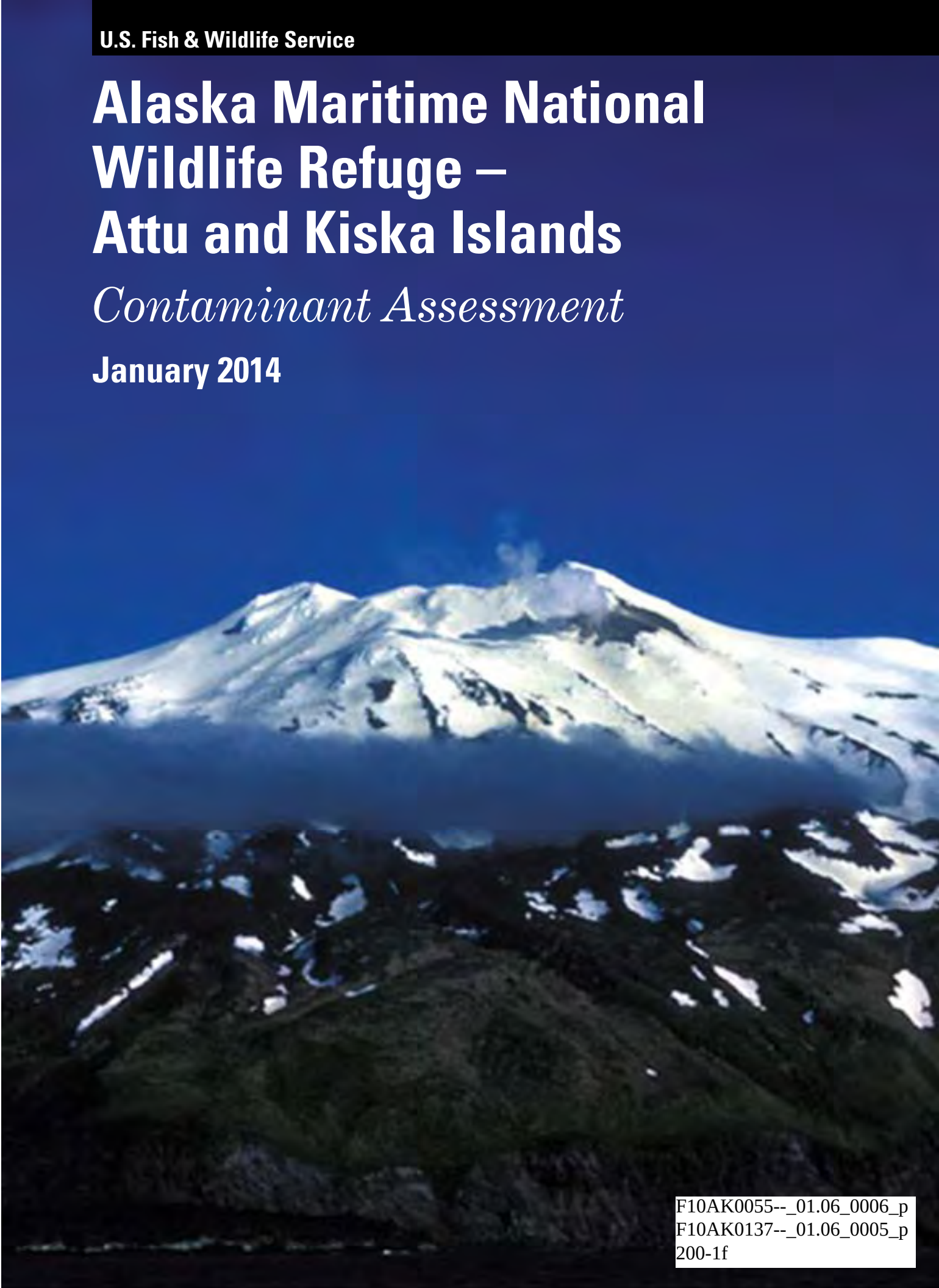
U.S. Fish & Wildlife Service

Alaska Maritime National Wildlife Refuge – Attu and Kiska Islands

Contaminant Assessment

January 2014



Alaska Maritime National Wildlife Refuge – Attu and Kiska Islands Contaminant Assessment

Deborah D. Rudis

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On the cover: Kiska Island Volcano. USFWS photo

Executive Summary

The purpose of the Contaminant Assessment Process (CAP) is to compile and summarize known past, present, and potential future contaminant issues on National Wildlife Refuges (NWRs). The CAP has gathered information to help Service personnel make informed management decisions about contaminant threats to refuge lands and resources. Because of the extent of the Alaska Maritime National Wildlife Refuge (refuge), CAP reports for this refuge cover units, subunits, or individual islands of the refuge. This report documents known and potential contaminant issues on Attu and Kiska Islands of the Aleutian Islands Unit of the Alaska Maritime National Wildlife Refuge.

Most people regard National Wildlife Refuges as untouched areas reserved for the conservation of wildlife and fish. However, during the World War II Aleutian campaign, Attu and Kiska were of strategic importance and were occupied by both Japanese and Allied forces. Remains of buildings, tent camps, gun emplacements, fuel storage tanks, pipelines, dumps, ammunition piles, utilities, vehicles, and ordnance are found on refuge land on these islands. As the years progress, erosion exposes new sites while others are overgrown by vegetation.

Both islands encompass a variety of maritime habitats, including rolling tundra where Aleutian Canada geese and rock ptarmigan nest, coastal cliffs that serve as nesting sites for thousands of seabirds, rivers where salmon spawn, and rocky shorelines where common eiders nest and feed offshore, along with sea otters that are found in the coastal kelp forest. Kiska holds the world's largest population of least auklets on the slopes of Kiska Volcano at Sirius Point. Monitoring these and other wildlife species is a primary refuge management goal.

The majority of contaminant issues on Attu and Kiska are from World War II (WWII) activities. Leakage and spills from petroleum product tank farms and other storage areas, fuel lines, burn pits, and barrel dumps are common, as are battery dumps, ammunition piles, electrical transformers, and debris piles. Unexploded ordnance is a serious issue on both islands, presenting potential hazards to refuge staff, visiting scientists, and the public. Soil and water sampling has been conducted at both islands by contractors for the U.S. Army Corps of Engineers, the branch of the U.S. Army responsible for assessing extent of contamination at former military sites, and its contractors. Soil, sediment, and some biota were sampled on Attu by the U.S. Fish and Wildlife Service (USFWS, Service) in the early 1990s. Additional sampling is needed on both islands to fully characterize the extent and severity of contamination.

On Attu, most all of the known contaminated sites are associated with former Department of Defense (DoD) activities on refuge lands, including a series of facilities operated by the U.S. Coast Guard (USCG) as aids to navigation. On Kiska, all of the known contaminated sites are associated with DoD activities. Cleanup and remediation of DoD sites will be undertaken by the U.S. Army Corps of Engineers (ACOE) under the Formerly Used Defense Sites (FUDS) program. If and when any potentially contaminated lands presently under USCG

jurisdiction are proposed to be conveyed back to the refuge, a full contaminant assessment involving rigorous sampling should be completed by the present land managers before the Service accepts any of these properties.

Because some of the contaminated sites on Attu are associated with long-term ongoing fuel leaks, these areas are a hazard to birds that forage in these upland locations. There are also sites where fuel still flows into nearby streams during warm weather periods. In addition, groundwater contamination by petroleum hydrocarbons may also be a concern at former tank farm sites. These sites should be a priority for further investigation, cleanup, and remediation actions.

The Great Circle Route for ocean-going transport brings over 3,000 vessels per year through the area between the Near Islands (the island complex that includes Attu) and the Rat Islands (where Kiska is located). Because of the potential for future oil spills, spill response preparedness through spill contingency planning is one way for the refuge to prepare for such potentially damaging events. Collection of adequate baseline data prior to spill events is important for damage assessment efforts when spill incidents occur that affect Service trust resources. The remote location of these islands will present considerable response challenges, should significant spills occur.

Sites in the western Aleutians may be subject to long-range atmospheric and oceanic transport of contaminants from sources in Asia, and migratory birds may serve as a biotic vector for transport of both contaminants and nutrients, particularly through guano deposition, to these island ecosystems.

Marine debris will continue to present ongoing challenges for the refuge. Potential transport of debris associated with the March 2011 Japan tsunami may exacerbate an already significant problem.

Table of Contents

Figures

Tables

Acronyms and Abbreviations

ACOE	Army Corps of Engineers
ADEC	Alaska Department of Environmental Conservation
AIS	automated identification system
AMAP	Arctic Monitoring and Assessment Programme
ANILCA	Alaska National Interest Lands Conservation Act
AST	above-ground storage tank
BLM	Bureau of Land Management
BTEX	benzene, toluene, ethylbenzene, and xylenes
CA	chemical agent
CAP	Contaminant Assessment Process
CCP	comprehensive conservation plan
CON/HTRW	containerized hazardous, toxic, and radioactive waste
COPCs	contaminant of potential concern
CWM	chemical warfare materials
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
EE/CA	engineering evaluation and cost analyses
EPA	U.S. Environmental Protection Agency
FUDS	Formerly Used Defense Sites
HTRW	hazardous, toxic, and radioactive waste
HTRW	hazardous and toxic waste
LORAN	Long Range Air Navigation
MD	munitions debris
MEC	munitions and explosives of concern
mg/kg	milligrams per kilogram
MMRP	Military Munitions Response Program
nm	nautical mile
MRF	munitions related feature
NDSA	Naval Defense Sea Area
NOAA	National Oceanic and Atmospheric Administration
NWR	National Wildlife Refuge
OC	organochlorine
OE	ordnance and explosives
OEW	ordnance and explosive waste

OP	organophosphorous pesticides
OU	operable unit
PA	preliminary assessment
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PLO	Public Land Order
POL	petroleum, oil, and lubricants
POPs	persistent organic pollutants
ppm	parts per million
RBSL	risk-based screening level
Refuge	Alaska Maritime National Wildlife Refuge
RI	Remedial Investigation
Service	U.S. Fish and Wildlife Service
SI	Site Investigation
SVOCs	semi-volatile organic compounds
System	National Wildlife Refuge System
TNT	2,4,6-trinitrotoluene
ug/l	micrograms per liter
USAF	United States Air Force
USFWS	United States Fish and Wildlife Service
USCG	United States Coast Guard
USTs	underground storage tanks
UXO	unexploded ordnance
VOCs	volatile organic compounds
WWII	World War II

Acknowledgments

Many individuals contributed to this report. The Alaska Maritime National Wildlife Refuge staff provided information, logistic support, and review of this document—in particular, J. Williams, K. Sundseth, and M. Maxwell. Staff at the U.S. Coast Guard (USCG) Station Attu was generous with their time and assistance during my June 2007 visit on the island. USCG Air Station Kodiak provided transportation to and from Attu. Captain Pepper and crew of the USFWS, Alaska Maritime NWR vessel, the R/V Tiglax, provided safe journey to and from Kiska and were always ready to support our field efforts in any way. Their camaraderie and good cheer are unsurpassed. L. Spitler at the Adak office of Alaska Maritime NWR provided logistical support for Kiska camping preparations. P. Johnson from the USFWS Alaska Regional Office accompanied me through treks on Kiska; he and our interagency, interdisciplinary, and international team of K. Sundseth, D. Corbett, B. Campbell, M. Hawfield, and D. Spennemann made our 2007 camp on Kiska a memorable and remarkable experience. Staff at the U.S. Fish and Wildlife Service (USFWS) Alaska Regional Office, Division of Realty was helpful with records search and review, particularly D. Jerry, N. Walsh, and J. Brewer. Files provided by R. Ragle from the Anchorage office of the U.S. Army Corps of Engineers (ACOE) and the Alaska Resources Library and Information Services (ARLIS) provided much of the historical information. Additional historic photos and other materials were from the National Archives office in Anchorage. P. Johnson provided support and feedback throughout this project and was the chief editor for accuracy and completeness, providing additional references and thoughtful comments. J. Williams of the Alaska Maritime NWR added invaluable information from his years of experience working in the Aleutians. Additional thanks are extended to B. Hanson and S. Brockmann of the USFWS Juneau Field Office for review and support. Schatz Publishing's staff professional expertise was invaluable in the final compilation and layout of this document.

Author's Notes

This report is a synthesis of available information on contaminant issues in the Alaska Maritime National Wildlife Refuge. Many sources were used to produce this document, and some passages have been reproduced from the refuge's annual narratives, Web sites, and Land Protection Plan (USFWS 2011). When appropriate, specifics sources of information have been cited and listed in the Bibliography and Literature Cited section of this document. The volume of internal memos, Department of Defense (DoD) documents, USFWS Division of Realty records, and personal observations and conversations preclude the citation of every source used to produce this CAP report. Both islands were visited by the author in 2007, and Kiska was revisited in 2009.

Contaminant Assessment Process

This blue goose, designed by J.N. "Ding" Darling, has become a symbol of the National Wildlife Refuge System.

The Contaminant Assessment Process (CAP) is a standardized and comprehensive method for assessing contaminant threats on National Wildlife Refuges, which encompass over 92 million acres in the United States. The mission of the National Wildlife Refuge System (System) "is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" [16 U.S.C. § 668dd(a)(2)]. It is the responsibility of the United States Fish and Wildlife Service (Service) to "ensure that the biological integrity, diversity, and environmental health of the System are maintained for the benefit of the present and future generations of Americans" [16 U.S.C. § 668dd (a)(4)(B)].

The mission of the National Wildlife Refuge System (System) "is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans"

Wildlife refuges are often thought of as pristine areas; however, many refuges have contaminant issues. The CAP is an important way of documenting, assessing, and monitoring contaminant threats on refuges. The CAP was developed by the United States Geological Survey Biological Resources Division's Biomonitoring of Environmental Status and Trends Program and the Service's Division of Environmental Quality. The Service utilizes the CAP to synthesize existing information, thereby documenting past, present, and potential contaminant issues that may affect refuges. Assessing contaminant sources and receptors, contamination events, transport mechanisms, and areas vulnerable to contamination are all aspects of the CAP. This comprehensive account of actual and potential contaminant issues are entered into CAP's national database, which enables Service personnel to initiate remedial activities or more detailed studies of potential problems affecting trust resources, develop proposals for future investigations, and initiate pollution prevention activities. The CAP was initiated nationally on refuges in 1995–1996.

The Contaminant Assessment Process in Alaska

In 1999, the CAP was initiated to evaluate contaminant issues for the 16 National Wildlife Refuges in Alaska . Fully 82 percent of the National Wildlife Refuge lands are in Alaska, totaling more than 76 million acres. Although Alaska is often regarded as a pristine wilderness, very few places in Alaska, even the most remote, are untouched. Alaska's history, and seemingly its future, are linked to natural resources. The exploration and extraction of oil and precious metals has left a legacy of contaminant problems throughout the state, including in its National Wildlife Refuges. Past and current activities in Alaska's refuges include oil exploration and drilling, mining, military activities, and even nuclear weapons testing. Often, sites were abandoned after operations ceased and, due to the high cost of removal, debris and entire structures were left to decay. In some areas, hazardous materials were spilled with little or no cleanup. On many refuges, abandoned 55-gallon drums, which eventually rust and release their contents, dot the landscape. The Alaska National Interest Lands Conservation Act (ANILCA) mandated that refuges develop

comprehensive conservation plans (16 U.S.C. § 304(g)(1)(1980)) that identify and describe "significant problems which may adversely affect the populations and habitats of fish and wildlife" ANILCA § 304(g)(2E) (1980). Implementation of the CAP in Alaska has made these issues part of the public record and helped managers incorporate contaminant issues into refuge comprehensive conservation plans (CCP). The most recent CCP for AK Maritime NWR was published in 1988 (USFWS 1988), a revised CCP is not planned in the foreseeable future.

Refuges in Alaska that have received contaminant assessments include Kenai (Parson 2001), Alaska Peninsula and Becharof (Parson 2004), Togiak (Rocque and Parson 2004), Tetlin (Rocque 2007), Yukon Delta (Rudis 2009), and Izembek National Wildlife Refuges (Rocque 2004). This CAP is the second report in a series documenting contaminant issues on the Alaska Maritime National Wildlife Refuge (Alaska Maritime NWR). The Bering Sea CAP was the first for Alaska Maritime NWR (Rudis 2010). These comprehensive reports detailing contaminant issues on the refuges are available in hard copy, compact disc, and via the Internet at **http://alaska.fws.gov/fisheries/contaminants/process.htm**. For further information about these reports, please contact the Service's Regional Office in Anchorage, Alaska.

Monkey flower, found along seeps and streams. D. Rudis, USFWS

The Alaska Maritime National Wildlife Refuge and the Islands of Attu and Kiska

The Alaska Maritime NWR was created in 1980 by the ANILCA. ANILCA also delineated five distinct geographic units and added 1.9 million acres of additional lands to 11 existing refuges, combining a majority of Alaska's seabird habitat into one refuge. The refuge extends from Forrester Island in southeast Alaska to Attu Island at the tip of the Aleutian Chain and almost to Barrow on the Arctic Ocean. Attu and Kiska are part of the Aleutian Islands Unit. These islands have been designated as conservation units for more than a century, first as part of the Aleutian Island National Wildlife Reservation and later the Aleutian Island National Wildlife Refuge. The following text provides some historical detail.

Attu and Kiska Islands

Attu is the westernmost of the Near Island group of the Aleutian Islands. It is over 1,000 miles from the Alaskan mainland and 750 miles northeast of the northernmost of the Japanese Kurile Islands. Both Attu and Kiska have topography characterized by irregular masses of volcanic rock and plateaus. In Attu, coastal landscapes are recessed by many bays and long fjords. Shorelines are a mix of wave-cut platforms, high sea cliffs flanked by deep fjords, low sea cliffs, and some sand and cobble beaches. Sandy beaches are a result of creek-transported sand to the coast. Cliffs as high as 2,000 feet are found on Attu, and the island has a mountainous interior that rises to about 2,600 feet. Attu has practically no large level areas, is about 35 miles in length (east to west), and is up to 20 miles in width.

The northern seaward flanks of the Kiska Volcano are lined by tall sea cliffs that fall up to 1,350 feet to the sea; the southern flanks drop to a low, lake-filled plain dominated by a series of large lakes—East and West Kiska Lakes (connected by a narrow channel) and Lake Christine.

Kiska is the westernmost of the Rat Islands group. Unusual for the Aleutian Islands, the 177-square-mile island is orientated from southwest to northeast, measuring 25 miles in length and between one and six miles wide. Kiska has three distinct topographical zones. The northern quarter of the island is formed by the Kiska Volcano—a symmetrical cone that rises to a height of 4,000 feet above sea level. The volcano was last active in 1990. The northern seaward flanks of the Kiska Volcano are lined by tall sea cliffs that fall up to 1,350 feet to the sea; the southern flanks drop to a low, lake-filled plain dominated by a series of large lakes—East and West Kiska Lakes (connected by a narrow channel) and Lake Christine. Terrain south of the Kiska Volcano is comprised of a series isolated plateaus. The southern half of the island is dominated by a sinuous drainage divide with steep slopes on the west and shallower slopes on the east. Sirius Point on Kiska contains the largest colony of least auklets in the Aleutian Islands and probably in the world (over 1,160,000 birds) and crested auklets.

Island vegetation on these two treeless islands is maritime tundra (Amundsen 1977) and is a combination of meadows in sheltered valleys; hollows and heaths occur on more exposed sites (Talbot and Talbot 1994). Grasses, lichens, mosses and herbaceous plants are abundant. Grasses in flat valley floors can reach six feet in height. There is a profusion of wildflowers in the summer. Woody vegetation is dwarf shrubs, primarily

willows (*Salix* species) and blueberries (*Vacciniums*). A variety of crustose lichen species are common on rocks and ridge tops.

The short-tailed albatross is an endangered species under Service jurisdiction. This seabird is seen in the offshore environment around Attu and Kiska. The federally threatened southwest Alaska Distinct Population Segment of northern sea otters uses the coastal kelp beds as feeding and loafing areas. The waters around Attu Island provide marine feeding habitat for the ground-nesting Kittlitz's murrelet. A 2003 Alaska Maritime NWR survey found 50 Kittlitz's murrelets at Attu Island, representing a notable concentration of this rare species. Marine waters in the Aleutians also provide wintering habitat for yellow-billed loons, an Endangered Species Act candidate species. Also found in the marine waters around these two islands are Steller sea lions and numerous whale species that are threatened or endangered species under jurisdiction of the National Marine Fisheries Service.

Attu Island supports a major cormorant colony, with a significant population of red-faced cormorants, a species that is largely found in the western Aleutians and the Commander Islands, and a substantial population of pelagic cormorants.

There are several large seabird colonies on Attu Island, including significant populations of black-legged kittiwake, common murre, thick-billed murre, tufted puffin, and horned puffin. Attu Island supports a major cormorant colony, with a significant population of red-faced cormorants, a species that is largely found in the western Aleutians and the Commander Islands, and a substantial population of pelagic cormorants. However, substantial declines have occurred for cormorants, kittiwakes, and murres on Attu between 1970 and 1979, and substantial declines have continued for cormorants – an overall 87 percent decline between 1970 and 2003 (Byrd and Williams 2004). The 2003, Alaska Maritime NWR survey (Byrd and Williams 2004) reported 2,165 pelagic cormorants and 1,938 red-faced cormorants and an additional 709 unidentified cormorants. A combined count of both common and thick-billed murre species during the 2003 survey totaled 7,691 individuals. Kittiwakes totaled 1,682 individuals.

A subspecies of rock ptarmigan (*Lagopus mutus evermanni*) is endemic to the Near Islands; a 1988 survey estimated about 4,600 birds inhabit Attu Island. More recent counts have documented a reduction of rock ptarmigan numbers. The Aleutian Canada goose population on Attu is well established. A 2006 fall survey on the eastern portion of the island found 76 flocks with a total of 721 geese (Frost, *et al.* 2008). Other avian inhabitants of Attu Island include species common throughout the Aleutians, such as the rock sandpiper, red-necked phalarope, gray-crowned rosy finch, Lapland longspur, Pacific wren, and snow bunting. Attu Island is closer to Asia than to North America, and its avian diversity reflects its unique biogeographic location, with regular occurrences of Asian species.

There are no native terrestrial mammals on Attu and Kiska. In 1750 the Russians introduced arctic foxes from the Commander Islands for fur farming on Attu, but foxes were eradicated by 1999. Norway rats were accidentally introduced to the island, probably during WWII and are most common along coastal areas. Marine mammals found in the marine environment include Steller sea lion, northern fur seal, harbor and spotted seal, and a variety of whale, porpoise, and dolphin species.

Commercial fishery resources are primarily marine species; there are also salmon populations on Attu Island. The Alaska Department of Fish and Game has catalogued anadromous fish streams on Attu and Kiska.

Two lakes and over 40 rivers, streams, and their tributaries on Attu are used for rearing by Dolly Varden/Arctic char; rearing and spawning by Coho and sockeye salmon; and spawning by pink and chum salmon. There are 22 anadromous water bodies on Kiska. Dolly Varden are present in about half of these water bodies. On Kiska, Coho spawn only in Model Cove and Gertrude Cove Rivers while sockeye spawn in two other water bodies. Pink salmon spawn in over half of Kiska's catalogued waters.

The ancient Aleuts were kayak-paddling colonists who first occupied the western Aleutians about 3,500 years ago (Balter 2012). The more eastern islands have the earliest known archaeological site that was radiocarbon-dated to 9,000 thousand years ago. Aleut presence on the Aleutian Islands was documented by Russian explorers in 1741. For thousands of years the Aleuts had successfully hunted marine mammals, fish, and birds. The Russians pressed the Aleuts into servitude to catch sea otters for their valuable fur, changing the Aleuts lives forever as disease, starvation, and suicide slashed the Aleut population by up to 90 percent (Balter 2012).

Attu

Aleut Unangan and the Russian Colonization

Attu village, situated on Chichagof harbor. A small Russian Orthodox church sits in the valley below high mountains. Photo by O.J. Murie, June 1937. Library of Congress

The Near Islands could have been occupied as early as 2000 BC and by 3,000 years ago there were several settlements in the Near Islands (Corbett *et al.* 2010). Over 50 prehistoric Aleut village sites have been documented throughout Attu (Stein 1977; Corbett *et al.* 2010; Corbett *et al.* 2001; Lefevre *et al.* 2001). The historic village of Attu was located at the head of Chichagof Harbor. Russian fur hunters attacked settlements on Attu in 1745; these violent acts are recorded by the names Murder Point and Massacre Bay (Corbett *et al.* 2010).

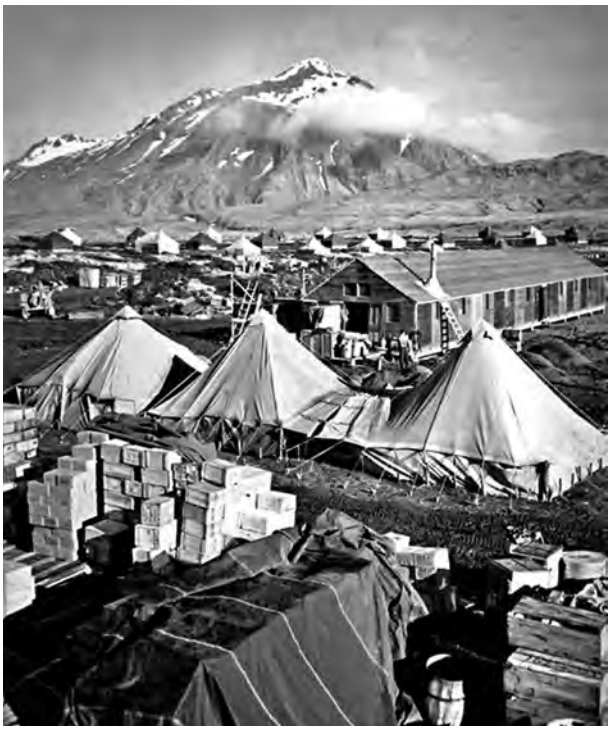
Russian hunting parties worked in the Near Islands, primarily Attu, between 1745 and 1799 (Corbett *et al.* 2010). The Russians relocated Unangan villagers from other islands to Attu where they worked

as trappers and hunters for the fur trade. A 20-year monopoly on the Pacific fur trade was granted to the Russian-American Company by the Russian government in 1799. The Company's census of 1860 listed 248 residents, including 221 Unangan and 27 Creoles (Golodoff 2012; Corbett *et al.* 2010), living on Attu. By this time Attu village was the only permanent winter settlement on the island (Corbett *et al.* 2010). After the sale of Alaska to the United States in 1867, a decline in services to remote islands contributed to the Unangan population decline. In 1870 the aboriginal population of Attu was 220 and had declined to 107 in 1880 (Golodoff 2012). By 1942, Attu's population, all living in Attu village at Chichagof Harbor, had dropped to 43 native Aleuts and two other Americans, Charles Foster Jones, 60, a radio technician, and his wife Etta, a schoolteacher.

Vessel at dock, 1943

World War II History

Japanese forces invaded the island in June of 1942, taking prisoner the 43 Attuans and Etta Jones, the schoolteacher. Charles Foster Jones, Etta's husband, was killed. After three months of Japanese occupation, the survivors were shipped off Attu to Japan and interned in Hokkaido for the duration of the war (Golodoff 2012). They were not technically prisoners of war; they had a different status. They were held in a civilian community under guard by town police. If they had been true prisoners of war, it is doubtful any would have survived. The Japanese occupied Attu, with an encampment of 2,600 men on the eastern end of the island. Holtz Bay, located on the northeastern edge of Attu, was used by the Japanese as an unloading point and seaplane anchorage. U.S. air and naval bombardment barraged Attu for nine months; the U.S. landed amphibious forces on Attu at Massacre Bay and captured the island from the Japanese during the three-week Battle of Attu in May 1943. In 1943 and 1944, the DoD constructed an Army and Navy outpost at Attu. Attu Island was originally designated as Attu Army Air Base. Navy facilities were located at Navy Town and a naval air station at Massacre Bay and in West Massacre Valley. Constructed by the Navy Seabees in 1943, the station included accommodations for 7,650 personnel in Quonset and Pacific huts, land and seaplane landing areas, hangars, repair shops, piers, a submarine base, a net depot, a Patrol Torpedo (PT) boat base, a drydock, an ordnance depot, a radio station, a hospital, fuel tanks, and support facilities.



Navy Town, 1943

Rapid construction on Attu by Army Engineer troops included an airfield with two runways, a one-runway satellite, field hangars, fuel storage tanks, docks, numerous Quonset and Pacific huts, a 400-bed hospital, and other ancillary structures to support an approximate 8,500-personnel work force. The protective garrison and airfields were completed by July 1944.

The Attu naval station was an 82,400-acre site used as an airfield and forward base in support of the Aleutian Campaign against Japanese forces. The Attu Naval Station was vacated in late 1945 following the end of WWII. The Attu Army Air Base was redesignated as Camp Earle Air Force Auxiliary Field in 1949. The Attu Naval Station was once again used by the Navy from 1959 to 1968.

The derelict LORAN A Station on Attu contains hazardous materials. D.Rudis, USFWS

U.S. Coast Guard Station Attu, closed in 2010. D. Rudis, USFWS

U.S. Coast Guard LORAN Stations

The original Long Range Air Navigation (LORAN) A site was built on Theodore Point in 1943. It was later abandoned by the USCG and a new station, LORAN C, was constructed at Murder Point/ Casco Cove in 1960. LORAN C Station Attu provided a navigational signal for mariners of the North Pacific since the 1970s. The seven support buildings included the main station base, two LORAN transmitter buildings, barracks, a warehouse, and a 6,600-foot-long paved runway. LORAN C Station Attu operated its own electrical power generators, its own potable water and wastewater treatment plants, and a permitted landfill. The fuel tank farm capacity was 325,000 gallons. The USCG maintained the station with twenty staff until August 2010 when it was decommissioned. The station's 625-foot LORAN tower was demolished in August of 2010 (USCG 2012). LORAN C Station Attu ceased transmission of the LORAN signal February 8, 2010, and the Russian-American signal ceased August 1, 2010.

U.S. Air Force

The Attu Island Seismic Array - FOX Remote Operating Facility was established in 1976 by the U.S. Air Force (USAF). The site was part

of a worldwide network of sites that monitored foreign compliance with a number of international treaties restricting nuclear weapon testing. The seismic array site is a 2.7-acre parcel approximately two miles north of the former USCG LORAN C Station. The site was connected to the LORAN C Station by a road, and underground power and communication cables. Special use/right-of-way permits for use of the site were issued to the USAF from April 1976 through April 1981, with five-year renewal periods. The site contains one structure, which served as the Remote Operating Facility building. This concrete structure is a two-story 19-foot-high structure, 10 feet wide and 20 feet long (USAF 2012). There was also a 100-square-foot subsurface vault, two boreholes approximately 180 and 143 feet deep, a third borehole that was covered up and never used, and a 50-foot tower. No petroleum products were used at this site.

Aleut people lived on Kiska starting around 4,500 years ago, based on archaeological data for Amchitka, one of the other islands of the Rat Island Group. A village site was excavated and documented as early as 1873 at the west end of the harbor by William Dall, a surveyor with the Coast Survey.

The USAF conducted visual site inspections in 2002, 2007, and 2008 before the site was decommissioned in May 2010. The series of visual site inspections documented that no hazardous materials remained on-site and there was no potential for future environmental hazards. All materials used by personnel during maintenance and repair of the facility were removed and shipped off-site as part of facility closure measures. They included batteries, fire extinguishers, enamel, a compressed gas nitrogen cylinder, and other miscellaneous items. The USAF reviewed all available records and reviewed personnel interviews to ascertain that there were no other hazards such as above-ground storage tanks (ASTs), underground storage tanks (USTs), spilled fuel, pipelines, biohazardous or solid waste, polychlorinated biphenyls (PCBs), ordnance, radioactive waste, or lead-based paint. Items left within the Remote Operating Facility were electrical wiring and lighting fixtures. Borehole casings were capped, and only buried cable between the boreholes was left. Loose vermiculite and abandoned cable were left in the vault. The Close-out Environmental Baseline Survey for this site was completed in May 2012 (USAF 2012).

Kiska and Little Kiska

Aleut people lived on Kiska starting around 4,500 years ago, based on archaeological data for Amchitka, one of the other islands of the Rat Island Group (Funk 2011). A village site was excavated and documented as early as 1873 at the west end of the harbor by William Dall, a surveyor with the Coast Survey (Corbett, *et al.* 2010). However, little is known about Aleut occupational history of Kiska (Funk 2011). Results of 2009 research demonstrate the high frequency of cultural remains on Kiska (Funk 2011). When the Russian America Company was formed, Kiska, along with Attu, was in the Atka District. By 1805, the original population of the Rat Islands was gone, dead, or relocated to other islands, including Atka and Attu. Arctic foxes were released on Kiska for fur trapping in 1835 (Bailey 1993).

World War II History

In 1901, the United States established an Astronomical Station in Kiska Harbor (ACOE 2004). In 1902, a tract of approximately 900

acres along Kiska Harbor was withdrawn by Executive order for a coal station that was never built (per a 2004 Archive Search Report). Navy involvement in Kiska predated WWII when all of Kiska and Little Kiska were withdrawn from the public domain in 1903 by Executive order to construct a Navy Base at Kiska Island. In 1904, a naval station was established that consisted of two temporary shelters and a 150-foot long wharf (ACOE 2004). Three government vessels spent the summer of 1904 in Kiska Harbor gathering information for a planned coal depot that was never developed. Further Navy base construction plans were abandoned in 1915. From 1919 through 1924, individuals were permitted to graze sheep, farm blue foxes, and operate a reindeer farm. The Kiska Ranching Company was incorporated with the Territory of Alaska in 1933 and operated on Kiska through 1942. The company's Articles of Incorporation included ambitious plans for fox farming and general livestock rearing, including sheep, cattle, horses, poultry, and other domestic animals. They also had plans for fish harvest and packing operations, merchandizing, vessel operations, building construction, and general development associated with these activities. Whether any of these activities came to fruition is unknown, as the company's annual reports could not be found (Domestic Corporation Docket, District Court, Division Number Three, Alaska, Docket 476, July 24, 1933).

Japanese camp remains, Kiska, 1943

A small naval weather station was established in 1942. On the 6th of June, 1942, the Japanese No. 3 Special Landing Party and 500 Japanese marines went ashore at Kiska and Little Kiska, capturing both islands. They captured the crew of 10 men from the American Naval Weather Detachment on Kiska.

The Japanese military developed island defenses and military support areas, and stationed troops on both of these islands. Total Japanese strength on Kiska Island was approximately 7,800 Army and Navy personnel. Japanese infrastructure included gun emplacements, beach head defenses, an airplane landing strip, personnel housing, military supply shelters, a water distribution system, an extensive system of underground tunnels, and diesel fuel powered generating stations. Kiska Harbor developments by Japanese Navy

personnel included a ship docking pier, a seaplane beach landing ramp, and a submarine base.

In a period of less than three months in 1943, Kiska received 600 tons of explosives from surface bombardment, and another 1,310 tons were dropped from the air. Strafing runs were also made. Blind bombing was not infrequent due to sudden patches of fog and inclement weather.

Little Kiska was primarily an outer defensive position established by the Japanese to protect Kiska Harbor (Spennemann 2008). The gun battery at the western end of the island included three gun emplacements, a personnel shelter, an ammunition store, a barracks building, and a fire control center (Spennemann 2008). Personnel trenches connected all structures, and telephone lines connected all the installations on Little Kiska.

A Naval Defensive Sea Area (NDSA), which is a water area set aside by Executive order because of its strategic nature or for purposes of defense, was established on February 14, 1941, by Executive Order 8680. The Kiska NDSA includes territorial waters between the extreme high-water marks and the three-mile marine boundaries (NAVFAC 2013).

The U.S. conducted bombing missions over Kiska for two and a half months after the Attu Island liberation. In a period of less than three months in 1943, Kiska received 600 tons of explosives from surface bombardment, and another 1,310 tons were dropped from the air. Strafing runs were also made. Blind bombing was not infrequent due to sudden patches of fog and inclement weather. During the 14-month battle for Kiska, Allies dropped more than 3,000 tons of bombs during 501 missions. Navy bombardments totaled over 16,300 rounds of 5-inch, 6-inch, 8-inch, and 14-inch shells (ACOE 2004). Bombs dropped on in-water targets included ships and float planes. Only two U.S. bombing raids were made on Little Kiska; they occurred just prior to Allied landings on Kiska.

Under the cover of fog, the Japanese garrison of 7,800 troops and civilians were evacuated from the island on July 23, 1943. Despite massive U.S. air power, the evacuation slipped by undetected. On August 15, 1943, an Allied force of 34,426 troops, of whom 5,300 were Canadian, landed on Kiska with Americans and Canadians landing at different locations. Neither set of soldiers were aware of the other's location, and the Allies shot into the fog for two days, believing the Japanese were still on Kiska. Casualties during the invasion were over 200 men, as troops died from either friendly fire or booby traps; 50 more were wounded, and additional troops suffered trench foot.

U. S. and Canadian forces expanded; they completed air facilities and base construction, including troop quarters and a hospital. Roads and piers were built in anticipation of future action against the Japanese. Structures included an improved runway, seaplane ramp, hangar, ship dock, barge dock, small craft pier, fuel storage tanks, and diesel generator units. The U.S. Army occupied approximately 5,850 acres of the eastern side of the island as a protective garrison. The Naval Auxiliary Air Facility and submarine base was used by the Navy until 1945. At the end of WWII, all existing structures were abandoned in place.

Military target practice occurred around Kiska between 1948 and 1950. Maps from 1948 show areas around Kiska designated as a "Prohibited

Area" and later as a "Danger Area" (NAVFAC 2013). These designations usually signify that an area is being used for military purpose, including target practice. Documentation for one exercise in 1950 described Navy rocket and bombing practice that targeted Kiska (ACOE 2004).

Land Status

Attu

In 1959, 11,670 acres along Massacre Bay to Murder Point were withdrawn for Navy use and creation of the Attu Naval Reservation by Public Land Order (PLO) 1949, dated August 19, 1959.

Attu Island was within the Aleutian Islands National Wildlife Reservation established by Executive Order 1733, dated March 3, 1913, which stated that, "The establishment of this reservation shall not interfere with the use of the islands for lighthouse, military, or naval purposes." This created an implied use permitting military operations. No formal withdrawal from the public domain for military purposes occurred during WWII.

Camp Earle Air Force Auxiliary Field, the military use area, contained 82,400 acres, approximately the eastern one-third of Attu. On January 27, 1953, this area was declared excess by the U.S. Air Force and relinquished to the U.S. Fish and Wildlife Service on January 15, 1954. The USAF improvements were abandoned in place.

In 1959, 11,670 acres along Massacre Bay to Murder Point were withdrawn for Navy use and creation of the Attu Naval Reservation by Public Land Order (PLO) 1949, dated August 19, 1959. In June of 1968, the Bureau of Land Management (BLM) accepted the relinquishment of this parcel, divesting the Navy of all real property on Attu Island. PLO 1949 was partially revoked by PLO 4564, dated January 16, 1969. This PLO withdrew 1,800 acres of land near Massacre Bay for use by the USCG and returned the remaining land to the refuge. All improvements formerly on the Navy inventory were transferred to the USCG (H. Hajek letter to B. Silcock, June 10, 1968). This action divested the Navy of all real property on Attu Island.

1959 PLO 1949	11,670 acres	Land from Massacre Bay to Murder Point withdrawn for Navy use and Attu Naval Reservation established.
1968		Navy relinquished all land to BLM.
1969 PLO 4564	9,870 acres	Partial revocation of PLO 1949 by PLO 4564 returned land to refuge.
1969 PLO 4564	1,800 acres	Land near Massacre Bay withdrawn for USCG; transfer of all Navy improvements to USCG.

The following information is from the files of the Service's Alaska Region Division of Realty.

U.S. Coast Guard Lands

The USCG withdrawal lands are from Massacre Bay southwest of Signal Point to Casco Point. There were 3 LORAN Stations on Attu,

Interior view of the LORAN A Station. D.Rudis, USFWS

one at Theodore Point for a very brief period, one at Casco Cove and the most recent one at the runway. LORAN A Station, which includes buildings numbered V-100, 101, and 102. Built by the Navy in 1948, these buildings have not been used by the USCG since 1960 (L. Wooldridge letter to USCG Commandant, Washington, D.C. February 23, 1967). In 1999, the USCG asked the Service to determine ownership of the LORAN A buildings (M. Milhollin letter to N. Parker, U.S. Fish and Wildlife Service, Realty Specialist, May 18, 1999). The Service determined that it "does not have ownership of, accountability for or jurisdiction over these buildings." (N. Parker note to M. Milhollin, USCG, Civil Engineer, May 20, 1999). The Service leased the LORAN buildings at Casco Cove to Attours for commercial birding tours for decades. The Service had signs on the building stating its ownership.

These lands were withdrawn by PLO 4564 on January 16, 1969, for use by the USCG, and that withdrawal has not been revoked. Additional correspondence through 1999 and 2000 between the USCG and the Service had not clarified responsibility for these buildings (and the cost of cleanup), and research on this matter continued (S. Shirkey letter to J. Martin, Refuge Manager, Alaska Maritime NWR, U.S. Fish and Wildlife Service, October 4, 1999; S. Janis letter to S. Shirkey, Chief, Real Property Branch, USCG, November 8, 1999; S. Shirkey letter to S. Janis, U.S. Fish and Wildlife Service, Chief, Realty Alaska Region, April 27, 2000). Correspondence in 2008 (N. Walsh letter to L. Deena, USCG Realty Specialist, December 3, 2008) included a complete history of all correspondence and documentation among the USCG, the Navy, and the Service on this property and found conflicting information. However, nothing was found signed by the Service accepting custody and accountability of the buildings at LORAN A Station, yet we collected money for their use for decades as noted previously.

Aleut Corporation Lands

As a result of the 1988 Civil Liberties Act (P.L. 100-383; 50 USC 1989b), The Aleut Corporation relinquished all of the historic and cemetery site applications on Attu in return for title to the historic village site in Chichagof Harbor. The Attu village site at Chichagof Harbor was conveyed to The Aleut Native Corporation in 1999. This is the only land conveyance on Attu to the corporation.

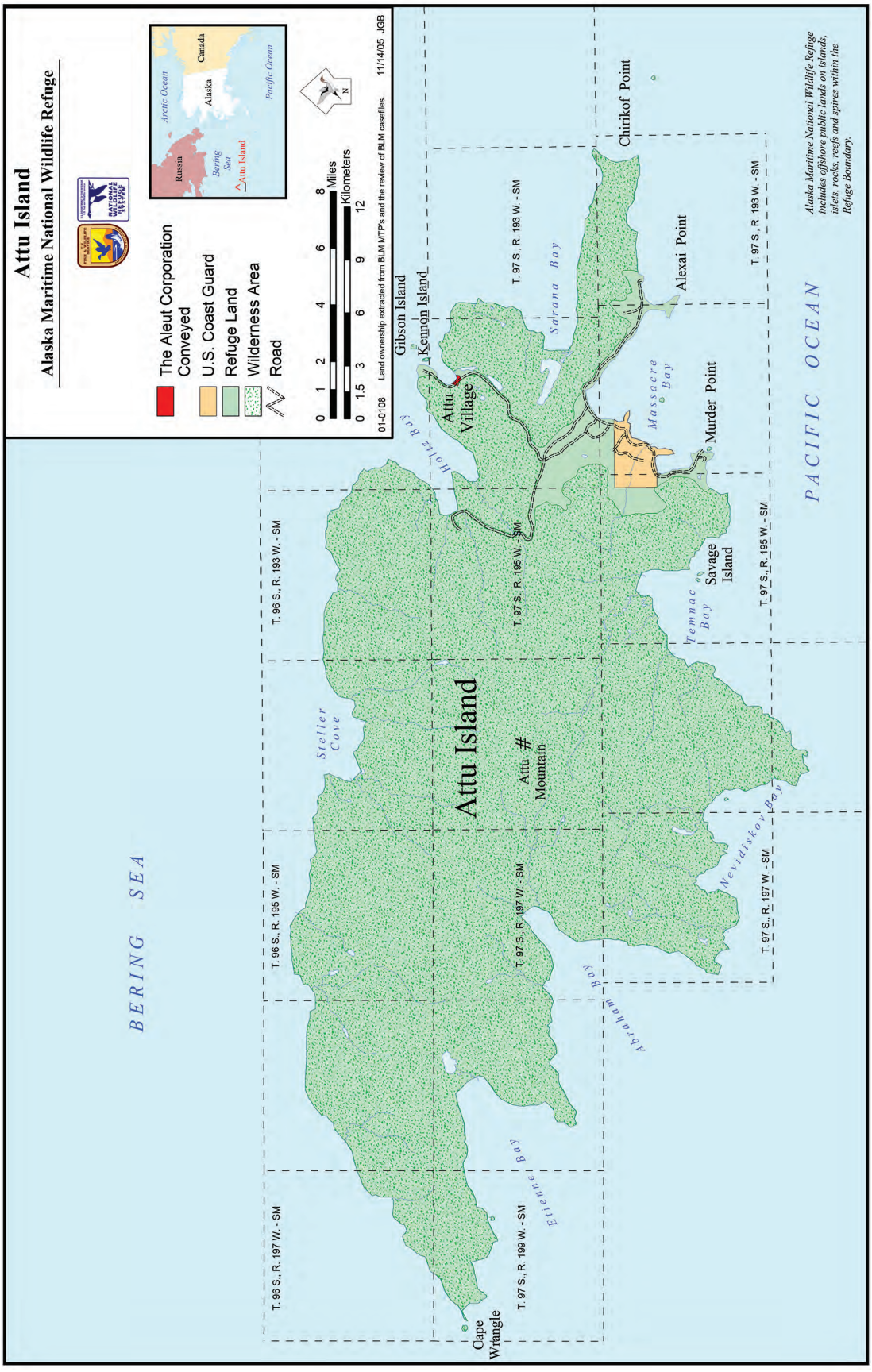


Figure 1. Attu Land Ownership (FWS map)

National Historic Landmark

The Attu Battlefield was designated as a National Historic Landmark, on February 4, 1985. It is the site of the only WWII battle fought on the North American continent, and occupation by Japanese troops marked the peak of Japan's military expansion in the North Pacific. Landmark designation confers the federal government's highest level of legal protections to cultural resources managed by federal agencies. Federal actions undertaken on a National Historic Landmark must be planned and executed in a way to minimize harm to the landmark. The Advisory Council on Historic Preservation must be given an opportunity to comment on planned federal actions. The National Park Service acts in an advisory capacity as an advocate for the Landmark (NHPA Section 110(a)(2)(E)(f)).

Ten historic sites associated with the Japanese occupation are listed with the Alaska Heritage Resource Survey for Kiska and Little Kiska Islands.

The "World War II Valor in the Pacific National Monument" (Proclamation 8327), was created through an Executive order issued on December 5, 2008. This designation protected four areas on Attu and five areas on Kiska and Little Kiska. The Service is tasked with managing and administering these lands within the refuge in partnership with the National Park Service for educational, interpretive, and research opportunities (USFWS *et al.* 2010). On Attu, Monument lands overlap with the Attu Battlefield and the U.S. Army and Navy airfields on Attu National Historic Landmark.

Kiska

With Attu, Kiska also became part of the National Wildlife Reservation created in 1913 by Executive order, which specifically stated that it could not interfere with military use of the island. The land and sea area on Kiska was withdrawn by a 1941 Executive order to create a naval defense sea area and airspace reservation. The War Assets Administration declared Kiska surplus for disposal on September 19, 1946. The surplus buildings were turned over to the Navy for their disposal.

The Navy returned Kiska back to the U.S. Department of the Interior on February 23, 1951. The original 1903 Executive order was formally revoked by PLO 1224 dated September 14, 1955. This returned Kiska to the Aleutian Islands National Wildlife Refuge. ANILCA of 1980 included Kiska in the Aleutians Island Unit of the Alaska Maritime NWR.

In 1985, portions of Kiska were designated as the Japanese Occupation Site, Kiska Island National Historic Landmark. Ten historic sites associated with the Japanese occupation are listed with the Alaska Heritage Resource Survey for Kiska and Little Kiska Islands. Areas on Kiska that are part of the World War II Valor in the Pacific National Monument include an aircraft crash site in addition to the two Allied troop landing locations, and the Japanese Occupation Site, which is also a National Historic Landmark.

There are presently four Alaska Native Claims Settlement Act, Section 14(h)(1) significant historic and cemetery sites on Kiska, which were conveyed to the Aleut Native Corporation, and there is one selected

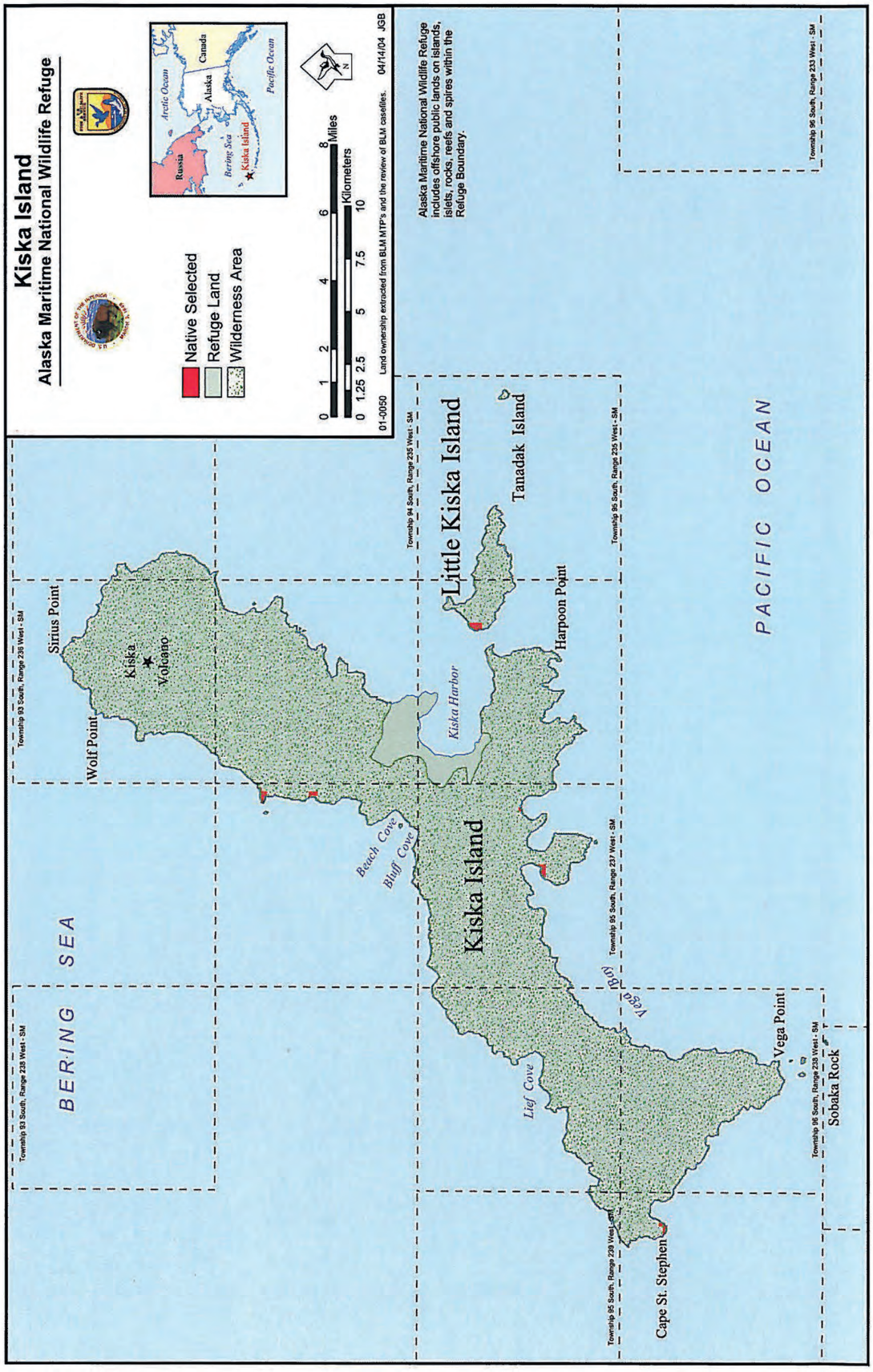


Figure 2. Kiska and Little Kiska land ownership (FWS map)

Native parcel. On Little Kiska, there is one conveyed parcel to the Aleut Native Corporation.

The Defense Environmental Restoration Program (DERP), established by Congress in 1986, directed the Secretary of Defense to "carry out a program of environmental restoration at facilities under the jurisdiction of the Secretary."

Alaska National Interests Lands Conservation Act (ANILCA)

The management of each refuge is dictated, in large part, by the legislation that created the refuge. In 1980, ANILCA [16 U.S.C. § 303 (1) (b) sets forth the major purposes for which the Alaska Maritime National Wildlife Refuge was established and shall be managed:

i. to conserve fish and wildlife populations and habitats in their natural diversity including, but not limited to, marine mammals, marine birds and other migratory birds, the marine resources upon which they rely, bears, caribou and other mammals;

ii. to fulfill the international treaty obligations of the United States with respect to fish and wildlife and their habitats;

iii. to provide, in a manner consistent with the purposes set forth in subparagraphs (i) and (ii), the opportunity for continued subsistence uses by local residents;

iv. to provide, in a manner consistent with subparagraphs (i) and (ii), a program of national and international scientific research on marine resources; and

v. to ensure, to the maximum extent practicable and in a manner consistent with the purposes set forth in paragraph (i), water quality and necessary water quantity within the refuge.

Defense Environmental Restoration Program (DERP)

The Defense Environmental Restoration Program (DERP), established by Congress in 1986, directed the Secretary of Defense to "carry out a program of environmental restoration at facilities under the jurisdiction of the Secretary." In 1990, the EPA designated DoD as the removal response authority for incidents involving military weapons and munitions under the jurisdiction, custody, and control of DoD. Although DoD has removal and response authority, these lands are all refuge property, and the Service continues to be involved in removal and response planning efforts by DoD. The ACOE is the agency responsible for environmental restoration at Formerly Used Defense Sites (FUDS). The U.S. Army Engineering and Support Center in Huntsville, Alabama, serves as the Center of Expertise and Design Center for Ordnance and Explosives. The ACOE, St. Louis District, prepares the Archive Search Reports in support of environmental restoration at active DoD installations.

Attu

Contaminant Investigations

U.S. Army Corps of Engineers (ACOE)

The ACOE, Alaska District office on Joint Base Elmendorf-Richardson is a repository for files on military sites on these islands and other Alaska locations. In 1977, the ACOE published, *Debris removal and clean up study Aleutian Islands and lower Alaska Peninsula.* This report included a detailed inventory of all WWII military debris and material remaining on Attu, Kiska, and other islands in the Aleutians. This report also incorporated recommendations on removal techniques and supporting cost estimates for cleanup. In 1979, a draft Environmental Impact Statement on WWII debris removal and cleanup was prepared based on findings of the 1977 work.

Hazardous waste on Attu deemed eligible for cleanup under DERP-FUDS included areas with hazardous, toxic, and radioactive wastes (HTRW) that consisted of large fuel tanks, pipelines, and pump stations; piles of 55-gallon drums scattered throughout the area with petroleum, oil, and lubricants (POL) contamination of soil and water, lead-acid battery remains and lead contaminated soils; electrical transformers and associated PCBs; heavy metals; polycyclic aromatic hydrocarbons (PAHs); and low levels of dioxins.

The 1991 initial DERP-FUDS Inventory Project Report documented the ACOE Alaska District's position that the Attu site was formerly used by DoD and is therefore eligible for DERP (ACOE 1991). It was also determined that there was hazardous waste at the site, eligible for cleanup under DERP-FUDS.

A final FUDS Inventory Project Report for Attu was completed by the ACOE in 1993. This report included information from the 1991 site visit and contaminant sampling of soil, sediment, and surface water conducted by Ecology & Environment, Inc. (E & E). Hazardous waste on Attu deemed eligible for cleanup under DERP-FUDS included areas with hazardous, toxic, and radioactive wastes (HTRW) that consisted of large fuel tanks, pipelines, and pump stations; piles of 55-gallon drums scattered throughout the area with petroleum, oil, and lubricants (POL) contamination of soil and water, lead-acid battery remains and lead contaminated soils; electrical transformers and associated PCBs; heavy metals; polycyclic aromatic hydrocarbons (PAHs); and low levels of dioxins. Ordnance and explosive waste (OEW) was estimated in tons, with some concentrated and with significant amounts scattered throughout the island hidden by the dense vegetation. In this report, sites were identified and cost estimates were developed for an HTRW Remedial Investigation (RI). An OEW project and a risk assessment were proposed, particularly for fencing to limit access to OEW, and an assessment was conducted of a dioxin-contaminated burned building site at Chichagof Point.

DoD records show an elaborate distribution system consisting of underground pipelines and pumping stations on Attu. At a minimum, 200,000 barrels of heavy Bunker C fuel oil, 28,000 barrels of aviation gasoline, and 31,000 barrels of diesel oil were stored in Navy Town. Information is not available about what was stored in the Army's tank farms.

U.S. Fish and Wildlife Service (USFWS, Service)

The Service conducted a series of contaminant investigations in 1988, 1989, and 1990 at abandoned military facilities on Attu, Tanaga, Little Kiska, Great Sitkin, and Semisopochnoi islands—all are located within

Debris above Massacre Valley, Attu. D. Rudis, USFWS

the Aleutian Islands Subunit of the Alaska Maritime National Wildlife Refuge. The principal investigator was Wayne M. Crayton from the Ecological Services Anchorage Field Office, who was assisted by Nancy Norvell and other staff from the Alaska Maritime NWR (Crayton 1991). These investigations centered on determining what, if any, contaminants (i.e., organochlorines, PAHs, inorganics) from military activities may have contaminated the surrounding refuge environment.

The Service collected a total of 239 soil, 149 sediment and 19 fish samples from 68 sites on Attu Island. Samples were analyzed for PAHs, PCBs, metals, and total organic carbon. PAHs, PCBs, chromium, and lead were identified as contaminants of concern.

Soil and sediment sample sites included:

- Engineer Hill,
- Jarmin Pass dump,
- Hogback Ridge,
- East Massacre Valley (several sites),
- Beach Road gymnasium barrel dump and transformer,
- Casco Cove barrel dump,
- Casco Beach Road barrel dump
- Casco Point transformer location, Navy Town (15 sites),
- Coast Artillery Hill (six sites),
- Lake Elwood,
- East-West Runway debris pile,
- Peaceful River Valley asphalt barrel dumps and river sediment,
- Murder Point (seven sites),
- Bassett Creek,
- Siddens Valley dump, powerhouse and fuel tank,
- Upper Henderson River, Chichagof Point radio shack, and
- Beach Road POL burn pit, and two sediment and four soil control sample sites.

Fish samples were collected from Lake Elwood, Lake Nevidiskov, Lake Nicholas, upper Henderson River, Bassett Creek, and the Coast Guard pump house pool reservoir and in an adjacent Peaceful River

Petroleum, oil, and lubricants (POL) from WWII continues to pollute wetlands on Attu. D.Rudis, USFWS

wetland. Inorganic concentrations in whole-body Dolly Varden and threespine stickleback samples did not constitute a biological threat, according to the report's author, who developed a screening process for assessing potential risk using a contaminant evaluation process. Because mercury concentrations are of interest due to biomagnification potential through the food web, review of these data found total mercury concentrations in Dolly Varden were at 0.10 to 0.22 parts per million (ppm) and at 0.38 ppm in the threespine stickleback composite sample from Lake Nicholas. These mercury concentrations are well below the Food and Drug Administration action level of 1.0 ppm in commercial fish.

Organochlorines (OCs) were not detected above quantification limits in any fish or sediment samples. Chichagof Point radio shack soil samples had a PCB, Arochlor 1254, at 5,800 to 9,200 ppm. State of Alaska soil cleanup level is 1 ppm (ADEC 2008). The potential source of PCBs at this location is deteriorated radio communications equipment. Concentrations of less than 1 ppm were reported from three other sites.

Most soil and sediment samples had PAH concentrations below background (<11 ppm); the highest PAH concentrations ranged from phenanthrene at 3.7 to 6.3 ppm; benzo(a)pyrene at 2.6 ppm; and naphthalene at 11ppm. However, the author states, "One might want to draw conclusions, based on the analytical data alone, that the island is not contaminated with PAHs. On the contrary, Attu Island is grossly contaminated with petroleum products. Field observations by Crayton of Bunker "C" fuel and other petroleum, oil, and lubricants (POL)

spills (which were not directly sampled) indicate that widespread petroleum contamination still existed in Navy Town, Peaceful Valley and East and West Massacre Bays." Later investigations confirmed contamination from petroleum hydrocarbons throughout the former military installation (E & E 1992b; Dames & Moore 1995b).

Peaceful River Valley is littered with "contaminant time bombs," as dozens of barrel dumps litter the valley, many containing POL residues and ammunition. Because this study collected a limited number of samples, more widespread sampling is needed to determine the extent of contamination at known sites and to identify additional contaminated sites, should they exist.

Arsenic, chromium, copper, iron, nickel, and zinc concentrations in soil and sediment samples were indicative of medium or high contamination at 14 of the sample sites. Arsenic was reported at 20 ppm in two soil samples at the POL burn pit, above the cleanup level of 3.7 ppm. In the Crayton 1991 report, metal concentrations were presented as ranges of values with contamination categories designated as none, medium, and high. Moderate nickel pollution was noted at other locations in Navy Town.

Navy Town Petroleum Contamination

Crayton (1991) noted that many underground pipelines, associated valve boxes, and pumping stations in Navy Town continued to profusely leak fuel at the time of these field studies.

Navy Town on Attu has a history of documented petroleum contamination. In 1966, the Service investigated a reported oil slick in Massacre Bay. Faulty valves and broken lines were leaking Bunker C fuel oil into a creek (now known as West Massacre Creek) that drains the Navy Town area (Helvie 1966). A joint decision was made by the Service and USCG to burn the bunker oil and aircraft fuel, and the same decision was reached by the USCG after a more thorough investigation (R. Bates, letter to Commander, Seventeenth Coast Guard District. May 1967). The Navy remediated the situation prior to the affected land reverting to Service jurisdiction (B. Silcock, letter to W. E. Nims, Commander, Naval Facilities Engineering Division, February 23, 1967). In May 1968, the Service stated that they had no objection to the Navy's relinquishment of the area, as the pollution problem was solved. (This would not be acceptable at this time.) Service biologists reported oil pollution problems in June 1970 in Massacre Bay, West Massacre and Peaceful River Valleys (D. Spencer, memorandum to Director, Alaska Operations Office, FWPCA, Anchorage, June 1970). In August 1970, the USCG gave the Navy permission to burn the remaining fuel in Navy Town's storage tanks, pipelines, and other petroleum deposits. In September of 1970, the Service inspected the stored oil disposal and estimated that 1,000 gallons of oil remained unburned. The Navy proposed to cover any unburnable oil with fill material. It was determined that the underground fuel pipeline system was the pollution source to the creek, and that the creek would have a persistent iridescent film. The Service concluded that," The crew performing this demolition appears to have done a rather complete job…." (Evans 1970). Crayton (1991) noted that many underground pipelines, associated valve boxes, and pumping stations in Navy Town continued to profusely leak fuel at the time of these field studies. In 2007, large collapsed fuel tanks

continued to have pooled fuel within retaining dikes. The creek draining Navy Town continued to have an oily sheen, and fuel was abundantly spattered on the vegetated banks.

Ecology & Environment, Inc. (E & E)

The ACOE contracted E & E for preliminary contaminant identification and characterization on Attu Island. Field activities were conducted in September 1991. The report, *Debris Inventory: Attu Island, Aleutian Islands, Alaska* (E & E 1992a) documented the location, quantity, and nature of debris found on Attu during the field season. A second report, *Contamination Assessment Report: Attu Island, Aleutian Islands, Alaska* (E & E 1992b) addressed associated contaminants and their sources. Objective of the project was to provide a preliminary reconnaissance of DoD debris, potential HTRW, and POL sources that could be hazardous to human health and/or the environment.

The project's specific objectives were to:

- Determine the presence and nature of hazardous substances and petroleum constituent sources;
- Approximate the extent of soil contamination at each identified waste source where possible;
- Determine the presence of contaminants in surface water, runoff, and sediments near identified waste sources.

Casco Cove machinery dump, Attu. D. Rudis, USFWS.

General field activities included collection of 86 soil samples, 13 surface water samples, one groundwater sample, and nine miscellaneous samples. Background, blanks, and duplicate samples were also included for quality assurance/quality control analyses.

Sample analyses included fuel quantification and identification of PAHs, PCBs, chlorinated herbicides, OC and organophosphorous (OP) pesticides, asbestos, metals, and volatile organic compounds (VOCs). Not all samples were analyzed for all contaminants. No OC or OP pesticides were detected in Attu soil samples taken by E & E. Only one soil sample from beneath a drum at Casco Cove had a detectable VOC, which was total xylene at 0.006 ppm. Numerous substances, including PAHs, PCBs, and some metals, were detected in sufficient concentrations to be considered contaminants of concern, based on State of Alaska soil cleanup levels (ADEC 2008).

Soil lead concentrations were up to 2,060 ppm in samples from Casco Cove/Casco Point, at 58,900 ppm near demolished batteries at Murder Point, and at 33,800 ppm from a sample taken at an unidentified red material along a bluff in east Massacre Valley.

Fuels and related hydrocarbon contaminants detected in soil samples included oil, Bunker C oil, diesel, diesel #2 fuel , kerosene, acenaphthylene, fluorene, naphthalene, phenanthrene, and anthracene. At almost all sampling sites, soil samples had some petroleum compounds (oil, diesel, diesel #2 fuel , or jet fuel) at concentrations far above state cleanup standards for diesel range organics, gasoline range organics, or residual range organics (Table 1). A soil sample had oil at 620,000 ppm collected from Jarmin Pass below a ravine with an estimated 4,000 drums; another soil sample from this area had diesel at 270,000 ppm. A soil sample below the lower Peaceful River drum group had 98,800 ppm of oil. All but two tank farm soil samples had petroleum compounds at concentrations of concern.

Metals identified as contaminants of concern in soil samples included lead, chromium, and arsenic. Soil lead concentrations were up to 2,060 ppm in samples from Casco Cove/Casco Point, at 58,900 ppm near demolished batteries at Murder Point, and at 33,800 ppm from a sample taken at an unidentified red material along a bluff in east Massacre Valley. The ADEC lead soil cleanup level is 400 ppm (Table 1).

Table 1. State of Alaska Soil Cleanup Levels for direct contact in locations with over 40 inches of annual rainfall (ADEC 2008).

Hazardous Substance	State of Alaska Soil Cleanup Level (ppm)
Inorganics	
Arsenic	3.7
Barium	16,600
Chromium	250
Lead	400
Mercury	25
Zinc	24,900
Organics	
PCBs	1
Petroleum hydrocarbons (gasoline range organics)	1,400
Petroleum hydrocarbons (diesel range organics)	12,500
Petroleum hydrocarbons (residual range organics)	22,000
Acenaphthylene	2,300
Anthracene	16,800
Acenaphthylene	2,300
Anthracene	16,800
Benzo(a)pyrene	0.40
Fluorene	1,900

Hazardous Substance	State of Alaska Soil Cleanup Level (ppm)
Naphthalene	1,100
Phenanthrene	16,800

Diesel and oil were detected in surface water samples from small isolated surface ponds within Navy Town, a pool of water near the USCG warehouse, pooled water at Tank Farm 1, and drainages below some of the tanks at Tank Farms 3 and 4. No target analytes were detected in water samples collected from the Peaceful River, East Massacre Creek, and West Massacre Creek, or from the groundwater sample.

Metals detected in miscellaneous materials include barium, chromium, and lead. Soils located near these materials were not collected for analysis. Asbestos was found in building materials at Massacre Valley. No detectable concentrations were reported for chlorinated herbicides, OCs, OPs, or VOCs in any samples.

Dames & Moore

Fuel tank farm area from Artillery Hill, Attu. D. Rudis, USFWS

An engineering evaluation and cost analyses (EE/CA) to determine the nature and extent of OEW surface and subsurface contamination was completed by Dames & Moore, Inc., in 1995, under contract to the U.S. Army Engineer Division Huntsville, Alabama. This project included an Archive Search Report review, research of additional data, and visual and metal detector inspection of 14 sites. Some of those sites were previously identified, and others were located during the field investigation.

Site hazard determination areas were as follows: multiple locations within Massacre Bay, including Casco Point, Barbara Point, Tank NT-54, fuel tank area, and magazines northwest of Casco Field; ordnance area west of Casco Field; Peaceful Valley; Alexai Point and Creek; East and West Massacre Valleys; upper Massacre Valley; Engineer Hill; Bassett Creek; Jim Fish Valley (Chichagof Valley); Chichagof Harbor and Point; Zwinge Valley; Jarmin Pass; Addison and O'Donnell Valleys; and the east and west arms of Holtz Bay.

UXO—ordnance that was fired or dropped but did not detonate as intended—identified at these sites included flares, cartridges, fuzes, projectiles, bombs, bomblets, and a variety of other munitions.

The Service's letter of May 13, 1996, from Glenn Elison, Acting Regional Director, to Mr. Charles Heaton, ACOE, Huntsville, Alabama, reviewed

The Service has requested a complete survey of hazardous and non-hazardous waste on Attu Island on numerous occasions, with full expectation that all ordnance, explosives, and hazardous and non-hazardous wastes would be identified and removed.

the EE/CA prepared for Attu (Dames & Moore 1995a, 1995b). The Service expressed serious concerns, which are summarized as follows. The EE/CA provided an initial ordnance and explosive (OE) hazard inventory but was not a complete waste inventory. Live ordnance at individual sites was not quantified, and no effort was made to determine if other wastes were present. No information was provided on non-OE wastes, including petroleum discharge sources, batteries, power station locations, transformers, etc. The 1995 report did not include any information on future plans to address OE hazards on Attu. The Service maintained that the exposure risk was underestimated, as in addition to USCG personnel, the island does have visitors, and access is unrestricted. The Service also asserted that No Further Action was an unacceptable solution to address the waste materials remaining on Attu, and the use of signage as an institutional control was not adequate to protect the public. The Service has requested a complete survey of hazardous and non-hazardous waste on Attu Island on numerous occasions, with full expectation that all ordnance, explosives, and hazardous and non-hazardous wastes would be identified and removed.

Removal and Remediation Activities to Date

Previous OEW and miscellaneous removal actions at military sites on Attu were summarized in Dames & Moore (1995a) and include the following:

1950 – U.S. Army historical records state that approximately 3,905 tons of ammunition were destroyed.

1956 – The U.S. Navy contracted with Bankers Life of Chicago, who subcontracted with General Metals of Tacoma to salvage non-ferrous metals, including truck and tractor parts, from 1956 to 1958. The venture was deemed too costly and was not completed.

1976 – Naval Explosive Ordnance Disposal Unit Nine of Adak conducted ordnance disposal activities in Peaceful and Zwinge Valleys. All major concentrations of ordnance were destroyed, but complete surface clearance was not achieved.

1989 – Naval Explosive Ordnance Disposal Unit Nine of Adak conducted ordnance disposal activities on Engineer Hill and in Peaceful and Zwinge Valleys in August. Small amounts of OEW were reported to have been destroyed.

1991 – Naval Explosive Ordnance Disposal Unit Nine of Adak conducted ordnance disposal operations in the vicinity of the Japanese War memorial on Engineer Hill during May 1991. The report indicates that OEW was observed in the ordnance area west of Casco Field, upper Massacre Valley, Zwinge Valley, Engineer Hill, Jarmin Pass, and Holtz Bay.

In 1999, a Japanese WWII sea mine washed ashore at Temnac Bay on Attu and was detonated in place by the Fort Richardson Explosive Ordnance Disposal unit (September 3, 1999, email from D. Bethel W POA02, Subject: trip report – Attu UXO removal effort).

Known OEW that remains on Attu is primarily located in burn piles and kickouts from burn piles. Bulk detonation at burn piles caused "kickout" (the ejection of undetonated devices), distributing dangerous ordnance over a wide area. However, the potential for OEW exists over all areas of the island since Army munitions, naval gunfire, and air-delivered ordnance were used during the Battle of Attu. To date, investigations conducted by DoD funded contractors have been limited to areas where significant combat or military activities took place, including former installations.

Chemical warfare materials (CWM) were stored at Attu during WWII. In 1947, some 887 one-ton containers of Lewisite (a chemical blistering agent) and 61 containers of mustard gas (another blistering agent) were dumped at sea approximately 12 miles from Attu, and 10 containers of each agent were shipped to Adak for disposal. Both the container size and number of containers is notable. These actions were documented in an ACm1C Form 1-3a, sent from Headquarters Alaska Department to the War Department, Chief Chemical Corps, dated November 2, 1946. These disposal actions accounted for the entire CWM initially reported on Attu in 1946. No evidence of CWM or related contamination was reported to have been observed during any subsequent site investigations or disposal actions. The Dames & Moore 1995b report states that Attu Island should not be further considered as a CWM site.

Pyramid Cove, burn barrel and asphalt tar site, Attu. D. Rudis, USFWS

At present, there are 25 warning signs posted around known UXO areas on Attu.

In 2002, the EPA completed an evaluation of the federal facilities on Attu for inclusion on the National Priorities List but determined that Attu was a low priority for listing. While evaluation includes hazardous substance residue from UXO, it does not include an evaluation of UXO explosive hazards (D. Leblang letter to D. Allen and P. Roth, March 8, 2002).

The ACOE conducted an additional reconnaissance visit to Attu in 2010 and continues to investigate cleanup options for these FUD sites as of 2012.

Remedial Planning

In notes from a July 1, 1992, interagency meeting on the *Review Remedial Alternatives Report for Environmental Evaluation at Attu, Amchitka, Kiska, and Great Sitkin Islands, Aleutian Islands, Alaska* held at the Corps of Engineers Offices in Anchorage, a summary of the meeting conclusions stated that, *"All hazardous and toxic waste (HTW) will be removed from the islands while minimizing any adverse effects to historic properties."* To date, that activity has not been completed.

Access to the island is unrestricted. Vessels can and do land at Attu, and visitors travel at will on the island.

A letter from the Service's Alaska Regional Director to the U.S. Army Engineer Division, Huntsville, Alabama, dated May 13, 1996, commented on the 1995 EE/CA and expressed serious concerns with this report and its conclusions. A summary of these comments follows. The EE/CA was not a complete inventory of wastes and was not thorough enough to identify the full extent of the OE and OEW; additional survey data from a 1991 Service report was not included in the EE/CA. The ACOE made an incorrect assumption that there is little chance of contact between the public and the large amount of unexploded ordnance on Attu.

Access to the island is unrestricted. Vessels can and do land at Attu, and visitors travel at will on the island. The standard mariner's guide, the National Oceanic and Atmospheric Administration (NOAA) Coast Pilot, for the Aleutians (vol. 9) does not include any information on OE or UXO hazards on these islands (NOAA Coast Pilot 2012). Institutional controls, particularly signs, do not protect the public, as it is unlikely that signs would remain in place and legible in the harsh Aleutian climate. The ACOE concluded that No Further Action was an acceptable alternative. The Service disagreed that the alternative or implementation of institutional controls would be an effective means to deal with OE exposure on Attu.

In July 2006, the Alaska Department of Environmental Conservation (ADEC) provided review comments to the ACOE on the Attu Draft Final CWM Scoping and Security Report of March 25, 2005, and disagreed with the ACOE that further investigation of potential CWM remaining on the island is impracticable, stating: *"Significant munitions and explosives of concern (MEC) contamination are present along with the potential for CWM or CA. The munitions response area (MRA) warrants prioritization under the Munitions Response Site Prioritization Protocol (MRSPP) and further investigation and remedial action. The ASR recommends detailed investigation into both CWM and OEW."* [Author's note – CA is "Chemical Agent"]

In addition, ADEC recommended that further investigation of Attu Island be planned in the form of a Remedial Investigation and Feasibility Study and include a public involvement plan as part of this process.

The USCG completed a draft Environmental Assessment for LORAN C Station closure (USCG 2012), which describes proposed actions for station closure and potential environmental effects.

U.S. Fish and Wildlife Service Site Visit 2007

Attu site descriptions are from a field visit by the author from May 30 to June 13, 2007. Location identification follows the 1992 E & E *Contamination Assessment Report Attu Island*, prepared for U.S. Army Corps of Engineers, Alaska District. Not all locations described in the E & E report were visited, but representative examples of each type of site were visited and assessed for this report.

Observations were limited to the eastern end of the 300-square-mile island, where the majority of WWII activities occurred and the USCG

maintained a LORAN station (LORAN C). Focus areas of the site visit were Murder Point, Casco Cove, the Peaceful River, various fuel tank farms, Navy Town, Massacre Valley, Chichagof Harbor, Chichagof Point, and some miscellaneous scattered drum groups. The extensive road system on Attu Island has been maintained by the USCG Station south to Murder Point, north to Engineer Hill, and northeast to East Massacre Valley. Transportation to other locations was limited to foot travel, bicycle, or an all-terrain vehicle. Road washouts and area closures associated with ordnance disposal sites and related human safety issues prevented access to some locations.

Sites that were not visited are described from the two E & E 1992 reports and the Dames & Moore 1995 reports, as well as numerous other sources. All sites that were visited, including some of which were not included in the E & E 1992b report, are noted in this document. Although latitude and longitude for each point of interest were taken in the field, an undetermined error made these data points unusable.

Supporting information used in preparation of the following assessment of contaminant sources and issues included literature cited reports, numerous unpublished correspondence from the ACOE office at Fort Richardson in Alaska, the ADEC Web site contaminated sites information, correspondence and other files from the USFWS Alaska Region Division of Realty, and other miscellaneous sources. Despite a number of previous studies, the extent of characterization at many Attu sites is limited, and it is likely that new issues will be discovered as more rigorous site investigations are completed.

Present day Navy Town from Google Earth

Attu Island Contaminant Sources and Issues

Given its pivotal role during WWII, including Japanese occupation and the subsequent bloody battle to retake the island, both U.S. and Japanese forces introduced contaminants into the environment. The majority of known contaminant issues, however, are associated with the U.S. military forces, which constructed a number of installations and associated infrastructure on the island. Over time, these facilities released contamination into the environment. Remediation of these DoD contaminated sites will be conducted under the auspices of the ACOE DERP-FUDS program.

Following is a compilation of material from summaries of known contaminant issues at former Army

Navy personnel attemped to burn Navy Town fuel tanks in August 1970.

and Navy installations on Attu. Material is primarily from ACOE documentation, and particularly from the 1993 Defense Environmental Restoration Program – Formerly Used Defense Sites (DERP-FUDS) Inventory Project Report (ACOE 1993).

Current remains of the Navy Town fueling facility include 105 large fuel tanks from the original 135 tanks, with capacities from 48,000 to 380,000 gallons, thousands of feet of pipelines, a set of beach front manifolds, and two pump stations. Only two of these large tanks are intact and may contain product. Bunker C and diesel grades were the primary fuels used. There is considerable POL contamination surrounding many of the tanks, including stained soils, fuel sheens on surface waters, POL odors, and stressed vegetation coated with a black petroleum product. Soil berms constructed around the tanks have accumulated POL-contaminated pooled water, sometimes over three feet deep. Most of the pipelines are broken or are rusted through and may contain POL residue. Manifolds and valves at the pump stations are still coated with viscous black POL (probably Bunker C). POL contamination is extensive, primarily due to the August 1970 attempt by the Navy to burn remaining fuel in Navy Town storage tanks, pipelines, and other petroleum deposits. Another potential source for POL and other toxic substances are the sewer lines, which could have had these substances dumped into them by military personnel.

Piles of 55-gallon barrels are scattered throughout the eastern portion of Attu, with surrounding soils typically stained, vegetation stressed, and surface waters exhibiting fuel sheen. Based on visual observations, it appears that less than 10 percent of the 55-gallon drum sites are intact and may contain product. There were also 52 other (600–800-gallon) above-ground storage tanks, some of which were fully or partially full with a very thick POL product. Additional standpipes for underground storage tanks were noted in several areas.

Electrical transformers were found, but based on past laboratory analyses, none have been confirmed to still contain PCB-containing oil. Based upon results of samples obtained by an ACOE contractor in 1991, stained soils are contaminated with oil and diesel, typically in the 10,000 to 50,000 ppm range and as high as 620,000 ppm. Lead contamination of soil is also prevalent, with higher concentrations reported in the range of 600 to 1,420 ppm (E & E 1992b). An unknown material sampled from

a container had lead at 33,800 ppm. Soil samples collected at Murder Point near several demolished batteries had an estimated lead concentration of 58,900 ppm, and a sample from a demolished and burned building with electric circuitry had a concentration of 67,000 ppm (E & E 1992b). Other contaminants found in Attu soil samples that were above cleanup levels include chromium, arsenic, asbestos, barium, PCB, and PAHs. Dioxins were found in burned building rubble at Chichagof Point (E & E 1992b). Surface waters at Navy Town contain elevated levels of diesel and oil (E & E 1992b).

Previous investigation and demolition teams found 100-pound Army practice bombs, smoke pots, smoke generators, rifle smoke grenades, flares, fuzes, barrage rockets, 250- and 500-pound projectiles, incendiary bombs and bomblets, 6-, 10-, 12-, and 14-inch projectiles, small arms ammunition up to .50-caliber, high explosive anti-tank and high explosive incendiary rounds, fragmentation bombs, 20 mm (high explosive), and 40 mm warheads.

Hundreds of tons of OEW remain on the eastern section of the island, particularly in the ordnance disposal site in Peaceful Valley between the Peaceful River and the east-west airstrip. This site has also been described as the ordnance area west of Casco Field; it was estimated at 450 acres and divided into 24 OEW burn sites (Dames & Moore 1995a). See Figure 5. OEW kickouts were distributed around each of the sites. A 1976 Navy effort to collect and dispose of OEW failed; the ordnance was stockpiled and detonated, but most of the ordnance was scattered and not exploded. This was not the first disposal effort, as the 1976 report noted heavy OEW surface contamination from previous improper disposal jobs. A 1991 survey by the Navy found large amounts of OEW in Peaceful Valley and scattered occurrences elsewhere. Previous investigation and demolition teams found 100-pound Army practice bombs, smoke pots, smoke generators, rifle smoke grenades, flares, fuzes, barrage rockets, 250- and 500-pound projectiles, incendiary bombs and bomblets, 6-, 10-, 12-, and 14-inch projectiles, small arms ammunition up to .50-caliber, high explosive anti-tank and high explosive incendiary rounds, fragmentation bombs, 20 mm (high explosive), and 40 mm warheads. Dames and Moore (1995a) provided additional documentation of the previously described OEW with estimations of the volume of these materials and descriptions of each of the 24 OEW burn sites. These included a site with thousands of mostly live exposed fuzes, boosters, and drums with potentially bulk high explosive (at a drum burn site); a site with an estimated 100 incendiary bombs (500 pounds each) and smoke generators that may contain chemicals; and a site with a 25-foot by 50-foot stack of partially burned crates containing five-inch rocket igniters and fins.

Anti-personnel mines and ordnance were reported to be present in the Zwinge Valley area in the Dames & Moore (1995a) report. Seven OEW burn sites were identified in an estimated 250-acre area. The largest site contained a large quantity of projectiles with UXO found up to 1,500 feet away. Live UXO was identified at all burn sites and included rounds, smoke grenades, projectiles, fuzes, propellant charge casings, and residue.

Ordnance was also found at three burn sites at Alexai Point. These burn sites had nose and tail fuzes, .50- and .30-caliber ammunition, and 20 mm high explosive incendiary rounds.

The potential for underwater UXO hazards exists in lakes and nearshore areas from combat and bombing operations. UXO may

A derelict vessel sits in Chichagof Harbor, Attu. D. Rudis USFWS

be present in Massacre Bay, Chichagof Harbor, and Holtz Bay, as well as Red Beach and Austin Cove from assault activities (Dames & Moore 1995a). Allied landing craft were sunk while landing troops and supplies; Japanese fired torpedoes and bombed American ships. The U.S. mine layer *Pruitt* was present during the Battle of Attu. When food supplies ran low, U.S. soldiers tossed hand grenades into the surf to kill fish. No underwater investigations have been performed to date.

Chemical warfare artillery and bombs in the form of mustard gas (M47A2 bombs) and Lewisite (M33 bombs) were stored on Attu but were removed from the island for disposal.

Lead batteries remain on the vessel at Chichagof Harbor, Attu. D. Rudis USFWS

The Attu Island military site was determined to be formerly used by DoD; it has both HTRW and OEW categories of hazardous waste, as stated in the DERP-FUDS 1993 Inventory Project Report. As such, the site is eligible for funding under the DERP-FUDS program. The containerized hazardous, toxic, and radioactive wastes (CON/HTRW) were determined to be released by DoD after the occurrence of "acts of war."

U.S. Coast Guard LORAN A and C Stations

The USCG LORAN C Station was active through 2010 and supported 20 staff. The LORAN C Station Attu property boundaries extend from south of the old east-west runway to Casco Bay, west to about 3,200 feet from the center of the present north-south runway, and north to above the active landfill (see Figure 3). Station property boundaries include some of the known WWII hazardous waste areas. During the summer of 2007, a Preliminary Environmental Impact Statement of the USCG property was initiated; the project contractor was Engineering and Environmental Management, Inc.

All hazardous waste from the LORAN C Station was shipped off island for proper disposal. Garbage and burnable trash was incinerated, and remaining ash, biosolids, and other camp domestic or municipal waste was transported to the ADEC permitted landfill (permit number SWGP CAMP-06). The ADEC 2008 landfill permit was revoked, and the landfill was closed in the summer of 2010 upon the LORAN C Station closure (C. Dunkin, ADEC, pers. comm.). Aluminum and some other metals were recycled. There was also a one-time construction debris disposal permit issued to the USCG. Hazardous materials were

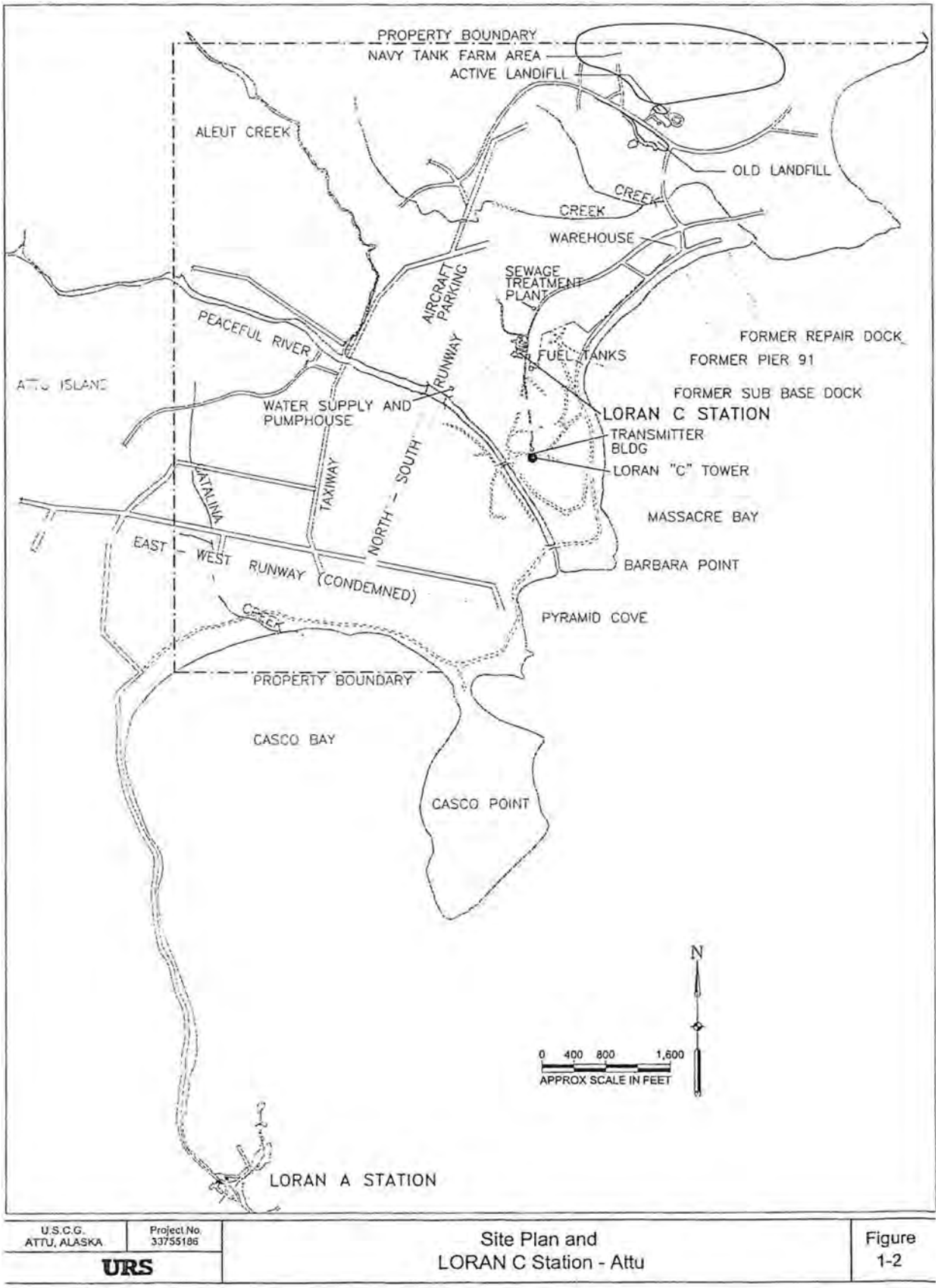


Figure 3. U.S. Coast Guard LORAN C Station

stored in a standard, regulation hazardous storage container located near the fuel tank area.

A description of all site-hardening activities performed after Station C closure are included in the USCG Draft Environmental Assessment for LORAN Station C

The summarized station closure activities were as follows:

> USCG is proposing to terminate the land withdrawal and relinquish the property back to the BLM, another federal agency, or a non-federal entity. Prior to relinquishment, the USCG was statutorily obligated to harden the site as mandated by Congress in Public Law 111-83. LORAN C Station Attu was hardened in accordance with Base Realignment and Closure Maintenance Service Level III. The site-hardening process was initiated when the international LORAN signal at Attu was turned off on August 1, 2010, prior to tower demolition. The majority of the site-hardening process began two weeks later and included the demolition and disposal of sensitive site infrastructure, communications equipment, hazardous materials, and security systems. Site-hardening procedures were completed in September 2010, with the exception of remediation activities. Remediation activities, such as landfill cleanup and tank farm removal, will continue over the next several years. Site hardening is considered a nondiscretionary action and does not require National Environmental Policy Act analysis.

A description of all site-hardening activities performed after Station C closure are included in the USCG Draft Environmental Assessment for LORAN Station C (USGG 2012). All of the ASTs at the LORAN C Station were cleaned and closed in 2010 (disconnected from distribution piping and blank flanges installed) in accordance with American Petroleum Institute standards; the tanks remain in place (USCG 2012). A 30-gallon gasoline tank for refueling vehicles was kept in an enclosed building designed for fuel storage. The closed fuel tank area has 10 ASTs (25,000 gallons each) that held a total of 250,000 gallons of diesel fuel. There are also five 30,000-gallon diesel ASTs. The fuel tank area has a cement floor and berm and is appropriately signed. Fuel was delivered once per year each May; pipe inspection occurred at that time. During fuel delivery, the barge was boomed and containment equipment was staged for spill response.

Sewage treatment for the station consisted of a mixer unit, chlorination and dechlorination chambers, and leach field and outfall pipe. Sewage was stirred in the mixer for 10 to 14 hours, piped to the chlorination chamber for approximately nine hours and then dechlorinated for about four hours before discharge to Pyramid Cove. The treated sewage was authorized by ADEC, Alaska Pollution Discharge Elimination System permit AK-002063. The permit was cancelled in December 2010 (D. Wilkinson, USCG, pers. comm.). Remaining solids from the tanks were landfilled.

ADECs Contaminated Sites Program records include leaking underground storage tank site spill reports for both of the USCG LORAN stations. LORAN C Station had a heating oil release in 1990, but no records could be found on the amount of oil released. The contaminated soil was excavated and stockpiled on-site with no remediation

of contaminated soil. The spill area was subsequently backfilled. The volume of POL-contaminated soil was estimated at 14,800 cubic yards (S. de Vries memorandum to J. Martin, December 16, 1998). The old underground storage tanks (USTs) were replaced with ASTs.

At LORAN A Station, three leaking USTs and related diesel range organic contaminated soils (that exceeded the hydrocarbon-specific cleanup level to protect migration to groundwater) were removed in 2002, and it is unknown if the soil was treated on-site.

ADEC records indicate that there are several known petroleum-contaminated areas at this site located: 1) between the new and old generator buildings; 2) near the bulk fuel containment area; 3) at the ground surface discharge location of 15,000 gallons of benzene-contaminated water; and 4) on the north side of station.

Multiple releases of hazardous substances have been reported at LORAN-C Station Attu throughout its history.

These records also indicate that the USCG created stockpiles of unknown volumes of petroleum-contaminated soil as the result of excavation activities associated with past construction projects at the station.

Other known and potential contamination concerns include heavy metals in soils and in groundwater and surface water (primarily lead from the use of lead-based paint on structures and at the small arms firing range), PCBs in soils due to transformers used on-site that were determined to not be PCB-free, and petroleum in soils and in groundwater and surface water.

The Draft Environmental Assessment for LORAN Station C (USGG 2012) included the following statements:

> The most recent survey for lead based paint (LBP) at LORAN-C Station Attu was conducted in 2005. LBP was detected at several buildings at the station on various surfaces including wood and metal doors and door jams, interior and exterior walls, and concrete foundations. LBP abatement was not conducted during site-hardening activities; therefore, these materials remain undisturbed at the station.
>
> Multiple releases of hazardous substances have been reported at LORAN-C Station Attu throughout its history. As of 2010, there were seven ongoing environmental action projects at LORAN-C Station Attu, including soil contamination, storage of contaminated water, contamination in the small arms firing range, and leaking underground storage tanks. Remediation would likely involve landspreading, or spreading the soil over non-environmentally sensitive areas and allowing biological activity and aeration to decompose the contaminants. These ongoing remediation projects address known contamination; however, it is likely that undocumented contamination exists. Phase I and Phase II Environmental Due Diligence Audits are recommended for the site. The USCG's remediation activities are regulated under CERCLA and Alaska Administrative Code (18 AAC 75).
>
> At least three separate asbestos containing materials (ACM)

WWII equipment remains at Murder Point on Attu. D. Rudis, USFWS

surveys have been conducted at LORAN-C Station Attu in the past 15 years. The most recent ACM survey was conducted in 2005 and identified ACMs at several buildings at the station. Examples of ACM items at the station include roofing materials, cable run covers, wall sheeting, fire doors, and floor tiles. Asbestos abatement was not conducted during site-hardening activities; therefore, these materials remain undisturbed at the station.

LORAN A Station is located at Murder Point. These structures are in complete disrepair and constitute a safety hazard (author's personal observation). In 1998, the Environmental Contaminants Specialist in the Anchorage Field Office summarized concerns about LORAN A Station to the refuge Manager of Alaska Maritime NWR (S. de Vries memorandum to J. Martin, December 16, 1998). This included concerns about lead paint (5,000 ppm lead concentration), friable asbestos, three 10,000-gallon USTs, and an AST with bullet holes in the bottom with probable POL underneath. She also noted transformers were still present on the sides of buildings and on a pole. Soil sampling did not reveal any PCBs, but resampling was recommended. If these LORAN station properties are returned to the refuge, it would be important to have a full contaminants assessment done before revocation of the existing land withdrawal.

The following section describes the Attu WWII sites that are known to be or are suspected to be contaminated. Individual site figures are from either E & E or Dames & Moore reports.

Casco Cove and Casco Point

Casco Cove

Bluffs are located along the perimeter of this site. The rocky bluffs extend into the bay, and the area has generally rocky beaches from 20 to 50 feet wide. Sites identified in the E & E 1992b report were located on a vegetated bench above the beach (see Figure 4). Vegetation was primarily grasses and maritime tundra, and the area was dotted with numerous small scattered pocket wetlands. The gravel beach had large rocks bedrock outcroppings. Wildlife consists of waterfowl and seabird use of the beach and nearshore area, including the dock remains. Species include common eider, harlequin duck, pelagic cormorant, tufted puffin, pigeon guillemot, and glaucous winged gull. Passerines noted in upland habitat are Lapland longspurs and song sparrows.

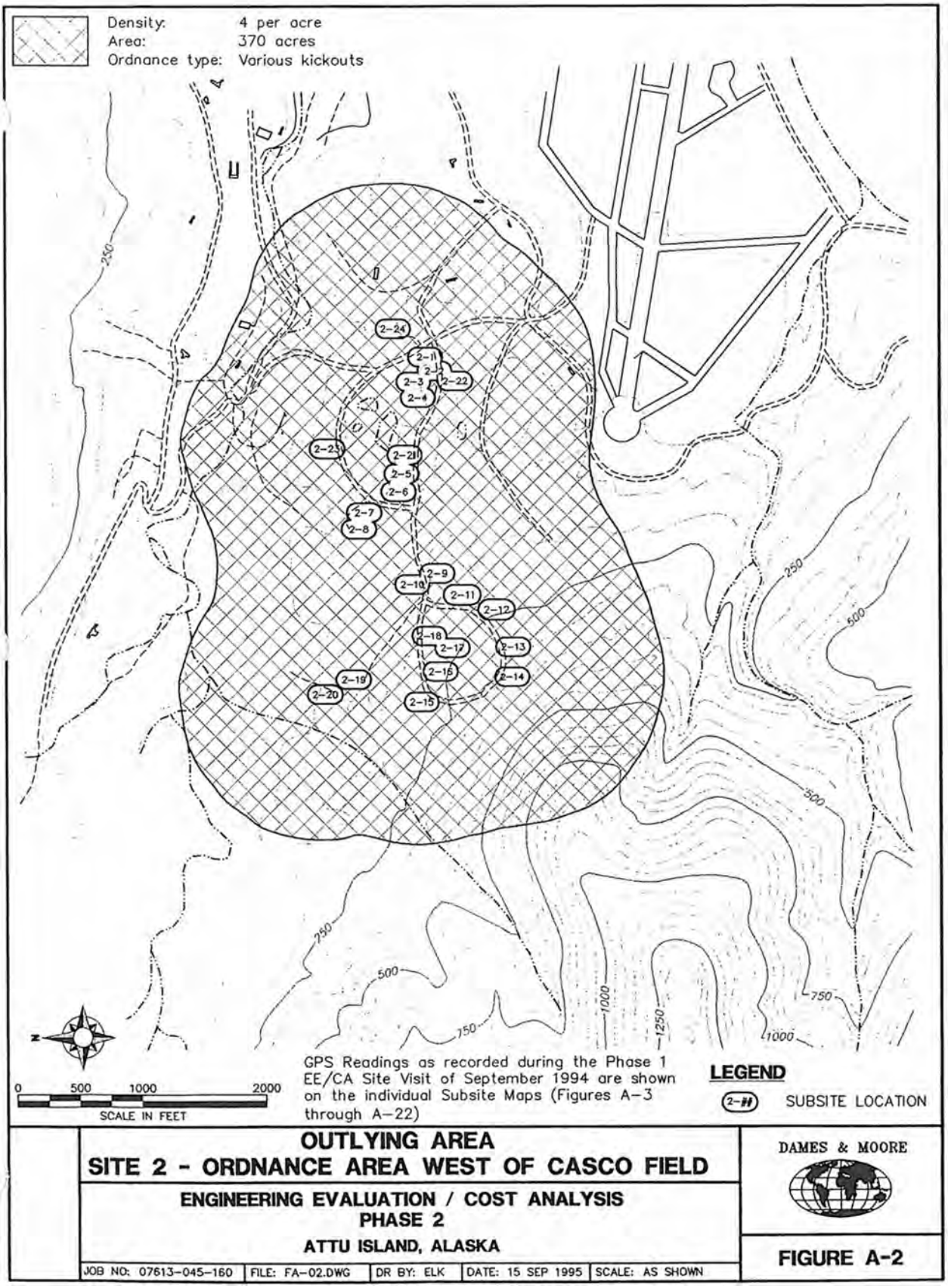


Figure 4. Casco Cove Point, Attu

A beach equipment bone yard with tractors and other metal and vehicle debris are at this location. These vehicles would have contained lead acid batteries, a potential source of lead contamination. Stained soils were not noted during the site visit, but fluids that drained from the abandoned equipment could result in subsurface soil contamination

Wooden and cement dock remnants extend from the shore. The dock is not useable for vessels.

Drum Group 3 has at least 40 corroded drums. Drums are in the stream mouth and salmon were observed spawning among the drums.

Casco Cove Drum Group 4 is a large drum pile with approximately 4,000 drums (E & E 1992b). All drums noted were corroded, rusted, and empty in 2007. Drums are scattered throughout area, but no product was seen in the down slope ditch, however contaminants could be present below surface. E & E collected 12 surface soil samples throughout this area and found elevated levels (see Table 1) of diesel (3,600 mg/kg), the PAHs acenaphthylene (23 mg/kg), and naphthalene (12 mg/kg); and lead (792 mg/kg).

In the Casco Cove area E & E collected two samples of a white crystalline powder from Drum Group 1 (Figure 4) and reported lead at 483 to 2,060 mg/kg. A soil sample collected by E & E from Casco Cove had 1,420 mg/kg lead. There were three surface water samples collected in this area, all from one location. No contamination was detected. This limited sample effort is inadequate to characterize soil and surface water contamination in the Casco Cove area.

A wooden platform and a building remnant debris pile remain at this site.

Casco Point

Collapsed wooden structures and metal debris piles are present; any contamination could be below ground surface.

There is a former boiler house along the road on the northwest shore; contamination potential there is unknown.

Drum Group 3 has at least 40 corroded drums. Drums are in the stream mouth and salmon were observed spawning among the drums (E & E 1992b). No surficial soil staining or sheens were noted; contamination could occur below ground surface.

Quonset hut remains and stained soil are present.

Ordnance Magazines Northwest of Casco Point

The following site information is from the 1995 Dames and Moore report. The site was not visited in 2007 by the author, as it is considered off-limits due to safety reasons.

The magazines are located in lower Peaceful Valley, a bowl surrounded by low hills covered with thick vegetation. The site is on a rolling bench and is vegetated where human disturbance has not eliminated ground cover. There are two major OEW burn sites with 24 specific locations, estimated at 450 acres. There are several ponds in this area. Most burn

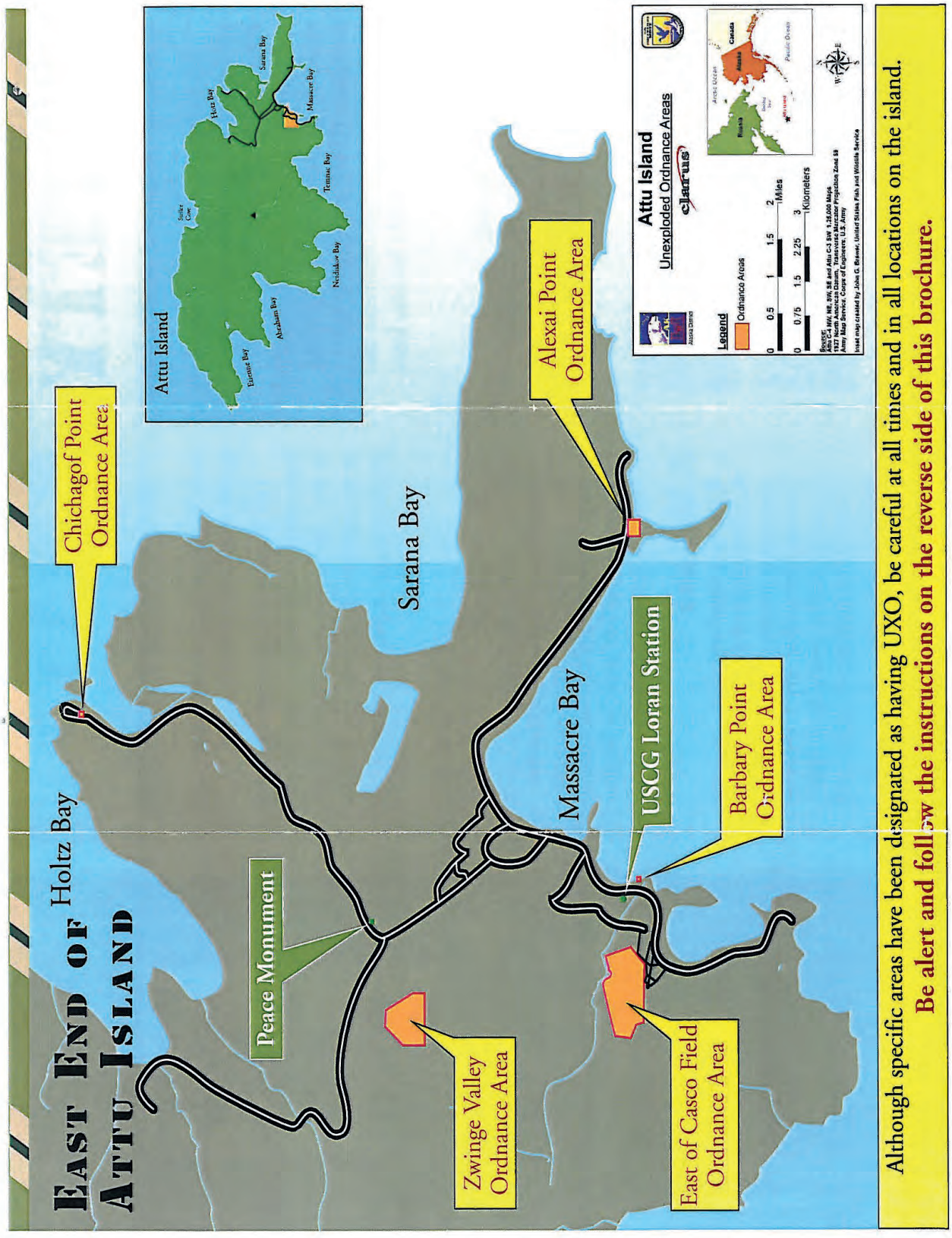


Figure 5. Attu Known Ordnance Concentration Areas

sites are barren open areas without vegetation; some sites are surrounded by berms.

This area was the disposal location for ordnance that was not removed from Attu during removal actions in 1976 and 1991. Disposal actions were through burning and detonation, which resulted in OEW kickouts scattered throughout the overall site. Kickouts included 4.5-inch finned barrage rockets, 75 mm rockets, 20 mm high explosive incendiary rounds, fuzes, 500-pound incendiary bombs, and four-pound incendiary bomblets. The 24 OEW burn sites were individually investigated, located on field maps, inventoried, and documented (Dames and Moore 1995a). No evidence of toxic chemical warfare agents was found during this effort.

Fuel Tank Farms

The four fuel tank farms were visited by the ACOE and its contractors in September 1994 (ACOE 1994). Their trip purpose was to inspect the sites for unexploded ordnance and other explosive hazards and determine if tank removal was warranted. Among the four tank farms were 135 tanks of various sizes. At that time, they found 11 of the 135 tanks standing but rusted through, 19 blown up and creating large metal piles, and 105 collapsed or burned. Some tanks are on gravel or asphalt pads. Additional notes from the Dames & Moore site visit are included in each of the four tank farm descriptions. Field observations on tank locations visited by the author in 2007 are included in the following site descriptions.

Fuel Tank Farm 1

Tank area 1 and spill, Attu. D. Rudis, USFWS.

This area, located west below the runway, consists of eight abandoned fuel storage tanks with subsurface vaults. This is the closest of the four tank farms to the USCG LORAN station. There is an 8- to 10-inch diameter pipe distribution system. The eight 30-foot diameter by nine foot high above ground tanks are each surrounded by an earthen berm. E & E collected two soil samples from this area. Sampling results from 1992 did not detect contamination that exceeded State standards. One soil sample contained 130 mg/kg oil, 0.4 mg/kg phenanthrene, and 0.3 mg/kg pyrene. A sample collected from the bottom of pooled water within a bermed tank area had 0.5 mg/kg naphthalene, 28 mg/kg mineral spirits, and 250 mg/kg oil. See Figure 4-2 in E & E 1992b

Fuel tank at fuel tank farm 2. These tanks were burned in an unsuccessful attempt to remove remaining fuel. D. Rudis, USFWS

report. The 1994 ACOE report did not note any POL contamination at this tank farm. The habitat is maritime tundra with scattered pocket wetlands and drainages throughout the area.

Within Tank Farm 1 is a large wooden foundation (about 70 feet by 100 feet) with at least a dozen barrels; pooled oily water was observed adjacent to the structure during the 2007 visit. A pallet of about six broken batteries was surrounded by stained soil; stressed vegetation was observed adjacent to the front of the wooden structure.

E & E (1992b) reported a water sample with 5,140 ug/L diesel and 9,220 ug/L oil. Lead was estimated at 4 ug/L and fluoranthene at 3 ug/L. Based on State of Alaska Water Quality Criteria, lead criteria are hardness dependent, and that measurement was not included in the ACOE report. Alaska Water Quality Criteria for fluoranthene is zero for freshwater aquatic life. A soil sample near the batteries had 2,100 mg/kg oil, 84 mg/kg lead, and 8 mg/kg chromium (metals were below State of Alaska soil cleanup levels; see Table 1).

Only cement walls and base of a building remain in Tank Farm 1. Fuel drums were present, but their condition was not noted. It was unclear which structure this was in the E & E (1992b) report.

Fuel Tank Farm 2

Tank Farm 2 follows the contour of the south side of Coast Artillery Hill. The area consists of a pump station and 20 steel fuel tanks, each about 60 feet in diameter and 18 feet in height. Tank numbers in the E & E 1992b report are NT-1 through NT-15. Tanks are paired and are located within excavated areas surrounded by soil berms constructed on the downhill side. In 2007, three tanks were intact but had rust holes, and all other tanks were collapsed. Some tanks had been blown up, and there was fire evidence on some of the tanks. There are also eight additional smaller tanks that were totally crushed.

The 1994 ACOE report noted POL contamination at five large fuel tanks that were not included in the 1992b E & E report. That site visit report noted an oily discharge that was flowing into a stream from the berm around one of these formerly unmapped tanks. Our 2007 site visit found oil sheening and stained soil at four locations within this tank farm complex.

The most notable area of petroleum contamination observed in 2007 was found at the pump station area. This pump station was not noted in the E & E 1992b report or in the 1994 ACOE report. Pump station pipes leaked black oil, coating vegetation and forming petroleum product pools and sheen. In 2007, an oily sheen and black oil surface pools were found on adjacent and down slope waters, and the area had a strong fuel odor. Just above the pump station was an area of heavy petroleum contamination, forming a tar pond approximately 100 feet or more in length.

Around the platform/base of the pump station were areas of heavy soil discoloration and stressed vegetation. The ACOE 1994 report noted 52 ASTs, with 10 having at least some POL product remaining. They estimated the POL-covered area around the large group of ASTs covered about 1,000 square feet.

Following the stream down slope from the pump station, a product discharge area was found in the creek bank where the black petroleum product flowed into the unnamed stream. Black, viscous oil was found downstream, coating vegetation along the stream bank in discrete deposits; most oil splotches observed in 2007 were less than 12 inches in diameter. Oil deposits continued at least 100 feet downstream. It appeared these oil splotches were deposited during high stream flows on the stream bank grassy bench. Any birds using this area could be at risk from the oil. This oil could easily stick to bird feathers, causing injury or death. Preening birds can also ingest oil, causing direct toxicity or oil transfer to eggs, resulting in egg death.

WWII fuel tanks are located on the hillside above Lake Elwood on Attu. D. Rudis, USFWS

A soil sample collected by E & E (1992b) at the base of Tank NT-4 had 260,000 mg/kg oil (well above State of Alaska soil cleanup level) and chromium at 13 mg/kg, which was well below the soil cleanup level (see Table 1).

Fuel Tank Farm 3

This large tank farm consisting of 54 tanks is located on the northwest flank of Coast Artillery Hill. Tanks were about 40 feet in diameter by 16 feet in height

and were surrounded by earthen berms in sets of two; all tanks were collapsed when visited in 2007. The tanks were arranged in four tiers on the hillside. E & E reported no visible contamination in the top two tiers of tanks, and none was observed during the 2007 site visit. Both the 2007 site visit and E & E work in 1992 found evidence of petroleum contamination from the lower two tiers of tanks. Pooled water within the bermed areas of these tanks typically exhibited surface sheens. Sediments generated rainbow sheen and produced POL bubbles when disturbed. Some tank runoff and pooled product areas had stressed vegetation.

E & E reported that surface water samples from drainages by the tank sets indicated that petroleum compounds were being released to at least two drainage locations.

Sheen was noted at additional down slope drainage areas in the wetland below the tanks; this flow drains into Lake Elwood. Waterfowl observed in Lake Elwood included common eider, red-throated loon, red-breasted merganser, mallard duck, Aleutian Canada goose, pintail, and common loon. Aleutian Canada geese nest on the slopes adjacent to the tank farm. Lapland longspurs were the only passerine species noted in the tank farm area.

Diesel and oil (quantified using hydraulic oil as a standard) were the primary compounds detected in soil samples collected by E & E. Highest soil hydrocarbon compound concentrations were at Navy Town Artillery Hill at Fuel Tank Farm 3 at tanks NT-28 (26,700 mg/kg), NT-26 (12,000 mg/kg), NT-31 (19,000 mg/kg) and NT-32 (13,200 mg/kg). Arsenic and lead were also detected, with the highest arsenic concentrations at 160 mg/kg and lead at 603 mg/kg. E & E reported that surface water samples from drainages by the tank sets indicated that petroleum compounds were being released to at least two drainage locations. One sample had diesel fuel at 353 ug/L; another water sample was at 3,230 ug/L. Three tank sets were observed draining into adjacent wetlands in 2007.

Tank Location Notes from 2007

Middle tier and upper tier tank locations did not have obvious stressed vegetation or discolored soil. Tank numbers on the E & E map are NT-16 through NT-34. The top tier of tanks was not numbered. Lower two-tier tank locations generally had sheen and/or petroleum odor present. The ACOE 1994 report only noted POL contamination at NT-25 and NT-28.

Fuel Tank Farm 4

This site is located at the base of the north side of Terrible Mountain and above Lake Elwood. Drainage from this tank farm is down to Lake Elwood. This area was not visited during the author's 2007 site visit. There are 11 paired 40 foot by 16 foot fuel tanks and one single tank in this area. Tanks are arranged in two tiers. E & E collected three soil samples in this area, with the highest petroleum compounds detected at 200 mg/kg. Tank numbers from the E & E 1992 report are NT-37 through NT-48. The 1994 ACOE report did not report any sign of POL contamination at this site. They noted that all tanks were flattened.

Navy Town remains, Attu. D. Rudis, USFWS

Remains of a Navy Town paint shop. D. Rudis, USFWS.

Navy Town

This extensive area has numerous WWII structural building remains; almost all had collapsed at the time of the 2007 site visit. Building debris is present throughout the area, as are scattered rusted fuel drums and tanks. Following are descriptions of some of the more notable sites.

The Navy Cove rock jetty to Loaf Island had old vehicles lining the inside of the jetty forming the breakwater support. No sheen or contaminants were seen on the rocks or water.

A large wooden foundation located near the USCG warehouse had oil slicks present on adjacent pooled water. Some stressed vegetation was noted. The E & E 1992 water sample from this location had oil at 9,220 ug/L and diesel at 5,140 ug/L. There were six large split battery casings in this area and soil was discolored. The size of this discolored area was estimated at 5 feet by 10 feet. A soil sample E & E collected from this area had oil at 2,100 mg/kg, lead at 84 mg/kg, and chromium at 8 mg/kg.

A group of over 40 corroded, medium-sized barrels containing a white-gray crystalline substance were stacked in a collapsed wooden frame. E & E labeled this site Drum Group 1, sample 011SL. Their analyses indicated this substance was an inorganic calcium salt, with lead at 292 mg/kg.

A WWII-period personnel equipment and netting debris pile contained discarded gas masks and numerous other canvas, rubber, metal, and plastic items. Wooden building platforms, wire cable piles, and other building and fuel tank remains were present.

This former paint storage area consisted of a wooden platform with solidified multi-colored paint piles remaining after paint cans had rusted away. Most paints used during WWII contained lead. Adjacent standing water had a small sheen area (approximately six inches by three inches); some stressed vegetation was also noted. This area was located approximately 80 to 100 feet from a creek. The E & E 1992 soil sample that was collected down slope had 250 mg/kg oil, 569 mg/kg lead, and 24 mg/kg chromium.

Navy Town is the location for the formerly permitted landfill for disposal of incinerated trash and other nonhazardous solid waste from the USCG station. Debris was covered with soil after dumping. Some old debris and barrels either dating from the 1970s or WWII were noted in the vicinity.

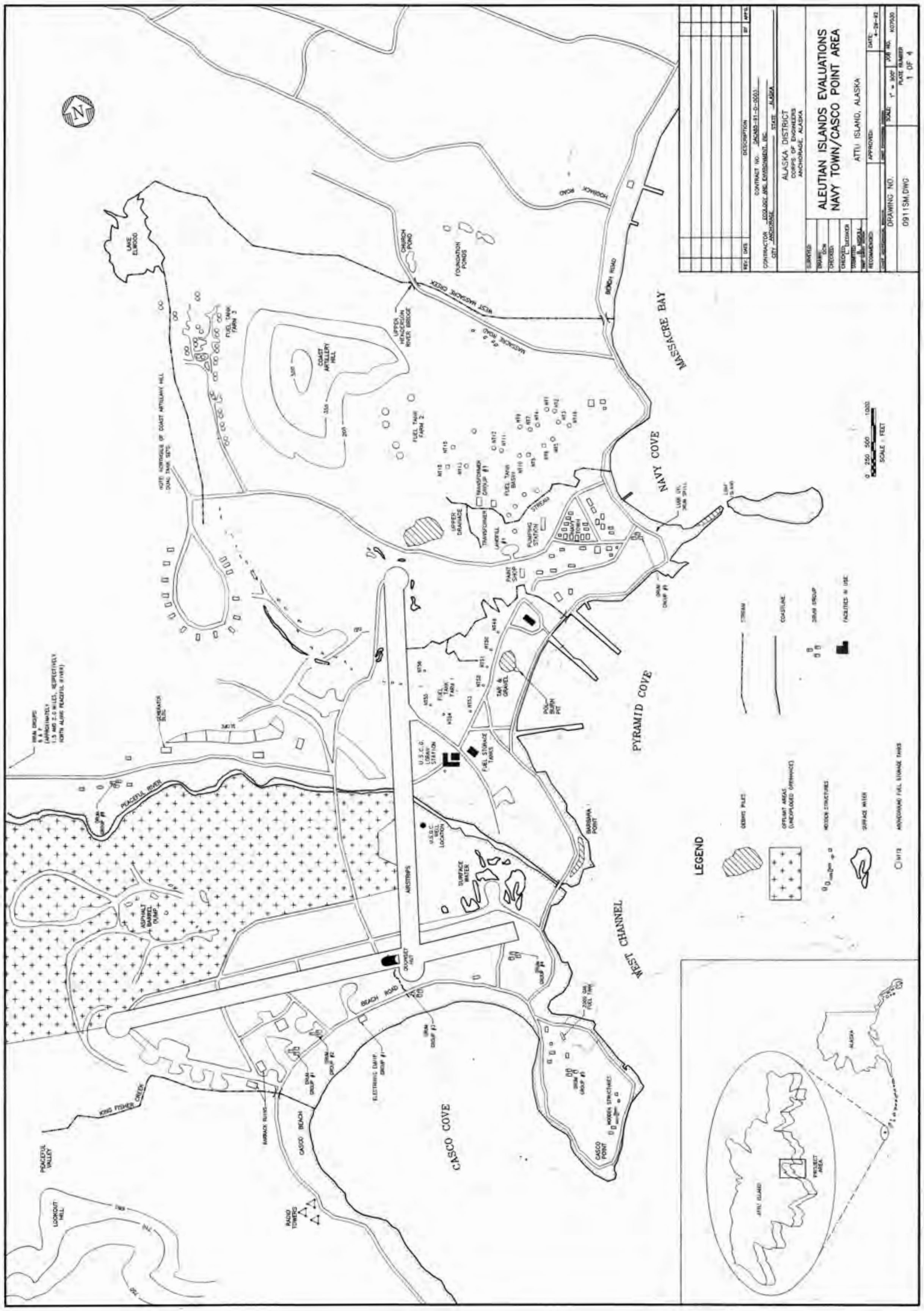


Figure 6. Navy Town and Casco Point, Attu

Birds do get caught in viscous oil and die. This Aleutian Canada goose was found dead in 2012. The interagency review team found carcasses of at least 11 individual geese in this same pool of oil during the 2013 site visit. Photo by John Zugunruhe, Zbird Tours

There is apparently a former landfill area located across the road from the active landfill. The area is completely revegetated and enclosed by soil berms, but some fuel slicks and stained soils were noted in down gradient wetlands. No additional information was found about this site in previous reports, and it is unknown if any soil or water samples were collected during any prior investigations.

A WWII fuel pump station is located below the USCG closed landfill. Cement walls hold in surface water. No surface water contamination was evident within pump station. An oil slick was present down slope.

A fuel tank disposal area included 20 or more tanks, and petroleum product discharge was present around some of the tanks. Product was solidified at the temperature range during the 2007 site visit (42 to 50 degrees F), but flow history was evident from when warmer weather conditions occur. Product depth was estimated at one to two inches in the pooled area around these tanks. Two adjacent pooled product areas were covered with standing water; the present size of these two areas was about 12 feet by 20 feet and 10 feet by 8 feet. This area is a hazard to birds during summer months when the product is in a liquid state. Dr. Bill Taylor, a rock ptarmigan researcher who worked on Attu each spring during 2003 to 2007, had noted geese and ptarmigan with oiled feathers on this area (B. Taylor, pers. comm.). This area is adjacent to a road, permitting vehicle access that would facilitate future cleanup and remediation efforts.

This area was identified as Tank Area 1 by E & E (1992b). E & E sampling of a tar material contained jet fuel at 58,000 mg/kg and oil at 110,000 mg/kg. A soil sample collected within the stressed vegetation area had 170 mg/kg of oil. (Note: a 1992 memo from the ACOE to P. Brokx of E & E stated that there were no jets nor jet fuel when Attu was in use; as jet fuels are closely related to kerosene, it is likely this sample was misidentified.)

A solo fuel tank is adjacent to Tank Area 1. Originating from this tank is an asphalt-like spill area about 50 feet by 8 feet; it also apparently spreads with warm weather conditions, as noted by the flow pattern present. These spills do trap birds as seen in the photo taken in 2012.

A tar and gravel POL burn pit site is located between the USCG station and the warehouse building. There are burned barrel remnants, burned asphalt-like substrate, and an asphalt-like pool with ponded

water. Some of the product apparently flows in warm weather conditions, as noted by the flow pattern present. Some spilled product areas had a more solid, asphalt-like consistency with moss and grass clumps growing on the material. The area covered is at least 300 feet by 100 feet. This site is adjacent to the road along Pyramid Cove.

A burned beverage bottle dump was noted at the location of the wooden platform of the former gymnasium and recreation hall. Barrels that appeared empty were scattered in the adjacent drainage.

Murder Point and Peninsula

The E & E sampling locations (1992b) were not specifically located by the study author in 2007.

Demolished building sites were located on the east side of the road. Some metal debris and barrels were scattered throughout this area. No stressed vegetation or stained soil was noted. Two soil samples collected by E & E from this area in 1992 had extremely high lead levels at 58,900 mg/kg and 67,000 mg/kg, well above the 400 mg/kg State of Alaska soil cleanup level (Table 1). E & E reported several demolished batteries and a burned building with electric circuitry. There are numerous ponds below this area, with large ponds located down slope of the WWII building sites. No stained soil or oil residue was found near the pond immediately down slope of this site.

Demolished radio antennae towers are present on Murder Point. Antennae towers can have lead cable and PCBs from capacitors.

The Murder Point Drum Group was not visited by this author. The E & E 1992 investigation did not find contamination in the soil sample collected at this site.

Interior view of the LORAN A Station, Attu. D. Rudis, USFWS

LORAN A Station

The abandoned former LORAN A Station is incorrectly signed as Service property. This building is derelict and appears unsafe; some interior walls seem unstable; inevitably, salts are leaching from cement; and trash and building debris are in the remaining interior spaces. The former station building houses two large furnaces and associated power panels, old propane tanks, most likely asbestos covered pipes, and discarded barrels, etc. This building is an attractive nuisance for island visitors; it is easily entered but has peeling wall board and ceiling materials, as well as exposed presumed-asbestos insulation. It

should be demolished and waste materials removed. There may be a liability risk in having this building standing and open for public use. The 'no trespassing' signs that are posted do not keep people from exploring this building, based on the numerous graffiti and writings noted inside on the building walls from the past few decades of birders and other visitors.

There is an associated smaller galley/mess building that is only in slightly better condition. Behind this second building there are a series of large tall poles, which may have been associated with radio antennas. Each of these poles has two to three support cables that, although not a hazardous waste, may be a hazard to birds flying in poor visibility conditions. When the LORAN A Station is eventually demolished, these poles and support cables should also be removed.

Because Massacre Valley and Massacre Bay were major supply areas for military operations on Attu, there are a considerable number of building platforms, metal debris, and barrels throughout the area.

Massacre Valley

Because Massacre Valley and Massacre Bay were major supply areas for military operations on Attu, there are a considerable number of building platforms, metal debris, and barrels throughout the area. Most do not appear to have the types of debris associated with hazardous waste sites on Attu, but there are debris piles with barrels and remains of a vehicle service garage (which often served as a source of hydrocarbon contaminants and/or contamination by semi-volatile compounds such as cleaning solvents at other Aleutian sites). E & E investigated and collected samples from five locations on the east side and three sites on the west side of the valley. They found petroleum related compounds and lead. Deteriorating road conditions made field reconnaissance in this area difficult.

A 250-foot stretch of beach north of Barbara Point has a large amount of metal debris, including tractors, vehicle parts, and machinery that appeared to have been bulldozed into this location.

Barrels and lumber piles dominated this debris area. There was petroleum contamination visible in adjacent surface water pools and streams during the 2007 site visit.

The site was identified by E & E as a former vehicle service area. There was a metal debris pile, hydraulic lifts, a barrel cache, and miscellaneous wiring and cable piles. A partially weathered oil patch was present, but adjacent streams on each side of the site did not exhibit an oily sheen in 2007. The E & E soil sample had POL at 2,280 mg/kg and lead at 84 mg/kg.

Building debris and large cans were found, but no surficial contamination was observed.

A remaining debris pile may be the pile sampled by E & E in 1992b report. They found residual soil contamination of lead at 2,750 mg/kg, oil at 860 mg/kg, and chromium at 137 mg/kg in one sample (chromium was below the State of Alaska soil cleanup level). The debris pile contained barrels and assorted metal debris. Spilled petroleum product was noted during the E & E site visit.

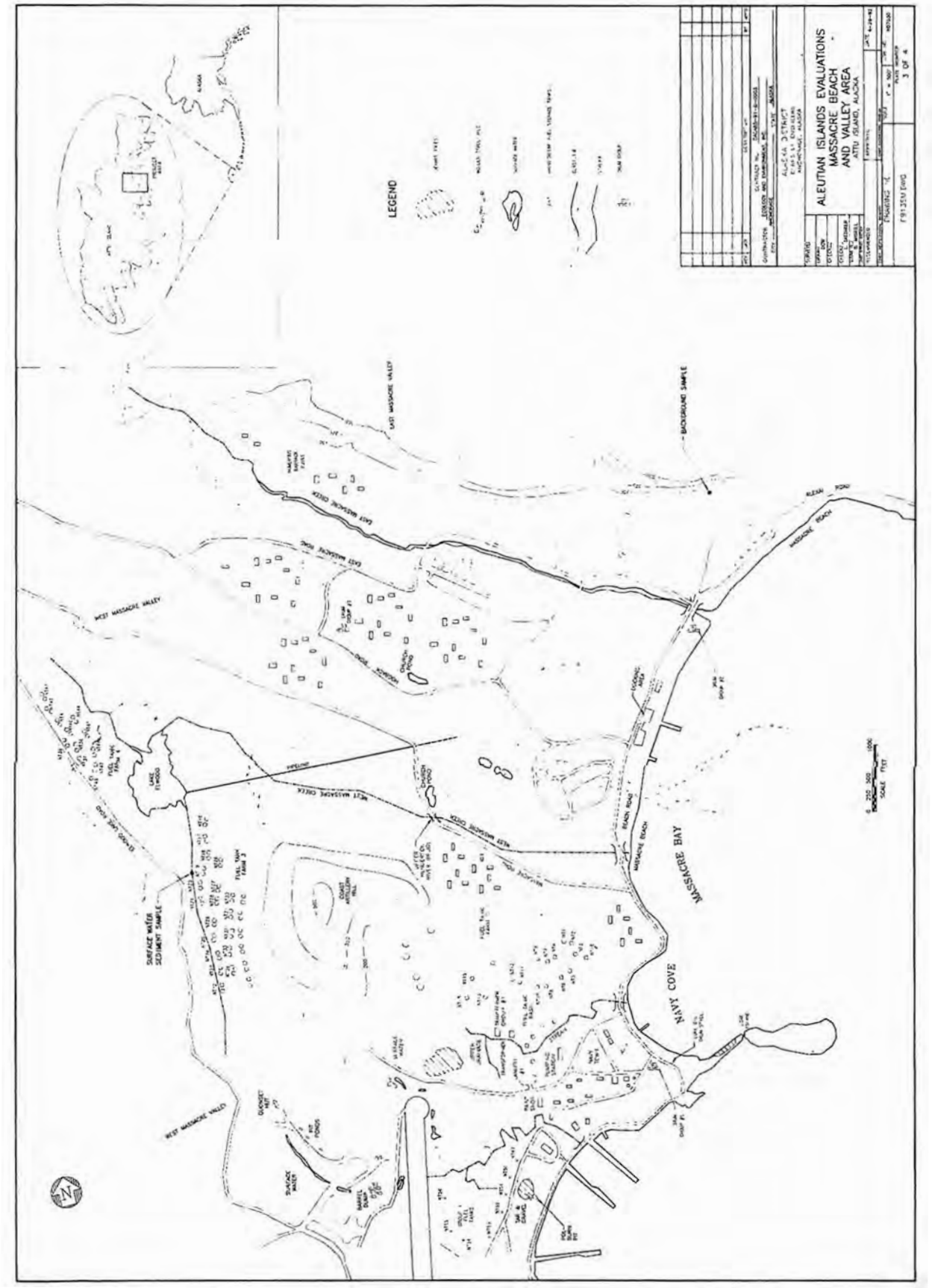


Figure 7. Massacre Bay, Attu

In 2007, the large metal debris pile did not have any obvious surface contamination, stressed vegetation, nor discolored soil that was noted during the E & E site visit.

Other 1992 E & E sampling sites on the east side of Massacre Valley were not located by the author in 2007. They reported an area near a bluff with an open container of a red substance that had 18,700 mg/kg barium, 5,720 mg/kg chromium, and 33,800 mg/kg lead. At a generator foundation, a soil sample that they collected within a stressed vegetation area had 2,820 mg/kg diesel and 3,970 mg/kg oil.

Asphalt POL flow into Peaceful River, Attu. D. Rudis, USFWS

West Massacre Valley sites were not visited during the 2007 USFWS field reconnaissance.

Peaceful River Valley

This is a steep-sided glacial valley about four miles long. The Peaceful River runs through the valley floor and empties into Pyramid Cove.

Approximately 1,500 feet above the north side of the Peaceful River is a large drum group. This may be the site described in the Dames and Moore 1995a report where hundreds of drums were found but not investigated. This site was not accessible in 2007, and it was not possible to determine, from a distance, if there were any leaking drums or surface soil contamination. This drum group is near or in the ordnance disposal restricted area. E & E named this the upper Peaceful River Drum Group and collected six surface soils samples at this site. Lead was detected in two samples at concentrations of 122 and 170 mg/kg (see p 5-11 in E & E 1992b).

Pyramid Cove, burn barrel, and asphalt tar site, Attu. D. Rudis, USFWS

Drum groups identified by E & E as Drum Groups 6 and 7 are approximately 1.5 and 2.0 miles north along the Peaceful River.

There is a large coal pile in a wetland area and about 100 feet above a creek. Coal piles can leach iron, manganese, and aluminum pollution into waterways and can cause acid drainage in adjacent waterways.

A barrel dump in this area shows some staining and sheening. An adjacent drainage did not show surface sheen in 2007. E & E collected seven soil samples and one solidified petroleum product

Hillside drainage into Peaceful River below antennae site on Attu. D. Rudis, USFWS

sample from the Peaceful River Valley. That product sample had oil at 98,800 mg/kg.

There is another Peaceful River Valley barrel area with a group of at least 15 drums. A stained soil area with stressed vegetation was approximately six feet by three feet. Additional barrels were scattered throughout the area.

At what is apparently Drum Group 8 as labeled by E & E, there is also a barrel area and barrel burn pile. Located below Drum Group 8, the burn pile is a large, semi-solid, asphalt-like lake that appears to soften with warmer temperatures. There is an extensive petroleum product flow area that continues into the river in some places and pools among the rocks along the river's edge. In the burn pile area are barrel ribs, partial barrels and burned petroleum product.

A hillside is below the antennae array above the Peaceful River. There are three seep areas with down slope drainages into Peaceful River. All three drainages have oil slicks that 'fracture' when disturbed, but there is no odor or stressed vegetation.

Alexai Point and Creek

Alexai Point is at the end of a large spit extending south from the peninsula formed by Gilbert Ridge. A 5,000-foot matting north-south runway was built by the ACOE in 1943. An additional 3,000-foot runway was later constructed. An extensive support and defense area was built from the foot of the point up into Alexai Pass.

There are three OEW burn sites in this area (Dames & Moore 1995a). These sites had dozens of live M103 nose and M100 series tail fuzes, burned and live .30- and .50-caliber ammunition, and 20 mm high explosive incendiary rounds. One of the burn sites had an approximately 80-cubic-foot pile of burned and live .30- and .50-caliber ammunition.

The Dames and Moore report also identified three deteriorated ammunition magazines. Fragments and a fin from a 250-pound bomb were located near the magazines. They reported two concrete structures on a small ridge at the tip of Alexai Point that may have been observation posts or anti-aircraft gun emplacements. They made many contacts with metal detectors throughout this site.

The E & E 1992 investigation found a group of about 30 stacked and corroded drums in this area, flanked by the runways. This poorly drained area had product-stained soils and stressed vegetation. Surface soil samples had elevated diesel (150,000 mg/kg) and flourene (64.5 mg/kg). There are three transformers on a collapsed transformer

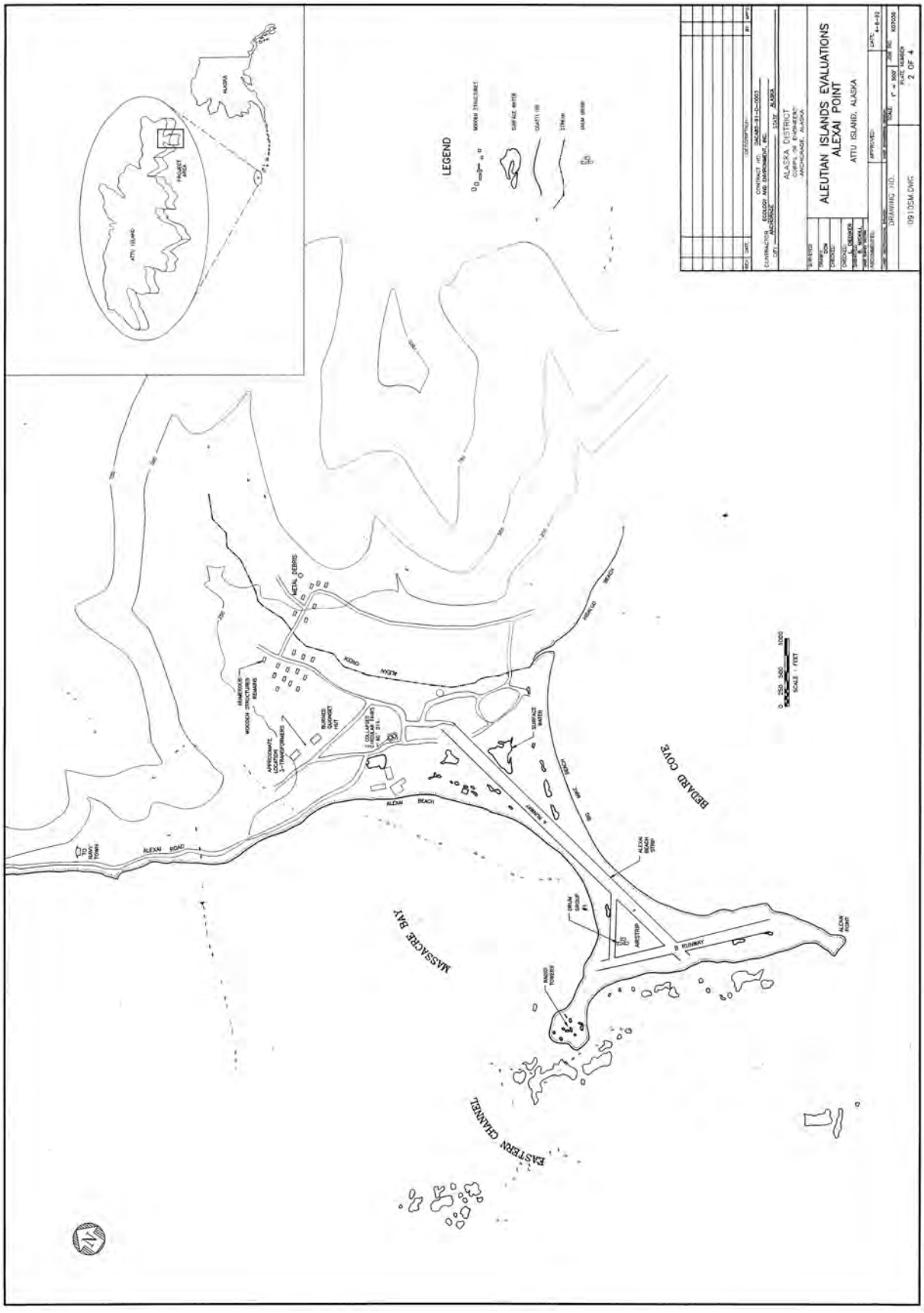


Figure 8. Alexai Point

pole. No PCB contamination was found in a solitary soil sample collected beneath an empty transformer.

Barrel Dump above the North-South Airstrip

A large barrel dump is located near the northern end of the airstrip and is just above Aleut Creek. This area was mapped by E & E as a barrel dump, but no samples were collected. There was an associated asphalt-like substance spill area noted during the 2007 visit. The solidified spill area continues down slope into a grassy area adjacent to Aleut Creek and flows into the creek. A sheen was noted on the creek surface. The solidified product becomes more fluid during warmer conditions, as evident by the flow pattern.

Chichagof Harbor

This area was visited on June 7, 2007 by USCG and USFWS personnel. In the Chichagof Harbor area, there is a group of at least 30 corroded fuel drums. A fuel-stained area is present by the drums, and there are small oily slicks in the emergent wetland near the old Aleut village. This area is about a tenth of a mile from the shoreline. Aleutian Canada geese nest in this area. A large unidentified shipwreck is grounded offshore of Chichagof Harbor.

Kennon Island off the point supports a large tufted puffin colony (approximately 800 individuals were noted during the 2007 site visit). Also seen were over 35 murres and at least 20 glaucous-winged gulls.

A smaller steel barge is wrecked onshore. Remains of nine batteries were observed within the hull on the wreck's starboard side.

Drum groups on either side of the road total over 130 barrels. Petroleum product sheening was present around the barrels and in the adjacent wetland. Vegetation did not appear stressed. A stream in the vicinity showed sheening when the stream sediment was disturbed.

Chichagof Point

E & E (1992b) identified three drum groups in this area and mapped remains of steel structures and cement foundations. Five soil samples and one water sample were collected in this area. At Drum Group 2, lead was detected in a soil sample at 226 mg/kg and diesel at 2,000 mg/kg. Samples were not collected at Drum Groups 3 and 4. Drum Group 1 had a soil sample with diesel at 31,000 mg/kg. At one of the cement foundations, a soil sample had lead at 630 mg/kg.

There are numerous wooden bunker remains on the top of Chichagof Hill. A few scattered barrels are uphill of the bunkers. During our June 2007 site visit, sheening was noted in one pool within a collapsed wooden structure and its cement foundation.

Kennon Island off the point supports a large tufted puffin colony (approximately 800 individuals were noted during the 2007 site visit). Also seen were over 35 murres and at least 20 glaucous-winged gulls.

Siddens Valley

There is a large generator station near the base of Engineer Hill. E & E found several large batteries with cracked casings (1992b). Two

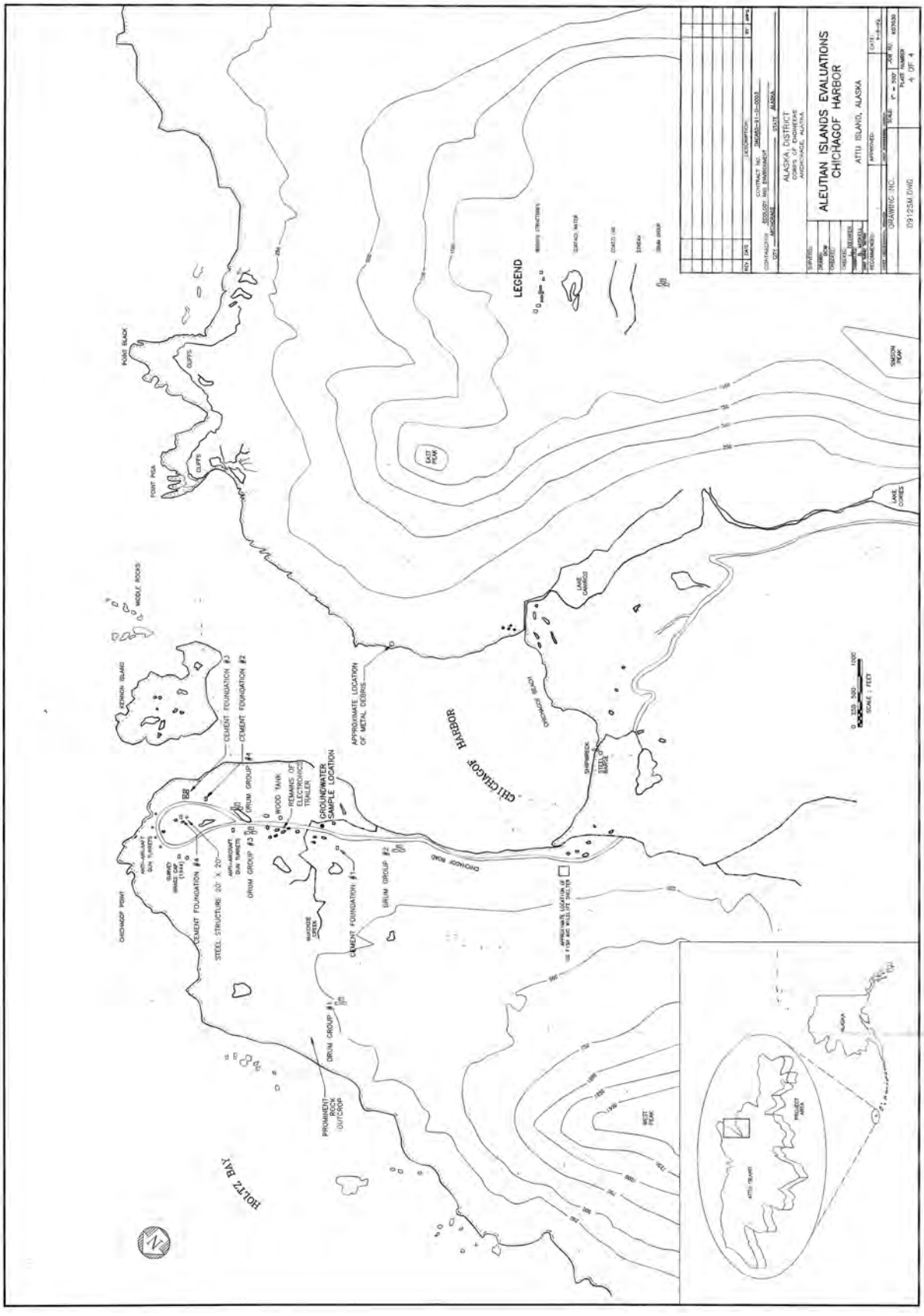


Figure 9. Chichagof Harbor, Attu

1,500-gallon fuel tanks are located adjacent to the generator station. Soil samples had elevated lead (188-363 mg/kg) and oil (2,700 to 28,000 mg/kg). USFWS was unable to visit this site in 2007.

Jarmin Pass

Jarmin Pass is a steep-sided site of approximately 100 acres located between upper Massacre Valley and O'Donnell Valley. E & E (1992b) estimated approximately 4,000 drums are located near the head of West Massacre Valley. Drums are stacked on the northeast side of the valley floor and in a large ravine that extends toward Engineer Hill. E & E noted that soil near the drum group had a slight sheen and product odor. A soil sample collected by E & E in the drainage below the ravine had oil at 620,000 mg/kg. Other samples they collected from this site had Bunker C at 420,000 mg/kg and flourene at 34 mg/kg. E & E observed a viscous, pale yellow, slimy material seeping from the drum group (1992b). Analytical results for this sample were 270,000 mg/kg diesel. They also noted stressed vegetation by the drum group. No UXO was found by Dames & Moore in 1995. The Service was unable to visit this site in 2007.

Engineer Hill

Construction debris at this site includes remains of a generator station. There is a foundation slab approximately 20 feet square. A soil sample collected by E & E had elevated concentrations of oil (220 mg/kg), arsenic (54 mg/kg), barium (495 mg/kg), and lead (96 mg/kg).

Holtz Bay on Attu reveals few signs of WWII activity. D. Rudis, USFWS

Holtz Bay

The Japanese established a base camp at West Holtz Bay, and U.S. forces attacked this area with 100-pound bombs. U.S. forces also attacked East Holtz in a concentrated bombing raid on the unfinished Japanese landing strip. After the Battle of Attu, a runway, small base, and a road were constructed at West Holtz Bay by U.S. forces.

In 1991, E & E visited both West and East Holtz Bay but did not sample this area. No WWII debris or structures were located in West Holtz Bay. In East Holtz Bay, bomb craters were visible as was the general outline of the Japanese landing strip. In 1995, Dames & Moore found berms in West Holtz Bay that defined an airstrip; two power poles, a pit, and a tunnel were seen from the road. No UXO hazards were located in West Holtz Bay Arm by E & E (1992b). In 1995, there was no longer access to East Holtz Arm due to road washouts. USFWS was unable to visit this site in 2007.

Zwinge Valley

This valley was used as an ordnance storage area subsequent to the Battle of Attu. Much of the stored ordnance was disposed of at the end of the war by on-site burning. Many OE items remain on-site; Dames & Moore (1995a) reported seven individual burn areas. A variety of ordnance items were found as kickouts from these burn piles. Dames & Moore (1995a) describes each of these sites; the largest is a 50- by 100-foot burn pile, and the other sites are less than half that size. Ordnance includes various projectile fuzes, projectiles and containers, propellant charge casings, rounds, and rifle smoke grenades. The author did not visit this site in 2007.

Guns

One 75 mm Japanese anti-aircraft gun still remains on Attu. Several 155 mm guns on Panama mounts are located at Chichagof Point. The author could find no additional information on historic guns that might be located on Attu or any discussion of abandoned munitions that might be associated with historic gun(s).

Dwarf Arctic willow grows low to the ground in the windy environment of the Aleutians. Here they are growing over part of a WWII drum. D. Rudis, USFWS

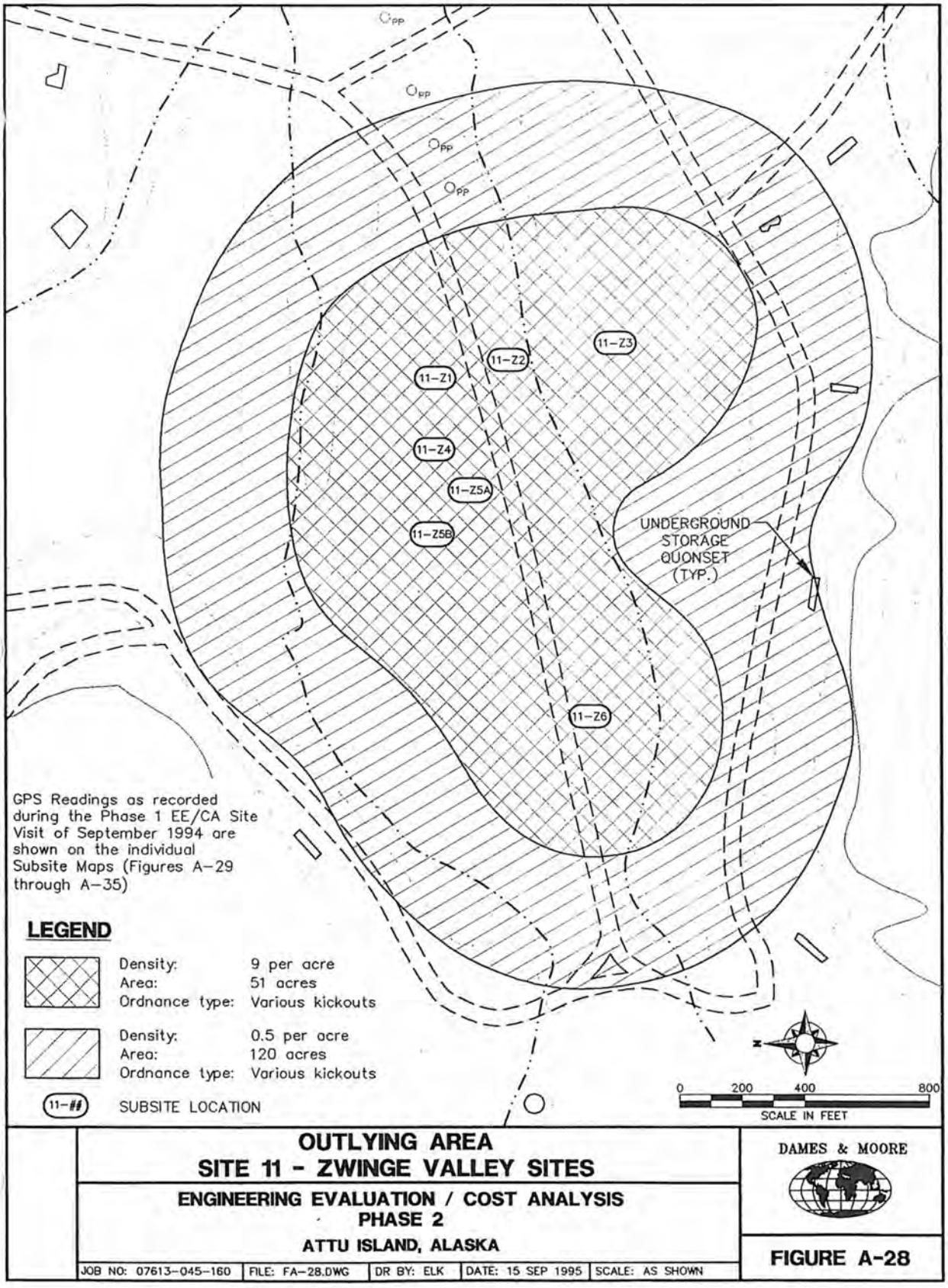


Figure 10. Zwinge Valley, Attu

Kiska

Efforts to document and assess contaminants and other hazardous materials on the WWII affected lands of Kiska are comparable to those on Attu and are described in this section.

Contaminant and UXO Investigations

Bomb disposal and booby-trap removal activities were conducted while Allied forces were on Kiska. U.S. military intelligence in 1944 estimated that the Japanese had created 26,600 yards of trenching and 375 dugouts (ACOE 2004). Per the Summary of Japanese Gun Defense Locations, there were 21 machine guns covered, 19 machine guns open, and two 70 mm howitzers. Any trenches or dugouts near gun emplacements have the potential to be ammunition caches. Although many of these underground diggings were investigated by Allied troops in 1943, it is probable that many items in these diggings, including abandoned ordnance, remain undiscovered. Japanese activities were noted in numerous locations, including the southernmost end of the island near Vega Point (North Pacific Force and 11th Air Force 1943). Trenches were reported on all of the hills overlooking Vega Bay on the southeastern side of the island, and Lilliput Cove was a defended area. Vega Point divides the two coves of Summer and Gulliver. Summer Cove and Vega Point show Japanese empty gun positions and a small structure. Numerous underground entrances or dugouts are also depicted along Gulliver Cove where the trail ends.

A military debris evaluation of the Aleutian Islands that included Kiska was conducted by the ACOE (ACOE 1977). This investigation included evaluation of the amount of military debris on Kiska and determination of restoration costs.

No records have been found that suggest any removal of UXO from the marine environment of the NDSA surrounding Kiska (NAVFAC 2013).

U.S. Army Corps of Engineers

A military debris evaluation of the Aleutian Islands that included Kiska was conducted by the ACOE (ACOE 1977). This investigation included evaluation of the amount of military debris on Kiska and determination of restoration costs. The report also presented information on existing debris, HTRW, OE, archeological sites, and environmental concerns to be addressed during restoration.

The ACOE prepared the document, *Inventory Project Report for Kiska and Little Kiska Island Garrison, Alaska, FUDS Site No. F10AK0137, 30 November 1992.* This report included information from a 1991 site visit, which identified hazardous and toxic waste, and documented areas of soil contamination (ACOE 1992). ACOE determined hazardous and toxic waste and ordnance was eligible for cleanup under DERP-FUDS. Ordnance includes small arms ammunition, bombs, and artillery shells.

Soil contamination was found at the lower camp garage, lower camp debris pile, petroleum seep, POL shed, power station, and North Head garage areas. Contaminants of concern at these sites include gasoline, diesel, Bunker C fuel oil, petroleum hydrocarbons, and lead.

An Archive Search Report found no evidence of CWM storage, use, or disposal on Kiska (ACOE 2004). A limited site inspection by ACOE in

Ordnance shops and yards on Kiska Island showing Athey trailers, caterpillar tractors, and empty oil drums in the yards. U.S. Signal Corps photo 196-3-44-8. 4 January 1944

2002 as part of the ASR, characterized OE and CWM potential based on visual examination. Limited exploration was done around Kiska Harbor, the submarine base, and Gertrude Cove. The site inspection noted that a team of at least three personnel would need to live on Kiska for at least two weeks to safely make an accurate assessment of the ordnance problem. The ASR research confirmed that there is current ordnance and explosive hazard at Kiska, which consists of UXO from Allied bombardment, hidden or abandoned ammunition caches, and a probable Allied firing range. These could be in collapsed dugouts, camouflaged caves, or washed out trenches. Years of erosion, washouts, and tundra growth may have further hidden or exposed hazards. Over half of the pre-invasion detailed charts from July 1943 show Japanese activities that have the potential for UXO presence. Many of these sites are small and would be in areas frequented by visitors on Kiska. The potential for UXO is relatively high throughout the Japanese encampments, surrounding areas, and farther afield due to inaccuracies in bombing and bombardment by Allied forces.

Under the Military Munitions Response Program (MMRP) and the DERP-FUDS program, Bristol Environmental Remediation Services was contracted by the ACOE for a Site Investigation (SI) field effort in 2011 on Kiska and Little Kiska (Bristol 2012). The SI team visited 12 geographic areas but was unable to visit four other areas on Kiska. They surveyed all of the munitions related features (MRFs) that were considered priority 1 sites, a ranking based on accessibility and visibility of known hazards present. MRFs are physical evidence that an area was used for munitions related activities such as gun positions, ammo storage areas, craters, trenches, munitions dumps, and land scars. Small arms were found at seven MRFs: Beach and Bluff Coves, Bukhti Point, Gertrude Cove, Main Camp, Mutt and Jeff Coves, North Head, and Little Kiska. The major concentration of MEC was found in the main camp area in large piles ranging from 30- to 100-square-foot piles. A 100-square-foot pile was also found on Little Kiska. Some MEC were found exposed, but other MEC may still exist below ground surface, as no digging was done during the SI. Bomb craters and Japanese dugouts and tunnels may also contain MEC but were not checked during the SI. No MEC were found at Salmon Lagoon, South Head, South Sector, the Submarine Base, and Trout Lagoon. Geographic areas that were not visited included Barley and Wheat Coves, Broad Beach, Reynard Cove, and Riot and Ranger Hills. Allied landing beaches were not investigated, as they are covered under the "Act of War" and not included in the FUDS program. Training ranges used by the U.S. military were over water

and occurred over Beach and Bluff Cove, Gertrude Cove, Mutt and Jeff Coves, Kiska Harbor, and off Little Kiska. No underwater investigations were conducted during this SI.

Gertrude Cove, Kiska. D.Rudis, USFWS

When the majority of Allied forces left Kiska in January 1944, it was mid-war, so munitions that were easily taken off-island were removed for use in other campaigns. The SI team more commonly found MEC in more remote areas and in areas where MEC removal by WWII personnel would have been difficult.

U.S. Navy

The Navy's Munitions Response Program addresses MEC and munitions constituents used or released on sites from past operations and activities. The preliminary assessment (PA) evaluated the potential for releases that may pose a potential threat to human health or the environment as result of the WWII-associated activities on Kiska. A records review and interviews were conducted to prepare the PA (NAVFAC 2013). An unknown quantity of MEC was lost, discarded, intentionally dropped, or fired into the marine environment of the NDSA surrounding Kiska and Little Kiska during WWII. As much as 30 percent of the explosive ordnance that was dropped or fired during WWII did not detonate as intended (NAVFAC 2013).

When ordnance undergoes a low-order detonation or breaks apart upon impact, munitions constituents such as bulk explosives can be scattered across the impact area (NAVTEC 2013). MEC can also remain relatively intact in the marine environment. Corrosion will release munitions constituents from intact MEC. Submerged MEC may also develop a coating or encrustation of biological material and organisms that can seal off the item from the environment. Photographs taken during the 1989 underwater survey indicate varying degrees of corrosion or encrustation of ordnance items after approximately 46 years in salt water (Cohen 1993).

MEC sources released into the marine environment at Kiska and Little Kiska by Allied forces consisted of coastal defense and anti-aircraft gun batteries, supply transfer points, Army Air Corps air combat units, and Navy air units and ships. Other MEC sources include what MEC Japanese or Allied troops lost or disposed of overboard, particularly in Kiska Harbor. The NAVTEC 2013 report notes that on at least one occasion Allied forces dropped eight 500-pound and eight 1,100-pound bombs with long-delay fuzes into Kiska Harbor to prevent submarines from entering the harbor.

Training strikes by the U.S. Air Force in 1950 included ammunition payloads of a full load of gun ammunition, six 5-inch rockets, eight 3.5-inch rockets, and six water/sand filled bombs (ACOE 2004). In 1943, test firings occurred in six areas on Kiska and Little Kiska: Area 1 – Kiska Harbor, Area 2 – off Little Kiska Head over Tiger Cove, Area 3 – off Little Kiska Head down South Pass, Area 4 – off Mutt and Jeff Coves, Area 5 – off Gertrude Cove, and Area 6 – off Beach and Bluff Coves (see Figure 11).

Figure 11. Areas of Known Allied In-water Ranges, Kiska

An underwater survey of Kiska Harbor in 1989 documented Japanese-origin MEC (Cohen 1993). The NAVFAC PA (2013) included a quote from a WWII veteran who stated that unused ordnance was disposed of at the dock ends. Also included was a 2007 dive report of thousands of small arms shells on the seafloor off the Kiska ship dock.

The PA for the NDSA (NAVFAC 2013) examined ecological and human risk from munitions constituents. Potential physical hazards to divers, fishers, and boat anchors were identified. Commercial nets and traps could unintentionally haul up MEC. Boat anchors could potentially detonate or get caught on MEC on the seafloor. Munitions constituents were determined to present a low ecological risk under expected

scenarios in the marine environment because any chemical constituent releases would only directly affect sediments.

The Navy recommended that because most potential MEC is the result of combat operations, Kiska and Little Kiska are not eligible for inclusion in the Munitions Response Program. All of the five identified NDSAs also have noncombat MEC, which includes practice-fired and practice-dropped UXO. The Navy will initiate a Notice to Mariners and an informational advisory to alert mariners of MEC in the area. The Navy will also request that NOAA include a Notice to Mariners on navigation charts. The Navy has also prepared an educational fact sheet on explosives safety for distribution to those in the Aleutian fishing fleet (NAVFAC 2013).

Because of the safety hazard from UXO in these five NDSAs, the Service should revisit the Navy's decision on MEC at Kiska and Little Kiska.

United States Fish and Wildlife Service

The Service previously conducted a series of investigations to begin identification of the nature of contaminants derived from military activity throughout the Aleutian Islands. The purpose of these investigations was to identify the nature of potential contamination resulting from the military operations in the Aleutian Islands. Investigations were conducted on Kiska and Little Kiska between 1987 and 1990 (Crayton 1990; 1991). The investigations included visual observations of waste and debris material; observations of surface contamination; collection and laboratory analysis of soil, sediment, and fish samples for the presence of hazardous compounds; and identification of biological receptors that may be affected by the presence of contamination.

There are few WWII Quonset huts remaining on Kiska. D. Rudis, USFWS

At Kiska Island, the investigation focused on the former U.S. and Allied military campsites located at Lower Camp, North Head Camp, and Canadian Camp. These sites are located along the northwestern edge of Kiska Harbor and the western side of the North Head Bluff. Background samples were collected at the Gertrude Cove area, located about four miles southwest of the harbor. The Service identified components of petroleum hydrocarbons, leachable metals, and PCBs. POL containers and power generating facilities were associated with the highest concentration of contaminants. The Service also documented the presence of roads, building debris, Quonset huts,

collapsed wood frame structures, gun emplacements with associated ammunition, water supply structures, and approximately 100 petroleum storage drums.

At Little Kiska, the Service investigation (Crayton 1991) found evidence of military activities only at the western end of the island and Orient Point to the east. In addition to gun emplacements and Quonset hut pits and debris, Crayton reported abandoned pump-type structures and building foundation ruins at many of the island's lakes. Petroleum contamination appeared to be minimal, but there was no direct sampling of drums and tanks that may have stored POLs.

Ecology and Environment (E & E)

The debris was characterized as hazardous due to sharp metal, exposed nails, structural collapse of buildings and bridges, and posed potential injury from small arms and munitions.

E & E produced three Kiska reports for the ACOE Alaska District in 1992.

Debris Inventory Kiska Island Aleutian Islands, Alaska (E & E 1992c). The presence, amount, and type of military debris and hazardous and toxic waste were documented by a reconnaissance-level site visit. The inventory was limited to the Kiska Harbor area, focusing on the Lower Camp, North Head, and the Canadian Camp. The debris inventory included waste type (wood, metal, or concrete) and volume. The debris was characterized as hazardous due to sharp metal, exposed nails, structural collapse of buildings and bridges, and posed potential injury from small arms and munitions. Drums, a power station, scavenged transformers, utility poles, electrical debris, batteries, steel boxes, and small arms munitions were all listed as hazards; UXO was not specifically addressed in the report.

Contamination Assessment Report Kiska Island Aleutian Islands, Alaska (E & E 1992d). This report supplemented the debris inventory and identified the sampling areas and analytical results for soil, sediment, and water samples. An evaluation of potential contaminant migration pathways and human and ecological receptors for the harbor area was included.

Remedial Alternatives Report for Environmental Evaluation at Attu, Amchitka, Kiska, and Great Sitkin Islands; Aleutian Islands, Alaska (E & E 1992e). This document included remedial recommendations to clean up debris and contaminated material for the Kiska Harbor area. UXO was not specifically addressed in this report.

Dames & Moore

Final Report 1995 Phase I Remedial Investigation Kiska and Little Kiska Islands Aleutian Islands, Alaska (1996). This RI identified 29 sites of concern that were categorized as either operable units (OUs) where previous work had been conducted, or as "areas" that were not previously investigated. Conceptual site models for ecological and human exposure scenarios were developed. The human pathway was deemed less significant by the contractor, due to infrequent visitation by the public. Preliminary ecological risk-based screening levels (RBSLs) for PAHs and PCBs, and for benzene, toluene, ethylbenzene, and zylenes (BTEX)

Lower Camp debris and bomb craters on surrounding hillside. D.Rudis, USFWS

were developed. The RBSLs were developed for comparison to field screening data and based on conservative exposure scenarios. Chemical and physical hazards of surface soil sheens were evaluated, as the transfer of small amounts of oil to a bird egg can cause embryo mortality.

Debris mapping and inventory in the Dames and Moore report provided detailed descriptions of petroleum seeps and surface water sheens at the following sites:

OU 1 - Lower Camp Petroleum seep and drums

OU 5 - Lower Camp power station

OU 6 - Lower camp electrical debris

OU 7 - Lower Camp debris pile and Beach Road drums

Area 15 - Kiska Island road net north

Criteria exceedances included analytical results that were greater than a chemical RBSL, identification of a potential physical/chemical hazard from hydrocarbon sheens, and/or evidence of chemicals of potential concern. Exceedances of ecological risk screening criteria were found at the following sites:

OU 2 - Lower Camp shed

OU 3 - Lower Camp garage

OU 4 - Canadian Camp garage and transformers

OU 9 - Camp Creek

OU 12 - North Head Camp transformers

Area 16 - Kiska Island Road net south

Area 17 - North Head Road net

Area 21 - Trout Lagoon Camp

Area 22 - Former Submarine Base and South Head hill

Area 23 - Gertrude Cove camp

There were five sites on Kiska Island in 1995 where containerized waste presented a potential environmental risk, either in their condition at the time or if released to the environment in the future. The report recommended that these wastes be removed. The sites are:

OU 2 - The collapsed shed has four 55-gallon drums of Bunker C oil;

OU 8 - Lower Camp consists of a collapsed wood building and drums, and five drums of kerosene/Bunker C oil based wax/grease;

Area 15 - Six 55-gallon drums of diesel #2 fuel along the road;

Area 17 - One 55-gallon drum of diesel #2 fuel;

Area 21 - A drum pile at Trout Lagoon has five 55-gallon drums of diesel #2 fuel.

The Service and the ACOE and its contractors may determine additional areas of concern.

Ordnance and explosives, including small arms, 20 mm or larger ordnance, grenades, detonators, fuzes, and blasting caps were found in Areas 25 and 29. The report listed eight OUs/Areas on Kiska where the contractor recommended that no further action was needed, based on a lack of apparent evidence of HTRW and lack of ecological risk. These sites are:

OU 10 - Gun revetments, wood and metal debris

OU 11 - Pier tanks and wood debris

OU 13 - North Head Camp garage and maintenance building

OU 14 - – North Head Camp drum dump

Area 18 - South Head trails

Area 19 - Gasoline distribution and storage area

Area 20 - Salmon Lagoon airstrip and road

Area 24 - Mutt and Jeff Coves

Kiska – Act of War Determination

The MMRP on Kiska Island meets the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) definition of hazardous substance

A 2009 Service document on Act of War Concurrence stated as follows,

One of the issues associated with the assessment and cleanup of military munitions on Kiska and Little Kiska Islands has been the DoD "Act of War" determination. According to the ACOE, its FUDS policies preclude ACOE from undertaking cleanup of munitions hazards deemed to be associated with an Act of War or combat operations.

The MMRP on Kiska Island meets the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) definition of hazardous substance (40 CFR 302.4(b), 40 CFR 261.23). Thus the "Act of War" exception in CERCLA 107(b)(2) applies, but this does not exclude FUDS eligibility, as portions of the site activities were not solely due to act of war considerations.

A legal analysis provided by the Department of the Interior Solicitor's Office, "takes issue with the legal merits of this Act of War determination."

In a December 29, 2008, memorandum, the Office of the Under Secretary of Defense issued an interim policy regarding DERP eligibility. In this policy, issued to all the armed services, environmental restoration is not to include *"Responses to address releases that are the result of an act of war."*

Since the DoD's position has been established by the Office of the Under Secretary of Defense, this issue is beyond the scope of what Region 7 can effectively address. The Alaska District of the ACOE will follow their Departmental policies until those policies are updated or superseded.

Removal and Remediation Activities to Date

Explosive Ordnance Disposal Activities

In 1943, a military task force was sent to Kiska to remove and dispose of Japanese ordnance. They disposed of mines and depth charges from a beached Japanese transport vessel. The majority of the ordnance was detonated on South Pass (ACOE 2004).

Kiska Island Contaminant Sources and Issues

Even though Kiska was set aside as a conservation area at the turn of the last century, the island played a major role during WWII, with both U.S. and Japanese forces introducing contaminants into the environment. Majorities of known contaminant issues are associated with the U.S. military forces and associated installations that were established by Allied troops. Remediation of these DoD contaminated sites will be conducted under the auspices of the Army Corps of Engineers, DERP-FUDS program, excepting areas excluded under the act of war consideration.

Kiska Site Descriptions

The Kiska harbor area is considered to be one of the best preserved historical scenes anywhere. The slow erosion processes on the tundra have had little effect on the bomb craters still visible on the hills surrounding the harbor. Dumps of U.S. and Japanese material are numerous. Right-hand drive Japanese truck frames are piled up, along with seaplane fighter aircraft engines and other evidence of Japanese occupation. Extensive support structures are still present, such as a water hydrant. Evidence of U.S. troop occupation remains in the few standing structures and numerous collapsed buildings. U.S. dump sites contain numerous 3-inch shells and other debris and aircraft wreckage, one of which may be the remains of a B-17 aircraft. Much additional survey work needs to be done on Kiska to document both its abundant cultural resources and numerous contaminant threats.

Some of the most dramatic remains are the numerous tunnels from the extensive Japanese underground system; some of these tunnels are concrete reinforced. Many are still sound and contain Japanese material.

A cultural resource investigation conducted in 1996 (Mobley 1996) also documented contaminant and hazardous materials. Mobley included

A 1943 Japanese shipwreck sits in Gertrude Cove, Kiska. D. Rudis, USFWS

discussion of previous underwater diver explorations of Kiska Harbor that documented nine submerged watercraft including the *Nissan Maru*, the Japanese submarine *RO-65*, and the transport *Kano Maru*. There is also the sunken U.S. vessel Abner Read, hit by a floating Japanese mine during the Allied assault; this ship has not been located. Vessels visible from the surface include the *Urajio Maru* in Kiska Harbor, the deteriorating *Borneo Maru* in Gertrude Cove, and the bow of the *Nozima Maru* that is off shore of Trout Lagoon.

Site descriptions are from the RI (Dames & Moore 1996), USFWS (Crayton 1990), an SI (Bristol 2012), and field notes taken by the author during the August 3–6, 2007, interagency site visit. Latitude/longitude was not included in the RI (Dames & Moore 1996) or the USFWS (Crayton 1990) report.

Site Investigation (Bristol 2012) Site Descriptions

Main Camp

The Bristol SI (2012) Main Camp geographic area includes OU1 through OU9, OU14, and Area 19 in the RI . This wide low-lying approximately 1,500- acre area includes the beach landing area at Kiska Harbor to the surrounding hill slopes. This was the focal point of WWII operations. There is an extensive amount of WWII artifacts and debris from both the Japanese occupation and Allied forces throughout the area. The majority of bombing occurred in this area. A large underground opening is near the beach and other entrances to underground areas are in the surrounding hills. MRFs in the Main Camp include anti-aircraft guns, bomb craters, building/revetment footprints, excavations, foxholes and trenches, artillery emplacements and underground shelters (Bristol 2012).

MEC identified during the SI and previous investigations included an electric blasting cap, a fuzed projectile, bomb fragments, an incendiary bomb, a 20 mm high explosive, a British hand grenade, a 5-pound incendiary bomb, and other munitions (Bristol 2012).

Salmon Lagoon

The Salmon Lagoon area is almost 2,000 acres and is located north of Main Camp and North Head, to the east of Riot and Ranger Hills and Barley and Wheat Coves; it is bounded to the east and south by the southern shoreline of Kiska Island. This was labeled Area 20 in

the RI (Dames & Moore 1996). Sites surveyed for the SI were coast gun positions; artillery and ground scars, including numerous bomb craters; excavations; building/revetment footprints; and foxholes and trenches. Previously identified MEC in Salmon Lagoon included a 500-pound bomb casing with a 100 series tail fuze with booster, and an armed 6-inch amour-piercing, high explosive, base-detonating anti-ship projectile. Neither this projectile nor any other MEC was found during the SI (Bristol 2012).

Trout Lagoon

This area includes about 600 acres and includes ground scars, excavations, building footprints, machine gun positions, underground shelters, and a large part of a sunken ship near the beach. Main Camp is to the north and Submarine Base to the south. Several pieces of munitions debris (MD) were found during the SI, but no MEC was found during the SI or previous investigations (Bristol 2012). The RI (Dames & Moore 1996) designated this area OU 10 and Area 21.

Gertrude Cove

The Gertrude Cove area is about 3,090 acres and is located southwest of Mutt and Jeff Coves. This was an operations and housing center during WWII. Gertrude Cove is believed to be one of the areas that was cleared of mines and booby-traps by U.S. forces following the Kiska reoccupation (ACOE 2004). Remains of sunken Japanese ships and historic items remain in this area of Kiska. This easily accessible beach is posted with a warning sign (in English, Russian, and Japanese) of potential explosive hazards. MRFs include artillery emplacements, tent revetments, ammunition storage, underground shelters, and a supply dump. The dump location is unknown but it was shown in a WWI photograph (Bristol 2012).

Danger signs along the shore of Kiska are posted in English, Russian, and Japanese. D. Rudis, USFWS

MEC found during the SI was a 60 mm high explosive mortar; earlier investigations reported 75 mm active rounds in the surf zone and two blocks of 2,4,6-trinitrotoluene (TNT) in the Gertrude Gun Dump (Bristol 2012). Numerous unknown subsurface metal anomalies were noted across Gertrude Cove beaches during the SI. This site is Area 23 in the RI (Dames & Moore 1996).

North Head camp, Kiska. D. Rudis, USFWS

Bukhti Point

This 763-acre area is a peninsula south of Mutt and Jeff Coves and Gertrude Cove. MRFs at this location include an observation post, buildings, light anti-aircraft/ machine gun positions, trench networks, and underground shelters and foxholes (Bristol 2012). During the SI, 21 Japanese 75 mm unfired and unfazed projectiles were found. It is likely that tundra vegetation could hide additional MEC (Bristol 2012). There were no records of MEC found during earlier investigations. This site is Area 25 in the RI (Dames & Moore 1996).

South Head

This approximately 2,137- acre area of rugged terrain with steep hills and valleys is located adjacent to Submarine Base to the west and is north of Mutt and Jeff Coves. The SI identified 94 MRFs, including anti-aircraft gun positions and ground scars representing trenches, excavations, building footprints, revetments, and foxholes (Bristol 2012). No MEC was identified in the SI or previous efforts. This site is Area 22 in the RI (Dames & Moore 1996).

Submarine Base

The Japanese Midget submarine and submarine-base facilities are located in a low-lying 1,066- acre area near the beach. These facilities included a railroad system that transported the Midget submarines into Kiska Harbor. Magnetic subsurface anomalies were detected during the SI (Bristol 2012), but their composition remains unknown without excavation. No MEC was found during the SI or previous investigations. This was referred to as Area 22 in the RI (Dames & Moore 1996).

North Head

North Head is the 447-acre peninsula above Kiska Harbor and was a strategic defense area that housed most of the coastal defense and anti-aircraft guns. The area was heavily used during WWII and has an extensive system of underground entrances and tunnels, several reinforced bunkers, and camp areas. Structural and metallic debris are extensive. MEC and MD were identified in, near, and around gun positions, as well as MD and small arms across the area. Bomb craters are visible throughout North Head. Identified MEC includes numerous rounds, projectiles, a fuze, and a flare (Bristol 2012). North Head is OU 12, OU 13, and Area 17 in the RI (Dames & Moore 1996).

Remedial Investigation (Dames & Moore 1996) Site Descriptions

OU 1 - Lower Camp Petroleum Seep and Drums

This one-acre site is located near Trout Lagoon Road in the center of Kiska Harbor (Figure 11). Partially buried drums and a petroleum seep were found at this location. Stressed vegetation and black staining was evident, covering an approximate 4- by 10-foot area. Sample analysis indicated that this black staining was over 50 percent Bunker C and less volatile fuel components (E & E 1992b). Marsh sediment down-gradient of the Trout Lagoon Road seep contained diesel #2 fuel, Bunker C, and naphthalene in relatively high concentrations (E & E 1992b).

A petroleum seep was also found in a marshy area near the intersection of Camp Creek and Front Street. Stressed vegetation and stained soil were found, but no sheen was present on the water. Samples collected contained volatile and semi-volatile organic compounds (VOCs and SVOCs), Bunker C fuel oil, and sulfides. Preliminary site evaluation of the Front Street seep by Dames & Moore (1995a) concluded that diesel #2 fuel, kerosene, and less volatile hydrocarbons associated with fuel were present.

Lead batteries are found at a number of locations on Kiska. D. Rudis USFWS

OU 2 – Lower Camp Shed

This site is approximately one-quarter mile northwest of the Kiska Harbor pier on the Canadian Road. Remains of the collapsed and burned cold storage building included wood, roofing, pipe lengths and glass. Six partially buried 55-gallon drums were present, four of which were rusted through and appeared to contain black petroleum oil. Soil staining was present beneath the drums in 2007. Results of soil sample analyses by E & E (1992d) and USFWS (Crayton 1990) reported Bunker C, fluoranthene, and phenanthrene. Drum samples contained 100 percent Bunker C.

OU 3 – Lower Camp Garage

This site was not a garage but a warehouse site. No evidence of surface oil staining or fuel spills were noted in 2007. Several vehicle batteries were present. USFWS (Crayton 1990) samples confirmed gross lead contamination (see Table 1 for State of Alaska soil cleanup levels) with lead concentrations of 1,890 to 7,010 mg/kg and mercury at 101 mg/kg. Selenium was at 10 times background levels. E & E sampling (1992d) results included Bunker C, barium, chromium, and lead in the vicinity of the batteries at 41,000 mg/kg.

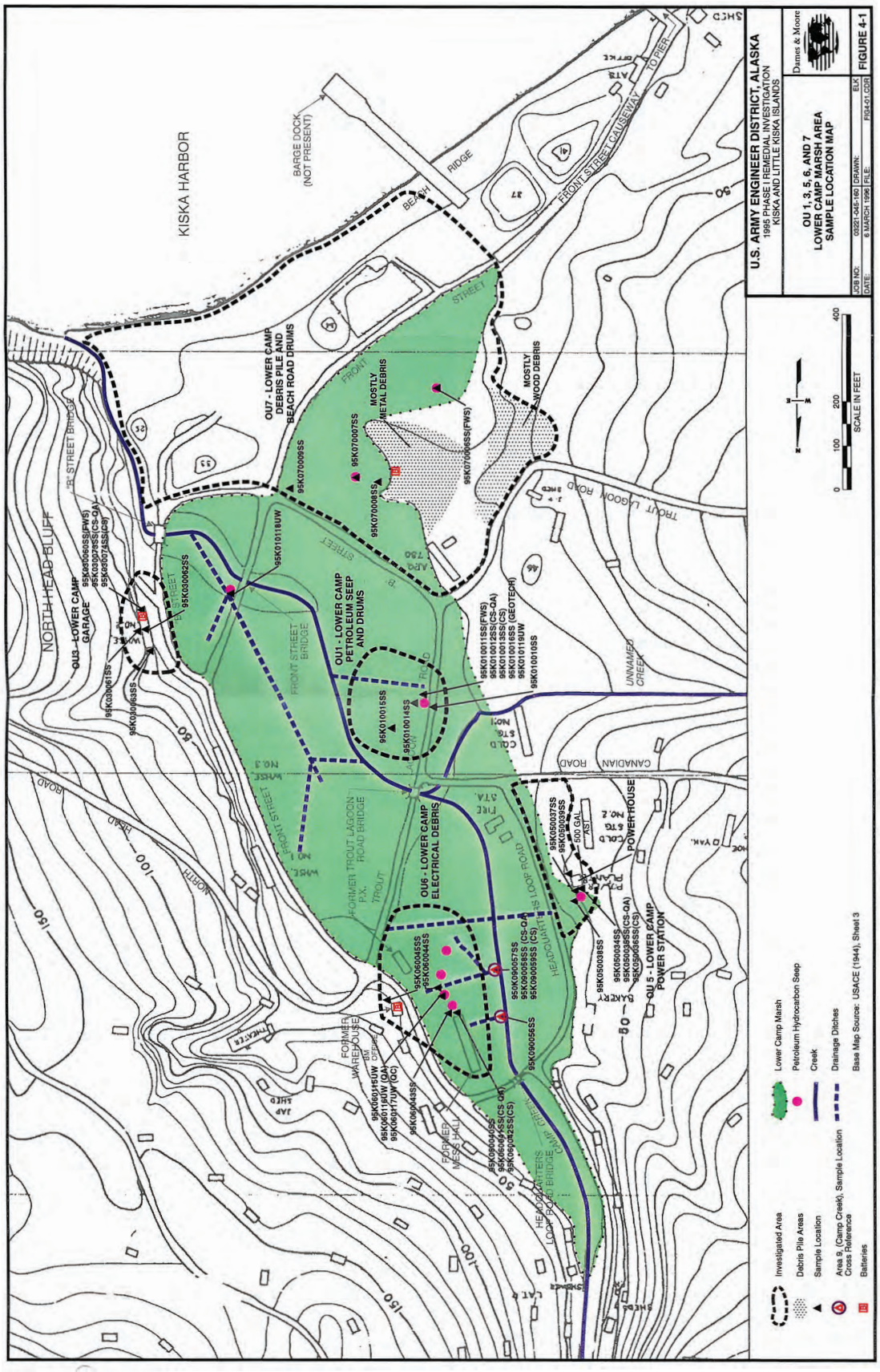


Figure 12. Lower Camp Marsh Area, Kiska

OU 4 – Canadian Camp Garage and Transformers

A former transformer platform, power generating facilities, five scavenged transformers, and a garage with four vehicle pits were reported by Crayton (1990). Garage soil samples contained trace levels of naphthalene-based compounds at 0.03 ppm to 0.79 ppm, fluorine at 0.03 ppm, and phenanthrene at 0.05 ppm. No PCBs were detected. Dames & Moore soil samples also showed a notable lack of contamination at this site (Figure 12).

OU 5 - Lower Camp Power Station

The power station was a steel Quonset hut; outside and adjacent to the hut were rusted remains of an empty 500-gallon AST and five empty transformer casings. Surface soil staining and petroleum odor were present in 2007. A small petroleum seep was observed in 2007 by the author near the stained soil, which created a sheen on ponded surface water. This seep was sampled by Crayton (1990) and all 24 PAH compounds were detected at elevated concentrations.

Crayton (1990) collected soil samples around two scavenged transformers located on the ground at the west end of a diesel generator powerhouse at this site. A PAH scan detected 23 of 24 compounds (all but acenaphthylene) in the soils near the power station at low concentrations between 0.01 and 0.23 mg/kg (Crayton 1990). Antimony, lead, mercury, copper, nickel, and selenium were observed at concentrations greater than 10 times the background levels. PCBs were present at the Lower Camp Power Generating Facility. Some samples were also collected around the fallen transformer platform located at the east end of the power station. Crayton's study detected low concentrations of PCBs and pesticides in the soil. PCB congeners Cl-5, CI-6, Cl-7, and CI-8 ranged from 0.03 to 4.43 mg/kg (above State of Alaska soil cleanup levels) and the pesticides cis-nonochlor and dichlorodiphenyltrichloroethane (2, 4-DDT) ranged from 0.02 to 0.03 mg/kg, respectively.

Barrels are often buried, which can mask their hazardous waste. D. Rudis, USFWS

E & E (1992d) collected two composite soil samples from soils underlying the transformers and two grab soil samples from potential drainage paths down-gradient from the transformers. Three grab sediment samples were collected from low-lying wetlands between the power station and Camp Creek. One composite surface soil sample was collected at the northeast end of the power, station. Wood and metal debris were scattered within this wetland.

E & E (1992d) results included a fuel oil scan, metals, PAHs, and PCBs. Results of the fuel scan found that the soil contained Bunker C at concentrations ranging from 610 to 1,000 mg/kg, and

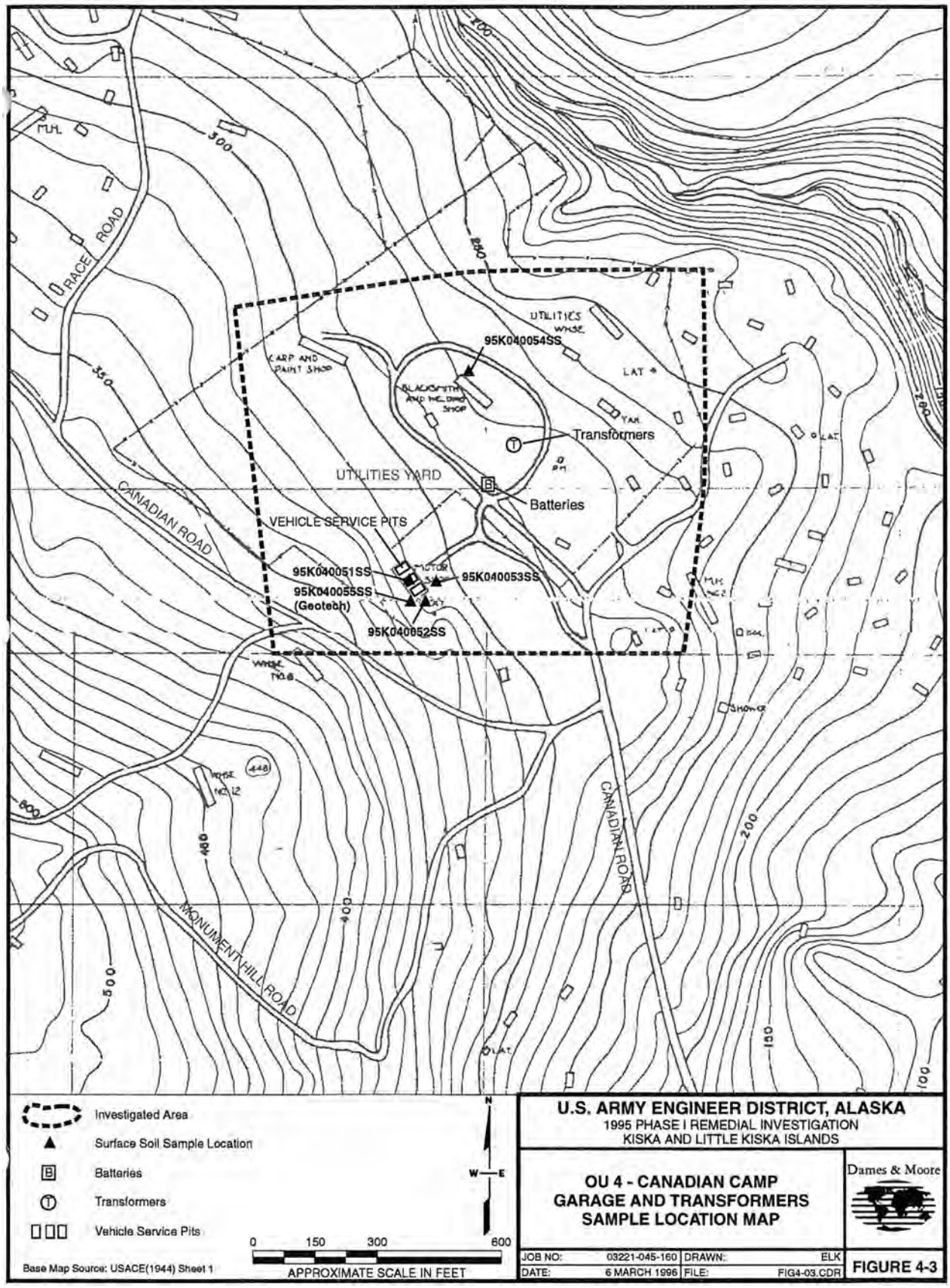


Figure 13. Canadian Camp Garage and Transformers, Kiska

Lower Camp debris pile, Kiska. D.Rudis, USFWS

Hydrant from Japanese occupation of Kiska. D.Rudis, USFWS

diesel #2 fuel at concentrations ranging from 1,400 to 3,300 mg/kg. Sediments were found to contain Bunker C at 220 to 1,000 mg/kg. Metals in sediments ranged from 18 to 130 mg/kg. PCBs analysis detected Aroclor1260 at a concentration of 0.100 mg/kg. PAHs were not detected, and they were likely obscured by sample matrix interferences. The RI sample results did not detect any PCBs.

OU 6 - Lower Camp Electrical Debris

In 2007, at least four 10- by 10-foot petroleum seeps were found in the marshy area southwest of a collapsed warehouse. Surface sheens were present in ponded water and in at least one acre of marsh. The four seep areas were surrounded by stained vegetation and soil. Large electrical storage batteries and wire debris were also present in this OU. Sample analyses by Dames & Moore showed elevated levels of kerosene and associated fuel compounds. Ditches in the area may be a pathway for contaminants to enter Camp Creek.

OU 7 - Lower Camp Debris Pile and Beach Road Drums

Two petroleum seeps were present in 2007. One was a 5- by 10 area devoid of vegetation, and surrounding soil was stained black. At least three partially buried and cored steel drums were observed at this site. The other seep had two barren areas, each approximately five feet by five feet in size. A sheen rose to the surface when sediment was disturbed. At least three drums were found at this site. Large debris piles were present, and three large storage batteries were located in the debris pile near a boat hull. Crayton (1990) analyzed soil samples and reported PAHs, antimony, lead, mercury, copper, nickel, and selenium at greater than 10 times background levels. Lead levels were 14,000 mg/kg. E & E (1992d) soil samples contained low levels of Bunker C, and samples from the seep areas had high concentrations of petroleum hydrocarbons. Drainage path samples contained elevated concentrations of gasoline, diesel #2 fuel, naphthalene, and petroleum hydrocarbons. Drum samples showed contents to be Bunker C and diesel fuel.

OU 8 - Lower Camp Collapsed Wood Building and Drums

This site is a former generator shed and shoe repair shop (Figure 14). Dames & Moore (1996) found five rusty 55-gallon drums that contained a yellow grease-like substance that they thought may be petroleum- based water repellent shoe wax. Analytical results (Dames & Moore 1996) for this substance indicated the material was 52 percent Bunker C and 23 percent kerosene. They reported that soil samples around the drums did not have any contaminants of potential concern (COPCs).

OU 9 - Camp Creek

A repair shop building foundation contained four large, deteriorated storage batteries. Remains of 15 to 20 rusted steel drums were observed in the creek and on the creek banks in 2007. No evidence of hydrocarbon sheen or stressed vegetation was noted. West of the concrete mess hall was a drainage pipe outfall; dark staining was present, and a hydrocarbon odor was noted. A sheen and hydrocarbon odor was present in a narrow drainage ditch north of the Trout Lagoon bridge, but no sheen was found in the creek below this ditch in 2007. Crayton (1990) sediment and fish samples from an area beneath Lower Camp bridges did not have detectable PAHs or OCs. E & E (1992d) water and sediment samples from Camp Creek detected Bunker C in sediments, but it was not in water samples.

OU 10 - Gun Revetments, Wood and Metal Debris

Debris in this area included rusted drums and a variety of metal remains. No HTRW sources, COPCs, or other media of concern were noted by Dames & Moore (1996).

Barrel remains and POL contaminated soil at North Camp area, Kiska. D. Rudis, USFWS

OU 11 - Pier Tanks and Wood Debris

Crayton (1990) sampled soil around the pier tanks, and no PAHs or OCs were detected.

OU 12 - North Head Camp Transformers

Four transformers were in this area; three transformer casings were empty, and no electrical components were present. One transformer case was open with electrical components nearby. Six broken large storage batteries were also in this area. Crayton's (1990) soil sampling did not detect PCBs, but PAHs were found at low concentrations. Antimony, lead, mercury, copper, nickel, and

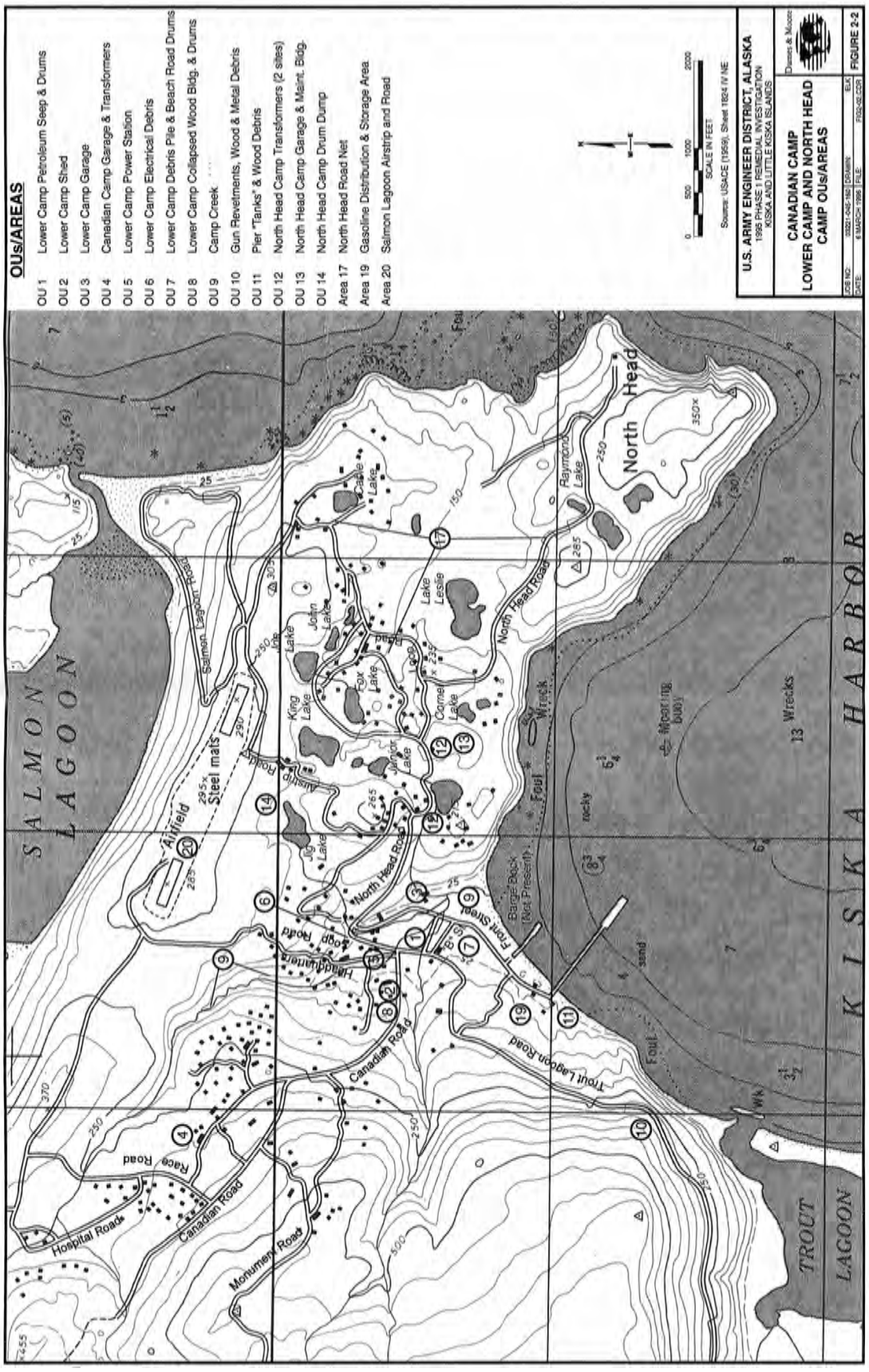


Figure 14. Canadian Lower Camp and North Head, Kiska

selenium were reported at concentrations 10 times above background levels for a soil sample collected at transformer #2.

OU 13 - North Head Camp Garage and Maintenance Building

Debris observed in 2007 included four decayed 55-gallon drums, an empty compressed gas cylinder, and vehicle remains; a shallow wood-lined service pit was noted in the center of the building foundation (Figure 14). No evidence of surface soil staining or other evidence of fuel spills was noted. Crayton (1990) and E & E (1992d) sampling in this area found PCBs and PAHs at low levels. Antimony, lead, mercury, copper, nickel, and selenium were reported at concentrations 10 times background (Crayton 1990). E & E (1992d) soil samples detected Bunker C in concentrations ranging from 320–5,500 mg/kg. Bunker C was also detected in a soil sample along the lake shore, which drains the area around these buildings.

OU 14 - North Head Camp Drum Dump

Seven drums found at this site in 2007 were rusted, and there was no apparent evidence of HTRW. Crayton's (1990) sampling did detect some PAHs; no OCs or metals above background concentrations were reported. Dames & Moore (1996) samples (Figure 13) did not identify any COPCs.

Area 15 – Kiska Island Road Net North

Spent and unspent munitions on Kiska. D. Rudis, USFWS

This area encompasses an eight-mile long road network (Figure 15). Dames & Moore (1996) investigated this area and reported several sites as potential HTRW sources. These sites are described as follows in that report.

Radar Station Camp: This camp was located at the west end of the access road and consists of the wooden remains of at least 14 building foundations. The remains of a shop building were identified using an ACOE 1945 drawing. A shallow, wood-lined vehicle service pit was observed in the middle of this foundation. A slight hydrocarbon odor was noted in the surface soil in the pit. Five large storage batteries cracked and in poor condition, were observed in the remains of a wood building identified as a powerhouse on the ACOE1945 drawing. Numerous live rounds of small caliber arms ammunition were found in a building footprint identified as a mess hall on the ACOE 1945 drawing, and in a wooden box located on the northeast side of the camp. Sixteen empty, rusted 55-gallon steel drums were located on the north side of the camp. The drums were aligned side by side in two end-to-end rows and were in poor condition. Dark staining and petroleum sheen was observed on the ground surface in and around the drums, and a strong hydrocarbon odor was noted in the area (Dames & Moore 1996).

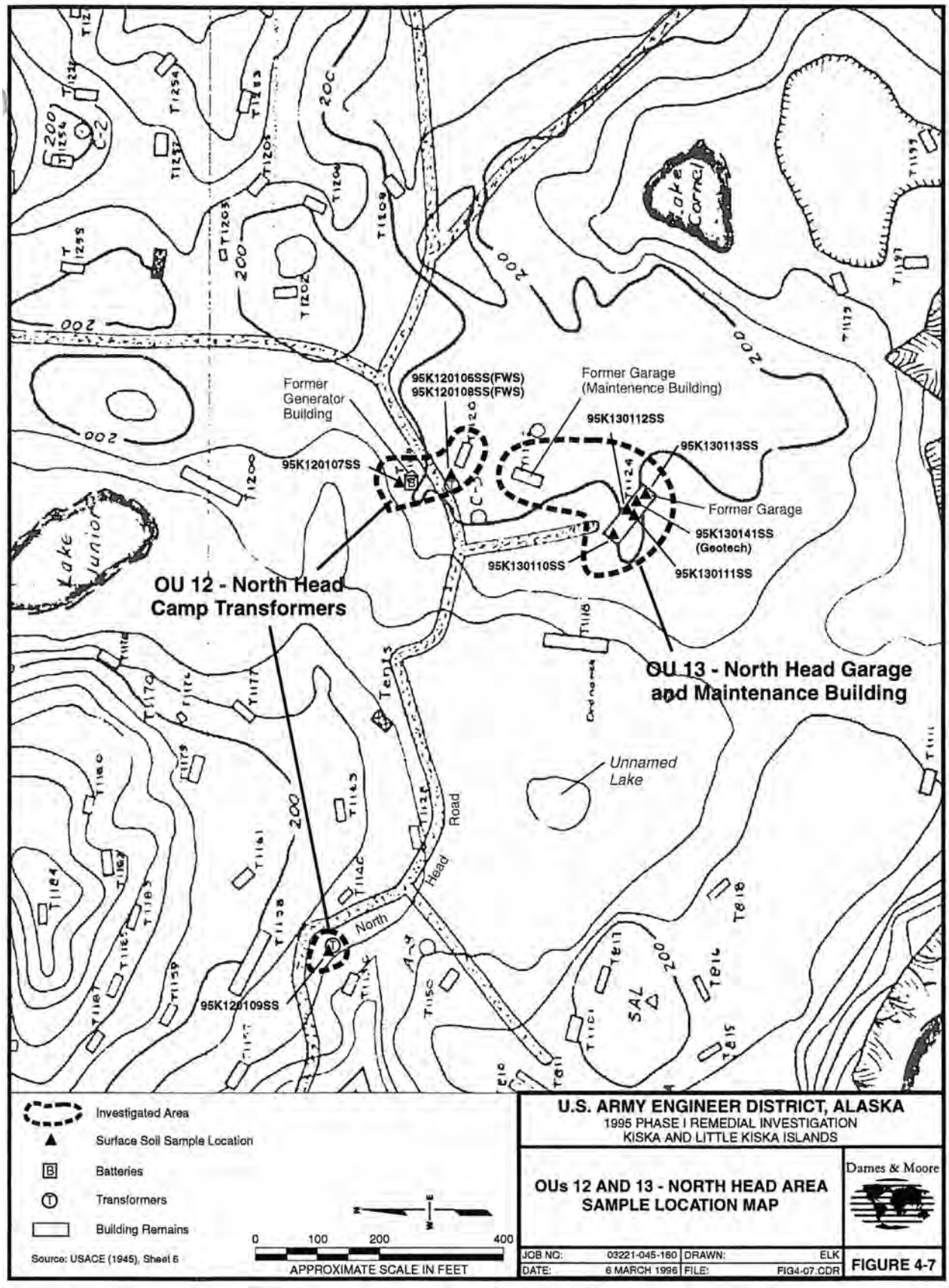


Figure 15. North Head Area, Kiska

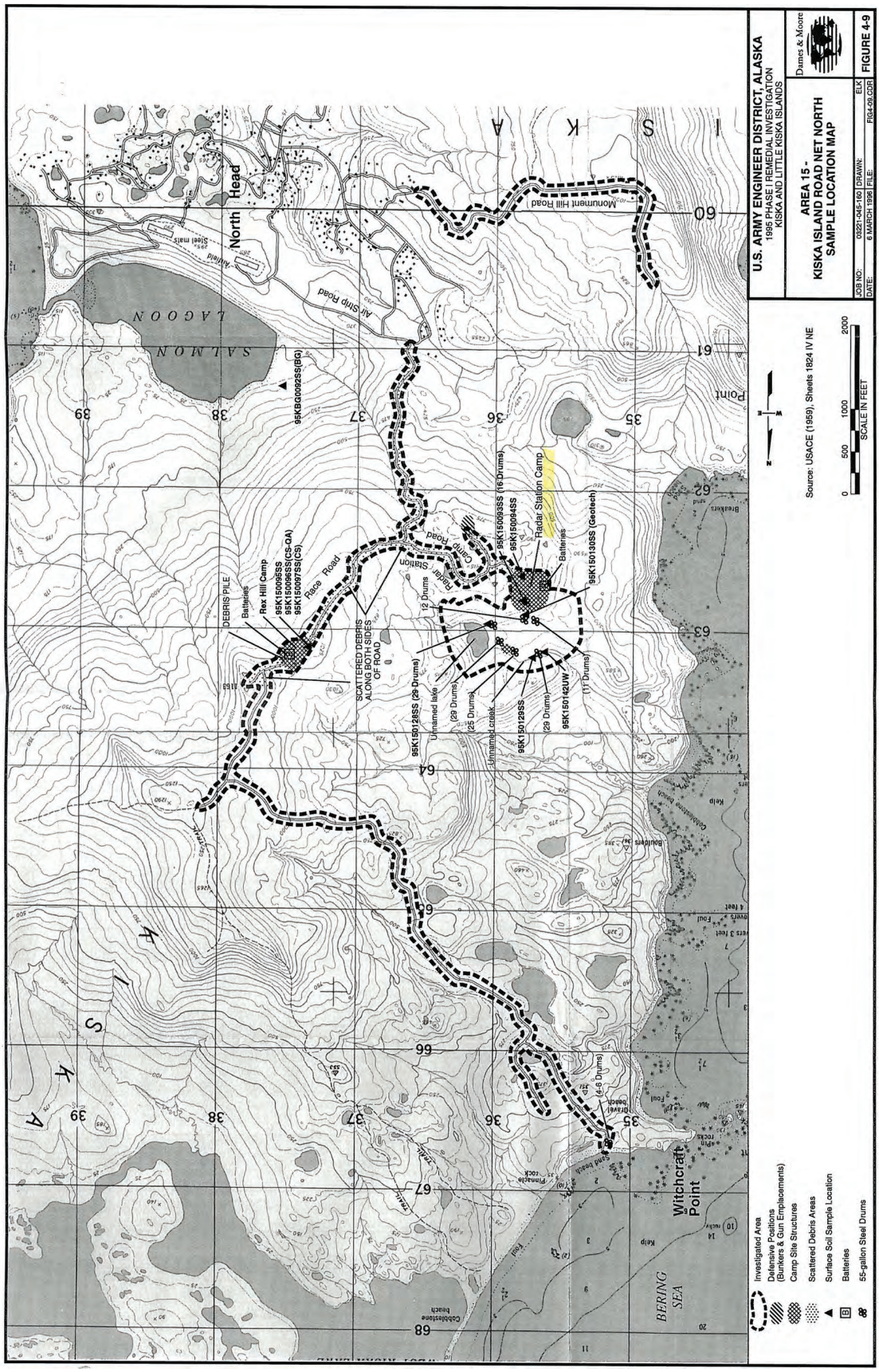


Figure 16. Kiska Island Road Net North, Kiska

Radar Station Camp Drum Storage Area: Approximately 155 steel drums (55-gallon each) were observed in six groups in the small valley located north of the Radar Station Camp. Most of the drums in the six groups were aligned side by side in two end-to-end rows. Many of the drums were reduced to rusted hoops or were rusted through to the ground. The drums were probably liquid storage containers since they had bung type openings. "USA GMC" was imprinted on several drums.

The easternmost and northwesternmost of the six groups of drums contain 29 drums each. Five drums in the easternmost group and one drum in the northwesternmost group were partially full of a petroleum material. Dark staining and an oily sheen were observed on the ground surface in and around each of the six groups of drums. A strong hydrocarbon odor was noted in the soil beneath several groups of drums (Dames & Moore 1996).

The ACOE1945 drawings indicate that the camp consisted of at least nine buildings, including a powerhouse, radio hut, mess hall, shower room, several barracks, and a VHF antenna array.

The scattered remains of at least nine drums were located in the small creek near the lake outlet. Dames & Moore (1996) reported PAHs at 25 mg/kg, and PAHs were detected in a stained soil sample. Diesel #2 fuel was present in a soil sample from the nine drum group in the creek. When the creek sediment near a group containing 25 drums was disturbed, petroleum sheen was observed on the creek, and a strong hydrocarbon odor was noted in the sediment (Dames & Moore 1996). The creek at this location was approximately 100 feet from the group of 25 drums.

Other material observed in the drum storage area included a standpipe and OE. A three-foot vertical standpipe protruded from a small square wooden platform located east of the group of 25 drums. This two-inch diameter steel pipe appeared to be buried in the ground in the center of the platform. Along the side of the pipe was a brass valve. The observed OE consisted of a scattered pile of at least 18 fused and live 75 mm projectiles on the eastern hillside of the Radar Camp Drum Storage Area (Dames & Moore 1996).

Rex Hill Camp: This camp is located on Race Road northeast of the Radar Station Camp

The ACOE1945 drawings indicate that the camp consisted of at least nine buildings, including a powerhouse, radio hut, mess hall, shower room, several barracks, and a VHF antenna array. The powerhouse location contained the remains of a wooden building and a large elevated stand. Dark staining and a strong hydrocarbon odor were noted at the base of the wooden stand (Dames & Moore 1996).

Dames & Moore reported the remains of a canvas bag contained approximately 12 pounds of high explosives. It consisted of four or five square bars and two smoke grenades; it was found adjacent to the west side of Race Road, north of the powerhouse and south of the camp area. Several empty and rusted steel 55-gallon drums, two small cans containing a heavy grease, several large vehicle or storage batteries, one box containing live small caliber ammunition, and one live hand grenade were found in the remains of the barracks buildings. An approximately 20- by 20-foot area, identified with a magnetometer,

appeared to contain partially buried debris. The debris area located on the east side of the camp contained live small caliber ammunition; two empty and rusted 55-gallon steel drums; and miscellaneous wood, glass, and metal debris.

Area 16 - Kiska Island Road Net South

This road network is approximately 13 miles long and was investigated by Dames & Moore (1996). At one drum pile, soil sheen was noted. That sample had fuel-related BTEX compounds. Ditches with standing water were present and could be potentially impacted.

Area 17 – North Head Road Net

This three-mile stretch of road was investigated by Dames & Moore (1996), and they identified several HTRW sources.

Transformers: The power pole network depicted on an ACOE 1944 construction map indicates 16 transformers were used in the North Head Camp area. Maps indicate transformers were concentrated at one main power station and three temporary power stations. The visual assessment of Area 17 identified the remains of five transformers associated with standing or fallen power poles.

Both single and three phase transformers were observed during the assessment. The single-phase transformer is smaller, and consists of a 2-foot long steel cast box with removable lid, and an oil fill line marked "OIL" is imprinted near the top of the casing. The three-phase transformer is about four feet long with a cylindrical body and a square top. The transformer casings were empty of liquid or contained electrical wiring, electrical connectors, or insulation. Oil was not found inside any of the transformers, but some accumulated rainwater was observed by Dames & Moore (1996).

Containers of unknown materials at North Head Camp, Kiska. D. Rudis, USFWS

One pole mounted transformer was noted in the RI (Dames & Moore 1996) approximately 600 feet south of Fox Lake, and one large, damaged pole mounted transformer was observed 300 feet north of King Lake. This transformer was marked by what appears to be several bullet holes, yet it was still mounted on the pole. The transformer contents were not investigated. Three small transformers were observed along the road north of Cable Lake. Stained soil was not observed in 1995.

Buildings: Dames & Moore (1996) identified the foundations of many revetted, fallen, wood frame buildings along North Head Road

and Loop Road, and throughout the North Head area. Glass, wood, and metal building debris; piping; and steel 55-gallon drums were associated with the building footprints. Two empty 55-gallon drums and two empty boilers were found within the footprint of a former mess hall. No stained soil was observed near these drums or within the building footprint. Another revetted building foundation located on a steep, short slope about 1,000 feet south of Fox Lake contained a drum about one-third full of clear liquid, and a strong petroleum odor was noted (Dames & Moore 1996). The drum was leaking, and the surrounding soil was stained and devoid of vegetation. Along North Head Road, three large deteriorated storage batteries were observed (Dames & Moore 1996).

Water Distribution Systems: Remains of two shower houses were observed along the northern portion of Loop Road (Dames & Moore 1996). Each shower facility had a concrete slab foundation. Rusted steel boilers were located near the former shower facility; these were approximately 200-gallon tanks fitted with 2-inch diameter steel pipes. A square metal tank with a capacity of about 1,000 gallons was found on the east side of "Hill 265" (the hill reference refers to the topographic high point elevation). This tank probably supplied water to the nearby shower facilities. A suspected water pipeline crosses Loop Road between the tanks and the shower houses, and a disconnected portion continues underground. In addition to the boiler tanks, five steel, empty, 500-gallons tanks were observed south of Fox Lake. No evidence of surface soil staining or petroleum sheens were associated with these tanks in the RI.

Miscellaneous: Other potential HTRW source materials reported by Dames & Moore (1996) included the remains of two large canvas bladders with flexible hoses and brass valves. These bladders appear to be part of a fuel storage system. A paint storage area was found on the north side of Loop Road within 300 feet of John Lake. The remains of approximately 42 paint cans (one gallon each) were within the remains of a wood frame building. The cans contained dried paint, some of which had spilled onto the adjacent ground surface.

Deborah Rudis with Japanese gun. WWII guns include both small and large artillery. USFWS

Gun Emplacements: North Head has the highest concentration of gun emplacements. In general, these are located along the perimeter of North Head Road, in clusters on the hilltops and at other strategic positions, such as south of Cable Lake, North Head Point, and on top of Hill "275" south of Junior Lake. Surface soil staining and stressed vegetation were not observed near the guns. In addition to the guns, live blasting caps and a 40 mm grenade were reported (Dames & Moore 1996). Numerous shell casings and munitions were observed alongside guns by the author in 2007.

Dames & Moore (1996) samples indicated one drum contained diesel #2 fuel, and PAHs associated with the fuel and adjacent stained soil

Piles of rusted Marston mat that was used for WWII runway surfacing by U.S. forces are found on Kiska. D. Rudis, USFWS

was also contaminated with diesel. Three large storage batteries, two cans of suspected grease, and numerous one-gallon cans of paint were also identified.

Area 18 – South Head Trails

No evidence of trails or former structures were found in this area, and it was considered as No Further Action required in the RI (Dames & Moore 1996).

Area 19 – Gasoline Distribution and Storage Area

Little evidence of any former fuel distribution system (Figure 16) was present, and there were no signs of stained soil, stressed vegetation, or other fuel related contamination (Dames & Moore 1996).

Area 20 – Salmon Lagoon Airstrip and Road (North Head)

No visual HTRW sources were found by Dames & Moore (1996). A six-inch projectile and a 500-pound bomb (with its fuze) were found along the road. Debris included steel runway matting and wood and metal debris. No other COPCs were identified.

Area 21 – Trout Lagoon Camp

Dames & Moore (1996) identified several areas with potential HTRW, primarily drums with petroleum products. Sample analyses detected diesel fuel, PAHs, VOCs, and some unidentified compounds. One sample had PCBs at 15 mg/kg, but the source of the PCBS was not evident, as no transformers or heat transfer equipment were found in the area.

Drum Pile: At the southern corner of Trout Lagoon, approximately fifty 55-gallon steel drums were found in a 60- by 20-foot area located approximately 300 feet south of Trout Lagoon. Most of the drums were rusted through and empty; however, two drums contained oil and accumulated surface water. A hydrocarbon odor was observed in surface soil next to a drum; however, stained soil was not observed. Stressed vegetation was evident adjacent to the drums, which appeared to contain petroleum (Dames & Moore 1996). Two of the five drums found are most likely diesel #2 fuel. Elevated PAH levels were found in soils around another of five drums.

Scattered Drums: Three scattered 55-gallon steel drums were located in the marsh west of the drum pile. The drums appeared to contain oil and accumulated surface water, but they were rusted and had holes. Two drums were approximately half full, and one drum was one-third

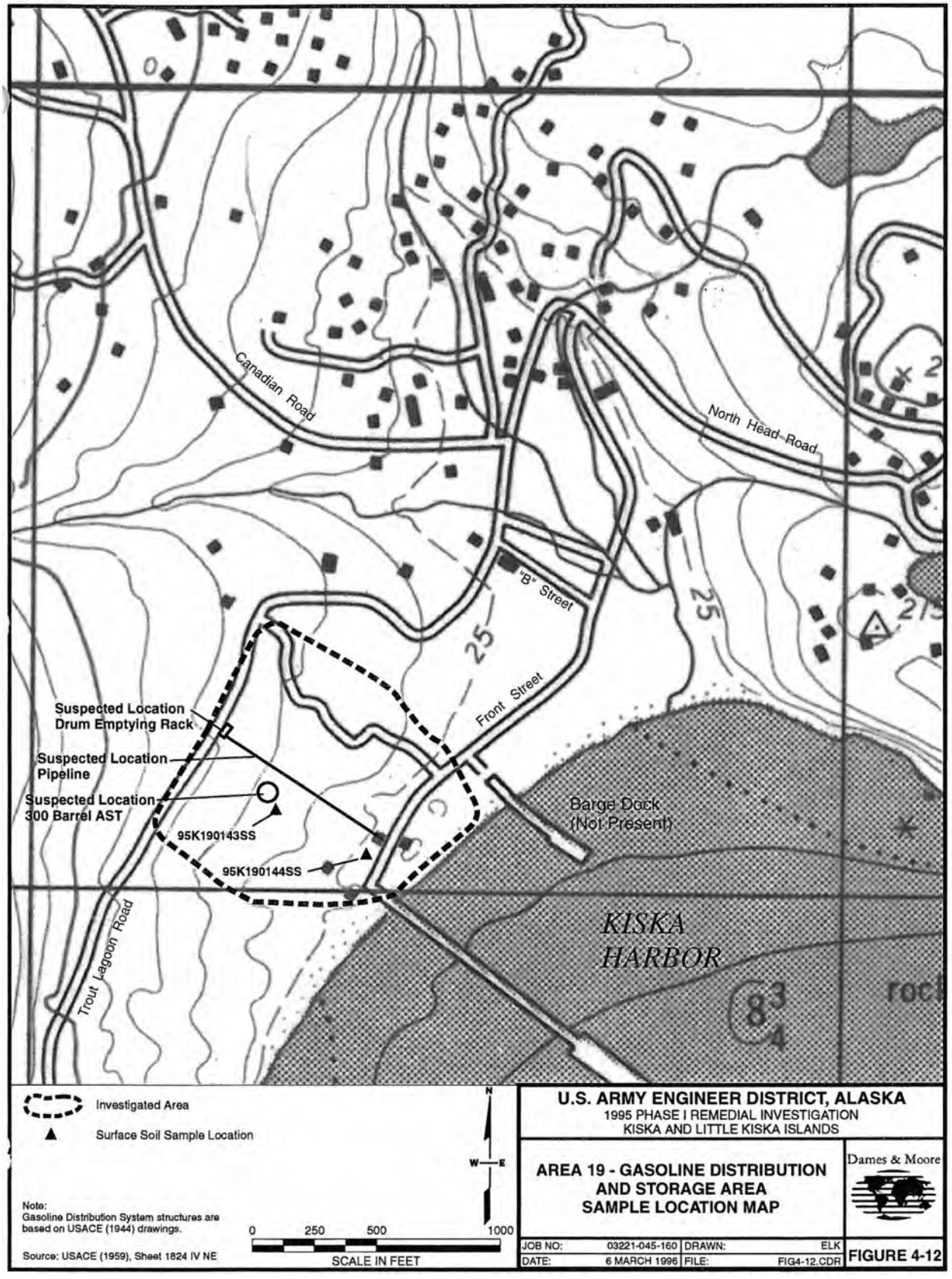


Figure 17. Gasoline Distribution and Storage Area, Kiska

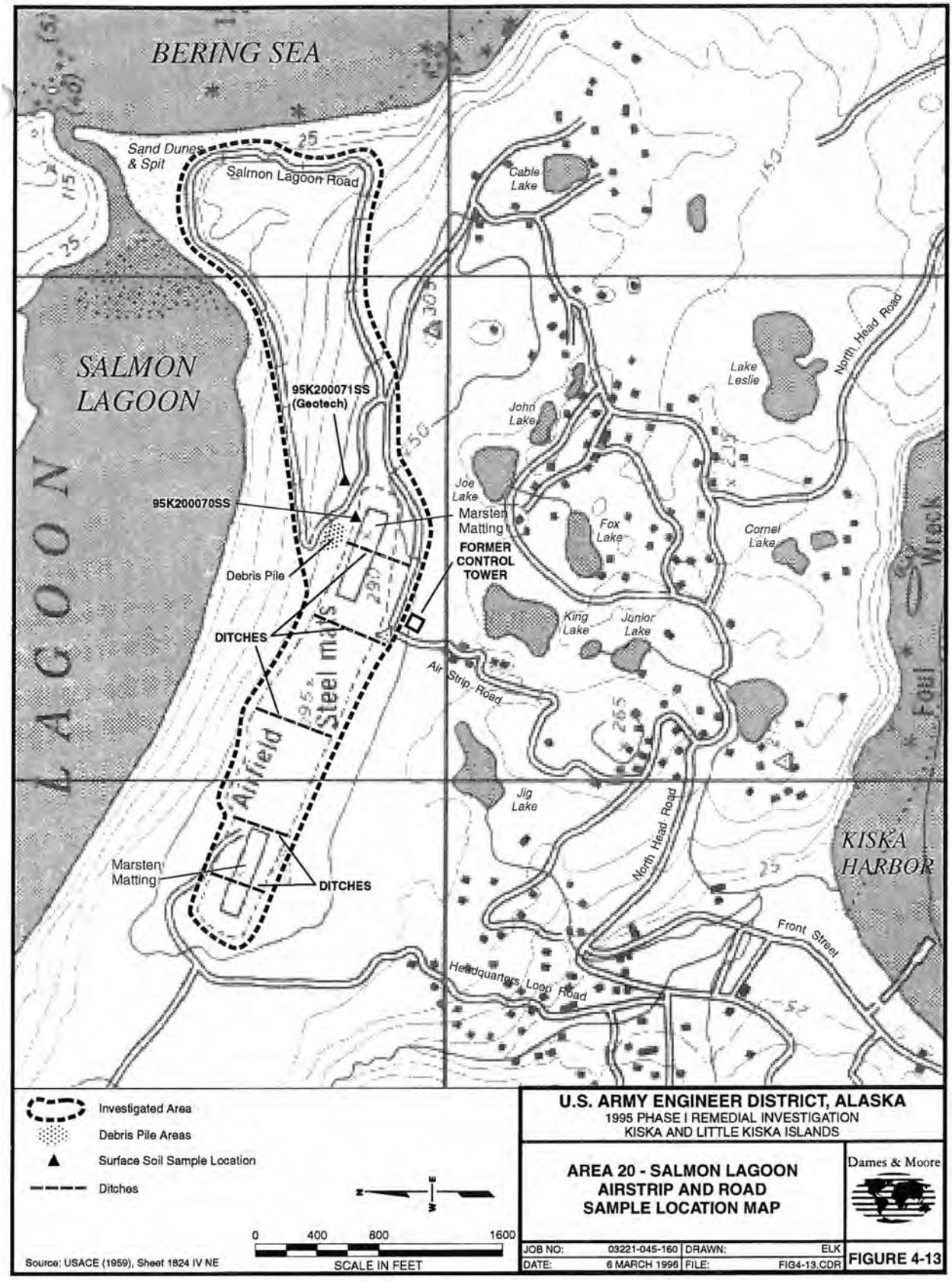


Figure 18. Salmon Lagoon Airstrip and Road, Kiska

full. Hydrocarbon odors and surface soil stains were observed next to each drum (Dames & Moore 1996).

Debris Pile: A debris pile located on the southeast side of Trout Lagoon Spit was identified by Dames & Moore (1996) and consisted of 44 rusted 55-gallon steel drums, wooden planking and lumber, steel fasteners, nails, bolts, and a wooden trailer bed. The drums were empty, and surface soil stains or hydrocarbon odors were not noted. Scattered in the debris were .35-caliber shell casings. A reinforced concrete pad with electrical cable was observed in the hillside near the debris pile.

Area 22 - Former Submarine Base and South Head Hill

The Submarine Base remains consisted of the former submarine haul-out railway, the repair shop, the Submarine Base camp, a road network, various tanks, various debris piles, and revetted structures. Several possible HTRW sources were identified during the visual assessment of the area by Dames & Moore (1996) and the author's 2007 site visit.

Submarine Railway: The submarine railway was completely overgrown with dense grass in 2007, beneath which the remains of the gravel base and the reinforced concrete launch ramp were located. The remains of two Japanese Midget, "Sydney-type," submarines were observed: scattered remnants of one was found in the beach surf zone east of the launch ramp, and the second more complete wreck was found in the launch ramp. The submarines appeared to be battery powered, and the remains of the batteries were near and within both of the submarine hulls. Over 100 batteries, several of which are broken and scattered, were observed at the submarine on the launch ramp. The submarine remains in the surf zone contained several broken batteries, which were noted at an extreme low tide in August 2007.

Submarine Repair Shop: The suspected remains of a submarine repair shop were located on either side of the launch ramp. The remains consisted of earthen revetments, as well as wood and metal debris. A gravel road ran between the earthen revetments and the south end of the Submarine Base. No surface soil staining or disturbed vegetation was observed around the submarine facilities in 2007.

Japanese submarine station, 1943. U. S. Signal Corps photo

Submarine Base Camp and Road: The Submarine Base Camp consisted of several collapsed wood frame buildings, including former barracks, a mess hall, and three shower houses. Seven 55-gallon steel drums were partially buried in a revetted bunker north of the creek at the end of the road. Eight 55-gallon steel drums

Japanese submarine WWII, Kiska. D. Rudis, USFWS

were scattered along the hillside at the end of the road. The drum locations were consistent with the location of the former Submarine Base power station. Surface soil staining and stressed vegetation were not observed at the Submarine Base Camp or near the drums in 2007.

Tanks: The remains of eight suspected water tanks were observed along the side of the road and in the marsh. Three 500-gallon tanks were present east and southeast of the submarine launch ramp. Two 500-gallon tanks were located on South Head Hill Road. A 1,000-gallon tank and associated water lines, valves, and standpipes were observed at the Submarine Base Camp. No surface soil staining or stressed vegetation was observed near the tanks in 1995 or in 2007.

Debris Pile: Military debris was identified around defensive positions along South Head Hill Road by Dames & Moore (1996). A wooden debris pile consisting of skids, steel beams and posts, and large outboard engines was found near the beach at the base of South Head Hill Road. Several bunkers and a gun emplacement were located further east along the road. A small, partially covered, debris pile was identified in a ravine on the north side of the road near the westernmost gun emplacement. The debris consisted of steel pipes, vehicle parts, OE, shell casings, glass, brass pump housings, an empty compressed gas cylinder, and four empty 55-gallon steel drums.

Area 23 – Gertrude Cove Camp

Several areas with potential HTRW sources were identified during the visual assessment of the area by Dames & Moore (1996) and the author's site visit.

Gertrude Cove Road to Trout Lagoon Road: At the beach in Gertrude Cove three live 75 mm projectiles were found in the surf by Dames & Moore (1996).

Gertrude Cove and Trout Lagoon Road Intersection: Several revetted building footprints and scattered wood and metal debris were observed along both sides of the Gertrude Cove Road east of the intersection (Figure 18). A small debris pile containing the remains of numerous gas masks, wood building material, various metal machinery parts, and other debris was found on the south side of Gertrude Road, 100 feet west of the Trout Lagoon Road intersection. Eight empty, rusty 55-gallon steel drums were found approximately 100 feet southwest of the gas masks and were either on the surface or partially buried. Evidence

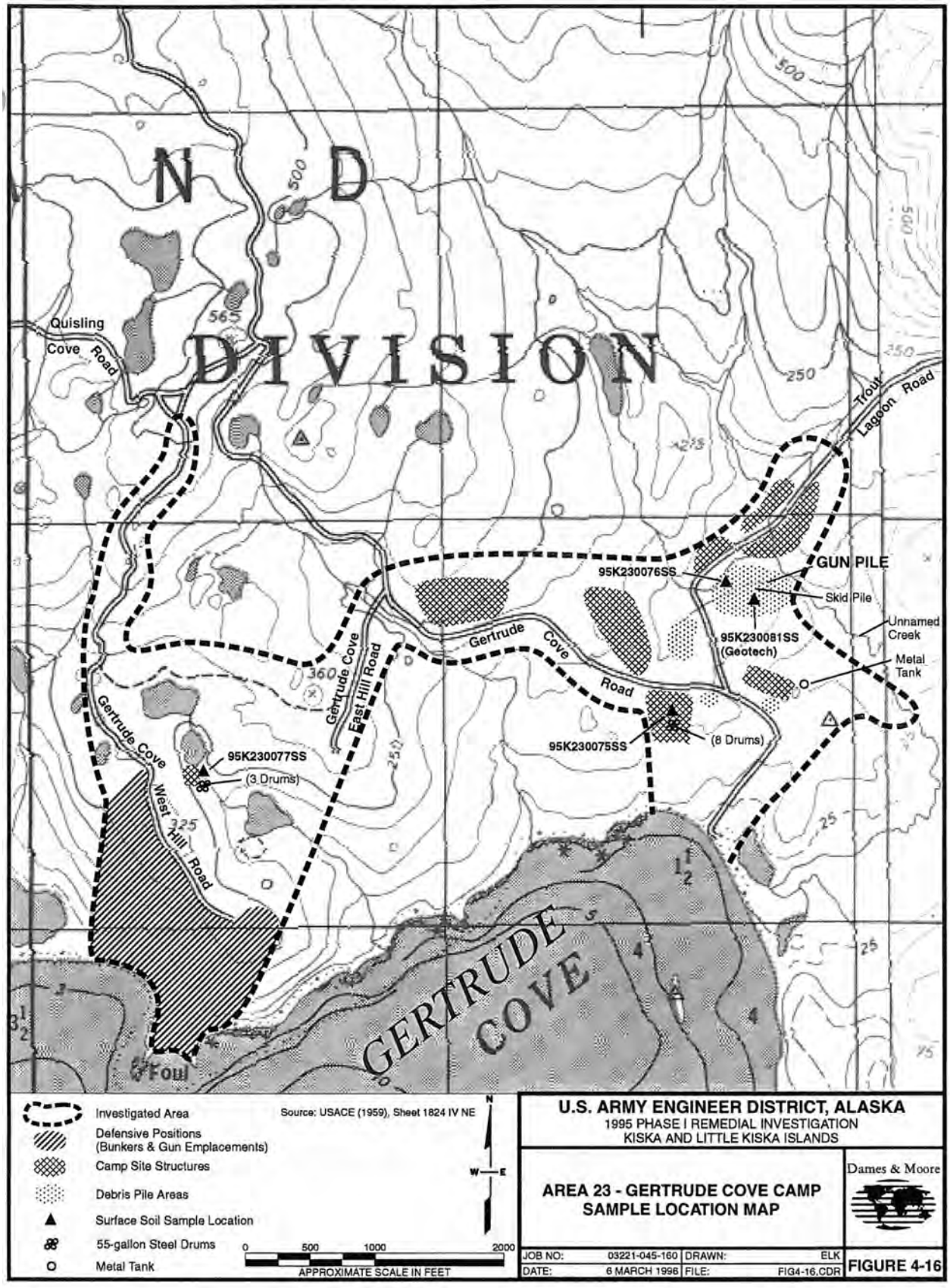


Figure 19. Gertrude Cove Camp, Kiska

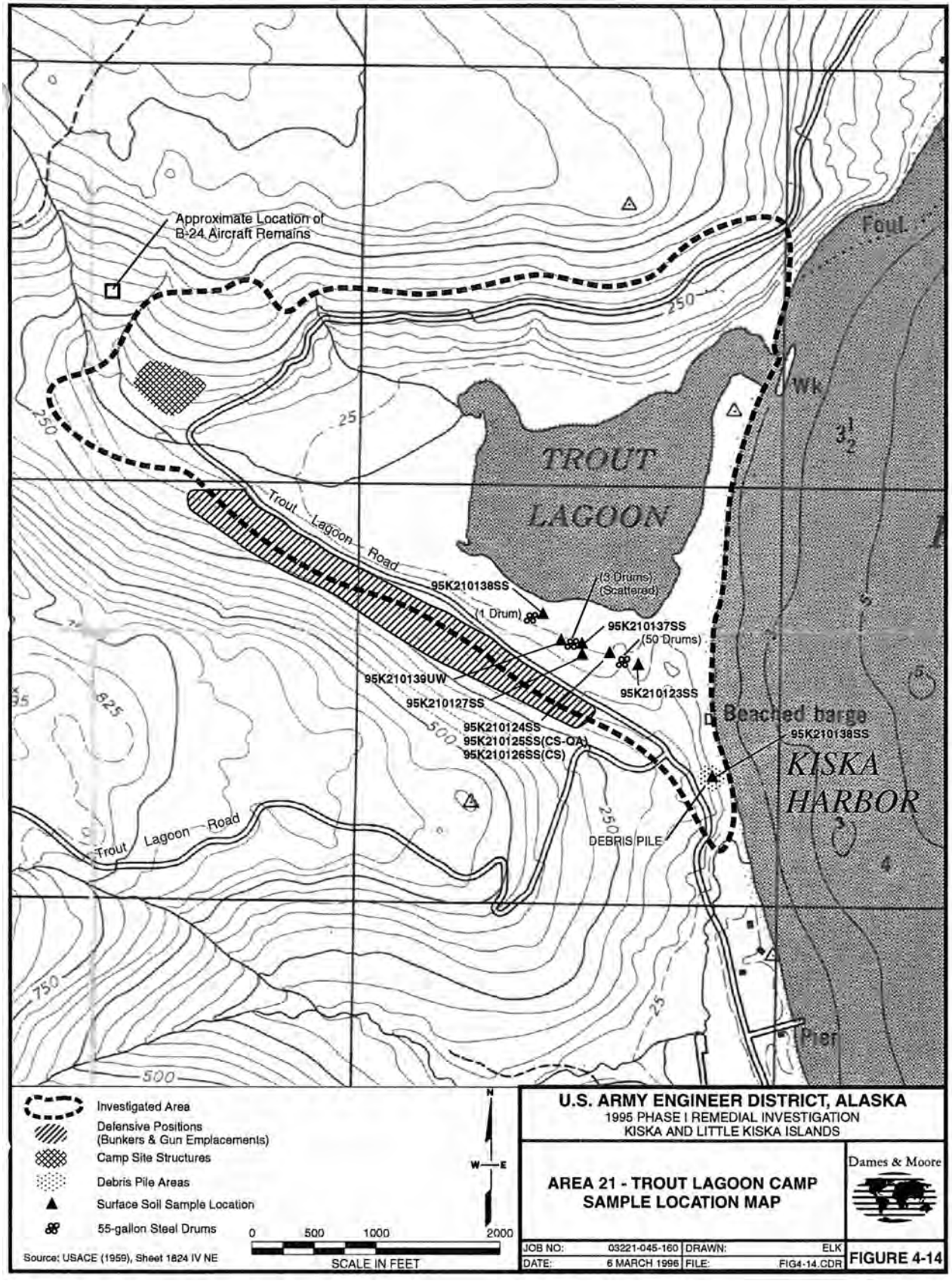


Figure 20. Trout Lagoon Camp, Kiska

Ordnance is found around some of the Kiska guns. D. Rudis, USFWS

of surface staining or stressed vegetation was not observed around the drums in 1995 or 2007.

Trout Lagoon Road: A large cleared area west of the road (Figure 19) contained the remains of a wood platform and two large piles of metal, wood, and glass building debris. A gun pile was located east of the road. A large debris pile containing numerous wooden skids was observed adjacent the gun pile. A smaller debris pile, observed approximately 300 feet east of the skid pile, contained one rusty, empty 55-gallon steel drum, three empty 5-gallon metal buckets, three 75 mm guns, the remains of several truck bodies, vehicle parts, rubber tires and wheels, and miscellaneous metal and wood debris. A strong hydrocarbon odor was noted in the area in 1995 by Dames & Moore; the exact source of the odor could not be determined, but they noted a grease container in the debris pile. Debris along both sides of Trout Lagoon Road included numerous revetted building footprints; some contained wood foundations remains. OE located along Trout Lagoon Road included three 75 mm guns and one 75 mm howitzer cannon. Two blocks of TNT were reported in the gun pile (Dames & Moore 1996).

Gertrude Cove East and West Hill Roads: The wooden foundation remains of a small revetted building, three rusty 55-gallon steel drums, and six 5-gallon gasoline cans were observed on a hillside adjacent to the west side of the middle lake. Evidence of possible HTRW sources were not observed in this area.

Area 24 – Mutt and Jeff Coves

A small foxhole contained several 57 mm rounds and several rounds of .30- and .50-caliber munitions. Several .30-caliber rounds were found in the trench system and foxholes on Cobra Neck (see Figure 20).

Area 25 – Kiska Island OE

Vegetation growth may cover ordnance on Kiska, and unexploded ordnance may be buried and only detected with metal detectors and trained personnel. A wide range of ordnance may be present, including, Japanese munitions that were abandoned when they evacuated their troops, Allied forces munitions that did not explode upon impact, and/or ordnance that was left behind following withdrawal of Allied forces. At gun sites on Kiska, there are often ammunition piles that are extremely hazardous, as many casings are corroded and could easily

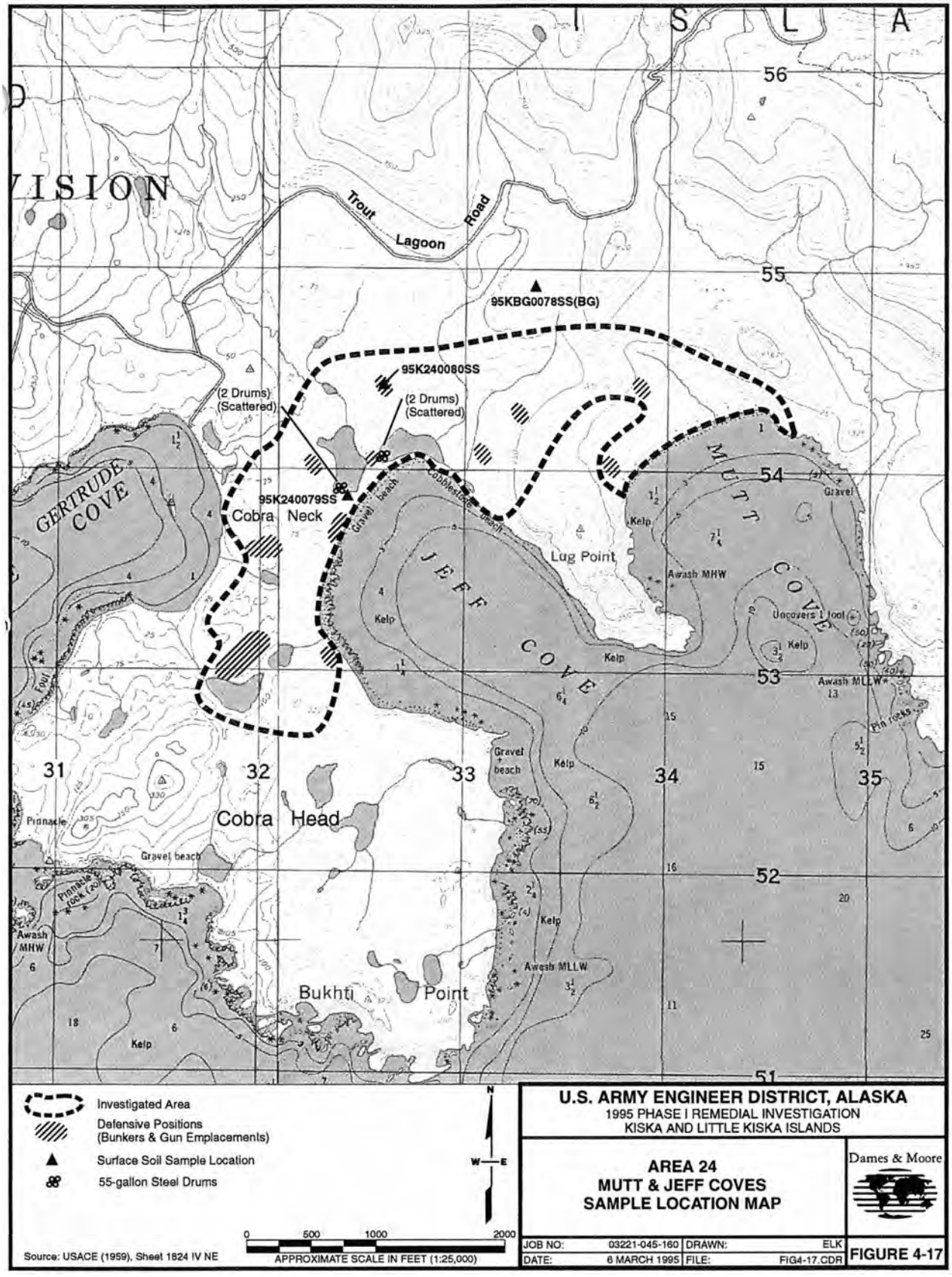


Figure 21. Mutt and Jeff Coves, Kiska

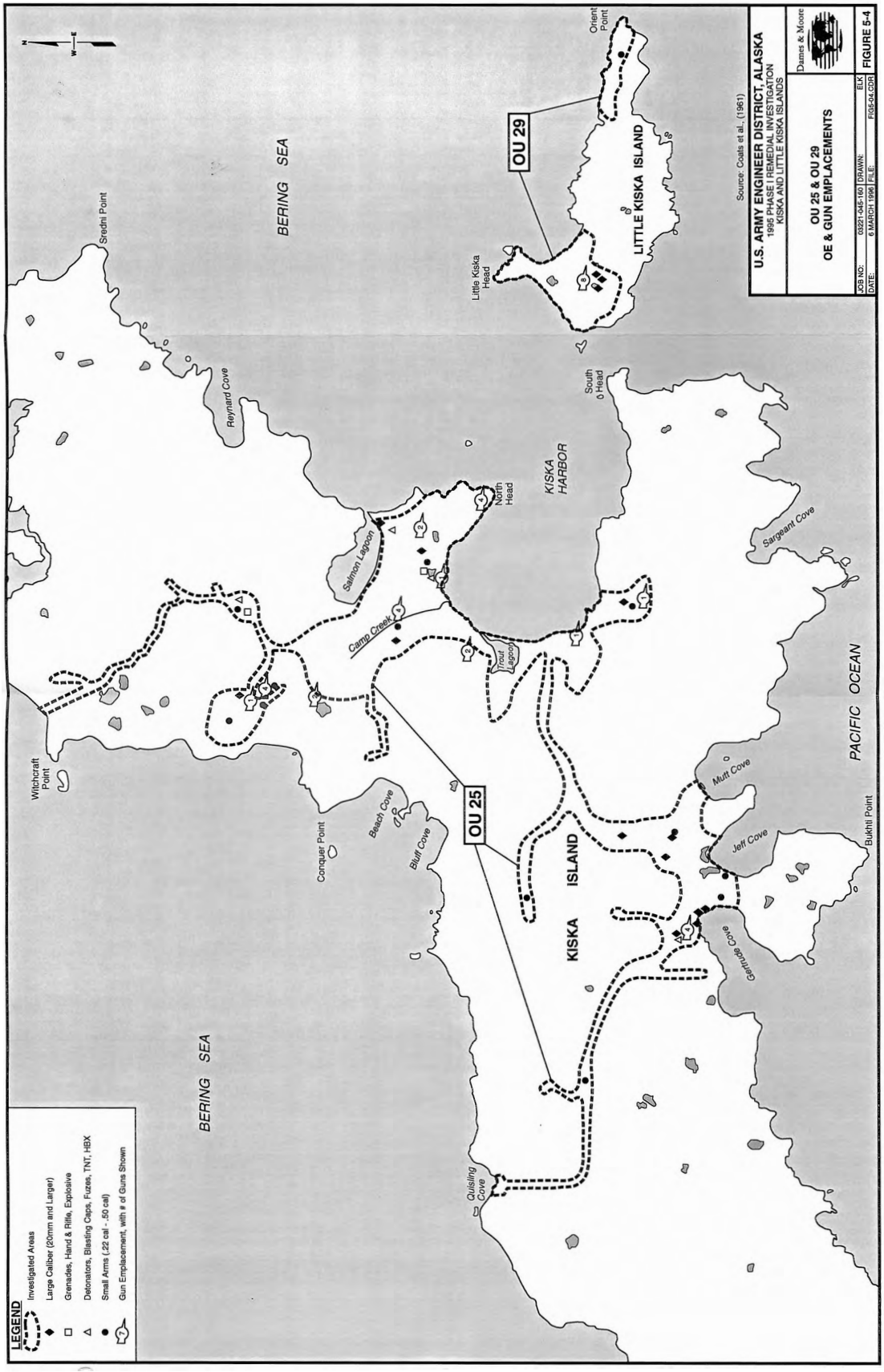


Figure 22. OE and Gun Emplacements, Kiska

explode if handled. OE found by several investigations consisted of small arms munitions, grenades, artillery rounds, and high explosives such as blasting caps.

Additional OE found near the area of the Canadian invasion was reported by seabird researchers from Memorial University, Newfoundland. OE included mortar rounds, artillery shells and a hand grenade. There is also a chance of OE at the United States forces invasion point (Figure 22).

Dames & Moore reported the following observations in the RI. No location documentation was included with their site descriptions.

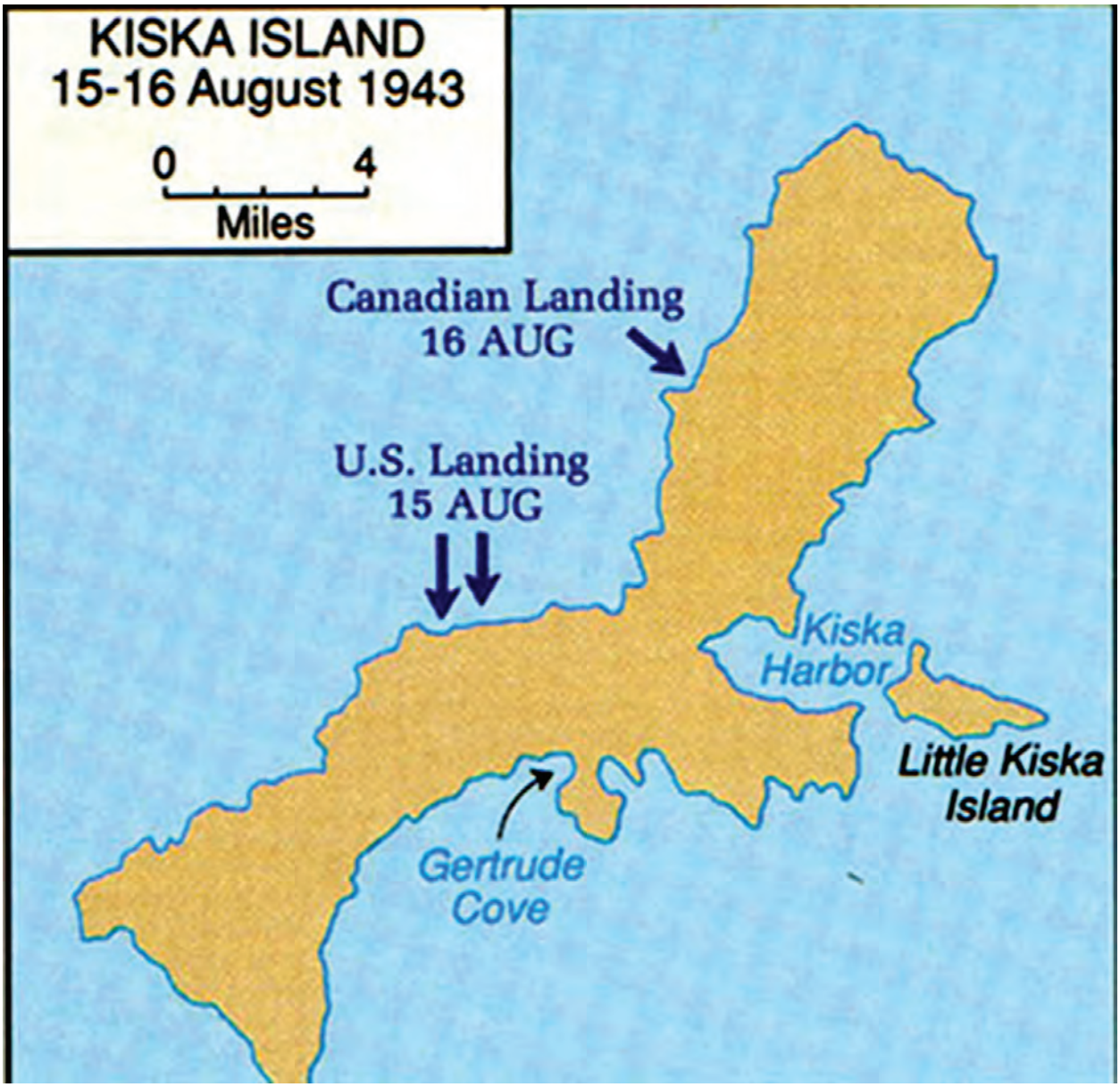


Figure 23. Battle of the Aleutians – Allied Landing Areas, Kiska

Area 15 - Kiska Island Road Net North: OE was observed at former camp locations, around Japanese guns, and at several locations along roads. Numerous live rounds of small caliber munitions were found in a building footprint identified as a mess hall in the Rex Hill camp area. Along Radar Station Camp Road, four 75 mm guns and a 20 mm anti-aircraft gun were observed. Small caliber munitions were found in a wooden box.

A scattered pile of at least 18 fused and live 75 mm projectiles was observed on the hillside on the eastern end of the Radar Station Camp Drum Storage Area. This ordnance was next to the road bed and spread around an area 30-feet long and 10-feet wide. The projectiles appeared rusted and weathered, but the box-like protection on the projectile fins was not weathered.

A 500-pound bomb was identified north of the airstrip on the steep portion of the hillside, 100 feet east of the Salmon Lagoon Road "switchback." The bomb was 2.5 feet long and cracked in the center, which is evidence of a low order detonation.

The remains of a canvas bag containing approximately 12 pounds of high explosive in four or five square bars, and two smoke grenades, were found adjacent to the west side of Race Road, north of the powerhouse and south of the camp area. The high explosive appeared severely weathered. In addition, a hand grenade lying on its side and moderately corroded was found in the remains of one Rex Hill barracks.

Area 16 - Kiska Island Road Net South: One 6-inch, unexploded projectile and machine gun munitions were found in Area 16. This corroded ordnance was lying in the center of Trout Lagoon Road.

Area 17 - North Head Road Net: Three types of OE were observed at Area 17, including blasting caps, unexploded artillery, and a grenade. The live blasting caps were around two gun emplacements on top of Hill 265. A 6-inch artillery shell was found on a steep, short slope roughly 1,000 feet south of Fox Lake. A 40 mm grenade was found on the south side of Hill 265.

North Head had the highest concentration of gun emplacements. In general, these were located along the perimeter of North Head Road and in clusters on the top of hills and other strategic positions. (See Spennemann 2008 for Kiska gun details.) Gun locations were south of Cable Lake, North Head Point, and the top of Hill "275" south of Junior Lake. No OE was found around these gun emplacements by Dames & Moore, but a 6-inch unexploded shell was found northwest of Gun A during the 2007 interagency Kiska gun investigation (Spennemann 2008). A partially buried shell was also found near a Gun A, and several shells, some of which may be live, were reported around Gun C (Spennemann 2008).

Area 20 - Salmon Lagoon Airstrip and Road: OE was observed along the Salmon Lagoon Road between the airstrip and the Salmon Lagoon Spit. A 500-pound bomb was identified north of the airstrip on the steep portion of the hillside, 100 feet east of the Salmon Lagoon Road "switchback." The bomb was 2.5 feet long and cracked in the center, which is evidence of a low order detonation. The bomb base plate and fuse were located near the bomb casing and described as a 100 series fuse with the booster remains.

A 6-inch diameter projectile was found approximately 1,000 feet northeast of the airstrip.

Area 22 - Former Submarine Base and South Head Hill Road: Small arms munitions and ordnance casings were identified at a debris pile located along the South Head Road, southwest of the Former Submarine Base. Several rounds of .30-caliber munitions were found in the debris pile. One 45 mm coastal defense gun was located on the beach approximately 50 feet south of the former submarine railway. Another 40 mm gun was located on South Head Hill, positioned to defend the harbor from points south. No OE was found around these two guns.

Area 23 - Gertrude Cove Camp: OE high explosives were identified at three locations in at this site. OE included 75 mm projectiles, three of which were found in the surf at Gertrude Cove Beach near Gertrude Cove Camp Road. Several 75 mm projectiles without the shell casings were found in two barrels of 75 mm guns at the gun pile. One 75 mm shell was found in the barrel of a howitzer cannon located under a truck body in the gun pile. Two blocks of TNT were found on the ground surface at the gun pile. Six 75 mm costal defense guns were abandoned along with other military debris approximately one-quarter mile from Gertrude Cove Beach.

UXO hazards are commonly found on Kiska, these were found in the North Head Camp area. D. Rudis, USFWS

Area 24 - Mutt and Jeff Coves: Identified ordnance included several 57 mm rounds found in a small foxhole located midway between Jeff Cove and Trout Lagoon Road. The same foxhole contained several rounds of .50- and .30-caliber munitions. Several .30-caliber rounds were also found in foxholes and in the trench system on Cobra Neck.

Observations of hazardous waste and contaminated sites noted during the author's 2007 interagency site visit are listed in this section.

North Head Road. This area had power poles, building debris, and scattered, corroded, 55-gallon steel drums.

North Head Camp. Building debris, power poles, and two propane canisters were found, and broken batteries (four) were present on bare, rocky soil; three were together and the fourth battery was approximately six feet apart from the group of three. A transformer and power poles remain.

At the North Head Camp airstrip, a wood and building debris area and paint cans remains

were found. Lead-acid battery remains, oily drums with product, and one battery were in this area. In the North Head Camp area, munitions, bullet casings, and bomb ends with fuzes were scattered around.

A hillside burn barrel was found above Lake Leslie.

Two 100-gal tanks were empty, and no sheen was noted.

A boiler, empty heating tank, and building remains are also in this area. Adjacent were five corroded 55-gallon steel barrels and one corroded tank.

Anti-aircraft guns and four bullet piles were found. Adjacent to this site was an approximate three-foot by four-foot area with broken pieces of an unknown solid white substance, along with additional bullets.

Truck and trailer remains, one intact battery under the truck wheel, and an additional broken battery were noted. A propane tank was downhill of these items.

Suspected lead-coated cable was on the ground along power poles. Other items included building debris and a propane tank.

A gun hill and machine gun parts remain, along with a battery and building debris.

In a wetland, there was an open fuel barrel; there was sheen on the water, emergent vegetation with a sheen coating, and a fuel odor in the wetland.

Four guns remain in place.

There was a broken battery, a pump with fuel, and a possible distribution pipe.

Canadian Camp

No sampling information from any prior investigations could be found for this area.

Along a stone wall in the Canadian Camp was a box with empty cartridges; a broken battery was nearby. A cement walled structure, approximately a 10-foot by 8-foot site, was a possible munitions storage area for nearby guns. Three fuel drums had oil, odor, and some semi-solid product. There was stained soil below the drum. Drums were just above some electrical debris. A debris pile contained miscellaneous debris, including rusted drums, ship parts, and an old vehicle. At this campsite, there was a drum with a viscous oily product and other scattered empty drums.

Shoreline

The main dock has creosote-treated pilings and a corroded former fuel supply line. There may be a landfill in this hillside berm where miscellaneous debris, including cable, drums, and aircraft parts, was noted. Above and past the docks were corroded steel tanks, vehicle parts, and aircraft debris. Creosote-treated logs were in a pile in dunes above beach. Three additional creosote-treated log piles were found

Spent shells in the Canadian Camp area, Kiska. D. Rudis, USFWS

in an adjacent swale. A dump of corroded drums was in the dunes behind the beach. No sampling information from any prior investigations could be found for this area. A small stream had oily sheen present.

In the Kiska harbor area is the well-documented Japanese mini-submarine with 50 or more batteries. At the Japanese submarine base were three large tanks; one was known to be empty, contents of the other two are unknown. There was no visible staining or stressed vegetation. On the beach, remains of a second Japanese mini-submarine (one section) and batteries were visible only at low tide.

A small shipwreck is partially buried in the sand at the mouth of Trout Lagoon. Heavy equipment (unidentified) and one intact lead acid battery are in this area.

The maintenance shed area had a battery, propane tank, and unidentified machinery. Also in this area were a much corroded transformer and old power pole remnants. Nearby was a Quonset hut and a corroded fuel tank.

A group of about 35 corroded drums were in Trout Lagoon Valley. None appeared to be intact.

There is also a single drum with some soil staining and weathered POL product.

- Other observations include:
- In an upper drum dump, approximately 60 corroded drums were noted.
- Spent shell casings were found on the hillside of Pinnacle Rock area.
- Noted in the same area were vehicle debris and two or possibly more corroded drums.
- The ravine above Trout Lagoon has miscellaneous debris scattered in tall grass.
- One power pole has a broken and open transformer; nearby was an unexploded artillery shell.

A munitions cache(s) was found on the north side of Kiska Island near Witchcraft Point in 2007. The following location description came from Dr. Ian Jones, a seabird biologist, who took the photographs the Service sent to the ACOE in May, 2008:

"... a large US dump area located where the cross-island road hits the beach just north of Witchcraft Point. The dump is mostly covered with sand and earth (and vegetation) but items are eroding out at the beach and there is a small stream that runs through it that has oil sheen and ordnance in it. Size: about 2-5 Ha." (5-12 acres)

Arnica blooming amidst WWII building debris on Kiska. D. Rudis, USFWS

Little Kiska

Little Kiska Island encompasses 1,833 acres; it lies just south of Kiska Island and has three areas of potential contaminant concerns. Little Kiska Head is on the northern part of a peninsula (Figure 2) and was investigated by Crayton (1991), and during the RI and SI. Crayton (1991) reported six drums and machinery stacked at the lower end of Sluff Lake, but no evidence of these items or any HTRW was found during the RI (Dames & Moore 1996). On Little Kiska Head, large bomb craters are located near the edge of Sluff Lake and continue westward towards the gun emplacement hill. Two soil samples collected during the RI did not have detectable concentrations of PAHs.

North of the road origin, three bunker footprints were located by Dames & Moore along the base of a hill. The bunkers appeared to be connected by a tunnel system.

On the west central side of Little Kiska is a gun emplacement, and bunker and building footprints. A road from the beach leads to this site (Figure 23). North of the road origin, three bunker footprints were located by Dames & Moore (1996) along the base of a hill. The bunkers appeared to be connected by a tunnel system (Dames & Moore 1996). Seventeen 55-gallon drums were scattered throughout a marshy area; all appeared empty and rusty (Dames & Moore 1996). One bunker contained 13 rusty, empty 55-gallon steel drums. Other drums were scattered around the road access and at the top of Gun Emplacement Hill. They did not see any signs of HTRW around any of these drums. Guns at this site are three 6-inch coastal defense guns, three 25 mm anti-aircraft guns, one gun turret, and one wheeled cannon. Rounds of OE were found at the base of one of the 6-inch guns. Additional rounds discovered by Dames & Moore (1996) were found on a lower southeast facing slope near a lake. The interagency team visit in 2007 located the guns and some of the OE, including artillery shells, spent shell casings, and artillery rounds. We also relocated the remains of a truck and battery that were noted in the RI (Dames & Moore 1996) report. Soil samples from this area collected for the RI did not have detectable PAHs (Dames & Moore 1996). Crayton (1991) collected sediment and fish samples from the lake east of Gun Emplacement Hill. Those fish samples had low concentrations of DDT. PAHs were detected at low concentrations in Gun Emplacement Lake sediments.

Orient Point is located at the easternmost end of Little Kiska. Remains of buildings and a powerhouse were located approximately 3,000 feet west of Orient Point (Dames & Moore 1996). On top of the bluff are the remains of about 15 buildings and their footprints. Building debris, including scrap wood, siding, roofing, and door and window frames, are scattered around the area. Overgrown foxholes, power poles and overgrown roads are located near the hilltop. Dames & Moore (1996) also found two groups of approximately 13 and 15 rusty 55-gallon steel drums. Drums were all empty, and no signs of HTRW were noted. Two soil samples from this area did not have detectable PAHs or PCBs (Dames & Moore 1996).

The SI team surveyed building locations, storage, artillery positions, a range fan, heavy anti-aircraft gun positions, ground scars, machine gun positions, and underground shelters (Bristol 2012). MEC found included an unfired 25 mm anti-aircraft round, a 6-inch unfuzed and unfired round near a 6-inch coastal defense gun, and several unfuzed 6-inch rounds near another 6-inch gun. These 6-inch rounds were also

reported in the RI. A cache of over 600 rounds of .50-caliber small arms ammunition was found in an estimated 12-foot square area. The ammunition crates were visible, and additional rounds were located under the vegetation. Little Kiska sites are OU 26, OU 27, and Area 28 in the RI (Dames & Moore 1996).

Vegetation reclaims the past on Kiska and Little Kiska, such as the remains of this Japanese stove on Little Kiska. D. Rudis USFWS

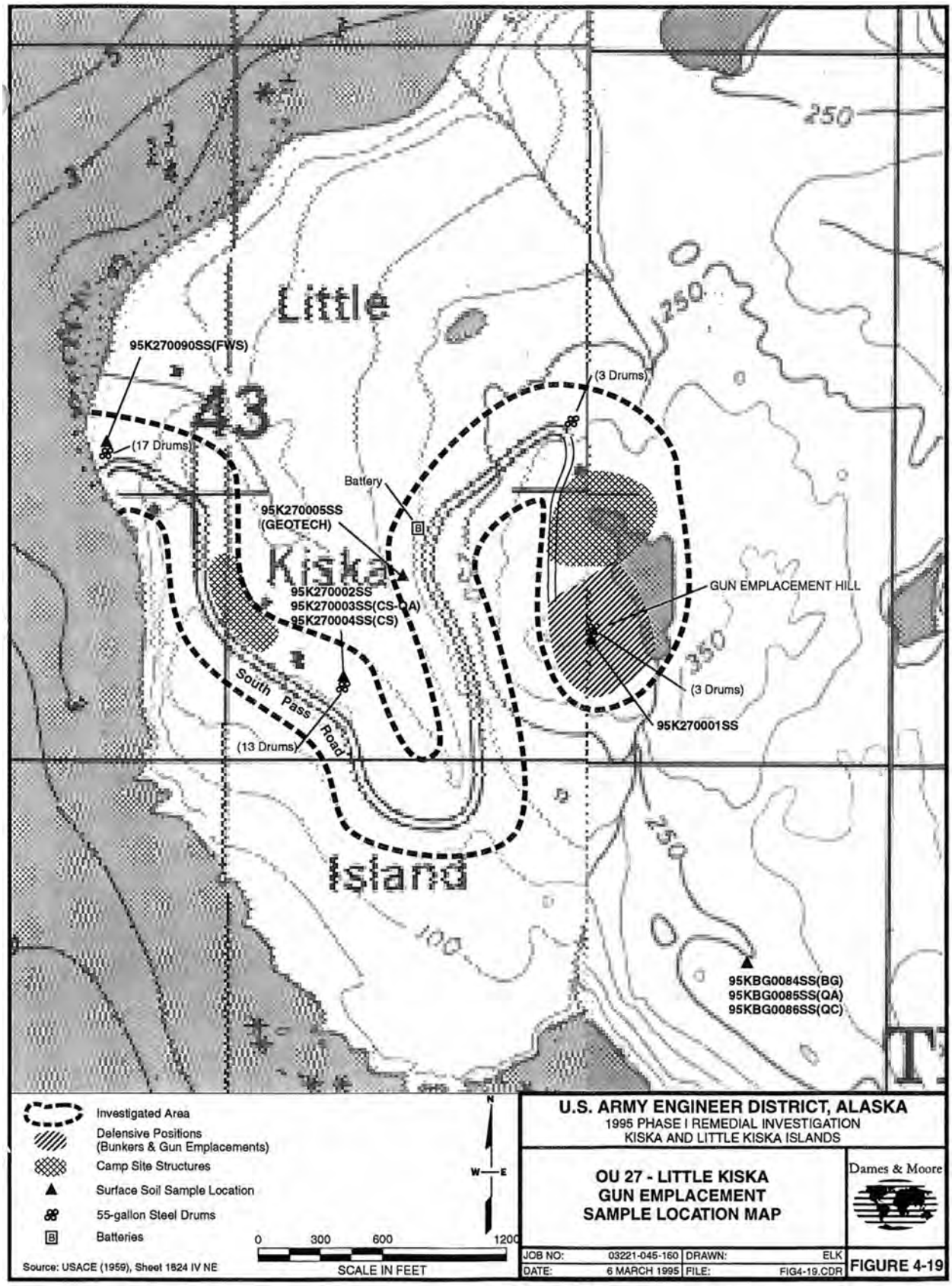


Figure 24. Little Kiska Gun Emplacement and Dames & Moore sampling locations.

Marine Environment

Seafood Harvest and Processors

The Aleutian Islands and Bering Sea Management Area supports some of the largest and most valuable commercial fisheries in the United States. Important fisheries are conducted for red and golden king crab, Tanner crab, Dungeness crab, Pacific cod, several species of flatfish, sablefish, Atka mackerel, walleye pollock, and Pacific salmon species. Finfish and shellfish stocks in this area provide year-round commercial fishing opportunity.

Seafood catcher-processors carry a number of hazardous chemicals associated with fish and shellfish processing. They include chemical cleaners such as ammonia, chlorine, caustic soda and nitric acid. Discharges authorized by ADEC for the Alaska Pollution Discharge Elimination System general permit for seafood processors include processing wastes, process disinfectants, and sanitary wastewaters, including domestic wastewater, cooling water, boiler water, gray water, freshwater pressure relief water, refrigeration condensate, water that is used to transfer seafood to a facility, and live tank water. All processors must route all processing wastes through a waste conveyance and treatment system before discharge.

- **AKG520000 Seafood Processors in Alaska GP.** (Expired/ Administratively Extended) Covers shore based facilities and vessels operating within 3.0 nautical miles (nm) of shore at mean lower low water or baseline. No new permittees can be authorized under this permit.
- **AKG521000 Coastal Fish Waste Discharges to Marine Water GP.** (Under Development) ADEC is developing this general permit for shore-based facilities and vessels discharging to marine water within 0.5 nautical miles (nm) of shore at mean lower low water.
- **AKG523000 Alaska Offshore Seafood Processors GP.** Covers currently permitted seafood processors discharging in Alaskan waters between 0.5 and 3.0 nm from shore at mean lower low water or baseline.
- **AKG524000 Offshore Seafood Processors in Alaska GP.** Covers seafood processors that discharge more than 3.0 nm from shore at mean lower low water or baseline.

The majority of crab processing activity occurs between January and March, with some activity in September and from November to December. Halibut processing generally occurs during the summer months, while Pacific cod and other miscellaneous fish may be processed at any time during the year.

Sensitive biological areas that are excluded from processor discharges are listed on the ADEC Web site. An interactive Google Earth map delineates these excluded areas where there is a one or three nautical mile buffer, dependent upon resource sensitivity.

- Steller and Spectacled Eiders
  - Stellar Eider Concentration Areas
  - Spectacled Eider Critical Habitat
  - Steller Eider Critical Habitat
- Stellar Sea lion
  - Sea Lion Haul Out
  - Sea Lion Haul Out 3nm Buffer
  - Sea Lion Rookery
  - Sea Lion Rookery 3 nm Buffer
  - Sea Lion Haul Out Rookery
  - Sea Lion Haul Out Rookery 3 nm Buffer
- Seabird Colonies greater than 1K
  - Alaska Seabird Colonies
  - Alaska Seabird Colony 1 nm buffer
- Alaska SW DPS Sea Otter Critical Habitat
- Alaska State Game Refuges, Critical Habitat, Sanctuaries
- Alaska National Wilderness Areas
- Alaska National Parks, Preserves, Monuments
- Alaska National Wildlife Refuges

Aleutian Canada geese nests are vulnerable to rat predation. D. Rudis, USFWS

Direct and unknown indirect effects to seabirds from discharged seafood processor wastes could occur from changes in the benthic community due to organic matter deposition, excess nutrient input leading to changes in the phytoplankton community, and residual concentrations of chlorine disinfectants. Because coastal waters around the Aleutians are generally well oxygenated, assimilation of soluble organic wastes and chemicals may buffer adverse effects. However, an indirect and unknown effect to bird populations could result from solid waste discharges. Discharged suspended matter may attract gulls and increase their populations by providing food throughout the winter months when natural food is less abundant and survival is the most difficult. An increase in the local gull population could adversely affect the breeding success of other birds, primarily from predation on eggs and chicks. Another potential secondary effect could occur from pathogens and parasites associated with seafood waste. These organisms could adversely affect seabirds that consume or have contact with seafood waste discharges.

Oil Spills

Shipwrecks resulting in oil and or cargo spills are another contaminant source along coastal refuge lands. Vessel sinking, grounding, and accidents are all common in marine waters of Western Alaska. A fleet of international ships travels the North Pacific Great Circle Routes from Asia to the west coast of the U.S. and back. Ships include a mix of large container ships, bulk carriers, car carriers, tankers, and others—the majority are foreign flagged and on "innocent passage" through these waters. These vessels carry large quantities of fuel oil, as each hold between 100,000 and 300,000 gallons, usually Bunker C. Various cargoes include chemicals and other hazardous materials. The spill risk they pose will grow as their traffic volume increases and as new shipping routes emerge to serve future resource development in Alaska and other Arctic regions. To improve vessel tracking ability, International Maritime Organization regulations (mandated January 1, 2009) require cargo ships above 300 gross tons to transmit long-range vessel identification and tracking data., However, many international ships that travel near or through the Aleutians may have no oil-spill contingency plans if they have no planned stops at U.S. ports.

Historical data on accidents and spills near the Aleutian Islands show that fishing vessels account for the majority of the accidents, most of these resulting in small spills, while the large commercial fleet has experienced only a few major accidents but with much larger spill volumes

Historical data on accidents and spills near the Aleutian Islands show that fishing vessels account for the majority of the accidents, most of these resulting in small spills, while the large commercial fleet has experienced only a few major accidents but with much larger spill volumes (Transportation Research Board 2008). Over the past 20 years, about 20 fishing vessel accidents with spills in excess of 1,000 gallons were recorded, while just two commercial cargo vessel accidents (the M/V *Selendang Ayu* in 2004 and the M/V *Kuroshima* in 1997) spilled 336,000 and 40,000 gallons, respectively. Data for the past 20 years on response to spills in the Aleutians have also shown that almost no oil has been recovered during events in which recovery attempts have been made by the responsible parties or government agencies. In many cases, weather and other conditions have prevented any response at all (Transportation Research Board 2008).

Other vessel-related pollution concerns include discharge and loss of packing straps, trawl nets, and other debris that can kill wildlife. (See next section on marine debris.) During 1993 and 1994, the refuge conducted beach surveys at numerous locations to determine the status of oil pollution on refuge beaches (Byrd *et al.* 1995). On Attu, 7.6 miles of coastline in Massacre Bay were searched for oil, and one 0.8 inch diameter spot of weathered oil was found. In contrast, 5.6 miles of beaches were surveyed on adjacent Shemya Island, and 104 weathered oil spots were found; over 70 percent were less than one inch in diameter (Krom 1993).

The following history and list of Attu and Kiska shipwrecks was compiled by Eric Nelson of the Alaska Maritime National Wildlife Refuge. Because the majority of these incidents occurred in the past, we have no records of the amount of fuel that spilled during the older wrecks. The earliest wrecks would have involved sailing ships and would not have used fuel for propulsion. It is also unknown whether

sunken vessels have intact fuel tanks that may eventually fail and cause a release.

Attu Shipwrecks

Shipwrecks around Attu have been on record since 1850. Of relevance to this report are the following shipwrecks as compiled by E. Nelson, USFWS:

Attu Island, January 5, 1943 - the 6,101-ton Japanese ship *Kotohiro Maru* was bombed and sunk off Attu. (History of U.S. Naval Operations in WWII, vol. VII)

Attu Island, July 19, 1943 - the U.S. Army cable ship *Dellwood* sank in Massacre Bay after striking a pinnacle rock. (Minerals Management Service)

Attu Island, March 5, 1981 - the 291-foot, 1,500-ton Korean M/V *Dae Rim* wrecked one-half mile east of Cape Wrangell on the north side. The vessel previously suffered a collision with a Soviet vessel, caught fire, and was abandoned by its crew 90 miles west of Attu. Twenty-four of the crew of 26 died after abandoning ship. The *Dae Rim*, still afloat, was taken under tow by another Soviet vessel, the towline was subsequently lost or cut loose, and *Dae Rim* drifted ashore. A U.S. Navy Explosive Ordnance Disposal team, using the USCG cutter *Boutwell* as a platform for operations, set high explosives on the wreck's fuel tanks to vent them and burn off about 110,000 gallons of fuel oil. All but two tanks were ruptured and burned by the explosive charges, with the *Boutwell* firing its guns to vent the remaining two. (U.S. Fish and Wildlife Service memorandum, June 2, 1981; Anchorage Daily News, March 26, 1984)

Kiska Shipwrecks

The earliest documented shipwreck off Kiska was in 1758. More relevant wrecks include the following:

Japanese shipwreck, Kiska. D. Rudis, USFWS

Kiska Island, June 19, 1942 - Japanese oiler *Nissan Maru* bombed and sunk in Kiska Harbor.

Kiska Island, July 5, 1942 - Japanese destroyer *Arare* torpedoed and sunk at entrance of Kiska Harbor by U.S. Navy sub USS *Growler (SS-215)*.

Kiska Island, July 15, 1942 - Japanese subchaser *SC-25* sunk in Kiska Harbor by U.S. submarine USS *Grunion (SS-216)*.

Kiska Island, July 15, 1942 - Japanese subchaser *SC-27* sunk in Kiska Harbor by U.S. submarine USS *Grunion*.

Japanese shipwreck on Kiska. D. Rudis, USFWS

Kiska Island, July 30, 1942 - U.S. Navy submarine USS *Grunion* was lost in vicinity of Kiska Island and presumed sunk by a Japanese torpedo. The imploded remains of the *Grunion* were found in 2007. (History of U.S. Naval Operations in WWII, vol. VII; Wikipedia)

Kiska Island, August 8, 1942 - the 8,572-ton Japanese cargo vessel *Kano Maru*, previously damaged by a torpedo from USS *Grunion*, sunk at Kiska Harbor by U.S. Navy *Catalina*. (History of U.S. Naval Operations in WWII, vol. VII)

Kiska Island, September 15, 1942 - the 7,190-ton Japanese troop transport *Nozima Maru* bombed and sunk at Kiska Harbor. Only the bow section remains, grounded near the beach; the stern section was re-floated in 1956 by the American salvage tug *Salvage King* and taken in tow to Japan by *Salvage King* and the Canadian salvage tug *Sudbury II*.

Kiska Island, October 5, 1942 - the 5,863-ton Japanese steamship *Borneo Maru* bombed and sunk at Gertrude Cove, Kiska Island.

Kiska Island, October 17, 1942 - Japanese supply destroyer *Oboro* bombed and sunk at Kiska Island.

Kiska Island, November 4, 1942 - Japanese submarine *RO-65* bombed and sunk at Kiska Island.

Kiska Island, January 5, 1943 - 6,577-ton Japanese ship *Montreal Maru* was bombed and sunk at Kiska. (History of U.S. Naval Operations in WWII, vol. VII)

Kiska Island, April 4, 1943 - Japanese steamship *Uragio Maru* bombed and sunk at Kiska Harbor.

Kiska Island, May 14, 1943 - Japanese submarine *I-31* sunk by U.S. forces. (Minerals Management Service)

Kiska Island, June 23, 1943 - Japanese submarine *I-7* sunk by U.S. forces. (Minerals Management Service)

Marine Debris

In 1988, 25 beaches on seven islands—Attu, Agattu, Shemya, Buldir, Kiska, Little Kiska, and Adak—were surveyed during a 10-day period for all plastic from sea level to high storm tide level. Of the total 2.3 miles of beach observed, 3,153 plastic objects were counted, representing 67

different finished plastic products. Debris was identified from Japan, the U.S.S.R., South Korea, People's Republic of China, Taiwan, Norway, and the United States. Most prevalent were items from Japan; of those that were identifiable, most were fishing related (Manville 1990). If the amount of plastic located on these beaches is at all indicative of that found elsewhere on Alaska's 36,000 miles of shoreline, plastic debris poses a serious potential problem for fish and wildlife.

Forty-four percent of all seabird species ingest floating plastic while feeding on or near the surface of the ocean, picking up anything that might resemble their natural food

Marine litter is now 60 to 80 percent plastic, reaching 90 to 95 percent in some areas (Moore 2008). The problem of microplastic marine debris (plastic particles smaller than 5 mm) has reached the attention of the international community (Arthur *et al.* 2009). Macroscopic plastic marine debris is persistent in the environment, shows a high resistance to aging, and exhibits minimal biological degradation (Rios *et al.* 2007). Plastics are primarily synthetic organic polymers derived from petroleum. These polymers break into smaller and smaller particles when exposed to ultraviolet radiation in sunlight, but they are still present as plastic and are accessible to plankton and other marine life. The length of time various plastic polymers persist in the ocean is not reliably known. Plastic debris and minute plastic particles are found floating in the ocean and stranded on beaches.

Forty-four percent of all seabird species ingest floating plastic while feeding on or near the surface of the ocean, picking up anything that might resemble their natural food (Minchin 1996; Auman *et al.* 1997; Blight and Burger 1997; Cadée 2002). Plastic items that resemble natural food items fail to provide nutrition and may weaken or kill seabirds through ingestion hazard, starvation, stomach lining irritation, and failure to develop fat stores needed for migration and reproduction (Moore 2008).

Plastic debris fragments adsorb, accumulate and transport persistent organic pollutants (POPs) (Rios *et al.* 2007). Contaminants may be accumulated in plastic debris because of its permeable lipophilic nature. Plastic debris from the North Pacific Ocean and coastal California sites contained detectable amounts of PAHs, (pyrene, fluoranthene, naphthalene, phenanthrene, and acenaphthylene). All samples had detectable concentrations of the pesticide DDT and its metabolites dichlorodiphenyldichloroethylene (DDE) and dichlorodiphenyldichloroethane (DDD) (Rios *et al.* 2007). Observations made during this study and by Mato *et al.* (2001) indicate the concentration of POPs in plastic debris increases with the age of the plastic and demonstrated that ambient seawater is the source of these contaminants.

The increasing abundance of marine plastic debris allows marine organisms to mistake more plastic for their natural food and ingest more plastic while feeding. These plastics are important point sources that carry POPs. It is not only the initial organism that ingests the plastics that may be affected by the POPs, but also the organisms within its food web. Blue mussels were found to transfer plastic particles from the gut to the circulatory system, where they persisted for 48 days, a phenomenon that has implications for predators (Browne *et al.* 2008). Laboratory trials have shown that amphipods (detritivores),

barnacles (filter feeders), and lugworms (deposit feeders) can ingest particles of microplastics (Thompson *et al*. 2004). Seabirds retain plastic pellets in their ventriculus for several months or more, allowing more contaminant absorption from greater contact and pellet abrasion time (Mato *et al.* 2001; Browne *et al.* 2008). Ryan *et al.* (1988) found that the mass of ingested plastic in great shearwaters was positively correlated with PCBs in their fat tissue and eggs.

There is the potential for debris associated with the 2011 Japanese tsunami to impact the Aleutian Islands, including Kiska and Attu. Alaska Maritime NWR has sent debris monitoring forms out with some field camps, and the *R/V Tiglax* documents and reports any debris encountered while at sea.

Kiska coastline. D. Rudis, USFWS

Future Development

The bases and battlefields of Attu and the Japanese Occupation Site on Kiska are part of the National Park Service's Historic Landmarks in Alaska. As such, these areas are included in the National Register of Historic Places. Portions of Attu and Kiska Islands also comprise part of the World War II Valor in the Pacific National Monument. These cultural resource designations do not afford complete protection of the sites, but they are also protected as refuge property, and development is not in the refuge plan. Any cleanup and remediation plans must be reviewed by a cultural resources expert.

Kiska Station, 1943. U. S. Signal Corps photo

Recreation

These refuge lands are rarely used for any recreational or subsistence purposes given their remote locations. American and Japanese WWII veterans have visited Attu Island in cooperation with the USCG when LORAN C Station Attu was operating. Because the USCG station is now closed, we anticipate that visitation to Attu will be even more limited and infrequent. Small cruise ships, birding groups, and fishing vessels occasionally visit Attu and Kiska Islands. When considering potential hazards associated with these activities, an oil spill (e.g., vessel grounding) would pose the most likely contaminant risk to refuge lands. There is risk to human visitors from UXO and other hazards. The NOAA Coast Pilot does not include any information or warnings to visiting mariners about these hazards (NOAA Coast Pilot 2012).

WWII dock remnants at Pyramid Cove on Attu Island. D. Rudis, USFWS

Hunting and Fishing

Commercial Fishing

Potential contaminant issues associated with the fishing industry include fuel spills, marine debris, processor waste discharges, and spills of processing-related chemicals. Another issue is the potential for invasive species, with the introduction of invasive plants from various sources including contractor's vehicles and other equipment/supplies used for site characterization and remediation.

One recommendation would be to ensure all cleanup crews decontaminate equipment before departure from port. In addition, rat kits should be onboard all vessels and at field camps.

Kiska coastline. D. Rudis, USFWS

Biotic Sources and Physical Transport

Biotic Sources

Pelagic organisms, migratory birds, marine mammals, anadromous fish, and other migratory species are possible biotic sources of contaminants. Because most of these species are highly mobile and migratory, they may be exposed to contaminants outside refuge boundaries. When these species return to the refuge, they may transport any accumulated contaminants back to the refuge, where they can become available to other refuge species and humans. Because many seabirds occupy high trophic positions in the marine food web, they often accumulate elevated contaminant concentrations due to biomagnifications (Fiske *et al.* 2003; Ricca *et al.* 2008). Seabirds can also be a vector of contaminant transport (Blais 2005; Michelutti *et al.* 2009), including in the Aleutian Islands and in Southeast Alaska, where pesticide concentrations in blue mussels were correlated with seabird density (Reese *et al.* 2012).

Given the very large avian populations found at some of the seabird colonies on Kiska (e.g., 1.8 million least auklets that nest at Sirius Point winter in the open ocean), biotransport could represent a locally important, but underappreciated, source of environmental contamination.

Migratory birds may be exposed to an array of potentially toxic chemicals on their wintering grounds outside of Alaska, including chemicals that are banned or no longer used in the United States. During spring migration, birds may transport these contaminants to their nesting grounds in the Aleutian Islands. This migratory transport of contaminants provides a potential exposure pathway to other organisms that would otherwise likely not be exposed to these chemicals (e.g., Reese *et al.* 2012). Given the very large avian populations found at some of the seabird colonies on Kiska (e.g., 1.8 million least auklets that nest at Sirius Point winter in the open ocean), biotransport could represent a locally important, but underappreciated, source of environmental contamination.

Higher trophic level organisms can receive pollutants via this biotic contaminant transfer pathway. Because the Pacific Rim is a known contaminant point source, overwintering and migratory movements of Aleutian seabirds in this area exposure these birds to organic compounds such as OC pesticides that are not readily globally diluted (Simonich and Hites 1995).

Marine fish, sea otters, bald eagles, and seabirds from the western Aleutians have been included in contaminants studies. Relevant studies that included sampling from Attu and/or Kiska are described in the following text.

Aleutian Fish Contaminant Study

A recent study on OC contaminants in fish from coastal waters of the western Aleutians examined Pacific cod, Pacific halibut and rock greenling (Miles *et al.* 2009). Pacific cod and Pacific halibut are commercially valued finfish, while rock greenlings are a food species for bald eagles. OCs included Total (∑) PCBs, ∑dichlorodiphenylethene (∑DDT), ∑chlordane cyclodiene (∑CHLOR), ∑other cyclodienes (∑ CYCLO), and ∑chlorinated benzenes and cyclohexanes (∑CBCH). Results from this study indicated that OCs remain common in the mid-trophic levels of food webs of these islands and have the potential for effects on upper

trophic levels. Contaminant concentrations were compared in resident coastal fishes from islands where there was known point-source pollution related to recent military activity (east Adak and northern Amchitka), and islands with historic (WWII) military activity, including Attu and Kiska.

Mean ∑PCBs (wet weight) from Pacific cod on Kiska were 1,080 ng/g and 365 ng/g from cod on Attu. Total PCBs were highest in cod from Adak and Amchitka Islands in areas of more recent military activities, indicating local point sources of these compounds. All halibut and cod sampled contained ∑PCBs. Pacific halibut from Kiska had a mean ∑PCBs of 335 ng/g, wet weight (range of 90 -1,090); Attu halibut samples mean ∑PCBs were similar at 286 ng/g (range 83-1,490). By comparison, reference site halibut mean ∑PCB concentrations from two locations were 195 (range 111-669) and 159 (range 72-347) ng/g, wet weight. Mean ∑PCBs in Kiska rock greenling were 23 ng/g. ∑PCBs in rock greenling from Attu at 66 ng/g, were above concentrations of Aroclors 1242 and 1254 that caused reproductive toxicities in some fish species (Hoffman *et al.* 1995).

∑DDT concentrations in cod and halibut from Kiska were the only ∑DDT concentrations that were greater than those from reference location fish samples. ∑CHLOR and ∑CBHC were also greater in Kiska cod than reference samples. Cod from Attu did not have higher concentrations of these OCs than reference samples. The authors concluded that generalized patterns of OC concentrations in all three fish species in their study indicate long-range as well as localized input. Concentrations of certain pesticides were more elevated at Attu and Kiska and reference island groups than at more contemporary military locations such as Adak; this infers contamination from either global sources or possibly regional distribution from localized input over time. Lighter-chlorinated congeners found at historical and reference locations implied possible long-range transport.

Bald eagle

Bald Eagles and Contaminants

Bald eagles on Attu have not been studied, but bald eagle populations on several other islands in the Aleutians have been the subject of contaminant investigations (Anthony *et al.* 1999; 2007; Estes *et al.* 1997). Elevated concentrations of OCs were found in bald

A subsequent investigation examined a large set of bald eagle eggs from these islands and analyzed for OCs and mercury (Anthony et al. 2007). They reported higher levels of mercury in eagle eggs from Kiska.

eagle eggs from Kiska, Amchitka, Adak, and Tanaga Islands (Anthony *et al.* 1999). Because OCs are primarily associated with agriculture and were not known to be used in the Aleutians, high OC concentrations were attributed to global aerial transport. An east-to-west increase in OC concentrations in eggs reported by Estes *et al.* (1997) and Anthony *et al.* (1999) suggests an Asiatic pollutant source.

Dietary intake was the probable source of these OC contaminants to eagles (Anthony *et al.* 1999). Reproductive success and productivity of these birds were depressed compared with populations from the other three islands during this sampling period (Anthony *et al.* 1999). Estes *et al.* (1997) reported elevated PCB and DDE levels in eagle eggs from Adak, Amchitka, Tanaga, and Kiska islands, which are all sites of past military activity. Although the productivity of bald eagles was normal at Adak, Tanaga, and Amchitka islands, productivity was depressed at Kiska. DDE levels in eagle eggs from Kiska were within the range known to cause reproductive suppression. The maximum concentration (4.1 mg/kg -1 wet weight) is close to that associated with a 40 to 50 percent reduction in average productivity of regional populations (Wiemeyer *et al.* 1984).

A subsequent investigation examined a large set of bald eagle eggs from these islands and analyzed for OCs and mercury (Anthony *et al.* 2007). They reported higher levels of mercury in eagle eggs from Kiska. As with the fish investigation (Miles *et al.* 2009), total PCBs were highest on Adak and Amchitka Islands in areas of past military activities, indicating local point sources of these compounds. PCBs found in blue mussels on other Aleutian Islands also indicated localized point sources (Reese *et al.* 2012). PCBs were elevated in eggs from all islands sampled; suggesting global transport of these organic compounds (Anthony *et al.* 2007). Two other studies on eagles from the Aleutians also showed elevated contaminant concentrations, but most concentrations were below threshold levels for reproductive effects (Elliott and Harris 2001; Wiemeyer *et al.* 1984).

Seabirds and Contaminants

Biota of the Aleutians are exposed to contaminants of distant origin due to the intensive atmospheric and oceanic processes characteristic of the region (Ricca *et al.* 2008; Rocque and Winker 2004; Stabeno *et al.* 1999), as well as to contaminants emanating from point sources associated with military installations from WWII and the Cold War (AMAP 1998; Anthony *et al.* 1999, 2007; Ricca *et al.* 2008; Rocque and Winker 2004).

Some of the earliest Aleutian seabird contaminant data were reported by Ohlendorf *et al.* in 1982. Aleutian tern eggs from Attu had low OC concentrations, but all nine selected OC compounds were detected (Ohlendorf et al. 1982). DDE (0.16–0.98 ppm) and PCBs (0.18–0.46 ppm) were OCs with the highest concentrations. Ricca *et al.* (2008) collected glaucous-winged gulls, northern fulmars, and tufted puffins along a natural longitudinal gradient across the western and central Aleutian Islands (Buldir, Kiska, Amchitka, and Adak). They found

∑PCBs comprised the largest proportion of OCs. Concentrations of ∑ PCBs and most chlorinated pesticides in glaucous-winged gulls consistently exhibited low levels at Kiska and Amchitka. In contrast, concentrations of ∑PCBs and chlorinated pesticides in northern fulmars and tufted puffins did not differ among islands. A strong point source for contaminants was not found at Kiska. Mercury, ∑PCBs, and DDE were biomagnified across seabird trophic levels (Ricca *et al.* 2008). Mercury concentrations increased westward in glaucous-winged gulls in the Rica *et al.* (2008) study. In contrast, mercury increased eastward in rock sandpiper (livers) sampled by Rocque and Winker (2004), which could indicate an eastern point source. There was a repeated pattern of west-to-east declines in some organic contaminants in cormorants and rock sandpipers that were attributed to atmospheric sources in Asia (Rocque and Winker 2004). The highest PCB concentrations in cormorants and the only PCBs detected in rock sandpipers were from Attu and Adak. Past military installations at both of these locations are the probable point sources of this contaminant.

Feathers from pigeon guillemots (Burger *et al.* 2007a) and muscle tissues from glaucous-winged gulls from both Kiska and Amchitka contained elevated mercury concentrations that could pose a risk (Burger *et al.* 2007b). Mean levels of pollutants reported from the two Burger *et al.* studies on Aleutian birds are generally below levels considered harmful (Rocque and Winker 2004). These results do not negate the fact that contaminants may potentially present problems for some birds in the Aleutian Islands, given the high concentrations of contaminants at some sites.

Sea otter. USFWS

Sea Otters and Contaminants

In contrast to most Aleutian seabird species, sea otters (*Enhydra lutris*) and their principal prey items (benthic invertebrates and coastal fishes) are comparatively sedentary. This life history trait limits the possibility of contaminant uptake to their local environments. Estes *et al.* (1997) reported elevated OC concentrations in sea otters from Adak and Amchitka Islands. These findings demonstrated that potentially harmful OC levels occur in the nearshore areas of these two Aleutian Islands.

Elevated concentrations of PCBs were also reported in sea otters from Adak and Amchitka (Bacon *et al.* 1999). These concentrations could be from point sources, atmospheric deposition, and/or transport by oceanic currents.

As stated in other Aleutian biota studies, there are potential local and distant contaminant sources for POPs such as OCs and PCBs on these

islands. Prevailing westerly winds and ocean currents in this region are a potential means of contaminant delivery to the Aleutians. DDT residues and metabolites in the Aleutian Islands are from areas of more recent use, probably in Asia (Iwata *et al.* 1993, 1994).

Physical Transport

Asia is the main source for volatile globally distilled contaminants, contributing over 50 percent of global anthropogenic mercury

The Aleutian Islands are considered to be within the Arctic geographic scope of the Arctic Monitoring and Assessment Programme (AMAP). Due to their persistence and toxicity, some environmental contaminants of particular concern within the Aleutian Islands are POPs such as PCBs, dioxins, DDT, hexachlorocyclohexane, chlordane, toxaphene, mirex, and dieldrin; heavy metals, such as cadmium, mercury, and lead; PAHs; and radionuclides. POPs are toxic chemicals that are not easily metabolized by organisms and are often passed up the food web, where they biomagnify. This is particularly true in top trophic-level predators where these compounds can bioaccumulate to harmful levels.

Both atmospheric and oceanic pathways contribute to the global distribution of contaminants and are a source of POPs and mercury in the Pacific and Arctic (AMAP 1998; Iwata *et al.* 1993; AMAP 2011). The winter Aleutian low pressure system pulls air from Asia across the Pacific Ocean and over the Aleutians (Barrie *et al.* 1992; AMAP 1998, 2011—in particular, see Figure 2.2.0 in AMAP 2011). Asia is the main source for volatile globally distilled contaminants, contributing over 50 percent of global anthropogenic mercury (Sunderland *et al.* 2009). China is the largest emitter of mercury from fossil fuel use, particularly coal, and is the greatest contributor of mercury to the western Aleutians (AMAP 2011). A graphic depiction of the pathway of high mercury atmospheric concentrations from Asia in April 2004 over the western Aleutians and the northwestern United States is illustrated in AMAP 2008, Figure 7.5. Most long-range atmospheric transport of mercury is transported as gaseous elemental mercury and occurs during the winter and spring due to atmospheric circulation patterns (AMAP 2011). A west-to-east decrease in atmospherically transported contaminant concentrations along the Aleutian archipelago would be expected due to prevailing weather patterns and distance from the source (Iwata *et al.* 1993). We would therefore expect the westernmost Aleutians, Attu, and the other Near Islands to be particularly susceptible to atmospheric transport of contaminants from Asian sources.

The role of ocean currents as a distant source from Eurasia is more complicated because the Alaska stream flows westward along the Pacific side of the Aleutians and then enters the eastward-flowing North Slope Alaska current along the Bering side, primarily through Amukta Pass in the east and Amchitka Pass in the west (Stabeno *et al.* 1999). Mercury concentrations in the ocean surface layer tend to parallel trends in atmospheric deposition (Sunderland *et al.* 2009).

A full discussion of physical pathways of contaminant transport can be found on the Arctic Monitoring and Assessment Programme (AMAP) Web site (http://www.amap.no/), in the AMAP Assessment Report: Arctic Pollution Issues (AMAP 1998), the AMAP Assessment 2002:

Persistent Organic Pollutants (POPs) in the Arctic (AMAP 2004), and the AMAP POPs Assessment (AMAP 2009).

Climate Change

Contaminant Fate and Transport

Based on information from Dames & Moore (1995a, 1995b, 1996), contaminant release from military activity contaminated soils on Attu and Kiska include the contaminant transport mechanisms of leaching and surface water runoff into surface water bodies. Leaching and percolation from contaminated subsurface soil into shallow groundwater is of concern where groundwater reaches surface water and forms seeps. Lake and creek sediments can be a secondary contaminant source for re-release of pollutants to surface waters and aquatic biota. Birds that eat fish and/or aquatic invertebrates can take up contaminants through this exposure route. Plant and invertebrate contaminant uptake can also occur through exposure to surface and subsurface soils. Bioaccumulative compounds such as PCBs can be transferred through the food web into higher trophic-level organisms. Surface water and soil sheens present a potential physical hazard to birds and sea otters through oiling of feathers or fur, leading to loss of insulation and resulting in hypothermia. These animals can also ingest oil during preening and grooming.

Warning signs are a component of institutional controls at contaminated sites. Severe weather conditions in the Aleutians can present challenges to sign placement and maintenance. USFWS

Because contaminants are transported globally through air and water, climate changes will alter contaminant pathways. The Aleutian Island chain, as with most of the Arctic, is particularly vulnerable to airborne contaminants from Asia. Rain and snow scavenge aerosols and gases from the atmosphere and deposit them at the water or ground surface (Macdonald *et al.* 2005). A change in relative amounts of snow or rain may have opposing effects for different contaminants (Macdonald *et al.* 2005). For example, with an increase in precipitation, lead, cadmium, and zinc will be more effectively trapped in the Arctic.

Higher water temperatures associated with projected climate change may result in enhanced contaminant toxicity and bioaccumulation by aquatic organisms (e.g., Schiedek *et al.* 2007; Noyes *et al.* 2009). Higher temperatures can affect a species' ability to cope with toxic substances (Schiedek *et al.* 2007). Conversely, contaminant exposure may impair the ability of some species to acclimate to temperature increases or other ecosystem changes (Noyes *et al.* 2009). There are species-specific

responses to temperature increase and contaminant exposure. For example, the Arctic char, a freshwater fish, is extremely susceptible to increased water temperatures, which result in higher metabolic rates, increased water pumping over gill surfaces, and an increased uptake of metals from the water (Macdonald *et al.* 2005). A combination of higher water temperature and a fungicide had a synergistic effect on egg survival of a Baltic amphipod (Schiedek *et al.* 2007), which was more than four-fold compared to exposure to only one of the stressors.

If OCs are retained in slightly higher concentrations at low trophic levels, any resultant biomagnification can have a dramatic effect on apex trophic-level feeders.

Organic contaminants can concentrate and be released to the environment in a variety of ways. Ice seasonality can release OCs such as PCBs to the environment (Macdonald *et al.* 2005). Both ocean and atmosphere are important as transport mechanisms for these compounds. Terrestrial system components such as soils and vegetation are also reservoirs for many POPs (Simonich and Hites 1995).

Alterations of wildlife and fish migration pathways or changes in numbers can change the biotransport of contaminants. Apex feeders that adapt to habitat changes by switching between land-based and aquatic foodwebs have the potential to change their exposure to contaminants such as mercury and OCs (Macdonald *et al.* 2005). If OCs are retained in slightly higher concentrations at low trophic levels, any resultant biomagnification can have a dramatic effect on apex trophic-level feeders. The balance between food items from aquatic and terrestrial food webs will alter exposure to biomagnifying contaminants, as each of these food webs are affected differently by contaminants (Macdonald *et al.* 2005; Noyes *et al.* 2009).

Arctic Marine Traffic, Environmental Considerations, and Impacts

Trans-Pacific shipments of goods between North America and Asia follow the Great Circle Route—the shortest sea route between these locations. This ship traffic typically transits from the North Pacific into the Bering Sea at Unimak Pass. These vessels then continue through the Bering Sea in close proximity to the Aleutian Islands, many of which are managed or co-managed by the Alaska Maritime NWR. Commercial vessel traffic poses a variety of significant environmental risks to refuge resources, including contaminant spills, disturbance of marine mammals and seabird habitat, invasive species introductions, and direct mortalities resulting from collisions.

Analysis of nine months of data (October 1, 2005, through June 30, 2006) from the automated identification system (AIS) vessel tracking system at Scotch Cap, Unimak Pass revealed that 2,336 vessels, or an average of eight or nine deep draft vessels a day (an estimated 3,100 vessels per year) used Unimak Pass for trans-North Pacific voyages. (Over 40,000 vessels worldwide are equipped with VHF transmitters that send signals to AIS base stations.) AIS data also reveals that the North Pacific Great Circle Route through Unimak Pass is used primarily by vessels traveling west from North America to ports on the East Asia coast. Vessel traffic will likely increase in future years with trade expansion between Asia markets and the U.S.

A second, more southern Great Circle Route across the North Pacific passes south of the Aleutians and is generally used for voyages from East Asia to North America. Commercial ships on trans-Pacific voyages generally follow a counterclockwise trade route from North America through the Aleutians to Asia, and travel back to North America along routes south of the Aleutians to take advantage of the North Pacific counterclockwise ocean currents.

Figure 25. U.S. Coast Guard Maritime Domain Awareness Center map showing the Northern and Southern Great Circle Routes across the North Pacific.

AIS transmitters are required on vessels over 300 gross tonnes. At present, there are two AIS receivers in the Aleutians, which only cover about 10 percent of the islands (Alaska Marine Exchange, pers. comm., May 26, 2011). United States–flagged vessels are required to carry plans for oil spill response or salvage, but these plans are not requisite for foreign-flagged vessels, except for U.S. ports where they intend to dock (The Economist 2007).

Using the AIS data from Unimak Pass collected over nine months and the information on fuel oil capacity by ship type from the ADEC database, the profile for 92 percent of the ocean-going vessels on international trade passing through the Aleutians on great circle voyages can be characterized as follows:

- Approximately 1,200 container ships (39 percent of total) per year have a median fuel capacity of 1.6 million gallons of persistent fuel oil;
- As many as 1,300 bulk and general freight ships (41 percent of total) have a median fuel capacity of approximately 470,000 gallons of mostly persistent fuel oil,
- About 265 motor vehicle carriers per year (8.5 percent of total) have an estimated average fuel capacity of 500,000 gallons of persistent fuel oil;
- About 110 reefer (refrigerated) cargo ships (3.5 percent of total) have a median fuel oil capacity of 317,000 gallons of mostly persistent fuel oil.

The remaining eight percent of vessels transiting Unimak Pass consist of tank vessels, passenger ships, towing vessels, and other miscellaneous ships. An additional 400 million gallons of fuel oils are also transported each year by the 20 to 22 tankers that use this route.

Analysis by Nuka Research Group, LLC & Cape International, Inc., (2006) showed that some 3,000 vessels transport 2.9 million gallons of persistent fuel oil through the Aleutians each day. Calculating fuel consumption that is required to reach the Aleutians from an East Asia or North America port, vessels traveling through the Aleutians will carry at least 100,000 to 200,000 gallons less fuel than maximum capacity.

Table 2. Comparisons of persistent fuel capacity for estimated annual number of trips, and percentage by vessel type, for large commercial ships transiting Unimak Pass in the Aleutian Islands via the North Pacific Great Circle Route.

Vessel Type	Median Persistent Fuel Oil Capacity/ Ship (gallons)	Estimated Annual # of Ships Transiting the Aleutian Islands	Percentage of Total Ships
Container ships	1.6 million	1,200	39
Bulk/general freight ships	470,000	1,300	41
Motor carriers	500,000	265	8.5
Refrigerated cargo ships	317,000	110	3.5

Spill prevention should be the highest priority, as a means for ensuring environmental protection.

The following information was summarized from the Arctic Council 2009 Arctic Marine Shipping Assessment Report (Arctic Council 2009).

There are no specifically tailored, mandatory environmental standards for vessels operating in Alaska waters. The most significant threat from ships to this marine environment is the release of oil through accidental or illegal discharge. Marine casualties involving the larger vessels described previously, including large oil transport tank ships, could be exceptionally damaging to the refuge and its natural resources.

Spill prevention should be the highest priority, as a means for ensuring environmental protection. Additional potential impacts from ships transiting the Aleutians include ship strikes on marine mammals, introduction of alien species and pathogens from ballast water discharge and hull fouling, organism exposure to sewage and wastewater discharges, disruption of migratory patterns of marine mammals from ship traffic and noise, entanglement in marine debris, and anthropogenic ambient and underwater noise produced from marine shipping activity. The predominately low frequency sounds associated with large vessels is similar to the general hearing sensitivity bandwidths of large whales and many fish species.

Vessel emissions, including particulate matter and greenhouse gases such as carbon dioxide, nitrogen oxides, sulfur oxides, and methane may have unanticipated consequences for the environment.

Areas of Concern and Future Sampling Needs

This contaminant assessment report analyzed some of the past, present, and future contaminant issues for Attu and Kiska Islands of the Alaska Maritime National Wildlife Refuge.

This report documents contaminant sources and issues for the refuge, including military properties and oil spills. Military-related contamination and hazards (WWII and later, in the case of Attu), present the greatest contaminant threats on these islands to people and wildlife. Because the full extent of contamination is unknown on these islands, additional sampling is needed to determine the extent of contamination and its severity. Because not all areas of Attu, Kiska, or Little Kiska have been investigated, potential exists for additional MEC/MD presence anywhere on these islands.

Both wildlife and cultural resources need to be considered and addressed during cleanup of contaminated sites and oil spill remediation. As previously noted, some sites should have, at a minimum, some initial cleanup and stabilization to prevent continual release of petroleum products to the environment and exposure of wildlife to contaminant hazards. At some sites, fuel products have been leaking since WWII, and will continue to threaten wildlife until cleanup occurs.

Fuel drums and POL contamination into a wetland on Kiska. D. Rudis, USFWS

At other sites, munitions and other ordnance are prevalent, posing a serious hazard to island visitors, Service staff and visiting scientists. The Service has neither the funds nor the responsibility to clean up and remediate these sites. The FUDS program is expected to address site cleanup at the majority of sites on Attu and Kiska (excluding the USCG sites), but the Service must be fully engaged in the decision process to ensure these lands meet acceptable cleanup criteria and natural and cultural resources are protected during the cleanup. Any contaminated sites that are currently under another entity or agencies management could potentially revert to the refuge depending upon outcomes of property ownership transfer.

In 1992, the Alaska Regional Director summarized the Service's concerns at Attu (D. Allen, letter to G. Braten, U.S. Army Corps of Engineers, 19 June 1992). They are encapsulated as follows.

The Service wants to work cooperatively with the ACOE on cleanup of all sites on refuge lands. The Service does not believe any materials should be placed in landfills on Attu due to easily erodible organic acidic soils. Buried materials can surface during rainfall or seismic activity. Because there is a shallow aquifer at the soil bedrock interface, anything placed in the soils or on bedrock could eventually contaminate the aquifer.

The Service believes that all contaminated sites on the refuge must be remediated. Tanks, associated pipes, and drums must be removed due to residual POL remaining in these structures or in soils around the structures that result in a continuous source of contamination. The Service realizes that removal of these structures will result in extensive landscape disturbance but that disturbance is necessary to reach closure on contamination at many of these sites. In addition, in-situ bioremediation should be considered for POL contaminated soils as has been done at other sites in Alaska. Extensive landscape disturbance would be an adverse effect on the National Historic Landmark and must be minimized.

Some contaminants on these islands are at extremely high concentrations, and the extent of soil, sediment, or water contamination is unknown.

The RI for Kiska (Dames & Moore 1996) includes 10 pages of recommendations for the contaminated sites on Kiska. These concerns and comments for Attu and Kiska Islands are still germane at this time. The recommendations include details for each site on needs for additional sampling, mapping, pathway identification, hydraulic connection, soil and water quality evaluation, removal actions, and ecological characterizations to determine risk. Our field visits also found that some materials still need identification and chemical characterization (e.g. the white solid material found on Kiska near an anti-aircraft gun and at other sites, the creosote-treated log pile above the beach on Kiska that has not yet been sampled for contaminants in soil or surface water).

For areas that contained identified MEC/MD, the SI for Kiska and Little Kiska recommended conducting a Remedial Investigation/ Feasibility Study that would include soil sampling and removal and disposal of known MEC. Reestablishment of the warning signs at accessible beaches was also recommended.

Direct and indirect contaminant exposure pathways to fish and wildlife are present at many of the contaminated sites on both islands. Avian receptors may be exposed to contaminated soil, sediment, surface water, and biota through ingestion, and may also be directly exposed to hydrocarbon contamination through dermal contact with oily wastes. Fish and other aquatic organisms can have direct exposure through water or sediment. Plants and invertebrates can uptake contamination through soil.

Some contaminants on these islands are at extremely high concentrations, and the extent of soil, sediment, or water contamination is unknown. Some of these contaminants have a high probability of bioconcentration in organisms such as aquatic insects. Biomagnification can occur with upper trophic level birds such as bald eagles and peregrine falcons. In particular, PCBs and methylmercury have a high bioaccumulation probability, while some BTEX and PAHs have more a moderate bioaccumulation probability. Both chemical and physical hazards exist from some contaminants

A balance will be necessary to determine acceptable disruption of historic properties vs. contaminant remediation. The law requires minimization of impacts to the National Historic Landmark. These potential conflicts of cultural resource protection versus cleanup will be exceptionally important at Attu and Kiska, given their National Historic Landmark and National Historic Monument status.

Conclusions

The Alaska Maritime National Wildlife Refuges remote islands of Attu and Kiska are the primary lands where the history of the Aleutian Islands Campaign remains relatively undisturbed. These islands played a significant role in an important chapter of America's WWII Pacific campaign. Contaminant issues on the refuge are primarily the result of these past military activities, which have been identified and highlighted in this report. Remedial work on these islands has been limited to incomplete site investigations, characterization work, and some collection of UXO. Extensive sampling is still needed to fully characterize the extent of contamination on these islands, and cleanup and remediation of the most contaminated sites remains an issue for the islands' wildlife and environment. The biggest contaminant threats to these refuge lands and resources may come from residual military fuel. Cleanup actions should be initiated at some of the most contaminated sites such as Attu's Navy Town and Massacre Valley, where POL contamination continues to affect wetlands and coastal areas, threatening wildlife. Other significant contaminant cleanup issues may include PCB and lead contamination. Of lands managed by the Service in Alaska, these two islands contain the most significant munitions hazards.

Narcissus anenomes are one of the spectacular wildflowers found in the Aleutians. D. Rudis, USFWS

The Service should continue to work with the ACOE to ensure cleanup of FUD sites, and with the USCG regarding cleanup issues at LORAN sites on Attu. As there is still a land interest (land withdrawal) for the Aleut village site on Attu, the Service is not the only land manager on the island. Additionally, the Service should continue working with the State of Alaska, the USCG, and others to maintain adequate spill response preparedness for these remote islands.

The information gathered during the Contaminant Assessment Process should help Service personnel make informed management decisions about contaminant threats to these refuge lands and resources. It is the responsibility of the Service to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people. Using CAP is one way in which the Service can ensure that our country's National Wildlife Refuges maintain their environmental health and integrity.

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Appendix

Wedge-leaved primrose is one of the early spring flowers that are common in wet soils of the Aleutians. D. Rudis, USFWS

Pyramid Cove barrel and burn pit area with POL saturated soil on Attu. D.Rudis, USFWS

POL from WWII continues to pollute wetlands on Attu. D.Rudis, USFWS

These and other fuel tanks hold unknown quantities of POL on Attu. D. Rudis, USFWS.

Fuel Tank Farm 2 – lower pump station is typical of all fuel pump stations on Attu. D. Rudis

Fuel tank farm 2, lower pump station POL contamination into the downstream swale. D. Rudis, USFWS.

Fuel tank farm 2 with leaking fuel. D. Rudis, USFWS.

Collapsed tanks at fuel tank farm 2 and residual POL. D. Rudis, USFWS.

Massacre Valley garage area and fuel drums, Attu. D. Rudis, USFWS

Massacre Valley wood and barrel dump, Attu. D. Rudis, USFWS

POL slick downslope of barrel area, Attu. D. Rudis, USFWS

Fuel tank basin spill, Attu. D. Rudis, USFWS

Massacre Creek and tanks, Attu. D. Rudis, USFWS

Pump station, Attu. D. Rudis, USFWS

Pyramid Cove pier, Attu. D. Rudis, USFWS

Machinery debris near old runway, Attu. D. Rudis, USFWS

Alexi Point Airfield 1943. One of the few sunny days on Attu

Attu hospital area, Navy Town WWII.

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Battery bank in Japanese submarine, Kiska. D. Rudis, USFWS

Kiska Village with sections of beach and dock in the background. U.S. Signal Corps photo 196-3-43-1847. 29 December 1943

Allied Forces encampment, Kiska. U.S. Signal Corps photo, 1943

Japanese submarine base destroyed by bombs, Kiska. U.S. Signal Corps photo 196-3-43-777. 7 September 1943

Generator site, Kiska, 1943. U.S. Signal Corps photo

U.S. Signal Corps photo, Kiska 196-3-43-668

Along the Kiska coast scattered debris dumps include barrels and unknown materials. D.Rudis, USFWS

You never know what you will find on Kiska (Philip Johnson with WWII bomb remains). D. Rudis, USFWS

View from North Head camp area, Kiska with Japanese shipwreck in background. D. Rudis, USFWS

Creosote treated pilings on the Kiska dock. D. Rudis, USFWS

An unknown substance stains the sand under the Kiska dock. D. Rudis, USFWS

Tourists from a small cruise ship hike to the guns at Kiska (observed from our 2007 field camp). D. Rudis, USFWS

Barrels and contaminated soil in the Canadian Camp area, Kiska. D. Rudis, USFWS

Trout Lagoon area, Kiska. D.Rudis, USFWS

Rocky shorelines with marine algae are common on Attu and Kiska. D. Rudis, USFWS