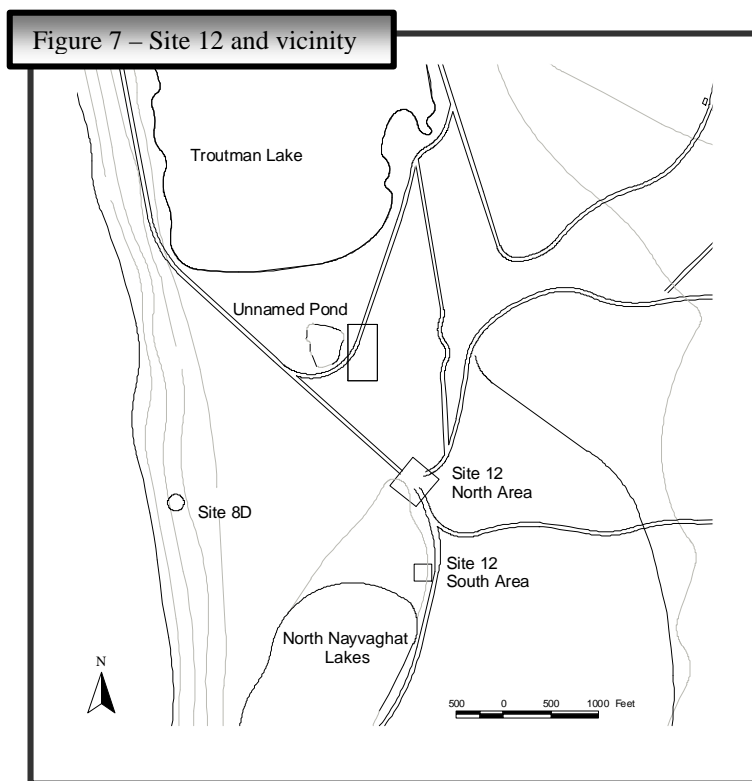
Site 12 – North Nayvaghast Lakes Disposal Site

Site Description: Site 12 is located north of Nayvaghast Lakes on the southwest side of an all-terrain vehicle (ATV) trail. The site is divided into a north and a south area (see Figure 7). The north area contained approximately 120 drums, battery remnants, and household refuse. The south area contained approximately 50 drums, including 18 drums full of garbage.

Cleanup Actions to Date: In 1999, OSCI removed contaminated soil and debris from the site including drums, dried paint, and batteries. OSCI removed 798 pounds of metal debris/drums, 8,702 pounds of hazardous and toxic debris, and 7,237 pounds of stained soil.

Investigation Summary: The site was investigated during the 1994 Phase I remedial investigation. OSCI collected soil confirmation samples following the removal activities. Additional confirmation samples were collected during the 2001 supplemental investigation.

Samples collected in 1994 included one surface water sample from North Nayvaghast Lake, two groundwater, three surface soil samples, and two subsurface soil samples. The soil samples were analyzed for VOCs, GRO, DRO, TRPH, priority pollutant metals, and PCBs. Groundwater and surface water samples were analyzed for VOCs,



GRO, DRO, TRPH, PCBs, and priority pollutant metals. The concentrations of metals detected in the soil samples were below background. Arsenic concentrations ranged from 4 to 10 mg/kg. The arsenic levels are consistent across many sites in Gambell, and do not appear associated with past military activity. No other analytes were detected in the soil samples. DRO and metals were detected at low levels in surface water and groundwater, but did not exceed background levels or the ADEC Table C cleanup levels. Background levels for groundwater and surface water were determined from a sample taken from MW-14 located at the base of Sevoukuk Mountain.

Confirmation samples were collected after completing the removal actions. Arsenic, cadmium, lead, and DRO were detected in soil at concentrations exceeding the ADEC cleanup levels. The sampling results are summarized in Table 11.

Chemical	Cleanup Level ^a	Results (1999)	Results (2001)
<i>Soil (mg/kg)</i>			
Arsenic	2	3 – 6	6 – 9.4
Cadmium	5	0.18 - 142	ND(0.2) – 1.6
Chromium	26	2.6 - 20	5.7 – 162
Lead	400	12.4 - 562	7 – 1,530
DRO	250	463	ND(5) – 46
Notes: ND non detect			
^a 18AAC75 Table B, Under 40 Inch Zone, migration to groundwater pathway (August 8, 2003)			

In 2001, supplemental RI fieldwork was completed at Site 12 to verify the previous confirmation sampling results. Soil samples were collected and analyzed for petroleum hydrocarbons (GRO, DRO, RRO), and RCRA metals. Arsenic, chromium, and lead exceeded the ADEC cleanup levels. DRO and cadmium were not detected at concentrations exceeding the cleanup levels. The sampling results are summarized in Table 11. No other analytes were detected at concentrations exceeding the ADEC cleanup levels. The arsenic levels at Site 12 are consistent across many sites in Gambell, and do not appear associated with past military activity.

Cleanup Objective: The cleanup levels selected for Site 12 are the ADEC Table B soil cleanup levels, based on the Migration to Groundwater pathway. Site 12 is located between Troutman and North Nayvagh Lakes, and contaminants have the potential to impact subsurface groundwater or surface waters.

Preferred Alternative: Excavate lead-contaminated soil, transport off-site for disposal at a permitted landfill. Since elevated levels of chromium and cadmium were detected in the same vicinity as the lead-contaminated soil, these contaminants will also be removed under this alternative. Excavation and off-site disposal of soil will permanently reduce the potential risk posed by contaminated soils at Site 12.

The no further action alternative was rejected because it would not reduce the risk associated with the lead-contaminated soil. There would be no reduction in the toxicity, mobility, or volume of contaminated soil. This alternative would not meet established regulatory criteria. Implementation of institutional controls or access restrictions were determined to be infeasible for the site. In-situ treatment of the contaminated soils was also considered, but ultimately rejected due to challenges in implementation at a remote site and additional testing requirements. Treatment of the soil on-site may reduce the mobility and toxicity of the lead, but it will not reduce the overall volume of lead contaminated soil.

Site 13 – Former Radar Power Station

Site Description: Site 13 is located east of the pond between Troutman and North Nayvaghat Lakes. The radar power station consisted of two wooden Quonset huts, one long wooden building, and several 150 foot towers that were reportedly demolished and buried on-site. Stained soils and miscellaneous surface debris such as steel wire, pipes, and marston matting were observed at the site.

Cleanup Actions to Date: In 1999, OSCI removed 343 pounds of miscellaneous metal debris from surface areas at Site 13.

Investigation Summary: Site 13 was investigated during the 1994 remedial investigation, including a geophysical survey to determine the extent of buried debris, installation of 3 monitoring wells, and collection of soil, surface water and groundwater samples.

The geophysical survey revealed strong anomalies around two mounds and scattered surface debris which are probably related to significant amounts of buried material. Subsurface soil samples were also collected and analyzed for VOCs, petroleum hydrocarbons (GRO, DRO, TRPH), priority pollutant metals, and PCBs. Surface soil samples were collected and analyzed for TRPH, PCBs, and priority pollutant metals. No analytes, except arsenic, were detected at concentrations exceeding cleanup levels. Arsenic concentrations ranged from 2 to 6 mg/kg, with an average concentration (95% UCL) of 4.5 mg/kg, compared to the ADEC Table B ingestion cleanup level of 5.5 mg/kg.

Cleanup Objective: ADEC Table B soil cleanup levels based on the Ingestion pathway.

Preferred Alternative: No further action. The buried debris is not eligible for further action under FUDS. Site 13 also meets the more stringent ADEC cleanup levels based on the Migration to Groundwater pathway.

Site 14 – Navy Plane Crash Site

Site Description: This site is located approximately 7 miles south of the Village of Gambell. A Navy reconnaissance plane which crashed in 1955 remains on the tundra, with debris located in the area immediately surrounding the plane. There were no apparent stains or any stressed vegetation at the site.

Preferred Alternative: No further action. The debris is not eligible for further action under FUDS.

Site 15 – Troutman Lake Disposal Site

Site Description: This site was reported to contain submerged ordnance at the north end of Troutman Lake.

Investigation Summary: During 2000 and 2001, Troutman Lake was investigated using geophysical surveying techniques. The entire lake bottom was mapped along a series of transect lines, to detect underwater anomalies representative of piles of steel ammunition boxes. Metallic anomalies detected by the equipment were then further investigated using ice augers, depth

sounding equipment, poles, and an underwater video camera to determine the source of the metal signal. An open water investigation was also conducted to verify the anomaly source using dredging anchors, depth-sounding leads, and an underwater camera. Anomaly locations within 20 feet of the lakeshore were verified by visual inspection. The source of the magnetic anomalies ranged from runway matting and 55-gallon drums, to geologic features such as iron or other mineral deposits. No evidence of ordnance or large piles of ammunition boxes was discovered in Troutman Lake. Additional details regarding the ordnance investigation can be found in the report Final Engineering Evaluation/Cost Analysis (Earth Tech Inc., 2002).

Preferred Alternative: No further action. The remaining underwater debris (miscellaneous metal debris) is not eligible for further action under FUDS.

Site 16 – Gambell Municipal Building Site

Site Description: This site consisted of a 35 by 55-foot area of stained gravel, located immediately west of the Municipal Building. The origin of the stain is unknown, and staining is most visible after a rainfall event.

Investigation Summary: Investigations were conducted during the 1994 Phase I remedial investigation, including a geophysical survey and collection of surface and subsurface soil samples. Additional soil samples were collected during the 2001 supplemental investigation.

The 1994 geophysical survey results revealed four small anomalies which may be related to buried materials. Surface soil samples were also collected and analyzed for petroleum hydrocarbons (DRO, GRO, TRPH), and priority pollutant metals. Subsurface soil samples were analyzed for VOCs, GRO, DRO, TRPH, PCBs, and priority pollutant metals. Groundwater was not encountered in the soil borings. Arsenic results ranged from 2 to 7 mg/kg, with an average concentration (95% UCL) of 5.4 mg/kg. Only 1 out of 7 samples exceeded the ADEC Table B ingestion cleanup level of 5.5 mg/kg. No other contaminants were identified at Site 16.

In 2001, four additional soil borings were drilled at the site based on community concerns. The samples were analyzed for petroleum hydrocarbons (DRO, GRO, RRO), VOCs or BTEX, and TAL metals. Fuels were not detected in any sample. Arsenic concentrations ranged from 3.6 to 9.8 mg/kg. Only 1 sample exceeded the ADEC Table B ingestion cleanup level of 5.5 mg/kg. The arsenic levels are consistent across many sites in Gambell, and do not appear associated with past military activity.

Cleanup Objective: ADEC Table B soil cleanup levels based on the Ingestion pathway.

Preferred Alternative: No further action. The buried debris is not eligible for further action under FUDS. Site 16 also meets the more stringent ADEC cleanup levels based on the Migration to Groundwater pathway.

Site 17 – Army Landfills

Site Description: The Army Landfills are located between the North Beach and Site 6 Military Landfill, which is north of the Gambell School and Municipal Building. The two landfills

reportedly contained buried debris and/or trash, as well as exposed surface debris such as drums, marston matting, and scrap metal.

Cleanup Actions to Date: Exposed miscellaneous surface debris, including nodwell tracks, marston matting, steel cable and scrap metal, was removed by Oil Spill Consultants during the 1999 removal action. The actual tonnage of debris removed was combined with Site 6 for a total of 1,748 pounds.

Investigation Summary: During the 1994 Phase I remedial investigation, a geophysical survey, installation of monitoring wells, and collection of soil and groundwater samples was completed. The 1994 geophysical survey results indicated the potential for buried debris associated with the reported landfills. In addition, five soil borings were completed to permafrost (7.5 to 10.5 feet). Monitoring wells were not installed at the site because well completion was impractical. Melted porewater samples were collected through the auger and submitted for analysis of VOCs, PCBs, petroleum hydrocarbons (GRO, DRO, TRPH), and priority pollutant metals. No contaminants were detected in the groundwater samples at concentration above ADEC Table C cleanup levels. Arsenic ranged from 2 to 6 mg/kg in soil, compared to the ADEC ingestion cleanup level of 5.5 mg/kg. Only 1 sample out of 13 exceeded the cleanup level. The arsenic levels are consistent across many sites in Gambell, and do not appear associated with past military activity. No other analytes were detected in soil above screening levels.

Cleanup Objective: ADEC Table B soil cleanup levels based on the Ingestion pathway.

Preferred Alternative: No further action. The remaining buried debris is not eligible for further action under FUDS. Site 17 also meets the more stringent ADEC cleanup levels based on the Migration to Groundwater pathway.

Site 18 – Former Main Camp

Site Description: This site is located at the northeast end of Troutman lake, between the current Municipal Building and east of the Gambell School.

Investigation Summary: Investigations completed at Site 18 in 1994 include a geophysical survey to determine the presence of buried debris, and collection of subsurface soil and groundwater samples. A white powdery material was also observed in a berm which borders Troutman Lake, and was determined to be inert, diatomaceous earth previously used for water filtration by the military (see Site 19).

A geophysical survey completed in 1994 showed a linear anomaly in the center of the survey grid, (between the high school and the washeteria). This feature was thought to represent buried water delivery lines for the existing Power Plant. One soil boring was drilled south of the anomaly due to the reported burial of discarded underground storage tanks in the vicinity. Subsurface soil samples and melted porewater were collected and analyzed for VOCs, petroleum hydrocarbons (DRO, GRO, TRPH), priority pollutant metals, and PCBs. No analytes were detected above screening levels. Arsenic concentrations in soil ranged from 2 to 5 mg/kg, and did not exceed the ADEC Table B Ingestion cleanup level.

During the 2001 investigation, further sampling was conducted at Site 18 based on community concerns. One soil boring was placed adjacent to the north fence of the Municipal Water Treatment/ Washeteria Building. The soil boring was advanced to 17.5 feet below ground surface, and two soil samples were collected near the bottom of the boring. The samples were analyzed for petroleum hydrocarbons (DRO, GRO, RRO), VOCs, and TAL metals. DRO was detected at concentrations ranging from 54 to 640 mg/kg in subsurface soil, which does not exceed the ADEC cleanup level of 10,250 mg/kg. Arsenic was detected at concentrations ranging from 5.6 to 5.9 mg/kg, which slightly exceeds the ADEC cleanup level of 5.5 mg/kg. Arsenic levels are consistent across many sites in Gambell, and do not appear associated with past military activity. No other analytes were detected above screening levels. One well point was also installed, and free product was observed. The free product recovered from the well point appeared clear and clean, and had the strong odor of fresh fuel, features not typical of degraded fuels from previous military activities. The free product (water) was not sampled.

Cleanup Objective: ADEC Table B soil cleanup levels based on the Ingestion pathway.

Preferred Alternative: No further action. The buried debris is not eligible for further action under FUDS.

Site 19 – Diatomaceous Earth

Site Description: Site 19 was identified as a separate area of concern by the Native Village of Gambell under the NALEMP program. This area coincides with the description of Site 18 presented above. Diatomaceous earth is an inert material which does not pose a chemical hazard, and thus cannot be addressed further under the FUDS program.

Preferred Alternative: No further action.

Site 20 – Schoolyard

Site Description: Site 20 is located north of the former Main Camp (Site 18) near the current Gambell School. The schoolyard contained two rubble piles that consisted primarily of concrete and rebar, plus a partially exposed concrete slab. The piles presented a physical hazard to local residents such as children attending school, ATV and snowmachine traffic.



Cleanup Actions to Date: The rubble piles and concrete pad were removed during August 2003 under the NALEMP program.

Preferred Alternative: No further action.

Site 21 – Toe of Sevuokuk Mountain

Site Description: This area, located at the base of Sevuokuk Mountain and southwest of Site 5, is thought to contain buried miscellaneous wire and metallic debris from military activities.

Preferred Alternative: No further action. The buried debris is not eligible for further action under FUDS.

Site 22 – Former CAA Housing

Site Description: Former Civil Aeronautical Administration (CAA) Housing units are located near the northeast edge of the Old Gambell section of the village. The CAA housing area consists of six homes and one lodge originally built as a weather data collection facility to help guide Russian pilots during World War II. The Navy and Army also reportedly used the housing area during the Cold War era during their efforts to lay submarine detection cables off the coast of St. Lawrence Island. This site was identified as a concern under the NALEMP program due to the possibility that asbestos-containing materials may be present in the structures.

Preferred Alternative: No further action. The buildings are presently occupied and/or owned by local residents, thus they do not qualify for further action under FUDS due to beneficial reuse.

Site 23 – Debris from High School Construction

Site Description: This site was identified by local residents as a concern in the Strategic Project Implementation Plan (SPIP) produced for the NALEMP program. The area is located due east of the Gambell landfill and consists of metallic debris that was originally unearthed during the construction of the Gambell High School. The City of Gambell moved the excavated debris to the local landfill for reburial. Removal actions undertaken by current landowners are not eligible for reimbursement or further action under FUDS.

Preferred Alternative: No further action. The buried debris is not eligible for further action under FUDS.

Site 24 – South of Municipal Building

Site Description: This area is located south of the Municipal Building along the northern shore of Troutman Lake.

Investigation Summary: A geophysical survey of the site was conducted in 2000, and subsurface anomalies consistent with metallic debris were found. During the 2001 supplemental remedial investigation, one soil boring was drilled to frozen soil. Two soil samples were collected and analyzed for petroleum hydrocarbons (DRO, GRO, RRO), VOCs, and TAL metals.

The results of the 2001 investigation showed that the soil samples contained arsenic at concentrations of 5.7 and 6.3 mg/kg. The arsenic levels are consistent across many sites in Gambell, and do not appear associated with past military activity. Fuels were not detected in the soil samples. No other analytes were detected at concentrations exceeding the screening levels.

Cleanup Objective: ADEC Table B soil cleanup levels based on the Ingestion pathway.

Preferred Alternative: No further action. The buried debris is not eligible for further action under FUDS. Site 24 also meets the more stringent ADEC cleanup levels based on the Migration to Groundwater pathway.

Site 25A – Village of Gambell South Housing Units

Site Description: Local residents identified the south housing units site as an area that may be contaminated by fuel-related products of military origin. During construction work performed in 1997 by Alaska Village Safe Water, oily soils were encountered at the permafrost interface. Residents are concerned that the military may have dumped barrels of oil directly on the ground in this vicinity.

Investigation Summary: During the 2001 supplemental investigation, six soil borings were drilled to permafrost, based on the locations of buried utilities, depressions, trenches, and disturbed ground identified by local residents and historical aerial photographs.

Soil samples were collected and analyzed for petroleum hydrocarbons (DRO, GRO, RRO), and BTEX. A subset of samples were also analyzed for VOCs and TAL metals. The results were compared to the ADEC Table B cleanup levels based on the migration to groundwater pathway. Fuels, BTEX and VOCs were not detected above cleanup levels in any sample. Arsenic was detected at concentrations from 2.2 to 19.2 mg/kg. Two of the three samples exceeded the ADEC cleanup level of 5.5 mg/kg. An analysis of the entire dataset from 2001 shows an average concentration (95% UCL) for arsenic of 7 mg/kg. The arsenic levels are consistent across many sites in Gambell, and do not appear associated with past military activity.

Cleanup Objective: ADEC Table B soil cleanup levels based on the Ingestion pathway.

Preferred Alternative: No further action. The observed arsenic concentrations are comparable to background levels elsewhere on St. Lawrence Island, and do not appear associated with a point source of contamination. Site 25A also meets the more stringent ADEC cleanup levels based on the Migration to Groundwater pathway.

Site 25B – Low Drainage Area Southwest of Armory

Site Description: Local residents identified this site during the 2001 supplemental investigation as an area where contaminants may migrate and accumulate. The site is located west of the Sivuqaq Lodge, southeast of the Gambell store and fuel storage tanks, and near a local church and Army Guard building.

Investigation Summary: Two soil borings were drilled to frozen soil (depth of 11 and 12 feet) to identify potential contamination. Soil samples were collected and analyzed for petroleum hydrocarbons (DRO, GRO, RRO), BTEX, and PCBs.

The soil sampling results were compared with the ADEC Table B cleanup levels, based on the migration to groundwater pathway. No analytes were detected at concentrations exceeding the screening levels.

Cleanup Objective: ADEC Table B soil cleanup levels based on the Ingestion pathway.

Preferred Alternative: No further action. Site 25B also meets the more stringent ADEC cleanup levels based on the Migration to Groundwater pathway.

Site 26 – Possible Debris Burial Site

Site Description: Site 26 was identified from a 1953 aerial photograph as a possible debris burial feature. The site is located east of the Gambell School near the Former Main Camp (Site 18). Local residents reported finding metal debris, machinery, oily debris, and transformers in this vicinity.

Investigation Summary: During the 2001 supplemental remedial investigation, two soil borings were drilled to frozen soil. Soil samples were collected and analyzed for petroleum hydrocarbons (DRO, GRO, RRO), VOCs, and TAL metals.

The results of the 2001 investigation showed arsenic at concentrations ranging from 3.6 to 7.7 mg/kg in surface and subsurface soils. One out of four samples exceeded the ADEC Table B ingestion cleanup level of 5.5 mg/kg. The arsenic levels are consistent across many sites in Gambell, and do not appear associated with past military activity. No other analytes were detected above cleanup levels.

Cleanup Objective: ADEC Table B soil cleanup levels based on the Ingestion pathway.

Preferred Alternative: No further action. The observed arsenic concentrations are comparable to background levels elsewhere on St. Lawrence Island, and do not appear associated with a point source of contamination. Site 26 also meets the more stringent ADEC cleanup levels based on the Migration to Groundwater pathway.

Site 27 – Drum Storage Area

Site Description: Analysis of an aerial photograph from 1955 indicated this location was a historical drum storage area. The community was also concerned about an area of rust-stained soil at this site. The site is located north of the former military power facility (Site 7), within the new housing area. The drums stored at this site have been removed.

Investigation Summary: During the 2001 supplemental remedial investigation, four soil borings were drilled to frozen soil to determine if contamination was present. Samples were collected and analyzed for petroleum hydrocarbons (DRO, GRO, RRO), VOCs, PCBs, and TAL metals.

The 2001 investigation results were compared with the ADEC Table B cleanup levels, based on the migration to groundwater pathway. Arsenic concentrations ranged from 5.4 to 16.9 mg/kg. The arsenic levels are consistent across many sites in Gambell, and do not appear associated with past military activity. No other analytes were detected in the soil samples at concentrations above screening levels. PCBs were not detected.

Cleanup Objective: ADEC Table B soil cleanup levels based on the Ingestion pathway.

Preferred Alternative: No further action. The observed arsenic concentrations are comparable to background levels and do not appear associated with a point source of contamination. Site 27 also meets the more stringent ADEC cleanup levels based on the Migration to Groundwater pathway.

Site 28 – Disturbed Ground

Site Description: Site 28 was identified from a 1972 aerial photograph as a disturbed area. This site is located south of Troutman Lake and west of an unnamed pond. The U.S. Army reportedly leased this area from January 1955 to May 1958; however, the Army's use of the land is unknown.

Investigation Summary: During the 2001 supplemental investigation, two soil borings were advanced to frozen soil to determine if contamination was present. Subsurface soil samples were collected and analyzed for petroleum hydrocarbons (DRO, GRO, RRO), VOCs, and TAL metals

The sampling results were compared with the ADEC Table B cleanup levels, based on the migration to groundwater pathway. Arsenic concentrations ranged from 5.5 to 10 mg/kg. The arsenic levels are consistent across many sites in Gambell, and do not appear associated with past military activity. No other analytes were detected in the soil samples at concentrations above screening levels.

Cleanup Objective: ADEC Table B soil cleanup levels based on the Ingestion pathway.

Preferred Alternative: No further action. The observed arsenic concentrations are comparable to background levels and do not appear associated with a point source of contamination. Site 28 also meets the more stringent ADEC cleanup levels based on the Migration to Groundwater pathway.

SUMMARY OF PREFERRED REMEDIAL ALTERNATIVES

The preferred remedial alternatives for the 38 sites discussed in this Proposed Plan are:

- No Further Action at Sites 1A, 1B, 1C, 2, 3, 4A, 4B, 4C, 4D, 4E, 5, 6, 8B, 8C, 9, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25A, 25B, 26, 27, 28
- Excavate and off-site disposal of arsenic-contaminated soil at Site 7
- Removal and off-site disposal of exposed marston matting at Site 8A
- Excavate and off-site disposal of small arms ammunition at Site 8D
- Excavate and off-site disposal of lead-contaminated soil at Site 12

Additional Information

All supporting documents and detailed historical information can be found in the Information Repositories located at:

Sivuqaq Corporation Building (Lodge)

P.O. Box 101
Gambell, Alaska 99742
Phone: (907) 985-5826
Hours: Monday – Friday 9:00 a.m. to 5:00 p.m.

National Parks Service

179 Front Street, Suite 121
Nome, Alaska 99762
Phone: (907) 443-6101
Hours: Monday – Friday 8:00 a.m. to 5:00 p.m.

Savoonga IRA Building

P.O. Box 120
Savoonga, Alaska 99769
Phone: (907) 984-6414
Hours: Monday – Friday 9:00 a.m. to 5:00 p.m.

Alaska Resource Library and Information Services (ARLIS)

3150 C Street, Suite 100
Anchorage, Alaska 99503
Phone: (907) 271-4560
Hours: Monday – Friday 8:00 a.m. to 5:00 p.m.

If you have questions about the information provided in this Proposed Plan, please contact:

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Community Participation

You are encouraged to provide comments on any of the alternatives presented in this Proposed Plan for the Gambell FUDS. A final decision on the alternatives for each of these sites will not be made until public comments are considered. The USACE will prepare a written response to all significant comments and any new data submitted in reference to this Proposed Plan. A summary of these responses will accompany the Decision Document and will be made available in the Administrative Record and Information Repositories. Your comments can be presented either in writing or at the following scheduled public meeting:

Date: Wednesday, July 21, 2004

Time: 7 pm

Place: Gambell, Alaska

The public comment period ends August 23, 2004. A pre-addressed comment form is included.

Glossary of Terms

Administrative Record – A collection of historical documents such as reports, studies, and maps which support the final cleanup decision for a site. This file is available for public review.

Aquifer – Rock or sediment in a formation that is capable of transmitting significant quantities of water. Common aquifer material includes mixtures of sand, silt, and gravel.

Alaska Department of Environmental Conservation (ADEC) – The lead state regulatory agency responsible for protecting public health, safety, and welfare, and the environment from adverse effects of environmental contamination.

Applicable or Relevant and Appropriate Requirements (ARARs) – Laws and regulations that establish cleanup levels for sites with contamination. ARARs include cleanup standards, standards of control, and other environmental protection criteria as specified under federal and state statutes and regulations. ARARs must be met (or a waiver approved) at a site to comply with CERCLA.

BNAs – Base, neutral, and acid compounds (includes PAHs).

Benzene – A colorless, volatile, inflammable, carcinogenic liquid (C₆H₆) used in a variety of chemical products, including motor fuel. Compounds containing benzene are called aromatic compounds.

Benzene, toluene, ethylbenzene, and xylene (BTEX) – Volatile organic chemicals (aromatic compounds) that are constituents of petroleum

BGS – Below ground surface.

Cleanup level – The concentration of a hazardous substance that may be present within a specified medium (i.e., soil, groundwater, or surface water) without posing an unacceptable risk to human health, safety, welfare, or the environment. ADEC provides tabulated cleanup levels in 18 AAC 75 that are applicable to contaminated soil and groundwater sites in Alaska.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) – The federal law, also known as Superfund, that guides cleanup of hazardous waste sites.

Decision Document – Identifies the selected remedy for a site, the rationale for its selection, and includes responses to public comments received on the Proposed Plan.

Diesel-range organics (DRO) – A mixture of organic compounds found in diesel fuel, jet fuel, and heating oil. Polynuclear aromatic hydrocarbons (PAHs), such as naphthalene, are included in this range. DRO are generally less volatile and less soluble than GRO.

Ethylbenzene – A colorless, volatile, flammable organic liquid (C₈H₁₀) with a sweet, gasoline-like odor used in a variety of chemical products, including motor fuel.

EPA – United States Environmental Protection Agency.

Feasibility Study (FS) – An evaluation of site conditions and potentially applicable remedial actions.

Formerly Used Defense Site (FUDS) – Properties that were formerly used by the Department of Defense

Gasoline-range organics (GRO) – A mixture of organic compounds found in gasoline.

Geophysical Survey – A method used to delineate underground features such as metallic debris.

Hazardous substance – A chemical that presents an imminent and substantial danger to the public health or welfare if it is released to the atmosphere, surface water, groundwater, or land surface. Regulatory definitions can be found in CERCLA § 101(14) and 102 and in the NCP40 CFR § 300.5.

Information Repository – A publicly accessible location where historical documents are stored.

Institutional Controls (ICs) – Any type of physical, legal, or administrative mechanism to restrict the use of, or limit access to, real property to prevent exposure to contaminants above permissible levels. The intent of the controls is to protect human health, the environment, and the integrity of an engineering remedy by limiting the activities that may occur at a particular site. Common examples of ICs include physical barriers to a site (e.g., fences and signs) and land use restrictions (e.g., restricting the installation of drinking water wells).

Method 2 Cleanup Levels – In 18 AAC 75, the State of Alaska provides four possible methods for determining soil cleanup levels. Method 2 utilizes tabulated cleanup levels (Table B1 and Table B2 for soil and Table C for groundwater) that must be met for site closure. Meeting the tabulated cleanup levels is considered to be protective of human health.

Milligram per kilogram (mg/kg) – A solid concentration measurement. One milligram of a substance in 1 kilogram of soil, which is also equal to a concentration of 1 *ppm* for that substance in soil (see definition for parts per million).

Milligram per liter (mg/L) – A liquid concentration measurement. One milligram of a substance in 1 liter of water is also equal to a concentration of 1 *ppm* in water (see definition for *parts per million*).

Monitored Natural Attenuation (MNA) – An environmental cleanup strategy in which naturally occurring processes (also known as intrinsic remediation) are allowed to cleanup contaminants. Environmental sampling is used to monitor the cleanup process.

MWH – Montgomery Watson Harza.

NALEMP – Native American Land Environmental Mitigation Program.

National Contingency Plan (NCP) – The regulations that provide the structure and procedures for responding to discharges of oil and hazardous substances, as directed by CERCLA.

No Further Response Action Planned (NFRAP) - A category of site response that identifies that no further remedial response activity is necessary to protect human health and the environment; thus no further remedial action will be performed there. *NFRAP* differs from *site closure* in that *NFRAP* sites require *institutional controls* to restrict access to contamination remaining at the site; whereas closed sites are available for unrestricted use and access. *NFRAP* sites are tracked in USAF and ADEC databases

OSCI – Oil Spill Consultants, Inc.

Parts per million (ppm) - A unit of measure used to express extremely low concentrations of chemicals in media such as soil or water. As an analogy, one ounce of a chemical in a million ounces of water is 1 ppm and is also equivalent to 12 seconds of time in a period of 12 days. Equivalent units for 1 ppm can be expressed as 1 mg/L (water) or 1 mg/Kg (soil).

Polyaromatic (or Polycyclic) Hydrocarbons (PAHs) – A class of very stable organic molecules made up of only carbon and hydrogen (benzene rings). They occur naturally in crude oil and refined products (such as diesel fuel) and also occur as products of incomplete combustion. Some PAHs are highly carcinogenic (e.g., benzo(a)pyrene).

Polychlorinated biphenyls (PCBs) – A group of toxic, persistent chemicals used in transformers and capacitors for insulating purposes and in gas pipeline systems as a lubricant.

Priority Pollutant Metals – Antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc.

Proposed Plan – A document required by section 117(a) of CERCLA that informs the public about alternatives that are considered for cleanup of a contaminated site and identifies a preferred cleanup alternative. The document encourages public comment on all alternatives.

RCRA – Resource, Conservation and Recovery Act. The federal law which regulates the generation, transport, and disposal of hazardous wastes.

RCRA metals – arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver.

Record of Decision (ROD) – As required by CERCLA section 117(b), a document of the final cleanup decision under the site cleanup rules. The ROD documents the rationale for selection of the cleanup remedy and establishes performance goals for achieving cleanup. A ROD issued by or for ADEC is similar to a USAF Decision Document or an EPA ROD, but its format may differ. The format for an ADEC ROD is specified in the ADEC *Guidance on Decision Documentation Under the Site Cleanup Rules* (July 1999).

Residual Range Organics (RRO) – heavy-range petroleum products such as lubricating oils, with petroleum hydrocarbon compounds corresponding to an alkane range from the beginning of C25 to the beginning of C36 and a boiling point range between approximately 400° C and 500° C (definition from 18AAC75.341)

Restoration Advisory Board (RAB) – An advisory body with diverse community representation designed to act as a focal point for the exchange of information between the USACE and interested stakeholders.

Remedial Action – Action taken to permanently eliminate, reduce, or control the hazards posed by hazardous substances, pollutants or contaminants at a site.

Responsiveness Summary – A summary of oral and/or written public comments received during a comment period and the responses to those comments. The responsiveness summary is part of the decision document or ROD.

Remedial Investigation (RI) – An evaluation of site conditions to determine the nature and extent of contamination. The RI emphasizes data collection and site characterization, and includes sampling and monitoring, as necessary.

Removal/Remedial Actions (RA) – Actions taken to abate, prevent, minimize, stabilize, mitigate, or eliminate the release or threat of a release of contaminants.

Screening Level – A number used for comparison with data collected during the remedial investigation. They include the most conservative ADEC Table B cleanup levels or a risk-based level published by the US EPA.

Site Closure – A written determination by ADEC that a site was adequately characterized and achieved the applicable requirements under the site cleanup rules (18 AAC 75.380(d)(1)).

SVOCs – Semi volatile organic compounds.

TAL metals – Target Analyte List metals. Includes aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc.

TCLP – Toxicity characteristic leaching procedure. A laboratory method used to determine the amount of a compound that could be present in water beneath a landfill.

Ten Times Rule – a provision set out in 18 AAC 75.350 that stipulates that cleanup levels may be adjusted in cases where groundwater is not considered drinking water. In order to use the ten times rule, groundwater must meet criteria set out in 18 AAC 75.350 considering the suitability of the aquifer for a drinking water source, historical and potential future use of the aquifer for a drinking water source, and the availability of alternative drinking water sources.

Toluene – A colorless, volatile, flammable liquid, C₇H₈, used in aviation fuel and other high-octane fuels, in dyestuffs, explosives, and as a solvent for gums and lacquers.

TRPH – Total recoverable petroleum hydrocarbons.

United States Army Corps of Engineers (USACE) – The agency responsible for cleanup of former military sites.

Upper Confidence Level (95%UCL) – The value at which there is a 95% likelihood that 95% of the dataset is below this value (e.g. the upper boundary). The UCL is also considered a reasonable estimate of the maximum exposure concentration.

VOCs – Volatile organic compounds.

Xylenes – A group of colorless, volatile, flammable liquids (C₈H₁₀) with a sweet odor that are used in a variety of products including motor

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