# Health Consultation

**PUBLIC COMMENT VERSION**

Evaluation of Environmental Exposures at the

GAMBELL FORMERLY USED DEFENSE SITE (FUDS)
NATIVE VILLAGE OF GAMBELL
GAMBELL, ALASKA

JULY 24, 2017

**COMMENT PERIOD ENDS: OCTOBER 30, 2017**

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Community Health Investigations
Atlanta, Georgia 30333

**Health Consultation: A Note of Explanation**

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR or ATSDR's Cooperative Agreement Partner which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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HEALTH CONSULTATION

PUBLIC COMMENT RELEASE

# Evaluation of Environmental Exposures at the

## GAMBELL FORMERLY USED DEFENSE SITE (FUDS)
## NATIVE VILLAGE OF GAMBELL
## GAMBELL, ALASKA

Prepared By:

U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry (ATSDR)
Division of Community Health Investigations

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## Foreword

The Agency for Toxic Substances and Disease Registry, ATSDR, was established by Congress in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act, also known as the Superfund law. This law established a fund to identify and clean up our country's hazardous waste sites. The Environmental Protection Agency (EPA) and the individual states regulate the investigation and cleanup of the sites.

Since 1986, ATSDR has been required by law to conduct a public health assessment at each of the sites on the EPA National Priorities List. The aim of these evaluations is to find out if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and should be stopped or reduced. If appropriate, ATSDR also conducts public health assessments when petitioned by concerned individuals. Public health assessments are carried out by environmental and health scientists from ATSDR and states with which ATSDR has cooperative agreements. The public health assessment process allows ATSDR scientists and cooperative-agreement partners flexibility in the format of the document when they present findings about the public health impact of hazardous waste sites. The flexible format allows health assessors to convey to affected populations important public health messages in a clear and expeditious way.

**Exposure:** As the first step in the evaluation, ATSDR scientists review environmental data to see how much contamination is at a site, where it is, and how people might come into contact with it. Generally, ATSDR does not collect its own environmental sampling data but reviews information provided by EPA, other government agencies, businesses, and the public. When there is not enough environmental information available, the report will indicate what further sampling data are needed.

**Health Effects:** If the review of the environmental data show that people have or could come into contact with hazardous substances, ATSDR scientists evaluate whether or not these contacts may result in harmful effects. ATSDR recognizes that children, because of their play activities and their growing bodies, may be more vulnerable to these effects. As a policy, unless data are available to suggest otherwise, ATSDR considers children to be more sensitive and vulnerable to hazardous substances. Thus, the health impact to children is considered first when evaluating the health threat to a community. The health impacts to other high-risk groups within the community (such as the elderly, chronically ill, and highly exposed people) also receive special attention during the evaluation.

ATSDR uses existing scientific information to evaluate the possible health effects that may result from exposures. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances is not available.

**Community:** ATSDR also needs to learn from the local community about the site and what concerns they may have about its impact on their health. Consequently, throughout the evaluation process, ATSDR actively gathers information and comments from the people who live or work near a site, including residents of the area, civic leaders, health professionals, and community groups. To ensure that the report responds to the community's health concerns, an early version is also distributed to the public for their comments. All public comments related to the document are addressed in the final version of the report.

**Conclusions:** The report presents conclusions about the public health threat posed by a site. Ways to stop or reduce exposure will then be recommended in the public health action plan.

ATSDR is primarily an advisory agency, so usually these reports identify what actions are appropriate for EPA or other regulatory agencies to take. However, if there is an urgent health threat, ATSDR can issue a public health advisory warning people of the risks. ATSDR can also recommend health education or pilot studies of health effects, full-scale epidemiology studies, disease registries, surveillance studies or research on specific hazardous substances.

**Comments:** If, after reading this report, you have questions or comments, we encourage you to send them to us.

Letters should be addressed as follows:

Attention: Manager, ATSDR Record Center, Agency for Toxic Substances and Disease Registry, 1600 Clifton Road (F-09), Atlanta, GA 30333.

## Summary and Statement of Issues

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| **INTRODUCTION** | The Native Village of Savoonga asked the Agency for Toxic Substances and Disease Registry (ATSDR) to evaluate human exposures and potential public health impacts of contaminants and physical hazards at two Formerly Used Defense Sites (FUDS) on St. Lawrence Island, Alaska, and advise them on any actions needed to reduce exposures. The two FUDS are located on opposite ends of St. Lawrence Island. The Gambell FUDS is a former military surveillance and communications station on the northwestern side of the island, intermingled within and just outside the village of Gambell. The military operated at Gambell from 1948 to the 1960s. The other FUDS, Northeast Cape, included a White Alice Communication System site and operated from 1957 to 1972. Northeast Cape is currently used as a seasonal fishing camp. The military facilities were left in place until the 1980s when the U.S. Army Corps of Engineers (USACE) began conducting environmental investigations and cleanup of the FUDS. ATSDR has evaluated both FUDS in separate public health documents. This public health assessment focuses on assessment contaminants in the areas of concern at the Gambell FUDS.<br><br>ATSDR used environmental information from the Native Village of Savoonga, USACE, the Native American Lands Environmental Mitigation Program (NALEMP), state of Alaska Drinking Water Program, Alaska Community Action on Toxics, Alaska Division of Public Health (ADPH), Alaska Department of Health and Social Services, and input from Tribal officials and community members to evaluate a number of exposure scenarios and draw the following conclusions. |
| **CONCLUSIONS** | ATSDR reached eight important conclusions in this public health assessment: |
| **Conclusion 1** | Adults and children might be injured by coming in contact with remaining partially buried or unearthed FUDS-related metal debris while driving all-terrain vehicles or other outside activities, including excavating for artifacts. This physical hazard is a public health hazard. |
| **Basis for Conclusion** | As heavy objects will rise to the surface after freeze/thaw events (frost heaving/frost jacking), it is possible that additional metal objects, once buried, might resurface, creating a physical hazard that can impale, cut, or contribute to any number of other injuries.<br><br>USACE and NALEMP contractors have removed more than 130 tons of metal (debris, drums, matting, cable, fuel tanks, etc.) during numerous removal actions. However, certainty that no metal debris remains cannot be assured. |

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| **Next Steps** | Prudent public health actions village residents can take include 1) inspecting the village and beach for resurfaced metal debris once each year after the spring thaw, 2) removing hazardous debris, and 3) continuing hazard awareness education and reporting procedures for suspected items. |
| **Conclusion 2** | ATSDR found that contact with site contaminants was not occurring or was too infrequent to contribute to cancer rates. ADPH's review of the cancer registry information for the period 1996 to 2013 found that even though the number of observed cases exceeds the number of expected cases for both communities, these increases were not statistically significant. |
| **Basis for Conclusion** | Cancer registry data review cannot provide a cause and effect evaluation related to the chemicals identified at the site; however, it provides an idea of the burden of disease in Gambell relative to other native Alaskan communities. ATSDR asked the ADPH to review the cancer registry information. They found that the number of observed cancer cases for Gambell (44) exceeds the number of expected cases (37), and the number of observed cases for Gambell and Savoonga communities combined (85) exceed the number of expected cases (77) for the period 1996 to 2013. Even though the number of observed cases exceeds the number of expected cases for both communities, these increases were not statistically significant. In other words, these increases are just as likely to result from chance as they are to be associated with lifestyle risk factors, family history, or the potential contaminants at the Gambell FUDS. |
| **Next Steps** | The American Cancer Society (http://www.cancer.org) estimates that for people living in the United States, one in two men and one in three women will develop cancer. Therefore, it is important to reduce exposure to all cancer risk factors whenever possible. |
| **Conclusion 3** | ATSDR did not find contact with site contaminants sufficient to contribute to birth defects. ADPH reviewed data from the Alaska Birth Defects Registry covering the period 1996 through 2011 and found the results for St. Lawrence Island to be similar to other Native Alaskan communities. |
| **Basis for Conclusion** | The cases of birth defects among St. Lawrence Island communities during 1996 through 2011 is not statistically different from other Alaskan communities. However, it might not be possible to see statistically significant differences in the small populations of Gambell and Savoonga. |
| **Next Steps** | ADPH will work with the community of Gambell to continue examining the prevalence of birth defects for the years from 2011 to present. The |

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| | next ADPH report will include an update from the prevalence study to include the most current data available. |
| **Conclusion 4** | Public drinking water in the village of Gambell is not expected to harm people's health. |
| **Basis for Conclusion** | Drinking water monitoring has not shown contaminants at levels above EPA's safe drinking water standards or ATSDR health-based comparison values, so the water is considered to be safe to drink. Drinking water is managed and monitored by the village of Gambell Water Plant in accordance with the Alaska Department of Environmental Conservation (ADEC) Division of Water Quality/Village Safe Water Program and Division of Environmental Health/Drinking Water Program. |
| **Next Steps** | ATSDR recommends that the village of Gambell, in accordance with the Alaska Department of Environmental Conservation (ADEC) Division of Water Quality/Village Safe Water Program and Division of Environmental Health/Drinking Water Program, test all water sources used for drinking on Gambell, including the non-regulated traditional sources to ensure safety. |
| **Conclusion 5** | Vapors intruding into indoor air from contaminants in soil and groundwater from the Gambell FUDS is not occurring, and therefore, is not expected to harm people's health. |
| **Basis for Conclusion** | Soil and groundwater samples collected after remediation have not detected contaminants at levels that present a concern for vapor intrusion. |
| **Next Steps** | Simple public health actions can be taken by residents to prevent vapors from volatile chemicals spilled on the ground near the footprint of a building on a slab foundation from being drawn into a heated building in the future. ATSDR recommends that containers used to store fuels or volatile chemicals be owner-inspected monthly and seated in a tray to capture spills and prevent vapors from intruding into heated buildings. |
| **Conclusion 6** | Exposure to soil and gravel contaminants related to the Gambell FUDS is currently not occurring, and therefore, it is not expected to harm people's health. |
| **Basis for Conclusion** | Data from removals actions show that contaminants are not present in soil at harmful levels. USACE and NALEMP contractors have removed more than 85 tons of chemical contaminated subsurface gravel, sediment, and soil and more than 29 tons of waste (e.g., asphalt) in containers. |
| **Conclusion 7** | There is insufficient information for ATSDR to determine the safety of activities at Troutman and Nayvaghaq Lakes. It is uncertain whether drinking water or ice from or recreating in Troutman and Nayvaghaq |

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| | Lakes could harm people's health because there are limited samples. Additionally, because complete removal of metallic debris and ordnance from these disposal sites cannot be assured, a small risk of injury from physical hazards remains for those who recreate in the lakes. |
| **Basis for Conclusion** | One surface water sample from each lake was tested in 1985. Additional sampling parameters including biological sampling from multiple surface water locations are needed to characterize lake water quality. Additionally, water treatment would need to be conducted to make the water drinkable. |
| **Next Steps** | Before these water bodies can be used safely for drinking and recreating, ATSDR recommends that ADEC conduct additional water quality testing. To reduce the risk of injury to those who recreate in the lakes due to remaining metal debris, ATSDR recommends the community continue hazard awareness training including reporting procedures for suspected items. |
| **Conclusion 8** | ATSDR cannot evaluate the exposure of adults and children who had direct contact with the contents of leaking 55-gallon metal drums because the contents of the drums are unknown and there are no sampling data of the drums' contents or the surrounding soil where contents may have leaked. |
| **Basis for Conclusion** | Not enough information is available to determine if exposure to the contents of drums had a health impact on residents.<br><br>USACE and NALEMP contractors removed more than a thousand 55-gallon drums and more than 85 tons of chemical contaminated soils and more than 29 tons of containerized waste since cleanup began in 1993. There are no known leaking drums currently identified in Gambell. |
| **Next Steps** | If drums are identified in the future, the Village is requested to notify the ADEC to facilitate testing, removal, and potential remediation. |
| **FOR MORE INFORMATION** | If you have questions or comments, you can call ATSDR toll-free at 1-800-CDC-INFO and ask for information on the Gambell FUDS site. |

# Background

## Introduction

The Native Village of Savoonga asked the Agency for Toxic Substances and Disease Registry (ATSDR) to evaluate human exposures and potential public health impacts of contaminants at two Formerly Used Defense Sites (FUDS) on St. Lawrence Island, Alaska, and advise the Native Village of Savoonga on actions needed to reduce exposures, if necessary. The two FUDS are located on opposite ends of St. Lawrence Island. The Gambell FUDS is a former military surveillance and communications station on the northwestern side of the island, intermingled within and just outside the village of Gambell where access to the former military installation areas is unrestricted [E & E 1992]. The military operated at Gambell from 1948 to 1965 [USACE 2009]. The other FUDS, Northeast Cape, operated from 1957 to 1972, and included a White Alice Communication System. Northeast Cape is currently used as a seasonal fishing camp. The military facilities were left in place until the 1980s when the U.S. Army Corps of Engineers (USACE) began conducting environmental investigations and cleanup of the FUDS.

ATSDR has evaluated each FUDS in separate public health assessment documents. This public health assessment focuses on contaminants in the areas of concern at the Gambell FUDS. ATSDR reviewed documents and information from the Native Village of Savoonga, USACE, the Native American Lands Environmental Mitigation Program (NALEMP), state of Alaska Drinking Water Program, Alaska Community Action on Toxics, Alaska Division of Public Health (ADPH), Alaska Department of Health and Social Services, and received input from Tribal officials and community members.

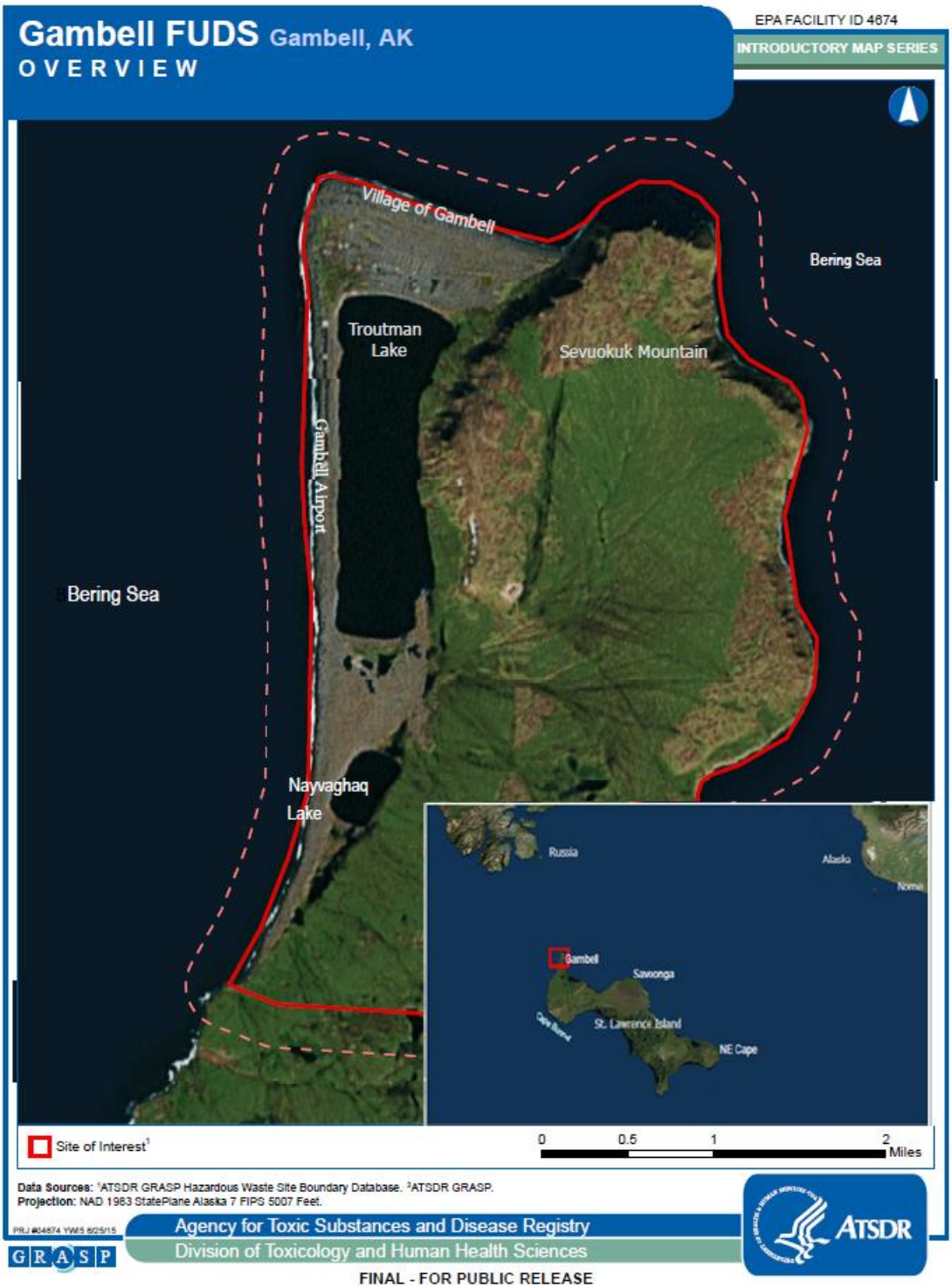
St. Lawrence Island is currently jointly owned by two Native corporations: Sivuqaq, Inc., in Gambell, Alaska, and the Kukulget, Inc. in Savoonga, Alaska [USACE 2009]. On St. Lawrence Island, the state of Alaska only owns land used for airstrips (Gambell and Savoonga) and related facilities [MW 1995; BCS 2007].

## Site Description

The Gambell FUDS is located within the Native Village of Gambell on the northwestern tip (Northwest Cape) of St. Lawrence Island in the western portion of the Bering Sea near the territorial waters of Russia. St. Lawrence Island is approximately 200 air miles southwest of Nome, Alaska, and 36 miles from Siberia, Russia [BCS 2006a]. St. Lawrence Island is about 100 miles long and between 8 and 22 miles wide [University of Washington 1999]. Most of the island is wilderness, consisting of tundra-covered flatland with little to no vegetation, and dotted with small lakes. Rocky mountains rise out of the tundra, naturally dividing the island into western, central, and eastern areas [E&E 1992].

The village of Gambell lies on a gravel spit that projects north and westward from the island. Figure 1 shows St. Lawrence Island and Gambell. The village is relatively flat, with an elevation range from sea level to approximately 30 feet above mean sea level [BCS 2006a]. Gambell is bordered on the north and west sides by the Bering Sea, the south side of the Gambell village is adjacent to Troutman Lake, an inland lake, and the east side is bordered by Sevuokuk (Sivuqaq) Mountain. Sevuokuk Mountain is the eastern boundary of the gravel spit, and it rises to a height of 615 feet. There are no harbors, ports, or docks [MW 1995].

**Figure 1. St. Lawrence Island and Gambell, Alaska**




The area around the village of Gambell is classified as a FUDS under the Defense Environmental Restoration Program. The Gambell FUDS covers approximately 2.7 square miles. The site includes areas around Troutman Lake and extends from the Bering Sea to the top of Sevuokuk

Mountain [BCS 2006a]. The site includes the airstrip and land now used by the Gambell Airport west and south of Troutman Lake to Nayvaghaq Lake [E&E 1992].

Gambell Airport is a public airport on approximately 200 acres owned by the state of Alaska. The airport contains one asphalt and concrete paved runway measuring 4,500 by 96 feet on the small strip of land west of Troutman Lake [FAA 2015].

### Demographics

St. Lawrence Island currently contains two populated communities approximately 50 miles apart: Gambell and Savoonga. Gambell is at the northwestern end of St. Lawrence Island and Savoonga is on the north central coast. Northeast Cape is approximately 50 miles further east from Savoonga and currently has no full time residents [E&E 1992; ATSDR 2013]. However, residents of St. Lawrence Island have expressed an interest in reestablishing a community at Northeast Cape in the future [NVS IRA Council 2009].

The people who live on St. Lawrence Island are primarily St. Lawrence Yupik who are descendants of the Siberian Yupik Eskimos and belong to either the Native Village of Gambell or the Native Village of Savoonga. Both are federally recognized tribes organized pursuant to the Indian Reorganization Act that operate under a federally approved constitution [E&E 1992, 1993]. The 2015 US Census Factfinder estimates 701 people living in Gambell and 671 people in Savoonga, with approximately 95% being Alaskan Native [US Census 2015]. Appendix A contains demographic information for the village of Gambell [HTL 2014, Esri 2016].

### Land Use and Natural Resource Use

The Yupik people lead a tribal subsistence lifestyle that relies on natural resources for nutritional, cultural, economic, and religious purposes. Land use at the Gambell site is residential and recreational with community service facilities and open space. The recreational and open space lands are primarily used for subsistence hunting, gathering, and eco-tourism [USACE 2009]. There are no gardens in Gambell. The ocean surrounding the Gambell area is used extensively for subsistence hunting of walrus, seals, sea birds, polar bears, and whales [MW 1999]. A subsistence use study indicates Gambell residents eat mainly marine mammals (94%); salmon 3%; other fish (1%); birds and eggs (1%); and plants and berries (1%) [Kawerak 2007]. The Gambell area supports habitat for a variety of seabirds, waterfowl, and mammals that either breed in or visit the area. Birds and bird eggs from a large rookery atop Sevuokuk Mountain also serve as a food source to residents [E&E 1992].

Archeological artifact digging is conducted within Gambell by permission. Archeological sites in Gambell have been excavated by archaeologists and local people. Finds from several archeological sites (Hillside, Levoghiyoq, Mayowagh, Ayveghyaget, Old Gambell, and Seklowaghyaget) show that humans have lived in the area for more than 2,000 years [Kawerak 2012; NPS 2014]. Excavation sites are highly visible as large mounds with scattered soil piles that are remnants of ongoing digging for artifacts by local residents. Sea mammal bones, structural wooden and bone remnants, pottery fragments, ground stone tools, and metal and glass fragments are scattered within and between soil piles. Military debris, consisting of rusted barrels, cable, and miscellaneous pieces of metal, were found and removed within the boundaries of the Mayowagh, Old Gambell, and Seklowaghyaget mounds. Digging up buried ivory and artifacts for crafts and

sale provides some economic cash inflow [URS 1985]. Other sources of cash income come from selling of ivory, carvings, crafts, and in the past - fox skins [Jolles 2002; ADEC 2012; Kawerak 2012].

### Climate and Weather

St. Lawrence Island has a cool, moist, subarctic maritime climate with some continental influences during winter, when much of the Bering Sea is capped with pack ice. Winds and fog are common; precipitation occurs approximately 300 days per year as light rain, mist, or snow. Annual snowfall averages 98 inches per year. Annual precipitation is about 18.6 inches per year, and more than half falls as light rain between June and September. Summer temperatures average between 34°F and 49°F, with a record high of 65°F. Winter temperatures range from -2°F to 10°F, with an extreme low of -26°F. Freeze-up normally occurs in October or November, and ice breakup normally occurs in June [E&E 1992, MW 1999].

The temperature in Gambell for much of the year (January–May and October–December) is below freezing. Snow can remain on the ground from mid-November through the end of May. The snow on the surface of the soil acts as a barrier between people and soil. The wind is constant, ranging from 12 miles per hour (mph) to 24 mph. Winds exceed 12 mph 70% of the time [MW 1999].

### Geology

The geology of St. Lawrence Island and the village of Gambell has an important influence on the likelihood for chemical contaminants to remain on the surface where people can come in contact with them. The island is composed of older sedimentary rocks (limestone, greywacke, and shale), granitic rocks (monzonite), Quaternary basalt, and highly permeable unconsolidated surficial deposits likely deposited as successive beach ridges [Patton 1980, BCS 2006a]. The village of Gambell area is underlain by highly permeable, unconsolidated Quaternary gravels, with minor coarse sands, over continuous permafrost occurring at 3–15 feet below ground surface (bgs) [USGS 1971].

The Gambell spit is mostly rocky, without plants, except for a few patches of beach grass. The village is built primarily on basalt gravel, typically, 2–6 cm (0.5–3 inches) in diameter, with slightly smaller gravel on the beach [USGS 1971]. The gravel has smooth edges resembling river rocks and is unconsolidated and free moving. The gravelly, sandy beach soils are well drained [Munter 1992]. The large gravel is often referred to as cobble. Patches of sand and soil are found in only a few locations, intermingled among rock at the base, slope, and top of Sevuokuk Mountain, and provide a substrate for the grasses, shrubs, heaths, sedges, mosses, and lichen [MW 1995]. Local transportation on the gravel spit is best by all-terrain vehicles (ATVs) [E&E 1993]. Walking on the gravel is difficult and takes much effort [Jolles 2002].

Sevuokuk Mountain is composed of Cretaceous quartz monzonite, a gray, coarsely crystalline granite rock rich in quartz and feldspars. The Cretaceous quartz monzonite of the Sevuokuk Mountain Pluton is exposed along the cliffs and higher elevations on the island. Exposed outcrops of quartz monzonite are coarsely crystalline and massive [MW 1995]. The mountain is topped by a flat, wave-cut plateau. No trees grow on St. Lawrence Island [BCS 2006a; Jolles 2002]. Tundra is present near moist areas at higher elevations, such as on Sevuokuk Mountain [MW 1995].

### Surface Water

Freshwater resources at Gambell consist of Troutman Lake (approximately 574 acres and approximately 10 feet deep) and Nayvaghaq Lake (approximately 93 acres) [URS 1985]. The level of Troutman Lake is about 4 feet above sea level, and is fed by Troutman Creek, a fresh water stream at its south end. Storm surges are reported to break over the spit periodically and cause the lake water to be brackish. The lake has no surface water outlet [Munter 1992]. The terrain east of Gambell is wet tundra, with standing water. Rivulets are formed on steeper slopes by snowmelt runoff [URS 1985, E&E 1992].

### Groundwater

Groundwater occurs within the surficial deposits of western St. Lawrence Island and provides the primary drinking water source. Depth to water within these deposits has been measured at 4 to 11 feet bgs throughout the vicinity of Gambell and south of Troutman Lake and is influenced by surface water [URS 1986].

### Site History

In 1943, the U.S. Army built Gambell Army Airfield, now known as Gambell Airport. They used it as a transport base during World War II and as an emergency landing field for aircraft patrolling the west coast of Alaska in the years that followed. From 1948 until the 1960s when operations ceased, various units of the U.S. Army and U.S. Air Force used approximately 2,543 acres of land in Gambell under Special Use Permits and Public Land Order. The Air Force built a base camp in 1950 at the foot of Sevuokuk Mountain and a radar site on the mountain top. The Air Force laid communications cables from the village of Gambell, up Sevuokuk Mountain, and south to Bunnell Cape. The Army used several areas during the late 1950s, with a main base camp located just northeast of Troutman Lake [E&E 1992]. The military abandoned their locations at Gambell by 1956. The Air Force land was transferred to the Bureau of Land Management (BLM) in 1962, and the Army's land was transferred to BLM in 1963 [MW 1998]. Reportedly several hundred men were stationed at Gambell with many local men being hired on occasion. [USACE 2008, USACE 2009].

When the military ceased operations at Gambell, DOD structures were either abandoned and scavenged or demolished, burned, and the debris buried on-site [MW 1998]. From the 1960s until the mid-1980s, the military left `waste buried in landfills and piled throughout the village. This littering of the village of Gambell by the U.S. military created stress and potentially impacted the health and welfare of the residents of Gambell [ATSDR 2013].

In the mid-1980s, the military began environmental investigations and established Gambell as a Formerly Used Defense Site, a program managed by the USACE under the Comprehensive Environmental Response, Compensation, and Liability Act, also known as CERCLA or Superfund. This law provides a Federal "Superfund" to clean up uncontrolled or abandoned hazardous-waste sites as well as accidents, spills, and other emergency releases of pollutants and contaminants into the environment. In 1986, the law was reauthorized to continue under the Superfund Amendments and Reauthorization Act (SARA) and requires a phased approach that characterizes site conditions, determines the nature of the waste, assesses risk to human health and the environment, evaluates the performance and cost of treatment technologies and conducts

cleanup activities. USACE contractors conducted environmental investigations at Gambell from the mid-1980s to 2008. During the environmental investigation, USACE contractors identified 38 areas of concern for contamination (Appendices B and C). The primary contaminants detected in the soil and sediments included petroleum fuels, oils, and metals.

USACE contractors conducted clean-up activities at areas where contamination and debris were determined to pose a hazard. Contractors removed more than 29 tons of hazardous and non-hazardous containerized wastes, including asphalt drums, paint, generators, batteries, and transformer debris once containing polychlorinated biphenyls (PCBs). Additionally, more than 1,000 empty 55-gallon drums that once contained chemicals such as petroleum fuels and other unknown compounds were removed. Contractors also removed more than 130 tons (71 tons in 1999 and 59 tons in 2006) of exposed metal debris including runway Marston matting[1], other metal debris (towers), cables, vehicles, equipment, fuel tanks, tractors, and batteries; and excavated 85 tons of contaminated soil (72 tons in 1999 and 13 tons in 2006).

**Figure 2: Example of weathered Marston matting**

The U.S. Department of Defense decided that no further action was needed for 35 of the 38 sites that had no evidence of any remaining environmental hazards. The decision documents dated June 2005 and September 2007 include detailed summaries of the remedial investigation results, removal of debris and hazardous materials, and other previous activities [USACE 2005, 2008].

Buried debris that was not eligible for cleanup under the FUDS program was addressed through the Native American Lands Environmental Mitigation Program (NALEMP), funded through the Department of Defense, to clean up construction debris and small remaining quantities of hazardous substances. The USACE cleanup of the Gambell FUDS was completed in 2007 and 2008, when all of the associated contaminated sites were determined to be "Cleanup Complete" [ADEC 2013]. However, NALEMP continues to be funded on an annual, as-needed basis to address metal debris and other non-FUDS issues.

## ATSDR Site Visits

ATSDR visited the villages of Savoonga and Gambell twice before receiving the petition and four times since receiving the petition. The first site visit was in March 2013. The health education specialist from ATSDR's field office in Seattle, Washington, and the regional representative from Anchorage, Alaska, travelled to both villages to meet with community members and gather community concerns regarding the FUDS at Northeast Cape and Gambell. Appendix D gives a

[1] Marston matting was used during World War II and later to quickly build temporary runways. The pierced steel planks used to make the runways, measure 10 feet long and 15 inches wide and have holes stamped through them. The matting was used extensively at Gambell as a runway surface. Figure 2 is an example of Marston matting. [http://guadalcanal.homestead.com/files/s_Airfield_marston_matting__Pagoda_HIll_area.JPG]

summary of the meeting and the Gambell community's concerns. A separate document contains the meeting summary for Savoonga and the concerns that the village has about Northeast Cape.

A second site visit was conducted in August 2013 by the lead health assessor from ATSDR headquarters in Atlanta, Georgia, and the regional representative from Anchorage, Alaska. During this visit, ATSDR representatives were able to tour Northeast Cape and Gambell to see the remaining portions of the two FUDS and gather information from tribal members, who were present when the sites were in operation. ATSDR also held community meetings to explain its plans and to gather any additional concerns the residents from the two villages have regarding the FUDS on St. Lawrence Island.

A third site visit occurred in mid-September 2014. ATSDR regional representative, Alaska Office, and preventive medicine physician, Centers for Disease Control and Prevention (CDC), visited the villages of Savoonga and Gambell to discuss the cancer concerns of community residents.

A fourth visit to the villages of Savoonga and Gambell took place in September 2015. The lead health assessor from ATSDR headquarters in Atlanta, Georgia, and the regional representative from Anchorage, Alaska, met with the tribal councils of Gambell and Savoonga and tribal members to present ATSDR's preliminary findings of the Gambell and Northeast Cape health consultations.

ATSDR met with the tribal councils and residents of the villages to discuss the Cancer Registry studies and to respond to cancer questions and concerns. In addition, ATSDR met with Chief Executive Officer/Executive Director of the Norton Sound Health Corporation and the health corporation board to share the results of the Cancer Registry studies and to discuss cancer prevention outreach to the villages.

## Community Health Concerns

In October 2011, the president of the Native Village of Savoonga asked that ATSDR conduct a public health assessment or health consultation on the FUDS of Gambell and Northeast Cape on St. Lawrence Island. The president asked that ATSDR assess health implications from the FUDS sites. The president also asked that ATSDR assess levels of persistent organic pollutants and all sources of excessive toxic exposures affecting Artic Indigenous Peoples [NVS 2011]. ATSDR found that data were available to evaluate community exposures and make appropriate recommendations to reduce or eliminate the exposures. ATSDR did note, however, that it would not be possible to determine the sources and levels of contaminants from other parts of the world that pollute the local environment and the sea mammals on which St. Lawrence Island residents rely [ATSDR 2012].

In February 2012, ATSDR agreed to conduct two separate public health assessments. These public health assessments focus on assessing the available data to determine whether exposure to contaminants from the Gambell or Northeast Cape sites might be harmful to St Lawrence Island residents.

In March 2013, ATSDR interviewed people from the Native Village of Gambell (Appendix D). Members of the village had several health concerns. They were concerned about what they see as elevated rates of cancer and other serious illnesses in their community. The village is very remote and available health care on St. Lawrence Island is limited. Tribal members would like to see

expanded health-care services on St. Lawrence Island. The Norton Sound Health Corporation has partnered with the Tribe to set up mobile clinics for early detection and treatment of common types of cancers such as lung, colorectal, breast, and prostate.

Residents from both communities were concerned about the number of cancer cases and birth defects within their communities. In response to the St. Lawrence Island communities' concerns, ATSDR worked with the Alaska Department of Health and Social Services, ADPH to review the cancer and birth defects registries data for Gambell and Savoonga. A review of the two registries data cannot show cause and effect from exposure to contaminants, but can provide an idea of the burden of disease in Gambell and Savoonga relative to other native Alaskan communities.

ADPH found that rates of cancer and birth defects were similar in Gambell and Savoonga compared to other native Alaskan communities. They note, however, that the scientific methodology of epidemiology has significant limitations that do not make it possible to determine whether any increases in cancer or birth defects are a result from chance variation, lifestyle risk factor, family history, or potential contaminants at the Gambell FUDS. These evaluations are presented in the Health Outcome Data Evaluation section of this report.

Community members have also expressed concern through the Alaska Community Action on Toxics (ACAT) about contact with Troutman and Nayvaghaq Lakes and potential vapors intruding into indoor air from contaminants in soil or groundwater. ATSDR reviewed the environmental information and the limited sampling data. Our evaluation is discussed in the sections that follow.

## Environmental Contaminant Data, Pathways Analyses, and Contaminant Screening

ATSDR reviewed environmental sampling reports from the USACE and the NALEMP programs to determine what contaminants were present and what levels were found in the sampled environmental media around the village of Gambell [NVG 2007, 2008, 2009, 2010, 2011; USACE 2005, 2008].

ATSDR identified the following potential health hazards at the Gambell FUDS:

1) **Health Hazard** - Contact with remaining exposed metal debris
2) **No Health Hazard** - Drinking from the Gambell public drinking water system because no contaminants related to the Gambell FUDS were present.
3) **No Health Hazard -** Vapors in indoor air from soil or groundwater contaminants related to the Gambell FUDS is not occurring. Military chemicals have not been found in soil or groundwater that could become vapors in indoor air
4) **No Health Hazard** – Contact with surface soil and gravel contaminants related to the Gambell FUDS is not occurring.
5) **Uncertain Health Hazard** - Drinking and direct contact with surface water at Troutman and Nayvaghaq Lakes is uncertain because there are too few samples.
6) **Uncertain Health Hazard** - Direct contact with chemicals in drums left by the military is uncertain because the contents of the drums are unknown.

## Discussion

The climate, weather, and geology of Gambell decrease the chances for people to contact chemical contaminants that have spilled, leaked, or been deposited in the environment. The high winds, cool temperatures, snow cover, and moist air reduce the frequency at which people contact environmental media. The large gravel substrate on which Gambell is located is highly permeable, allowing contaminants and water to flow through it quickly. Typically, soil acts as a natural filter and slows the movement of substances down to groundwater. It captures contaminant particles by retaining chemicals or dissolved substances on the soil particle surface. Microbes in the soil process the chemicals. Gambell's surface, however, is mostly gravel, with only a few spots of soil. Contaminants that spilled or leaked onto the ground would not readily adhere to the course gravel. They would likely move quickly down through the gravel to the groundwater table and out to sea.

ATSDR evaluates exposure situations by comparing the chemical sampling data with media-specific (water, soil, sediments, and air) comparison values (CVs) to screen contaminants and to identify those that might harm health. Contaminants exceeding CVs are then examined more closely by calculating exposure doses using site-specific exposure assumptions. For the exposure situations identified at the Gambell FUDS (see previous section), only the drinking water pathway could be evaluated by this methodology. Table 1 provides a summary of ATSDR's evaluations. Discussion of ATSDR's evaluations for the exposure situations follows (Table 1).

**Table 1. Summary of Exposure Evaluations**

| Exposure Conclusions | Remedial Activities | ATSDR Evaluation and Conclusion Category | Comments | Recommendations and Planned Actions |
|---|---|---|---|---|
| **1.Contact with metal debris can cause injury.** Adults and children might be injured by contact with remaining metal debris while driving all-terrain vehicles or digging. This physical hazard is a public health hazard. | Removals. USACE and NALEMP contractors have removed more than 130 tons of metal debris during numerous removal actions. However, certainty that no metal debris remains cannot be assured. | Public health hazard (past, current and future). | Because heavy objects will rise to the surface after freeze/thaw events (frost heaving/frost jacking) it is possible that additional metal objects once buried might resurface creating a physical hazard. | Prudent public health actions include 1) inspecting the village and beach for resurfaced metal debris once each year after the spring thaw, 2) removing hazardous debris, and 3) continued hazard awareness education and education regarding reporting procedures for suspected items. |
| **2. Military chemicals have not been found in public drinking water.** Drinking water from the Gambell public drinking water system is not expected to harm people's health. Gambell's public water system is being regularly monitored. Testing has not shown contaminants above EPA safe drinking water standards or ATSDR health comparison values. | Removal of buried drums near Site 5 and the source of the public drinking water wells in 1999 and 2001. Monitoring of groundwater continued through 2009 when all remediation under FUDs was completed. | No harm expected (current and future). | Public drinking water is managed and monitored by the village of Gambell Water Plant in accordance with ADEC Division of Water Quality/Village Safe Water Program and Division of Environmental Health/Drinking Water Program. | Regularly scheduled monitoring of the water system helps ensure safety of the water system. |

| Exposure Conclusions | Remedial Activities | ATSDR Evaluation and Conclusion Category | Comments | Recommendations and Planned Actions |
|---|---|---|---|---|
| **3. Military chemicals have not been found in soil or groundwater that could become vapors in indoor air.** Vapors intruding into indoor air from contaminants in soil and groundwater from the Gambell FUDS is not occurring and therefore, is not expected to harm people's health. | Removals. USACE and NALEMP contractors have removed contaminated soil and buried drums located near the high school and 1990 houses. | No exposure (current and future). | Groundwater and soil samples collected following cleanup have not detected contaminants at levels that present a concern for vapor intrusion. | Due to the permeability of the soil matrix, residents can take prudent public health precautions to prevent future vapor intrusion issues. ATSDR recommends that containers used to store fuels or volatile chemicals be owner-inspected monthly and seated in a tray to capture spills and prevent vapors from intruding into heated buildings. |
| **4. Contact with surface soil and gravel is not likely harmful.** Exposure to surface soil and gravel contaminants related to the Gambell FUDS is currently not occurring and therefore, is not expected to harm people's health. | Removals. USACE and NALEMP contractors have removed more than 29 tons of chemical contaminated soils. More than a thousand 55-gallon drums were removed. | No exposure (current and future). | Because of the large gravel substrate of the Gambell area, chemical spills that occurred in the past during and after the military disposal would have quickly traveled down through the gravel and sediment below and would not stick to the surface of the gravel rocks. The top 3 inches were not sampled at Gambell. Soil borings were collected. Groundwater ranges from 1 to 3 feet deep and permafrost from 2 to 10 feet deep. | No additional actions or recommendations are warranted. |

| Exposure Conclusions | Remedial Activities | ATSDR Evaluation and Conclusion Category | Comments | Recommendations and Planned Actions |
|---|---|---|---|---|
| **5. Safety of activities at surface water lakes is uncertain.**<br>There is insufficient information for ATSDR to determine whether drinking water or ice from or recreating in Troutman and Nayvaghaq Lakes could harm people's health because there are limited data. Additionally, because complete removal of metallic debris and ordnance from these disposal sites cannot be assured, a small risk of injury from physical hazards remains for those who recreate in the lakes. | Removals. USACE and NALEMP contractors have removed buried and submerged metal debris including small arms ammunition and grenades from Troutman Lake waste site (Site 15) and drums and contaminated soil near Nayvaghaq Lake waste site (Site 12) | Cannot determine public health hazard (past, current and future). | One surface water sample from each lake was tested in 1985. Additional sampling parameters including biological sampling from multiple surface water locations are needed to characterize lake water quality. Additionally, water treatment would need to be conducted to make the water drinkable. | Before these water bodies can be used safely for drinking and recreating, ATSDR recommends that ADEC conduct additional water quality testing. To reduce the risk of injury to those who recreate in the lakes due to remaining metal debris, ATSDR recommends the community continue hazard awareness training including reporting procedures for suspected items. |
| **6. Health impact of contact with chemicals in drums is uncertain.**<br>Direct contact of adults and children with the contents of leaking 55-gallon metal drums cannot be evaluated because there are no sampling data and the contents of the drums are unknown. | Removals. USACE and NALEMP contractors have removed more than 29 tons of chemical contaminated soils. More than a thousand 55-gallon drums were removed from the Gambell area. | Cannot determine public health hazard (past). | In the past, because of the exposed piles of disposed waste, people could have directly touched chemicals leaking from abandoned containers. However, no data are available to evaluate those types of exposures. There is not enough information to determine if exposure to the contents of drums had a health impact on residents. | If drums are identified in the future, the Village has been requested to notify the ADEC to facilitate testing, removal, and potential remediation. |

### 1. Contact with remaining exposed metal debris can cause injury.

*Adults and children might be injured by contacting any remaining metal debris while driving ATVs or during other activities such as digging. This physical hazard is a public health hazard.*

Freezing and thawing can cause heavy objects to rise to the surface, and additional metal objects once buried might resurface, creating a physical hazard. Residents are concerned about the potential for ATV and snowmobile accidents caused by collision with the debris. Metal cables and other debris in the past have surfaced and presented a physical hazard.

Soil within Gambell is spotty, occurring near the base of Sevuokuk Mountain at the ancestral archeological dig sites and near the end of the Gambell airstrip. Residents who dig for artifacts do so in areas with soil and could become injured from contact with metal debris.
Any debris that was not removed has the potential to be heaved to the surface from the permafrost layer below the ground surface. During the environmental investigations, 38 areas of concern (AOC) were identified for further investigation. Appendix B details those AOCs. Appendix C includes a map of the AOCs. The following AOCs contained surface debris, which posed a physical hazard in the past: 1A, 1C, 2, 3, 4E, 8A, 15, 17, 20, 23, 24, and 27. USACE and NALEMP contractors removed extensive metal debris at these sites. The sites are now listed as warranting no further action. However, in AOC 18B, debris remains close to the above ground water tanks, but could not be removed because of the risk of compromising the water tanks [USACE 2005].

Prudent public health actions for Gambell residents includes inspecting the village for resurfaced metal debris once each year after the spring thaw. Areas along the exposed beach may be more likely to present with exposed metal debris. ATSDR recommends that ATV and snowmobile riders pay close attention and use caution while riding on the ATV trails or along the beach and report any surface debris to the NALEMP program for removal [ATSDR 2016c]. Residents who dig or walk around Gambell need to be made aware of the potential for surface debris. Although the probability is low of encountering remaining metal debris that is hazardous, continued awareness of the hazard and education regarding reporting procedures for suspected items will reduce exposure to these physical hazards.

### 2. Military chemicals have not been found in public drinking water.

*Public drinking water in the village of Gambell is not expected to harm people's health. Drinking water in the Gambell public drinking water system is being regularly monitored. Testing has not shown contamination above EPA safe drinking water standards or ATSDR health comparison values.*

Drinking water in Gambell comes from groundwater, but is considered by the state to be under the influence of surface water. There are no private wells. There are two drinking water supply points for the village, the village water well and the infiltration gallery[2]. The infiltration gallery was used as the primary source until 1996 when the Public Health Service constructed the

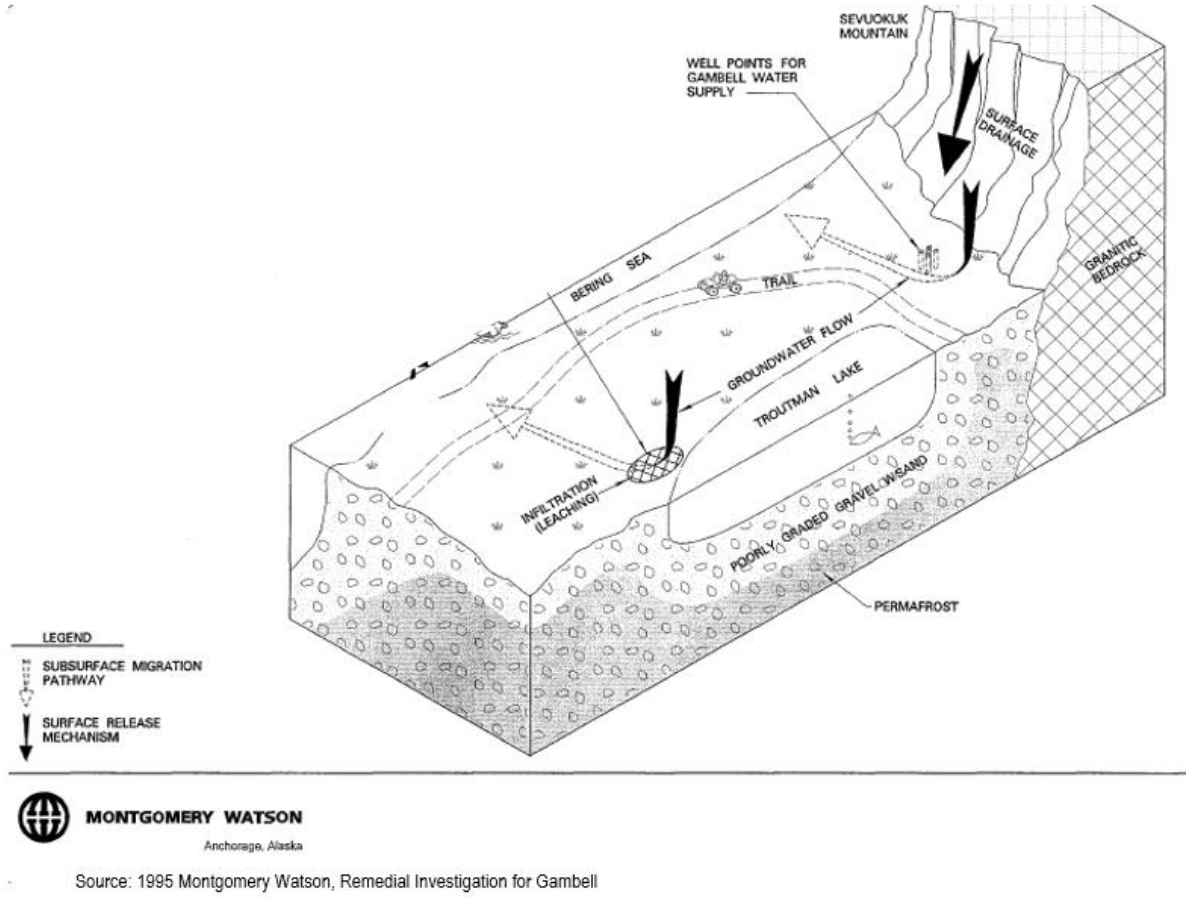
[2] An infiltration gallery is a man-made conduit built in permeable earth for collecting groundwater. Collected water is then pumped to a storage tank, treated as needed, and distributed [World Health Organization 1996].

Gambell village well. The infiltration gallery is still used as a backup water supply. Both are near the base of Sevuokuk Mountain [MW 1999; BCS 2006a, 2006b]. The Gambell public water supply serves approximately 140 homes through direct plumbing. Approximately 40 additional homes are not plumbed. Those homes obtain their water by carrying it from the washeteria which is supplied by the public water system [ATSDR 2016d]. The Gambell public water supply is managed and monitored on a regular basis by the village of Gambell Water Plant in accordance with ADEC, Division of Water Quality/Village Safe Water Program and Division of Environmental Health/Drinking Water Program.

According to a State of Alaska hydrogeological investigation report [Ireland 1994], the Gambell aquifer appears to originate along the front of the steep bluff of Sevuokuk Mountain, and continues north towards the Bering Sea. The aquifer appears to be a pool that has thawed from the permafrost. As the permafrost expands or recedes, the aquifer dimensions vary accordingly. Warm recharge water from Sevuokuk Mountain effectively melts the permafrost where the mountain face joins the gravel spit. Most of the water entering the aquifer comes 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 1992; MW 1995, 1999; USACE 2005; BCS 2006a, 2006b, 2007].

The documented groundwater flow direction in this area during the summer months is to the north, parallel to the base of Sevuokuk Mountain, towards the Bering Sea as depicted in Figure 3 (approximately 1,200 feet). The groundwater flow rate, as determined by the hydraulic gradient, ranges from 30 to 1,100 feet per day [MW 1995]. This groundwater flow rate range indicates rapidly moving groundwater, which decreases the likelihood that contaminants from the 1950s would still be in the groundwater. During the winter when surface water freezes, groundwater flow direction has been shown to reverse slightly [Golder 1994]. No salt water intrusion has been detected in the groundwater.

**Figure 3. Schematic of Surface and Groundwater Flow**




Source: 1995 Montgomery Watson, Remedial Investigation for Gambell

### *Village Well*

The village water well is housed inside a building within a fenced area. The well, constructed in 1996, consists of a well point completed to a depth of 20 feet. The depth-to-water fluctuates seasonally, but averages around 10 feet bgs [BCS 2006a, 2006b, 2007; MW 1999]. The well is equipped with a pump having a maximum capacity of 30 gallons per minute (gpm) and an optimum pump rate of 20 gallons per minute. The water is treated to reduce particulates, iron, manganese, and infectious agents and to control corrosion. In 1994, fluoride was added, but samples collected in 2010 show that is no longer being done. There are three storage tanks (500,000; 212,000; and 100,000 gallon capacities) in a separate treatment plant building in Gambell that store the treated water before delivery to the village water system. The tanks are used to provide a continuous water supply, to buffer the demand on the pump, and to provide adequate contact time for chlorination. The tanks are refilled as needed at a rate of 20 gallons per minute. Typical daily water use is 30,000 gallons [MW 1999]. A separate pipe provides a return flow to the well house from the storage tank. Water from this pipe is discharged back into the well to prevent freezing. The well, pump, and storage tanks are used year round.

### *Infiltration Gallery*

Before well water was available for the village, an infiltration gallery was built near the foot of Sevuokuk Mountain in 1992 and used as a seasonal potable water source for village residents of Gambell (Figure 4) [MW 1995; BCS 2006a, 2006b, 2007]. Surface water likely seeps into the below-ground water collection system, making it susceptible to contamination. A small spring in the area is thought to be recharged by surface and subsurface flow from the base of the mountain. During the winter, the gallery freezes and is not useable. The pipes that connected the gallery to the village water supply have been capped and the gallery is currently available as a back-up supply [MW 1999].

**Figure 4. Infiltration Gallery Building**

*Building surrounding the infiltration gallery. Photo by ADEC.*

### *Drinking Water Sampling Results*

Water samples have been taken by Gambell Water Plant and USACE contractors for different purposes. The Gambell Water Plant tests drinking water samples after the treatment process to determine the safety of the finished drinking water. USACE contractors conducting environmental investigations tested raw untreated water to determine if environmental contaminants were present in the groundwater before treatment.

Sampling results for Gambell Water Plant drinking water are reported to the State of Alaska Drinking Water Program/Village Safe Water Program. The results are used for compliance of the public utility and represent the drinking to which people are exposed. Table 2 presents a summary of the drinking water results.

ATSDR reviewed the drinking water sampling results from the village of Gambell public water supply for the period August 1992 through September 2015. Data are available online at http://dec.alaska.gov:8080/DWW. Drinking water samples were tested for coliforms, inorganic compounds (such as arsenic, lead, copper, iron, and manganese), nitrates, nitrites, VOCs (such as benzene, trichloroethylene, toluene, ethylbenzene, and total xylenes), chlorination byproducts (trihalomethanes), radionuclides, and semivolatile organic compounds (SVOCs) (such as pesticides, polycyclic aromatic hydrocarbons (PAHs), and PCBs). Testing is performed according to an established schedule. Additional samples maybe collected when equipment is changed, if an analyte is detected, or for other reasons.

Results over the last 23 years of sampling (Table 2) show no contaminants in the Gambell water supply above EPA safe drinking water standards or ATSDR health comparison values. During one quarterly sampling, chlorination byproducts (trihalomethanes) appeared slightly elevated, but below levels of health concern due to a broken pump that was replaced.

Several members of the Gambell community expressed concerns about the fuel contaminants in the drinking water system. Fuel-related compounds include benzene, toluene, ethylbenzene, and xylenes (BTEX). To address concerns ATSDR evaluated and summarize in Table 2 levels of chemical analytes detected since 1993, including occasional detections of trace levels of ethylbenzene, toluene, and total xylenes. Benzene has not been detected in drinking water. Detection of one of the fuel-related chemicals has not corresponded with simultaneous detections of any other fuel-related chemical from the same sample. Because more than one chemical does not occur in the same sample and repeated samples do not show the same chemical, these detections classified as are transient, intermittent, or trace and indicate that the larger reservoir of water as a whole is not contaminated. Levels of these chemical are so low as to be considered trace levels occurring right at the limits of detection. ATSDR identified no contaminants in the Gambell water supply above EPA's safe drinking water standard or ATSDR's health comparison values. Therefore, the Gambell public water is not expected to harm people's health.

**Table 2. Public Drinking Water (Village Well) Supply Sampling Results**

| Chemical Analyte | Number of Detections per Number of Sampling Events | Public Water Supply 1993 – 2015 (micrograms per Liter) | EPA's Maximum Contaminant Level Safe Drinking Water Standards (micrograms per Liter) | ATSDR Health Comparison Values | | |
|---|---|---|---|---|---|---|
| | | | | Hierarchy Level 1 | Hierarchy Level 2 | Hierarchy Level 3 |
| Benzene | 0 / 28 | ND | 5 | EMEGc Child: 5<br>EMEGc Adult: 18<br>CREG: 0.64 | RMEG Child: 40<br>RMEG Adult: 140 LTHA: 3 | MCL: 5<br>MCLG: 0 |
| Ethylbenzene | 4 / 28 | ND - 15.7 | 700 | None | EMEGi Child: 4,000<br>EMEGi Adult: 14,000<br>RMEG Child: 1,000<br>RMEG Adult: 3,500<br>LTHA: 700 | MCL: 700<br>MCLG: 700 |
| Toluene | 6 / 28 | ND - 1.0 | 1000 | None | EMEGi Child: 2,000<br>EMEGi Adult: 700<br>RMEG Child: 800 RMEG Adult: 2,800 | EMEGa Child: 8,000<br>EMEGa Adult: 28,000<br>MCL: 1,000<br>MCLG: 1,000 |
| Total Xylenes | 5 / 28 | ND – 79.4 | 10,000 | EMEGc Child: 2,000<br>EMEGc Adult: 7,000 | EMEGi Child: 4,000<br>EMEGi Adult: 14,000<br>RMEG Child: 2,000<br>RMEG Adult: 7,000 | EMEGa Child: 10,000<br>EMEGa Adult: 35,000<br>MCL: 10,000<br>MCLG: 10,000 |
| PCBs | 0 / 4 | ND | 0.5 | CREG: 0.018 | None | MCL: 0.5 |
| PAH:<br>Benzo(a)pyrene | 0 / 4 | ND | 0.2 | CREG: 0.0048 | None | MCL: 0.2 |
| Other PAHs | 0 / 4 | ND | 0.2 - 3400 | None | None | None |

EPA – U.S. Environmental Protection Agency
ND – Not Detected
PCBs – Polychlorinated Biphenyls
PAHs – Polycyclic Aromatic Hydrocarbons
EMEG – Environmental Media Evaluation Guide (ATSDR)
CREG – Cancer Risk Evaluation Guide (ATSDR)
RMEG – Reference Dose Media Evaluation Guide (EPA)
LTHA – Lifetime Health Advisory (EPA)
a. acute (occurring less than 14 days)

i. intermediate (occurring between 14 and 365 days
c. chronic (occurring for more than 365 days)
MCL – Maximum Contaminant Level (EPA)
MCLG - Maximum Contaminant Level Goal (EPA)

**3. Military chemicals have not been found in soil or groundwater that could become vapors in indoor air.**

*Vapors intruding into indoor air from contaminants in soil and groundwater is not a concern from the Gambell FUDS because soil and groundwater samples collected after remediation have mostly not detected contaminants or levels of contaminants were too low to become vapors in indoor air.*

Community members have expressed concern through ACAT about potential vapors in indoor air. The movement of volatile chemicals and gases from soil and groundwater into indoor air is known as vapor intrusion and can be a concern for people who may inhale the vapors that accumulate indoors [ATSDR 2008].

***Subsurface Soil Sampling Results***

Subsurface soil samples were analyzed by USACE contractors as part of the remedial investigation during 1992–2008. Surface soil samples collected at Gambell were defined by USACE contractors as being from 6 to 18 inches below grade [E&E 1993; MW 1995, 1999]. Most of the soil samples collected during the remedial investigation were borings collected from 2.5 to 10 feet deep below surface level throughout the Gambell FUDS [MW 1995, 1998]. Soil samples were analyzed for various compounds, including gasoline-range organics, diesel-range organics, and residual-range organics which are associated with petroleum hydrocarbons such as fuels. Analysis also included inorganic compounds (metals), VOCs, and SVOCs (including PAHs and PCBs).

NALEMP contractors reported "very little evidence of fuel contamination" was discovered during excavation activities. All samples collected were well below the Alaska Department of Environmental Conservation Method Two Under 40-inch-Zone, ingestion pathway soil cleanup levels for diesel range organics, residual range organics, and gasoline range organics. These low levels indicate weathered and degraded residual petroleum hydrocarbons. BTEX compounds, VOCs, SVOCs, PAHs, and PCBs were not detected. [NVG 2006].

EPA considers petroleum hydrocarbons at these levels to be less of a concern for vapor intrusion than chlorinated hydrocarbons for the following reasons as discussed in their 2012 informational paper: Petroleum Hydrocarbons and Chlorinated Solvents Differ in their Potential for Vapor Intrusion. Petroleum hydrocarbons biodegrade readily by way of aerobic (oxygenated) environmental conditions, whereas chlorinated solvents typically biodegrade much more slowly through anaerobic conditions. The rapid aerobic degradation limits the concentration and subsurface migration of petroleum vapors in unsaturated soils [Howard 1991, EPA 2012]. In addition, petroleum hydrocarbon liquids (e.g., gasoline, diesel fuel) are lighter (less dense) than water and when released, can float on the groundwater surface (water table), unlike chlorinated solvents (e.g., trichloroethylene: TCE, tetrachloroethylene: PCE) that are heavier than water and sink through the groundwater column to the bottom of the aquifer. These key differences (biodegradability and density) lead to very different subsurface behavior that often reduces the potential for human exposure to vapor intrusion from petroleum hydrocarbons [EPA 2012].

### *Groundwater Sampling Results*

Groundwater sampling was conducted as part of the remedial investigation during 1992–2008. USACE contractors conducting environmental investigations installed 32 monitoring wells (MW) throughout the Gambell FUDS and surrounding the public water wells and infiltration gallery. These monitoring wells were used to determine the effects of surface spills on groundwater, and to evaluate how susceptible the drinking water source is to potential contamination. [USACE 2009].

Groundwater samples were analyzed for various compounds, including gasoline-range organics, diesel-range organics, residual-range organics, inorganic compounds (metals), VOCs, and SVOCs. Testing results indicated that after cleanup activities, volatile contaminant levels were either non-detectable (below the limits of detection) or estimated to be very low (just above the detection level). PCBs were not detected in groundwater samples. Inorganic compounds including barium, chromium, lead, nickel, and vanadium were detected a low levels (below EPA safe drinking water standards and ATSDR health comparison values). These inorganic compounds are not capable of volatilizing at room temperature. Therefore, low level detections of these metal do not present a vapor intrusion concern.

The monitoring wells were tested seasonally during spring and summer remedial investigation activities from 1992 through 2008. During that time, several wells were not sampled or removed for various reasons including lack of water and a few reclaimed by the ocean and were not recoverable. Many monitoring wells were decommissioned by Village Safe Water in October 2007 to protect the aquifer. Bristol Environmental Remediation Service searched for, removed, and properly decommissioned the remaining wells according to ADEC procedures during August 2008 [BERS 2008]. In 2007 and 2008 monitoring wells were sampled before they were officially decommissioned according to state of Alaska procedures.

Although sampling results indicates that vapor intrusion of contaminants from the Gambell FUDS is not a concern, fuels recently spilled on the ground near the footprint of a building built on a slab foundation could occur and become sucked into heated buildings. ATSDR has no data to evaluate this potential exposure, but simple precautionary measure can be taken by individuals to help reduce the risk of vapor intrusion from new chemical or fuel spills. ATSDR recommends that containers used to store fuels or volatile chemicals be owner-inspected monthly and seated in a tray to capture spills and prevent vapors from intruding into heated buildings. Public educational material is available at https://dec.alaska.gov/spar/ppr/hho.htm

**4. Contact with surface soil and gravel is not likely harmful.**

*Exposure to soil and gravel contaminants related to the Gambell FUDS is currently not occurring, and is not expected to harm people's health.* USACE and NALEMP contractors removed more than 85 tons of chemical contaminated soils and more than a thousand 55-gallon drums. Sampling and removal actions occurred during 1993–2008. Exposure to soil, sediment, and gravel through skin contact or swallowing is also unlikely to have been a hazard for the following reasons:

**Figure 5. Gambell's Ground Surface Gravel**

- Large gravel (Figure 5) on the surface to which people are exposed was not analyzed. ATSDR considers that people might be exposed to surface soil between 0 to 3 inches deep during their normal living and recreational activities (non-occupational). However, surface soil samples collected at Gambell were defined by USACE contractors as being from 6 to 18 inches bgs [E&E 1993; MW 1995, 1999]. Figure 6 shows that the gravel decreases in size only slightly with depth.
- Contaminants from chemical spills that occurred in the past during and after the military disposal would not likely stick on the smooth surface of the large gravel rock because there is no fine soil particles or organic material to trap it. Instead chemicals would travel down through the gravel and sediment below where they would spread out, become diluted by the groundwater, and move toward the Bering Sea.

**Figure 6. Gravel Beneath the Surface**

By L. MacDonald. [BERS 2008]

- Soil permeability values, the average distance that a liquid spilled on the surface would travel in a day, were determined to be 30 to 1,500 feet/day with an average of 800 feet/day [MW 1995]. Munter (1994) reported that two samples of gravels at Gambell yielded permeability values of 16,000 and 26,000 feet per day. These data indicate that although the permeability of the gravels underlying the Gambell spit may be quite variable, in general, permeability is very high allowing liquids on the surface to move quickly through the gravel matrix.
- Most of the soil samples collected during the remedial investigation were borings collected from 2.5 to 10 feet deep bgs [MW 1995, 1998]. Few people would access this depth of soil with sufficient frequency to be a concern. The likelihood of dermal exposure is lessened somewhat if contaminants are deeper than 3 inches below the surface of the soil.
- Moisture and even standing water is present in the gravel just below the first few inches of the surface. This increases the solubility and opportunity for natural attenuation or

degradation of organic contaminants. It also reduces the likelihood that inorganic contaminants would stick to hands.

**7. Safety of activities at Troutman and Nayvaghaq Lakes is uncertain.**

There is insufficient information for ATSDR to determine the public health implications of drinking water or ice from or recreating in Troutman and Nayvaghaq Lakes. Additionally, because complete removal of metallic debris and ordnance from these disposal sites cannot be assured, a small risk of physical hazards remains to those who recreate in the lakes.

Community members have expressed concern through ACAT about potential contamination of two major surface water bodies present on the Gambell spit: Troutman Lake and Nayvaghaq Lake. Troutman Lake covers approximately 574 acres and is roughly 10 feet deep. The lakes are large masses of water that are continually recharged from surface and groundwater [URS 1985]. Current exposure to Troutman Lake water is uncertain and may include use of ice blocks in the winter for consumption as was commonly done prior to the establishing of the Gambell Village well as the public water source [ATSDR 2016b]. Additional exposure may include incidental ingestion of water or dermal contact by swimmers in the summer as children have been known to swim in Troutman Lake [E & E 1992]. Use as a fisheries resource has not been reported [Georgette 1992; Fishingworks 2016].

Nayvaghaq Lake covers approximately 93 acres [URS 1985]. Nayvaghaq Lake is roughly 6 times smaller than Troutman Lake. Its depth and use as a resource has not been reported.

**Contamination History**

Approximately twenty-five years after the military left Gambell, the U.S. Army Corps of Engineers began to investigate the two bodies of water as disposal sites: Site 15 - Troutman Lake Disposal Site and Site 12 - Nayvaghaq Lake Disposal Site. In 1985, contractors for the U.S. Army Corps of Engineers tested one surface water sample from Troutman Lake and one surface water sample from Nayvaghaq Lake. The purpose of the sampling was to provide preliminary information about potential contaminants or parameters needing additional studies. Water was obtained from both lakes as discrete bulk samples from the upper foot of the water column. No testing for fecal coliforms was conducted. In terms of primary and secondary water characteristics, no unusual parameters were apparent for either lake [URS 1985].

Total dissolved solids were measured as 675 mg/l in Troutman Lake and 176 mg/l in Nayvaghaq Lake. Chloride concentration for Troutman Lake, 400 mg/l, was higher than the recommended drinking water limit of 250 mg/l and can be attributed to saltwater intrusion; all other parameters were below EPA's recommended water quality limits. Oil and grease extraction yielded a value of 0.17 mg/l, and 0.22 mg/l respectively, for Troutman and Nayvaghaq and Lakes. Testing for PCBs was negative for both samples. No testing was performed for materials on EPA's Hazardous Substance List.

In 1991, ADEC sampled water from Troutman Lake and Troutman Creek to determine the adequacy of these water sources for use by the community. However, the one sample from Troutman Lake was obtained from the well that at the time served the washeteria (laundromat) as the brackish water source. Two samples from Troutman Creek were obtained. One sample from one mile upstream of Troutman Lake, the other from 300 feet upstream of the point identified by ADEC/VSW for a proposed water intake location. Samples tested for herbicides, pesticides, PCBs, and volatile organic chemicals (VOCs) showed no detections. Trace amounts of lead and barium (below EPA's safe drinking water standards) were detected in one of the stream samples (farthest from Troutman Lake). ADEC concluded that Troutman Creek and Troutman Lake are not contaminated by chemicals. ADEC recommended further investigations before final selection, of either supply is used for potable water [ADEC 1991].

In 2000, contractors conducted a geophysical survey that confirmed the presence of miscellaneous metallic debris estimated at less than one ton including submerged ordnance and other debris at the north end of Troutman Lake at Site 15. Marsten matting, wire, 55-gallon drums, 1300 rounds of 0.30 ordnance, grenades and other metallic debris were submerged along the northern shore of Troutman Lake prior to removal efforts in 2001, 2007 and 2009 [NVG 2006, 2007, 2010]. Metallic debris and associated contaminated soils were removed from Nayvaghaq Lake Disposal Site (Site 12) during 2006 and 2007 [NVG 2006, 2007]. ATSDR could not find additional data of water or sediment to characterize the two lakes.

**Public Health Implications**

Before a body of water is determined to be safe for consumption or recreational purposes, water quality testing for many parameters including an assessment of biological contamination must be performed. Additionally, surface water used for drinking water would also require treatment. The sampling data from Troutman and Nayvaghaq Lakes are insufficient to determine the safety of these lakes for drinking water or recreational use. Therefore, before Troutman or Nayvaghaq Lakes can be safely used for consumption or swimming, ATSDR recommends the ADEC conduct additional water quality testing. In addition, because complete removal of metallic debris and ordnance from these disposal sites cannot be assured, a small risk of physical hazards remains to those who recreate in the lakes. Although the probability of encountering remaining metal debris is low, continued awareness of the hazard and education regarding reporting procedures for suspected items will reduce exposure to these physical hazards.

### 8. Health Impact of contact with chemicals in drums is uncertain.

In the past, people might have directly touched chemicals leaking from the more than a thousand 55-gallon metal drums the military left on Gambell.

The large amount of disposed material near areas used by children and adults increases the likelihood for exposure. However, there are no data on which to evaluate those types of exposures. Transformers containing PCBs were used during the military operations. Soils,

gravel, and groundwater were sampled for PCBs. None of the areas sampled at Gambell contained PCBs above EPA or ADEC cleanup standards.

Presently, no buried drums are known to remain after the removal actions completed by USACE and DOD contractors. However, buried drums remain a concern for community members who believe some drums are buried beneath homes and buildings built in the 1990s. If drums are identified in the future, the Village has been requested to notify the ADEC to facilitate testing, removal, and potential remediation.

## Health Outcome Data Analysis

ATSDR representatives attended public meetings with residents from both villages (Gambell and Savoonga) to gather their concerns about the two FUDS on St. Lawrence Island. Many of the concerns were about the health of the communities and the number of cancer cases and birth defects within the communities. ATSDR, working with the Alaska Department of Health and Social Services, was able to obtain the number of birth defects and cancer cases for Gambell and Savoonga [Alaska Birth Defects Registry 2012; Alaska Cancer Registry 2014].

### Cancer Registry Data

Cancer registry data review cannot provide a cause and effect evaluation related to the chemicals identified at the site; however, it provides an idea of the burden of disease in Gambell relative to other native Alaskan communities. ATSDR asked the ADPH to review the cancer registry information. The Alaska Cancer Registry is a database that contains information on the number of cancer cases diagnosed in Alaska since 1996.

They found that the number of observed cancer cases for Gambell (44) exceeds the number of expected cases (37), and the number of observed cases for Gambell and Savoonga communities combined (85) exceed the number of expected cases (77) for the period 1996 to 2013. More than 70% of these cancers are from six types: lung, colorectal, stomach, female breast, uterus, and pancreatic. These are fairly common cancers, and the numbers for each is typically what is expected in the Alaska population [Alaska Cancer Registry 2014].

Based on available data, the number of cases in a cluster of years does not appear to be unusually high, and the distribution by year appears to be random. Also, there does not appear to be a large number of uncommon cancer cases. Although the percentage of cancer deaths in Savoonga and Gambell is slightly higher than the rest of Alaska, the number of cancer deaths per year and the types of cancer deaths do not appear unusual [Alaska Cancer Registry 2014]. Even though the number of observed cases exceeds the number of expected cases for both communities, the statistical test does not show these increases to be statistically significant. In other words, these increases are just as likely to result from chance as they are to be associated with lifestyle risk factors, family history, or the potential contaminants at the Gambell FUDS.

The number one cause of death in Alaska Natives is cancer. Many of these cancer cases could be prevented with regular exercise and by quitting tobacco use, decreasing alcohol use, and

maintaining a healthy, traditional diet. Smoking accounts for at least 30% of all cancer deaths and 87% of lung cancer deaths in the United States. By contrast, only about 2% of cancer deaths are believed to be a result of natural and product-related environmental pollutants [American Cancer Society 2013]. More specifically, during 2011–2013, a total of 21.8% of Alaska adults were smokers, compared with 43.7% in the Nome census area, which is the area that includes St. Lawrence Island.

The increasing average age of the St. Lawrence Island population might also contribute to an increase in the perceived number of cancer cases by the community. Between 2000 and 2010, the number of persons age 50 years and older increased 43.6% in Savoonga and 22.5% in Gambell [Thakkar 2014]. The incidence of cancer increases with age [American Cancer Society 2013]. While the statistical analyses of the cancer data adjust for the difference in rates by age, it is understandable how members of the community would look at the number of cases and not the rate.

### Birth Defects

The National Birth Defects Prevention Network (NBDPN) has defined 45 major birth defects (congenital anomalies) [NBDPN 2016]. For birth defects, ADPH analyzed only the prevalence of non-alcohol-related birth defects. The summary of the analysis is presented here.

Birth defects are rare events. When they occur in a small population, rate calculations can be statistically unreliable. For the analysis completed by the Alaska Birth Defects Registry (2012), all major anomalies were examined by summing the cases in 5-year intervals. Even after summing the cases in 5-year increments, the confidence intervals were extremely wide. The wide confidence intervals indicate a high level of uncertainty.

The data can include diagnostic bias, whereby some health-care providers might have more sophisticated equipment or clinical specialists, and better report some of the birth defects. Birth defects are reportable up to age six years. The prevalences presented include all reports for children born during 1996-2011 that were received before January 1, 2012.

St. Lawrence Island is within the Southwest Region category of the Alaska census database. During 1996–2011, the prevalence of major, non-alcohol–related defects among infants born to St. Lawrence Island residents (666.7, CI: 457.4-875.9) was higher than the prevalence rate for the remainder of the Southwest Region (602.3, CI: 560.5–644.1). However, the confidence intervals for St. Lawrence Island fit within the confidence intervals of those other census areas, indicating no statistically significant difference. The St. Lawrence Island prevalence is more similar to census areas with predominately Alaska Native populations, as well as the Anchorage Native population group [Alaska Birth Defects Registry 2012].

According to staff at the Alaska Department of Fish and Game, in general, communities in the census areas of Dillingham, Nome, North Slope Borough, and Wade Hampton (renamed "Kusilvak" Census Area in 2015) have diets that include marine mammals (whales and walrus) more similar to communities on St. Lawrence Island. The birth defects data indicate that there is no statistically significant difference in overall prevalence among those communities [Alaska Birth Defects Registry 2012].

Some of the anomalies include, but are not limited to, cardiovascular, alimentary tract, genitourinary, central nervous system, eye and ear, musculoskeletal, and chromosomal defects. During 1996–2011, major congenital anomalies, including alcohol-related defects, affected approximately 6% of Alaskan live births annually. This rate is twice the national average. Further analysis indicated the prevalence of major congenital anomalies was higher among Alaska Native children than among non-native children.

Data limitations do exist. Some birth defects undergo medical records abstraction and case verification. During this analysis, ADPH based the prevalence of cases on the number of cases reported under the qualifying International Classification of Diseases (ICD)-9 codes, regardless of case verification.

## Limitations

This public health assessment attempts to define and evaluate the exposure of Gambell residents to hazardous substances released into the environment from the Gambell FUDS. ATSDR is committed to assisting the community and governmental authorities and agencies in understanding possible current exposures, past exposure, and those likely to occur in the future. However, several limitations increase the uncertainty of this evaluation.

**Lack of data availability for the most contaminated period**

Unfortunately, a large data gap exists from the time the military disposed of waste until the time that environmental investigations began in 1993. During this 30-year period, the petroleum products (residual organics) most likely dissolved, broke down, and washed away so that levels found during the remedial investigation were likely lower than in the years right after contaminants leaked or were disposed. Additional processes might include biologic degradation, migration, volatilization, and adsorption.

> *Chemical drums.* ATSDR cannot determine how many discarded drums were full, partially full, or empty from the time the drums were discarded and when they were actually removed from the areas of concern around Gambell. Without records of what was disposed in each area and the amounts disposed, it is hard to even estimate how much material was dumped, retrieved, and attenuated, and any that might be in isolated areas. Tons of debris were removed, but many of the drums, which might have contained hazardous substances, were empty. Additionally, thousands of drums were removed from Gambell during the remedial investigation and cleanup work conducted under the NALEMP program. The drums were in various states of decay and leaked into the surrounding gravel, sediment, and soil at different rates. Many villagers reported that military personnel intentionally poked holes in the sides of the drums to sink the drums [ATSDR 2013]. Whether people were exposed to the contents of buried and semi-buried drums, and if so, for how long, is also uncertain. Additionally, ATSDR has no data to evaluate reports by community members that drums remain beneath area homes and structures built in the 1990s. ATSDR used the available environmental sampling data (1990s through 2013) to determine what contaminant levels were in the soil, sediment, and groundwater and make conclusions about any potential health effects.

*Troutman and Nayvaghaq Lakes Contaminant Characterization.* ATSDR has limited chemical sampling information of surface water and no data for the sediments at either of these lakes, located just south of Gambell. Munitions investigations have identified and removed small arms ammunitions, but did not report on chemical findings. Lakes and bodies of water have been used as disposal areas at other U.S. military sites. Gambell residents have said they are concerned about contamination of these lakes, which have been used for swimming and as sources of drinking water. ATSDR is uncertain whether Gambell residents get fish, shellfish, or other types of food from the lakes. No reports provide usable details about these potential resources.

*Sources other than drums.* ATSDR does not have information on levels of contaminants from other sources at the time of their disposal. This might include materials that were covered with lead paint, and other sources of heavy metals, such as artillery rounds, that might have been dumped in the area.

**Cancer and birth defects evaluation limitations**

Typically, cancer and birth defects evaluation relies on data collected by doctors, hospitals, and laboratories and reported to the state. Epidemiologists use the reported data to make comparisons of affected people based on location, age, sex, race, income, and other parameters. Epidemiological reviews of cancer and birth defects data have limitations and uncertainty. Several issues make it difficult to identify increases in birth defects and cancers. Epidemiological studies rely on findings for large numbers of people to find small differences. When there are fewer people in the study, it is very hard to spot differences. This may be the case with the population at Gambell. Additionally, the number of reported cases might be more or less than actually occurred. Cases are not always verified to ensure that diagnosed cases are accurately reported. Delays in case reporting for isolated communities are also a concern. For that reason, reviewers use data sets that are a few years earlier than the current year to ensure completeness.

## Conclusions

1. Adults and children could be injured by coming in contact with any remaining partially buried or unearthed metal debris while driving all-terrain vehicles or other outside activities, including excavating for artifacts. Additional metal objects, once buried, might resurface after freezes and thaws, creating a physical hazard that can cut, impale or contribute to numerous other injuries. USACE and NALEMP contractors have removed more than 130 tons of metal debris during numerous removal actions. However, certainty that no metal debris remains cannot be assured. This physical hazard is a public health hazard.
2. There is insufficient information for ATSDR to determine whether drinking water or ice from or recreating in Troutman and Nayvaghaq Lakes could harm people's health because there are limited samples. Additionally, because complete removal of metallic debris and ordnance from these disposal sites cannot be assured, a small risk of injury from physical hazards remains for those who recreate in the lakes.
3. ATSDR cannot evaluate the exposure of adults and children who came in direct contact with the contents of leaking 55-gallon metal drums. No sampling data are available and the contents of the drums are unknown.
4. Drinking water from the Gambell public drinking water system is not expected to harm people's health. Gambell's public water system is being regularly monitored. Testing has not shown contaminants above EPA safe drinking water standards or ATSDR health comparison values. Drinking water is managed and monitored by the village of Gambell Water Plant in accordance with the Alaska Department of Environmental Conservation (ADEC) Division of Water Quality/Village Safe Water Program and Division of Environmental Health/Drinking Water Program
5. Vapors intruding into indoor air from contaminants in soil and groundwater from the Gambell FUDS is not occurring and therefore, is not expected to harm people's health.
6. Exposure to soil and gravel contaminants related to the Gambell FUDS is currently not occurring. Soil and gravel are not expected to harm the health of adults and children who touch them. Contaminants that spilled on the ground would likely not stick to the surface gravel. Contaminants found beneath gravel are not contacted by residents. Data from removals actions show that contaminants are not present in soil at sufficiently elevated levels to be harmful.
7. Accidental ingestion of lead-based paint in homes is not likely occurring based on discussions with Tribal representatives.
8. ADPH's review of the cancer registry information for the period 1996 to 2013 found that even though the number of observed cases exceeds the number of expected cases for both communities, the statistical test does not show these increases to be statistically significant. In other words, these increases are just as likely to result from chance as they are to be associated with lifestyle risk factors, family history, or the potential contaminants at the Gambell FUDS.

9. ADPH reviewed data from the Alaska Birth Defects Registry covering the period 1996 through 2011 and found the results for St. Lawrence Island to be similar to other Native Alaskan communities. However, it might not be possible to see statistically significant differences in the small populations of Gambell and Savoonga. `

## Recommendations and Public Health Action Plan

1. ATSDR recommends that the Village members inspect the village for resurfaced metal debris once each year after the spring thaw. We also recommend, removing hazardous debris and continued hazard awareness education and reporting procedures for suspected items.

2. Before surface water bodies Troutman and Nayvaghaq Lakes can be safely used for drinking or recreation, ATSDR recommends additional water quality testing by ADEC needs to be performed based on use.

3. If drums are identified in the future, the Village has been requested to notify the ADEC to facilitate testing, removal, and potential remediation.

4. Scheduled monitoring of the water system helps ensure its safety. ATSDR recommends that the village of Gambell in accordance with the Alaska Department of Environmental Conservation (ADEC) Division of Water Quality/Village Safe Water Program and Division of Environmental Health/Drinking Water Program test all water sources used for drinking on Gambell, including the non-regulated traditional sources to ensure safety.

5. ATSDR recommends that containers used to store fuels or volatile chemicals be owner-inspected monthly and seated in a tray to capture spills and prevent vapors from intruding into heated buildings.

6. Tribal members would like to see expanded healthcare services on St. Lawrence Island. ATSDR recommends that the Norton Sound Health Corporation continue to partner with the Tribe to set up mobile clinics for early detection and treatment of common cancers such as lung, colorectal, breast, and prostate.

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# Appendices

# Appendix A. Gambell Population and Demographic Data

| Gambell Population Data | |
|---|---|
| **POPULATION** (As of July 1, 2014) | |
| Total Population | 693 |
| Population in Families | 617 |
| | |
| **HOUSEHOLDS** | |
| Total Households | 168 |
| Average Household Size | 4.13 |
| Family Households | 130 |
| Average Family Size | 5 |
| | |
| **HOUSING** | |
| Total Housing Units | 206 (100%) |
| Owner Occupied HU | 139 (67.5%) |
| Renter Occupied HU | 29 (14.1%) |
| Vacant Housing Units | 38 (18.4%) |
| Median Home Value | $143,750 |
| Average Home Value | $218,796 |
| Housing Units Pre-1950 | 23 |
| **INCOME** | |
| Median Household Income | $29,038 |
| Average Household Income | $40,472 |
| Per Capita Income | $9,884 |

Source : http://alaska.hometownlocator.com/ak/nome-ca/gambell.cfm

| Gambell Demographic Data | | | | |
|---|---|---|---|---|
| Demographics | Year 2000 | Year 2010 | Percent Change | Percent of Total 2010 Population |
| Total Population | 649 | 681 | +4% | |
| American Indian/ Alaska Native alone | 621 | 651 | +4% | 95.6% |
| Asian alone | 3 | 1 | -66% | 0.15% |
| White alone | 23 | 26 | +4% | 4% |
| Black alone | 0 | 0 | +0% | 0% |
| Native Hawaiian & Other Pacific Islander alone | 0 | 0 | +0% | 0% |
| Some Other Race alone | 0 | 0 | +0% | 0% |
| Two or More Races | 2 | 3 | +50% | 0.46% |
| Hispanic or Latino | 2 | 3 | +50% | 0.46% |
| Children Aged 6 and Younger | 83 | 113 | +36% | 17.4% |
| Adults Aged 65 and Older | 38 | 38 | +0% | 5.84% |
| Females Aged 15 to 44 | 120 | 125 | +4% | 19.2% |

Source : http://alaska.hometownlocator.com/ak/nome-ca/gambell.cfm

# Appendix B. Areas of Concern Description

| Area of concern | Description | Soil and or metal debris removal actions | ATSDR evaluation |
|---|---|---|---|
| 1A North Beach (Army) | Sites 1A–1C are located along North Beach, where two well-established all-terrain vehicle (ATV) trails intersect. The site consisted of exposed surface debris, including engine pieces, Marston matting, Weasel vehicle tracks, steel cables, a partially buried 100-foot crane, and other buried metallic debris that are periodically exposed and reclaimed by shifting gravels along the beach area. | 1997/2005 | Although a large amount of metal debris has been removed, some metal debris might remain and rise to the surface after freezes/thaws, creating a physical hazard to residents riding ATVs or digging. ATSDR recommends inspections after freezes/thaws to identify potential hazards. |
| 1B North Beach (Air Force) | The Army landing area was located on North Beach east of an area now used by local residents to land or launch whaling boats. | 1997 | Same as for 1A. |
| 1C North Beach | Site 1C 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. | 1997 | Same as for 1A. |
| 2 Military Burial Site | 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. Facilities associated with military housing/operations and a power plant were reportedly demolished and buried at this site. Ordnance was potentially buried here as well, but investigations did not find any. Exposed debris was present, including remnants of a rock fireplace, partially buried concrete pad, burned wood, scattered metal debris/gear, and discolored gravel. | 1997/1999/2006 | Same as for 1A. |
| 3 Communications Facility | Site 3 is located approximately 700 feet south of the North Beach, near the base of Sevuokuk Mountain. The preliminary assessment indicated the possible burial of Jamesway huts, power plant generators, transformers, oils, batteries, and sulfuric acid. Exposed above-ground debris included Weasel vehicle tracks, Marston matting, pipe, empty drums, and anchors for guy wire. | 1997/1999/2006 | Same as for 1A. |
| 4A Former Quonset Huts | Site 4A consisted of collapsed Quonset hut frames and empty transformer casings on the top of Sevuokuk Mountain. | 1997/1999/2007 | No Exposure. |
| 4B Air Force Radar Site | Site 4B was a U.S. Air Force radar station, located on top of Sevuokuk Mountain. The site is dominantly boulders and bedrock, and very little soil is present. 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. | 1999 | No Exposure. |
| 4C Discarded Drums | Site 4C is located at the south end of Sevuokuk Mountain, and contained discarded drums along an ATV trail. | 1999 | Same as for 1A. |
| 4D Former Transformers | Site 4D is located near the top of Sevuokuk Mountain. Three empty transformer casings and miscellaneous debris were seen in the mountainside drainage above the pump house. | 1999 | Same as for 1A. |
| 4E Western Face of Sevuokuk Mtn | Various types of cable and wire were 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. | NALEMP (2006/2007) | Same as for 1A. |

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| 5 Former Tramway Site | Site 5 is located near the base of Sevuokuk Mountain. Site 5 is the former tramway corridor that provided access to the radar site on top of the mountain. The site also includes the current village water supply well at the base of the mountain and an associated groundwater monitoring wells. This site includes two disposal areas, the Cable Burial Area and the Secondary Transformer Burial Area [E&E, 1993]. The Secondary Transformer Burial Area was investigated in 1997 and found to contain steel cable, not transformers. The cable was removed at the time of excavation. | 1997/2006 | Same as for 1A. |
| 6 Military Landfill | 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. A geophysical survey to delineate the extent of buried debris was completed in 1994. | 1999/ 2003 | Same as for 1A. |
| **7** Former Military Power Facility | 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. | 1996/2003/2006 | Same as for 1A. |
| 8 A Marston Matting | Site 8 includes the area surrounding the airstrip from west beach (north of the airfield), east to the western edge of Troutman Lake, and 3 miles south to the northern shore of North Nayvaghaq Lakes. Exposed Marston matting debris (8A) is located along the eastern side of the airstrip. | 1999/2006 | Marston matting at Site 8A was left in place when the military demobilized from the area in the 1960s. Exposed Marston matting debris is located in an area heavily traveled by local residents using ATVs and snowmobiles. The debris poses a clear danger to local residents who frequently cross the area on ATVs and snowmobiles. The debris has sharp and jagged edges that stick above the ground. Large piles of debris create a navigation hazard during the winter when partially covered by snow. Although a large amount of metal debris has been removed, some remains that is close to the water tower structures. Removal is thought to pose a concern for the structural integrity of the tower. ATSDR recommends inspections after freezes and thaws to identify potential hazards. |
| 8 B Buried Debris | Buried miscellaneous metallic debris (8B) has been reported south of the old village area, including numerous 55-gallon drums and a Jeep. | 2006 | Same as 8A. |
| 8 C Navy Landfill | 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 built this landfill during their use of the former CAA housing area. The Navy landfill might have asbestos-containing materials. | 2008/2009 | No Exposure. |

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| 8 D Beach Ammo | Buried small-arms ammunition debris, including intact approximately 1300 rounds of 0.30 caliber ammunition, were located along the beach (8D) southwest of Troutman Lake. Additionally, unexploded grenade were found by the NALEMP workers who contacted the USACE and DOD. | 2000/2004/2006 | Same as 8A. Any remaining unexploded ordnance poses additional potential physical hazards. However, the likelihood of encountering it low. |
| 9 Asphalt Barrel Cache | Site 9 is located on the east side of the local airport runway. Drums of leaking tar were present in two areas. | 1999 | Same as for 1A. |
| 10 Sevuokuk Mtn Trail | Site 10 consists of a trail system that 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 Sevuokuk Mountain. Empty 55-gallon drums, located approximately 250 feet apart, marked the trails. Other debris at the site included Marston matting and Weasel vehicle tracks. No staining or stressed vegetation were observed during the initial remedial investigation, and the drums were either empty or contained gravel. | 1999 | Same as for 1A. |
| 11 Communications Cable Route | 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. | 1999 | No exposure. |
| 12 Nayvaghaq Lake Disposal Site | Site 12 is located north of Nayvaghaq Lakes on the southwest side of an ATV trail. The site is divided into a north and a south area. The north area contained approximately 120 metal drums, battery remnants, and miscellaneous metal debris. The south area contained approximately 50 drums. The area south of Troutman Lake is within the City of Gambell boundary. The area is now used primarily for recreation, subsistence food gathering, and as a gravel borrow source. However, this site has the potential to be developed for residential use, given the flat topography and close proximity to a potentially new drinking water source. | 1999/2001/2009 | Metallic debris and potential UXO presents a low risk for physical hazard to those who recreate on and in the lake during the summer months. Troutman Lake water quality for drinking or recreating must be evaluated further by ADEC before the lake can be used safely for drinking or recreating. |
| 13 Former Radar Power Station | Site 13 is located east of the pond between Troutman Lake and North Nayvaghaq Lake. 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 present at the site. | 1999/2006 | Same as for 1A. ATSDR is also concerned that some of the wooden material might have been used at one in the homes of village residents contributing to the lead paint concern. |
| 14 Navy Plane Crash Site | Site 14 is located approximately 7 miles south of the Village of Gambell. A Navy P2V-5 Neptune reconnaissance plane crashed at this location in June 1955. The aircraft's gasoline tank exploded and most of the fuels burned, leaving no apparent stains or any stressed vegetation at the site. Debris remains on the tundra, in the area immediately surrounding the crash site. | NA | Remains potentially pose a physical hazard. |
| 15 Troutman Lake | Site 15 is located along the northern edge of Troutman Lake. A USAED geophysical survey performed in 2000 confirmed the presence of miscellaneous metallic debris estimated at less than one ton including Marsten matting, wire, 55-gallon drums, 1300 rounds of 0.30 ordnance, grenades and other metallic debris were submerged along the northern shore of Troutman Lake prior to removal efforts. | 2000/2001/2006/2007 | Metallic debris and potential UXO presents a low risk for physical hazard to those who recreate on and in the lake during the summer months. Troutman Lake water quality for drinking or recreating must be evaluated further by ADEC before the lake can be used safely for drinking or recreating. |

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| 16 Gambell Municipal Bldg. Site | Site 16 consisted of a 35-foot 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. A geophysical survey was conducted in 1994. The survey revealed four small irregularities that might be related to buried materials. The buried debris was cleaned up under the NALEMP. | 1994/2001/2009/2010 | Numerous sampling removal actions. No Exposure. |
| 17 Army Landfills | 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 55-gallon drums, Marston matting, and scrap metal. A geophysical survey of the area was conducted in 1994. The survey indicated the potential for buried debris associated with the reported landfills. The buried debris was cleaned up under the NALEMP. | 1999/2005/2007 | No known exposure. |
| 18 Main Camp | Site 18 is located at the northeast end of Troutman Lake, between the current Municipal Building and the Gambell School. A geophysical survey was conducted in 1994 to determine the presence of buried debris between the high school and self-service laundry (washeteria) thought to represent water delivery lines for the existing power plant. The buried debris was cleaned up under the NALEMP. | 2005 | No known exposure. |
| 19 Diatomaceous Earth | Site 19 was identified as a separate area of concern by the Native Village of Gambell under the NALEMP program. This area description matches that of Site 18. A white powdery material in a berm that borders Troutman Lake was determined to be inert, diatomaceous earth, a nonhazardous material previously used for water filtration by the military. | NA | No exposure. |
| 20 Schoolyard | Site 20 is located north of the former Main Camp (Site 18) near the current Gambell School. The schoolyard contained two rubble piles that primarily contained concrete and rebar, plus a partially exposed concrete slab. | 2003/2007 | The piles presented a physical hazard to local residents such as children attending school, ATV and snow machine traffic. |
| 21 Base of Sevuokuk Mountain | Site 21 is located at the base of Sevuokuk Mountain and southwest of Site 5. It is thought to contain buried miscellaneous wire and metallic debris from military activities. The buried debris was cleaned up under the NALEMP. | 2006 | No exposure. |
| 22 Former CAA Housing | Former 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 in 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 because of the possibility that asbestos-containing materials might have been present in the structures. | 2007/2009 | No known exposure. |
| 23 High School Construction Debris | Site 23 was identified by local residents as a concern in the Strategic Project Implementation Plan produced for the NALEMP program. The area is located due east of the Gambell landfill. It contained 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. | 2008 | No known exposure. |

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| 24 South of Municipal Building | Site 24 is located south of the municipal building along the northern shore of Troutman Lake. A geophysical survey of the site was conducted in 2000, and subsurface irregularities consistent with metallic debris were found. The buried debris was cleaned up under the NALEMP. | 2006 | No exposure. |
| 25A South Housing Units | During the 2001 investigation, local residents identified Site 25A, located just north of Troutman Lake, as an area that might be contaminated by fuel-related products used by the military. 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 might have dumped barrels of oil directly on the ground in this area. | 2001/2008 | No known exposure. |
| 25B Low Drainage Area | Local residents identified Site 25B during the 2001 supplemental investigation as an area where contaminants might 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. | No Removal. Contamination was not found. | No known exposure. |
| 26 Debris Burial Site | 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. | 2001 | No known exposure. |
| 27 Drum Storage Area | The site is located north of the former military power facility (Site 7), within the new housing area. Analysis of an aerial photograph from 1955 indicated that this had been a container drum storage area. The community was also concerned about an area of rust-stained soil at this site. The drums stored at this site have been removed. | 2001/2010 | No known exposure. |
| 28 Disturbed Ground | 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 leased this area from January 1955 to May 1958, and used the area for communications. | 2001 | No exposure. |

## Appendix C. Map of Areas of Concern

## Site Location Map (with areas of concern numbered)

Source: USACE 2005 and http://wiki.bssd.org/index.php/Gambell (2015)

# Appendix D. Summary of Native Village of Gambell Key Information Interviews

Agency for Toxic Substances and Disease Registry (ATSDR)

Summary of Native Village of Gambell Key Resident Interviews on the

Gambell Formerly Used Defense Sites

April 18, 2013

In February, 2012 the Agency for Toxic Substances and Disease Registry (ATSDR) accepted a petition from the Native Village of Savoonga to perform a health assessment of environmental data collected at the sites of former military use on St. Lawrence Island at Gambell and Northeast Cape. ATSDR conducted qualitative in-depth interviews with ten residents in Gambell, March 6 through March 8, 2013 to collect information on the historic use of the Gambell sites and to document health concerns expressed by the residents related to exposure to contaminants which originate from the former military sites.

The Native Village of Gambell and the Gambell Formerly Used Defense sites have a rich history. This is a summary of the information provided by the interviewees only. "The people of the village used to be at the old village site and this area was pretty much occupied (by the military)." In the "spring and summer, June (there was) fishing here (at) the point." People "used to go up hill (for) green picking, berry picking." "We used clams whenever they were/are available, they wash up sometimes or we get them from walrus stomach, still alive no shells, the walrus spit out the shells, all of the types of clams they (the walrus) eat." It used to be that "Eskimos travelled between here and Siberia, but once the cold war started people didn't travel anymore."

"The U.S. Navy, Air Force and Army were here for a total of six or seven years around the time of the Korean war, around 1951-1957." The Air Force radar site was on the top of the mountain and the Army built a camp at the base of the mountain. "The Army had over 1,000 troops (another inviewee reported 200 troops) and the Air Force maybe around 50." "The U.S. and Russia were about to go to war." There used to be a lot of Russian MIGs flying around out there and "they even shot down one of our (navy patrol) planes," the wreck is still there about seven to eight miles down the coast. "Glad they (the Russians) didn't take over Gambell." The Army also had restricted areas, for example "a communication listening site" at the end of Troutman Lake.

The military hired a few people from the village, and "70 to 80 young men (from Gambell) were in the Army National Guard. They "helped out with clean-up when the general was coming." "Some Gambell people went over to the Northeast Cape site to build it."

"Back in my days (before the military) transportation was not so much." It took as long as one year for mail to reach Gambell. The Army used to air drop food before there was an air strip. The lake served as a winter airstrip "clear off the snow" and in the summer it was

used by float planes. The Army used Marston matting before a runway was paved in 1963. Before there was bulk fuel there were many fuel drums. The military had to haul fuel and gas to the top of the mountain.

"(I) worked in the motor pool, it used to be right in front of the (current) school where the playground is. "There were lots of spills (of) oil and what not, solvents, cleaning liquids, (it) was hard to keep metals from not rusting in a salt environment, don't know whatever they do with waste oil from vehicles and power plant," and "whatever happened to transformers with PCBs buried somewhere back then." "Before they left they dumped a lot of stuff in the lake, may have thought it would dissolve," "started to blast ice (Troutman lake) to dump ordinance 50 caliber ammunition, hand grenades," "30 caliber, M-1 ammunition securely packed," "what all they dumped in lake, ammunition and other stuff…didn't know." Military "built latrines of barrels cut in half and used lots of lye" buried in the area of the (current) windmills. "Believe there were toxic spills on hill radar site and over here that we don't know."

"When they pulled out they didn't take nothing but (their) rifles and rucksacks." "Not very many of us know what happened back then." Around 1962 there was an Army exercise to clean-out debris, some drums with stuff inside (were) emptied on the ground, put holes in them so that they would sink," "LST brought in (and) filled with empty barrels…300 barrels dump in ocean, mountain of empty materials." "What they didn't haul out they buried." "Tried to clean up a little bit, but not all of it, some of the dump sites they didn't want to dig up, probably know contamination in it so didn't want to touch." A portion of the current housing, the school, a city building and the water plant are located in the area where the Army had its camp, "don't know how much percentage of debris taken out, some debris under housing, school, and water tanks."

On March 6, 2013 ATSDR participated in a meeting with a quorum of the Native Village of Gambell tribal council. The council does not agree with the U.S. Army Corps of Engineers decision to close out the remediation of the Gambell former military sites, "they say they finished the site and that's why they closed it, (there are) more sites to be looked at and analyzed." The council members stated that they were misled by the U.S. Army Corps of Engineers (Corps). That they were told they were signing an upcoming year cooperative agreement when in fact the document they signed was the record of decision for closing out the Corps work at the Gambell sites, "we didn't know about it until the following year, we wanted to be part of the decision." The council would like to have continued dialogue with the Corps on the Gambell sites.

The council was also told by a member of the Corps that the Corps cannot take samples less than 30 feet from buildings. Only later did the council find through an inquiry with Corps management that the Corps did not have such a "regulation." The council was also

concerned that the Corps removed five monitoring wells "deepest 22 feet and shallowest 10 to 12 feet" about a year after they had been installed in the area of the village drinking water source. The council was not told the wells were going to be removed and wanted the monitoring wells to remain in place for future use.

Several interviewees expressed concern about the impact of contaminants from the former military activity on the ground water. The community ground water source is at the base of the hill "where water gathers from the hill." Interviewees described a dynamic fresh water-salt water hydrogeology and changing permafrost conditions. The Native American Lands Environmental Mitigation Program (NALEMP) crew in the course of their clean-up activities "found rust colored rocks that smelled of stove oil and black sludge, next time, the following year, they looked for it at the exact same place it was gone." Also, "(while) excavating the water and sewer lines (1992-1994) encountered oil spill and discoloration of stones," "oil spill migration throughout." The Gambell hydrogeology and permafrost conditions were described as, "land (is) all gravel on permafrost," "fresh water flows on top permafrost out towards the sea," "anything sits on top of permafrost…always shifting down there," "all the spills, fuel migrating all over the top of permafrost," "(if) storm surge is too great then contamination pushes back to water source." "The top of Troutman Lake is fresh water lies on salt water and is influenced by salt water," "high tides Pacific swells come in and go over runway, twice this happened." Also, "water plant, Quonset hut, on Shore of Troutman Lake full of chemicals used for water treatment."

A number of the interviewees expressed concern about military debris that surface after freeze-thaw periods (in the area of the high school and the new housing). Sharp objects puncture four wheeler tires, and, 'sometimes something that was buried comes out and we run into it while dog teaming and break our sleds.' "Global warming, summers warming materials, waste emerging from warming." "Every spring permafrost thaws and something comes out of the ground, looks like wisp of smoke." Other concerns include rusty ground, rust colored pebbles or rocks at Project 12. "When Army Corps was working some locals say they unearthed some human waste storage area, unearthed at the back of project 12, and covered back up."

An event that occurred in the past was recounted as follows, "something in lake they dump floated into the beach make people sick… people used to have no cancer, people now dying of cancer." Another event was described as, "twenty miles north of NE cape in water before the ice came in, over two hundred dead walrus, some look like their skin was burned, around 1951, 1952 or 1953 atomic bomb blown up…every once in a while people get sick from cancer and dies even from here." Also, "doctors experimenting give people radioactive iodine."

In regard to the general health of the people: “In those days no one told us these were toxic (buried military waste and debris),” “don’t know something is bad and later find out it is bad,” “notice after they left, seems to me in my own opinion, sickness get around in the village, cancer go up more than at time when the military had properties here,” “people never encountered or experienced sickness like cancer before the Army, Air Force, and FAA,” “people seen at clinic misdiagnosed sent home with Tylenol, by the time they are real sick cancer gets to point where it is terminal,” “(whether) it is cigarettes, military, our lifestyle cancer is coming up, five to ten just in a year and very quick in thirty to forty percent of people (diagnosed with cancer)” “the elders are gone (but) the young are around drinking the water,” “growing up getting colds in the spring and the fall, now common cold whenever,” “lots of colds,” “school and FAA asbestos toxic materials.” Several interviewees said that cancer occurred in Savoonga at an even more alarming rate.

When we were ordered to clean the camp “when I was in the army we were instructed by the commander ‘pick up everything that doesn’t grow,’ I would like to see this place cleaned up of everything that doesn’t grow even the not hazardous stuff.”

Joe Sarcone
Regional Representative - Alaska
Agency for Toxic Substances and Disease Registry (ATSDR)
U.S. Department of Health and Human Services
222 W. 8th Avenue Stop 45, Room 261
Anchorage, Alaska 99513
907-271-4073
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# Appendix E. Letter From the Native Village of Savoonga Requesting an ATSDR Health Assessment & Health Consultation on St. Lawrence Island FUDS

NATIVE VILLAGE OF SAVOONGA • P.O. BOX 120, SAVOONGA, AK 99769 • PHONE 984-6414 • FAX 984-6027

October 21, 2011

Joe Sarcone
Regional Representative
ATSDR Alaska Office
222 W. 8"' Avenue Room 261, Stop 45
Anchorage, AK 99513

Mr. Sarcone,

Thank you for your interest in assisting us with a Public Health Assessment & Health Consultation here on St. Lawrence Island. At this time we are making a formal request for the Agency for the Agency for Toxic Substances & Disease Registry to conduct a Public Health Assessment & Health Consultation to assess health implications from the two Formerly Used Defense Sites on our Island. This Consultation should also look beyond these sites and include levels of global distillation of Persistent Organic Pollutants and all sources of toxic exposures that Arctic Indigenous Peoples are being disproportionately exposed to.

ATSDR needs.to learn what people on our Island know about FUDS and what concerns they may have about the sites' impact on the health of our Yupik people. We want to ensure that ATSDR gathers information and comments from the people who have lived or worked near the sites, including residents of the area and our villages, our leaders, health professionals and ACAT research team members with whom we have collaborated on a community based research project.

To ensure that the said report responds to our community's health concerns, we also want to ensure that it is distributed to the communities received for our comments. We understand that the final version of the report will reflect comments received from our communities. Thank you in advance for your assistance.

Sincerely,

Kenneth Hlasyeduk for Ronnie
Ronnie Toolie, President

## Appendix F. Letter from ATSDR to Native Village of Savoonga Accepting Request for an ATSDR Evaluation on St. Lawrence Island FUDS

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Agency for Toxic Substances
and Disease Registry
Atlanta GA 30333

FEB 22 2012

Mr. Ronnie Toolie
President, Native Village of Savoonga
P.O. Box 120
Savoonga, Alaska 99769

Dear Mr. Toolie:

This letter is in response your October 21, 2011, letter to the Agency for Toxic Substances and Disease Registry (ATSDR) describing your concerns about the residents of Savoonga, Alaska on the St. Lawrence Island, and our previous January 13, 2012, letter describing the ATSDR Petition Program. In your letter, you indicated that the health of residents may be affected by environmental contaminants from two Formerly Used Defense Sites (FUDS) on the island, persistent organic pollutants deposited on the island through the process of global distillation, and other sources to which Arctic Indigenous Peoples are disproportionately exposed. Because of your concerns, you asked that ATSDR conduct a public health assessment that considers all possible sources of exposure. This letter describes how your request will be addressed.

ATSDR worked with the U.S. Army Corps of Engineers (ACE), U.S. Environmental Protection Agency (EPA), Alaska Department of Environmental Conservation (ADEC), Alaska Department of Health and Social Services (ADHSS), and the Alaska Community Action on Toxics to gather and review the available environmental sampling data collected at the Gamble and Northeast Cape (NEC) sites. The available reports include results of soil, groundwater and surface water sampling conducted at specific sites for both Gamble and NEC, and descriptions of the remedial actions completed or planned for the sites. ATSDR has determined that these data can be used to evaluate community exposures, and ATSDR will assess the public health impact for both Gamble and NEC. We expect to initiate these assessments in 2013.

It is important to note that our public health assessments are conducted to determine whether people have been, or are currently being, exposed to hazardous substances released into the environment from a hazardous waste site or facility. Our goal is to determine whether exposure to contaminants from Gamble or NEC sites may be harmful to St. Lawrence Island residents. Our evaluation will not be able to determine the cause of a disease, or medical condition, experienced by the island's residents.

Additionally, we will focus on evaluating the community's exposure to the contaminants that have been measured in the environment on St. Lawrence Island. We will not be able to determine whether the contaminants are the results of past military activity, global transport and deposition, or are naturally occurring in the environment. Where we find harmful exposures, we will make appropriate recommendations to reduce, or eliminate, the exposures.

**Page 2 -- Mr. Ronnie Toolie**

**If you have questions about the planned public health assessments, please contact Mr. Greg Zarus, lead environmental health assessor, at (770) 488-0778 or email at GZarus@cdc.gov. If you have any additional questions regarding ATSDR's process to review your request, please contact CAPT Susan Neurath, ATSDR Petition Coordinator, at (770) 488-3368 or email at SNeurath@cdc.gov.**

**Sincerely,**

William Cibulas Jr.

**William Cibulas Jr., Ph.D.**
**CAPT, U.S. Public Health Service**
**Director**
**Division of Health Assessment and Consultation**