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Alaska District

IN-SITU CHEMICAL OXIDATION (PHASE I) AND INTRUSIVE DRUM REMOVAL/LANDFILL CAP

Northeast Cape, St. Lawrence Island, Alaska
Contract No. W911KB-09-C-0013
FUDS No. F10AK096905_7.04_0500_a
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WORK PLAN
REVISION 1
JULY 2009

Submitted by:

Bristol
ENVIRONMENTAL
REMEDIATION SERVICES, LLC

111 W. 16th Avenue, Third Floor
Anchorage, Alaska 99501-5109
Phone (907) 563-0013
Fax (907) 563-6713

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ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
AAC	Alaska Administrative Code
AC&WS	Aircraft Control and Warning Station
ACM	asbestos-containing material
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ANCSA	Alaska Native Claims Settlement Act
AS	Alaska Statutes
BEESC	Bristol Environmental & Engineering Services Corporation
Bristol	Bristol Environmental Remediation Services, LLC
C.I.H.	Certified Industrial Hygienist
CAT	Caterpillar
CDAP	Chemical Data Acquisition Plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CO	Contracting Officer
Con-HTW	containerized hazardous and toxic waste
CQC	contractor quality control
CQCP	Contractor Quality Control Plan
CSP	Certified Safety Professional
EM	Engineer Manual
Emerald	Emerald Alaska, Inc.
EO	Executive Order
EPA	U.S. Environmental Protection Agency
FeEDTA	iron ethylenediaminetetraacetic
FUDS	Formerly Used Defense Sites
GPS	Global Positioning System
H_2O_2	hydrogen peroxide
HWAP	hazardous waste accumulation point
ISCO	in-situ chemical oxidation

ACRONYMS AND ABBREVIATIONS (continued)

ISO	International Standards Organization
MOC	Main Operations Complex
MW	Montgomery Watson
MWH	Montgomery Watson Harza
NE Cape	Northeast Cape
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NSI	Northland Services, Inc.
PCBs	polychlorinated biphenyls
PL	Public Law
PLO	Public Land Order
POL	petroleum, oil, and lubricants
ppm	parts per million
QAR	Quality Assurance Representative
RIs	remedial investigations
S&W	Shannon & Wilson, Inc.
SAP	Sampling and Analysis Plan
SOW	Scope of Work
SPCC	Spill Prevention, Control, and Countermeasures Plan
SSHP	Site Safety and Health Plan
SWPPP	Storm Water Pollution Prevention Plan
T&D	transportation and disposal
USACE	U.S. Army Corps of Engineers, Alaska District
USAF	U.S. Air Force
USC	U.S. Code
WMP	Waste Management Plan
WP	Work Plan

APPROVALS

By their signatures, the undersigned approve this Work Plan.

Molly Welker — 7/21/09

Molly Welker
Project Manager
Date

Charles L. Croley — 7-22-09

Chuck Croley
Site Superintendent
Date

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1.0 INTRODUCTION

This Work Plan (WP) has been developed for approval by the U.S. Army Corps of Engineers, Alaska District (USACE), as a control mechanism for the work to be performed on Contract No. W911KB-09-C-0013 for In-Situ Chemical Oxidation (ISCO) and Intrusive Drum Removal/Landfill Cap at Northeast Cape (NE Cape), St. Lawrence Island, Alaska. The USACE has contracted with Bristol Environmental Remediation Services, LLC (Bristol) and its team of subcontractors to accomplish the proposed work. This WP covers the Intrusive Drum Removal and Landfill Cap. The WP for the Phase I ISCO Treatment is included as Appendix A.

The Scope of Work (SOW) for this project includes the following:

- **Site 7 – Cargo Beach Road Landfill Intrusive Drum Removal and Landfill Cap**
  - Preparing plans and reports;
  - Mobilizing/demobilizing to/from the NE Cape site;
  - Exposing buried drums/debris and excavating test pits across areas of known mapped metallic anomalies;
  - Removing, draining, and disposing of drums and product associated with drums;
  - Excavating, removing and disposing of contaminated soil;
  - Designing and constructing a landfill cap;
  - Stabilizing and re-vegetating disturbed areas; and
  - Preparing a Construction Completion Report to include a survey of boundaries, a boundary map, and discussion of work performed.
- **Main Operations Complex (MOC) Area Phase I ISCO Treatment**
  - Performing bench scale study to assess site-specific parameters affecting treatability,
  - Designing and performing a feasible Phase I ISCO technology in an isolated MOC location,
  - Evaluation of ability of ISCO to achieve remediation goals for contaminants of concern,
  - Post-treatment monitoring (at least one round) preparation of a draft and final technical memorandum to summarize results, and
  - Preparing a draft and final report detailing results of Phase I treatment and feasibility of the technology for Phase II implementation.

Additional documents developed for the work performed for the Intrusive Drum Removal/Landfill Cap at NE Cape include the following:

- Sampling and Analysis Plan (SAP),
- Spill Prevention, Control, and Countermeasures Plan (SPCC),
- Waste Management Plan (WMP),
- Contractor Quality Control Plan (CQCP),
- Site Safety and Health Plan (SSHP), and
- Storm Water Pollution Prevention Plan (SWPPP).

The design and details of the ISCO study are incorporated in the ISCO WP in Appendix A. The ISCO Field Sampling Plan and Quality Assurance Plan are included in the Intrusive Drum Removal/Landfill Cap SAP.

2.0 SITE DESCRIPTION

2.1 PHYSICAL DESCRIPTION

2.1.1 Location

St. Lawrence Island is located in the Bering Sea, near the territorial waters of Russia, approximately 135 air miles southwest of Nome, Alaska (Figure 1). The project site, which originally encompassed 4,800 acres located near NE Cape, falls between Kitnagak Bay to the northeast, Kangighsak Point to the northwest, and the Kinipaghulghat Mountains to the south (Figure 2). The site is located at 63 degrees 20 minutes North Latitude, 168 degrees 59 minutes West Longitude, in Township 25 South, Range 54 West, Kateel River Meridian.

2.2 PHYSICAL ENVIRONMENT

2.2.1 Climate

St. Lawrence Island has a cool, moist, subarctic maritime climate with some continental influences during winter when much of the Bering Sea is capped with ice pack. Winds and fog are common, and precipitation occurs approximately 300 days per year as light rain, mist, or snow. Annual snowfall is approximately 80 inches per year. Total annual precipitation is about 16 inches per year, and more than half falls as light rain between June and September. Summer temperatures average between 34 degrees Fahrenheit (°F) and 48°F, with a record high of 65°F. Winter temperatures range from –2°F to 10°F, with an extreme low of –30°F. Freeze-up normally occurs in October or November, and breakup normally occurs in June.

Winds are generally in a northerly to northeasterly direction from September to June, and southwesterly in July and August. Winds exceeding 11 miles per hour occur 70 percent of the time. In the winter, winds average 23 miles per hour. The average wind speed is 18 miles per hour. Gusts in the NE Cape area have measured as high as 110 miles per hour (USACE, 2002).

2.2.2 Topography

The Lower Mountain area consists mainly of flat coastal plains that gradually turn into rolling tundra toward the base of the Kinipaghulghat Mountains. The mountains rise abruptly to a

maximum elevation of more than 1,850 feet above mean sea level. Elevations across the work area range from sea level to approximately 200 feet above mean sea level.

2.2.3 Geology

St. Lawrence Island consists of isolated bedrock highlands of igneous, metamorphic, and older sedimentary rocks surrounded by unconsolidated surficial deposits overlying a relatively shallow erosional bedrock surface. In the immediate vicinity of the Lower Mountain area, shallow, unconsolidated surficial materials overlie quartz monzonitic rocks of the Kinipaghulghat Pluton. The Pluton forms the mountainous work area south of the MOC, including Kangukhsam Mountain. The Suqitughneq River drainage at the work area in the Kinipaghulghat Pluton has created an erosional valley and alluvial fan of unconsolidated sediments. Granitic bedrock materials are exposed at the coast north of the site at Kitnagak Bay, suggesting that quartz monzonitic bedrock underlies the unconsolidated materials at a relatively shallow depth on a wave-cut erosional platform.

The unconsolidated materials exhibit an alluvial soil profile in areas that have not been disturbed by man. In general, silts near the surface overlying more sand-dominated soils at depth characterize native soil stratigraphy at the site. The silt may contain varying quantities of clay/sand/gravel and may vary from zero to 10 feet in thickness. The silt is dark brown to dark green and sometimes exhibits a mottled texture. In some areas, the silt exhibits an aqua green or blue color. Dark brown silts are observed in outcrop. The sand at depth contains varying degrees of silt/gravel/cobbles and varies from 2 feet to more than 20 feet in thickness. These deeper, coarse-grained materials are generally unsorted and are likely to be of glaciofluvial origin. The depth to bedrock at the lower elevation areas of the site is unknown.

Beach material is primarily cobble (1-inch stones) with some sand. Some areas have large boulders and rocks (USACE, 2002).

2.2.4 Hydrology

Because of the relatively remote and undeveloped nature of St. Lawrence Island, there are few data about regional groundwater. Bedrock materials south of the site (and underlying the unconsolidated deposits) are not expected to store and transmit significant quantities of

groundwater. Typically, these types of granitic rocks are generally impermeable and transmit groundwater only through localized fractures and weathered soil zones at the surface.

The primary potential aquifer at the NE Cape site is the unconsolidated alluvial material that underlies the area, although a deeper, confined aquifer may also exist. The mountainous area to the south provides an ideal recharge area for the unconsolidated materials, providing runoff from rain and snowmelt during the summer. Based on the topography and geology of the site, the regional groundwater flow direction is expected to be from the mountainous recharge area south of the site, flowing north and eventually discharging to the Bering Sea.

A key factor influencing the flow of groundwater at the site is the existence of permafrost and frozen soils, which render the unconsolidated materials effectively impermeable in areas. The U.S. Geological Survey has classified St. Lawrence Island as an area of "moderately thick to thin permafrost." Although the depth of permafrost at St. Lawrence Island is unknown, the base of permafrost on the mainland at Nome (135 air miles to the northeast) is estimated to be at a depth of 120 feet. The deeper unconsolidated deposits at the site are probably permanently frozen, and the shallow soils represent the active layer, where soils are thawed only during portions of the year. Frozen soils have a profound effect in retarding groundwater flow during most of the year.

In addition to the Bering Sea north of the NE Cape facility, surface water in the vicinity of the work area consists of small streams, small- to moderate-sized lakes, and marshy areas. Surface water generally flows northward from the highland area to the south. Small surface waterbodies are common throughout the area. The primary stream drainage in the area is fed by runoff from the prominent drainage of the Kinipaghulghat Mountain valley in the Lower Mountain area. Several smaller tributaries feed this stream drainage as it flows north to Kitnagak Point. This stream was impacted by a diesel fuel spill in the 1960s. The smaller tributaries originate from two small, unnamed lakes (USACE, 2002).

2.3 AIR QUALITY

Air quality in the area is good. There are minimal sources of air emissions at the site because of its remote nature. The occasional boat motor, all-terrain vehicle engine, or fire has a negligible effect. Air emissions at the site increase during remedial action work because more equipment and vehicles are at the site. Winds typical of the area disperse emissions (USACE, 2002).

2.4 SOCIOECONOMIC CONDITIONS

2.4.1 Community Profile

The nearest community on St. Lawrence Island to the project site is the Village of Savoonga, approximately 60 miles northwest of the site, with a population of 643 people according to the 2000 U.S. Census. There are no permanent residents at the NE Cape site, but there is a small subsistence hunting and fishing camp in the area that is inhabited in the summer by residents of Savoonga and Gambell. The island is accessible by boat, regularly scheduled airlines (to Gambell and Savoonga), and chartered air flights out of Nome. There is no regularly scheduled commercial access to the project site (USACE, 2002).

2.4.2 Subsistence Activities

Savoonga is a traditional Siberian Yup'ik village with a subsistence lifestyle based on walrus and whale hunting. Whale, seal, walrus, and reindeer comprise 80 percent of islanders' diets. The economy is largely based upon subsistence hunting of walrus, seal, fish, and whale, with some cash income. Berries and edible plants are also harvested. A Native fishing and hunting camp also exists at the project site and is used primarily during the summer season. Subsistence fishing for halibut takes place in the vicinity of NE Cape.

2.5 BIOLOGICAL ENVIRONMENT

2.5.1 Vegetation

The NE Cape area has several major habitat types, including moist tundra dominated by heaths, grasses, sedges, mosses, and lichens, with shrubs that include bearberry, dwarf birch, narrow-leaf Labrador tea, and willow. These plants typically grow in one to three feet of

undecayed organic mat over saturated and frozen soil. Alpine tundra plants (dwarf, prostrate plants that include heaths and tundra species adapted to dry, thin soil conditions) grow on the slopes and exposed ridges of the nearby mountains. The NE Cape area has many low-lying areas with lakes, bogs, and poorly drained soils (USACE, 2002).

2.5.2 Fish and Wildlife

Large mammals are generally not abundant on St. Lawrence Island. Polar bears may be on the island anytime during the year, but are most often present when the ice pack is near shore. Some years, polar bears are stranded on the island throughout the summer when the ice pack moves out earlier than usual. More than 1,000 reindeer can also be found on the island. Arctic foxes, cross foxes, red foxes (less commonly), wolves (rarely), and several small mammals (tundra shrews, arctic ground squirrels, Greenland collared lemmings, red-backed voles, and tundra voles) also inhabit the island. Animals usually seen in or around the buildings are small mammals such as ground squirrels and the occasional fox.

Marine mammals are present in the vicinity of the NE Cape area as seasonal migrants in the offshore and nearshore marine waters, at haul-out sites, and in association with the advancing and retreating ice pack. No haul-out sites are within the work area. During the summer, walrus, sea lions, and spotted seals may be present in offshore waters. During the ice season, ringed seals, bearded seals, walrus, and spotted seals can be found in nearshore and offshore leads and open water. Bowhead, gray, minke, killer, right, humpback, blue, and beluga whales inhabit offshore waters.

The only breeding seabird colony known to exist at the NE Cape facility consists of about 60 glaucous gulls and 60 herring gulls at Seevookhan Mountain, about 5 miles southeast of the NE Cape site. Several other species of birds have been sighted in the vicinity of the NE Cape site, including common ravens, snow buntings, whistling swans, Lapland longspurs, and gulls.

Ten primary species of fish reside in the streams and tundra ponds of St. Lawrence Island. These include blackfish, nine-spined stickleback, grayling, whitefish, and arctic char/Dolly

Varden. Five of the six species of Pacific salmon occur around the island and rear in many of the larger drainages.

2.5.3 Endangered and Threatened Species

Endangered or threatened species of animals on St. Lawrence Island, which are protected under the Endangered Species Act, include the polar bear (threatened), spectacled eider (threatened), the Steller's Eider (threatened), the Steller sea lion (endangered), and the short-tailed albatross (endangered). The prevalence of these, with respect to the NE Cape site, is unknown. Alaska Natives are given some exemptions from this act and are allowed to hunt polar bears for subsistence harvests or handicrafts, as long as the population is not depleted, and the animals are not wasted. Vegetative species that have been proposed as threatened are the perennial plants, Rumex krausei, and Primula tuchuktschorum (USACE, 2002).

2.5.4 Site History

St. Lawrence Island was established as a reindeer reserve by Executive Order on January 7, 1903. The present project site was acquired by the U.S. Air Force (USAF) on January 16, 1952, under Public Land Order (PLO) 970, which removed 21,013 acres from the reserve. In 1952, the USAF Aircraft Control and Warning Station (AC&WS) was formally activated by the assignment of the 712th AC&WS Squadron and the 698th Security Squadron. The original site was designed to support 212 men. Throughout its existence, the NE Cape facility has been a surveillance station, providing radar coverage for the Alaskan Air Command and, later, for the North American Air Defense Command, as part of an Alaska-wide system constructed to reduce potential vulnerability to bomber attacks across the polar regions.

The White Alice Station area remained in operation with minimal military staff until 1972. All lands were then withdrawn from the military under PLO 5187 for classification under Section 17(d)(1) of the Alaska Native Claims Settlement Act (ANCSA) of 1971, which entitled local community village corporations to select and receive specific tracts of federal land. Interim Conveyance No. 203 (June 1979) conveyed unsurveyed lands of St. Lawrence Island to Sivuqaq, Inc., and Savoonga Native Corporation. Excluded from transfer were surveyed land, easements, and land-use permits effective before conveyance.

In 1982, transfer of the White Alice Station area, south of the MOC, to the U.S. Department of the Navy was initiated. However, this transaction was not formally completed and was superseded by ANCSA. The Navy conducted a removal action under its Comprehensive Long-Term Environmental Action Navy program. The action included removal of specified hazardous items and containerized hazardous and toxic waste.

In 2000, the White Alice Station was reclassified as a Formerly Used Defense Sites (FUDS)-eligible property and, in response, the USACE included the area in the ongoing cleanup program for NE Cape (USACE, 2002).

2.5.5 Previous Studies and Actions

Environmental investigations and cleanup activities at NE Cape began in the mid 1980s with the goal of locating and identifying areas of contamination and gathering enough information to develop a cleanup plan. Remedial investigations (RIs) were initiated at NE Cape during the summer of 1994. Additional sampling was performed during subsequent investigations: Phase II RI [Montgomery Watson (MW), 1996 and 1999]; Phase III RI [Montgomery Watson Harza (MWH), 2003]; and Phase IV RI [Shannon &Wilson, Inc. (S&W), 2005]. The studies divided the concerns among 34 separate sites. The results of the RI showed that contaminants were present at some but not all sites.

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3.0 SCOPE OF WORK

3.1 SCOPE OF WORK

The SOW for the Intrusive Drum Removal and Landfill Cap project consists of the following activities:

- Preparing plans and reports;
- Mobilizing/demobilizing to/from the NE Cape site;
- Removal of 55-gallon drums filled with liquid from the entire magnetic footprint (R&M Geophysical Survey, 2007) within the approximately 150,000 square feet of the landfill;
- Excavating 10 test pits and trenches, each covering an area of 100 square feet and a depth of 4 feet;
- Removing, draining, and disposing of fifty, 55-gallon drums;
- Removing and disposing of 2,500 gallons of product associated with drums;
- Excavating, removing, and disposing of approximately 75 tons of petroleum, oil, and lubricant (POL)-contaminated soil;
- Designing and constructing a landfill cap;
- Surveying all test pit and trench corners, sample locations, drum locations, pre- and post landfill cap elevations, and landfill cap boundaries; and
- Stabilizing and re-vegetating disturbed areas.

3.2 SITE DESCRIPTION

3.2.1 Cargo Beach Road Landfill (Site 7)

The Cargo Beach Road Landfill (Site 7) is located approximately 0.4 mile north of the MOC, along Cargo Beach Road (Figure 3). Site 7 is an unpermitted landfill that was used as the installation's main solid waste disposal area from 1965 until closure in 1974. Figure 4 is a site map of the work area. The dump contains a wide variety of unknown materials. The landfill appears to have been created by dumping debris off the sides of a topographic mound known as a glacial drumlin. The debris appears to have been covered by grading soil out from the top of the mound. A significant amount of metallic and wooden debris is exposed along the base of a slope on the east side of the road.

At Site 7, over 6,000 55-gallon drums were gathered from the surrounding area during the 2000 field season. During the 2003 field season, 15 tons of scrap metal were removed from the area east of Cargo Beach Road [Bristol Environmental & Engineering Services Corporation (BEESC), 2004]. Polychlorinated biphenyl (PCB)-contaminated soils (14 tons) from 6 discrete areas along the southeastern exposed edge of the landfill were excavated and shipped off site during the 2005 field season (BEESC, 2006). Exposed drums and debris were removed from the landfill site in 2005, including several drums of waste oil discovered around the perimeter edges of the landfill. Liquid from two drums was drained and sent off site for disposal. Field test kits indicated the drums contained used oil and were not contaminated with PCBs. Several other partially buried drums, apparently full with liquid wastes, remain in place. In 2005, BEESC protected these drums with rocks. In 2007, a magnetic survey was conducted at Site 7 to determine areas in the landfill containing metallic features. Figure 6 shows the magnetic anomalies found by the survey.

3.2.2 Main Operations Complex

The MOC once provided the majority of the site infrastructure, including central housing, administrative buildings, power generation sites, fuel storage tanks, and maintenance areas for the entire NE Cape facility (Figure 3). Multiple sites, including Sites 10, 11, 13, 15, 19, and 27, comprise the MOC. Figure 5 is a site map of the MOC work area.

Remedial investigations were conducted at the MOC in 1994, 1996, 1998, 2001, 2002, and 2004 (MW, 1996 & 1999; MWH, 2003; and S&W, 2005). The sampling results demonstrated that soils and groundwater contain petroleum compounds at elevated levels. No measurable free product was observed in the monitoring wells during the various phases of RI.

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

The USACE issued the Draft Decision Document for NE Cape, FUDS in January 2009. The selected remedy for soil and groundwater at the MOC is chemical oxidation. Appendix A

contains the work plan for the ISCO Treatment study that will be performed by AECOM, a Bristol subcontractor.

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4.0 INTRUSIVE DRUM REMOVAL ACTIVITIES

The SOW at NE Cape for the intrusive drum removal will consist of the following major activities:

- Mobilization and demobilization;
- Intrusive drum removal, drum waste disposal, contaminated soil removal, and landfill cap;
- Surveying all test pit, trench corners, and drum locations,
- Transporting and disposing of drum waste and contaminated soil off site, and
- Reporting.

4.1 MOBILIZATION AND DEMOBILIZATION

4.1.1 Mapped Metallic Anomalies

A geophysical study was performed at Site 7 in 2007 and Bristol has obtained a map of the known metallic anomalies in Geographic Information Systems format. Figure 6 shows the metallic anomalies locations. Bristol will identify delineated areas of geomagnetic anomalies and upload the coordinates to a Geographic Positioning System (GPS) unit, which will be available to the field crew prior to mobilization.

4.1.2 Photographic Documentation

Electronic photographs of all work areas will be obtained before commencing drum removal/landfill cap and ISCO treatment work. These photographs will serve as a complete photographic record of site conditions at the time fieldwork begins. Upon completion of fieldwork, electronic photographs will be obtained from the same vantage points. The latter photographs will document work completed.

4.1.3 Subcontractors

Bristol's primary subcontractors for this project are listed in Table 4-1.

Table 4-1 Major Subcontractors for the Intrusive Drum Removal/Landfill Cap Project

Subcontractor	Assignment
AECOM	ISCO treatability and bench scale study
Bering Air	Aircraft charters
Denali Drilling	Drilling services
Eco-land, Inc.	Surveying
Emerald Alaska, Inc.	On-site hazardous waste management and disposal
Fairweather, Inc.	Infirmary and emergency medical services
Global Services, Inc.	Camp services
Northland Services, Inc.	Marine transportation
Waste Management, Inc.	Solid, RCRA and TSCA soil disposal
TestAmerica Laboratories, Inc.	Fixed-based analytical testing laboratory

Notes:
ISCO = in-situ chemical oxidation
RCRA = Resource Conservation and Recovery Act
TSCA = Toxic Substances Control Act

4.1.4 Barge Mobilization

Northland Services, Inc. (NSI) will be utilized for marine transportation of supplies and equipment to NE Cape. An open deck ramp-barge will be used for mobilization and demobilization. NSI's barge will depart Seattle on May 1, 2009, and will depart from Anchorage by May 13, 2009. Bristol's Caterpillar (CAT) D6H and D8 bulldozer will be loaded on the front of the mobilization barge for transport to NE Cape. Once in Kitnagak Bay, the ramp-barge will be pushed onto the beach and the CAT D6H and D8 bulldozer will be offloaded to construct a gravel ramp. Ramp construction will involve placing and compacting gravel fill. Once the gravel ramp has been constructed, general cargo offloading will begin. Most of the cargo will be loaded on flats so that it can be rolled off the barge using a front-end loader, minimizing the time the barge is beached. Bristol will transport to St. Lawrence Island sufficient fuel, nonperishable items, and spare parts on the mobilization barge to support the camp and equipment for the 2009 construction season.

To eliminate fuel resupply barge landings at Cargo Beach, Bristol will bring approximately 55,000 gallons of fuel to the island on the mobilization barge. The fuel will be stored in

International Standards Organization (ISO) tanks that are U.S. Coast Guard-approved for over-water fuel transfer. A total of eleven ISO tanks with a capacity of 5,500 gallons will be mobilized, and each tank will hold 5,000 gallons of fuel. The fuel farm will be located adjacent to the MOC (Figure 3).

4.1.5 Flight Support

Crew transport and day-to-day resupply of perishable items, critical parts, and sample shipments will be accomplished using charter flights out of Nome. Bristol will utilize Bering Air for chartered aircraft flights at least three times per week between NE Cape and Nome. Additional charter flights will be made, as necessary, to transport local labor between Gambell, Savoonga, and NE Cape.

Most perishable resupply items will be air-freighted to Nome on either Alaska Airlines or Northern Air Cargo. A CASA 212 chartered out of Nome will be used to transport large items that cannot be carried by the passenger aircraft and must be flown to the island.

Government personnel coming from Anchorage will fly between Anchorage and Nome on regularly scheduled commercial flights. Flights arranged for government personnel traveling to the NE Cape site from Nome will utilize chartered flight operated by Frontier/Hagelund on a C-406 or with Security Aviation out of Anchorage. All charter arrangements for government personnel will be made with carriers that comply with Public Law (PL) 99-661 and U.S. Department of Defense Directive 5500.53.

4.1.6 Camp and Work Facilities

The construction camp, including berthing facilities, mess facilities, and office space, will be located on the airport parking area pad, as shown on Figure 3. The camp will be located on the pad, so as to provide the minimum 250-foot distance from the runway centerline and the nearest structure. The camp will accommodate up to 35 people and will include accommodations for government representatives.

Drinking water for the camp will mainly be bottled water and supplemented if needed with water filtered from the nearby Suqitughneq River. Other camp processes, such as water treatment, power generation, and solid waste disposal, will meet State of Alaska permitting restrictions and will be addressed in Bristol's contract with the camp provider. All gray and black water from the camp facilities will be treated through a septic system. Bristol anticipates that some water will be required for dust control.

The medical infirmary will be located at the camp, will comply with the requirements set forth in Section 3 of the Engineer Manual (EM) 385-1-1 (USACE, 2008), and will be attended by a full-time EMT III/Paramedic. Satellite communications for the project will be provided.

4.1.6.1 Container Storage Area

The Container Storage Area will be located immediately east of the MOC, at the camp site, and also at Site 7. Loaded and weighed containers will be stacked in these areas until they are hauled off-island on the demobilization barge at the end of the project.

4.1.6.2 Mechanics Shop

Bristol will erect a temporary mechanics shop to support equipment maintenance operations for the duration of the project. The shop will be set up at the MOC on the former Building 103 floor slab (Figure 3).

4.1.6.3 Hazardous Waste Accumulation Point

The hazardous waste accumulation point (HWAP) will be established southwest of Site 7, approximately 800 feet along Cargo Beach Road (Figure 3). The HWAP will serve as the central collection, identification, bulking, and secure storage point for any Con-HTW encountered during the project. The HWAP will also serve as the drum collection, crushing, and cleaning site. The site will contain a lined impoundment area, created by placing a 20-mil liner over soil berms, capable of holding 20,000 gallons of wastewater. The ground surface will be as smooth as practicable and free of any protuberances that may puncture the liner. Once the hazardous waste is packaged and loaded into its proper shipping container for off-island transport, it will be transported to the container storage area.

4.1.6.4 Fuel Storage

The fuel storage area will be located immediately southeast of the MOC, as shown on Figure 3. Eleven 5,500-gallon ISO tanks (filled to 5,000 gallons each) are planned for this project, for total fuel storage of 55,000 gallons. A lined fuel containment area will be constructed to hold the ISO tanks. An SPCC for the temporary fuel facility is presented in Appendix B of this document.

4.1.6.5 Borrow Source

A local borrow source is located south of the MOC. Volvo A40 rock trucks will perform hauling operations between the borrow source and Site 7 during landfill cap construction. A quarry agreement between Bristol and the local Native corporations may be finalized and submitted to the USACE prior to the start of the fieldwork in July 2009.

4.2 INTRUSIVE DRUM REMOVAL FIELD ACTIVITIES

4.2.1 Work Synopsis

This section presents the major work items, also listed in Table 4-2 and the appropriate project plan reference provided for further details.

Table 4-2 Project Summary by Site

Site	Building/Location	Project Activities	Project Plan Reference
7	Cargo Beach Road Landfill	Landfill Debris Exposure	WP, Section 4.2.3
		Test Pit and Trenching Excavation	WP, Section 4.2.4
		Drum Pad Sampling	WP, Section 4.2.5
		Removal of Drum and Drum Contents	WP, Section 4.2.6
		Stained Soil Removal	WP, Section 4.2.7
		Drum Decommissioning	WP, Section 4.2.8
		Waste Characterization	WP, Section 4.2.9
		Impoundment Area Water Treatment	WP, Section 4.2.10
		Landfill Cap Construction	WP, Section 4.2.11
10, 11, 13, 15, 19, and 27	Main Operations Complex	In-Situ Chemical Oxidation Treatment	AECOM WP (Appendix A)

Note: WP = Work Plan

4.2.2 Work Site Access

Four stream crossings, consisting of three culverts and one bridge exist within the work areas at the NE Cape site. The stream crossings were repaired in 2003, but may require additional repair work. Bristol anticipates culvert repair may be required on a stream crossing just south of the MOC, on a stretch of road between the borrow source and Site 7. In preparation, Bristol will mobilize enough 18-inch culvert sections to address necessary repairs. All efforts will be asserted to minimize adverse impacts to the streams. Bristol has received Fish Habitat Permits for the Suqitughneq and Quangeghsaq rivers in case bridge and road repairs are necessary on these rivers (Appendix C).

Other work to support access to the sites includes repair of road surfaces. These repairs will be accomplished where necessary with graders and bulldozers, using on-site materials.

4.2.3 Landfill Debris Exposure

Prior to any fieldwork at Site 7, Bristol will install silt fencing where needed around the perimeter of the Cargo Beach Road Landfill for erosion control. Areas within the landfill that displayed high levels of magnetic activity during the 2007 geophysical investigation will be examined for the presence of drums (Figure 6). Using a GPS unit as a guide to the locations of these known metallic anomalies, Bristol will disturb the upper one foot of fill across the surface of the landfill in an attempt to expose underlying debris. Bristol will perform this surface disturbance across 150,000 square feet of the Site 7 Cargo Beach Landfill, utilizing a Hitachi 120 excavator with attached bucket and thumb.

4.2.4 Test Pit and Trenching Excavation

Using the Hitachi 120, Bristol will excavate 10 test pits and/or trenches, each encompassing an area of 100 square feet, and at least 4 feet deep to further determine the presence and extent of buried drums. Test pits will be excavated in areas where buried drums are uncovered during the debris exposure process. In the event that buried drums are not visible, test pits or trenches will be excavated in areas of known mapped metallic anomalies. All test pits, trench corners, and drum locations, will be surveyed by a professional land surveyor registered in the State of Alaska. Horizontal control will be based on feet and referenced to the North American Datum of 1983 (NAD83), State Plane, and Zone 9.

4.2.5 Drum Pad Sampling

Prior to waste accumulation activities at the HWAP, the gravel pad at the HWAP will be sampled for diesel-range organics, residual-range organics, gasoline-range organics, PCBs, and benzene, toluene, ethylbenzene, and xylenes to determine initial conditions. It will again be sampled after the waste accumulation activities are finished. The SAP details the analyses and procedures that will be used for characterization.

4.2.6 Removal of Drums and Drum Contents

Drums will be removed from the landfill and taken to the HWAP for cleaning, crushing, and packaging for appropriate disposal or recycling. Bristol will remove the drums from the landfill using the Hitachi 120 excavator with bucket and thumb attachments, and load the

drums into totes for transportation to the HWAP. The totes, designed to contain any possible leaking fluids, will be transported upon an 8-foot by 20-foot flatbed, which is mounted on a chassis, capable of hauling approximately eight totes simultaneously. If a drum appears to be in such poor condition that its removal could result in the spilling of liquid product, its contents will be transferred to a new container in-situ. In-situ pumping of fluids from leaking drums will be accomplished using an air-driven diaphragm pump. Liquids will be pumped into DOT/UN approved containers and the empty drum will be transferred to the HWAP for processing.

Upon arrival at the HWAP, liquid drum contents will be characterized and consolidated with similar materials into clean, DOT/UN approved liquid-tight containers. Product generated from buried drums will be properly characterized via field screening and, when necessary, fixed-laboratory analysis for waste disposal purposes by the field crew. Water, oil, and oily sludge will be containerized separately, with sludge collected into open-top drums. Bristol will make every attempt to minimize wastes by avoiding the mixture of clean and contaminated materials. Waste streams will not be mixed. The WMP contains details of the waste consolidation methods that will be employed.

Emerald Alaska, Inc. (Emerald) will have one crew member on site performing the field activities relating to drum draining, cleaning, and decommissioning. An environmental sampler from Bristol will also be on site to assist with this process. The contract scope identifies the removal of fifty, 55-gallon drums from Site 7, and the accumulation of 2,500 gallons of product for disposal, with an option to remove up to an additional 500 gallons of product. If more than this amount of product is encountered, Bristol will enter into the Contingency Plan (Section 4.4).

4.2.7 Stained Soil Removal

Soils associated with buried drums may show signs of staining. Bristol will identify and remove grossly stained soils after receiving approval from the QAR using a Hitachi 120 excavator. The scope states a maximum of 75 tons of POL-contaminated soils will be loaded directly into lined, 20-foot, open-top containers. The soils will be properly characterized for

waste disposal purposes by Bristol's environmental field personnel. The SAP describes the analyses that will be used for characterization of stained soil for disposal.

4.2.8 Drum Decommissioning

Drum cleaning will consist of a high-pressure, hot water rinse. The water generated from this cleaning process will drain into the lined impoundment area. Following this rinse, the drums will be wiped with oil-absorbent materials prior to crushing and packaging for recycling. Absorbent materials will be properly containerized for disposal. Crushed drums will be loaded into intermodal containers for shipment to the appropriate recycling center or disposal facility. Intermodal containers will be lined to prevent incidental leakage from drum residuals and rain water.

4.2.9 Waste Characterization

Waste characterization activities will occur at the HWAP, located adjacent to the Site 7 landfill (Figure 3). Liquid petroleum product recovered from the buried drums will be bulked into liquid-tight 55-gallon drums. The Emerald field personnel will composite the contents of five drums into one field-screening sample. Composite field screening will be performed on every five full 55-gallon size drum that has been consolidated or re-containerized. The field-screening method to be employed will involve Clor-D-Tect 1000 chlorine halogen test kits. These kits will aid in identifying chlorine levels above the regulatory limit of 1,000 parts per million (ppm). If results indicate concentrations below 1,000 ppm, then the liquid product will be characterized as "off-spec used oil" and disposed of accordingly. If results of the field screening indicate concentrations above the detection limit of 1,000 ppm, then each of the five drums comprising the composite sample will be sampled individually. Those drums that exceed the detection limit of the field-screening kit will be segregated from the off-spec used oil. Hazardous wastes will be segregated and labeled as detailed in the WMP.

Spent field-screening kits will be discarded in a 5-gallon drum and properly disposed of at their respective waste disposal facility. For more information on waste types and disposition, refer to the WMP.

4.2.10 Impoundment Area Water Treatment

Rinse water, as well as water decanted from liquid-containing drums removed from the landfill, will be stored in an impoundment area capable of holding 20,000 gallons. The water will be run through an oil-water separator and an Absorbent® W water scrubbing system before being collected in a separate, second "post-treatment" holding impoundment. A General Wastewater Permit for the treatment system is provided in Appendix C of the WMP. Per the permit, water samples will be collected and sent to a fixed analytical laboratory to ensure water quality standards are met prior to discharge of treated water.

Bristol's environmental field personnel will collect water samples from the post-treatment holding pond prior to wastewater discharge. The samples will be field analyzed for pH, settleable solids and turbidity, as well as sent to the laboratory and analyzed for total aqueous hydrocarbons and total aromatic hydrocarbons. If it is determined that drums containing PCBs, pesticides, antifreeze, or metals were removed from Site 7, these compounds will also be analyzed in the treated water, prior to discharge. The SAP provides details on the analyses and sampling methods that will be used.

4.2.11 Landfill Cap Construction

The proposed landfill cap plan for Site 7 has been approved by Mr. Jeff Brownlee of the Alaska Department of Environmental Conservation (ADEC) Division - Spill Prevention and Response Contaminated Sites Program (Appendix D). Landfill cap construction and the drum removal task will be performed concurrently. The plans for the proposed landfill cap design are provided in Appendix D. Approximately 30,000 cubic yards of soil is needed to construct the approved 24-inch cap. Prior to placing cap fill, the boundary of the landfill cap area will be flagged with orange survey tape, and a minimum of 10 temporary benchmarks for quality control will be established to support grade control by a professional land surveyor registered in the State of Alaska. Silt fencing will be used as needed in down gradient locations for erosion control. Photographs of the site prior to any drum removal and placement of the cap will be taken.

The cap will consist of a cover of 24 inches of granular borrow material obtained from a local borrow area. The borrow material containing the highest percentage of fines will be used for the top 6 inches of the cap. There is little organic matter in the locally available borrow material. However, there is sufficient fine material to bind the coarser fraction together.

A CAT 322D excavator and a CAT D-8 bulldozer will be used to excavate the borrow material and load Volvo A40 rock trucks. The material will then be hauled to Site 7 where it will be placed in approximately 6-inch lifts, spread, and track-walked by a CAT D-6 bulldozer to at least 90 percent relative compaction. The cap will also be graded, contoured, and vegetated to prevent erosion. Bristol does not anticipate having to stockpile the borrow material at Site 7 prior to placement. The Site Superintendent will be responsible for setting grade. A professional post-survey will be conducted of the completed landfill cap to allow the surveyor to create an as-built figure of the completed cap. Photographs will be taken after the cap is completed.

The landfill cap construction includes maintaining the Cargo Beach Landfill Road through the landfill even though the road may be temporarily closed during the cap construction. Bristol anticipates that the road between Site 7 and the borrow area will need to be maintained and upgraded to ensure that the rock trucks can safely travel between these work areas. Bristol does not anticipate any dust control issues, but a 2,500-gallon water truck will be available on site if needed to suppress any dust.

If for some unknown reason, Bristol is unable to complete the cap, it will be stabilized with coir logs and geotextile fabric, and revegetated prior to demobilization from NE Cape. The cap will achieve final completion during a later field season.

If the landfill cap is completed during the 2009 construction season, the site will be stabilized and re-vegetated according to Section 7 in the SWPPP. Bristol will attempt to purchase native grass seed adapted to the St. Lawrence Island environment as recommended by the Alaska Plant Materials Center, and will spread it in accordance with their instructions. The seed mixture will be proportioned by weight as follows:

Common Name	Mixture % by Weight
Tufted Hairgrass	70
Red Fescue	30

The recommended amount of seed mixture for revegetation is one pound per 100 square feet. Fertilizer will be applied at a rate of 450 pounds per acre, and will have a nitrogen-phosphorus-potassium ratio of 20 percent nitrogen; 20 percent phosphorus; and 10 percent potassium. Grass seed and fertilizer application will be limited to a period after breakup to July 15 or after August 20, up to the presence of no more than 2 inches of crustless snow. No watering is necessary.

4.2.12 Demobilization

Demobilization will begin when fieldwork is completed at the end of the 2009 construction season. Upon completion of fieldwork activities, Bristol will remove all debris, waste, and excess material from the site. All construction-related support areas (e.g., temporary roads created while accessing landfill, stockpiling areas, and impoundments at HWAP) will be restored to their existing conditions. Contaminated equipment will be decontaminated prior to leaving the site.

A six- to eleven-person crew, consisting of Bristol and Global Services, Inc., personnel, will require approximately five days dismantling the support and nonessential camp facilities and staging them for loading at Cargo Beach. The work will be completed prior to barge arrival. Four days will be required to load the demobilization barge. Bristol's equipment and the camp will be transported to Anchorage, Alaska. The wastes will be transported from NE Cape to Seattle (intermediate stops are expected) for transportation to their respective disposal/recycling facilities. After the barge has been loaded, aircraft will fly the demobilization crew to Nome, Alaska.

4.3 OPTIONS TO HANDLE ADDITIONAL WASTE STREAMS: DRUMS, LIQUID AND CONTAMINATED SOIL

Although the base of the SOW is to remove liquid-filled drums from the landfill, Bristol will anticipate other miscellaneous wastes. Various options were set up in the contract to handle additional wastes or additional quantities of wastes. Table 4-3 presents the options with their associated task number and description. The following sections describe each option and presents Bristol's plan for notification and handling of each option.

Table 4-3 Options

Option/Item	Description	Quantity per Option	Number of Options Available
Option Task 1/ 0001AE	Additional drums containing POL liquids	50 gallons	10
Option Task 2/ 0001AF	Additional contaminated soil - nonhazardous POL	5 tons	10
Option Task 2/ 0001AG	Additional contaminated soil - PCBs	5 tons	10
Option Task 2/ 0001AH	Additional contaminated soil - hazardous	5 tons	10
Option Task 3/ 0001AJ	Batteries	25 pounds	5
Option Task 3/ 0001AK	Transformers	250 pounds	5
Option Task 4/ 0001AL	Additional test pits	1	10

Notes:
PCBs = polychlorinated biphenyls
POL = petroleum, oil, and lubricants

4.3.1 Additional Drums Containing POL Liquids

The SOW covers a maximum of 2,500 gallons of POL liquids to be removed and disposed of during the intrusive drum removal at Site 7. Bristol will track the quantities of POL liquids removed in the daily quality control reports, and when the amount removed is close to 2,500 gallons and it appears that the quantity may be exceeded, Bristol will notify the USACE, including the site Quality Assurance Representative (QAR). The HTW Accumulation Summary Sheet found in Appendix B of the Waste Management Plan will be used to quantify and track the number of gallons of product containerized. In the event that the 2,500 gallons is reached, an option for an additional 50 gallons is available in the contract (Option Task 1)

once it is approved by the USACE. A total of 10 options for 50 gallons of POL liquids are available in the contract, if needed and approved by the USACE.

Bristol will have additional materials needed for characterizing, containing, and disposing of 500 additional gallons of various wastes (without mixing) on site (see the WMP for POL liquid-handling information).

4.3.2 Transformers

The SOW does not include disposal of transformers during the intrusive drum removal at Site 7. If transformers are discovered while excavating during the intrusive drum removal, Bristol will immediately notify the USACE, including the site QAR and the COR. The transformers will be segregated until approval by the USACE is obtained for using the option set up for transformer recovery (Option Task 3). An option for 250 pounds of transformer is available, if approved by the USACE. A total of five options, for 250 pounds, of transformers, each are available in the contract, if needed, and approved by the USACE.

Bristol will have additional materials needed for containing and disposing of 1,250 pounds of transformers available on site.

The transformer will be packed into an open-top 55-gallon drum or, as size dictates, a tote. A tote may be used as a form of secondary containment for non-leaking transformers that are too large to fit inside DOT/UN certified drums. The tote will not serve as the shipping container. If a transformer is found, it will not fit inside a drum, and its integrity appears suspect, then the transformer oil will be pumped into DOT/UN certified drums. The carcass and associated drums of transformer oil will be shipped separately. If it appears the transformer will not fit into available containers, then all oil within the transformer will be pumped in-situ into a liquid-tight 55-gallon drum. A dedicated transformer oil pump will be used to transfer transformer oil that is found to contain greater than 50 ppm PCB through field testing. The liquid contents will be transferred to the HWAP for characterization and the transformer will be dismantled into manageable sizes for disposal.

Dexsil® Clor-N-Oil kits will be utilized for field screening oil associated with the transformer. The kits will be capable of detecting PCB concentrations above 50 ppm. If the result indicates that the transformer oil contains less than 50 ppm then the waste stream profile will be classified as non-regulated transformer oil with 0 to 49 ppm PCB. This material will be sent to Emerald's facility where they will perform confirmation testing prior to recycling. Transformer oil will be kept segregated from other used oil and other waste streams found. Transformer oil found that indicates less than 50 ppm PCBs may be consolidated with like transformer oil based on the Chlor-n-Oil 50 results.

4.3.3 Batteries

If whole batteries are discovered while excavating during the intrusive drum removal, Bristol will immediately notify the USACE, including the site QAR and the COR. The whole batteries, and those batteries that become damaged during the excavation, will be segregated until approval by the USACE is obtained for using the option set up for batteries (Option Task 3). The option for 25 pounds of whole batteries is available if approved by the USACE. A total of five options for 25 pounds each, of whole batteries, are available in the contract, if approved by the USACE.

Bristol will have additional materials needed for containing and disposing of 125 pounds of whole batteries will be available on site (see the WMP for handling batteries and disposal information). Whole batteries will be bulked into an open-top drum, appropriately labeled, and stored at the HWAP pending final transportation and disposal at a designated facility.

4.3.4 Additional Nonhazardous POL-Contaminated Soil

The SOW covers a maximum of 75 tons of nonhazardous POL-contaminated soil to be removed and disposed of during the intrusive drum removal at Site 7. Bristol will track the quantities of nonhazardous POL-contaminated soil removed in the daily reports; when the amount removed is close to 75 tons, and it appears that the quantity may be exceeded, Bristol will notify the USACE, including the site QAR and the COR. In the event that the 75 tons is reached, an option for an additional five tons is available (Option Task 2), if approved by the

USACE. A total of 10 options for five tons each, of nonhazardous POL-contaminated soil are available in the contract, if needed and approved by the USACE.

Bristol will have additional containers for transporting an additional 500 tons of nonhazardous POL-contaminated soil available on site.

4.3.5 PCB-Contaminated Soil

The SOW does not include PCB-contaminated soil to be removed and disposed of during the intrusive drum removal at Site 7. If PCB-contaminated soil is discovered while excavating during the intrusive drum removal activities, Bristol will immediately notify the site QAR. For example, if a leaking transformer is found or obvious soil staining is present around the transformer then the associated soil and transformer will be containerized. Soil will be placed in drums, Super Sacks®, and/or intermodal containers based on the volume of stained and suspect soil found. All containers of soil will have samples analyzed by the fixed-based laboratory for waste characterization according to Section 4.2.2 of the SAP.

The soil will be segregated until approval by the USACE is obtained for using the option set up for PCB-contaminated soil (Option Task 2). The option for five tons of PCB-contaminated soil is available, if approved by the USACE. A total of 10 options for five tons each, of PCB-contaminated soil, are available in the contract, if needed and approved by the USACE.

Bristol will have additional 20-foot containers, bulk bags, or Super Sacks needed for disposing of 500 tons of PCBs-contaminated soil available on site in the event that this option is used.

4.3.6 Soil Contaminated with Hazardous Waste

The SOW does not include soil contaminated with hazardous waste to be removed and disposed of during the intrusive drum removal at Site 7. Only grossly-stained soil, and soil associated with a leaky drum or transformer, will be removed from the landfill. If the waste characterization results provided by the fixed-based analytical laboratory identify the containerized soil as hazardous waste, Bristol will immediately notify the site QAR. The soil will be segregated until approval by the USACE is obtained for using the option set up for soil

contaminated with hazardous waste (Option Task 2). The option for five tons of hazardous-contaminated soil is available if approved by the USACE. A total of 10 options for five tons each, of hazardous contaminated soil are available in the contract, if needed and approved by the USACE.

Bristol will have additional 20-foot containers, bulk bags, or Super Sacks needed for containing and disposing of 500 tons of soil contaminated with hazardous waste on site.

4.3.7 Additional Test Pits

The SOW covers a maximum of ten test pits to be excavated during the intrusive drum removal at Site 7. Bristol will track the number of test pits and as soon as it appears that additional test pits will be needed, Bristol will notify the USACE, including the site QAR and the COR. If it is determined by the USACE that additional test pit(s) are needed, up to ten options for one additional test pit, each, are available (Option Task 4). Approval for each option will be required by the USACE prior to use.

Bristol will have additional materials needed for supporting ten additional test pits on site. This will include supplies for the camp to run one additional day per test pit and include crew costs.

4.4 CONTINGENCY PLAN

This section outlines a Contingency Plan to address the inadvertent discovery of large quantities of buried drums, impacted soil, and/or other items beyond the base quantities and options defined in the SOW. Bristol has budgeted 51 days of field work to complete the drum removal task. Therefore, 30 to 35 days after beginning drum removal activities, Bristol will know if the Contingency Plan must be implemented. If the Contingency Plan is implemented, all the drum removal, sampling, and waste characterization procedures will follow the procedures set forth in the Work Plan, Sampling and Analysis Plan, and Waste Management Plan. Under any circumstances, all field work associated with the Contingency Plan will be completed by no later than September 5, 2009, so that Bristol can be off the island by September 15, 2009. Extending our stay on the island beyond September 15, 2009,

significantly increases the chances that we will incur weather-related delays during demobilization.

The following steps will be taken in the event Bristol unearths a large cache of liquid-filled drums and/or encounters a large volume of contaminated soil:

- Bristol will immediately notify the USACE QAR and recommend that the Drum Crew begin delineating the size of the drum cache.

- If the USACE agrees with our recommendation, Bristol will stop removing drums and processing drum contents. This will allow the Drum Crew to concentrate on unearthing the drum cache in order to better estimate the number of drums, the quantity of liquids, and the volume of grossly contaminated soil present.

- Once the size of the drum cache is known, Bristol will provide an estimate of the cost and schedule impacts to the USACE. Bristol will have the capability on site to handle a total of 6,250 gallons of liquid in 55-gallon drums. This is over twice the volume of liquids identified in the SOW.

- If additional liquid storage capacity is necessary, Bristol is prepared to utilize our ISO fuel tanks as they are emptied of fuel. Each ISO tank is capable of transporting up to 4,500 gallons of liquid waste.

- Bristol will have the capability on site to containerize and transport up to 250 tons of contaminated soil. This is 25 tons more than the weight of soil identified in the SOW. If additional soil is encountered, Bristol will fly one cubic yard Super Sacks® to the site to contain contaminated soil. Bristol will then arrange to have additional 20-foot containers barged to the site by Northland to transport the Super Sacks to the disposal facility. One additional empty container will be required to transport 20 Super Sacks of soil.

The inadvertent discovery of large quantities of buried drums and/or grossly contaminated soil will potentially cause significant cost and schedule impacts to the project. The USACE's

options for proceeding with the project will ultimately depend on the number of drums and the volume of liquids and grossly contaminated soil encountered. In a worst-case scenario, the estimated cost and/or schedule impacts will not allow the project to be completed during the 2009 season. Under this scenario Bristol will recommend that the USACE stop landfill cap construction, and re-scope the project to utilize the remaining cap construction funds for drum removal, and to stabilize the remaining drums (if any) and the uncapped portion of the landfill.

4.5 REPORTING

After completion of the project, Bristol will submit the Construction Completion Report in accordance with Section 3.4 of the SOW under Task 4. The Construction Completion Report will contain the following information:

- Introduction and project overview;
- Deviations from the approved WP;
- Test pit and trench excavation details;
- Contingency plan implementation (if needed);
- Chemical data tables detailing drum and soil sample results;
- Maps/figures showing drum disposal areas, stained soil, surface debris assessment areas, and contaminant concentrations respective to these features;
- Deed Notice Support Appendix – Will be included if the landfill cap is completed in 2009. This appendix shall be a stand-alone and shall contain all required Deed Notice documentation after final closure of the landfill is approved, including landfill boundary survey, boundary map, and text description.

  A notation on the deed to the landfill facility property will be put on record or some other instrument that is normally examined during a title search. Written notification that the notation has been recorded and that a copy has been placed in the operating record, will be submitted to the ADEC. The notation on the deed must, in perpetuity, notify any potential purchaser of the property of the following:

  - the land was used as a disposal facility
  - the type of waste that was buried there
  - the property may not be suitable for some uses
  - maintenance and repairs to the property might become necessary to prevent pollution problems

  - any activity that results in damage to the final cover of the property must be corrected to control potential pollution problems;

- Field logs;
- CDQR and Laboratory Data Review Checklists;
- Site photographs;
- ADEC Contaminated Sites Laboratory Approval Letter; and
- References.

5.0 SPILL PREVENTION AND RESPONSE

5.1 GENERAL PROVISIONS

All NE Cape site personnel will be properly trained and supervised in protocols for hazardous waste operations and emergency spill response. Proper equipment, procedures, and safeguards will be used when handling waste materials. To minimize the frequency of spills, personnel will be instructed during safety briefings on the proper methods for transferring and handling hazardous materials. Refer to the SPCC Plan (Appendix B) for complete details on spill prevention and control for the temporary fuel storage area. The sections below detail spill prevention and control for areas other than the temporary fuel storage area.

5.2 LIKELY SPILL SCENARIOS

Activities that could result in a spill include the removal and cleaning of intrusive drums, containerizing wastes, and the general fueling and lubricating activities associated with equipment use.

5.3 SPILL PREVENTION MEASURES FOR INTRUSIVE DRUM REMOVAL

The following procedures will be enforced throughout this project:

- Prior to accumulation of wastes, verify that containers are in good condition with tight-fitting lids.
- To prevent spillage while moving intrusive drums, the drums will be transported from the landfill to the HWAP inside of an impermeable plastic tote, with a capacity exceeding the size of the drum contents.
- Verify that totes are properly banded and pallets are secure on forklifts before transporting them.
- Oil and/or sludge from intrusive drums will be transferred to U.S. Department of Transportation certified containers inside a lined containment area at the HWAP. Containerized oil waste will be handled and stored in accordance with requirements for other containerized oils.
- Drum cleaning will be performed on plastic liners sufficiently permeable to contain oil and other bulk product waste. Buckets will be used to collect bulk liquids from the low points of cut drums as appropriate. Sorbent pads will also be placed at appropriate locations to collect dripping fuel. Wash water used in drum cleaning will be collected and transported to an impoundment area prior to treatment and disposal.

5.4 SPILL PREVENTION MEASURES FOR ISCO

- In the event of an accidental spill of concentrated hydrogen peroxide (H_2O_2) liquid, adequate ventilation and an ample supply of water will be available. The spill will be diluted with a large volume of water to avoid rapid oxygen releases and high temperatures during decomposition, which could present a fire hazard.
- In the event of an accidental spill of sodium persulfate solid, clean solids will be swept into a dust pan, dissolved in water, and added to the sodium persulfate mix tank. If solids are not clean or spill onto the ground, the material will be dissolved and diluted with a large volume of water. Spills of sodium persulfate solution will be diluted with a large volume of water and neutralized with sodium thiosulfate and sodium bicarbonate.
- In the event of an accidental spill of iron etheylenediaminetetraacetic (FeEDTA) solids, the clean material will be swept into a dust pan, and dissolved in the FeEDTA mix tank. If spilled solids are not clean or spill onto the ground, the material will be dissolved and diluted with a large volume of water. Spills of FeEDTA solution will be diluted with a large a large volume of water.

5.5 SPILL RESPONSE EQUIPMENT

To minimize the impact of spilled material by quick response, Bristol will maintain emergency spill response kits on site. Each kit will contain absorbent materials (oil sorbent pads and booms) and personal protective equipment (safety glasses or goggles, chemical-resistant gloves, Tyvek® suit, and booties, etc.). Personnel on site will be familiar with the contents and use of the kits. In addition, each vehicle on site will carry oil-sorbent pads. Spill kits that contain absorbents and spill booms will be located at all three main work sites (material excavation, chemical oxidation, and the drum cleanup area). Additionally, each vehicle will be equipped with an action packer that contains an SPC "Attack Pack®" as well as the normal required USACE fire extinguisher, first-aid kit, and other safety-related items.

5.6 SPILL RESPONSE PROCEDURES

Bristol will immediately contain any spill. Work will be stopped in areas of release if there is any reason to believe the spill represents a safety concern. The following procedures will apply in the event of a spill:

	Spill Response Procedures
1.	Protect project personnel and notify the Site Superintendent.
2.	Identify contaminant spilled, source of release, volume of release, and any associated contaminated media (such as soil).
3.	Take necessary personal precautions; isolate or segregate contaminated material from human contact (using temporary berms, absorbents, and shut-off valves, as necessary).
4.	Keep nonessential people away; isolate hazardous areas and deny entry.
5.	Take immediate measures, using properly protected personnel, to control the discharge at its source and contain the release.
6.	Stay upwind and keep out of low areas.
7.	Keep combustibles and ignition sources away from spilled materials.
8.	Use water or vapor suppression foams or sprays to reduce vapors, as needed.
9.	Take additional actions and request outside assistance, as required.
10.	Report spills as indicated in Section 7.6 of the Spill Prevention, Control, and Countermeasures Plan (Appendix B).

These procedures for responding to spills and releases will be reviewed weekly as part of the on-site health and safety meetings.

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6.0 PROJECT SCHEDULE

The project schedule is presented in Appendix E. The project schedule and work sequence are summarized as follows:

- Planning documents will be finalized and all necessary permits will be in place by July 2009.
- The mobilization barge will arrive at NE Cape by early July 2009.
- The camp will be set up and mobilization complete by mid July 2009.
- A drum removal, landfill cap, and the ISCO treatability study will be conducted from July 2009 to September 2009.
- All of the fieldwork, including demobilization, will be completed by mid September 2009.
- The Draft Report will be submitted to the USACE by early May 2010.
- The final Remedial Action Report will be submitted to the USACE by mid June 2010.
- Contract closeout will be completed by June 30, 2010.

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7.0 PROJECT ORGANIZATION AND KEY PERSONNEL

Key personnel for this project are identified in this section. A diagram of Bristol's organizational structure is presented on Figure 7.

7.1 KEY HOME OFFICE PERSONNEL

7.1.1 Project Manager, Ms. Molly Welker

Ms. Molly Welker, the Project Manager, is responsible for ensuring project tasks are completed on schedule and within budget, recommending and justifying project modifications, implementing methods of tracking materials and resources, coordinating work with subcontractors, and complying with normal safety procedures and regulatory requirements.

7.1.2 Safety and Health Manager, Mr. Clark Roberts, C.I.H., C.S.P.

Mr. Clark Roberts, Certified Industrial Hygienist, Certified Safety Professional, will manage and implement Bristol's Safety and Health Program for this project. Mr. Roberts works with Bristol's Site Safety and Health Officer assigned to individual projects to develop and implement effective SSHPs. He is based in Bristol's San Antonio, Texas, office.

7.1.3 Regulatory Compliance Manager/Transportation and Disposal (T&D) Coordinator, Mr. Tyler Ellingboe

Mr. Tyler Ellingboe will serve as the Regulatory Compliance Manager, and oversees all activities related to collecting, manifesting, transporting, and disposing of hazardous materials and wastes for Bristol. He will work closely with the environmental field crew from Bristol and Emerald to ensure wastes are properly identified,

Mr. Ellingboe will also serve as the T&D Coordinator, and will be responsible for ensuring proper manifesting, placarding, and tracking of waste streams.

7.2 KEY FIELD PERSONNEL

7.2.1 Site Superintendent, Mr. Charles (Chuck) Croley

Mr. Chuck Croley is responsible for management of scheduling, coordination, and execution of Bristol's on-site activities in accordance with the contract specifications. He will report directly to the Project Manager. Mr. Croley will be Bristol's on-site representative in dealings with subcontractors.

7.2.2 Contractor Quality Control System Manager, Mr. Russell James

Mr. Russell James will be responsible for management of contractor quality control (CQC) and will have the authority to act in all CQC matters for the project. He will work with the Project Manager to implement the CQCP to ensure project quality objectives are met. Mr. James will be Bristol's liaison with the USACE QAR.

7.2.3 Regulatory Specialist, Mr. Tyler Ellingboe

Mr. Tyler Ellingboe will be the primary point of contact for environmental and regulatory matters in the field, and will oversee all activities in the field related to collecting, manifesting, transporting, and disposing of hazardous materials and wastes.

7.2.4 Project Chemist, Ms. Julie Sharp-Dahl

Ms. Julie Sharp-Dahl has the responsibility for project-related quality aspects related to the collection and chemical analysis of all samples, as delegated by the Project Manager. Her primary role is to provide oversight to the data development and review process and oversight of all subcontracting laboratories.

7.2.5 Site Safety and Health Officer, Mr. Chuck Croley

Mr. Croley will be responsible for overall planning and compliance with safety and health activities. He will conduct daily safety meetings and address worker safety concerns. The Site Safety and Health Officer will be responsible for communicating safety issues and concerns, and reporting safety incidents to the Site Superintendent and the Project Manager.

7.2.6 ADEC Qualified Sampler, Mr. Eric Barnhill

Mr. Eric Barnhill will be the ADEC-Certified Environmental Sampler for collection and processing of environmental samples.

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8.0 APPLICABLE LAWS AND REGULATIONS

The following laws, regulations, and permits are potentially applicable to project activities.

8.1 LIST OF APPLICABLE LAWS AND REGULATIONS

8.1.1 Federal Laws and Regulations

- Safe Drinking Water Act
  - National Primary Drinking Water Regulations, Title 40, Code of Federal Regulations Section 141 (40 CFR 141), and Implementation, 40 CFR 142, 1994
  - Maximum Contaminant Level Goals, PL No. 99-339, 100 Statute 642, 1986 and 1994
  - U.S. Environmental Protection Agency (EPA) Drinking Water Standards and Health Advisories, EPA 822-B-00-001, summer 2000
- Clean Water Act, Title 33 U.S. Code (USC), Sections 1251-1376 (33 USC 1251-1376)
  - Criteria and Standards for the National Pollutant Discharge Elimination System (NPDES), 40 CFR 125
  - Water Quality Standards, 40 CFR 131
  - EPA-administered Permit Program for the NPDES, 40 CFR 122
  - Guidelines for the Evaluation of the Disposal of Dredged or Fill Material, 40 CFR 230, Section 404(b)(1)
- Resource Conservation and Recovery Act
  - Identification and Listing of Hazardous Waste, 40 CFR 261
  - Removal of asbestos-containing material (ACM_, 40 CFR 61
  - Handling of ACM, 29 CFR 1910 and 1926
  - Release of Hazardous Substances to the Environment, 40 CFR 300 and 302
  - Management of Used Oil, 40 CFR 279
  - Protection of Floodplains, Executive Order (EO) 11988
  - Protection of Wetlands, EO 11990
- Toxic Substances Control Act, 40 CFR 761
- Endangered Species Act
- Fish and Wildlife Coordination Act
- National Historic Preservation Act
- Coastal Zone Management Act

- Marine Mammal Protection Act
- Migratory Bird Treaty Act
- Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, EO 12898
- Protection of Children from Environmental Health Risks and Safety Risks, EO 13045
- St. Lawrence Island FUDS, EO 12088, PL No. 98-212
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
- National Oil and Hazardous Substance Pollution Contingency Plan
- U.S. Department of Transportation, Transportation of Hazardous Materials, 49 CFR 171-178
- Disposal of Waste Material, Including ACM and PCB, 40 CFR 60, 257, 261, 262, 263, 268, 279, 761, and 763
- Magnuson-Stevens Fishery Conservation and Management Act, 16 USC 1801 et seq., and Essential Fish Habitat, 50 CFR 600.920
- National Environmental Policy Act (NEPA)

8.1.2 State Laws and Regulations

- Alaska Regulations for Storage, Labeling, Containerizing, and Disposal of Hazardous Waste, Title 18 Alaska Administrative Code, Chapter 62 (18 AAC 62)
- Alaska Water Quality Standards, 18 AAC 70, as amended May 27, 1999
- Alaska Drinking Water Regulations, 18 AAC 80, as amended November 14, 2001
- Alaska Underground Storage Tank Regulations, 18 AAC 78, as amended December 20, 2000
- Underground Storage Tanks Procedures Manual, December 10, 1998
- Oil and Hazardous Substances Pollution Control, 18 AAC 75, as amended April 4, 2001
- Alaska Department of Fish and Game (ADF&G), 5 AAC 95, Fish and Game Habitat
- Alaska Department of Natural Resources, 11 AAC 62.720, Tideland Permit
- Alaska Historic Preservation Act, Alaska Statute (AS) 41.35, January 1992
- Alaska Coastal Management Regulations, 6 AAC 6, October 16, 1987
- ADF&G Fish Habitat Permits, AS 16.05.840
- Temporary Water Use, 11 AAC 93.210-220

8.1.3 Camp Regulations

- Alaska Food Code, 18 AAC 31
- Alaska Wastewater Disposal, 18 AAC 72
- Temporary Water Use, 11 AAC 93.210-220

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9.0 REFERENCES

Bristol Environmental & Engineering Services Corporation (BEESC). 2004 (July). *Removal Action Report (Revision 1), White Alice Site Removal Action, Northeast Cape, St. Lawrence Island, Alaska.*

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MW. 1996 (December 6). *Draft Phase II Remedial Investigation/Feasibility Study*, Northeast Cape, Alaska.

Montgomery Watson Harza.(MWH) 2003 (March). *Summary Report, Phase III Remedial Investigation, Northeast Cape, St. Lawrence Island, Alaska. Final.*

Shannon & Wilson, Inc. (S&W). 2005 (June). *Phase IV Remedial Investigation, Northeast Cape, St. Lawrence Island, Alaska. Final.*

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USACE. 2002 (March). *Engineering Evaluation and Cost Analysis, Environmental Assessment and Finding of No Significant Impact, White Alice Site Removal Action, Northeast Cape, St. Lawrence Island, Alaska.*

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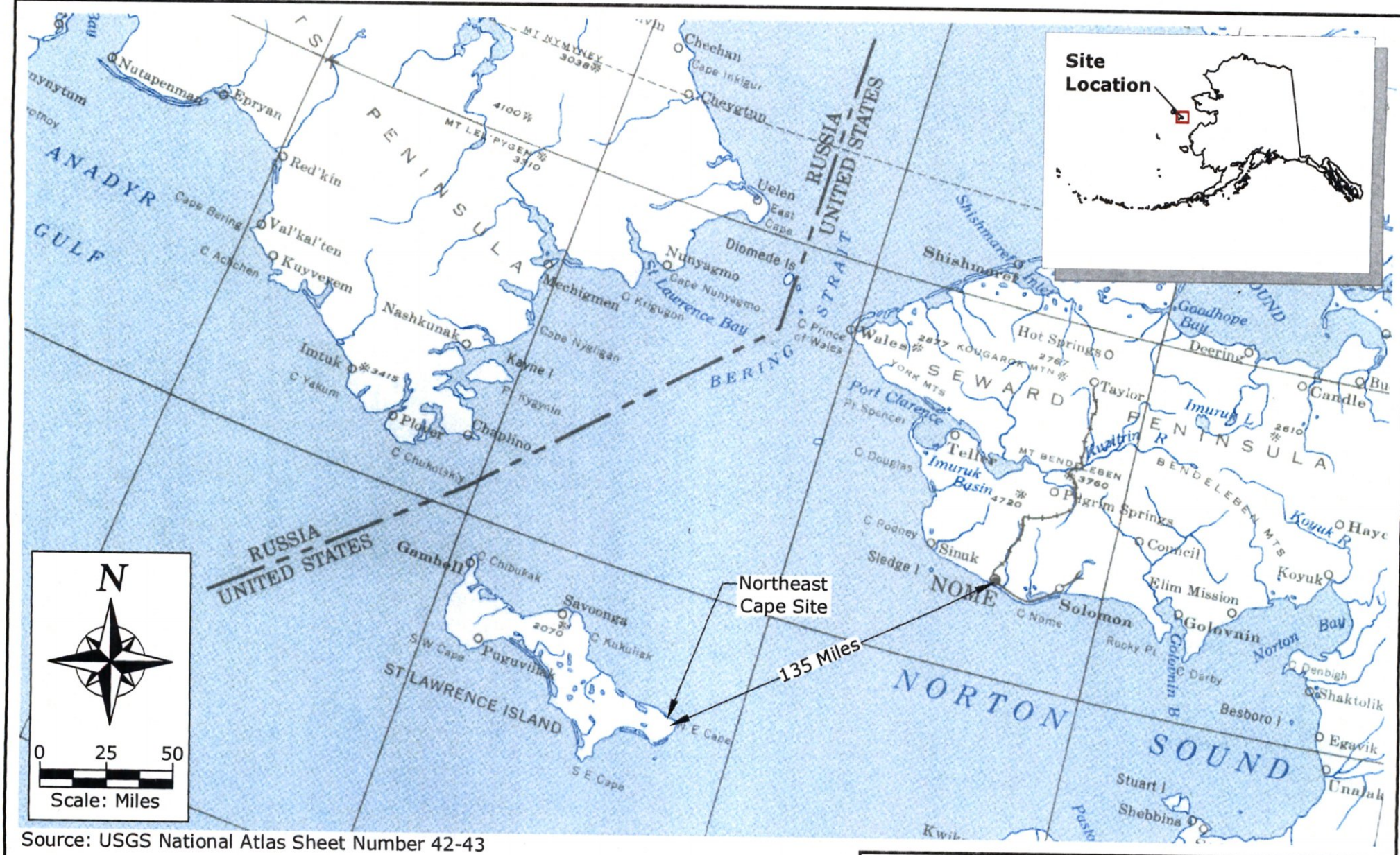
FIGURES

Drawing: O:\JOBS\49028 NECAPE LANDFILL\ACAD-ENVIRO\WP\DWG\49028_FIG1_WP_APR09.DWG - Layout: 49028_FIG1_WP_APR09
User: MGARCIA May 07, 2009 - 1:41pm Xrefs: - Images: NECAPE.JPG



Source: USGS National Atlas Sheet Number 42-43

FIGURE 1
NORTHEAST CAPE, ST. LAWRENCE ISLAND, ALASKA
IN-SITE CHEMICAL OXIDATION AND INSTRUSIVE
DRUM REMOVAL/LANDFILL CAP
VICINITY MAP

Bristol
ENVIRONMENTAL REMEDIATION SERVICES, LLC
Phone (907) 563-0013 Fax (907) 563-6713
CONTRACT NO: W911KB-09-C-0013

DATUM:	NA
PROJECTION:	NA
PROJECT NO.	49028
DATE	04/16/09
DWN.	MTG
SCALE	SHOWN
APPRVD.	MW

Northeast Cape Site

Akcolokok Pt
Alngeevak Pt
Tomname Pt
Sooghmeghat
Okikak Mtn
Tomname Mtn
Sevak Camp
Kangighsak Pt
Kitnegak Bay
Lietnik
Seevoo Pt
Seepanpak Lagoon
Kangukhsam Mtn
Camp Kulowiye
Northeast Cape
Seevookhan Mtn
Eayagit Pt
Siuneghak Lagoon
Gudrum Mtn
Soomaghat Mtn
Kinipasyuk
Tapisaghak
Myghapowit Mtn
Makhek River
Nivkhapakhit Lake
Maknik Lagoon
Shulghat Mts
Nivghapak Pt
TO NORTH MOUTH OF YUKON RIVER 130 MI.
Kiloknak Lagoon
Apavawook Cape
Tapaghtalghee Bay
Kooku Beach
Punuk Islands
Sekinak L

N

0 3 6

SCALE: Miles

FIGURE 2
NORTHEAST CAPE, ST. LAWRENCE ISLAND, ALASKA
IN-SITE CHEMICAL OXIDATION AND INSTRUSIVE
DRUM REMOVAL/LANDFILL CAP
LOCATION MAP

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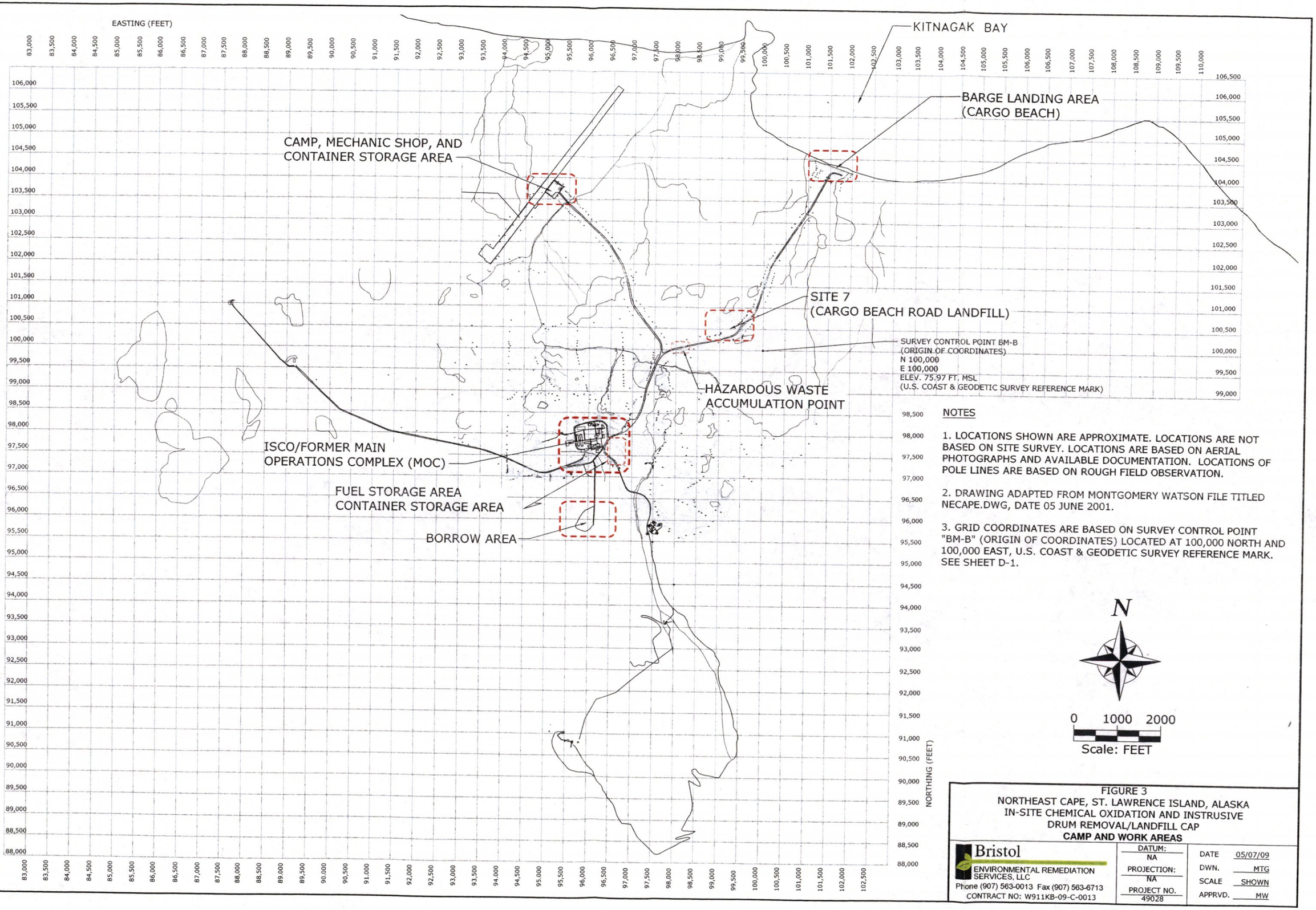
ENVIRONMENTAL REMEDIATION SERVICES, LLC
Phone (907) 563-0013 Fax (907) 563-6713
CONTRACT NO: W911KB-09-C-0013

DATUM:	NA
PROJECTION:	NA
PROJECT NO.	49028
DATE	04/16/09
DWN.	MTG
SCALE	SHOWN
APPRVD.	MW



NOTES

1. LOCATIONS SHOWN ARE APPROXIMATE. LOCATIONS ARE NOT BASED ON SITE SURVEY. LOCATIONS ARE BASED ON AERIAL PHOTOGRAPHS AND AVAILABLE DOCUMENTATION. LOCATIONS OF POLE LINES ARE BASED ON ROUGH FIELD OBSERVATION.

2. DRAWING ADAPTED FROM MONTGOMERY WATSON FILE TITLED NECAPE.DWG, DATE 05 JUNE 2001.

3. GRID COORDINATES ARE BASED ON SURVEY CONTROL POINT "BM-B" (ORIGIN OF COORDINATES) LOCATED AT 100,000 NORTH AND 100,000 EAST, U.S. COAST & GEODETIC SURVEY REFERENCE MARK. SEE SHEET D-1.

N

0 1000 2000

Scale: FEET

FIGURE 3
NORTHEAST CAPE, ST. LAWRENCE ISLAND, ALASKA
IN-SITE CHEMICAL OXIDATION AND INSTRUSIVE
DRUM REMOVAL/LANDFILL CAP
CAMP AND WORK AREAS

Bristol
ENVIRONMENTAL REMEDIATION SERVICES, LLC
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CONTRACT NO: W911KB-09-C-0013

DATUM:	NA
PROJECTION:	NA
PROJECT NO.	49028
DATE	05/07/09
DWN.	MTG
SCALE	SHOWN
APPRVD.	MW

N

0 50 100

Scale: FEET

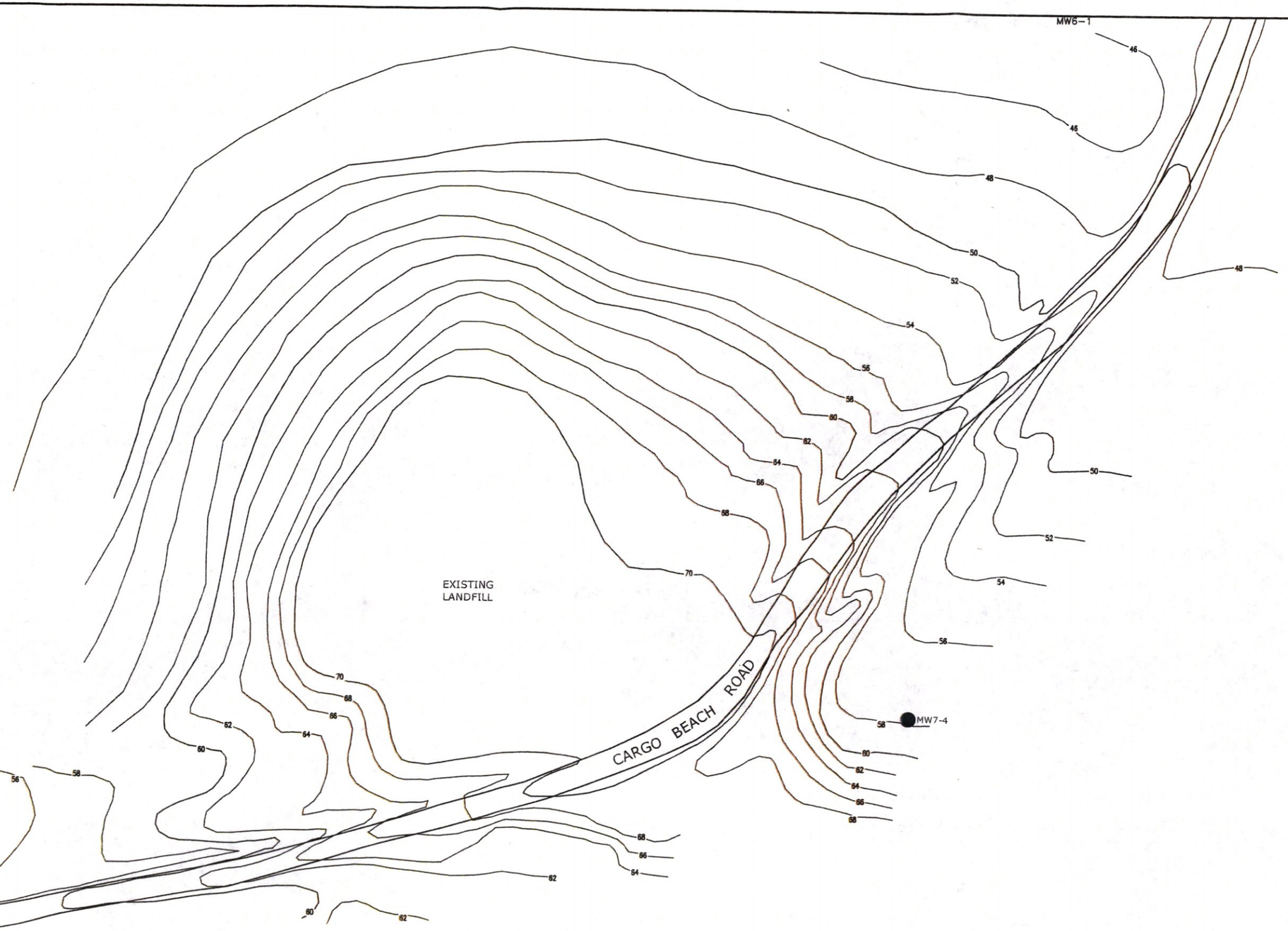

FIGURE 4
NORTHEAST CAPE, ST. LAWRENCE ISLAND, ALASKA
IN-SITE CHEMICAL OXIDATION AND INTRUSIVE
DRUM REMOVAL/LANDFILL CAP
SITE 7 WORK AREA

Bristol
ENVIRONMENTAL REMEDIATION SERVICES, LLC
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CONTRACT NO: W911KB-09-C-0013

DATUM: NA
PROJECTION: NA
PROJECT NO. 49028

DATE 05/07/09
DWN. MTG
SCALE SHOWN
APPRVD. MW

Drawing: O:\JOBS\49028 NECAPE LANDFILL\ACAD-ENVIRO\WP\DWG\49028_FIG4_WP_MAY09.DWG - Layout: 49028_FIG4_WP_MAY09
User: MGARCIA May 13, 2009 - 8:52am Xrefs: - Images: NE1.JPG

N

0 30 60

Scale: FEET

SITE 27

SITE 13

PHASE 1 ISCO AREA OF INTEREST

24" DIA CMP

CTP 13-2

UTILIDOR "HYDRANT #2"

MW27-1

FORMER WOODEN SHED

MW13-1

MW13-2

HYDRANT #2

FORMER BUILDING 110 POWER PLANT

Concrete Slab

FORMER ENGINES/GENERATORS

FORMER BLDG 108 AUTO STORAGE

MW10-2

MW11-2

MW10-1

MH#5

FORMER BOILERS

UTILIDOR "POWER PLANT"

CTP 13-1

CTP 13-3

FORMER BLDG 107

FORMER BLDG. 107 (SOUTH PORTION REMOVED)

MW15-1

MW19-1

MH#3 MH#4

MH#2

UTILIDOR "VEHICLE STORAGE"

MH#6

UTILIDOR #1 (MH#1 TO MH#5)

FORMER BLDG 109 AUTO MAINTENANCE

UTILIDOR "HYDRANT #3"

HYDRANT #3

UTILIDOR #2 (MH#5 TO MH#7)

PERIMETER ROAD

CARGO BEACH ROAD

UTILIDOR "GARAGE"

MW19-2

FORMER BLDG 103 (ONLY CONCRETE FLOOR SLAB REMAINS)

FORMER BLDG 105

WALKWAY

MH#9

FORMER T-130

MH#11

MH#8

MH#7

UTILIDOR "OPERATIONS BUILDING"

FORMER BLDG 102

UTILIDOR "BACHELOR OFFICERS QUARTERS"

SOURCE:
U.S. ARMY ENGINEER DISTRICT, CORP OF ENGINEERS ANCHORAGE, ALASKA
NORTHEAST CAPE, ST. LAWRENCE ISLAND, ALASKA
WHITE ALICE SITE REMOVAL ACTION DEMOLITION, SITE LOCATION MAP
REFERENCE NUMBER: D-1 SHEET 1 OF 8
RFP# DACA85-02-R-0004
DRAWING #: 16-13-52
DATE: 06-5-2001

FIGURE 5
NORTHEAST CAPE, ST. LAWRENCE ISLAND, ALASKA
IN-SITE CHEMICAL OXIDATION AND INTRUSIVE
DRUM REMOVAL/LANDFILL CAP
PHASE 1 ISCO AREA OF INTEREST

Bristol
ENVIRONMENTAL REMEDIATION SERVICES, LLC
Phone (907) 563-0013 Fax (907) 563-6713
CONTRACT NO: W911KB-09-C-0013

DATUM:	NA
PROJECTION:	NA
PROJECT NO.	49028
DATE	05/07/09
DWN.	MTG
SCALE	SHOWN
APPRVD.	MW

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LEGEND

GEOPHYSICAL ANOMALIES (2007)

EXISTING LANDFILL

CARGO BEACH ROAD

MW7-4

N

0 50 100

Scale: FEET

FIGURE 6
NORTHEAST CAPE, ST. LAWRENCE ISLAND, ALASKA
IN-SITE CHEMICAL OXIDATION AND INTRUSIVE
DRUM REMOVAL/LANDFILL CAP
MAGNETIC ANOMALY AREAS OF INTEREST

Bristol
ENVIRONMENTAL REMEDIATION SERVICES, LLC
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CONTRACT NO: W911KB-09-C-0013

DATUM: NA
PROJECTION: NA
PROJECT NO. 49028

DATE 05/07/09
DWN. MTG
SCALE SHOWN
APPRVD. MW

U.S. Army Corps of Engineers, Alaska District

- **BERS CEO** — Steve Johnson
- **Project Manager** — Molly Welker
- **Safety & Health Manager** — Clark Roberts, C.I.H., C.S.P.
- **Site Superintendent/SSHO** — Chuck Croley
- **CQCSM** — Russell James
- **Regulatory Compliance Manager/T&D Coordinator** — Tyler Ellingboe
- **Craft Labor Crews**
- **ISCO Subcontractors** — AECOM
- **Other Subcontractors** — Camp, Air Support, Barge
- **Project Chemist** — Julie Sharp-Dahl
- **Environmental Sampler** — Eric Barnhill
- **Waste Disposal Subcontractors**
- **Analytical Laboratory**

Direct Reporting

Lines of Communication

CEO: Chief Executive Officer
CQCSM: Contractor Quality Control System Manager
ISCO: In-situ Chemical Oxidation
SSHO: Site Safety & Health Officer
T&D: Transportation & Disposal

FIGURE 7
NORTHEAST CAPE, ST. LAWRENCE ISLAND, ALASKA
IN-SITE CHEMICAL OXIDATION AND INTRUSIVE
DRUM REMOVAL/LANDFILL CAP
CONTRACTOR QUALITY CONTROL ORGANIZATION

Bristol
ENVIRONMENTAL REMEDIATION SERVICES, LLC
Phone (907) 563-0013 Fax (907) 563-6713
CONTRACT NO: W911KB-09-C-0013

DATUM: NA
PROJECTION: NA
PROJECT NO. 49028

DATE 05/12/09
DWN. MTG
SCALE SHOWN
APPRVD. MW

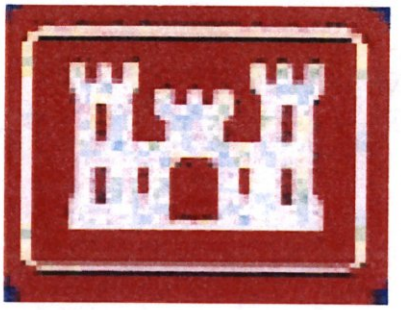
APPENDIX A

In-Situ Chemical Oxidation Work Plan
FUDS No. F10AK096903_07.04_0500_a

Final Work Plan

IN SITU CHEMICAL OXIDATION PILOT STUDY: MAIN OPERATIONS COMPLEX AREA

Northeast Cape



St. Lawrence Island, Alaska

July 2009

AECOM

Final Work Plan

IN SITU CHEMICAL OXIDATION
PILOT STUDY
MAIN OPERATIONS COMPLEX AREA

Northeast Cape, St. Lawrence, Alaska

Prepared for:
U.S. Army Corps of Engineers Alaska District
P.O. Box 6898
Elmendorf AFB Alaska 99506-6898
Project #F10AK0969-03

Prepared by:
AECOM Technical Services, Inc.
Anchorage, Alaska

July 2009

AECOM

CONTENTS

TABLE

ACRONYMS AND ABBREVIATIONS

ADEC	Alaska Department of Environmental Conservation
ATS	AECOM Technical Services, Inc.
COC	chemical of concern
DO	dissolved oxygen
DRO	diesel range organics
FeEDTA	ferric ethylenediaminetetraacetic acid
GRO	gasoline range organics
ISCO	in situ chemical oxidation
MOC	Main Operations Complex
ORP	oxidation-reduction potential
OVA	organic vapor analyzer
pH	hydrogen ion concentration
PVC	polyvinyl chlorides
RRO	residual range organics
TPH	total petroleum hydrocarbons
U.S.	United Stated
UIC	underground injection control
USACE	U.S. Army Corps of Engineers
WP	work plan

1.0 INTRODUCTION

This work plan (WP) is intended to outline the design and operational parameters for an in situ chemical oxidation (ISCO) pilot study to be conducted at the Northeast Cape Main Operations Complex Area (site) located on St. Lawrence Island, Alaska. This pilot study is intended to evaluate the potential for ISCO to treat site specific contaminants of concern within soil and groundwater media at the site and to determine site specific operational and design parameters necessary for the scale up of an ISCO based remedy at the site.

This work plan describes:

- The objectives of the pilot study;
- The conceptual approach to evaluating ISCO at the site;
- The methods used to develop an ISCO pilot study at the site based on the available site hydraulic and chemical data, and
- The procedures that will be used for implementing and monitoring an ISCO pilot study at the site.

1.1 DOCUMENT ORGANIZATION

This work plan is organized as follows:

- Section 1.0 presents the introduction, project background information, and objectives of the pilot study;
- Section 2.0 presents the technical background for chemical oxidation;
- Section 3.0 presents the pilot study design, installation, execution, and monitoring approach for the pilot study
- Section 4.0 describes the reporting process, and
- Section 5.0 presents an overview of the pilot study schedule

1.2 SITE BACKGROUND

1.2.1 Location

The Northeast Cape site is located on St. Lawrence Island, in the Bering Sea, near the territorial waters of Russia, approximately 135 air-miles southwest of Nome. The village of Savoonga is the closest community and is located 60 miles northwest of the site. The Northeast Cape site, at 63°10' North, 168°58' West, is 9 miles west of the northeastern cape of St. Lawrence Island. The Northeast Cape site originally encompassed 4,800 acres. The site is bounded by Kitnagak Bay to the northeast, Kangighsak Point to the northwest, and the Kinipaghulghat Mountains to the south. Figure 1 provides a map showing the site's general vicinity. Figure 2 provides an overview of the site location on St. Lawrence Island.

1.2.2 Main Operations Complex

The majority of the site infrastructure lies within the Main Operations Complex (MOC) at the Northeast Cape installation, and includes the former heat and power building, fuel storage tanks, maintenance, and housing quarters. A map of the Northeast Cape work area is provided as Figure 3.

Within the MOC area, individual sites were grouped together to evaluate an overall response action for the known contamination. These sites are located on the northeast portion of the main complex gravel pad and include Sites 10, 11, 13, 15, 19, and 27. The locations of the various sites are illustrated on Figure 4.

The United States (U.S.) Army Corps of Engineers (USACE) issued the Draft Decision Document for Northeast Cape, Formerly Used Defense Site in January 2009. The selected remedy for soil and groundwater at the MOC is chemical oxidation.

1.2.3 Soils

The primary contaminants of concern in soil at the MOC are total petroleum hydrocarbons (TPH) as diesel range organics (DRO). Surface and subsurface soils are contaminated with petroleum fuels as gasoline range organics (GRO), naphthalene, and benzene at depths up to 16 feet below ground surface. The fuel contamination is assumed to have created a smear zone along the shallow groundwater interface. Although, review of data made available indicates a release of diesel fuel from one of the 400,000-gallon storage tanks (Site 11) occurred in the past, there was no data indicating the presence of non-aqueous phase liquid in the MOC area, based on available data.

Soils are of highly variable lithology, but generally of a coarse characteristic, and include silty sandy gravel, sands, and cobbles.

1.2.4 Groundwater

Shallow groundwater is contaminated throughout the northeast portion of the site. The primary contaminants of concern in groundwater are TPH-DRO, TPH-GRO, TPH as residual range organics (RRO), and benzene. Lead is also elevated at various locations but is not a remediation objective of this WP. Based on review of the Phase IV Remedial Investigation Report (Shannon and Wilson 2005), the depth to groundwater across the northeast portion of the MOC varies and has been observed at depths of 7.5 feet up to depths as great as 20.5 feet.

1.2.5 Phase I In Situ Chemical Oxidation Remediation Goals

Contaminants of concern and their associated remediation goals for the ISCO Pilot Study are summarized below in Table 1 (USACE 2009).

Table 1: In-Situ Chemical Oxidation Remediation Goals

Contaminant of Concern	Soil Cleanup Level (mg/kg)	Groundwater Cleanup Level (mg/L)
TPH-DRO	9,200	1.5
TPH-GRO	N/A	1.3
TPH-RRO	N/A	1.1
Naphthalene	120	N/A
Benzene	2	.005

Notes:
mg/kg milligrams per kilogram
mg/L milligrams per liter
N/A Not Applicable
Source: USACE, Final Scope of Work FY09, Main Operations Complex Area, 2009

1.3 OBJECTIVES

The primary objectives of the Phase I ISCO pilot study are to evaluate the feasibility of ISCO technology for application in an isolated location and to evaluate the ability of ISCO to achieve remediation goals for all contaminants of concern and corresponding media of concern.

Secondary objectives of the pilot study are to:

- Determine the field soil oxidant demand;

- Collect site-specific data to establish a rate of injection for the oxidant solutions;
- Assess lateral and vertical distribution of oxidant;
- Use distribution data to evaluate the appropriate lateral and vertical spacing for injection points during full-scale ISCO remediation;
- Determine the volume and concentration of oxidant to be injected during full-scale ISCO remediation;
- Collect time-series data post-injection to evaluate COC transport and propagation of an oxidant front, useful for full scale remediation and monitoring design; and
- Evaluate rebound of chemical concentrations following one round of oxidant injections.

2.0 CHEMICAL OXIDATION TECHNICAL APPROACH

In situ chemical oxidation is a remedial technology that uses invasive techniques to provide contact between chemical oxidants and the targeted contaminants. Effective contact between oxidant and contaminant results in the rapid chemical conversion of the contaminant into innocuous compounds. Commonly used oxidants for treatment of chemicals of concern (COCs) such as those found at the site include hydrogen peroxide, permanganate (sodium or potassium), sodium persulfate, and ozone.

Selection of an appropriate chemical oxidant for in situ treatment relies on a detailed site characterization and oxidant selection screening based on geology, hydrogeology, and organic contaminants. The successful application of a particular chemical oxidant requires the oxidant come into direct contact with the contaminant and in some cases, also includes the effective buffering of the chemical reaction to allow the reaction to occur at an appropriate rate.

AECOM Technical Services (ATS) considered the use of permanganate, however this oxidant has not been demonstrated to be effective on benzene and saturated aliphatics, and was eliminated from consideration. Ozone was also considered because of its oxidizing capacity. However, this oxidant has a lower relative efficiency as compared to catalyzed hydrogen peroxide or activated sodium persulfate. The efficiency limitation derives from ozone's short half-life and its non-selective oxidation of naturally occurring organic matter, and was, therefore removed from current consideration.

2.1 CATALYZED HYDROGEN PEROXIDE

Catalyzed hydrogen peroxide is an advanced oxidation process by which hydrogen peroxide reactions produce highly reactive radical species. These radicals subsequently serve as the active oxidants. Hydrogen peroxide is typically catalyzed by exposure to a divalent metal, e.g. ferrous iron (Fe^{+2}). The reaction of Fe^{+2} with hydrogen peroxide produces a highly reactive hydroxyl radical (OH) which is the strongest oxidant used for ISCO. Only fluorine, which is not used because of its hazardous properties, is a stronger chemical oxidant. The driving force as an oxidant is illustrated by the thermodynamic standard electrode potential for the hydroxide as show in the half-reaction below.

$$2 \cdot OH + 2H^+ + 2e^- \rightarrow 2H_2O \qquad E°=+2.8V$$

In addition to hydroxyl radical production, hydrogen peroxide and catalyzed hydrogen peroxide can also result in the formation of a number of other reactive species capable of degrading common organic contaminant species. Half reactions for some of these additional reactive species are shown below.

$$H_2O_2 + 2H^+ + 2e^- \rightarrow 2H_2O \qquad E°=+1.8V$$

$$\cdot HO_2 + 2H^+ + 2e^- \rightarrow 2H_2O \qquad E°=+1.7V$$

$$O_2^- + 4H^+ + 3e^- \rightarrow 2H_2O \qquad E°=-2.4V$$

$$HO_2^- + H_2O + 2e^- \rightarrow 3OH^- \qquad E°= -0.88V$$

Advantages offered by application of catalyzed hydrogen peroxide include the very rapid generation of highly reactive, non specific hydroxyl radicals and intermediate reactive species as described above. Reactions involving hydrogen peroxide are very exothermic and as such rapid decomposition of hydrogen peroxide can be accompanied by a significant amount of heat and gas (oxygen)

evolution. The half reaction shown below shows the highly exothermic nature of hydrogen peroxide dissociation and the potential for oxygen gas generation.

$$H_2O_2 \rightarrow \frac{1}{2} O_2(g) + H_2O \qquad \Delta H = -23.4 \text{ kcal/mol}$$

Heat generated as a result of dissociation, when properly controlled, can enhance contaminant mass transfer into the dissolved phase, and thereby further reducing the potential for rebound. Additionally, the oxygen generated during dissociation can help to increase natural attenuation of residual contamination by enhancing aerobic biological processes.

Disadvantages associated with application of catalyzed hydrogen peroxide include challenges associated with effective transport of the oxidant based on its short half life and the potential for excessive heat and gas generation if improperly applied. A short half life limits the amount of time for the oxidant to contact and react with contaminants, potentially limiting its effectiveness.

2.2 SODIUM PERSULFATE

Activated sodium persulfate is another advanced oxidation process by which the persulfate ion ($S_2O_8^{-2}$) and sulfate radical (SO_4^{-}) serve as strong oxidants capable of oxidizing most organic compounds to carbon dioxide. The standard reduction potentials for the persulfate ion and sulfate radical half reactions (shown below) are +2.1 V and +2.6 V, respectively.

$$S_2O_8^{-2} + 2\,e^- \rightarrow 2\,SO_4^- \qquad E^\circ = +2.1V$$

$$\cdot SO_4^- + 2e^- \rightarrow SO_4^{-2} \qquad E^\circ = +2.6V$$

There is not a direct stoichiometric balance for radical chemistry when using sodium persulfate. The chemistry, therefore, differs significantly from that of oxidants such as permanganates, which have stoichiometric ratios of permanganate to contaminant, which are calculable. The persulfate free radical chemistry is functionally related to Fenton's chemistry. However, as opposed to the hydrogen peroxide and iron reaction, persulfate reactions are considerably more stable, and the heat generated by the exothermic reaction is well regulated by the heat capacity of the groundwater. Advantages offered by persulfate include its relative stability (which allows for increased contact time and higher destruction efficiency) and the ability to generate multiple radical species capable of contaminant destruction when properly catalyzed.

The reagent is very soluble in water to concentrations above 10 percent and very stable. These properties allow for optimum delivery and distribution to the subsurface matrix similar to sodium permanganate. In addition, the reagent is similar to sodium permanganate with respect to safety issues (i.e., handling, compatibility, etc.).

2.3 COMBINED HYDROGEN PEROXIDE AND ACTIVATED PERSULFATE

Unique challenges posed at the site include the extremely low groundwater temperatures (4–6 degrees Celsius typical), and the abbreviated field work season dictated by the site's climate. These challenges create the need for an ISCO application capable of generating sufficient heat to overcome chemical solubility and reaction kinetics limitations posed by site groundwater temperatures. Engineering control of favorable reaction temperatures is critical to the generation of highly reactive species capable of rapid contaminant degradation, necessary to accomplish the task goals of applying and evaluating ISCO processes within a single field season. To overcome these challenges, ATS has selected the application of hydrogen peroxide in conjunction with iron activated sodium persulfate. The selected combination of oxidants and activators will allow for a synergistic approach that takes advantage of the strengths and treatment potential offered by both oxidants while overcoming some of the challenges presented by site conditions.

The application of iron catalyzed hydrogen peroxide offers several benefits to the treatment process in addition to the production of highly reactive radicals. The heat generated through decomposition of the hydrogen peroxide offers multiple benefits to the overall treatment strategy:

- Increased groundwater temperatures result in the dissolution of sorbed phase contaminant mass making it available for oxidative destruction by reactive radical species;
- The thermal energy supplied by the decomposition of hydrogen peroxide and the associated rise in groundwater temperature will help to maintain the solubility of both iron and persulfate reagents, and will improve the reaction kinetics required for both the hydrogen peroxide and persulfate approach.

The proposed combination of oxidants offers the advantage of multiple potential modes of sodium persulfate activation:

- *Iron activation:* Provides catalysis of both hydrogen peroxide and persulfate oxidation mechanisms. In addition to catalysis of hydroxide and sulfate radicals, iron catalysis may aid in the formation of organic radicals and superoxide (reducing) radicals;
- *Heat activation:* Generated through peroxide decomposition, assists in the formation of sulfate radicals from persulfate; and,
- *Hydrogen peroxide activation:* Hydroxyl radical (derived from hydrogen peroxide) catalysis of sulfate radicals, and the synergistic sulfate radical formation of more peroxide radicals.

The addition of the sodium persulfate component to the ISCO approach may provide a more stable and long lived oxidant, which may extend the treatment duration associated with a single ISCO application event and allow for improved oxidation efficiency.

3.0 CHEMICAL OXIDATION PILOT STUDY ACTIVITIES

A prerequisite for ISCO pilot study design is the formulation of a robust conceptual site model. Therefore, ATS will attempt to collect supplemental data in order to construct a conceptual site model for the pilot study area. This data will include water levels to confirm regional groundwater flow direction, slug testing at select monitoring wells to evaluate conductivity/permeability, and test pitting to aid in pilot study site selection and oxidant demand sample collection.

Chemical oxidation pilot testing activities will include the following work components:

- Hydrogeological evaluation
- test pit based site characterization;
- bench scale soil oxidant demand testing;
- bench scale treatability testing;
- pilot study design and construction;
- chemical oxidant injection; and,
- performance monitoring.

Each of these components is discussed in greater detail in the sections that follow.

3.1 HYDROGEOLOGICAL EVALUATION

In order to evaluate hydrogeological conditions at the site, existing monitoring wells at the MOC (including MW88-1, MW88-3, MW88-4, MW88-5, MW88-10, 16MW1, 16MW2, 16MW3, 18MW1, 17MW1, 22MW2, 22MW3, 20MW1, and 26MW1) will be opened and groundwater allowed to equilibrate prior to gauging depth to water in each monitoring well. A groundwater elevation contour map will be generated in the field in order to evaluate regional groundwater flow direction and gradient. Slug tests will be conducted in a sub set of the existing monitoring wells (including MW88-4, MW88-5, and MW88-1) in order to evaluate conductivity and permeability. Distance to adjacent and near-by water bodies will be estimated using a measuring wheel / or GPS unit.

3.2 TEST PIT SITE CHARACTERIZATION

To rapidly evaluate the lithology and characterize soil conditions, ATS proposes to conduct test pit excavations at the pilot study site. Test pitting was selected based on the ability to collect detailed site lithologic data during excavation and the impracticality of using another rapid assessment method, such as direct push soil sampling, in the soils at this site. Descriptive soil characteristic information will provide valuable data regarding small and large scale variations of lithology at the site. In addition, direct observations can be made regarding the contaminant distribution (i.e., stained soils).

To confirm the presence of contamination in the potential study area (see Figure 4 - northeast portion of the MOC), an assessment grid will be established in the field, and up to 12 test pits are proposed to evaluate lithologic and pre-ISCO soil contaminant conditions. An excavator or back hoe will be used to dig each test pit to a depth of ten feet below land surface or to the water table, which ever is encountered first. Soil excavated from the test pits will be visually evaluated, photographed, logged, and screened with an organic vapor analyzer (OVA).

Soil samples will be collected to characterize soil contamination at locations where OVA readings suggest the presence of petroleum impacts. Selected soil samples will undergo field screening analysis for TPH-DRO and -GRO using a Site Lab field test kit (Appendix C). Samples will be collected from the excavator bucket based on visual observations and OVA screening results.

The dimensions of each test pit will be determined in the field based on visual observations and field screening. Each test pit will be logged on a separate form as it is excavated, including types and relative percentages of materials encountered, and depth to the water table (if encountered). Each pit will be uniquely numbered on a base map. The sidewalls of each test pit will be photographed.

The test pits will be backfilled with excavated material in reverse order of excavation following completion of the test pitting activities. Test Pit and soil sampling locations will be surveyed relative to a local landmark. The test pit results will be used to generate a base map indicating site lithologic conditions and baseline soil quality (OVA data and field screening results).

The results of the proposed test pitting and soil sampling activities will be summarized in the pilot study report. The information will include: test pitting protocols, test pit observations and screening data in a table, representative photographs, and tabulated test pit sampling results with a comparison to applicable regulatory standards.

3.3 BENCH SCALE TOTAL OXIDANT DEMAND TESTING

Prior to performing oxidant injections at the site bench scale testing to evaluate the natural oxidant demand of site soils will be conducted. This testing will be conducted on site using site soil and groundwater media obtained during the test pit characterization efforts described above. Details regarding oxidant demand testing procedures are provided in Appendix A.

3.4 BENCH SCALE TREATABILITY TESTING

In addition to the total oxidant demand testing discussed above, a bench scale treatability test will also be conducted. A treatability study would normally be conducted prior to the formulation of a field study work plan; however, project schedules and limitations (frozen ground vs. manual sampling vs. cost) on the ability to collect representative samples prior to the summer field season commit this phase to be performed while ISCO related site characterization and baseline sampling are underway. The objective of the bench scale treatability study is to supplement the in situ approach by varying oxidant dosages and examining catalyzed hydrogen peroxide, iron activated persulfate, and hydrogen peroxide activated sodium persulfate as independent treatability scenarios. Evaluation of oxidant effectiveness and oxidant efficiencies in the bench typically help refine the design of the pilot study work plan. In this situation, the results will be available to help explain observations of in situ chemical oxidation pilot study behavior, and refine the development of the next phase of ISCO work.

The bench scale treatability test will be conducted at an off-site laboratory and completed in parallel with field testing. This testing will be conducted using site soil and groundwater media obtained during the test pit characterization efforts described above. Bulk samples of soil will be collected in plastic bag lined 5-gallon pails and bulk groundwater samples will be collected in bulk collapsible containers. Soil and groundwater samples will be packed in coolers with ice packs and shipped to ATS' treatability lab facility in Orlando, Florida. Details regarding laboratory treatability testing procedures are also provided in Appendix A.

3.5 PILOT STUDY DESIGN AND CONSTRUCTION

The pilot study will be implemented at a single location where elevated concentrations of COCs were detected during previous investigation activities. The study will be constructed in the portion of the MOC Area adjacent to Site 13, Site 27, and Perimeter Road, pending site reconnaissance and assessment screening results. Figure 4 shows the area where the pilot study will be conducted. The detailed well layout for the pilot study will include an adjacent pair of injection wells and up to seven monitoring wells. The monitoring well locations are distributed throughout the expected area of influence and the anticipated flow path of the injected reagent. The field pilot study has been designed to allow for the evaluation of system performance and critical design and operational parameters including achievable radius of influence, oxidant consumption, and contaminant removal.

These parameters will be evaluated using monitoring wells located at varying radial distances from the point of injection. Strategic placement of injection and monitoring wells will facilitate a better understanding of the effects of oxidant injection on the subsurface contamination. Figure 5 shows the proposed injection and monitoring well layout for the pilot study.

3.5.1 Injection Wells

The injection wells will be installed using standard hollow stem auger drilling techniques. Injection wells will be installed as a vertical pair with the shallow well screened from approximately 1 foot above the groundwater table to 4 feet below the groundwater table and the deeper well screened from approximately 4 to 9 feet below the groundwater table. Injection wells will be completed with 5 feet of 2-inch diameter stainless steel wire wrapped screen, 2-inch diameter stainless steel well casing, and will be grouted in place with neat cement. One to two-feet of finer-grained seal sand will be placed over the well filter pack to mitigate the penetration of neat cement into the well filter pack. Neat cement will be tremmied into place above the fine sand seal to ground surface for wellhead completion. The injection wells will be completed as flush mounts The identity of the well will be permanently marked on the well cap. Figure 6 presents the proposed well construction information for injections wells in the pilot study area.

3.5.2 Monitoring Wells

The monitoring well network for the pilot study was designed in a manner that allows for both qualitative and quantitative evaluation of the study objectives at monitoring points of varying radial distances from the injection point. These radial and down gradient monitoring locations will be used to assess the extent of degradation and the rate of oxidant consumption at various time intervals and radial distances from the injection wells.

Monitoring wells will be installed using standard hollow stem auger drilling techniques. Monitoring wells for the pilot study will be screened from approximately one foot above to 9 feet below the groundwater surface interface. All monitoring wells will be completed with 10 feet of 2-inch diameter polyvinyl chloride (PVC) vee-wire screens, 2-inch diameter PVC well casing, and will be grouted with neat cement or cement bentonite grout. One foot of finer-grained sand will be placed over the well filter pack to mitigate the penetration of fines from the into the well filter pack. Neat cement will be tremmied into placed above the sand to ground surface for wellhead completion. Monitoring wells will be completed as flush mounts. The identity of the well will be permanently marked on the well cap. Figure 7 presents the proposed well construction and completion information for monitoring wells in the pilot study area.

3.5.3 Well Development

Well development will be conducted no sooner than 48 hours after and no longer than 7 days beyond completion of the monitoring and injection wells. Monitoring wells and Injections wells will be developed by a combination of surging, bailing, and over pumping or sustained pumping. The following information will be recorded during well development:

- Well Designation
- Date of well installation
- Date of development
- Static water level before and after development
- Quantity of standing water in well and annulus prior to development
- Specific conductivity, temperature, and ph measurements taken and recorded at the start of development, at least twice during, and the conclusion of development
- Groundwater quality instrument calibration information

- Depth from top of well casing to bottom of well
- Screen length
- Depth from top of well casing to top of sediment inside well, before, and after development
- Physical character of removed water, including changes during development in clarity, color, particulates, and odor
- Type and size/capacity of pump and or bailer used
- Height of well casing above ground surface
- Quantity of water removed and removal time

During this process groundwater quality parameters will be recorded. All investigation derived wastes (IDW) including soil cuttings and development fluids will be containerized and/or treated on-site at the Hazardous Waste Accumulation Point (HWAP) in accordance with the Waste Management Plan.

3.6 OXIDANT INJECTIONS

3.6.1 Permits

The USACE will obtain the necessary Right-of-Entry for access to the property. An underground injection control (UIC) permit is not required to conduct ISCO at this site. However, the principles and procedures described in this work plan will be reviewed by the UIC division of the U.S. Environmental Protection Agency for acceptance prior to performing the injections described below.

3.6.2 Injectate Solution Composition and Volume

For the ISCO pilot study hydrogen peroxide, sodium persulfate, and iron activation chemical (FeEDTA [ferric ethylenediaminetetraacetic acid]) solutions will be prepared by mixing the individual oxidants and activator with water obtained from natural springs or flowing streams located in the region of the site. These natural water sources may exhibit oxidant demand; however the expectation is that the organic load, and thus the oxidant demand by non-target organics, will be low.

Individual solutions of hydrogen peroxide, sodium persulfate, and iron activator will be prepared for injection in a sequential pulse fashion, where a small batch pulse of hydrogen peroxide solution will be injected followed by a similar pulse of sodium persulfate and iron activator solution. Injection volumes of up to 2,644 gallons of oxidant/activator solution will be applied in each injection well. The final concentration of hydrogen peroxide in the injectate solution will be determined based on site monitoring during injection but will not exceed 17.5 percent, and therefore, the resulting maximum mass of hydrogen peroxide to be injected is approximately 1,150 pounds. Concentration of sodium persulfate in the injectate solution will be determined based on oxidant demand testing conducted prior to the pilot study. Sodium persulfate concentrations in the injectate will not exceed 20%, therefore the resulting maximum mass of sodium persulfate to be injected is approximately 5,807 pounds. Similarly the maximum solution strength of FeEDTA to be applied will not exceed 4,250 parts per million (ppm); therefore, the resulting maximum mass of FeEDTA to be applied is 529 pounds.

3.6.3 Injection Equipment and Process

The pilot study will employ a temporary injection setup. Mixing tanks, transfer pumps, piping and instrumentation will be provided and removed from the site upon completion of the pilot study. Injectate solution mixing and injection will be accomplished using a network of transfer piping/hoses in line with centrifugal style injection pumps, flow meters, flow totalizers, flow control valves and pressure relief circuits. Figure 8 provides a process flow diagram for the injection system to be employed for chemical injections. A portable diesel powered generator will be used to supply power to the injection equipment. Qualified personnel will be used to install the injection setup and conduct

the injection of the chemical oxidants and activator. In general the injection process for the pilot study involves the mixing of reagents with water obtained from site surface water bodies in small batches. Injections will be performed by pumping the injectate solution into the injection well where it will be forced through the well screen and into the target saturated zone. The coarse soils are generally favorable aquifer characteristics for injections, and it is expected that injection can be accomplished at relatively low pressures.

Oxidant injections will be conducted using an alternating pulse sequence approach where small batches of the individual oxidants (<100 gallons) will be injected in an alternating fashion. ATS initially plans to inject a 10 percent solution of hydrogen peroxide solution. If heat or gas production cannot be controlled, the concentration of hydrogen peroxide injected may be reduced and conversely, ATS may decide to increase the concentration of hydrogen peroxide (up to 17.5 percent) if heat build up can be managed. Hydrogen peroxide solution will be injected followed by sodium persulfate and iron activator. Injections will occur sequentially, starting with the deep injection point.

The following data associated with delivery hydraulics will be collected during the injection process:

- Injection solution flow rate;
- Wellhead injection pressure;
- Temperature, hydrogen ion concentration (pH), specific conductivity of the injection solution;
- Cumulative volume of injection solution delivered to the injection well.

Appendix B contains an example injection log sheet that will be used to record data during injection activities associated with the pilot study. To alleviate the potential for solution short circuiting from the injection zone to the surface, the monitoring wells will be sealed with well plugs at all times during injection activities except during sample collection. Monitoring of the pilot study will be conducted according to the schedules and procedures described in Section 3.7.

3.7 PERFORMANCE MONITORING

The monitoring plan established for the pilot study consists of three discrete sampling periods

- Baseline monitoring;
- Injection performance monitoring, and
- Post-Injection performance monitoring.

Each component of the monitoring plan is described further below.

3.7.1 Baseline Monitoring

Baseline sampling of soil and groundwater media will be conducted prior to the initiation of ISCO injection activities. Results obtained during this sampling will serve as the basis for evaluating the overall efficacy of the treatment process.

Following well installation and development activities and prior to injection activities, baseline samples will be collected from all monitoring wells. The proposed monitoring plan is specific to the objectives of the study and generally includes the following parameters;

- Static water level elevations;
- Field parameters including temperature, pH specific conductivity, oxidation-reduction potential (ORP), and dissolved oxygen (DO);

- Field analysis of residual (i.e. unreacted) persulfate, hydrogen peroxide, and activator (See Appendix C for field kit information), and
- Target COCs.

Baseline soil samples will be collected from the smear zone soils during monitoring well installation. Samples will be collected and analyzed in accordance with the Sampling and Analysis Plan.

3.7.2 Injection Monitoring

Groundwater data from the monitoring wells within the target injection region of influence and immediately down gradient will be collected while solution is being injected. Water levels will be measured periodically during the injection process (minimum of one time per hour) at monitoring wells surrounding the injection well using an electronic water level indicator. Automated pressure data loggers will be used in select wells to increase the frequency of water level data collection during the injection process.

Vertically discrete down-hole water quality field parameters will be monitored during the injection event in all pilot study monitoring wells. Field parameters, specifically, conductivity, ORP, DO, and temperature will be used as a qualitative means to evaluate injection radius of influence during injection activities. Periodically (a minimum of four times daily) throughout the course of the injection monitoring, a down–hole water quality meter will be slowly lowered through the screened interval and data corresponding to a discrete depth (approximately one reading for every two vertical feet of screened interval) recorded to determine if injection solution initially arrived in a stratified manner. Periodic field monitoring of groundwater for injected reagents (using field screening kits) will also be conducted in order to gauge reagent distribution.

3.7.3 Post-Injection Monitoring

After the injection event is complete, monitoring wells within the pilot study area will be tested periodically over the one month study duration. Post injection performance monitoring sampling of groundwater will be conducted on a schedule corresponding to 3, 7, 14, and 28 days following the completion of oxidant injections. Data collected during this phase of monitoring will be utilized to track changes in contaminant concentrations in response to the applied ISCO treatment. In addition to groundwater samples, soil samples will be collected at day 7, and day 28 to evaluate the gross efficacy of the applied ISCO process on soils located with in the pilot study area. Post-injection soil borings will be installed within 3-5 feet of the installed monitoring wells with a goal of avoiding damage to the constructed monitoring well while collecting samples from adjacent soils. A sampling schedule and discussion is presented in the ISCO Sampling Activities Section of the Sampling and Analysis Plan (SAP). Applicable soil and groundwater sample collection procedures are discussed in Section 3.1 of the SAP.

4.0 REPORTING

Following the performance monitoring events and laboratory analysis, the ground water and soil monitoring data collected during the pilot study will be analyzed as a function of time and distance from the injection location. This information will be used to determine the overall efficacy of the applied treatment and to determine the lateral influence of the injections. The Pilot Study Report will contain at a minimum the following information:

- Introduction and project overview
- Bench scale study results
- Treatment activities and key field observations
- Deviations from the approved work plan
- Pre-treatment and post treatment contaminant distribution
- Contaminant mass removal data
- Recommendations for Phase II Treatment
- Chemical data tables
- References
- Figures
- Field Logs
- Monitor well boring, construction, and development logs
- Injection well boring, construction, and development logs
- Analytical Data Review and Laboratory Data Review Checklists
- Site photographs
- ADEC Contaminated Site Laboratory Approval Letter

Post treatment monitoring results will be submitted to the USACE in a separate draft technical memorandum that includes a brief introduction, description of sampling efforts, deviations from the Work Plan, chemical data tables, field sampling forms, and associated figures to represent post treatment results. The technical memorandum will be submitted no later than December 31, 2009.

5.0 SCHEDULE

It is anticipated that the injection and monitoring wells for this study will be installed and ready for injections in early August 2009. Field work associated with pilot study activities are anticipated to be occurring during a window of approximately 7 weeks. A report summarizing activities will be submitted within 60 days of field work completion.

The tentative schedule for the scope of work included in this work plan is provided below:

- Draft work plan submittal – May 15, 2009
- Final work plan submittal – June 15, 2009
- Receive approval from ADEC/USACE to install field test wells and conduct in situ injections (i.e., approval for underground injection) – June 29, 2009
- Initiate pot hole characterization and ISCO TOD study – July 8, 2009
- Initiate well installation activities – July 17, 2009
- Complete well installation, well development, and baseline sampling activities – August 4, 2009
- Initiate injection activities – August 6, 2009
- Complete injection activities and initiate post-injection monitoring program – August 10, 2009
- Complete post injection monitoring program – September 10, 2009
- Complete off site ISCO treatability study – September 20, 2009
- Draft ISCO pilot study report submittal – October 13 2009
- Final ISCO pilot study report submittal – November 26 2009
- Technical Memorandum Post Treatment Monitoring Results – by December 31, 2009

6.0 REFERENCES

Shannon & Wilson. 2005. *Phase IV Remedial Investigation Report*.

United States Army Corps of Engineers (USACE). 2009. *Final Scope of Work FY09, Main Operations Complex Area, Northeast Cape, St. Lawrence Island, Alaska*.

FIGURES

Figure 1: General Vicinity

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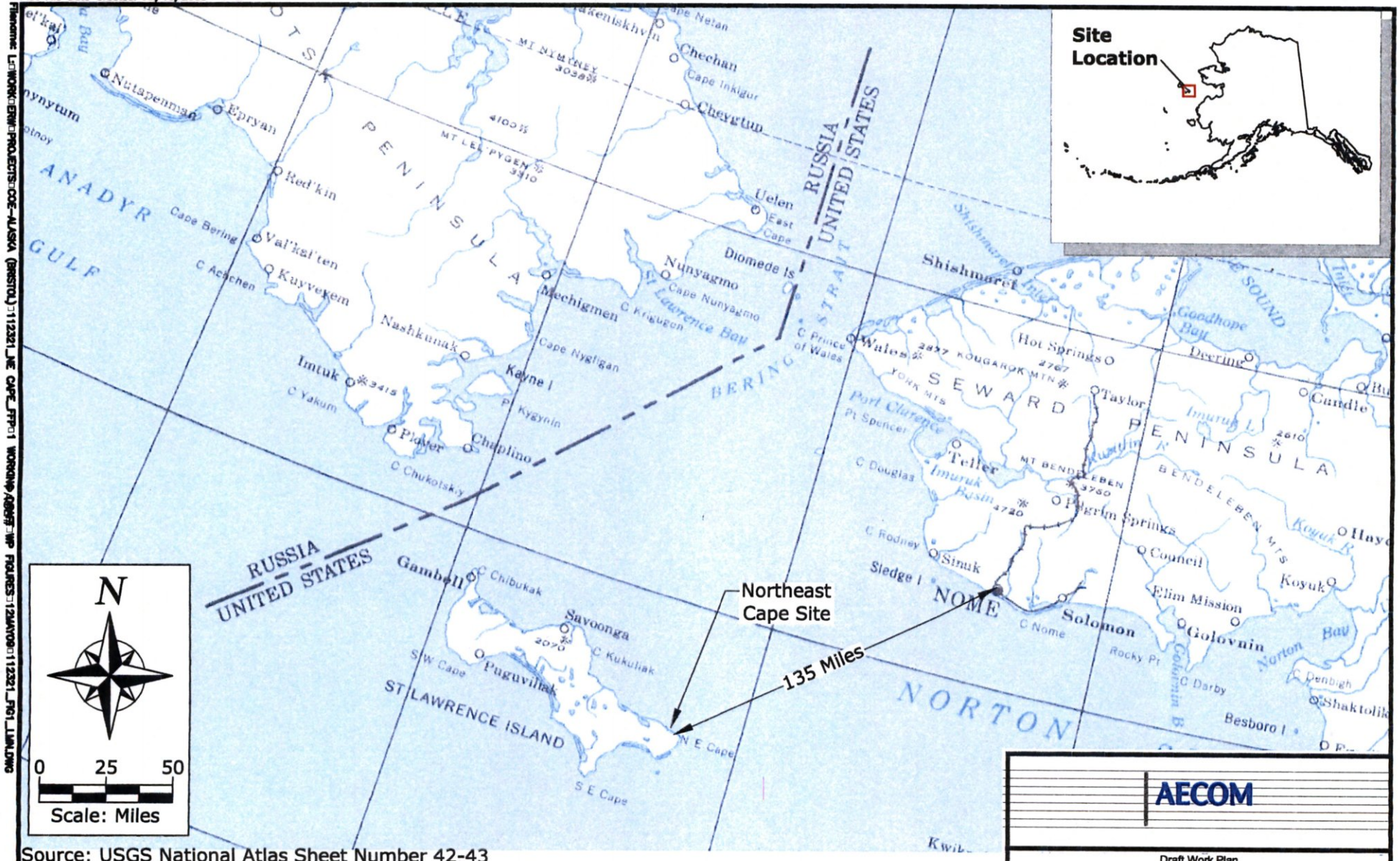

Source: USGS National Atlas Sheet Number 42-43

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Draft Work Plan

Northeast Cape, St. Lawrence Island, Alaska
In-Situ Chemical Oxidation
Pilot Study Vicinity Map

U.S. Army Engineer District, Alaska
P.O. Box 6898, Elmendorf AFB, Alaska 99506-6869

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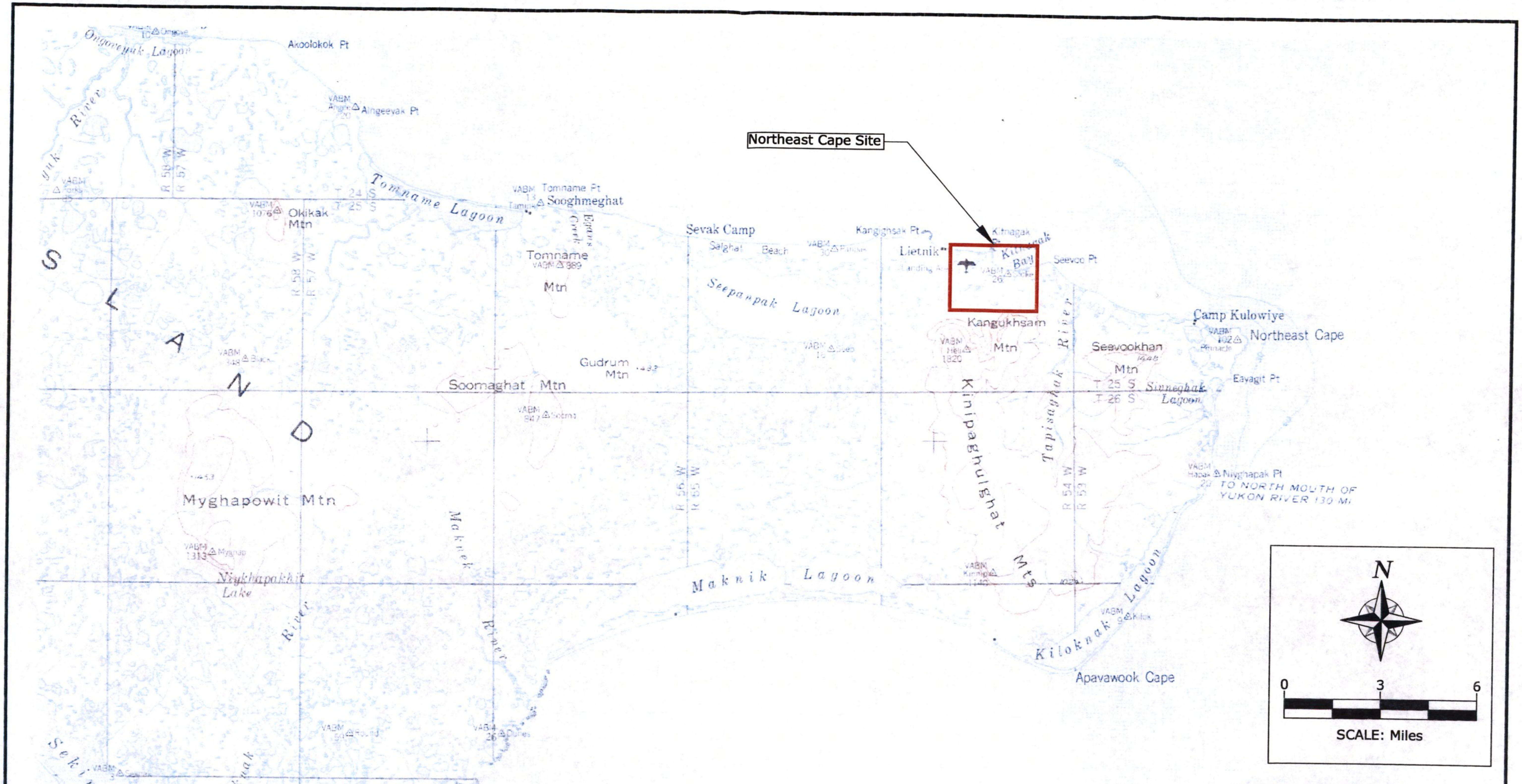

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Draft Work Plan

Northeast Cape, St. Lawrence Island, Alaska
In-Situ Chemical Oxidation
Pilot Study Site Location Map

U.S. Army Engineer District, Alaska
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EASTING (FEET)

KITNAGAK BAY

BARGE LANDING AREA
(CARGO BEACH)

CAMP, MECHANIC SHOP, AND
CONTAINER STORAGE AREA

SITE 7
(CARGO BEACH ROAD LANDFILL)

SURVEY CONTROL POINT BM-B
(ORIGIN OF COORDINATES)
N 100,000
E 100,000
ELEV. 75.97 FT. MSL
(U.S. COAST & GEODETIC SURVEY REFERENCE MARK)

HAZARDOUS WASTE
ACCUMULATION POINT

ISCO/FORMER MAIN
OPERATIONS COMPLEX (MOC)

FUEL STORAGE AREA
CONTAINER STORAGE AREA

BORROW AREA

NORTHING (FEET)

NOTES

1. LOCATIONS SHOWN ARE APPROXIMATE. LOCATIONS ARE NOT BASED ON SITE SURVEY. LOCATIONS ARE BASED ON AERIAL PHOTOGRAPHS AND AVAILABLE DOCUMENTATION. LOCATIONS OF POLE LINES ARE BASED ON ROUGH FIELD OBSERVATION.

2. DRAWING ADAPTED FROM MONTGOMERY WATSON FILE TITLED NECAPE.DWG, DATE 05 JUNE 2001.

3. GRID COORDINATES ARE BASED ON SURVEY CONTROL POINT "BM-B" (ORIGIN OF COORDINATES) LOCATED AT 100,000 NORTH AND 100,000 EAST, U.S. COAST & GEODETIC SURVEY REFERENCE MARK. SEE SHEET D-1.

N

0 1000 2000
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Draft Work Plan
Northeast Cape, St. Lawrence Island, Alaska
In-Situ Chemical Oxidation
Pilot Study Work Area
U.S. Army Engineer District, Alaska
P.O. Box 6898, Elmendorf AFB, Alaska 99506-6898

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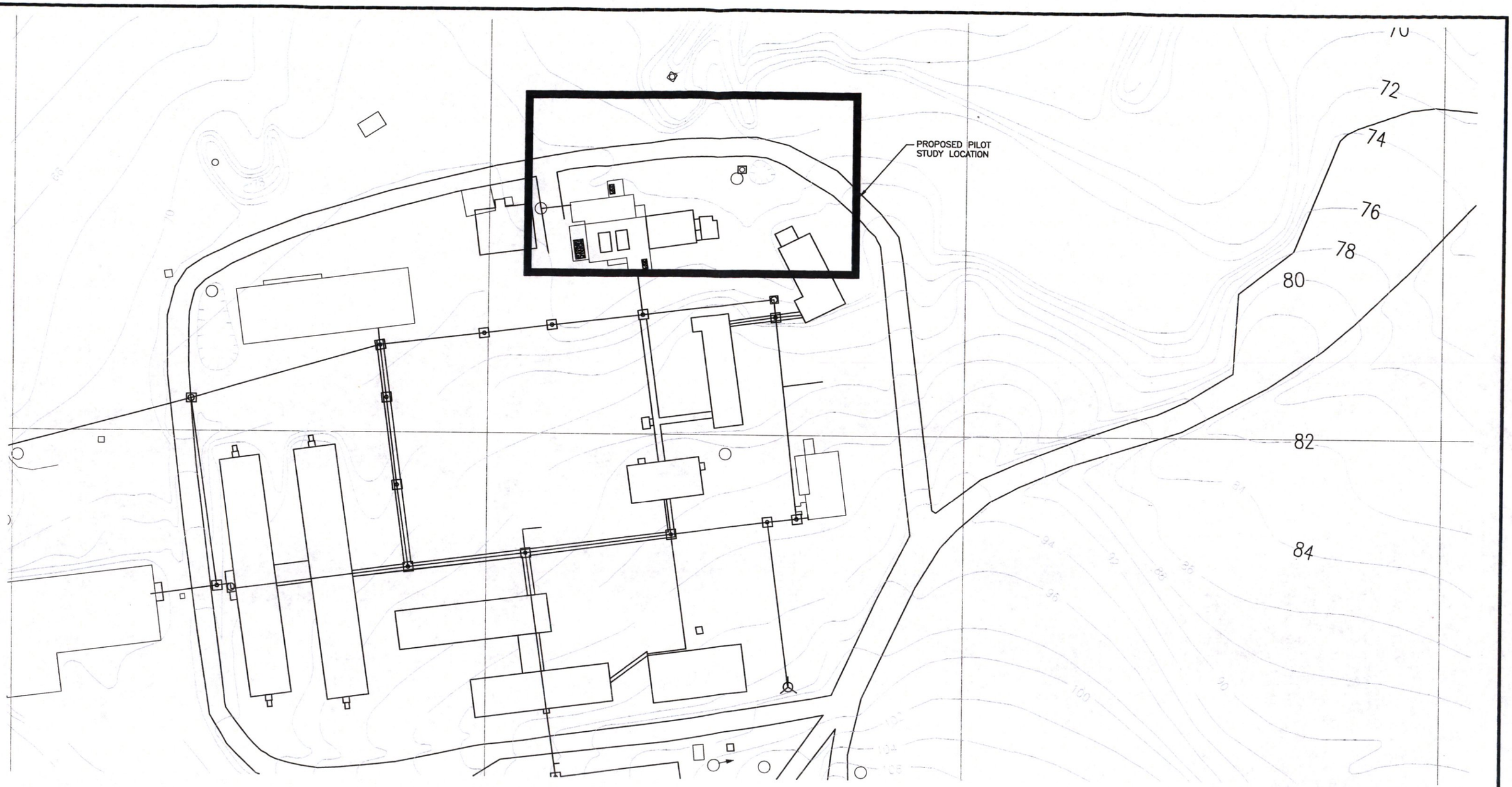

NOTE:

HISTORICAL SAMPLE LOCATIONS CAN BE FOUND ON FIGURE 5-9, SHANNON & WILSON, PHASE IV REMEDIAL INVESTIGATION REPORT.

N

0 100 200

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Draft Work Plan

MOC and Proposed
Pilot Study Location

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

FILE NAME:	DRN	PROJECT NO.	DATE	FIGURE NO.
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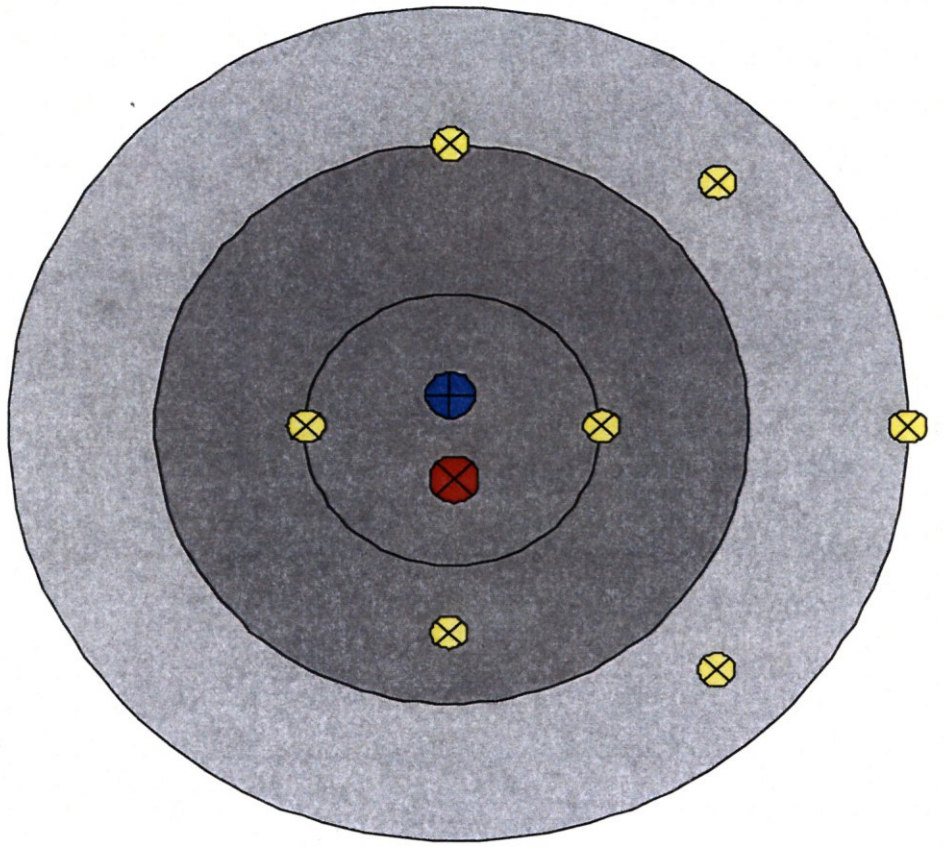

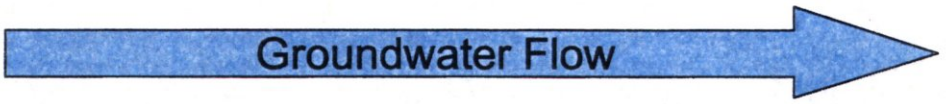

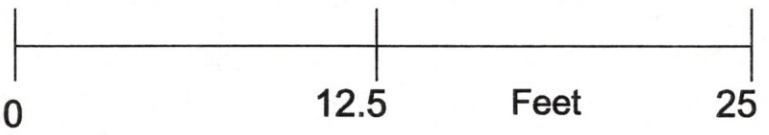

Performance Monitoring Well
Injection Well
Deeper Injection Well

NOTE:

The screened interval is from 1 ft above the water table to 9 ft below.

AECOM

Draft Work Plan

Proposed Pilot Study Layout

U.S. Army Engineer District, Alaska
Elmendorf AFB, Alaska 99506-6898

FILE NAME:	DRN	PROJECT NO.	DATE	FIGURE NO.
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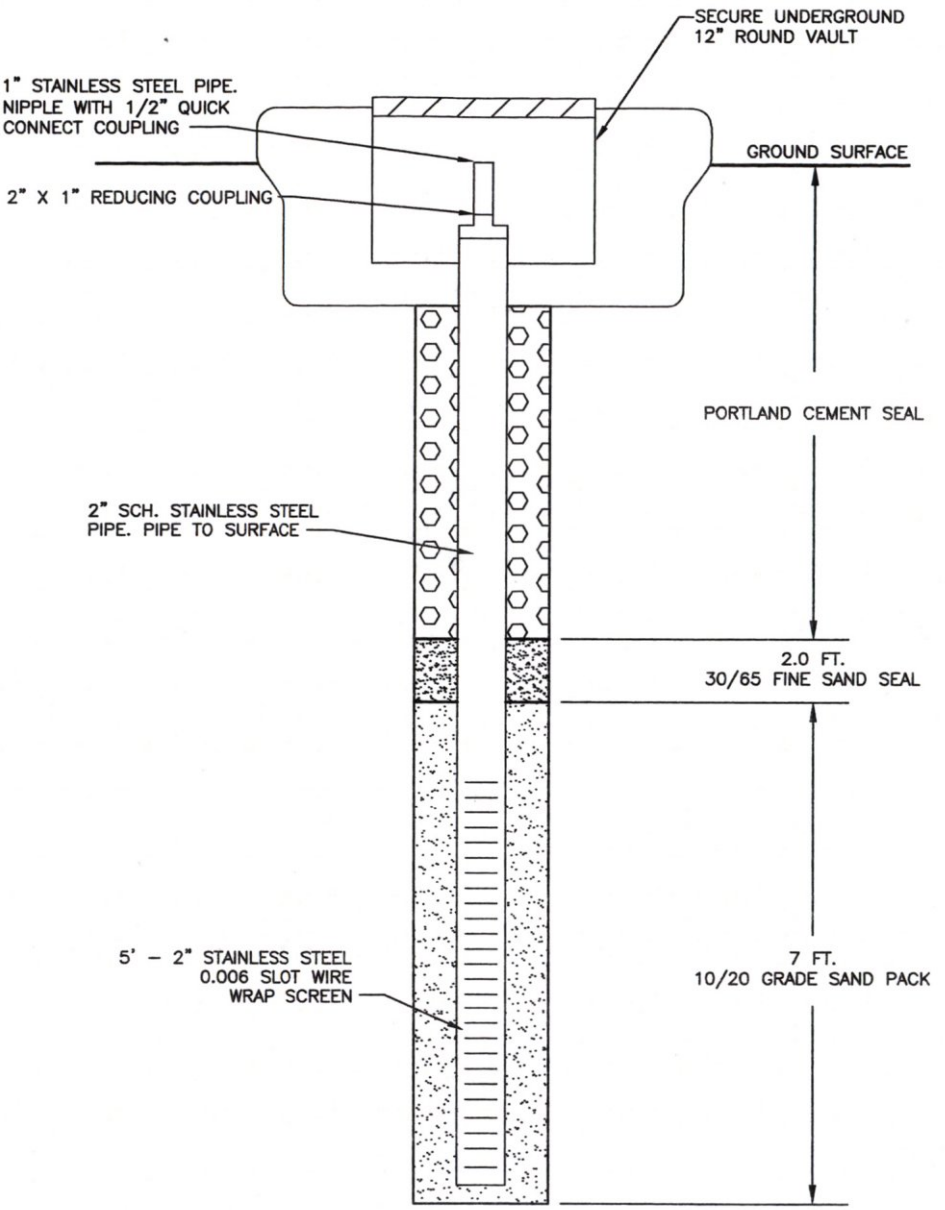

TYPICAL OXIDANT INJECTION WELL DETAIL
NOT TO SCALE

AECOM

Draft Work Plan

Proposed Injection Well
Construction Detail

U.S. Army Engineer District, Alaska
Elmendorf AFB, Alaska 99506-6898

FILE NAME:	DRN	PROJECT NO.	DATE	FIGURE NO.
112321_Fig6_lmn.dwg	lmn	112321	July 2009	6

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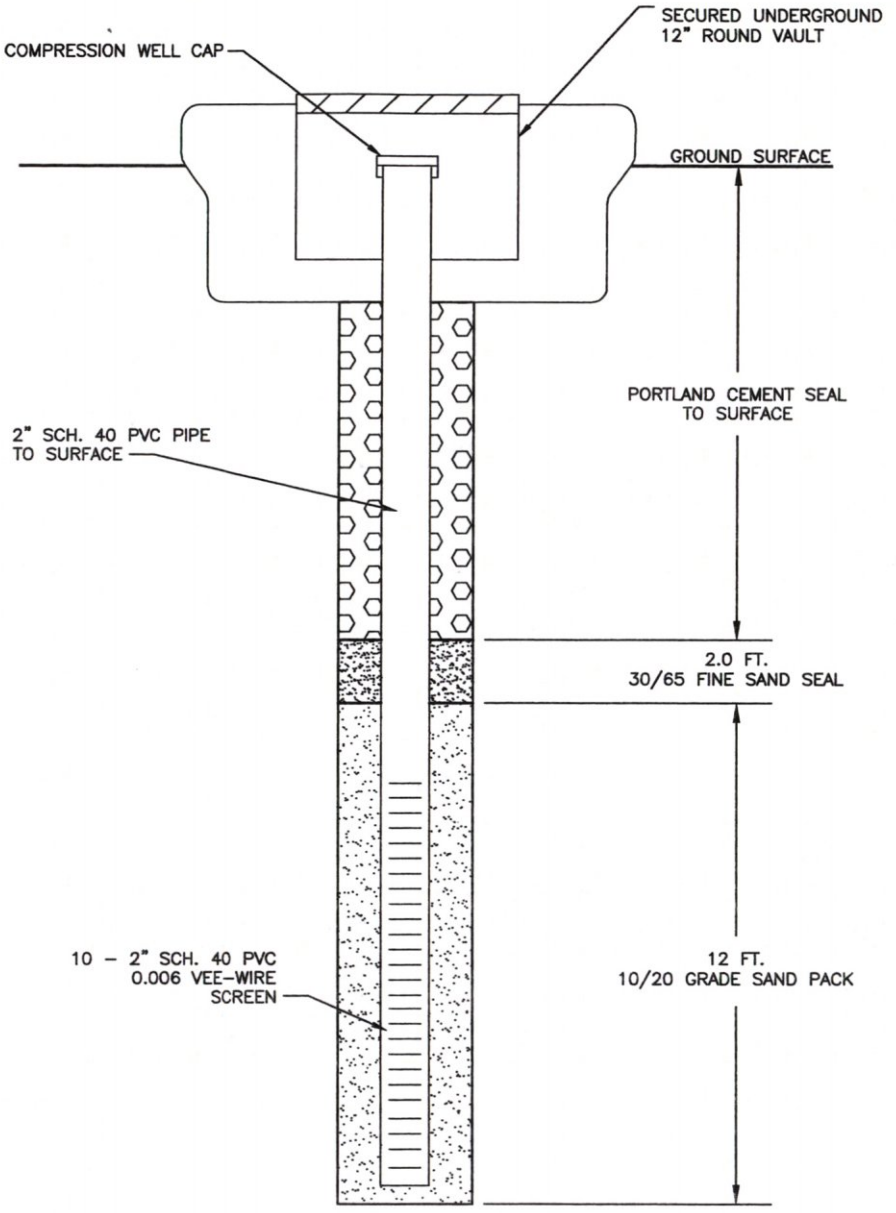

TYPICAL MONITOR WELL DETAIL
NOT TO SCALE

AECOM

Draft Work Plan

Proposed Monitor Well
Construction Detail

U.S. Army Engineer District, Alaska
Elmendorf AFB, Alaska 99506-6898

FILE NAME:	DRN	PROJECT NO.	DATE	FIGURE NO.
112321_Fig7_lmn.dwg	lmn	112321	July 2009	7

Plotted By: lisa.normoo
Layout--Sheet Name: LAYOUT1
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PV
PT
FT
T
PI
TO WELL
55 GAL DRUM
1"
WATER HEATER
WATER DISTRIBUTION LANCE
250 GAL WATER TANK
H2O PUMP
MX
85 GAL OVERPACK
FE / EDTA TANK
Na2S2O8 TANK
1.5"
FEED PUMP
IN-LINE MIXER
H2O2 PUMP 0-5 GPM
P
35% H2O2 DRUM
DILUTE H2O2 TANK

AECOM

Draft Work Plan

Process Flow Diagram

ISCO Pilot Plant

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

FILE NAME:	DRN	PROJECT NO.	DATE	FIGURE NO.
112321_Fig8_lmn.dwg	lmn	112321	July 2009	8

Plotted By: lisa.normoo
Layout-Sheet Name: LAYOUT1
Plot File Date Created: Jul/15/2009 12:49 PM

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Appendix A
Total Oxidant Demand and Chemical Oxidation Treatability Study Procedures

DIESEL RANGE ORGANICS REMEDIATION,
NORTHEAST CAPE, ST. LAWRENCE ISLAND, ALASKA

AECOM TREATABILITY STUDIES LABORATORY:

TOTAL OXIDANT DEMAND AND COMPARISON OF ALKALINE ACTIVATED SODIUM PERSULFATE, POTASSIUM PERMANGANATE, AND CATALYZED HYDROGEN PEROXIDE OXIDATION:

TREATABILITY OF DIESEL RANGE ORGANICS

1.0 INTRODUCTION

The objectives of the bench-scale treatability study is to determine the total oxidant demand (TOD) for site soils, provide performance comparisons of multiple oxidants utilized for in-situ chemical oxidation (ISCO) of total petroleum hydrocarbons (TPH) -diesel range organics (DRO) in site soils and groundwater and assist with optimization of oxidant loading.

The primary contaminants of concern at this site are TPH-DRO in groundwater and site soil. TPH-gasoline range organics (GRO), residual range organics (RRO), benzene, and naphthalene are also of concern.

The proposed scope of the bench study consists of the following:

- Determine the buffering capacity of Site soil in response to increasing acidity;
- Determine the total oxidant demand of Site soil and groundwater for alkaline catalyzed sodium persulfate ($Na_2S_2O_8$), utilizing FMC's commercially available Klozur™ (sodium persulfate);
- Evaluate three oxidizing approaches for their effectiveness and efficiency at oxidation of TPH-DRO dissolved in site groundwater.
  - Catalyzed Hydrogen Peroxide (CHP)
  - Iron activated sodium persulfate
  - Hydrogen peroxide activated sodium persulfate

2.0 PERSULFATE TOTAL OXIDANT DEMAND STUDY DESIGN

Testing performed during this phase of bench scale evaluation is aimed at quantifying the TOD of the site sample media. Soil samples will be collected from the test pits and/or monitor well borings, as described in the body of the Work Plan. For the TOD study, triplicate soil and groundwater slurry tests, amended with a dosage of Klozur™ persulfate, will be prepared for TOD testing in each area (Table 1). TOD testing is not typically performed for CHP. However, the TOD value of CHP is recognized to be greater than for activated sodium persulfate.

TOD treatments will be allowed to react for 5 days and hydrogen ion concentration (pH) will be monitored at the start of reaction vessel preparation, every day on a 24 hour time interval. At the end of treatment, all reaction vessels will be titrated with a 0.5M or 1.0M solution of sodium thiosulfate and TOD calculated.

Table 1: Total Oxidant Demand Test – Sodium Persulfate Treated Sample Preparation

Persulfate Control			FeEDTA			Hydrogen Peroxide			# Samples
Test 1	Test 2	Test 3	Test 1	Test 2	Test 3	Test 1	Test 2	Test 3	3
Test 1	Test 2	Test 3	Test 1	Test 2	Test 3	Test 1	Test 2	Test 3	3
Test 1	Test 2	Test 3	Test 1	Test 2	Test 3	Test 1	Test 2	Test 3	3

Persulfate Control			FeEDTA			Hydrogen Peroxide			# Samples
Dosed w/ persulfate only			Dosed w/ FeEDTA to meet 300 ppm Fe in solution			Dosed with 8% Peroxide			

Note: Up to three composite soil samples, representative of unique depths or stratigraphy will be analyzed
FeEDTA ferric ethylenediaminetetraacetic acid
ppm parts per million

TOD testing results will be used to determine minimum oxidant demands for the second phase of oxidant (hydrogen peroxide activated sodium persulfate, iron activated sodium persulfate, and catalyzed hydrogen peroxide) testing in the Bench-scale Treatability Study

2.1 BUFFER CAPACITY DETERMINATION

The initial phase of the TOD test is to evaluate the buffer capacity of the soil media from each treatability study area by titrating a slurry of homogenized soil and grab groundwater sample mixture (with a ratio of 1 to 1.5 in mass) using a sulfuric acid solution. Buffer capacity titrations will be performed in triplicate, and subsequent measurement of pH will be made at 24, 48, and 72 hours following the initial titration.

2.2 TOTAL OXIDANT DEMAND CALCULATION

During this phase of the study, the TOD of soil media from each area of the test site will be evaluated by back titration. This will be accomplished by using a colorimetric technique based on a maximum ratio of oxidant mass to soil mass of 10 grams per kilogram (g/kg). Klozur™ sodium persulfate will be added to a 1:1.5 slurry of soil and water to achieve an oxidant concentration of 10 g/kg. For iron-ethylenediaminetetraacetic (Fe-EDTA) activation, enough Fe-EDTA will be added to establish 300 parts per million (ppm) iron in each slurry. The TOD will be performed in triplicate for each activator. A triplicate set of TOD persulfate controls will constructed without activator.

For the TOD controls and FeEDTA activated vessels, the following preparatory procedure will be utilized: Weigh 100 grams of soil sample and place into a 500 milliliter (mL) reaction vessel, a 500 mL polyethylene bottle, or a large mason-type jar. Measure 150 mL groundwater using a graduated cylinder, and add to the soil jar to create a slurry. Mix gently by swirling to saturate the soil. An adjustment may be made to the volume of water if the soils are predominated by clays of very fine grain sizes that are easily suspended.

For the TOD controls, use the following calculation to determine the mass of sodium persulfate required to provide a 10 g/kg oxidant: soil ratio:

Given: $Na_2S_2O_8$ MW = 238 g/mol
S_2O_8 MW = 192.1 g/mol

Dose: 10 g/kg = 1 g S_2O_8 / 100 g soil

$$\frac{1.0\ \text{g}\ S_2O_8 \times 238\ \text{g/mol}\ Na_2S_2O_8}{192.1\ \text{g/mol}\ S_2O_8} = 1.239\ \text{g}\ Na_2S_2O_8$$

Measure this quantity of persulfate on an analytical scale of sufficient sensitivity. Use of large plastic weigh boats is recommended. Transfer the weighed sodium persulfate into each of the reaction vessels and swirl to mix, following addition.

For activation, enough Fe-EDTA will be added to establish 300 ppm iron in each slurry. The chelated iron product recommended for use, Dissolvine®, has the formula [FeEDTA]Na • $3H_2O$. Dissolvine is 13.26% Fe, therefore, the following calculation is utilized to determine the Dissolvine dosage:

$$\frac{300 \text{ mg/L Fe}}{13.26\% \text{ FeEDTA}} = 2{,}262.44 \text{ mg/L FeEDTA} = 0.2262 \text{ g FeEDTA}/100 \text{ mL}$$

Note: Dissolvine solubility at 20C is 90 g/L

Measure the mass of FeEDTA indicated above in a large plastic weigh boat, then add to the triplicate of treated condition reaction vessels only. Swirl to stir.

The resulting oxidant-soil mixture is homogenized and allowed to react for a period of 5 days. The pH and oxidation-reduction potential (ORP) will be monitored initially, and at 24 hour intervals for the duration of the experiment. Following the reaction period, potassium iodide (KI) will be added in excess (10 times the molar concentration of persulfate) according to the following stoichiometric calculation:

$$\frac{1.239 \text{ g } Na_2S_2O_8 \times 1 \text{ mol } S_2O_8 \times 10x \text{ KI} \times 166 \text{ g KI}}{238 \text{ g } Na_2S_2O_8 \times 1x \text{ } S_2O_8 \times 1 \text{ mol KI}} = 8.642 \text{ g KI}$$

Measure the indicated mass of solid KI in a plastic weigh boat and add the indicated mass of KI to the reaction vessel to be analyzed. Stir by swirling to mix. It is better at this point to have a magnetic stir plate and stir bar in place within the vessel; however, the weight of the soil can sometimes be too great for the magnetic stir bar to mix. Allow the slurry vessel to mix for at least 30 minutes.

The addition of the KI mixture results in the production of iodine from the reaction of the iodide with excess persulfate. This reaction will result in an orange-red iodine solution. The resulting iodine solution will then be titrated with a solution of the reducing compound sodium thiosulfate pentahydrate ($Na_2S_2O_3 \bullet 5H_2O$). To facilitate titration, a graduated burette or 0–100 µL micropipette is useful for the drop-wise addition of titrant to the reaction vessel. A 0.5M $Na_2S_2O_3$ solution should be prepared in the following manner:

Given: $Na_2S_2O_3 \bullet 5H_2O$ MW = 248.19 g/mol
$5H_2O$ = 90.08 g/mol
248.19 g/mol - 90.08 g/mol = MW 158.11 g/mol $Na_2S_2O_3$

$$\frac{0.5 \text{ M } Na_2S_2O_3 \times 158.11 \text{ g/mol } Na_2S_2O_3 \times 248.19 \text{ g/mol } Na_2S_2O_3 \bullet 5H_2O}{1\text{L x } 158.11 \text{ g/mol } Na_2S_2O_3} = 124.095 \text{ g } Na_2S_2O_3 \bullet 5H_2O$$

Or, 12.41 g/100 mL of sodium thiosulfate pentahydrate.
A 1.0M $Na_2S_2O_3$ solution may be prepared in a similar manner.

The ORP may be recorded throughout the titration. When the titrated mixture reaches a pale yellow color, 10-20 mL of starch indicator will be added to produce a pale blue starch iodine complex. The titration will then be continued until the complex color has dissipated indicating reduction of the iodine. The titration can be confirmed as complete when the ORP has returned to a value at or near the initial measurement. The volume of 0.5M (or 1.0M) sodium thiosulfate solution utilized in the titration will be entered into a spreadsheet calculator, which will convert the volume to moles of thiosulfate, and then to equivalent moles of persulfate. Moles of persulfate will be converted to grams and this value will indicate the mass of residual persulfate. This value will subtracted from the actual dose quantity, and the resulting difference is the oxidant demand value, stated in g/kg. This value can be calibrated against the value determined for the control samples to correct for oxidant loss due to auto-decomposition of the oxidant in solution.

3.0 TREATABILITY STUDY

The primary goals of this phase of the study are to evaluate various chemical oxidation approaches targeting the contaminants of concern at the site and to estimate the efficacy of the tested oxidants to mineralize the targeted contaminants. The results will be available for use to refine subsequent field implementation of in situ chemical oxidation at the site. A proposed approach is outlined below.

The following oxidant scenarios will be tested:

- Catalyzed Hydrogen Peroxide
- Hydrogen Peroxide Activated Sodium Persulfate
- Iron Activated Sodium Persulfate

Soil and groundwater characterization – Soil samples will be received as delivered from the field, checked, and logged into the laboratory upon acceptance. Samples will be placed in a 4 degrees Celsius cooler following login. Prior to use, each matrix (soil and groundwater) will be composited to provide uniform and homogenized samples for study. The composited samples will be submitted characterized for the ISCO related parameters indicated in Table 2 to establish a universal bench study baseline:

Table 2 – Baseline Soil and Groundwater Sampling Parameters

	Groundwater	Soil
DRO/RRO	AK 102/103	AK 102/103
GRO	AK 101	AK 101
BTEX & Naphthalene	EPA 8260b	EPA 8260b
Metals: As, Cr, Pb	EPA 6010b Metals	EPA 6010b Metals
Total Iron	SM 6010B	SM 6010B
Ferrous Iron	HACH Method 8146	N/A
Hexavalent Cr	SM 218.6 CrIV	7196a CrIV
Sulfate	SM 4500	N/A
Alkalinity (as $CaCO_3$)	EPA 310.1	N/A
TOC	EPA 415.1	N/A

BTEX benzene, toluene, ethylbenzene, and xylene
EPA Environmental Protection Agency, United States
N/A not applicable

Site soil and groundwater from each area will be reacted at two different oxidant concentrations (twice the calculated TOD [2X] and five times the calculated TOD [5X]). The 2X and 5X concentrations are multipliers of the persulfate TOD value, and have been selected to provide a low and high dosage range of oxidant treatments. This is a proposed oxidant dosage multiplier. Baseline contaminant concentrations may suggest stoichiometric doses to achieve greater contaminant reduction within a limited time frame of study.

Sampling points for sodium persulfate reaction vessels are set at 1, 2, 3, and 4 weeks to monitor the reaction of the oxidants with the chemicals of concern at both 2X and 5X concentrations. The modified Fenton's reaction is expected to be complete on a much shorter time frame, and sampling points are set at 1, 2, 5, and 7 hours following reagent addition.

At each sampling point, the contents of the reaction vessel will be utilized to generate a sample for evaluation. An aliquot from each reaction vessel will be collected and the residual oxidant will be measured. Then, the remaining oxidant in the reaction vessel will be chemically quenched using an

appropriate reagent, and an aliquot of reaction solution will be analyzed for the parameters indicated in Table 1 (according to the schedule in Attachment 1). The analytical laboratory will be notified which samples have been quenched and the reagents used.

Each sample event in the Bench-Scale Treatability Study will be set up in individual 1,500 mL glass bottles topped with fermentation caps. Oxidant requirements for each area will be based on the initial TOD determined for each area (see *Total Oxidant Demand Calculation*). The following formulas will be used to calculate the 2X and 5X oxidant loading requirements for Table 2.

- Catalyzed hydrogen peroxide – 2.5 percent and 10 percent H_2O_2 solution concentration with 1:1 molar Fe: H_2O_2;
- Hydrogen peroxide activated sodium persulfate – TOD (g/kg) x 2 or TOD (g/kg) x 5 (a high dose of 10% solution strength of sodium persulfate may substitute TOD 5X), and;
- FeEDTA activated sodium persulfate - TOD (g/kg) x 2 or TOD (g/kg) x 5 (a high dose of 10% solution strength of sodium persulfate may substitute TOD 5X).

Each reaction vessel will be mixed by inversion once, wrapped in aluminum foil to prevent UV degradation of contaminants, and capped with a fermentation lock cap to prevent air from entering the bottle while allowing relief of pressurizing gasses which may be generated during the reactions.

The following sample volumes will be collected from each 1,500 mL reaction vessel and submitted for the associated analyses:

Groundwater

- 3-40 mL VOAs for analysis via United States Environmental Protection Agency (EPA) Method 8260 for benzene, toluene, ethylbenzene, and xylene (BTEX) and naphthalene, and for GRO via Method AK101;
- 1-1000 mL amber bottle for analysis via Method AK 102/103 for DRO and RRO;
- 100 mL for total metals (As, Pb, Cr) analysis via EPA Method 6010;
- 1-250 mL polyethylene bottle for $Cr6^+$ analysis via EPA Method 218.6, Ferrous iron by HACH Method 8146;
- 20 mL for residual reagent and pH analysis

Soil

- 1-2oz glass jar and 2-5 g Encore™ sampling devices for analysis via EPA Method 8260 for BTEX and naphthalene;
- 1-8 oz amber glass jar for analysis for GRO via Method AK101 and Method AK 102/103 for DRO and RRO;
- 1-2 oz glass jar for total metals (As, Cr, Pb, total Fe) analysis via EPA Method 6010;
- 1-4 oz glass jar for Cr6+ analysis via EPA Method 7196a;

Table 3: Reagent Matrix

	pH Control			Site Slurry Controls**			Oxidant Evaluation**					
Reagent	**TOD 2x**	**TOD 5x**	**DI Water**	**Peroxide + $Na_2S_2O_8$**	**FeEDTA + $Na_2S_2O_8$**	**CHP**	**Peroxide + $Na_2S_2O_8$ 2x**	**Peroxide + $Na_2S_2O_8$ 5x**	**FeEDTA + $Na_2S_2O_8$ 2x**	**FeEDTA + $Na_2S_2O_8$ 5x**	**CHP 2.5%**	**CHP 5.0 %**
Site water	200 mL	200 mL		1500 mL	1500 mL	1500 mL	1500 mL	1500 mL	1500 mL	1500 mL	1500 mL	1500 mL
DI water			200 mL									
Site soil	100 g	100 g	100 g	750 g	750 g	750 g	750 g	750 g	750g	750 g	750 g	750 g
Peroxide + $Na_2S_2O_8$	8% H_2O_2, TOD x 2	8% H_2O_2, TOD x 5	8% H_2O_2, TOD x 5				TOD x 2	TOD x 5	--	--	--	--
FeEDTA + $Na_2S_2O_8$	300 ppm Fe, TOD x 2	300 ppm Fe, TOD x 5	300 ppm Fe, TOD x 5				TOD x 2	TOD x 5	--	--	--	--
Catalyzed Hydrogen Peroxide (CHP)	2.5% H_2O_2, 15mg/L Fe^{+2}	5% H_2O_2, 30mg/L Fe^{+2}	5% H_2O_2, 30mg/L Fe^{+2}								2.5% H_2O_2, 15mg/L Fe^{+2}	5% H_2O_2, 30mg/L Fe^{+2}

Reagent addition in grams or mL as shown
pH Control samples – single reaction vessels throughout study analyzed for pH and ORP only
TOD (g/kg) in grams equivalent 100g soil
* pH, ORP, and unreacted (residual) oxidant (as applicable)
** Analytical parameters per Appendix A – Analytical Matrix
Refer to "Procedure for Activating Klozur® Persulfate with an 8% Hydrogen Peroxide Solution",
http://www.envsolutions.fmc.com/Portals/fao/Content/Docs/Hydrogen%20Peroxide%20activator%20safety%20and%20mixing%20instructions.pdf

3.1.1 Sampling

Groundwater and soil sampling will follow the analytical matrix presented in Attachment 1. Sufficient reaction vessels will be prepared so that one vessel will be sacrificed at each sampling event.

3.1.2 Controls

Un-amended Site groundwater controls from each area will be established for the catalyzed hydrogen peroxide and respective persulfate reactions. Two control bottles will be set-up (one per sampling event) for each area and the un-amended samples will function as experimental controls for the oxidant studies. At each sample time, the respective control samples will be transferred to the appropriate sample containers and submitted to an independent analytical laboratory for analysis according to the analytical matrix provided as Attachment 1.

3.1.3 Catalyzed Hydrogen Peroxide

At each sample time, the reaction vessel for that reaction time will be sacrificed for analysis. Each bottle will be opened and a sample of the water will be analyzed for residual hydrogen peroxide using a Hach brand hydrogen peroxide test kit Model HYP-1 (or equivalent), and pH. The residual hydrogen peroxide in the remaining sample will then be chemically quenched by adding bovine catalase to the respective samples. The sample will be transferred to the appropriate sample containers, and submitted to an independent analytical laboratory for analysis according to the analytical matrix provided as Attachment 1.

3.1.4 Iron Activated Persulfate Reaction Vessels

At each sample time, the reaction vessel for that reaction time will be sacrificed for analysis. Each bottle will be opened and a sample of the water analyzed for residual persulfate via iodometric titration, and pH. The residual persulfate in the remaining sample will then be chemically quenched by adding 20 percent sodium thiosulfate to the respective samples. The sample will be transferred to the appropriate sample containers, and submitted to an independent analytical laboratory for analysis according to the analytical matrix provided as Attachment 1.

3.1.5 Hydrogen Peroxide Activated Persulfate Reaction Vessels

At each sample time, the reaction vessel for that reaction time will be sacrificed for analysis. Each bottle will be opened and a sample of the water analyzed for residual persulfate via iodometric titration, for residual hydrogen peroxide using a Hach brand hydrogen peroxide test kit Model HYP-1 (or equivalent), and pH. The residual hydrogen peroxide (if indicated) in the remaining sample will then be chemically quenched by adding bovine catalase; residual persulfate by the addition of 20% sodium thiosulfate to the respective samples. The sample will be transferred to the appropriate sample containers, and submitted to an independent analytical laboratory for analysis according to the analytical matrix provided as Attachment 1.

3.1.6 Special Notes

3.1.6.1 VOC AND METALS SAMPLING

For volatile organic compounds (VOCs), the sample will be transferred to an un-preserved 40 mL volatile organic analysis (VOA) vial. The VOA vial will be sealed, labeled, and submitted under chain-of-custody (COC) to a certified analytical laboratory for analysis. It should be noted on the COC that the samples are un-preserved and have a 7-day hold time, rather then the standard 14-day hold time for VOC analysis. A similar process and appropriate sample container will be used to collect the sample for the remaining samples.

If the analytical results of the 7-day reaction vessels indicate the target contaminants within the reaction vessel are at non-detectable levels, then subsequent collection of analytical samples may be abandoned.

3.1.6.2 RESIDUAL OXIDANT ANALYSIS

Samples will be collected in a similar manner from the respective reaction vessels for use in titrations to determine the amount of residual persulfate, permanganate, or peroxide present. No quenching agents are utilized during this step.

3.1.6.3 PH/ORP ANALYSIS

Once the samples have been collected for laboratory analysis and residual oxidant testing, the reaction vessels will be opened and tested for ORP and pH.

4.0 LABORATORY ANALYSES

Soil and groundwater analyses will be performed by National Environmental Laboratory Accreditation Conference certified environmental laboratory. All analytical test methods will be performed in accordance with EPA or other standard testing methods.

5.0 FINAL REPORT

Upon completion of the Bench-Scale Study field work and laboratory analysis, AECOM Technical Services will prepare a technical memorandum that summarizes the results of the Bench-Scale Study and ISCO reagent effectiveness. The technical memorandum will include a discussion on the following:

- Summary of laboratory results
- Preferred reagent(s) for the field application
- Recommendations

The technical memorandum will supplement the results of the field pilot study currently planned for installation during the summer of 2009, and may provide further recommendations on oxidant selection and oxidant loading requirements.

Attachment 1
Analytical Matrix

			Matrix	
		Time (weeks)	GW.	Soil
Control	Universal Control	0	1-8, 10-12	1 – 8
		1	1 - 5	1 – 3
		3	1-8, 10-12	1 – 5
		5	1	1
		7	1-8, 10-12	1 – 8
		Time (hours)		
Catalyzed H2O2	5% H2O2 +30mg/L Fe	0	--	--
		1	1-8, 11-12	1-7, 9
		3	1-5	1-3
		5	1-5	1-3
		7	1-8, 11-12	1-7, 9
	10% H2O2 + 60 mg/L Fe	0	--	--
		1	1-8, 11-12	1-7, 9
		3	1-5	1-3
		5	1-5	1-3
		7	1-8, 11-12	1-7, 9
		Time (weeks)		
Persulfate + FeEDTA	2% persulfate	0	--	--
		1	1 - 5	1 - 3
		3	1-8, 10-12	1 - 5
		5	1	1
		7	1-8, 10-12	1 - 8
	10% persulfate	0		
		1	1 - 5	1 - 3
		3	1-8, 10-12	1 - 5
		5	1	1
		7	1-8, 10-12	1 - 8
		Time (weeks)		
Persulfate + 8% H2O2	2% persulfate	0	--	--
		1	1 - 5	1 - 3
		3	1-8, 10-12	1 - 5
		5	1	1
		7	1-8, 10-12	1 - 8
	10% persulfate	0	--	--
		1	1 - 5	1 - 3
		3	1-8, 10-12	1 - 5
		5	1	1
		7	1-8, 10-12	1 - 8

Analytical Code

DRO	1
GRO	2
RRO	3
Naphtalene	4
Benzene	5
As, Cr, Pb	6
Hex Cr	7
Iron (II)	8
Iron, total	9
Sulfate	10
Alkalinity	11
TOC	12

Appendix B
Example Field Injection Log

Injection System Log

Site: _____
Location: _____
Injection Point ID: _____

Date: _____
Weather: _____

Monitoring Zone: _____
Personnel: _____

		Hydrogen Peroxide					Sodium Persulfate					FeEDTA						
DATE	TIME	Oxidant Conc (%/v)	FLOW (gpm)	Circuit Temp (F)	Circuit Pres. (psi)	Gallons of Oxidant Solution Injected	Oxidant Conc (%/v)	FLOW (gpm)	Circuit Temp (F)	Circuit Pres. (psi)	Gallons of Oxidant Solution Injected	Catalyst Conc (ppm)	FLOW (gpm)	Circuit Temp (F)	Circuit Pres. (psi)	Gallons of Catalyst Solution Injected	Injection Pressure at Well (psi)	Notes

Page ____ of _____

INJECTION MONITORING PARAMETERS

Site: _____
Location: _____
Injection Point ID: _____

Date: _____
Weather: _____

Monitoring Zone: _____
Personnel: _____

Sample Name	MP	Interval	DATE	TIME	Water Level	TEMP	EC	DO	pH	ORP	Conc. (mg/L)	Notes

Appendix C
Field Screening and Test Kit Methodologies

Sodium Persulfate CHEMets®
0 - 7 & 7 - 70 ppm

Safety Information

Read MSDS before performing this test procedure. Wear safety glasses.

Test Procedure

1. Fill the sample cup to the 25 mL mark with the sample (fig 1).

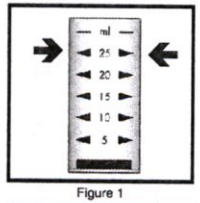


Figure 1

2. Place the CHEMet ampoule in the sample cup. Snap the tip by pressing the ampoule against the side of the cup. The ampoule will fill leaving a small bubble to facilitate mixing (fig 2).

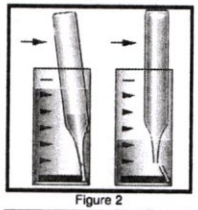


Figure 2

3. Mix the contents of the ampoule by inverting it several times, allowing the bubble to travel from end to end each time. Wipe all liquid from the exterior of the ampoule. Test results should be obtained **within one minute** after snapping the ampoule tip.
4. Use the appropriate comparator to determine the level of sodium persulfate in the sample. If the color of the CHEMet ampoule is between two color standards, a concentration estimate can be made.

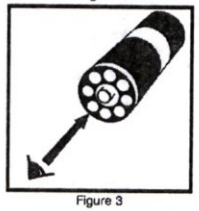


Figure 3

   a. Place the CHEMet ampoule, flat end downward into the center tube of the low range comparator. Direct the top of the comparator up toward a source of bright light while viewing from the bottom. Rotate the comparator until the color standard below the CHEMet ampoule shows the closest match (fig 3).
   b. Hold the high range comparator in a nearly horizontal position while standing directly beneath a bright source of light. Place the CHEMet ampoule between the color standards moving it from left to right along the comparator until the best color match is found (fig 4).

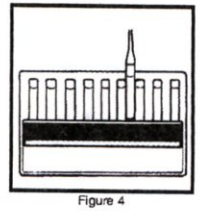


Figure 4

Test Method

The Sodium Persulfate CHEMets®[1] test method employs the ferric thiocyanate chemistry.[2] In an acidic solution, sodium persulfate oxidizes ferrous iron. The resulting ferric iron reacts with ammonium thiocyanate to form ferric thiocyanate, a red-orange colored complex, in direct proportion to the sodium persulfate concentration.

Various oxidizing agents such as hydrogen peroxide, ozone, ferric ions and cupric ions will produce high test results.

1. CHEMets is a registered trademark of CHEMetrics, Inc. U.S. Patent No. 3,634,038
2. D. F. Boltz and J. A. Howell, eds., Colorimetric Determination of Nonmetals, 2nd ed., Vol. 8, p. 304 (1978)

Reorder Information	**Cat. No.**
***Test Kit**, complete*	*K-7870*
***Refill**, 30 CHEMet ampoules*	*R-7870*
***Sample Cup**, 25 mL, package of six*	*A-0013*
***Comparator**, 0-7 ppm*	*C-7807*
***Comparator**, 7-70 ppm*	*C-7870*

CHEMetrics
Water Analysis Systems

CHEMetrics, Inc., 4295 Catlett Road, Calverton, VA 20138-0214 U.S.A.
Phone: (800) 356-3072; Fax: (540) 788-4856; E-Mail: orders@chemetrics.com
www.chemetrics.com
June 06, Rev. 3

26672-88

• Iron, Ferrous, Test Kit

1,10 Phenanthroline Iron Reagent Method

• Trousse d'analyse fer ferreux

Méthode réactif fer 1, 10 Phéanthroline

• Eisen, 2wertig Test Kit

1,10 Phenanthrolin-Eisenreagenz Methode

• Kit de análisis para hierro ferroso

Método reactivo de fenatrolina de hierro 1,10

0.0 – 10.0 mg/L

• Mod. IR-18C

• # 26672-00

- To ensure accurate results, read carefully before proceeding.
- Pour obtenir des résultats exacts, lire attentivement le mode d'emploi avant d'utiliser la trousse.
- Um genaue Ergebnisse zu gewährleisten, lesen Sie das Folgende bitte aufmerksam durch, bevor Sie fortfahren.
- Para obtener resultados precisos, lea detenidamente las instrucciones antes de proceder al análisis.

WARNING

Handling chemical samples, standards, and reagents can be dangerous. Review the Material Safety Data Sheets before handling any chemicals.

ATTENTION

La manipulation des échantillons chimiques, étalons et réactifs peut être dangereuse. Lire les fiches de données de sécurité des produits avant de manipuler tout produit chimique.

WARNUNG

Die Handhabung chemischer Proben, Standards und Reagenzien kann gefährlich sein. Bitte gehen Sie die Materialsicherheitsdatenblätter durch, bevor Sie Chemikalien handhaben.

ADVERTENCIA

El manejo de sustancias químicas, patrones y reactivos, puede resultar peligroso. Lea las fichas de informaciones de seguridad de materiales antes de manipular cualquier producto químico.

HACH®

Introduction

The 1,10 phenanthroline indicator in the Ferrous Iron Reagent reacts with ferrous iron in the sample to form an orange color in proportion to the ferrous iron concentration. Ferric iron does not react. The ferric iron (Fe^{3+}) concentration can be determined by subtracting the ferrous iron concentration from the results of a total iron test.

Introduction

L'indicateur 1,10 phénanthroline dans le réactif fer ferreux réagit avec le fer ferreux présent dans l'échantillon pour former une coloration orange proportionnelle à la concentration de fer ferreux. Le fer ferrique ne réagit pas. La concentration de fer ferrique (Fe^{3+}) peut être déterminée en soustrayant la concentration de fer ferreux des résultats d'une analyse de fer total.

Einleitung

Der 1,10 Phenantrolin Indikator im Eisen(II)-Reagenz reagiert mit Eisen(II) in der Probe durch Bildungen einer orangen Farbe, proprotional zur Konzentration des zweiwertigen Eisens. Eisen(III) reagiert nicht. Die Konzentration des dreiwertigen Eisen (Fe^{3+}) kann bestimmt werden, indem man die Konzentration des zweiwertigen Eisens von den Ergebnissen eines Eisen Gesamt Tests subtrahiert.

Introducción

El indicador de 1,10-fenantrolina en el Reactivo para Hierro Ferroso reacciona con el hierro ferroso de la muestra para formar un color anaranjado en proporción con la concentración de hierro ferroso. El hierro férrico no reacciona. La concentración de hierro férrico (Fe^{3+}) puede ser determinada restando la concentración de hierro ferroso de el resultado de una prueba de hierro total.

Measuring Hints and General Test Information

- Wash all labware between tests. Contamination may alter test results. Clean with a non-abrasive detergent or a solvent such as isopropyl alcohol. Use a soft cloth for wiping or drying. Do not use paper towels or tissue on plastic tubes as this may scratch them. Rinse with clean water (preferably deionized water).
- Rinse all viewing tubes thoroughly with the sample water before testing.
- Use clippers to open plastic powder pillows.
- For critical testing, reagent accuracy should be checked with each new lot of reagents. Prepare a ferrous iron stock solution (100 mg/L Fe) by dissolving 0.702 grams of ferrous ammonium sulfate, hexahydrate, in one liter deionized water. Dilute 5.00 mL of this solution to 100 mL with deionized water to make a 5.0 mg/L standard solution. Prepare this immediately before use. Follow the ferrous iron test instructions using this solution instead of a water sample.

Conseils pour les mesures et informations générales sur l'analyse

- Laver toute la verrerie entre les analyses. La contamination peut fausser les résultats d'analyses. Laver avec un détergent non abrasif ou un solvant tel que l'isopropanol. Utiliser un tissu doux pour essuyer ou sécher. Ne pas utiliser de tissu ou papier d'essuyage sur les tubes en plastique pour ne pas les rayer. Rincer à l'eau propre (de préférence de l'eau désionisée).
- Rincer soigneusement tous les tubes colorimétriques avec l'échantillon d'eau avant l'analyse.
- Utiliser la pince coupante pour ouvrir les gélules en plastique.
- Pour des analyses critiques, l'exactitude du réactif doit être vérifiée pour chaque nouveau lot de réactifs. Préparer une solution-mère de fer ferreux (100 mg/L Fe) en dissolvant 0,702 grammes d'ammonium-fer (II) sulfate, hexahydrate, dans un litre d'eau désionisée. Diluer 3,00 mL de cette solution à 100 mL avec de l'eau désionisée pour obtenir une solution étalon à 3,0 mg/L. Préparer cette solution immédiatement avant emploi. Suivre les instructions d'analyse du fer ferreux en remplaçant l'échantillon par cette solution étalon.

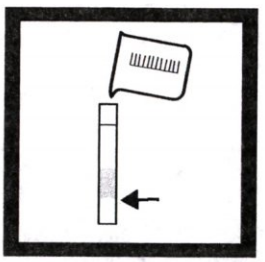
Meßtips und allgemeine Testinformationen

- Waschen Sie alle Laborartikel zwischen den Tests. Verunreinigung kann die Testergebnisse verfälschen. Reinigen Sie sie mit einem nicht scharfen Detergent oder einem Lösungsmittel wie zum Beispiel Isopropylalkohol. Verwenden Sie für das Abwischen oder Abtrocknen ein weiches Tuch. Verwenden Sie bei den Plastikröhrchen keine Papierhandtücher oder Tissue-Papier, da dieses sie zerkratzen kann. Spülen Sie mit sauberem Wasser (vorzugsweise entsalztes Wasser).
- Spülen Sie alle Prüfröhrchen vor dem Test gründlich mit dem Probenwasser.
- Verwenden Sie eine Schere zur Öffnung der Plastik-Pulverkissen.
- Um genaue Bestimungen zu erzielen, sollte die Genauigkeit der Reagenzien für jede neue Charge überprüft werden. Bereiten Sie eine Eisen-II Stammlösung (100mg/L Fe) auf, indem Sie 0,702 Gramm Eisen-II Ammoniumsulfat, hexahydrat, in einem Liter entsalzten Wasser lösen. 3,00 mL dieser Lösung werden mit 100 mL entsalztem Wasser verdünnt, so dass eine 3,0 mg/L Standardlösung entsteht. Diese Lösung wird unmittelbar vor Gebrauch angesetzt. Arbeiten Sie, unter Benutzung dieser Lösung anstelle einer Wasserprobe, gemäß den Anweisungen für den Eisen(II) Test.

Consejos para la medición e información general sobre el análisis

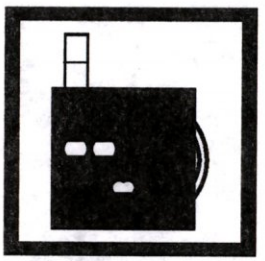
- Lavar todo el material de laboratorio entre los análisis. La contaminación puede alterar los resultados. Limpiar con un detergente no abrasivo o con un solvente como el alcohol isopropílico. Utilizar un paño suave para limpiar o secar. No utilizar ni toallitas ni pañuelos de papel para limpiar los tubos de plastico para no rayarlos. Aclarar con agua limpia (preferentemente agua desionizada).
- Enjuagar todos los tubos para colorimetría abundantemente con la muestra de agua antes de realizar el análisis.
- Utilice las pinzas cortantes para abrir las cápsulas de plástico.
- Para pruebas exigentes o difficiles, la precisión del reactivo debe ser verificada cada vez que se comienza con un nuevo lote. Preparar una solución de reserva de hierro ferroso (100 mg/L Fe), disolviendo 0,702 gs. de sulfato de amonio ferroso, hexahidrato, en un litro de agua desionizada. Diluya 3,00 mL de esta solución en 100 mL de agua desionizada para hacer una solución estándar de 3,00 mg/L. Esta debe ser preparada inmediatamente antes de usarla. Siga las instrucciones de la prueba de hierro ferroso empleando esta solución en vez de una muestra de agua.

• Procedure • Technique • Verfahren • Procedimiento



1. Fill a viewing tube to the first (5-mL) line with sample water. This is the blank.

- ♦ Remplir un tube colorimétrique jusqu'au premier trait (5 mL) avec l'échantillon d'eau. Ceci est le blanc.
- ♦ Füllen Sie ein Prüfröhrchen bis zur ersten (5 mL) Linie mit Probenwasser. Dieses ist die Blindprobe.
- ♦ Llene un tubo para colorimetría hasta la primera marca (5 mL) con la muestra de agua. Esto constituye el blanco.



2. Place this tube in the top left opening of the color comparator.

- ♦ Placer ce tube dans l'ouverture supérieure gauche du comparateur.
- ♦ Stellen Sie dieses Röhrchen in die obere linke Öffnung des Farbkomparators.
- ♦ Coloque este tubo en la abertura superior izquierda del comparador.

3. Fill the measuring vial to the 25-mL mark with sample water.

- ♦ Remplir le tube de mesure jusqu'au trait 25 mL avec l'échantillon d'eau.
- ♦ Füllen Sie das Messröhrchen bis zur 25 mL Markierung mit dem Probenwasser.
- ♦ Llene el frasco medidor hasta la marca de 25 mL con el agua de la muestra.

4. Add the contents of one Ferrous Iron Reagent Powder Pillow to the measuring vial.

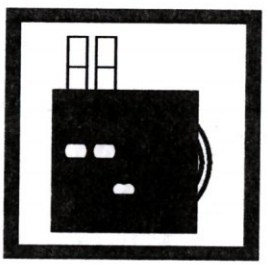
- ♦ Ajouter le contenu d'une gélule de réactif du fer ferreux au tube de mesure.
- ♦ Geben Sie den Inhalt eines Eisen(II)-Reagenz-Pulverkissens in das Messröhrchen.
- ♦ Agregue el contenido de una cápsula del Reactivo para Hierro Ferroso al frasco medidor.

5. Swirl to mix. An orange color will develop if ferrous iron is present. Allow three minutes for full color development.

- Agiter pour mélanger. En présence de fer ferreux, une coloration orange se développe. Attendre le développement complet de la coloration.
- Schwenken Sie zum Vermischen. Ist Eisen(II) vorhanden, entwickelt sich eine orange Färbung. Warten Sie drei Minuten, bis sich die Farbe vollständig ausgebildet hat.
- Agite para mezclar. Se formará un color anaranjado en presencia de hierro ferroso. Deje pasar tres minutos para que el color se desarrolle completamente.

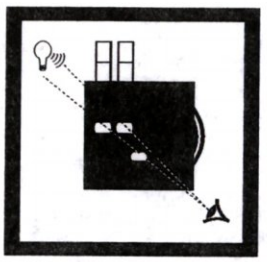
6. Fill another viewing tube to the first (5-mL) mark with the prepared sample.

- Remplir un autre tube jusqu'au premier trait (5 mL) avec l'échantillon préparé.
- Füllen Sie ein weiteres Prüfröhrchen bis zur ersten (5 mL-) Linie mit der vorbereiteten Probe.
- Llene otro tubo para colorimetría hasta la marca de 5mL con la muestra preparada en los puntos 4 y 5.



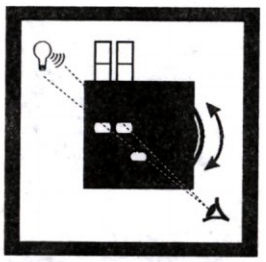
7. Place the second tube in the top right opening of the color comparator.

- Placer le second tube dans l'ouverture supérieure droite du comparateur.
- Setzen Sie das zweite Röhrchen in die obere rechte Öffnung des Farbkomparators.
- Coloque el segundo tubo en la abertura superior derecha del comparador.



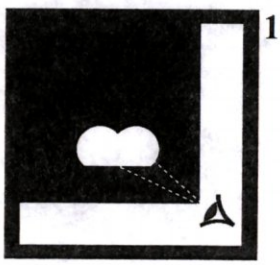
8. Hold comparator up to a light source such as the sky, a window or a lamp. Look through the openings in front.

- Tenir le comparateur face à une surface uniformément éclairée (ciel, lampe, fenêtre) et regarder par les ouvertures de la face antérieure du comparateur.
- Halten Sie den Komparator gegen eine Lichtquelle wie zum Beispiel den Himmel, ein Fenster oder eine Lampe. Sehen Sie durch die Öffnungen vorn.
- Lleve el comparador hasta una fuente de luz, tal como el cielo, una ventana o una lámpara. Mire a través de las aberturas frontales del comparador.



9. Rotate the color disc until the color matches in the two openings.

- Tourner le disque jusqu'à égalité des teintes dans les deux ouvertures.
- Drehen Sie die Farbscheibe, bis die Farbe in den beiden Öffnungen übereinstimmt.
- Haga girar el disco de color hasta que el color coincida en ambas aberturas.



10. Read the mg/L ferrous iron in the scale window.

- Lire la concentration du fer ferreux en mg/L dans la fenêtre de l'échelle.
- Lesen Sie die mg/L Eisen(II) im Skalenfenster ab.
- Lea la concentración de hierro ferroso en mg/L en la ventanilla graduada.

REPLACEMENTS

Description	Unit	Cat. No.
Clippers	each	968-00
Color Comparator	each	1732-00
Color Disc, Iron Phenanthroline	each	1874-00
Ferrous Iron Reagent Powder Pillows, 25 mL	100/pkg	1037-69
Instruction Card, IR-18C Test Kit	each	26672-88
Vial, measuring, with 2, 5, 10, 15, 20 and 25-mL marks	each	2193-00
Viewing Tube, plastic	4/pkg	46600-04
Water, deionized	4 L	272-56

REACTIFS ET PIECES DE RECHANGE

Désignation	Unité	Réf. Nº
Pince coupante pour gélules moyennes	1	968-00
Comparateur	1	1732-00
Disque coloré fer, phénanthroline	1	1874-00
Réactif du fer ferreux en gélules pour 25 mL	100/paq	1037-69
Mode d'emploi de la trousse IR-18C	1	26672-88
Tube de mesure marqué 2, 5, 10, 15, 20 et 25 mL	1	2193-00
Tube colorimétrique en plastique avec bouchon	4/paq	46600-04
Eau désionisée	4 L	272-56

VERBRAUCHSMATERIAL UND ERSATZTEILE

Beschreibung	Einheit	Kat. Nr.
Abschneider	1	968-00
Farbkomparator	1	1732-00
Farbscheibe, Eisenphenanthrolin	1	1874-00
Eisen(II) Reagenz-Pulverkissen, 25 mL	100/Stck	1037-69
Anleitungskarte, IR-18C Test Kit	1	26672-88
Messröhrchen m. 2, 5, 10, 15, 20 und 25 mL Markierungen	1	2193-00
Farbprüfröhrchen, Plastik, mit Kappe	4/Stck	46600-04
Entsalztes Wasser	4 L	272-56

REACTIVOS Y MATERIALES

Descripción	Unidad	Nº Ref.
Pinzas cortantes para cápsulas intermedias	1	968-00
Comparador de Colores	1	1732-00
Disco de colores, fenantrolina de hierro	1	1874-00
Reactivo para Hierro Ferroso, Bolsas de Polvo, 25 mL	100/lote	1037-69
Tarjeta de Instrucciones, Juego de Prueba IR-18C	1	26672-88
Frasco medidor, con marcas a 2, 5, 10, 15, 20 y 25 mL	1	2193-00
Tubo para colorimetría de plástico, con tapa protectora	4/lote	46600-04
Agua desionizada	4 L	272-56

OPTIONAL REAGENTS AND EQUIPMENT

Description	Unit	Cat. No.
Caps, for plastic Color Viewing Tubes 46600-04	4/pkg	46600-14
Ferrous Ammonium Sulfate, Hexahydrate	113 g	11256-14
Flask, volumetric, Class A, 100-mL	each	26366-42
Flask, volumetric, Class A, 1000-mL	each	26366-53
Pipet, volumetric, Class A, 5-mL	each	14515-37
Pipet Filler, safety bulb	each	14651-00

REACTIFS ET EQUIPEMENTS OPTIONNELS

Désignation	Unité	Réf. Nº
Bouchons pour tubes en plastique 46600-04	4/paq	46600-14
Ammonium, fer (II) sulfate, 6 H_2O ACS	113 g	11256-14
Fiole jaugée, classe A, 100ml	1	26366-42
Fiole jaugée, classe A, 1000 ml	1	26366-53
Pipette jaugée, classe A, 5,00ml	1	14515-37
Poire à pipetter	1	14651-00

ZUSÄTZLICHE REAGENZIEN UND ZUBEHÖR

Beschreibung	Einheit	Kat. Nr.
Kappen, für Plastik-Farbprüfröhrchen 46600-04	4/Stck	46600-14
Eisen(II)-Ammoniumsulfat, hexahydrat	113 g	11256-14
Messkolben, Klasse A, 100 mL	1	26366-42
Messkolben, Klasse A, 1000 mL	1	26366-53
Messpipette, Klasse A, 5mL	1	14515-37
Pipettenfüller, Sicherheitsball	1	14651-00

REACTIVOS Y EQUIPAMIENTO OPCIONALES

Descripción	Unidad	Nº Ref.
Tapas protectoras para tubos de plástico 46600-04	4/lote	46600-14
Sulfato de Amonio Ferroso, Hexahidratado	113 g	11256-14
Frasco volumétrico, clase A, 100-mL	1	26366-42
Frasco volumétrico, clase A, 1000-mL	1	26366-53
Pipeta volumétrica, clase A, 5-0 mL	1	14515-37
Bulbo de seguridad para llenador de pipeta.	1	14651-00

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HACH COMPANY
WORLD HEADQUARTERS
P.O. Box 389
Loveland, Colorado 80539-0389
Telephone : (970) 669-3050
FAX : (970) 669-2932
Telex : 160840

HACH EUROPE
Chaussée de Namur, 1
B-5150 Floriffoux (Namur), Belgium
Telephone : (32) (81) 44.71.71
FAX : (32) (81) 44.13.00

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Outside the U.S.A. - **Contact the HACH office or distributor serving you.**

te/dk 5/97 1ed

Hydrogen Peroxide Test Kit
Model HYP-1
Cat. No. 22917-00

Sample Preparation for Both Ranges

1. Fill the glass sample cell to the mark with the water to be tested. Use care to fill exactly to the mark.
2. Add 1 mL of Ammonium Molybdate solution to the sample cell.
3. Tear open one Sulfite 1 Reagent Powder Pillow as shown in Figure 1. Add the contents of the pillow to the sample cell.
4. Cap the sample cell and invert repeatedly to mix. Not all of the powder must dissolve. If hydrogen peroxide is present, a blue color will develop. Wait for five minutes before proceeding to Step 5. This is the prepared sample.

WARNING: The chemicals in this kit may be hazardous to the health and safety of the user if inappropriately handled. Please read all warnings before performing the tests and use appropriate safety equipment.

HACH COMPANY, P.O. BOX 389, LOVELAND, COLORADO 80359
TELEPHONE: WITHIN U.S. 800-227-4224, OUTSIDE U.S. 970-669-3050, TELEX: 160840

High Range Test Instructions

1 drop = 1 mg/L Hydrogen Peroxide

5. Fill the plastic measuring tube level full with the prepared sample. Pour the sample from the plastic measuring tube into the flask.
6. Add Sodium Thiosulfate Titrant drop by drop to the flask. Do not pause during the titration for anything other than to refill the dropper as this will cause low results. Hold the dropper vertically above the flask to add drops. Swirl the sample in the flask constantly while adding drops and count each drop as it is added. Continue to add Sodium Thiosulfate Titrant until the sample loses all blue color or is very faintly yellow.
7. Each drop used to bring about the color change is Step 6 is equal to 1 mg/L hydrogen peroxide (H_2O_2).
8. As soon as possible, rinse the glass sample cell and cap, the plastic measuring tube and the flask with clean water.

Low Range Test Instructions

1 drop = 0.2 mg/L Hydrogen Peroxide

If the result from Step 6 of the high range test is low (2 mg/L or less), it is advisable to test a larger sample to obtain a more sensitive test.

5. Follow the sample preparation instructions (Steps 1 to 4 above) with a fresh sample of water to be tested and pour the entire prepared sample from the glass sample cell into the flask.
6. Add Sodium Thiosulfate Titrant drop by drop to the flask. Do not pause during the titration for anything other than to refill the dropper as this will cause low results. Hold the dropper vertically above the flask to add drops. Swirl the sample in the flask constantly while adding drops and count each drop as it is added. Continue to add Sodium Thiosulfate Titrant until the sample loses all blue color or is very faintly yellow.

7. To calculate the mg/L of hydrogen peroxide (H_2O_2) present in the sample, multiply the number of drops used to bring about the color change in Step 6 by 0.2.

8. As soon as possible, rinse the glass sample cell and cap, the plastic measuring tube and the flask with clean water.

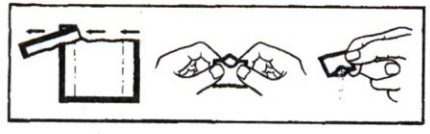

Figure 1

REPLACEMENTS

Cat. No.	Description	Unit
24491-00	Hydrogen Peroxide Reagent Set contains one each:	100 tests
2203-99	Sulfite 1 Reagent Powder Pillows*	pkg/50x2
24087-37	Sodium Thiosulfate Titrant, Stablizer	118 mL MDB**
1933-37	Ammonium Molybdate Reagent	118 mL MDB**
505-41	Flask, erlenmeyer, 50 mL	each
20849-00	Sample Cell, marked	pkg/6
21665-06	Cap, white, foam liner	pkg/6
438-00	Tube, plastic measuring	each

*Sulfite 1 Reagent is a proprietary name for a specially formulated starch-iodide reagent used in both the sulfite and hydrogen peroxide tests.

**marked dropping bottle

Note: When Cat. No. 20849-00 is ordered as a replacement for the glass sample cell it will be supplied with a black cap. Do **not** use this black cap in the hydrogen peroxide test as it will be decomposed. Always use Cat. No 21665-06 as the replacement cap for this test.

4/91

MADE IN U.S.A.

siteLAB
Petroleum Hydrocarbon Solutions

Quick Reference Guide

for Sitelab UVF-3100 Petroleum Hydrocarbon Applications

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UVF-3100 Standard Operating Procedures Version 7.0

Sample Preparation & Analysis...

Testing Soil?

Using the digital scale and spatulas, weigh 5 grams of soil into an extraction jar (within +/- 0.1 gram)

Testing Water?

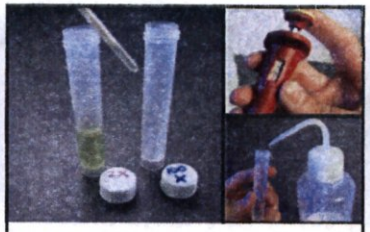
Using a plastic test tube, measure out 10 mL of water sample and add to extraction jar.

2. Add Solvent

Add Methanol to solvent dispenser bottle. Using a test tube, dispense solvent to the 10 mL line. Empty into the extraction jar. This creates a 2X Extract Dilution. Shake soil jars by hand for several minutes. Shake water jars for ten to twenty seconds.

3. Filter Extract

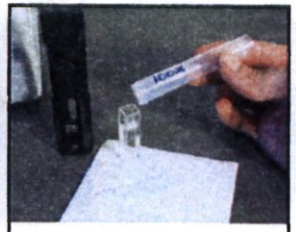
Let soil extract jars settle for a few minutes before removing lid. Suck up 2 to 4 mL of extract from the jar's surface using a syringe. Attach/screw a filter to the syringe and dispense contents into test tube. Label extract tube with sample ID and 2X Dilution – keep track!



4. Dilute Extract

Adjust the setting on the Sitelab pipette, attach a tip and use a 2nd test tube to prepare a larger dilution for analysis - in order for the sample to be detected within the analyzer's calibration range.

Recommended Dilutions:
Extract Volume + Solvent = DIL
"100"uL into 5 mL = 100X (start)
"020"uL into 10 mL = 1,000X



5. Add to Cuvette

Pour the dilution made in Step 4 into the glass cuvette. Cuvette needs to be about ¾ full. Use tissue wipes to clean outside glass to remove fingerprints and liquids. Next, carefully slide cuvette into the black cuvette holder. Be sure not to spill sample.

6. Test Sample

Lower into analyzer and close the lid. Be sure the cuvette holder's arrow shaped handle points to silver dot (to left of chamber). Wait a few seconds for concentration to stabilize. Multiply the reading by the dilution tested. Avoid readings below detection limit.

Products Used...

Sitelab test procedures listed here require the following...

UVF-3100 Analyzer & Tools:
Product No. UVF-3100A or D

- Optic Emission Filters
- Scale & Spatulas
- Adjustable Pipette
- Solvent Dispenser
- Tissues & Markers
- Software & Manual

20 Sample Extraction Kits:
Product No. EXTR010-20

Includes jars, filters, cuvettes and other materials needed to prepare samples for analysis (shown here)

WARNING! Product uses flammable alcohols – Methanol, HPLC grade. Dispose solvent waste properly.

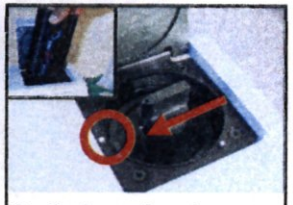
Calibrate Instrument...

1. Calibration Kit

Choose a certified Sitelab Calibration Kit for your application:

Cal Kit & Emission Optics	
GRO/BTEX	Slot B
Total PAHs/EPH	Slot A
TPH-EDRO Range	Slot A
TPH-Oil Range	Slot A
Target PAHs	Slot D

Or ask about custom kits available



2. Setup Analyzer

Turn on. Allow to warm up or press "H" to bypass. Rotate filter cylinder so that correct Emission Optics are aligned next to silver dot (to left). Press "ENT" then "2" and enter the proper Maximum Range setting (see cal kit certificate for details).

3. Calibrate

Always start using the highest calibrator first. Pour calibrator into cuvette and lower into analyzer. Be sure to enter and/or change the correct concentration. Pour calibrator back into test tube when finished. Test remaining calibrators

Quality Controls...

4. Clean Cuvette

Rinse with solvent into a waste jar between samples or calibrators. Place upside down onto tissue wipes to drain. Fill with clean methanol and analyze when prompted at end of each calibration. Wait for value to stabilize before pressing zero.

5. Check Curve

Periodically check the calibration curve for drift and linearity by testing one or two standards as if they were samples, including the methanol (as blank). To view curve and report test results, download data using Sitelab UVF3100 software

APPENDIX B

Spill Prevention, Control, and Countermeasures Plan

ENGINEER'S CERTIFICATION

I hereby certify that I or my agent has personally examined this facility and attest that this Spill Prevention, Control, and Countermeasures (SPCC) Plan has been prepared in accordance with good engineering practices, including consideration of applicable industry standards, and with the requirements of the SPCC Rule (40 CFR Part 112). I further attest that this plan establishes procedures for testing and inspections, and that this plan is adequate for this facility.

This certification will expire if there is a change in the facility design, construction, operation, or maintenance that could materially affect the potential for discharge of oil into or upon navigable waters or adjoining shorelines. Recertification of this plan is not required for non-technical changes to the plan, such as changes to names and phone numbers.

Kyle L. Petersen, P.E.
Registration No.: Alaska CE-11250

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REVIEW PAGE

In accordance with Title 40 Code of Federal Regulations (CFR) 112.5(b), a review and evaluation of this Spill Prevention, Control, and Countermeasures (SPCC) Plan is conducted at least once every five years if the temporary fuel storage area is still in use. As a result of this review and evaluation, Bristol Environmental Remediation Services, LLC (Bristol) will amend the SPCC Plan within six months of the review to include more effective prevention and control technology if: (1) such technology will significantly reduce the likelihood of a spill event from the facility, and (2) such technology has been field-proven at the time of review. Any technical amendment to the SPCC Plan shall be certified by a Professional Engineer within six months after a change in the facility design, construction, operation, or maintenance occurs that materially affects the facility's potential for the discharge of oil into or upon the navigable waters of the United States or adjoining shorelines. A Certification of the Applicability of the Substantial Harm Criteria Checklist is included as Attachment 1.

Review	Signature

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MANAGEMENT APPROVAL

Bristol is committed to the prevention of discharges of oil to navigable waters and the environment, and maintains the highest standards for spill prevention, control, and countermeasures through regular review, updating, and implementation of this Spill Prevention, Control, and Countermeasures Plan for the temporary fuel storage area constructed to support Bristol's In-Situ Chemical Oxidation (Phase I) and Intrusive Drum Removal/Landfill Cap at Northeast Cape, St. Lawrence Island, Alaska.

Molly Welker
Bristol Project Manager

Signature: Molly Welker

Date: May 13, 2009

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TABLES

FIGURES

ATTACHMENTS

ACRONYMS AND ABBREVIATIONS

ADEC	Alaska Department of Environmental Conservation
Bristol	Bristol Environmental Remediation Services, LLC
CFR	Code of Federal Regulations
EPA	U.S. Environmental Protection Agency
ISO	International Standards Organization
MOC	Main Operations Complex
PPE	personal protective equipment
SPCC	Spill Prevention, Control, and Countermeasures
TDC	Transportation and Disposal Coordinator

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1.0 FACILITY OWNER AND OPERATOR

1.1 FACILITY OWNER ADDRESS AND TELEPHONE

Bristol Environmental Remediation Services, LLC (Bristol)
111 West 16th Avenue, Third Floor
Anchorage, Alaska 99501
Contact: Molly Welker
Phone: 907-563-0013

1.2 LAND OWNER ADDRESS AND TELEPHONE

Sivuqaq Incorporated - Native Corporation
P.O. Box 101
Gambell, Alaska 99742
Tel: 907-985-5826
Fax 907-985-5426
E-mail sivuqaq@gci.net

Savoonga Native Corporation
PO Box 150
Savoonga, Alaska 99769
Tel: (907) 984-6613

1.3 DESIGNATED PERSON RESPONSIBLE FOR SPILL PREVENTION

Chuck Croley, Bristol Site Superintendent
Bristol Environmental Remediation Services, LLC (Bristol)
111 West 16th Avenue, Third Floor
Anchorage, Alaska 99501
Business Phone: 907-563-0013
Cell Phone: (907) 242-7402

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2.0 FACILITY AND EMERGENCY CONTACTS

NAME/AGENCY	PHONE
GOVERNMENT REPORTING	
National Response Center	1-800-424-8802
Alaska Department of Environmental Conservation (ADEC) Fairbanks Office	907-451-2121
ADEC – After Hours	1-800-478-9300
U.S. Coast Guard	907-581-3466 907-391-2733 (24 Hr.)
SPILL RESPONSE ORGANIZATIONS	
Alaska Chadux Corporation	907-348-2365 (24 Hr.)
B.C.S. Consulting Service	907-457-6825
SPILL PREVENTION MANAGER	
Chuck Croley – Bristol Site Superintendent/Spill Prevention Manager	1-206-973-0239 907-242-7402 (Cell)
PROJECT MANAGER	
Molly Welker, Bristol Project Manager	907-563-0013 (Office)
Carey Cossaboom, USACE Project Manager	907-753-2689
EMERGENCY CONTACTS	
Base Camp (Also for Medical Emergencies)	1-206-973-0239
Alaska State Troopers (Anchorage)	907-269-5511
Alaska State Troopers (Nome)	907-443-2441
Norton Sound Health Corporation Medevac	907-443-3311
Providence Hospital (Anchorage)	907-562-2211
Alaska Regional Hospital (Anchorage)	907-264-1222
Alaska Native Medical Center (Anchorage)	907-563-2662
Alaska Native Medical Center (Emergency)	907-729-1729

Notes:
Bristol = Bristol Environmental Remediation Services, LLC

Reporting requirements will follow Alaska Department of Environmental Conservation (ADEC) spill reporting guidelines (see Section 8.6). The National Response Center (single-

source contact for all federal agencies) should be notified first, followed by the ADEC. In an emergency, or if a spill has entered or threatens to approach water, the U.S. Coast Guard should be notified immediately. The U.S. Environmental Protection Agency (EPA) notification is required for a single spill discharged to navigable water that is greater than 1,000 gallons, or two spills discharged to navigable water within any 12-month period that are greater than 42 gallons each. Alaska Chadux Corporation or B.C.S. Consulting Service can be contacted for spill response and cleanup operations.

3.0 FACILITY LOCATION AND SETTING

3.1 FUEL FACILITY LOCATION

The temporary fuel facility is located on the Northeast Cape on St. Lawrence Island (Figure 1). The site is located at 63 degrees 20 minutes north latitude, by 168 degrees 59 minutes west longitude, in Township 25 South, Range 54 West, Kateel River Meridian. The temporary fuel storage facilities will be used to support the U.S. Army Corps of Engineers, Alaska District, project for In-Situ Chemical Oxidation (ISCO) and Intrusive Drum Removal/Landfill cap. The fuel will be used for heavy equipment personnel support vehicles/equipment and construction camp generators.

3.2 SITE HISTORY

In June 2009, Bristol will mobilize ten 5,500-gallon International Standards Organization (ISO) tanks containing diesel and one 5,500-gallon ISO tank containing unleaded gasoline (filled to 5,000 gallons each). The ISO tanks will be unloaded from the barge at St. Lawrence Island, loaded on a trailer, and then trucked to the temporary fuel storage facility.

At the completion of the project, the ISO tanks will be loaded on a flatbed truck with a crane or a forklift, returned to the beach, and loaded aboard the barge for demobilization to Anchorage, Alaska. The completion of the project will occur at the end of the summer (approximately September 2009).

3.3 DRAINAGE PATHWAY AND DISTANCE TO NAVIGABLE WATERS

The main temporary fuel storage facility is about 8.000 feet southwest of Kitnagak Bay on a gravel pad immediately southeast of the Former Main Operations Complex (MOC) Area (Figure 2). The topography slopes gently northeast from the main fuel storage location to Kitnagak Bay. The Suqitughneq River is located approximately 2,000 feet from the temporary facility. A distinct drainage pathway to the Suqitughneq River exists approximately 750 feet northwest of the area of the main temporary fuel storage facility. Figure 3 shows the drainages in the vicinity of the temporary fuel storage facility. The Certification of the Applicability of the Substantial Harm Criteria Checklist is included as Attachment 1.

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4.0 FACILITY DESCRIPTION

4.1 FUEL FACILITY LAYOUT

4.1.1 General Description

The layout for the main temporary fuel storage facility is shown on Figure 4. The main temporary fuel storage facility will be constructed on a gravel pad immediately southeast of the former MOC Area.

4.1.2 Fuel Storage

The eleven 5,500-gallon ISO tanks at the temporary fuel storage facility will have a maximum fuel storage capacity of 60,500 gallons (maximum stored capacity will be no greater than 55,000 gallons). The ISO tanks are single-walled, stainless-steel material with a shell thickness of 0.24 inches.

Ten ISO tanks will store diesel fuel and one will store gasoline. Table 1 identifies the fuel tanks and assigns a tank ID number for the purpose of Spill Prevention Control and Countermeasures (SPCC).

Table 1 Fuel Storage Tanks

Tank ID	Tank Capacity (Gallons)	Contents	Maximum Quantity Stored (Gallons)	Tank Description
1 through 10	5,500 (ea)	Diesel No. 2	50,000 (91% Capacity)	Single-walled, ISO tanks with stainless-steel spill boxes on top fittings
11	5,500 (ea)	Unleaded Gasoline	5,000 (91% Capacity)	Single-walled, ISO tanks with stainless-steel spill boxes on top fittings

Notes:

% = percent
ea = each
ID = identification
ISO = International Standards Organization

4.1.3 Containment

At the main temporary fuel storage facility, the ISO tanks will be placed in a common secondary containment area. This containment area will be constructed on a laydown area

immediately southeast of the MOC Area. Figure 4 shows a cross section and dimensions of the containment berm and ISO tanks.

Granular fill from the borrow pit will be transported to the location and spread to level and expand the area. Because the fill is somewhat angular and sharp, a minimum one-fourth inch-thick geotextile will be laid over the rock and then covered with Typar® liner, and finally a 20-mil Hypalon™ liner as the impervious containment surface. Berms will be created with soil transported from the borrow pit. The Hypalon® liner will be laid over the berms and secured with sand bags.

The minimum inside length of the containment berm will be 78 feet, and the minimum inside width will be 30 feet. The berm will be built to a height of 2.0 feet. The maximum expected rain event for one day is estimated to be 2.36 inches. The volume of the containment berm using these dimensions and the one-day maximum storm precipitation was calculated to be 7,809 gallons.

4.1.4 Fuel Delivery to St. Lawrence Island

Each 5,500-gallon ISO tank will be fueled in Anchorage, Alaska, before the tanks are loaded and mobilized to St. Lawrence Island. At St. Lawrence Island, the ISO tanks will be offloaded onto a flatbed truck and transported to the main temporary fuel storage area at the construction camp. At the main temporary fuel storage locations, the ISO tanks will be placed within the bermed secondary containment area. No refueling or transfer of contents between ISO tanks will take place on the island.

4.2 OPERATING PROCEDURES

Fuel from the main temporary fuel storage location will be transferred into the 900-gallon-capacity oiler truck. Fuel will be transferred to the oiler truck by a 3-inch pump and hose equipped with dry-break connectors and Camlock fittings. The truck will be parked outside the containment berm, and spill pans will be placed beneath the connection to the tank on the oiler truck. The ISO tanks will not be connected to one another using a manifold system. The oiler truck will be used to transport and dispense fuel to the camp generators, and to individual pieces of equipment Bristol will operate on the island.

Diesel and unleaded gasoline will be dispensed to equipment storage tanks and to individual vehicles using a conventional 1-inch-diameter hose and fuel nozzle. An electrically-powered fuel transfer pump will be placed inside the containment berm. For vehicles, spill pans will be placed beneath the fill port during refueling.

The following procedures will be adhered to during all fueling operations to or from the fuel tanks:

- Parking brakes are on. The vehicle is blocked. The engine is off unless required to operate the fuel transfer pump;
- The delivery hose and all valves and piping are checked for visible leaks, cracks, or damage;
- A check is made to ensure that valves are in the proper position;
- A drip pan is placed underneath nozzle connections and under hose connections, if required;
- Fuel levels of the target tank are checked to determine how much product the fuel tank can take. The target amount is not to exceed 90 percent of the tank capacity;
- During the transfer, flow is restricted to a reduced rate until it is certain that the product is flowing correctly. Once the pump is running, the operator must remain ready for emergency shut-downs until all fluid is transferred. The transfer rate is again reduced when the 90 percent level is approached. All personnel must be notified when the transfer operation is nearing completion;
- Once fueling is complete, valving is closed so that fuel can no longer be transferred from the tank. Any fuel remaining in the piping or transfer hose is be collected and returned to the appropriate tank;
- All valves on the truck are closed. The hose, valves, and surrounding ground are checked for leaks; and
- If leaks are found, absorbent pads are used to capture any fuel prior to unblocking the tires and leaving the area.

4.3 FACILITY INSPECTION AND MAINTENANCE

4.3.1 Facility Inspection

A formal fuel facility inspection is to be performed every week and logged on the form provided as Attachment 2, Fuel Facility Inspection Checklist. All inspections must be signed by the Inspector, reviewed and initialed by the designated person, and filed in the SPCC files.

These records will be kept for a minimum of three years. Staff familiar with fuel facility operations will perform regular walkthroughs of the facility.

If any spills are found during the inspections, ADEC spill identification and notification procedures must be followed (Attachments 3 and 4). Areas of inspection are listed below:

- General Housekeeping. It is essential that the facility be kept clean and free of unnecessary items. Only items directly related to the operation of the facility and the storage of fuels should be in the containment areas. Personnel will perform formal monthly and informal regular checks of the facility for cleanliness and make corrections immediately. Any serious problems will be recorded and filed.
- Safety Equipment. A check will be made to ensure the availability of all fire extinguishers, safety signs, and other safety equipment. Any discrepancies will be recorded and corrected immediately.
- Signs. A check will be made to ensure that all required signs are in place. The following signs are required:
  - Tank signs – tank content indicated on the tanks;
  - Hazard placards;
  - Tank identification numbers;
  - "No Smoking" signs in storage, secondary containment, and fuel dispensing areas;
  - ADEC Discharge Notification and Reporting Placard (Attachment 3); and
  - Signs warning drivers of tank proximity.
- Security. A check will be made for any notable security issues. Security concerns will be addressed as soon as possible.
- Tanks. A check will be made for chipped or worn paint, drip marks and leaks, discoloration of tanks, corrosion, and cracks. Particular attention will be made for "weeping" or "wet" staining on the tank near the ground, which may signify internal leaking.
- Tank Supports and Foundations. These will be checked to see if the tanks are stable and level to ensure the foundations and supports are not weakening. Particular attention will be focused on cracks and gaps between the tank and foundation.
- Pumps and Hoses. Pumps, valves, and connections will be checked for leaks and drips. All spills will be immediately cleaned up and maintenance will be scheduled as required. All hoses will be inspected for cracks, leaks, or other signs of weakening and replaced as soon as possible. A check will be made to ensure that hoses are kept on hose reels or in a protected manner when not in use.

4.3.2 Spill Response Equipment Inventory and Inspection

All spill response equipment will be inspected once a week and after any event during which any of the equipment is used. This inspection will entail a complete inventory and an operational check of emergency response and support equipment (such as pumps). All deficiencies will be corrected as soon as possible, any new equipment added to the list, and the updated list filed in the SPCC files.

4.4 TRAINING

4.4.1 Initial SPCC Training

Any person who is to operate fuel storage and delivery equipment will receive training when initially hired, or when assigned duties that involve fuel handling or storage. Initial training will include operation, maintenance, and SPCC functions. As a minimum, all personnel must read the SPCC Plan and document that they have read and understood it. Training will be documented on the form provided in Attachment 5, Spill Response Team Training, Drill, and Exercise Log. This record will be maintained in the SPCC files, for at least three years.

4.4.2 Spill and Safety Briefings

Spill and safety briefings will be provided to all new personnel upon employment and regularly to all available personnel who operate and/or maintain fuel and/or equipment. The briefings will include any changes or problems with the equipment or facility, any new procedures, or any other information that could help prevent accidents and spills. The subjects covered at the briefing and attendance will be documented on the form provided in Attachment 6, Record of Attendance for Spill Response and Safety Meetings. In lieu of a meeting, a written briefing may be issued. The form contained in Attachment 6 will be attached to the written briefing. Personnel will be required to sign the form once they read and understand what it says. The signed forms will be maintained in the SPCC records.

4.5 FUEL FACILITY RECORD KEEPING

Records of all activities pertaining to the fuel facility will be maintained on file by Bristol in the SPCC documents for this project, for a period of at least three years. These records include, but are not limited to:

- Copies of Inspections;
- Operator Inspections;
- Government Inspections;
- Maintenance Records;
- Records of Major Maintenance and Construction;
- Pressure Testing of Tanks;
- Visual Integrity Inspections;
- Fuel Inventory Records;
- Training Documents;
- Training Records;
- Exercise and Safety Briefing Logs;
- Equipment Operating Procedures;
- Training Manuals;
- Oil Spill Records;
- Notification Reports;
- After-action Reports;
- SPCC Plan; and
- SPCC Correspondence.

5.0 SPILL HISTORY

The main temporary fuel storage facility is newly constructed and provides support necessary for Bristol's 2009 site activities. No spills have occurred at this location from operation of the temporary facility. The facility will be inspected regularly by personnel. An inspection will be made for indications of spilled fuel (including stains, odors, and stressed vegetation).

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6.0 POTENTIAL SPILLS AND CONTROL MEASURES

Table 2 presents potential spill predictions, volumes, and rates for this project.

Table 2 Potential Spill Predictions, Volumes, and Rates

Source	Type of Failure	Tank Volume (Gallons)	Maximum Spill Volume (Gallons)	Direction of Flow	Containment	Ratio (Cont./Vol.)
ISO Tank	Rupture, leakage	5,500	5,000	Into surrounding soil	Secondary containment with impermeable liner	1,200% (main); >110% (auxiliary)
Oiler Truck Loading	Rupture, piping failure, valve failure	900	855	Into surrounding soil	By boom and absorbent pads	100% if boom is placed in time
Transfer Hose/ Pump	Pipe/hose rupture	9	8 (estimated maximum)	Into surrounding soil	By boom and absorbent pads	100% if boom is placed in time

Notes:
% = percent ISO = International Standards Organization
Cont. = containment Vol. = volume

6.1 TANK FAILURE

A puncture or rupture of tanks is unlikely because of the berm surrounding the tanks. If a valve is broken by violent contact, the complete drainage of any tank is possible. Valves are unlikely to break from freezing because this is a seasonal camp.

A complete spill from a tank would be contained within the containment berm. Fuel spilled outside the tank, within the containment berm, could be pumped into tanker trucks, or into 55-gallon drums. Recovered fuel would be stored in 55-gallon drums or other containers until they are properly disposed of.

A spill traveling towards the river would require the placement of boom to contain the flow. Initial recovery could be performed with heavy equipment, shovels, absorbent pads, drums

and other containers, and a portable pump, if needed. Long-term treatment and storage of contaminated soil would be required.

6.2 BROKEN HOSE CONNECTION

6.2.1 Transfers From Fuel Truck

Generators and vehicles will be filled by the fuel truck hose. The maximum capacity of the truck pump is estimated at approximately 900 gallons. Spill containment (spill buckets) will be provided for hose connections. If a hose connection or the pumping system were to break during fueling operations, the spill would likely be spilled onto the surrounding soil. The spill would likely be noticed immediately, and the operator would most likely stop pump operations within one minute. The estimated maximum amount of spilled fuel from such an event would not be more than 200 gallons. Some of, or the majority of, such a spill would likely be cleaned up before it could affect navigable waters. Absorbent pads, pumps, boom, and other means would be used to recover the fuel. Contaminated water, soil, or fuel could be pumped into 55-gallon drums for future disposal.

The chance of a hose break is considered to be low. If a hose is ruptured during fueling operations, the amount of fuel spilled will depend on how fast the operator shuts off the pump. In most cases, the operator will shut off the pump immediately. An estimated 200 gallons of fuel could be spilled in this scenario. However, the exact location of a hose break cannot be known until the break occurs, so it must be assumed that any spill could travel to the shoreline. Absorbent pads, boom, emergency soil berms, portable fuel pumps, and other manual methods may be required to stop the flow and recover the fuel. Some long-term treatment of the soil would be expected.

6.3 OVERSPILLS

An overspill of the generators or vehicles while fueling is possible if the tanks and/or fuel truck are not carefully monitored during fueling operations. Flow control for the generator tank is achieved through constant monitoring of the tank level. Because none of the tanks have automatic shut-off capabilities, an overspill during fueling is possible, even when closely monitored. In the event of an overspill, the operator will stop pumping immediately.

Absorbent pads, pumps, and oil/water separators would normally be used to recover this fuel. Soil berms, boom, and other means of containment and recovery would be required in the event that fuel overflows from the primary containment. In this case, immediate spill response would be needed to ensure that fuel does not enter the river.

Fuel levels will be carefully monitored at all times during fuel transfers. Poor monitoring could result in a severe spill. An emphasis should be placed on the need for continual training, awareness, and education.

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7.0 EVALUATION OF COUNTERMEASURES

This section evaluates compliance of the temporary fuel storage tanks with spill prevention regulatory requirements. Paragraph titles reflect specific areas of concern outlined in Title 40, Code of Federal Regulations, Section 112 (40 CFR 112) and other related documents. Each area of concern is rated as SATISFACTORY, NOT APPLICABLE, or UNKNOWN. The rating in this case was derived from observations of prevailing conditions collected from data collected during previous temporary fuel storage operations. Any limitations are so noted and discussed in the body of this SPCC Plan. Operational and design issues may exist at the site that were not identified during the site visits.

7.1 INSPECTIONS, TESTS, AND RECORDS, 40 CFR 112.7(E)

(SATISFACTORY) Under the requirements of this SPCC Plan, employees inspect the fuel facility regularly during their normal work functions, and weekly during the fuel facility inspection. The inspections are logged using the Fuel Facility Inspection Checklist provided as Attachment 2. The completed forms will be signed by the fuel systems manager and kept on file for three years.

7.2 PERSONNEL, TRAINING, AND DISCHARGE PREVENTION PROCEDURES [40 CFR 112.7(F)]

7.2.1 Personnel Instructions [40 CFR 112.7(f)(1)]

7.2.1.1 Annual Training

(SATISFACTORY) Because the fuel storage facilities are temporary, new workers involved with fuel handling will attend an initial training session that will meet the requirements of the annual training.

7.2.1.2 Annual Exercises

(SATISFACTORY) Because the fuel storage facilities are temporary, annual exercise requirements will be met by accomplishing an initial "tabletop" spill scenario on site, at the beginning of the project. All employees that operate fuel facility equipment will attend the "tabletop" exercise in operations and spill prevention. Training, exercise, and inventory procedures will be established under this SPCC Plan and all associated records maintained in

the SPCC Records. A reporting placard is included with this SPCC Plan, and should be prominently displayed at the fuel facility. A Spill Response Team Training, Drill, and Exercise Log is provided as Attachment 5.

7.2.1.3 Weekly Spill Response and Safety Meetings

(SATISFACTORY) Each week, employees will be provided a spill response and safety briefing. This briefing will be in a verbal or written format, such as applicable current news articles, and will be tailored to this fuel facility. The briefing will be documented on the Record of Attendance for Spill Response and Safety Meetings attendance record, provided as Attachment 6, and will be maintained in the project file.

7.2.2 Designated Person Accountable for Spill Prevention, 40 CFR 112.7(f)(2)

(SATISFACTORY) The Site Superintendent is Mr. Chuck Croley. He is assigned as the Spill Prevention Manager, and is the designated person accountable for spill prevention at the fuel facility.

7.2.3 Spill Prevention Briefings, 40 CFR 112.7(f)(3)

(SATISFACTORY) Spill prevention briefings will be given monthly. Sign-in sheets (Attachment 6) will be maintained with the other SPCC records, and kept on file for three years in the SPCC records.

7.3 Site Security, 40 CFR 112.7(g)

7.3.1 Fencing, 40 CFR 112.7(g)(1)

(NOT APPLICABLE) The fuel storage facility is located at a remote site that will be occupied only by contractors and agency representatives. The nearest village, Savoonga, is located approximately 60 miles west of the project site. The remote nature of the site will provide adequate security for the fuel facility.

7.3.2 Flow Valves Locked, 40 CFR 112.7(g)(2)

(SATISFACTORY) When construction operations are completed, all valves on all ISO tanks will be locked. Individual ISO tank openings will be secured with wire tag seals, unless being used.

7.3.3 Starter Controls Locked, 40 CFR 112.7(g)(3)

(SATISFACTORY) Fuel will be transferred by electric- or gasoline-powered transfer pumps that will be connected and operated only when fuel transfer is taking place.

7.3.4 Loading/Unloading Connections Securely Capped, 40 CFR 112.7(g)(4)

(SATISFACTORY) There are no pipeline loading/unloading connections. Individual ISO tank openings will be secured with wire tag seals, unless being used.

7.3.5 Lighting Adequate to Detect Spills, 40 CFR 112.7(g)(5)

(SATISFACTORY) Fuel transfer and weekly fuel facility inspections will take place during daylight hours only. Daylight will be prevalent given the seasonal operation (summer), and northern latitude of the site.

7.3.6 Facility Loading/ Unloading Rack, 40 CFR 112.7(h)

(NOT APPLICABLE) The facility does not have a loading rack.

7.4 Brittle Fracture, 40 CFR 112.7(i)

(NOT APPLICABLE) There are no field-constructed tanks at the facility.

7.5 Drainage Control, 40 CFR 112.8(b)

7.5.1 Drainage from Diked Storage Areas, 40 CFR 112.8(b)(1)

(SATISFACTORY) Water that accumulates in the containment dike of the temporary fuel storage facility will be pumped directly onto the ground if there is no evidence of petroleum sheen. If petroleum sheen is evident, the water will be treated at the wastewater treatment facility, located at Site 7, before discharge to the ground.

7.5.2 Valves Used on Diked Storage Areas, 40 CFR 112.8(b)(2)

(NOT APPLICABLE) There are no valves on the diked storage area.

7.5.3 Facility Drainage Systems and Equipment, 40 CFR 112.8 (b)(3), (4), and (5)

(NOT APPLICABLE) There are no drainage systems at the diked containment area. No treatment units or slop tanks for contaminated water treatment will exist at the main temporary fuel storage facility. Water treatment, if necessary, will occur at the wastewater treatment facility located at Site 7.

7.6 Bulk Storage Containers/Secondary Containment, 40 CFR 112.8(c)

7.6.1 Tank Compatibility with Its Contents, 40 CFR 112.8(c)(1)

(SATISFACTORY) All ISO tanks are constructed of stainless steel, welded in accordance with American Petroleum Institute standards, and are compatible with the contents they hold.

7.6.2 Diked Area Construction and Containment Volume for Storage Tanks, 40 CFR 112.8(c)(2)

(SATISFACTORY) The main temporary fuel storage facility will have bermed and lined secondary containment capable of containing a minimum capacity of the largest tank volume, plus anticipated storm water.

7.6.3 Drainage of Uncontaminated Rainwater, 40 CFR 112.8(c)(3)

(SATISFACTORY) Rainwater that accumulates in the containment dike of the temporary fuel storage facility will be pumped directly onto the ground if there is no evidence of petroleum sheen. If petroleum sheen is evident, the water will be treated at the wastewater treatment facility, located at Site 7, before discharged to the ground.

7.6.4 Corrosion Protection of Buried Metallic Storage Tanks, 40 CFR 112.8(c)(4)

(NOT APPLICABLE) There are no buried metallic storage tanks.

7.6.5 Corrosion Protection of Partially Buried Metallic Tanks, 40 CFR 112.8(c)(5)

(NOT APPLICABLE) There are no partially buried metallic tanks.

7.6.6 Aboveground Tank Periodic Integrity Testing, 40 CFR 112.8(c)(6)

(SATISFACTORY) Because the tanks are shop-built containers with a capacity of 5,500 gallons each, equivalent integrity testing is provided in the form of visual inspections for the storage tanks, and barriers are provided between the tanks and the ground (diked containment area).

7.6.7 Control of Leakage Through Internal Heating Coils, 40 CFR 112.8(c)(7)

(NOT APPLICABLE) None of the tanks at the facility have internal heating coils.

7.6.8 Tank Installation Fail-safe Engineered, 40 CFR 112.8(c)(8)

(SATISFACTORY) Tanks are located within a diked containment. A complete tank failure is unlikely. Any spills would be contained within the dike.

7.6.9 Disposal Facilities for Effluent Discharge, 40 CFR 112.8(c)(9)

(NOT APPLICABLE) The fuel facility is not equipped with an effluent discharge system.

7.6.10 Visible Leak Corrections, 40 CFR 112.8(c)(10)

(SATISFACTORY) Visible leaks are reported to the Site Superintendent and fixed immediately. Spilled fuel is cleaned up immediately with absorbent pads or other applicable spill response equipment. Soiled pads and other similar spill control equipment would be kept in an overpack drum until they can be removed from the island or burned in an approved manner.

7.6.11 Portable Oil Storage Tanks, 40 CFR 112.8(c)(11)

(SATISFACTORY) All portable tanks at the temporary fuel storage facility will be in secondary containment structures with sufficient freeboard to contain the capacity of the largest tank in the dike, and expected maximum rainfall.

7.7 Facility Transfer Operations, 40 CFR 112.8(d)

7.7.1 Buried Piping Installation Protection and Examination, 40 CFR 112.8(d)(1)

(NOT APPLICABLE) No buried piping installations are present.

7.7.2 Not-in-service and Standby Service Terminal Connections, 40 CFR 112.8(d)(2)

(NOT APPLICABLE) There are no not-in-service or standby service terminal connections at this facility.

7.7.3 Pipe Supports Design, 40 CFR 112.8(d)(3)

(NOT APPLICABLE) The facility does not have a piping system.

7.7.4 Aboveground Valve and Pipeline Examination, 40 CFR 112.8(d)(4)

(SATISFACTORY) Aboveground valves will be examined during the weekly inspections. These inspections will be documented using the Fuel Facility Inspection Checklist (Attachment 2) and will be kept in the Site Superintendent's spill response files for at least three years. Bristol personnel will also observe valves periodically during each workday and will be instructed to report any problems to the Site Superintendent. There are no aboveground pipelines.

7.7.5 Protection from Vehicles, 40 CFR 112.8(d)(5)

(SATISFACTORY) The ISO tanks will be kept inside a bermed containment area, with a distance of 11 feet between the outside berm and the tanks. Speed limits in the vicinity of the ISO tanks will be 10 miles per hour, and will be discussed at safety meetings and posted.

7.8 Spill Control Equipment

(SATISFACTORY) Sufficient spill equipment is available to contain a catastrophic spill of one of the 5,500-gallon ISO tanks inside the lined and bermed facilities. Sufficient spill equipment is also available to contain a spill associated with fuel transfer from the main temporary fuel storage facility to the oiler truck. Table 3 presents spill control equipment at Bristol's project site.

Table 3 Spill Control Equipment

Amount	Material	Location	Inspection Remarks
3	55-gallon overpack drums	Various	New and complete
1	95-gallon overpack drum	Various	New and complete
20	3-inch by 12-foot SOCs™	Various	New and complete
12	3-inch by 4-foot SOCs	Various	New and complete
32	18-inch by 18-inch absorbent pillows	Various	New and complete
2,200	18-inch by 18-inch absorbent pads	Various	New and complete
800	12-inch by 12-inch absorbent wipes	Various	New and complete
25	Disposal bags	Various	New and complete
2	Rolls of 3-foot by 120-foot absorbent pad	Various	New and complete
1	750 feet of containment boom	Various	New and complete

Field first aid-kits and fire extinguishers will be available in all field vehicles. A fuel transfer pump, personal protective equipment (PPE), and 55-gallon drums will be available for spill cleanups. Heavy equipment, shovels, and other miscellaneous tools will also be available.

(Intentionally blank)

8.0 SPILLS

This section addresses procedures designed to prevent spills, and provides contingency measures for mitigation of any spills that occur during the performance of this project. The procedures discussed in this section cover control of detected spills.

8.1 GENERAL PROVISIONS

All employees will be properly trained and supervised in protocols for hazardous waste operations and emergency spill response. Proper equipment, procedures, and safeguards will be used when handling waste materials. To minimize the frequency of spills, personnel will be instructed during daily safety briefings on the proper methods for transferring and handling hazardous materials.

8.2 LIKELY SPILL SCENARIOS

Activities that could result in a spill include fueling activities associated with equipment use. A release of hazardous materials to the land could occur during equipment fueling, or transfer operations, such as from hose rupture or overfilling.

8.3 SPILL RESPONSE EQUIPMENT

To minimize the impact of spilled material by quick response, Bristol will maintain emergency spill response kits on site. Each kit will contain absorbent materials (oil sorbent pads and booms) and PPE (safety glasses or goggles, chemical-resistant gloves, Tyvek® suits and booties, etc.). Personnel on site will be familiar with the contents and use of the kits. In addition, each vehicle on site will carry oil-sorbent pads.

Spill response materials will also be maintained at the fueling station and inside vehicles. These materials include universal and oil-only sorbent materials, and PPE. The vehicles will have spill kits containing oil-sorbent pads and an "SPC Attack Pac™". The SPC Attack Pac contains materials to absorb up to 7 gallons of liquid spills. Personnel working at the fueling station will be familiar with the type of hazardous materials stored there, and will be instructed in the appropriate spill response procedures.

8.4 SPILL RESPONSE PROCEDURES

Bristol will contain any spill and stop all work in areas of release if there is any reason to believe the spill represents a safety concern. The following procedures will apply in the event of a spill:

- Protect project personnel and notify the Site Superintendent.
- Identify contaminant spilled, source of release, volume of release, and any associated contaminated media (such as soil).
- Take necessary personal precautions, isolate or segregate contaminated material from human contact (using temporary berms, absorbents, and shut-off valves, as necessary).
- Take immediate measures, using properly protected personnel, to control the discharge at its source and contain the release.
- Keep combustibles and ignition sources away from spilled materials.
- Take additional actions and request outside assistance, as required.

These procedures for response to spills and releases will be reviewed weekly as part of the health and safety meetings. The following sections further outline typical spill resources Bristol will employ in the event of the release of a contaminant to land.

8.4.1 Release to Water

- Contain and absorb using absorbent booms, roll absorbent, or other appropriate mechanisms.
- Eliminate and contain the spill source.
- Place absorbent between the spill source and its most direct pathway(s) to surface water access, as close to the source as possible.
- Locate and establish spill absorbent downgradient where product may collect.
- Place absorbent in other downgradient areas likely to collect spilled product.
- Change collected absorbent as necessary and store in U.S. Department of Transportation-approved containers.

8.5 SPILL REPORTING PROCEDURES

In the event of a spill, Bristol will provide all emergency measures necessary, including notifying appropriate personnel and containing the spill. The Transportation and Disposal Coordinator (TDC) will serve as Bristol's on-site representative for spill and release reporting.

The TDC will receive training for these procedures and be familiar with all aspects of implementation. The following chain of communication will be used in case of a spill:

- Site personnel will first contact Bristol's Site Superintendent.
- Bristol's Site Superintendent will contact the appropriate agencies.
- All spills will be reported using the Oil Discharge Notification Form (Attachment 4).

8.6 NOTIFICATIONS

Upon discovery of a spill, the appropriate parties listed below will be notified. Use the Oil Discharge Notification Form (Attachment 4) to document all releases. Immediate notifications should not be delayed by lack of any information required on the Oil Discharge Notification Form. The ADEC notification and reporting requirements is provided as Attachment 3.

8.6.1 Discharge to Water

For any discharge to water, immediately notify (verbally):

- National Response Center (1-800-424-8802);
- U.S. Coast Guard ((1-907-391-2733);
- ADEC, Fairbanks District Office (907) 451-2121;
- EPA (if single spill greater than 1,000 gallons, or two spills discharged to navigable water within any 12-month period that are greater than 42 gallons each).

8.6.2 Discharge to Land

- For any discharges to land of greater than 55 gallons, immediately notify (verbally).
  - National Response Center (1-800-424-8802);
  - U.S. Coast Guard ((1-907-391-2733);
  - ADEC, Fairbanks District Office (907) 451-2121;
  - EPA (if single spill greater than 1,000 gallons, or two spills discharged to navigable water within any 12-month period that are greater than 42 gallons each).
- Discharge to Land (less than 55 gallons):
  - Within 48 hours (written): ADEC, Fairbanks District Office (fax 907-451-2188) – releases exceeding 10 gallons, but less than 55 gallons, outside of secondary containment;

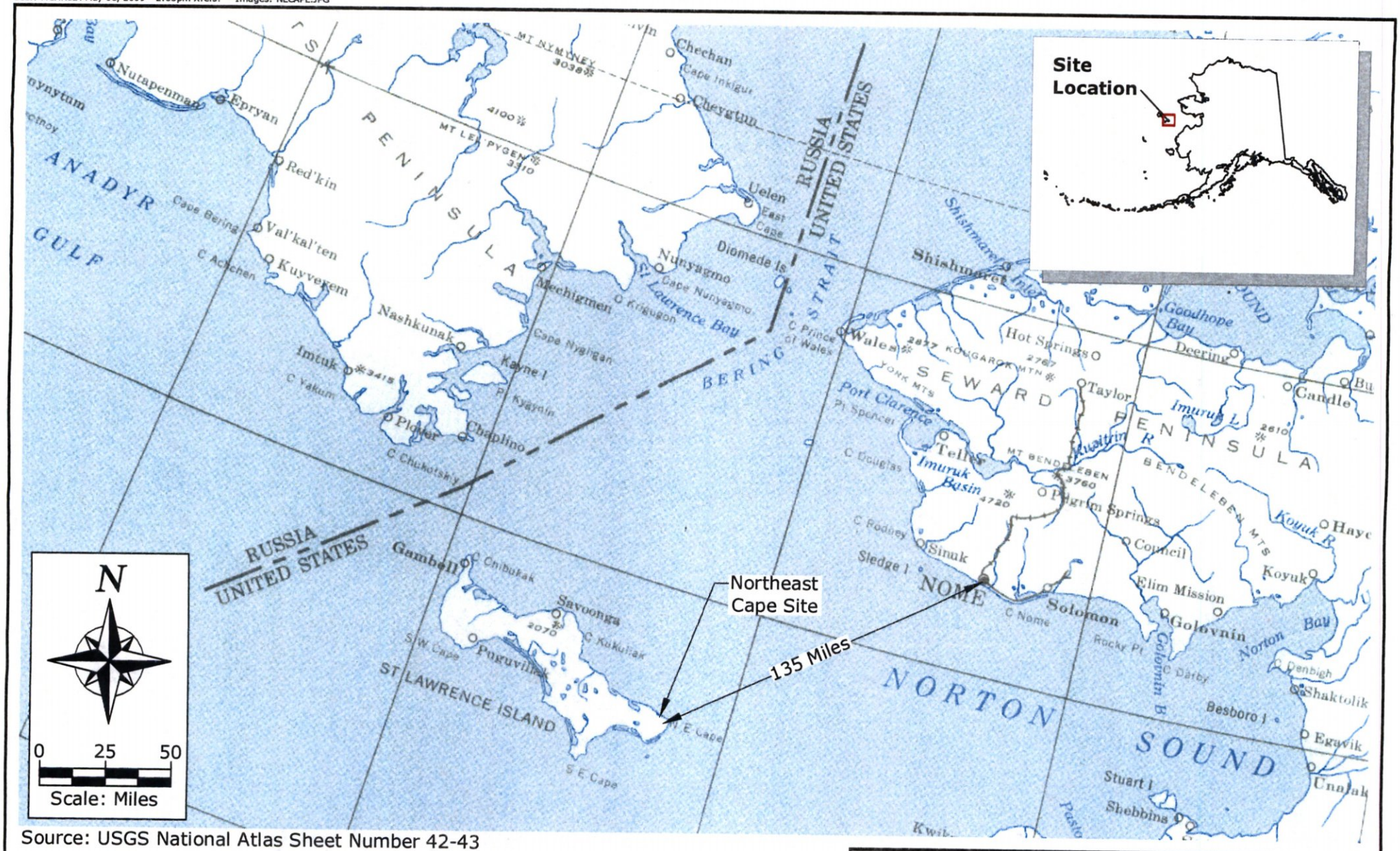
- Monthly (written): ADEC Fairbanks District Office (fax 907-451-2188) – less than 10 gallons. Interim reports will be submitted when the total of separate releases of less than 10 gallons accumulates to exceed 10 gallons.

8.7 CONTAINMENT PROCEDURES

- Establish an exclusion zone to control access to the site. Smoking and open flames are banned within the exclusion zone.
- Prevent release of additional product by using the following procedures, as appropriate:
  - Close valves.
  - Set upright the container releasing the product.
  - Plug punctures with wooden pegs, sticks, rags, or absorbent pads.
  - Move the container into a lined containment area.
- Contain the released product by using the following procedures, as appropriate:
  - Construct earthen berms downgradient of the product.
  - Apply granular sorbent or absorbent pads and booms.
  - Collect free product with barrel pumps, buckets, skimmers, or other physical means.
- Clean up the spill by using the following procedures:
  - Recover free product.
  - Excavate affected soils and place in containment cells.
  - Gather contaminated spill response materials and place in sealable drums for disposal.
- Provide follow-up notification to appropriate parties listed in Section 8.6.

FIGURES

Drawing: O:\JOBS\49028 NECAPE LANDFILL\ACAD-ENVIRO\SPCC\DWG\49028_FIG1_SPCC_MAY09.DWG - Layout: 49028_FIG1_SPCC_MAY09
User: MGARCIA May 08, 2009 - 2:05pm Xrefs: - Images: NECAPE.JPG

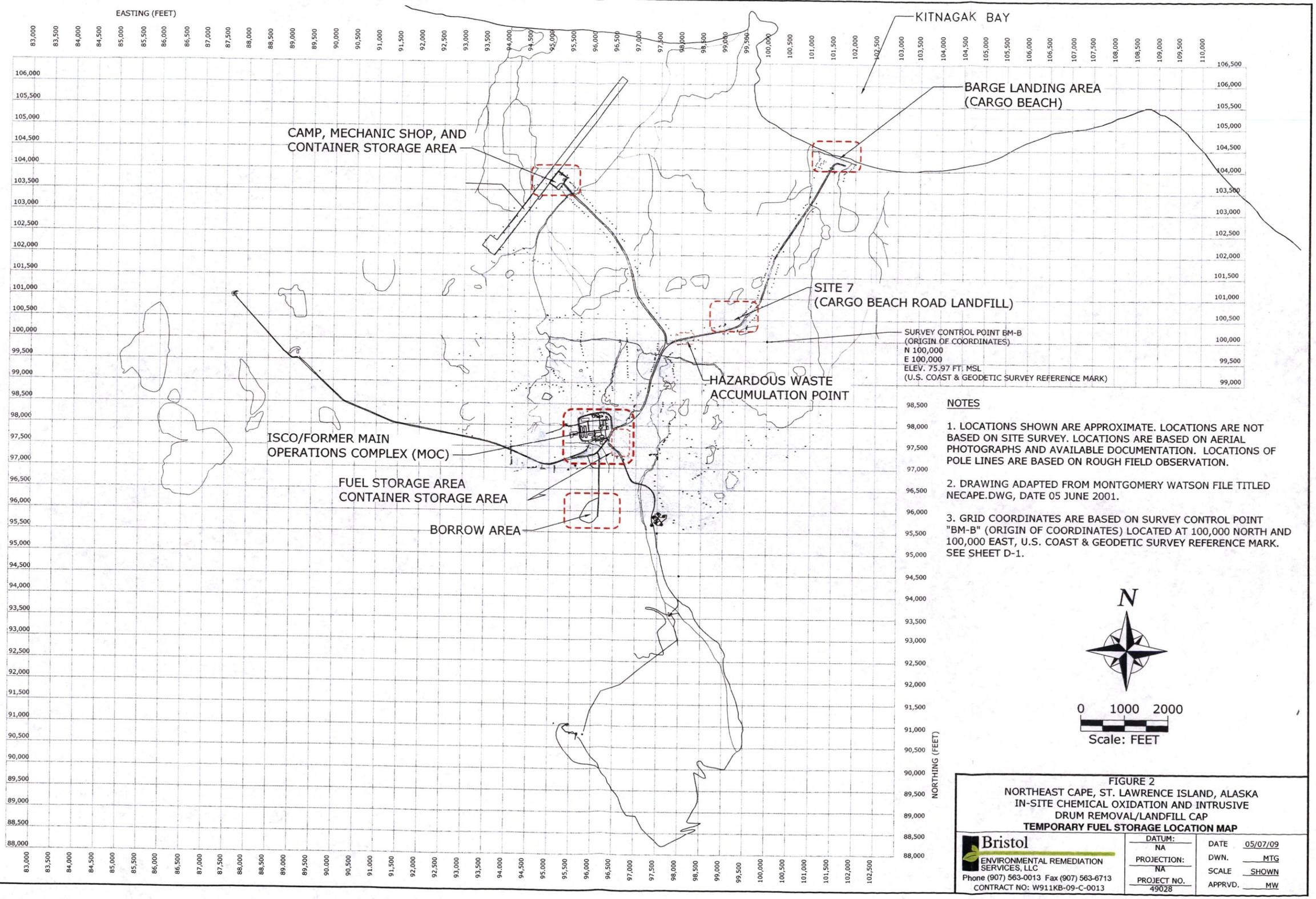


Source: USGS National Atlas Sheet Number 42-43

FIGURE 1
NORTHEAST CAPE, ST. LAWRENCE ISLAND, ALASKA
IN-SITE CHEMICAL OXIDATION AND INTRUSIVE
DRUM REMOVAL/LANDFILL CAP
VICINITY MAP

Bristol
ENVIRONMENTAL REMEDIATION SERVICES, LLC
Phone (907) 563-0013 Fax (907) 563-6713
CONTRACT NO: W911KB-09-C-0013

DATUM:	NA
PROJECTION:	NA
PROJECT NO.	49028
DATE	04/16/09
DWN.	MTG
SCALE	SHOWN
APPRVD.	MW



NOTES

1. LOCATIONS SHOWN ARE APPROXIMATE. LOCATIONS ARE NOT BASED ON SITE SURVEY. LOCATIONS ARE BASED ON AERIAL PHOTOGRAPHS AND AVAILABLE DOCUMENTATION. LOCATIONS OF POLE LINES ARE BASED ON ROUGH FIELD OBSERVATION.

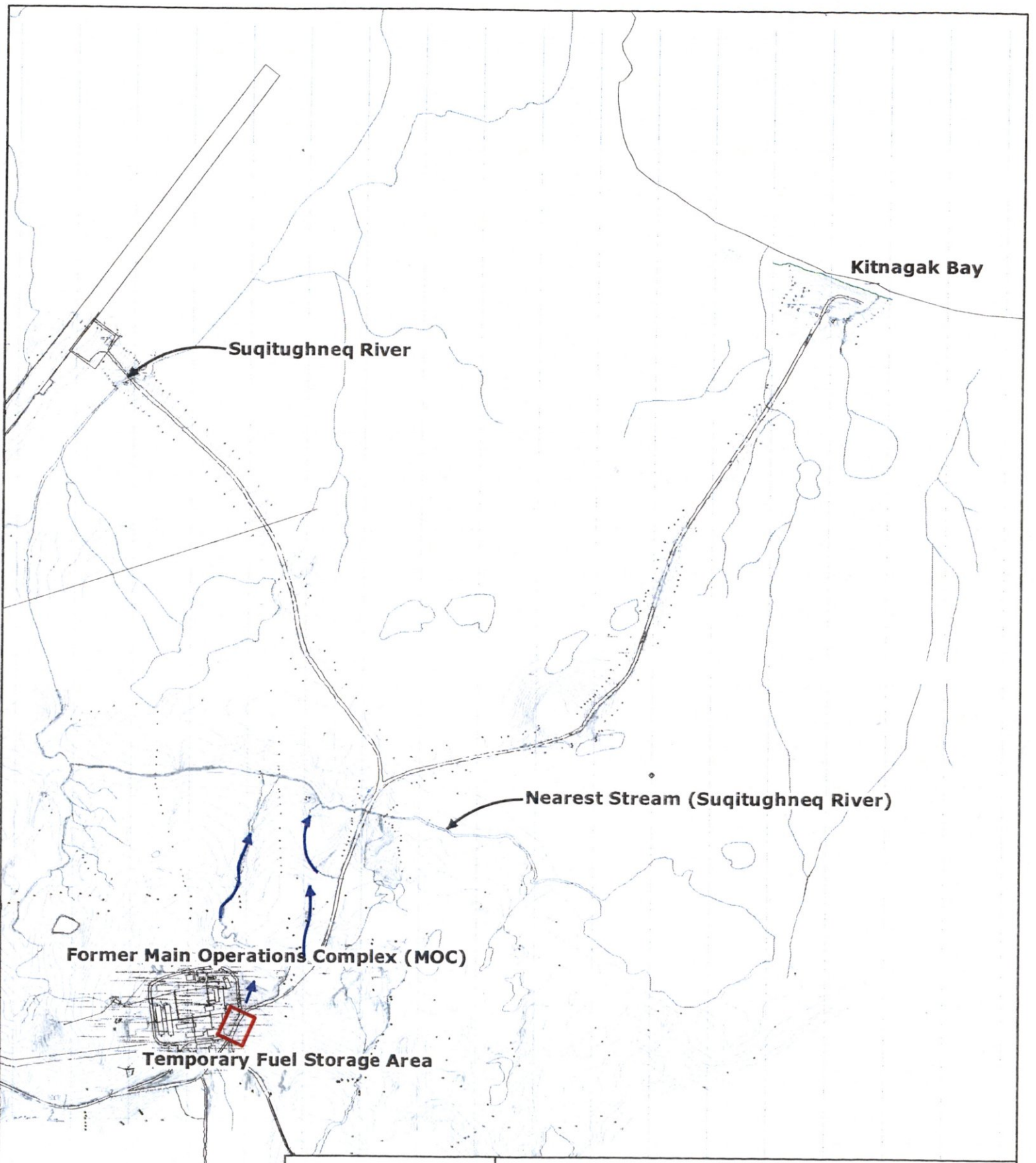
2. DRAWING ADAPTED FROM MONTGOMERY WATSON FILE TITLED NECAPE.DWG, DATE 05 JUNE 2001.

3. GRID COORDINATES ARE BASED ON SURVEY CONTROL POINT "BM-B" (ORIGIN OF COORDINATES) LOCATED AT 100,000 NORTH AND 100,000 EAST, U.S. COAST & GEODETIC SURVEY REFERENCE MARK. SEE SHEET D-1.

FIGURE 2
NORTHEAST CAPE, ST. LAWRENCE ISLAND, ALASKA
IN-SITE CHEMICAL OXIDATION AND INTRUSIVE
DRUM REMOVAL/LANDFILL CAP
TEMPORARY FUEL STORAGE LOCATION MAP

Bristol
ENVIRONMENTAL REMEDIATION SERVICES, LLC
Phone (907) 563-0013 Fax (907) 563-6713
CONTRACT NO: W911KB-09-C-0013

DATUM:	NA
PROJECTION:	NA
PROJECT NO.	49028
DATE	05/07/09
DWN.	MTG
SCALE	SHOWN
APPRVD.	MW



N
W E
S

Note: Not to Scale.
Blue lines indicate surface water flow.

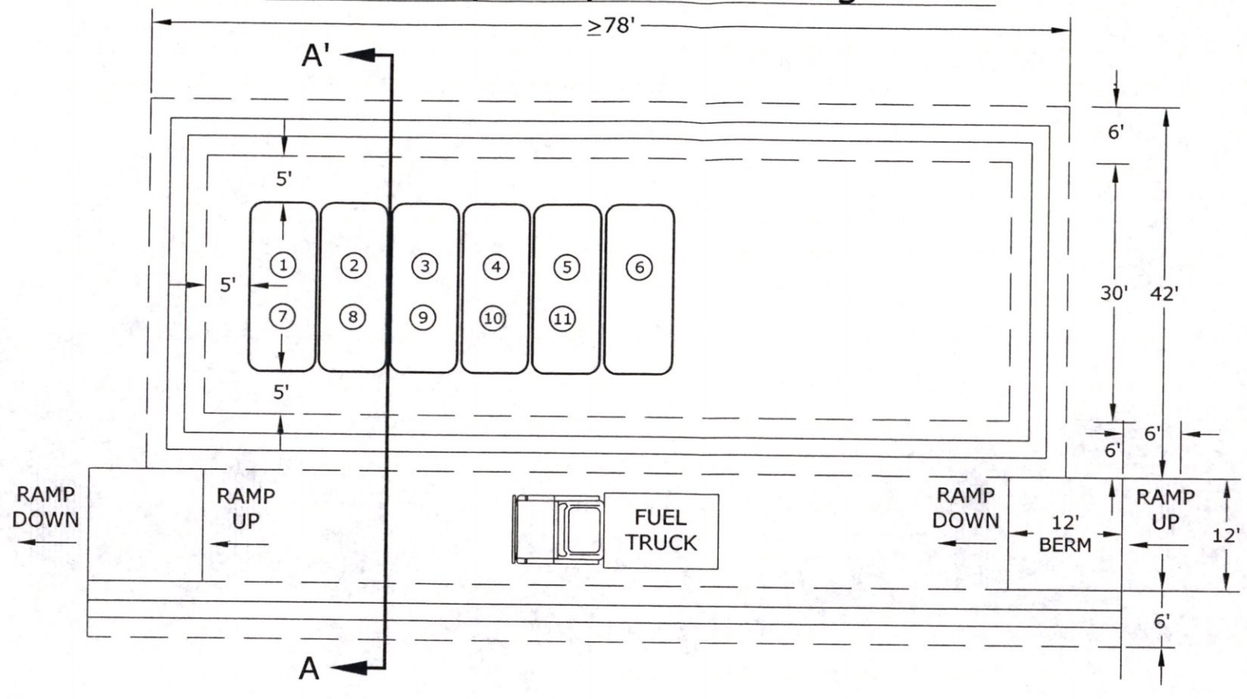
Figure 3
Northeast Cape, St. Lawrence Island, Alaska
Rivers and Drainage in Vicinity of Fuel Storage Area

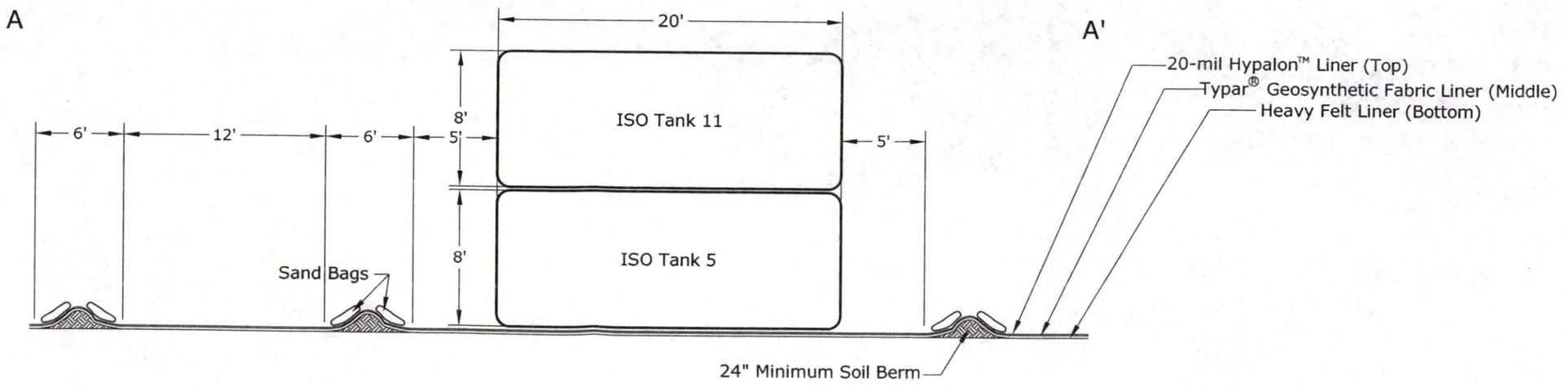
Bristol
ENVIRONMENTAL REMEDIATION SERVICES, LLC
Phone (907)563-0013 Fax (907)563-6713
Project No. 49028

DATUM: N/A	DATE 05-13-09	SHEET 1
PROJECTION: N/A	DWN. BI-ME	of 1
	SCALE NTS	
	APPRVD. BERS-MW	

Main Temporary Fuel Storage Area

TANK #	CAPACITY (GALLONS)	CONTENTS
1	5,500	DIESEL
2	5,500	DIESEL
3	5,500	DIESEL
4	5,500	DIESEL
5	5,500	DIESEL
6	5,500	DIESEL
7	5,500	DIESEL
8	5,500	DIESEL
9	5,500	DIESEL
10	5,500	DIESEL
11	5,500	GASOLINE





Typical Fuel Storage Area Cross Section A-A'

FIGURE 4
NORTHEAST CAPE, ST. LAWRENCE ISLAND, ALASKA
IN-SITE CHEMICAL OXIDATION AND INTRUSIVE
DRUM REMOVAL/LANDFILL CAP
TEMPORARY FUEL STORAGE AREA DETAIL

Bristol
ENVIRONMENTAL REMEDIATION SERVICES, LLC
Phone (907) 563-0013 Fax (907) 563-6713
CONTRACT NO: W911KB-09-C-0013

DATUM: NA
PROJECTION: NA
PROJECT NO. 49028

DATE 04/16/09
DWN. MTG
SCALE SHOWN
APPRVD. MW

ATTACHMENT 1

Certification of the Applicability of the Substantial Harm Criteria Checklist

CERTIFICATION OF THE APPLICABILITY OF THE SUBSTANTIAL HARM CRITERIA CHECKLIST

Does the facility transfer oil over water to or from vessels and does the facility have a total oil storage capacity greater than or equal to 42,000 gallons?

Yes ☐ No ☐

Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and, within any storage area, does the facility lack secondary containment that is sufficiently large to contain the capacity of the largest aboveground oil storage tank, plus sufficient freeboard to allow for precipitation?

Yes ☐ No ☐

Does the facility have a total oil storage capacity greater than or equal to 1 million gallons, and is the facility located such that a discharge from the facility could cause injury to fish and wildlife and sensitive environments?

Yes ☐ No ☐

Does the facility have a total oil storage capacity greater than or equal to1 million gallons, and is the facility located such that a discharge from the facility would shut down a public drinking water intake?

Yes ☐ No ☐

Does the facility have a total oil storage capacity greater than or equal to 1 million gallons, and has the facility experienced a reportable oil spill in an amount greater than or equal to 10,000 gallons within the last 5 years?

Yes ☐ No ☐

ATTACHMENT 2

Fuel Facility Inspection Checklist

FUEL TANK INSPECTION CHECKLIST

ITEM	TANK # OR LOCATION	DATE	INSPECTORS SIGNATURE

FUEL TANK INSPECTION CHECKLIST (Continued)			
ITEM	**TANK # OR LOCATION**	**DATE**	**INSPECTORS SIGNATURE**

Tanks

Drip marks and leaks
Discoloration of tanks
Corrosion
Leaks
Cracks

Tank Support Foundation

Settling
Cracks
Gaps between tank & foundation
Gaps, breaks between liner & wall

Piping

Drip marks and leaks
Discoloration of soil under TF piping
Corrosion
Seepage from valves & seals
Bowing of pipe

Fuel Pumps

Pumps are operational
Drip marks and leaks
Discoloration of soil under pumps
Corrosion
Seepage from valves & seals
Fire Extinguisher is available and operational
Appropriate locks are in place

Secondary Containment Area (if applicable)

Water in containment area
Debris
Wall erosion
Floor settling
Puddles containing spilled or leaked material
Discoloration of soil/sand inside the containment area
Hardened areas of soil/sand inside the containment area
Vegetation starting to grow inside containment area

Fuel Trucks

Both trucks are operational
Pump equipment is operational
Hoses are in good order
Drip marks and leaks in truck parking area
Corrosion
Seepage from valves and seals
Extinguishers are on trucks and operational
Safety equipment is on trucks
Spill equipment is on trucks

Other

Electricity and Security lighting are operational
Security locks are properly placed
Appropriate Operational, Safety, and Emergency Action checklists are available

ATTACHMENT 3

ADEC Discharge Notification and Reporting Requirements Placard

REPORT ALL

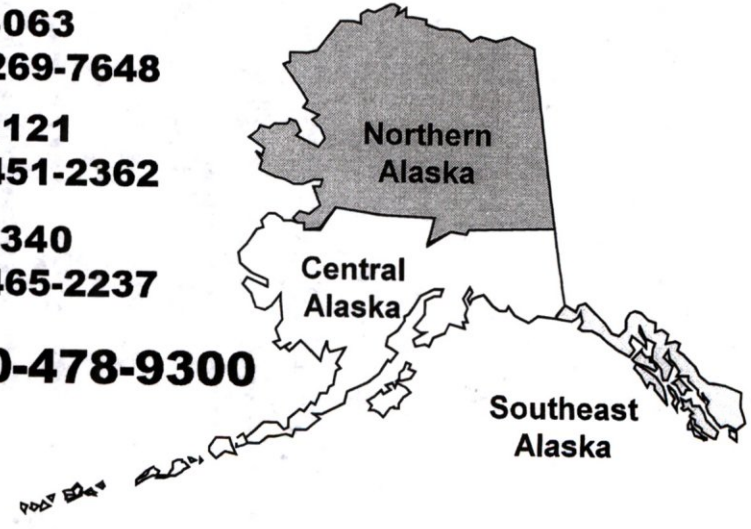
OIL AND HAZARDOUS SUBSTANCE SPILLS

ALASKA LAW REQUIRES REPORTING OF ALL SPILLS

During normal business hours

contact the nearest DEC Area Response Team office:

Central Area Response Team:	**Anchorage**	**269-3063** **fax: 269-7648**
Northern Area Response Team:	**Fairbanks**	**451-2121** **fax: 451-2362**
Southeast Area Response Team:	**Juneau**	**465-5340** **fax: 465-2237**



Outside normal business hours, call: 1-800-478-9300

Alaska Department of Environmental Conservation
Division of Spill Prevention and Response

rev. 4/2002

Alaska Department of Environmental Conservation

Discharge Notification and Reporting Requirements

AS 46.03.755 and 18 AAC 75 Article 3

Notification of a discharge must be made to the **nearest** Area Response Team during working hours:

Anchorage:	**269-3063** **269-7648 (FAX)**	**Fairbanks:**	**451-2121** **451-2362 (FAX)**	**Juneau:**	**465-5340** **465-2237 (FAX)**

OR

to the 24-Hour Emergency Reporting Number during non-working hours: **1-800-478-9300**

Notification Requirements

Hazardous Substance Discharges

Any release of a hazardous substance must be reported as soon as the person has knowledge of the discharge.

Oil Discharges

■ TO WATER

- Any release of oil to water must be reported as soon as the person has knowledge of the discharge.

■ TO LAND

- Any release of oil in ***excess of 55 gallons*** must be reported as soon as the person has knowledge of the discharge.
- Any release of oil in ***excess of 10 gallons but less than 55 gallons*** must be reported within 48 hours after the person has knowledge of the discharge.
- A person in charge of a facility or operation shall maintain, and provide to the Department on a monthly basis, a written record of any discharge of oil ***from 1 to 10 gallons***.

■ TO IMPERMEABLE SECONDARY CONTAINMENT AREAS

- Any release of oil ***in excess of 55 gallons*** must be reported within 48 hours after the person has knowledge of the discharge.

Special Requirements for Regulated Underground Storage Tank (UST) Facilities*

If your **release detection system** indicates a possible discharge, or if you notice **unusual operating conditions** that might indicate a release, you must notify the Storage Tank Program at the nearest DEC Office **within 7 days**:

Anchorage:	(907) 269-7504	Fairbanks:	(907) 451-2360
Juneau:	(907) 465-5200	Soldotna:	(907) 262-5210

*Regulated UST facilities are defined at 18 AAC 78.005 and do not include heating oil tanks.

rev. April/2002

ATTACHMENT 4

Oil Discharge Notification Form

OIL DISCHARGE NOTIFICATION FORM

STATE NOTIFICATION

When a spill occurs, the following information should be reported according to the Alaska Department of Environmental Conservation (ADEC).

Anchorage: 269-7500 **Fairbanks: 451-2121** **Juneau: 465-5340**

Or the 24-Hour Emergency Reporting Number during non-working hours: *1-800-478-9300*

FEDERAL NOTIFICATION

National Response Center: 1-800-424-8802
Note: It is not necessary to wait for all information before calling The National Response Center.

COLLECT AS MUCH OF THE FOLLOWING INFORMATION AS YOU CAN:

	A. REPORTING PARTY	**B. RESPONSIBLE PARTY (if different)**
NAME		
PHONE		
COMPANY		
POSITION		
ADDRESS		

C. ORGANIZATION TYPE

PRIVATE	**PUBLIC UTILITY**	**GOVERNMENT**
Citizen		Local
Business		State
		Federal

Were Materials Discharged? YES ____ NO ____
Calling for Responsible Party? YES ____ NO ____

D. INCIDENT DESCRIPTION

Source and/or Cause
Start of Spill Date/Time
Discharged Material
Discharge Quantity & Unit
Quantity in Water
Discharge Location
Nearest City and Distance From it
Storage Tank Container Type Aboveground ____ Underground ____ Unknown ____

OIL DISCHARGE NOTIFICATION FORM (Continued)

E. FACILITY CAPACITY

Tank Capacity _____ Other Tanks Potentially Affected _____

F. GEOGRAPHIC OR PHYSICAL LOCATION

Latitude 57 deg 33 min N, Longitude 157 deg 34 min West

_____

G. RESPONSE ACTION

Actions Taken to Correct or Mitigate Discharge:

_____

_____

_____

H. IMPACT

Number of Injuries _____ Number of Fatalities _____

WereTthere Evacuations?	YES ☐	NO ☐	UNK ☐	Number _____
Was There any Damage?	YES ☐	NO ☐	UNK ☐	Dollars _____

I. DISPERSANTS

Were appropriate procedures or approvals used or obtained prior to any dispersant use, if applicable?

YES ☐ NO ☐

J. ADDITIONAL INFORMATION

Any Other Information

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

K. CALLER NOTIFICATIONS

AGENCY	DATE	TIME	CONTACT NAME
U.S. Coast Guard			
EPA			
ADEC			

ATTACHMENT 5

Spill Response Team Training, Drill, and Exercise Log

TRAINING, DRILL, AND EXERCISE LOG

X = COMPLETED   B = BASIC   R = REFRESHER   T = ON THE JOB TRAINING

Name	Annual SPCC Training	Fuel Truck Operator Training	Other

ATTACHMENT 6

Record of Attendance for Spill Response and Safety Meetings

RECORD OF ATTENDANCE FOR SPILL RESPONSE AND SAFETY MEETINGS

Spill Response Meeting ___ Date _____

Safety Meeting ___ Date _____

Record	Required Action	Implementation

ATTENDEES:	SIGNATURE	COMMENTS

APPENDIX C

ADF&G Fish Habitat Permits

STATE OF ALASKA

SARAH PALIN, GOVERNOR

1300 COLLEGE RD.
FAIRBANKS, AK 99701
PHONE: (907) 459-7289
FAX: (907) 459-7303

DEPARTMENT OF FISH AND GAME

DIVISION OF HABITAT

FISH HABITAT PERMIT
FH09-III-OI03

ISSUED: April 22, 2009
EXPIRES: December 31, 2014

Ms. Molly Welker
Bristol Environmental and Engineering Services Corporation
111 W. 16th Ave., Third Floor
Anchorage, AK 99501-5109

Dear Ms. Welker:

RE: Bridge Repair, Northeast Cape White Alice Site Removal Action (St. Lawrence Island); T25S, R54W, Suqitughneq River; SID AK0203-17AA

Pursuant to AS 16.05.841, the Alaska Department of Fish and Game (ADF&G), Division of Habitat, has reviewed your proposal to place riprap or conduct maintenance activities in the Suqitughneq River (on St. Lawrence Island) to protect the bridge abutments. ADF&G received your request via email on April 17, 2009. Your original request was received on March 19, 2002 with a more detailed description received via email on April 3, 2002. The original activity was permitted under Fish Habitat Permit FG02-III-0072 which expired December 31,2005.

Your original proposed project entailed placing approximately 15 cubic yards of riprap at the base of the abutments of the bridge crossing the Suqitughneq River each work season (two work seasons are anticipated). An excavator, operating from the deck of the bridge, will place the riprap. The current proposed work will included any necessary repairs but will not exceed the original footprint and scope of work.

The Suqitughneq River supports anadromous Dolly Varden (and possibly whitefish) and resident fish (e.g., Alaska blackfish) in the area of your proposed activity. Based upon our review of your plans, your proposed project should not obstruct the efficient passage and movement of fish.

In accordance with AS 16.05.841, project approval is hereby given subject to the following stipulations:

(1) Banks shall not be altered or disturbed in any way. If stream banks are inadvertently disturbed, they shall be immediately stabilized to prevent erosion.

(2) "End-dumping" riprap is prohibited. Riprap shall be strategically placed to prevent excess rock in the streambed.

The permittee is responsible for the actions of contractors, agents, or other persons who perform work to accomplish the approved plan. For any activity that significantly deviates from the approved plan, the permittee shall notify the ADF&G and obtain written approval in the form of a permit amendment before beginning the activity. Any action taken by the permittee, or an agent of the permittee, that increases the project's overall scope or that negates, alters, or minimizes the intent or effectiveness of any stipulation contained in this permit will be deemed a significant deviation from the approved plan. The final determination as to the significance of any deviation and the need for a permit amendment is the responsibility of the ADF&G. Therefore, it is recommended that the ADF&G be consulted immediately when a deviation from the approved plan is being considered.

This letter constitutes a permit issued under the authority of AS 16.05.841. This permit must be retained on site during construction. Please be advised that this approval does not relieve you of the responsibility of securing other permits, state, federal or local.

This permit provides reasonable notice from the commissioner that failure to meet its terms and conditions constitutes violation of AS 16.05.861; no separate notice under AS 16.05.861 is required before citation for violation of AS 16.05.841 can occur.

In addition to the penalties provided by law, this permit may be terminated or revoked for failure to comply with its provisions or failure to comply with applicable statutes and regulations. The department reserves the right to require mitigation measures to correct disruption to fish and game created by the project and which were a direct result of the failure to comply with this permit or any applicable law.

The recipient of this permit (permittee) shall indemnify, save harmless, and defend the department, its agents and its employees from any and all claims, actions or liabilities for injuries or damages sustained by any person or property arising directly or indirectly from permitted activities or the permittee's performance under this permit. However, this provision has no effect, if, and only if, the, sole proximate cause of the injury is the department's negligence.

Sincerely,

Denby S. Lloyd, Commissioner

BY: Robert F. "Mac" McLean, Regional Supervisor
Habitat Division
Alaska Department of Fish and Game

cc: Chris Milles, ADNR, Fairbanks
Ann Rappoport, USFWS, Anchorage
Jeanne Hanson, NMFS, Anchorage

RFM:mac

STATE OF ALASKA

SARAH PALIN, GOVERNOR

1300 COLLEGE RD.
FAIRBANKS, AK 99701
PHONE: (907) 459-7289
FAX: (907) 459-7303

DEPARTMENT OF FISH AND GAME

DIVISION OF HABITAT

FISH HABITAT PERMIT
FH09-III-OI02

ISSUED: April 22, 2009
EXPIRES: December 31, 2014

Ms. Molly Welker
Bristol Environmental and Engineering Services Corporation
111 W. 16th Ave., Third Floor
Anchorage, AK 99501-5109

Dear Ms. Welker:

RE: Equipment Stream Crossing, Northeast Cape White Alice Site Removal Action (St. Lawrence Island), T25S, R54W, Quangeghsaq River; SID AK 0203-17AA

Pursuant to AS 16.05.841, the Alaska Department of Fish and Game (ADF&G), Division of Habitat, has reviewed your proposal to make multiple crossings at multiple sites (four) across the Quangeghsaq River with amphibious all-terrain vehicles. Timbers or poles may need to be placed in and adjacent to the stream to create better crossing sites that prevent ATVs from getting stuck and reduce damage to vegetation. Access is needed to cut down and remove hundreds of poles from abandoned utility lines. ADF&G originally received a description of the proposed project on March 19, 2002 and a more detailed description via email on April 3, 2002. That activity was permitted under Fish Habitat Permit FG02-III-0073 which expired December 31, 2005. Additional access may be needed to conduct maintenance activities.

The Quangeghsaq River supports anadromous Dolly Varden (and possibly whitefish) and resident fish (e.g., Alaska blackfish) in the area of your proposed activity. Based upon our review of your plans, your proposed project may obstruct the efficient passage and movement of fish.

In accordance with AS 16.05.841, project approval IS hereby gIven subject to the following stipulations:

(1) Equipment crossings shall be made from bank to bank in a direction substantially perpendicular to the direction of stream flow.

Equipment crossings shall be made only at locations with gradually sloping banks. There shall be no crossings at locations with sheer or cut banks.

Banks shall not be altered or disturbed in any way to facilitate crossings. If stream banks are inadvertently disturbed, they shall be immediately stabilized to prevent erosion.

(2) If timber/poles are placed in and adjacent to the stream to create a crossing site, they must be placed in such a way that free passage of fish is assured. In addition, all material shall be completely removed from the streambed and banks at the end of each work season. If needed, the streambed shall be recontoured to assure that "trenches" are not left that will trap fish at low-water levels.

(3) Vehicle crossings shall be limited to only what is necessary to accomplish work.

(4) No damming or diversions are permitted.

The permittee is responsible for the actions of contractors, agents, or other persons who perform work to accomplish the approved plan. For any activity that significantly deviates from the approved plan, the permittee shall notify the ADF&G and obtain written approval in the form of a permit amendment before beginning the activity. Any action taken by the permittee, or an agent of the permittee, that increases the project's overall scope or that negates, alters, or minimizes the intent or effectiveness of any stipulation contained in this permit will be deemed a significant deviation from the approved plan. The final determination as to the significance of any deviation and the need for a permit amendment is the responsibility of the ADF&G. Therefore, it is recommended that the ADF&G be consulted immediately when a deviation from the approved plan is being considered.

This letter constitutes a permit issued under the authority of AS 16.05.841. This permit must be retained on site during construction. Please be advised that this approval does not relieve you of the responsibility of securing other permits, state, federal or local.

This permit provides reasonable notice from the commissioner that failure to meet its terms and conditions constitutes violation of AS 16.05.861; no separate notice under AS 16.05.861 is required before citation for violation of AS 16.05.841 can occur.

In addition to the penalties provided by law, this permit may be terminated or revoked for failure to comply with its provisions or failure to comply with applicable statutes and regulations. The department reserves the right to require mitigation measures to correct disruption to fish and game created by the project and which were a direct result of the failure to comply with this permit or any applicable law.

The recipient of this permit (permittee) shall indemnify, save harmless, and defend the department, its agents and its employees from any and all claims, actions or liabilities for

injuries or damages sustained by any person or property arising directly or indirectly from permitted activities or the permittee's performance under this permit. However, this provision has no effect, if, and only if, the sole proximate cause of the injury is the department's negligence.

Sincerely,

Denby S. Lloyd, Commissioner

BY: Robert F. "Mac" McLean, Regional Supervisor
Habitat Division

cc: Chris Milles, ADNR, Fairbanks
Ann Rappoport, USFWS, Anchorage
Jeanne Hanson, NMFS, Anchorage

RFM:mac

STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF PARKS AND OUTDOOR RECREATION
OFFICE OF HISTORY AND ARCHAEOLOGY

SARAH PALIN, GOVERNOR

550 W. 7TH AVENUE, SUITE 1310
ANCHORAGE, ALASKA 99501-3565
PHONE: (907) 269-8721
FAX: (907) 269-8908

July 2, 2009

File No.: 3130-1R COE/Environmental
3330-6N XSL-060

SUBJECT: Cleanup operations at Northeast Cape, Saint Lawrence Island
FUDS program

Guy R. McConnell
Chief, Environmental Resources Section
U. S. Army Corps of Engineers, Alaska District
P. O. Box 6898
Anchorage, AK 99506-0898

Dear Mr. McConnell:

The Alaska State Historic Preservation Office received your correspondence on May 29, 2009 and has reviewed your proposed cleanup operations under Section 106 of the National Historic Preservation Act. As mentioned in your letter, Alaska Heritage Resources Survey (AHRS) site, Northeast Cape AC & W and WACS (XSL-060) is within the area of potential effect. Demolition of XSL-060 has already been mitigated however, through implementation of a memorandum of agreement between the Corps and SHPO (signed in 1999). We concur with your finding therefore, that no historic properties will be adversely affected by this project.

Please contact Stefanie Ludwig at 269-8720 if you have any questions or if we can be of further assistance.

Sincerely,

Judith E. Bittner
State Historic Preservation Officer

JEB:sll

STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES
Division of Mining, Land and Water

Northern Regional Land Section

SARAH PALIN, GOVERNOR

NORTHERN REGION
3700 AIRPORT WAY
FAIRBANKS, ALASKA 99709-4699
PHONE: (907) 451-3014
FAX: (907) 451-2751
dianna.leinberger@alaska.gov

May 18, 2009

Christopher Floyd
US Army Corps of Engineers, Alaska District
Environmental Resources Section
EN-CW-ER
PO BOX 6898
Elmendorf AFB, AK 99506-06898

RE: **Letter of Entry for state tidelands within Kitnagak Bay, Saint Lawrence Island**

For the purpose of accessing the Northeast Cape for a Formerly Used Defense Site Cleanup and a Native American Lands Environmental Mitigation Program Project

Dear Mr. Floyd,

The Department of Natural Resources, Division of Mining, Land and Water hereby grants the US Army Corps of Engineers (USACE) a "Letter of Entry" authorization to enter upon state tidelands for the express purpose of conducting barge landings for the continued assessment and cleanup of the Northeast Cape. The barge landings will occur at Kitnagak Bay located within Kateel River Meridian, Township 25 South, Range 54 West, sections 10, 11, 12, 14, 15.

The Northern Region Land Office is hereby providing this letter allowing for entry for the purpose of conducting the above described project. The Letter of Entry is subject to the following terms and conditions:

- The Letter of Entry does not convey any interest in state land and as such is revocable immediately, with or without cause. The USACE, its contractors and sub-contractors are authorized use of the barge landing within state tidelands, but are not authorized to preclude or restrict public access on and through the tideland area.

- All operations must be conducted in a manner that will assure minimum conflict with other users of the area. This Letter of Entry is subject to the principles of the public trust doctrine specifically the right of the public to use navigable waterways and the land beneath them for navigation, commerce, fishing, hunting, protection of areas for ecological study, and other purposes, must be protected.

- The Regional Manager or his designee reserves the right to grant other interests to the subject areas consistent with the public trust doctrine. The State of Alaska makes no representations or warranties whatsoever, either expressed or implied, as to the existence, number, or nature of such valid existing rights.

- All activities at the site shall be conducted in a manner that will minimize the disturbance to the natural character of the beach.

- All waste generated by the USACE, its contractors and sub-contractors under this Letter of Entry will be removed or otherwise disposed of as required by state and federal law.

- Abandonment of equipment is prohibited on state lands.

- Refueling of equipment and the storage of petroleum products on state owned tidelands is prohibited.

- The USACE, its contractors and sub-contractors shall immediately notify the Alaska Department of Environmental Conservation (ADEC) by telephone, and immediately afterwards send ADEC a written notice by facsimile, hand delivery, or first class mail, informing ADEC of any unauthorized discharges of oil to water, any discharge of hazardous substances other than oil and any discharge or cumulative discharge of oil greater than 55 gallons solely to land and outside an impermeable containment area. If a discharge, including a cumulative discharge, of oil is greater than 10 gallons but less than 55 gallons, or a discharge of oil greater than 55 gallons is made to an impermeable secondary containment area, the USACE, its contractors and sub-contractors shall report the discharge within 48 hours, and immediately afterwards send ADEC a written notice by facsimile, hand delivery, or first class mail. Any discharge of oil, including a cumulative discharge, solely to land greater than one gallon up to 10 gallons must be reported in writing on a monthly basis. The posting of information requirements of 18 AAC75.305 shall be met. Scope and Duration of Initial Response Actions (18 AAC 75.310) and reporting requirements of 18 AAC 75, Article 3 also apply.

  The USACE, its contractors and subcontractors shall supply ADEC with all follow-up incident reports. Notification of a discharge must be made to the nearest ADEC Area Response Team during working hours: Anchorage (907) 269-7500, fax (907) 269-7648; Fairbanks (907) 451-2121, fax (907) 451-2362; Juneau (907) 465-5340, fax (907) 465-2237. The ADEC oil spill report number outside normal business hours is (800) 478-9300.

- The USACE may not assign or transfer, in part or whole, the Letter of Entry to another party.

- The USACE must obtain written approval from the Regional Manager or his designee prior to making any changes or improvements to the project site or their operations as authorized by this Letter of Entry.

- This Letter of Entry does not relieve the USACE from securing other necessary state, federal and local permits. This Letter of Entry does not provide authorization for travel on private property.

- The USACE, its contractors and sub-contractors shall observe all federal, state and local laws and regulations applicable to the authorized areas, including regulations for the protection of fish and wildlife, and shall keep all premises in a neat, orderly, and sanitary condition.

- The Alaska Historic Preservation Act requires that if cultural or paleontological resources are discovered on state lands as a result of this activity, work that would disturb such resources must be stopped and the State Historic Preservation Office be contacted immediately at (907) 269-8720.

- This Letter of Entry is issued for a specific use. Use of the barge landing for purposes other than those specified constitutes a breach of this authorization and may result in revocation. This Letter of Entry is revocable with any applicable laws, statutes and regulations (state and federal).

Any questions regarding any aspect of this Letter of Entry shall be directed to Dianna Leinberger, Department of Natural Resources, Division of Mining, Land and Water, Northern Region Land Office, 3700 Airport Way, Fairbanks, Alaska 99709, (907) 451-3014, dianna.leinberger@alaska.gov.

Sincerely,

Dianna Leinberger

Dianna Leinberger
Natural Resource Specialist

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

June 29, 2009

Guy R. McConnell
Chief, Environmental Resources Section
U.S. Army Corps of Engineers, District Alaska
PO Box 6898
Elmendorf AFB, AK 99506-0898

Dear Mr. Connell:

I have reviewed your May 18, 2009 letter to Doug Mecum concerning an Army Corps of Engineers (ACOE) Formerly Used Defense Site (FUDS) project proposed at Northeast Cape on Saint Lawrence Island. The Steller sea lion (*Eumetopias jubatus*) is a species listed as "endangered" under the Endangered Species Act and may occur in the project vicinity. There is Steller sea lion designated critical habitat on haulout sites located on South Punuk Island at (64 04.0N, 168 51.0W) and at SW Cape (63 18.0N, 171 26.0W) on St. Lawrence Island. Other listed species you have identified as potentially present include: blue, fin, humpback, North Pacific right, and sperms whales.

According to your project description, contractors will access St. Lawrence Island by landing craft at Kitnagak Bay on the opposite site of the island and approximately 19 miles away from the nearest designated Steller sea lion critical habitat at South Punuk Island. As stated in your description: "There will be no reason for the landing craft to approach either of these two critical habitats." Any aircraft associated with the project will approach from the east and land at the Northeast Cape airstrip, and there will be no need to approach the Punuk Islands.

Based on the information in your letter and data available to us concerning critical habitat and the distribution of Steller sea lions and other species listed as "endangered" under NOAA Fisheries jurisdiction in the project area, we concur with your conclusion that the proposed activities will have no effect on the Federally listed species identified. However, our information concerning possible Steller sea lion use of St. Lawrence Island is scant and somewhat dated. Thus, if for any reason ACOE staff or contractors observe or encounter Steller sea lions within the project area, we request operations immediately cease and that ACOE staff contact our office to reinitiate consultation.

Please contact Mr. Dana J. Seagars (907-271-5005) or by e-mail (dana.seagars@noaa.gov) if you have any questions or require additional information.

Sincerely,

Kaja Brix
ARA, Protected Resources Division

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Anchorage Fish and Wildlife Field Office
605 West 4th Avenue, Room G-61
Anchorage, Alaska 99501-2249

in reply refer to AFWFO

May 13, 2009

Susan Luetters
Bristol Environmental & Engineering Services Corporation
111 W 16th Ave., Third Floor
Anchorage, Alaska 99501

Re: St. Lawrence Island NE Cape Site USACE Dump Cleanup (*Consultation number 2009-0093*)

Dear Ms. Luetters,

On April 14, 2009, we received your email that Bristol Environmental & Engineering Services Corporation is working with the U.S. Army Corps of Engineers relative to a former military installation and White Alice Site that is in the process of being remediated towards closure. This site is located on the northeast corner of St. Lawrence Island. The Cargo Beach Road Landfill is an unpermitted landfill that was used as the installation's main solid waste disposal area from 1965 until closure in 1974. Bristol Environmental & Engineering Services Corporation is currently preparing the storm water pollution prevention plan relative to the removal of drums within an area that is the former dump site for the facility. Bristol Environmental & Engineering Services Corporation is scoped to remove 75 tons of contaminated soil with an option of another 150 tons of contaminated soil if needed. There will be no field screening or soil sampling and an in-situ chemical oxidation process will be used to remediate petroleum hydrocarbons in groundwater and soil at the former Main Operations Complex. Bristol Environmental & Engineering Services Corporation will remove drums filled with liquid up to 2500 gallons and the whole site will be capped with local material from a nearby and existing borrow area.

On May 11, 2009, I spoke with Chris Floyd from the Army Corps of Engineers. Apparently this former dump site was used to dispose of containers filled with various unknown liquids and when the military was done using the site, the dump site was simply covered with a large mound of dirt. Currently, contaminants, namely petroleum hydrocarbons, are leaking out of the sides of this mounded area and this project is to remedy that situation, remove drums, and re-cap the site more effectively.

As stated in the information you provided on April 14, 2009, drums containing liquids will be transported to a drum-processing area, to be established along Cargo Beach Road immediately northeast of the site. Contaminated soil will be placed in lined intermodal shipping containers for off-island disposal. Wastewater will be cleaned and disposed of on-site. From your email on April 23, 2009, with respect to the potential for migratory ground nesting birds, the crew will evaluate the site prior to beginning work. However, consultation by you with a Bristol employee that has been involved with the project in the past indicated that there is a high fox population on that end of the island which makes the likelihood of ground nesting birds rather low.

As we discussed on April 21, 2009, yellow-billed loons (*Gavia adamsii*, listed as a candidate species in 2009) nest on St. Lawrence Island. However, they are less than likely to nest in the action area because the site is disturbed and lacking vegetation in some places. In addition, the

fox population is reported to be high in the action area and the crew will look for migratory bird nests prior to beginning work.

Spectacled eiders (*Somateria fischeri,* listed as threatened in 1993) may stage for migration off the northern coast of the action area from July 15 – October 1. This work is proposed for Summer 2009 and thus spectacled eiders may be present in the vicinity during the action. However, wastewater will be cleaned on-site without an outfall and wastes will be transferred to appropriate containers for storage and off-island disposal.

As a result, we believe the probability that this action will result in the taking of listed species is discountable. As a result, the Service concurs with your determination that the proposed action is not likely to adversely affect listed species or adversely modify critical habitat. Preparation of a biological assessment or further consultation under section 7 of the ESA is not necessary at this time. In view of this, requirements of section 7 have been satisfied. However, obligations under the ESA must be reconsidered if new information reveals project impacts that may affect listed species or critical habitat in a manner not previously considered, if this action is subsequently modified in a manner which was not considered in this assessment, or if a new species is listed or critical habitat is determined that may be affected by the identified action.

This letter relates only to federally listed or proposed species, and/or designated or proposed critical habitat, under our jurisdiction; namely, the Aleutian shield fern (*Polystichum aleuticum*, listed as endangered in 1988), spectacled eider (*Somateria fischeri,* listed as threatened in 1993), North American breeding Steller's eider (*Polysticta stelleri*, listed as threatened in 1997), the southwest distinct population segment of northern sea otter (*Enhydra lutris kenyoni,* listed as threatened in 2005), short-tailed albatross (*Phoebastria albatrus*, listed as endangered in 2000), polar bear (*Ursus maritimus*, listed as threatened in 2008), Kittlitz's murrelet (*Brachyramphus brevirostris,* listed as a candidate species in 2005), and yellow-billed loon (*Gavia adamsii*, listed as a candidate species in 2009). This letter does not address species under the jurisdiction of the National Marine Fisheries Service, or other legislation or responsibilities under the Fish and Wildlife Coordination Act, Clean Water Act, National Environmental Policy Act, Marine Mammal Protection Act, Migratory Bird Treaty Act, or Bald and Golden Eagle Protection Act.

Thank you for your cooperation in meeting our joint responsibilities under section 7 of the ESA. If you have any questions, please contact me at (907) 271-3063 and refer to consultation number 2009-0093.

Sincerely,

Tim Langer

Tim Langer, Ph.D.
Endangered Species Biologist

T:\s7\2009 sec 7\NLAA\20090093 s7 letter.pdf

APPENDIX D

Proposed Landfill Cap Design

CONTRACT NUMBER: W911KB-09-C-0013

INTRUSIVE DRUM REMOVAL / LANDFILL CAP
NE CAPE, ST. LAWRENCE ISLAND, ALASKA

JULY 16, 2009

ISSUED FOR CONSTRUCTION

DRAWING INDEX

DWG.	DESCRIPTION
T1.0	COVER SHEET AND DRAWING INDEX
C1.1	EXISTING SITE / SURVEY CONTROL
C2.1	SITE PLAN
C2.2	SITE CROSS SECTIONS

CONTRACTOR: Bristol ENVIRONMENTAL REMEDIATION SERVICES, LLC
Phone (907) 563-0013 Fax (907) 563-6713

DESIGNER: Bristol ENVIRONMENTAL & ENGINEERING SERVICES CORPORATION
Phone (907) 563-0013 Fax (907) 563-6713

7/17/09
BRISTOL PROJECT MANAGER DATE

07/16/2009
BRISTOL PROJECT ENGINEER DATE

7-17-09
BRISTOL SITE SUPERINTENDENT DATE

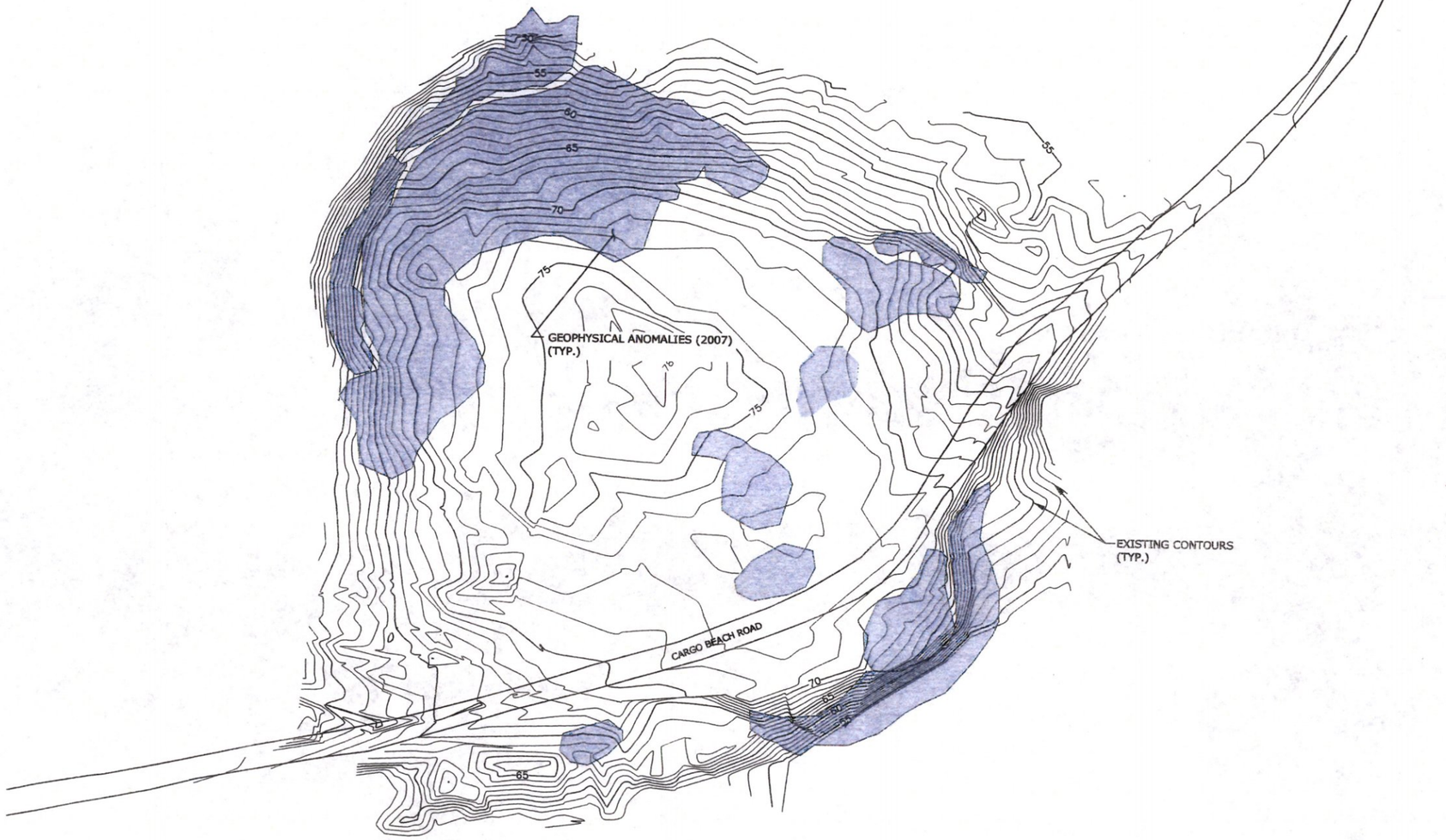
NORTHEAST CONTROL POINT
N 3406599.41
E 1814304.21

NOTES:

1. HORIZONTAL AND VERTICAL CONTROL IS BASED ON INFORMATION COLLECTED BY ECO-LAND, LLC IN JUNE 2009.

LEGEND

CONTROL POINTS FROM ECO-LAND, LLC SURVEY



SOUTHEAST CONTROL POINT
N 3405640.03
E 1814293.85

60 0 30 60
HORIZONTAL SCALE IN FEET

ISSUED FOR CONSTRUCTION

REVISIONS				REVISIONS			
NO.	DATE	BY	DESCRIPTION	NO.	DATE	BY	DESCRIPTION

Bristol
ENVIRONMENTAL & ENGINEERING SERVICES CORPORATION

Project No. 210005

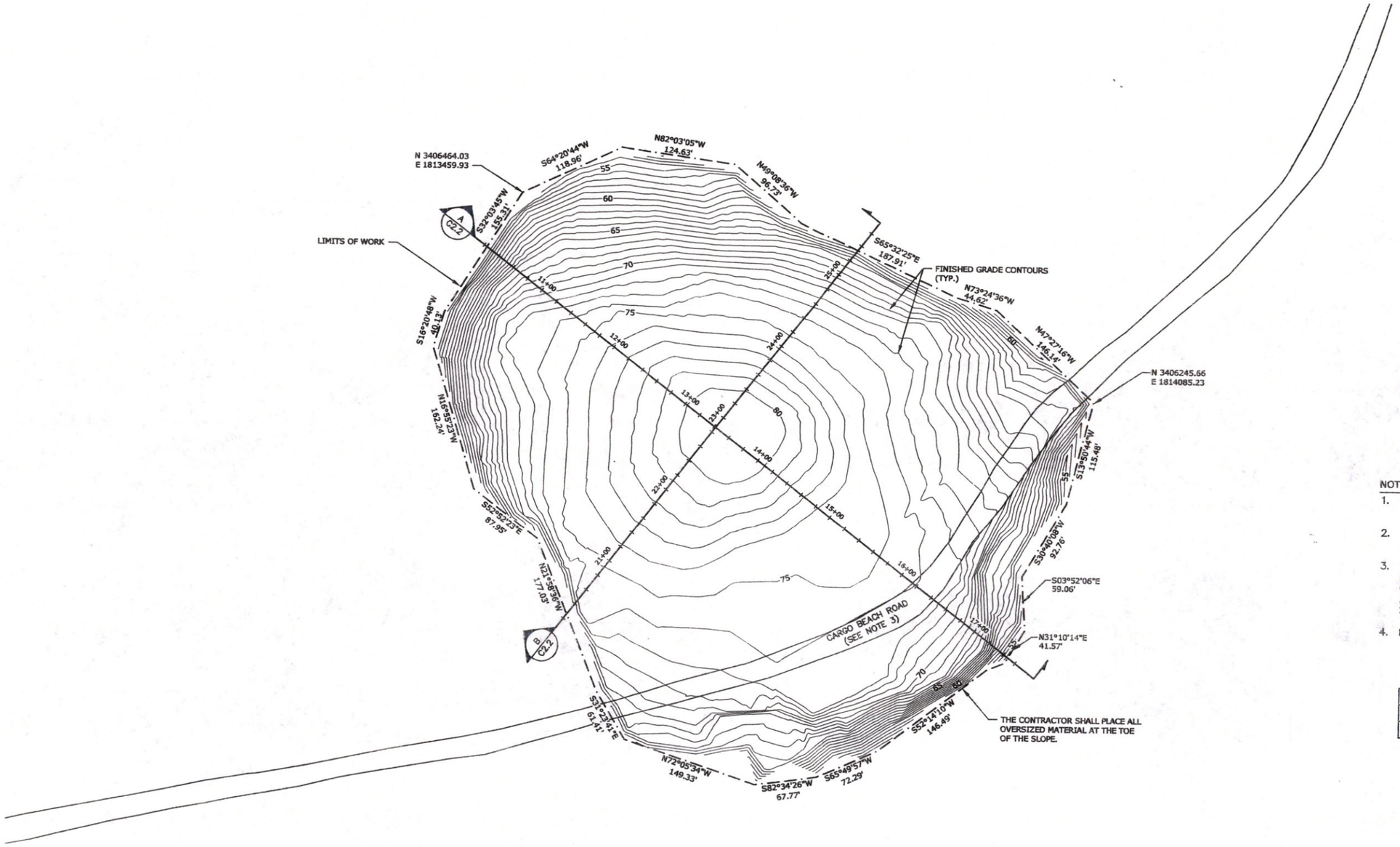
STATE OF ALASKA
49TH
TRAVIS M. WOODS
No. CE-10178
07/16/09
REGISTERED PROFESSIONAL ENGINEER

NE CAPE, ST. LAWRENCE ISLAND, ALASKA
INTRUSIVE DRUM REMOVAL/LANDFILL CAP

CARGO BEACH ROAD LANDFILL
EXISTING SITE / SURVEY CONTROL

SHEET NO.
C1.1

SCALE: SHOWN | DESIGNED: DET | CHECKED: TMW | DRAWN: DET



NOTES:

1. RESHAPE TRASH TO MATCH THE SHAPE OF THE NEW CAP SHOWN.
2. THE CONTRACTOR SHALL PLACE A MAXIMUM 2-FEET OF FILL FOR THE CAP.
3. THE CONTRACTOR SHALL ENSURE THAT CARGO BEACH ROAD IS IN PASSABLE CONDITION AT THE COMPLETION OF THE PROJECT. THE ROAD SHALL HAVE NO ABRUPT CHANGES OF GRADE AND AN EVEN CROSS SLOPE.
4. ESTIMATED CONSTRUCTION QUANTITIES.

SUMMARY OF QUANTITIES		
ITEM	UNITS	TOTAL
CLOSURE MATERIAL	CUBIC YARDS	30000

1/— CARGO BEACH ROAD LANDFILL SITE PLAN
SCALE: SHOWN

REVISIONS				REVISIONS			
NO.	DATE	BY	DESCRIPTION	NO.	DATE	BY	DESCRIPTION

Bristol
ENVIRONMENTAL & ENGINEERING SERVICES CORPORATION
Project No. 210005

STATE OF ALASKA
4978
TRAVIS M. WOODS
No. CE-10178
07/16/09
REGISTERED PROFESSIONAL ENGINEER

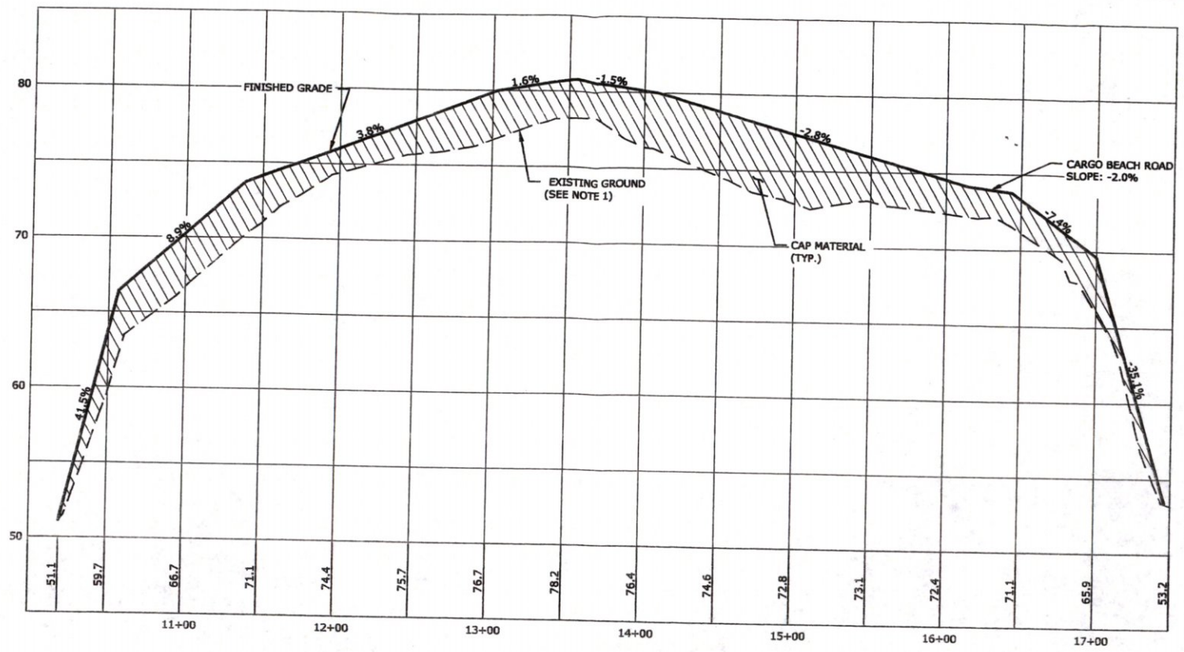
NE CAPE, ST. LAWRENCE ISLAND, ALASKA
INTRUSIVE DRUM REMOVAL/LANDFILL CAP

CARGO BEACH ROAD LANDFILL SITE PLAN

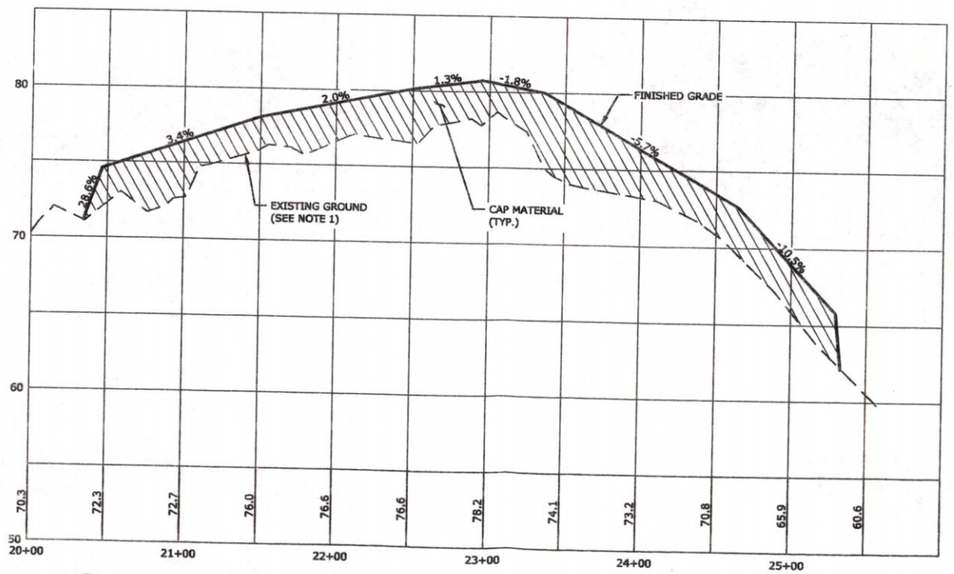
SCALE: SHOWN | DESIGNED: DCT | CHECKED: TMW

SHEET NO.
C2.1

User: DTANNAHILL Jul 17, 2009 - 9:23am
Drawing: K:\JOBS\210005 CIVDES NECAPELF\ACAD-DESIGN\CIV DES\DWG\210005_C-2_REV1.DWG - Layout: C2.1
Xrefs: BR22X34REV.DWG 210005_BASE.DWG - Images: APPENDIX A.TIF



A
—
CARGO BEACH ROAD LANDFILL PROFILE - NORTHWEST TO SOUTHEAST
SCALE: SHOWN



B
—
CARGO BEACH ROAD LANDFILL PROFILE - SOUTHWEST TO NORTHEAST
SCALE: SHOWN

NOTES:

1. HORIZONTAL AND VERTICAL CONTROL IS BASED ON INFORMATION COLLECTED BY ECO-LAND, LLC IN JUNE 2009.
2. SLOPE OF FINISHED GRADE VARIES.

HORIZONTAL SCALE IN FEET
50 0 25 50
5 0 2.5 5
VERTICAL SCALE IN FEET

REVISIONS				REVISIONS			
NO.	DATE	BY	DESCRIPTION	NO.	DATE	BY	DESCRIPTION

Bristol
ENVIRONMENTAL & ENGINEERING SERVICES CORPORATION
Project No. 210005

STATE OF ALASKA
4978
TRAVIS H. WOODS
No. CE-10178
07/16/09
REGISTERED PROFESSIONAL ENGINEER

NE CAPE, ST. LAWRENCE ISLAND, ALASKA
INTRUSIVE DRUM REMOVAL/LANDFILL CAP

CARGO BEACH ROAD LANDFILL SITE CROSS SECTIONS

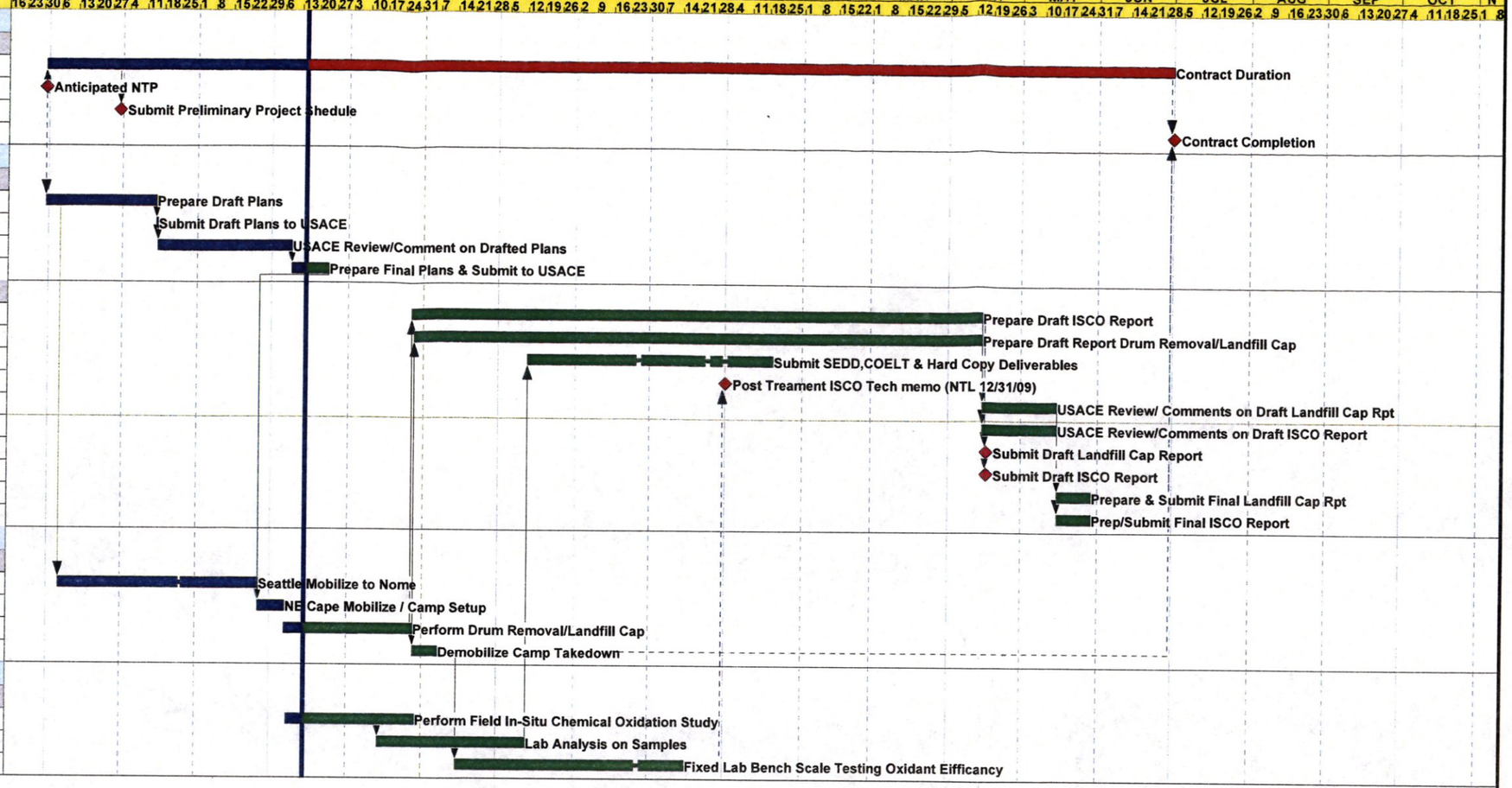
SHEET NO.
C2.2

SCALE: SHOWN | DESIGNED: DST | CHECKED: TWW | DRAWN: DST

APPENDIX E

Project Schedule

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish
General Conditions				
GC01	Contract Duration	457	31MAR09A	30JUN10
GC04	Anticipated NTP	0	31MAR09A	
GC05	Submit Preliminary Project Shedule	0	30APR09A	
GC02	Contract Completion	0		30JUN10*
Submittals				
Planning Doc's				
001	Prepare Draft Plans	33	31MAR09A	14MAY09A
002	Submit Draft Plans to USACE	1	15MAY09A	15MAY09A
003	USACE Review/Comment on Drafted Plans	30	16MAY09A	08JUL09A
004	Prepare Final Plans & Submit to USACE	14	09JUL09A	23JUL09
Final Doc's				
202	Prepare Draft ISCO Report	231	27AUG09	14APR10
103	Prepare Draft Report Drum Removal/Landfill Cap	230	28AUG09	14APR10
005	Submit SEDD,COELT & Hard Copy Deliverables	65	13OCT09	19JAN10
203	Post Treament ISCO Tech memo (NTL 12/31/09)	0		31DEC09*
006	USACE Review/ Comments on Draft Landfill Cap Rpt	30	15APR10	14MAY10
205	USACE Review/Comments on Draft ISCO Report	30	15APR10	14MAY10
007	Submit Draft Landfill Cap Report	0		16APR10
204	Submit Draft ISCO Report	0		16APR10
006-1	Prepare & Submit Final Landfill Cap Rpt	14	15MAY10	28MAY10
006-2	Prep/Submit Final ISCO Report	14	15MAY10	28MAY10
Drums / Cap				
99	Seattle Mobilize to Nome	63	06APR09A	25JUN09A
100	NE Cape Mobilize / Camp Setup	14	26JUN09A	06JUL09A
101	Perform Drum Removal/Landfill Cap	52	07JUL09A	27AUG09
C23	Demobilize Camp Takedown	10	28AUG09	06SEP09
ISCO Study				
200	Perform Field In-Situ Chemical Oxidation Study	52	08JUL09A	28AUG09
201	Lab Analysis on Samples	60	14AUG09	12OCT09
206	Fixed Lab Bench Scale Testing Oxidant Eifficancy	64	15SEP09	15DEC09



Start Date	16MAR09
Finish Date	30JUN10
Data Date	15JUL09
Run Date	17JUL09 15:51

NC01

Bristol Enviromental Remediation

NE Cape Landfill

Update DD 7/15/09

Early Bar
Progress Bar
Critical Activity