Nevada
Environmental
Restoration
Project

DOE/NV--819--REV. 1

National Nuclear Security Administration

Amchitka Island Surface Closure Report

Revision No.: 1

July 2003

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Division

U.S. Department of Energy
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AMCHITKA ISLAND SURFACE CLOSURE REPORT

U.S. Department of Energy
National Nuclear Security Administration
Nevada Site Office
Las Vegas, Nevada

Revision No.: 1

July 2003

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AMCHITKA ISLAND SURFACE
CLOSURE REPORT

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Environmental Restoration Division

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List of Acronyms and Abbreviations

AAC	*Alaska Administrative Code*
ADEC	Alaska Department of Environmental Conservation
AEC	U.S. Atomic Energy Commission
ARAR	Applicable or relevant and appropriate requirements
ATV	All-Terrain Vehicle
BTU	British Thermal Unit
CERCLA	*Comprehensive Emergency Response, Compensation, and Liability Act*
CQCP	Construction Quality Control Plan
CRZ	Contamination reduction zone
cy	Cubic yard
DGC	Alaska Department of Governmental Coordination
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
EZ	Exclusion Zone
IDW	Investigation-derived waste
IT	IT Corporation
NNSA/NSO	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office
NOI	Notice of Intent
NPDES	National Pollutant and Discharge Elimination System
NWP	Nationwide Permit
PCB	Polychlorinated biphenyl
PID	Photoionization detector
PPE	Personal protective equipment
ppm	Parts per million
psi	Pounds per square inch

QAPP	Quality Assurance Project Plan
QC	Quality Control
SZ	Support zone
TCLP	Toxicity characteristic leaching procedure
USFWS	U.S. Fish and Wildlife Service
USN	U.S. Navy
UST	Underground storage tank
WWII	World War II
°F	Degrees Fahrenheit
°C	Degrees Celsius

1.0 Introduction

This closure report presents the project organization and construction procedures utilized in the performance of the remedial actions at the six U.S. Department of Energy (DOE) drill sites and the hot mix plant located on Amchitka Island, Alaska. Also included, in its entirety, is the Human Health and Ecological Risk Assessment for the Mud Pit Release Sites. The risk assessment analyzes the risks associated with the historical spills of drilling mud into surface water drainages. This document (located in Appendix J) completes the investigation and remedial actions associated with the Amchitka surface sites.

1.1 Background

Amchitka Island is located near the far western end of the Aleutian Islands, approximately 1,340 miles west-southwest of Anchorage, Alaska (Figure 1-1). It is part of the Aleutian Islands Unit of the Alaska Maritime National Wildlife Refuge, which is administered by the U.S. Fish and Wildlife Service (USFWS). Since World War II (WWII), Amchitka has been used by multiple United States government agencies for a variety of military and research activities. From 1943 to 1950, it was used as a forward air base for the U.S. Armed Forces. During the late 1960s and early 1970s, it was used by the U.S. Department of Defense (DoD) and the U.S. Atomic Energy Commission (AEC) (predecessor agency to DOE) as a site for three underground nuclear tests. Most recently, during the late 1980s and early 1990s, the U.S. Navy (USN) constructed and operated a radar station on the island. Amchitka is currently uninhabited and access to the island is restricted. Visitors are required to obtain access authorization from either the USFWS or the USN. However, trespassing by commercial fishermen is common.

Three underground nuclear tests were conducted on Amchitka Island. The DoD, in conjunction with the AEC, conducted the first nuclear test (Long Shot) in order to provide data that would improve the United States' capability of detecting underground nuclear explosions. The Long Shot device (approximately 80 kilotons) was detonated on October 29, 1965. The second nuclear test (Milrow) was a weapons-related test conducted by the AEC as a means to study the feasibility of detonating a much larger device in the future. The Milrow device (approximately 1,000 kilotons) was detonated on October 2, 1969. The third nuclear test (Cannikin) was a

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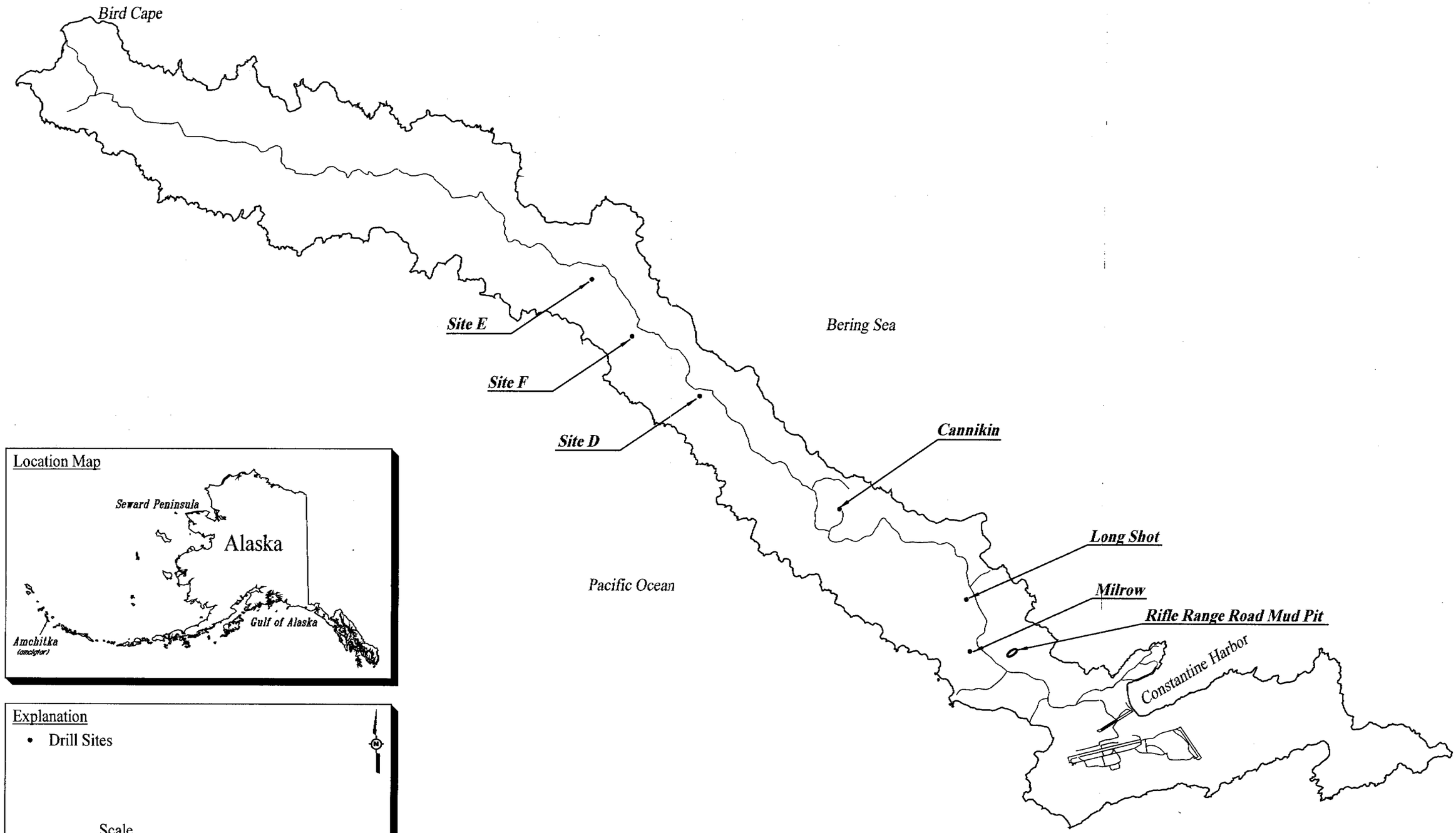

Sources: U.S. Geological Survey Map, 1975

Figure 1-1
Amchitka Island Alaska
Drill Site Location Map

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weapons-related test and was detonated on November 6, 1971. The locations of these nuclear test sites and drill sites discussed in this section are shown in Figure 1-1.

In addition to the three sites that were used for nuclear tests, six other sites were considered for possible nuclear testing. The other potential sites were designated A, D, E, F, G, and H; Sites B and C were later renamed Milrow and Cannikin, respectively. Large-diameter emplacement holes were drilled at Sites D and F, but were not used. An exploratory hole was drilled at Site E. Site H was graded in preparation for drilling activities that did not occur. Sites A and G were located and staked, but no further preparation was made. It was estimated that approximately 195 acres were disturbed by drilling or preparation for drilling at Sites B, C, D, E, F, and H. This area includes access roads and spoil-disposal areas (Fuller and Kirkwood, 1977). Drill Sites D, E, F, and the three test sites, contained mud pits which have previously impacted the environment.

1.1.1 Physical Environment

The island's coastline is very rugged with sea cliffs, isolated sandy and gravel beaches, and grassy slopes. The lowest elevations are on the eastern third of the island and are characterized by isolated, shallow ponds and heavily vegetated drainages. The central portion of the island has higher elevations, is more prone to wind erosion, and has fewer lakes. The westernmost 3 miles of the island are barren. The area contains a windswept rocky plateau with sparse vegetation, except for those areas (e.g., stream drainages) protected from the wind. The average surface elevation at the western end of the island is approximately 800 feet. The highest elevation on the island is approximately 1,600 feet.

1.1.1.1 Climate

Amchitka is characterized by a pronounced maritime climate, including frequent storms, strong winds, and often cloudy skies. There is no prevailing wind on Amchitka, although during the summer months the winds are generally out of the southwest. The mean wind speed between December and February is 30 miles per hour; between March and May it is 26 miles per hour, between June and August it is 22 miles per hour, and between September and November it is 27 miles per hour. The maximum-recorded wind velocity on Amchitka is 115 miles per hour. The ocean moderates temperatures, which average 31 degrees Fahrenheit (°F) in winter (January)

and 48°F in summer (August). Annual precipitation is about 33 inches, including approximately 71 inches of snow.

1.1.1.2 Geology and Soils

Amchitka apparently formed in early Tertiary time (roughly 50 million years ago) as a result of tectonic uplift and deposition of volcanic flow and marine sediments collectively known as the Amchitka Formation. Most of the island contains only a thin, discontinuous veneer of unconsolidated sediments overlying the volcanic bedrock. Over most of the island, organic soils, including peat, overlie the unconsolidated sediments. The principal organic soil on the island blankets much of the poorly drained areas, marine terraces and other topographically low areas, and contain constituent plant materials that have decomposed and often contain horizons of peat. In the most topographically depressed and wettest parts of the island, the soils are typically peaty, with a thick mat of vegetation and little organic decomposition. In the drier and topographically higher areas, the soils are folists (well-drained organic soil). Limited areas of poorly developed sandy soils exist in dune areas in a narrow strip along the Bering Sea coastal bluffs.

1.1.1.3 Hydrology

Amchitka is covered with hundreds of small, shallow ponds up to 330 feet wide and up to 10 feet deep. The smaller ponds are considerably shallower, typically ranging from 12 to 20 inches deep. Ponds are most numerous on the eastern two-thirds of the island (approximately 26 ponds per square mile), where they have developed above marine terraces and are confined by thick vegetation peat. Many lakes in this region lack a definite inlet or outlet. Fewer ponds are present on the western third of the island, where they typically occupy bedrock depressions. Larger pond sediments are either floc (suspension of low-density detrital organic material) over gravel, organic silts over gravel, or clean gravel. The bottoms of smaller ponds are usually composed of peat or fine sediment covered with floc.

Watersheds on Amchitka Island are generally limited to 1 to 3 miles in length since all streams drain perpendicular to the long axis of the island into either the Bering Sea or the Pacific Ocean. Streams on the eastern part of the island flow slowly through tundra-covered watersheds, range from 3 to 10 feet wide, are up to 12 inches deep, and are characterized by low gradients and flow velocities. Streams in the central and western regions range from 6 to 13 feet wide and are up to

14 inches deep. Most of the streams in the island flow year-round. During relatively dry periods, stream flows are sustained by baseflow from soils and the underlying weathered bedrock; surface runoff and baseflow contribute to flows during wet periods.

The groundwater system on Amchitka Island can be divided into three zones: (1) a shallow, water-bearing zone developed entirely within the organic soils and peat; (2) an intermediate groundwater zone developed within the shallow, weathered bedrock where fractures are relatively open; and (3) a deep groundwater zone developed in less weathered bedrock where fractures are less open. The shallow water-bearing zone occurs largely in the tundra vegetation, peat, and underlying organic soils, and accumulates due to the high porosity and low vertical permeability characteristics of these materials. Perched groundwater is likely widespread in the eastern half of the island, as indicated by the large number of ponds in the region. Groundwater in the intermediate zone occurs in open fractures and within the volcanic rock matrix, where weathering processes have resulted in increased effective porosity. The intermediate zone may extend over most of the island and have a depth extending several hundred feet below the base of the shallow groundwater zone. Groundwater in the deep zone occurs in less weathered bedrock at depths greater than several hundred feet, and appears isolated from the surface water/shallow perched groundwater. Groundwater discharging springs are common on Amchitka. The best example is Constantine Spring. This spring served as a water supply during U.S. Army, USN, and AEC occupation of the island. Some of the island's deeper lakes (e.g., Pumphouse Lake, Long Lake, and Jones Lake) are also fed by bedrock springs.

The water in streams, lakes, and springs on Amchitka Island is generally of excellent quality. However, the chemical character of surface water on the island is quite varied. The surface water generally has less than 200 milligrams per liter total dissolved solids, with sodium and chloride as the dominant cation and anion, respectively.

1.1.2 Archaeology

Numerous prehistoric archaeological sites have been documented on Amchitka Island. Most of the sites occur along the coast in the southeastern half of the island. In addition, there are sites relating to historic occupation of the island. Three are located in the Constantine Harbor area, which will be the focal point of much of the proposed remediation activities. Others may be located near other areas proposed for cleanup.

Nonnative materials remaining on Amchitka Island are derived from three major occupations: WWII U.S. Armed Forces; AEC/DOE nuclear testing period; and USN Radar Station Operations. In considering these materials, it is important to remember that all of them were designed to be temporary in nature.

The first group, WWII facilities, were the subject of a U.S. Army Corps of Engineers cleanup effort in 1986. At that time, several buildings were left in place because of potential historic significance. These were the North and South Hangars, the Officer's Club, and the Chapel. The North Hangar was subsequently demolished by the USN. The Chapel and the Officer's Club are collapsed, or nearly so, and no cleanup of these structures was attempted. The South Hangar, potentially eligible for inclusion on the National Register of Historic Places, was removed.

The nuclear testing period buildings were demolished (including some that were reused by the USN during the radar station operations); all dated from the middle to late 1960s. They did not appear to be architecturally significant and were not eligible for inclusion on the National Register. The landscapes of the three surface ground zeros were eligible.

Finally, the USN's buildings from the 1987 to 1993 period are not considered eligible for inclusion on the National Register because the antenna system did not become operational until after 1989, the defined end of the Cold War era.

Cleanup activities were confined to existing roads and disturbed areas. This includes the borrow sources. Therefore, there was no adverse effect on the prehistoric sites from these activities. On-island personnel were required to undergo training emphasizing that unauthorized excavation and collection are prohibited by the *Archaeological Resources Protection Act* of 1979, as amended, and that violation carries both criminal and civil penalties, including jail time. This training was accomplished by both written materials and on-site briefings.

1.2 Remedial Action Objective

The remedial action objective was to eliminate human and ecological exposure to contaminants by capping drilling mud pits and removing the tank contents at the hot mix plant, which was utilized to support asphalt-paving operations on the island. In addition, shallow groundwater monitoring wells at the Long Shot and Milrow Sites were to be plugged and abandoned.

1.3 Applicable, Relevant, and Appropriate Requirements

Remediation work on Amchitka was conducted by the DOE National Nuclear Security Administration Nevada Site Office (NNSA/NSO) under the authority of the *Comprehensive Emergency Response, Compensation, and Liability Act* (CERCLA). This statute specifies that on-site remedial actions shall attain federal and state standards, requirements, criteria, and limitations determined to be applicable or relevant and appropriate. Applicable or relevant and appropriate requirements (ARARs) are site-specific and represent the universal enforceable standards by which the CERCLA remedial action was assessed. The NNSA/NSO developed ARARs specific to the proposed remedial action on Amchitka Island and included them in the Removal Action Work Plan. The regulatory agency for this project was the Alaska Department of Environmental Conservation. Table 1-1 presents the ARARs used for the project.

Institutional controls will be implemented to protect the mud pit caps. The coordinates of the mud pit corners are located and restrictions will be enforced by the USFWS to prevent visitors from disturbing the caps. In addition, the mud pit sites will be inspected every 5 years as part of the ongoing EPA long-term monitoring on the island.

1.4 Scope of Work

The scope of work for the remedial action was comprised of the following components:

- Mobilization
- Site setup
- Site preparation
- Soil processing
- Water treatment and discharge (water on the mud pits)
- Drilling mud stabilization
- Cap placement
- Drilling mud excavation and consolidation (Cannikin only)
- Confirmatory sampling and analyses of the excavated drilling mud (Cannikin only)
- Backfill of excavated areas (Cannikin only)
- Collection, treatment, and disposal of accumulated water (decontamination rinsate)
- Closing the hot mix plant
- Plugging and abandoning existing shallow groundwater monitoring wells
- Site restoration
- Demobilization

Table 1-1
Applicable, Relevant and Appropriate Requirements
Amchitka Remedial Action
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Requirements	Authority	Prerequisite	Description
ACTION-SPECIFIC REQUIREMENTS			
National Environmental Policy Act and implementing regulations	42 *United States Code* (USC) 4321 et seq. (2000) 40 *Code of Federal Regulations* (CFR) 1500 et seq. (1999)	Implementation of a major federal action	Requires various levels of impact analyses relating to proposed project; discusses alternatives to proposed project and related impacts
Comprehensive Environmental Response, Compensation, and Liability Act and implementing regulations	42 USC 9620 et seq. (2000) 40 CFR 300 (1999)	Existence of an abandoned hazardous waste site	Governs cleanup of abandoned hazardous waste sites; defines process for preparation and implementation of cleanup
Occupational Safety and Health Act and implementing regulations	29 CFR 1910.120 (1999)	Employment of federal and contractor employees	Regulations pertaining to protection of workers in an occupational setting
Generator Requirements	40 CFR 261 (1999) 40 CFR 262, Subparts A-C (1999)	Generation of a *Resource Conservation and Recovery Act* hazardous waste	Requires that a hazardous waste determination be made; sets requirements for the on-site accumulation of hazardous waste, including container requirements, inspections, and pretransport requirements
Underground Storage Tanks (USTs)	18 *Alaska Administrative Code* (AAC) 78.085-100 (1998)	Underground storage tank	Permanent closure of an UST; site characterization and assessment
Leaking USTs	18 AAC 78.200-276 (1998)	UST release	Release investigation, notification, corrective action
Clean Water Act (CWA)-Wetlands Permitting	40 CFR 122 (1999) 33 CFR 330 (1999) Nationwide Permit #38, *Cleanup of Hazardous and Toxic Waste*	Dredging or filling wetlands	Authorizes activities under a general permit that typically result in minimal adverse effects on the aquatic environment
National Pollutant Discharge Elimination System Stormwater Program	33 USC 1329 (2000) 40 CFR 122.26 (1999)	Construction activity resulting in disturbance of at least five acres or less than five acres as part of development with potential to disturb five or more acres	Controls discharge of pollutants from non-point sources (stormwater) into waterbodies

Table 1-1
Applicable, Relevant and Appropriate Requirements
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Requirements	Authority	Prerequisite	Description
ACTION-SPECIFIC REQUIREMENTS - continued			
Alaska (AK) Air Quality Regulations	18 AAC 50.045(d) (1998)	Handling, transporting, or storage of bulk materials	Dust control requirements; reasonable precautions must be taken to prevent emission of particulate matter into ambient air
	18 AAC 50.055(a-c) (1998)	Industrial process or fuel-burning equipment	Industrial processes and fuel-burning equipment; Addresses opacity, particulate matter emissions, and sulphur-compound emissions
Recommended Practices for Monitoring Well Design, Installation and Decommissioning (April 1992)	Incorporated by reference in 18 AAC 75.345(j) (1998)	Groundwater monitoring wells	Plugging and abandonment requirements for monitoring wells
AK Fish and Game Regulations	*Alaska Statutes* (AS)16.05.840 (1999) AS16.05.870 (1999)	Activities affecting freshwater streams, ponds, and/or anadromous fish	*Fishway Act* and *Anadromous Fish Act*
CHEMICAL-SPECIFIC REQUIREMENTS			
AK Water Quality Standards	18 AA C70.005-050 (1998)	Potential for degradation/ pollution of a waterbody	Antidegradation policy, protected water use classes, water quality standards table
AK Water Toxics Criteria	40 CFR 131.36 (1999)	Potential for degradation/ pollution of a waterbody	Federally-promulgated water toxics criteria that have been adopted as Alaska water quality standards
AK Wastewater Disposal	18 AAC 72.500-510 (1998) 18 AAC 72.600 (1998) 18 AAC 72.610 (1998)	Discharge of nondomestic wastewater onto land, surface water, or groundwater; construction or use of a nondomestic wastewater treatment works	Submission and approval of engineering plans; plan review and permit fees
	18 AAC 72.900-990 (1998)	Disposal of nondomestic wastewater into or onto the land, surface water, or groundwater in Alaska	General permit procedures, reports, emergency notice, inspections, appeals

Table 1-1
Applicable, Relevant and Appropriate Requirements
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Requirements	Authority	Prerequisite	Description
CHEMICAL-SPECIFIC REQUIREMENTS - continued			
AK Oil and Hazardous Substances Pollution Control Regulations	18 AAC 75.325 (1998)	Discharge/release of oil or hazardous substance	Site cleanup rules
	18 AAC 75.335-341 (1998)		Site characterization and soil cleanup levels
	18 AAC 75.345 (1998)		Groundwater and surface water cleanup. Requires groundwater and surface water to be cleaned up to certain numerical standards and establishes point of compliance and monitoring requirements.
	18 AAC 75.350-360 (1998)		Groundwater use, sampling and analysis, cleanup requirements
	18 AAC 75.375-390 (1998)		Institutional controls, final reporting requirements and site closure, waiver or modification
	18 AAC 75.990 (1998)		Definitions
LOCATION-SPECIFIC REQUIREMENTS			
AK Coastal Zone Management Program	AS 16.20 (1999) 15 CFR 930.30-40 (1999)	Activity within a coastal zone	Requires a project consistency review; results in determination of state and federal permitting requirements
Coastal Zone Management Act	16 USC 1541 et seq. (2000)		
National Wildlife Refuge System Administration Act & Implementing Regulations	16 USC 668dd-ee (2000) 50 CFR 25-36 (1999)	Activity within a national wildlife refuge	Administration and management of areas in the National Wildlife Refuge System
Refuge Recreation Act	16 USC 460k-3 (2000)	Activity within a national wildlife refuge	Authority for establishment of fees and charges and issuance of permits

Table 1-1
Applicable, Relevant and Appropriate Requirements
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Requirements	Authority	Prerequisite	Description
LOCATION-SPECIFIC REQUIREMENTS - continued			
Executive Order 11990, Protection of Wetlands	--	Federal action potentially affecting wetlands	Requires a federal agency to review actions for potential wetlands impacts
Executive Order 11988, Floodplain Management	--	Federal action within a floodplain or that may affect a floodplain	Evaluation and avoidance of floodplain impacts
Compliance with Floodplain-Wetlands Environmental Review Requirements	10 CFR 1022 (1999)	Federal action with the potential to effect wetlands and/or floodplains	Evaluation and assessment of wetlands and floodplains that may be impacted by DOE activity
Endangered Species Act	16 USC 1531 et seq. (2000) 50 CFR 402 (1999)	Federal action	Requires a federal agency to review proposed actions in order to determine any effect on endangered/threatened species and/or their habitat; mandates consultation with USFWS if species or habitat may be adversely affected by federal actions
Fish and Wildlife Coordination Act	16 USC 661 et seq. (2000)	Federal actions resulting in control or modification of a natural stream or water body	Requires federal agencies to assess impacts of water-related projects on fish and wildlife; prevent loss and/or damage to these resources; and provides for the development and improvement of the resources
National Historic Preservation Act	16 USC 470 (2000) 36 CFR 63 (1999) 36 CFR 800 (1999)	Federal action	Identification, evaluation, registration, protection, and preservation of historic properties; requires federal agencies identify and evaluate potential impacts on historic properties; discusses federal consultation with State Historic Preservation Officer

All labor, supervision, equipment, materials, and transportation necessary to perform this remedial action was provided by the NNSA/NSO.

1.5 Project Organization

The following sections describe the organization that was adhered to throughout the project. Field operations for the investigation were conducted by NNSA/NSO and contracted personnel. Figure 1-2 is the Organizational Work Chart used for the remedial actions.

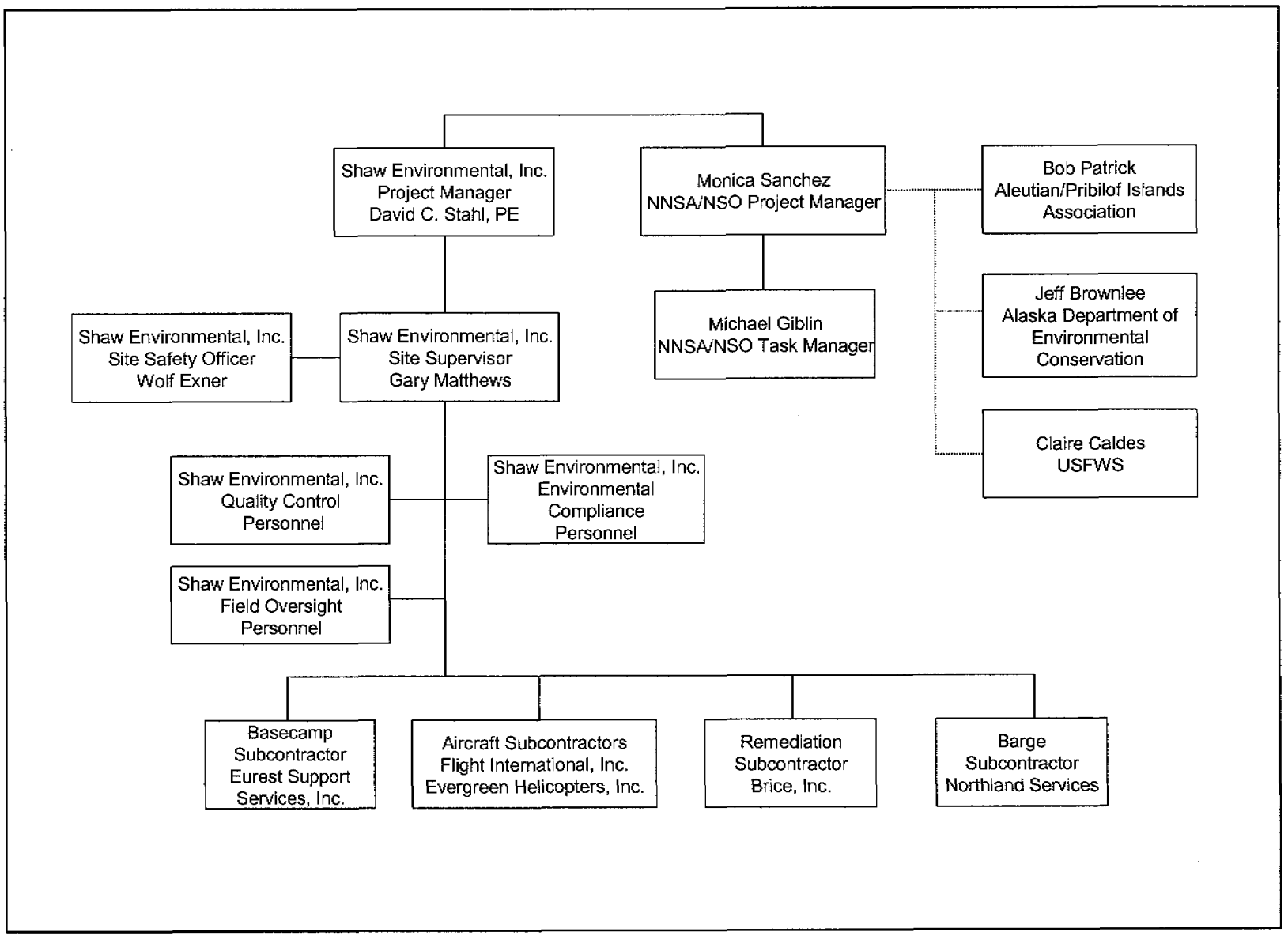

Figure 1-2
Organizational Work Chart

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2.0 Remedial Action

The following sections describe the remedial action activities as they were performed.

2.1 Preliminary Activities

Several preliminary activities were performed prior to mobilization for efficient and effective performance. These activities were required to provide necessary information, as well as the necessary material, equipment, and labor to complete the remedial action. The following sections detail the required preliminary activities.

2.1.1 Procurement Activities

Procurement was an important aspect of this project because four major subcontracts were required for the implementation of the field activities. The major subcontracts are listed below:

- Base camp services
- Barge transportation
- Air transportation
- Remediation services

In addition, material purchases, equipment rentals, and other miscellaneous subcontractor services necessary for field activities were procured prior to and during implementation of the remedial action. All procurement activities were conducted in accordance with government rules and regulations.

2.1.2 Permitting Activities

Specific activities discussed in this work plan and those associated with the operation of a base camp required the acquisition of federal and state permits and/or authorizations. Remedial action and base camp permits/authorizations were obtained by the respective DOE subcontractor.

All required environmental permits for the project were obtained prior to the commencement of each individual activity on the island. The following represent the applicable permitting/ authorization requirements for remedial activities and base camp operations on the island which were required to complete the project.

Access Requirements:

- ***Access to the Maritime National Wildlife Refuge, Amchitka Island.*** Amchitka Island is part of the Alaska Maritime National Wildlife Refuge, which is administered by the USFWS. Access to the island is currently restricted to government agencies and entities specifically approved by the USFWS. The DOE submitted a Special Use Permit application to the USFWS and obtained authorization to access the island to conduct remedial activities and base camp operations.

- ***Coastal Zone Impacts.*** Federal activities that may impact the coastal zone in Alaska are required to document consistency with the requirements of the Alaska Coastal Management Program. This program is administered by the Alaska Department of Governmental Coordination (DGC) and requires a consistency review and certification. The consistency review and certification involves the examination of project activities in relation to established State and regional coastal zone management standards and a certification that such standards would be met. The State issued a consistency determination prior to remedial action activities on the island.

Activities specific to the remedial action:

- ***Construction Activities Disturbing Greater Than Five Acres.*** The federal National Pollutant Discharge Elimination System (NPDES) program required a permit for the discharge of storm water resulting from construction activities that disturbed greater than five acres of earth. The capping of mud pits on Amchitka involved the disturbance of a cumulative total greater than five acres and required a NPDES storm water permit. The DOE secured a Construction General Permit, a nationwide permit for remediation construction activities. As required by regulation, a Notice of Intent (NOI) was submitted to the U.S. Environmental Protection Agency (EPA) stating DOE's intent to apply this nationwide permit to Amchitka remedial activities. Upon completion of this project, the DOE submitted a Notice of Termination to the EPA.

- ***Containment/Stabilization of Hazardous or Toxic Waste.*** The remedial action at the mud pits involved stabilization of mud pit material and subsequent isolation from the environment through application of a cap. However, prior to stabilization, several thousands of gallons of standing water (resulting from precipitation) were discharged from the mud pits. Emergent wetland vegetation was identified in some of the mud pits, prompting the mud pits to be considered wetlands. To address remedial action within a wetland, the DOE applied for use of Nationwide Permit (NWP) #38, Cleanup of Hazardous and Toxic Waste, under the *Clean Water Act* Section 404 program. The DOE received authorization to proceed with remedial action under this permit.

- ***Discharge of Standing Water from Mud Pits.*** As indicated above, several thousands of gallons of standing water was discharged from the mud pits in preparation for capping. This water was discharged directly to the ground surface or treated prior to discharge under State of Alaska Wastewater General Permit #9640-DB004. A Notice of Disposal

was submitted to the Alaska Department of Environmental Conservation (ADEC) in order to conduct discharge activities under this general permit. The discharge of water to a surface water body was not authorized under this State permit and did not occur during DOE operations.

Activities specific to base camp operation:

- ***Operation of Food Service Facilities.*** The base camp provided hot and cold meals for site workers throughout the duration of the project. This service required a State of Alaska food service operator's permit, which was obtained by the subcontractor.

- ***Use of Constantine Spring Water.*** Plans called for the use of water from Constantine Springs to support base camp operations. The water was used for drinking, laundry, shower facilities, and cooking. Drinking water required treatment prior to use. A State permit was obtained prior to operating a drinking water treatment system on the island.

- ***Disposal of Grey Water.*** Grey water was generated from the use of shower, laundry, and kitchen facilities in the base camp. A State of Alaska wastewater discharge permit was obtained after the construction of a leachfield was approved.

- ***Disposal of Black Water.*** Black water generated from the use of portable toilets was containerized and disposed of in Anchorage at a sewage treatment plant in accordance with the State of Alaska disposal permit.

2.2 Mobilization

All equipment, materials, and personnel were mobilized from Anchorage, Alaska, on board chartered carriers.

2.2.1 Personnel

Sufficient construction personnel, equipment, and materials were mobilized to the site by chartered aircraft and seagoing vessels to initiate remedial action activities. All remedial action activities were completed by Brice, Inc., an Alaska-licensed contractor. Personnel providing oversight for the DOE consisted of the following:

- Project Manager
- Site Supervisor
- Project Engineer
- Quality Control Engineers
- Health and Safety Officer

An environmental compliance specialist was mobilized to oversee the removal of waste from the island. Additional personnel were mobilized as necessary to perform site audits and assessments in accordance with DOE policy.

2.2.2 Equipment

The major equipment required for the remedial action consisted of one or more of the following items:

- Base camp equipped with living quarters, dining, and sanitary facilities
- Tracked excavators
- Low ground-pressure bulldozers
- Vacuum truck
- 30,000-gallon modular tanks
- Rubber-tired backhoes
- Rubber-tired loaders
- Vibratory drum roller
- Road grader
- Articulated dump trucks
- Soil processing plant equipped with a vibrating screen
- 4-inch trash pumps
- 2-inch trash pumps
- Hoses, fittings, and related materials
- Pick-up trucks
- Activated carbon water treatment system
- Photoionization detector (PID)
- Explosimeter/oxygen analyzer

Miscellaneous office and health and safety (H&S) materials, as well as the geosynthetic membrane and material needed for general site restoration, were also obtained and brought on site prior to the remedial action.

2.3 Site Setup

The first work activities performed as part of the remedial action were site setup. The primary purpose of site setup was to establish the field facilities necessary to accomplish the remedial action. Site setup activities included:

- Inspecting all sites for nesting Aleutian Canada Geese and implementing the USFWS-approved hazing plan in accordance with the *Migratory Bird Transit Act*

- Establishing a base camp complete with sleeping, dining, and sanitary facilities as well as telephone/telefax service
- Constructing two lined fuel storage areas for storage and dispensing of diesel fuel and gasoline
- Identifying and designating the temporary laydown areas as well as specific locations for storage/stockpiling of construction equipment and materials and staging of materials
- Identifying and designating the exclusion, contamination reduction, and support zones

Each of these tasks are described in detail in the following sections.

2.3.1 Aleutian Canada Goose Management

The Aleutian Canada Goose, a threatened species, is abundant on Amchitka. In order to complete the remedial actions with as little disturbance of nesting geese as possible, prior to any site activities, biologists surveyed all proposed areas of activity for the presence of nesting geese. The mobilization date of mid-May was well before the mating time of the goose, so no nesting pairs were anticipated or found. No nests were located in the vicinity of the established work areas, and the approved USFWS procedures for hazing the geese and prohibiting them from nesting in the vicinity of the sites were successfully implemented. The mitigation field forms utilized by site biologists are included in Appendix A.

2.3.2 Base Camp Establishment

Approximately 4 weeks prior to personnel mobilization, a base camp to support approximately 150 personnel was set up in the vicinity of Baker Runway. The base camp was installed and maintained in accordance with all applicable federal, state, and local regulations. The base camp provided sleeping quarters, dining, and sanitary facilities for all personnel. The base camp operator obtained all permits regarding black water, grey water, and solid waste disposal. An incinerator was set up to reduce the volume of solid waste to be shipped to Anchorage for disposal. Within the base camp, office trailers were set up to support DOE and its subcontractors, the USN and its subcontractors, and the U.S. Army Corps and its subcontractors activities. The trailers were equipped with office equipment or hookups for a copier, satellite telephone/telefax service, and were of adequate size to provide room for the quality control (QC) records, which were filed and available at all times. Additional office trailers were set up at Long Shot, the

Cannikin site, and Site D. The trailers were equipped with electricity and office equipment to support all construction activities.

2.3.3 Work Area Identification

The various work areas required to complete the remedial action were designated prior to initiating work activities. The equipment and material laydown areas were used to store construction machinery, equipment, and tools, and stage construction materials and supplies needed during the remedial action. Other containers, such as 55-gallon drums, used to contain used personal protective equipment (PPE) were placed in this area. A waste storage area was constructed to store drums of used PPE and other non base camp-related waste generated during the remedial action.

2.3.4 Contamination Control Zone Delineation

Contamination control zones consisting of an exclusion zone (EZ), contamination reduction zone (CRZ), and a support zone (SZ) were established. A brief description of each zone is included in the following:

- EZ - The EZ included the mud pits and contiguous areas. This area was known to contain contaminated materials and had the highest potential for exposure to the contaminants by contact; therefore, appropriate PPE was worn when working in this zone.
- CRZ - The CRZ was comprised of the personnel decontamination facility, the equipment decontamination pad, and a portion of the temporary site access road. This was the corridor through which all personnel and equipment passed through to enter or exit the EZ. Personnel and equipment decontamination occurred here.
- SZ - The SZ consisted of all other areas. This zone was an uncontaminated area used for storage and general administrative functions.

2.3.5 Personnel Decontamination Facility Establishment

A personnel decontamination facility was established within the CRZ to provide personnel with a controlled transition from the EZ to the SZ. A step-off area was located at the entrance to the personnel decontamination facility. A boot wash, hand wash, and emergency eyewash was provided in this area. Personnel doffed PPE in this area. Lined drums were positioned within this

area to dispose of PPE. All PPE was disposed of off island in accordance with applicable regulations.

2.4 Site Preparation

The next work activities prepared the site for all subsequent construction operations required to fulfill the remedial action. These initial tasks included:

- Protecting all site features from damage which could have occurred during performance of the remedial action
- Constructing stabilized construction exits at the entrance to each of the DOE sites and constructing/upgrading temporary access roads and laydown areas at each site prior to initiating earth disturbance activities
- Installing erosion and sedimentation controls consisting of diversion ditches and berms upgradient, and silt fence and strawbale check dams downgradient of all work areas
- Removing the wooden pier and decommissioning the manifold system at Drill Site D
- Constructing a sediment trap in Site D to collect, clarify, and discharge storm water runon
- Constructing equipment decontamination pads

2.4.1 Protection of Site Features

Prior to and during the performance of the remedial action, site features, such as monitoring wells, were protected, as necessary, to prevent damage which may result from construction operations. Existing site features which were to remain in place, or to be reused, were protected from damage by heavy equipment and vehicular traffic by placing high-visibility ribbon and orange plastic fencing, as necessary, around the site feature.

2.4.2 Temporary Access Road and Stabilized Construction Exit Installation

Access to the mud pit at Drill Site E required a temporary site access roadway to be constructed from the drill pad to the mud pit. Actual location of the access road was determined in the field. The access road was constructed of a nonwoven geotextile and 6 inches (minimum) of stone. Site traffic was kept to a minimum and was confined to the temporary site access roadway. Very little travel on the undisturbed tundra was necessary; however, when it became necessary, all-terrain

vehicles (ATVs) with tire pressures less than 5 pounds per square inch (psi) were utilized. At the completion of the remedial action, the temporary access road area was revegetated.

A stabilized construction exit was constructed at each of the DOE sites with the exception of Rifle Range Road. The construction site was stabilized with large aggregate (riprap) over a geotextile to prevent the traveling of drilling mud, dirt, or sediment onto Infantry Road. The stabilized construction exit was maintained during the remedial action.

2.4.3 Erosion and Sedimentation Control Structure Installation

Temporary controls to minimize erosion and sedimentation was installed at each site and contiguous work areas during the remedial action. The primary erosion and sedimentation control structures utilized were diversion trenching and silt fencing. A sediment trap at Drill Site D was also constructed. Erosion and sedimentation control measures were slightly field modified to suit construction operations. Sheet C-25AB presents the structures utilized.

2.4.4 Drill Site D Pier Removal and Manifold Decommissioning

Pier Removal - Once the standing water was removed from the mud pits, low ground pressure equipment removed the wooden pier by cutting the supports above the mud line and removing the wooden pieces in the equipment bucket. The supports below the mud line were left in place. The wooden pieces of the pier were accumulated, and if necessary decontaminated with a high-pressure sprayer to remove any drilling mud. The wood was disposed of in the USN's permitted landfill on the island. Navy subcontractor personnel inspected each load of wooden debris prior to deposition into the landfill.

Manifold Decommission - After the standing water was removed from the mud pit, the manifold was opened and the water contained within the outlet pipe was discharged over the concrete pad to the ground surface. The manifold was removed at the large gate valve and transferred to the USN's landfill for disposal. The steel outlet pipe was plugged with native soil and the inlet of the pipe was crushed with heavy equipment. The gate valve was then closed and the out slope of the mud pit regraded to cover the outlet of the pipe.

2.4.5 Equipment Decontamination Pad Construction

An equipment decontamination pad was constructed at each mud pit site within the CRZ at the designated locations. All equipment leaving the EZ, which had contacted contaminated material, was decontaminated at this location. The equipment decontamination pad consisted of an area approximately 15 by 40 feet, graded to drain to one corner, and covered with 2 layers of 30-mil liner and geotextile placed on grade with earthen berms approximately 1 foot in height around the perimeter. All rinsewater generated was treated at Drill Site D as discussed in Section 2.5.1. Decontamination was accomplished using a high-pressure washer with makeup water from Constantine Springs.

2.5 Drilling Mud Pit Remediation

The remediation of the drilling mud pits consisted of constructing 30-mil geosynthetic caps over each mud pit. A general cross section of the cap system is shown on Sheet C-25AB. The remedial action was completed by performance of several sequential tasks using conventional earth-moving equipment. These tasks are discussed in the following sections and will include treatment and discharge of standing water in the mud pits, operation of several soil-processing areas, stabilization of the drilling mud, installation of the geosynthetic cap, and site restoration. All activities associated with the remedial action were completed in accordance with the approved Construction Quality Control Plan (CQCP).

2.5.1 Water Treatment and Discharge

In order to stabilize the drilling mud, it was necessary to pump all standing water from the mud pits. In order to do this, several high-output, portable trash pumps were utilized to pump the water from the pits. Analytical data on the standing water showed that, as long as the underlying mud was not disturbed, the water could be discharged without prior treatment. The suction hose was attached to a float which prevented the drilling mud from becoming disturbed during pumping operations. The pumps discharged onto the concrete drill pad at Drill Site D, or into an energy dissipater constructed of 6-inch diameter rock. The dissipater prevented erosion downgradient of the pump discharge point. The approved water treatment plan, detailing the system, is located in Appendix B.

An anionic polymer was added to flocculate out free product. The water was then passed through a series of sand filters, and finally activated carbon canisters to remove any organics. Treated water was sampled at the discharge point at the frequency required in ADEC's Wastewater General Permit Number 9640-DB-004. In addition to the standing water within the mud pits, all other water generated as a result of equipment decontamination and water contained within the hot mix plant tanks were treated by this method prior to discharge. All sampling and analyses was done in accordance with the Quality Assurance Project Plan (QAPP). Appendix C contains the summary of analytical results and quantity of water discharged.

2.5.2 Soil Processing

During the remedial activities, it was necessary to process soils from several borrow areas. A large borrow area located at Mile Marker 8 on Infantry Road was utilized to supply soil for the Cannikin and Long Shot mud pits. Borrow areas in the vicinity of the Rifle Range Road mud pit and within Drill Site D were utilized to supply soil for pits at those locations plus Drill Sites E and F. All proposed borrow areas were located within previously disturbed areas; no virgin tundra was utilized for borrow material. While on the island, DOE obtained USFWS permission to utilize an area just west of Drill Site D for borrow material. This area is shown on Sheet C-13AB.

As stated in Section 2.4.3, prior to any earth disturbance activities, erosion and sediment control structures were installed. The soil excavated from the borrow areas was utilized for several different applications. The applications and the required gradation of soils were as follows:

- Soil to stabilize the drilling mud <6-inch maximum diameter
- Intermediate cover (1 foot below liner) <1 inch maximum diameter
- Protective cover (1 foot above liner)<1 inch maximum diameter
- Soil cover <2-inch maximum diameter
- Vegetated layer <3-inch maximum diameter

Soils were excavated from the borrow areas and placed into the processor equipped with a series of vibratory screens. Processed material was segregated and stockpiled based on gradation. Stockpiled material was loaded into dump trucks for use, as required. Care was taken during borrow area operations to minimize any disturbance outside of the previously disturbed borrow

area footprint. At the conclusion of the project, the borrow areas were restored. Appendix D contains all geotechnical data on the processed soils.

2.5.3 Drilling Mud Excavation and Consolidation

The Cannikin site contained three mud pits, one at the surface ground zero drilling pad, and two at the post-shot drillback well. The drilling mud within the southern post-shot drillback mud pit (approximately 550 cubic yards) was removed and consolidated into the northern mud pit. The following sections detail this activity.

2.5.3.1 Drilling Mud Excavation

After the standing water on the mud pit was removed, a tracked excavator removed all of the drilling mud from the southern mud pit and loaded it into dump trucks, then transported it approximately 120 yards to the northern mud pit for consolidation.

2.5.3.2 Confirmatory Sampling

After visual inspection determined that all drilling mud was removed from the southern mud pit, a round of confirmatory samples were taken of the *in situ* soils which showed elevated diesel-range organics. After additional material was excavated and bedrock was reached, a second round of sampling verified that the contaminants were below the regulatory cleanup levels. The samples were analyzed for diesel-range organics by Method AK102. All sampling and analyses were done in accordance with the CQCP and the QAPP. Table 2-1 presents the results of the second round of confirmatory sampling. On June 19, 2001, after reviewing the data, ADEC approves the area for backfill.

2.5.4 Drilling Mud Stabilization

After the standing water was removed from each of the mud pits, screened solidification soils were hauled from the borrow area and end-dumped into the mud pit. Tracked excavators equipped with mixing blades and tilling attachments mixed the screened material with the drilling mud. The tracked excavator mixed the solidification soils into the drilling mud, taking care to mix the full thickness of drilling mud. The solidification soils, when mixed with the drilling mud, stabilized the mixture to allow the excavator to construct a working platform out of the mixture.

Table 2-1
Cannikin South Mud Pit
Post Excavation *In Situ* Soil Sample Results

Sample	DRO by AK 102
AM-CAN S007	336 ppm
AM-CAN S008	181 ppm
AM-CAN S009	ND at 150 ppm
AM-CAN S010	ND at 150 ppm
AM-CAN S011	ND at 150 ppm

The excavator then worked off of the platform, allowing them to reach the full extent and depth of drilling mud.

The mixing continued until the Quality Control Engineer (QC) determined that a homogeneous mixture had been obtained. Nuclear density tests were performed on the solidified drilling mud as solidification soils were added. The tests served to monitor the solidification process and to document the final conditions. Additional solidification soils were added at the QC Engineer's discretion to achieve the desired consistency. The solidified drilling mud was then graded with a low ground-pressure bulldozer to promote runoff from the mud pit and to meet required lines and grades of overlying geomembrane. Appendix E presents nuclear density test results.

2.5.5 Equipment Decontamination

All site vehicles, construction machinery, and equipment exiting the EZ at each drill site were decontaminated at the equipment decontamination pad. Vehicle and equipment decontamination was accomplished with a hot-water pressure washer. All rinsate was containerized and transported to Drill Site D for treatment and discharge.

2.5.6 Cap Construction

Once the drilling mud was stabilized, a geosynthetic cap constructed of soil layers and a 30-mil geomembrane cover was installed. The following sections detail the placement of the cap layers, beginning at the lowest layer.

2.5.6.1 Intermediate Cover Placement

Once the drilling mud mixture is brought to grade, a one-foot minimum layer of intermediate cover (screened to a maximum particle size of one-inch) was placed in a one-foot lift and compacted with a minimum of four passes by a drum roller. The intermediate cover acted as the base for the geosynthetic liner; therefore, the surface was kept free of sharp rocks, sticks, and other deleterious material that could potentially damage the liner. Geotechnical samples were taken at a rate of 1 per 2,000 cubic yards (cy) of material placed to confirm the material was acceptable. Raw data is presented in Appendix D. All samples met requirements.

2.5.6.2 Anchor Trench Construction

A perimeter berm or bench was constructed around each mud pit to help contain the drilling mud during solidification and to accommodate the anchor trench. The alignment of the perimeter or bench was over-excavated to remove any organic, peaty soils. Fill material from the borrow area was then placed in one-foot lifts and compacted to bring the area back to grade. An anchor trench was excavated around the perimeter of each mud pit to secure the geomembrane. Care was taken to ensure that the wall of the anchor trench did not contain any sharp, protruding rocks that could potentially damage the geomembrane.

2.5.6.3 Geomembrane Placement

Once the intermediate cover was placed and the anchor trench installed, a 30-mil polyester geomembrane, XR-5® as manufactured by Seaman Corporation, was installed over the intermediate cover. The geomembrane was manufactured in panels up to 40,000 square feet in size, minimizing the required number of field welds. All field seams that were done were hot welded. Care was taken to ensure that wrinkles, fishmouths, and other defects were prevented. The geomembrane extended into the base of the anchor trench. After the geomembrane was in place, the anchor trench was backfilled and compacted in 1-foot lifts. Installation was in accordance with the approved CQCP. Locations of all destructive seam tests and repairs are presented in the drawing package. Appendix F presents all QA/QC testing performed.

2.5.6.4 Protective Cover Soil Placement

After geomembrane deployment was completed and approved by the QC Engineer, a one-foot layer of protective cover soil (screened to a maximum particle size of 1 inch) was placed over the geomembrane with low ground-pressure bulldozers, and compacted with a drum roller. The protective cover protected the liner from damage during construction. Care was taken during placement to minimize wrinkles that could occur in the underlying geomembrane. Geotechnical samples were taken at a rate of 1 per 2,000 cy of material placed to confirm the material was acceptable. Raw data is presented in Appendix D. All samples met requirements.

2.5.6.5 Soil Cover Layer

After the protective cover layer had been placed, an 18-inch layer of soil cover was placed to provide additional frost protection for the geomembrane cover. This layer was placed in one-foot lifts and compacted by four passes of a drum roller. The maximum particle size of this material was two inches. Geotechnical samples were taken at a rate of 1 per 2,000 cy of material placed to confirm the material was acceptable. Raw data is presented in Appendix D. All samples met requirements.

2.5.6.6 Vegetated Layer Placement

The final six-inch lift of material was placed and proof-rolled by one pass of a drum roller.

2.5.7 Revegetation

The mud pit caps were revegetated using a seed mat product called North American Green SC150. The SC150 consisted of a control blanket manufactured with a USFWS-approved seed mixture built right into the blanket. All revegetation was done in accordance with the CQCP.

2.5.8 Site Restoration

All disturbed mud pit areas were reseeded with the erosion blanket containing the USFWS-approved seed mixture to minimize erosion. The soil borrow areas were graded in such a way as to blend into the surrounding contours. Site restoration was completed in accordance with the CQCP. At the U.S. Fish and Wildlife Services' request, monuments in the form of steel

pipe were installed at each site. Final grading and monument locations for all sites are presented in the drawing package.

2.6 Hot Mix Plant Closure

The hot mix plant was located adjacent to Charlie Runway and consisted of two underground storage tanks (USTs). The UST consisted of two approximately 25,000-gallon tanks located approximately 22 feet apart from center to center. The tanks were configured side-by-side. Historical records suggest that the tank(s) held asphalt used in constructing and/or maintaining the nearby runways. A sample of one of the tanks was collected in 1995 and was analyzed for metals, total halogens, polychlorinated biphenyls (PCBs), hydrocarbon scan, and British Thermal Unit (BTU) content (USACE, 1996). The hydrocarbon scan was the only analysis that yielded detects: 309,000 parts per million (ppm) and 124,000 ppm of "unknown petroleum" compounds. The BTU content was 18,000 BTU per pound. No associated piping or distribution system was observed during the UST closure. Approximately 17,430 gallons of water were treated at the Drill Site D water treatment plant, while 6,953 gallons of a used oil and 3,923 gallons of water were transported to Alaska Pollution Control, Inc. located in Palmer, Alaska, for reclamation. Certificates of disposal for the used oil are presented in Appendix G.

2.6.1 Site Assessment

Samples of the subsurface soils associated with each tank was collected in accordance with 18 *Alaska Administrative Code* (AAC) 78.090(d)(iii) for in-place tank closure. Based on field measurements and in accordance with 18 AAC 78.090(d)(vii), the surface area used to determine the number of soil samples required for each tank equates to collection of a total of four soil samples.

2.6.1.1 Soil Sample Collection

An excavator was used to scrape the surface soil and locate the tank perimeter. Once the confines of the tanks were evident, test pits were installed and field screening and soil sampling commenced. Samples were collected from test pits using the excavator. Each excavator bucket was field screened using a PID instrument to determine the areas contaminated. The results of field screening were used to locate four soil samples in biased locations. All soil samples were

collected within five feet horizontal distance of the tank and at an elevation below and within two feet of the tank bottom.

Samples were analyzed by an Alaska-approved laboratory for all parameters shown in Table 2-2. Lab data are contained in Appendix H.

Table 2-2
Hot Mix Plant *In Situ* Soil Sample Results

Sample	Gasoline-Range Organics	Diesel Hydrocarbons	Benzene	Toluene	Ethyl Benzene	Xylenes
	Method AK 101 (mg/kg)	AK 102 (mg/kg)	EPA 80218 (mg/kg)			
AM-HMP-S001	ND[1] (3.9)	ND (74.1)	ND (0.024)	ND (0.097)	ND (0.097)	ND (0.195)
AM-HMP-S002	ND (2.8)	ND (74.3)	ND (0.017)	ND (0.070)	ND (0.070)	ND (0.140)
AM-HMP-S003	ND (3.49)	148	ND (0.021)	ND (0.087)	ND (0.087)	ND (0.175)
AM-HMP-S004	ND (3.14)	ND (72.6)	ND (0.019)	ND (0.078)	ND (0.078)	ND (0.157)
AM-HMP-S005	ND (3.29)	ND (73.7)	ND (0.020)	ND (0.082)	ND (0.082)	ND (0.164)
AM-HMP-S5006	ND (8.00)	NA[2]	ND (0.050)	ND (0.200)	ND (0.200)	ND (0.400)

[1] Not Detected (Reporting limit)
[2] Not Analyzed

mg/kg = Milligram per kilogram

No release was evident. Therefore, no further action was required as soil cleanup levels in 18 AAC 75 were not exceeded. The DOE contacted ADEC and gained approval for in-place closure based on the data.

2.6.1.2 Waste Characterization Sampling

A representative sample of the liquid from each tank was collected by lowering a disposable bailer into the tank. The samples were labeled appropriately and put into resealable "bubble-wrap" packing material, then immediately placed in a cooler with ice to maintain a shipping temperature of 4 degrees Celsius (°C), and then shipped to the designated laboratory. The following suite of parameters were analyzed for:

- PCBs
- Ignitability
- Corrosivity
- Reactivity
- Toxicity Characteristic Leaching Procedure (TCLP)
  - Semivolatile Organics
  - Volatile Organics
  - Metals

All analytical data are presented in Appendix I.

2.6.2 Tank Content Removal

After the results from the characterization sampling had been obtained, the liquid was pumped out of the tanks and placed into ISO tanks. Waste from the hot mix plant was stored in a bermed, lined area enclosed with safety fencing. Appropriate signage was posted. Once all of the liquid was pumped out, the tanks were rinsed with a high-pressure cleaner to remove as much residual as practical.

2.6.3 Tank Closure

Once the tank contents were removed and the tanks cleaned, the tanks were filled with native soils to prevent the possibility of future collapse. The native soils were taken from the Rifle Range Road Borrow area. The area was then fine graded and reseeded.

2.6.4 Closure Supervision and Reporting

As required in 18 AAC 78.400, the closure of the two underground tanks was conducted and supervised by an Alaska State UST-certified individual. The collection and interpretation of field data and reporting of site characterization data was conducted and supervised by a "qualified person," as specified in the UST Procedures Manual.

2.7 Monitoring Well Abandonment

A total of 16 monitoring wells at Milrow and Long Shot were abandoned as part of the remedial activities. Well abandonment consisted of removing the PVC well casing and filling the boring with a bentonite slurry. The following wells were abandoned:

MILROW

- W-2
- W-3
- W-4
- W-5
- W-6
- W-7
- W-8
- W-9
- W-11
- W-12
- W-14
- W-16
- W-17
- W-19

LONGSHOT

- WL-1
- WL-2

2.8 Final Survey

A final survey of all work areas was completed prior to demobilization. The survey was completed by McCintock Land Associates, Inc. of Eagle River, Alaska. The survey was utilized to provide as-built drawings of all mud pit caps and borrow areas.

2.9 Disposal

The remedial action contractor was responsible for coordination of all disposal activities for wastes and recyclable materials generated during the remedial action. No remedial action wastes/materials were disposed of on the island; all wastes were transported off the island for disposal.

2.10 Demobilization

Final demobilization consisted of removing all personnel, equipment, and remaining materials at the completion of the remedial action. Prior to demobilization, the sites were inspected by

Brice Incorporated, IT Corporation, and DOE to verify that all equipment and materials had been removed and the site restored, as much as practical, to its preconstruction condition.

The base camp was demobilized and all material, equipment waste, and debris were transported via barge back to Anchorage.

2.11 Long-Term Monitoring

The monitoring associated with the mud pit caps includes a physical inspection of the caps. This will be completed as part of the long-term stewardship activities. At this time, the NNSA/NSO is entering into negotiations with the EPA to include the inspections into their long-term surveillance of the groundwater, which occurs on five-year intervals. The ADEC will be included in discussions with EPA.

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3.0 Photographs

This section provides photographs showing mobilization/demobilization as well as the mud pits before and after the cleanup activities. All photographs were taken by Shaw Environmental, Inc. during the 2001 construction season (April to October).

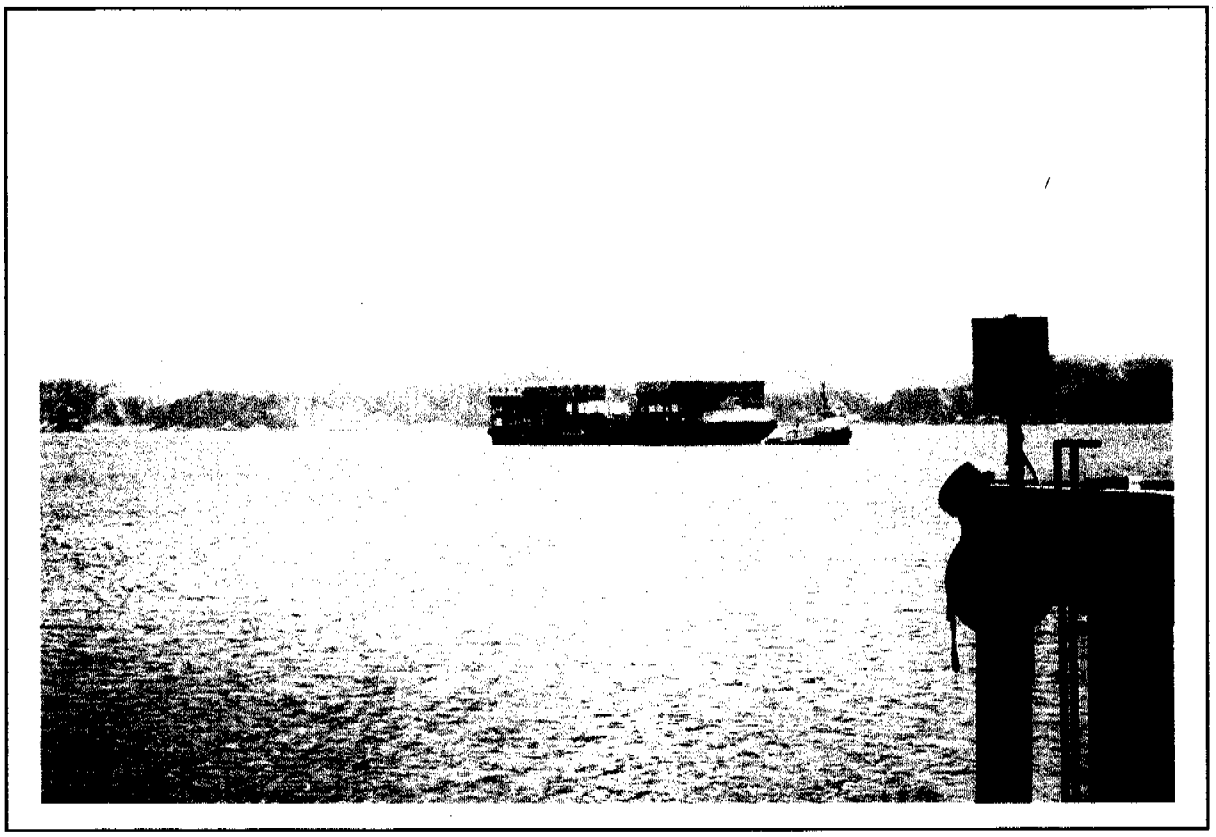

Figure 3-1
Base Camp Mobilization

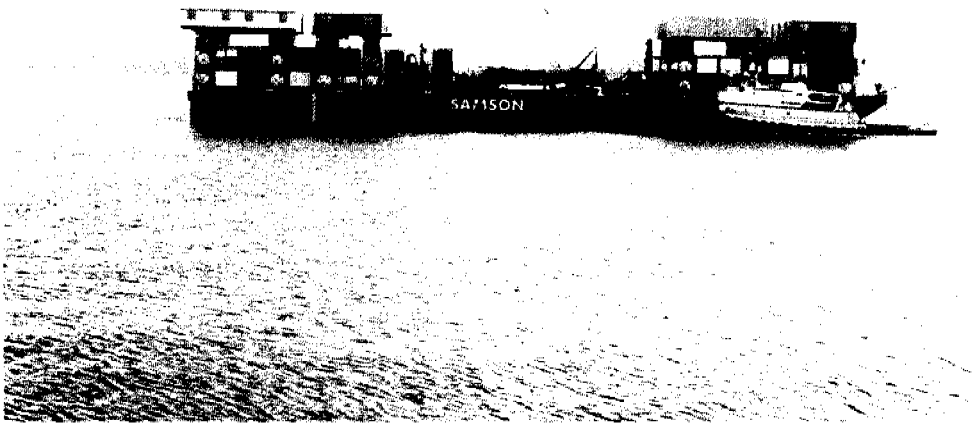

Figure 3-2
Base Camp Mobilization

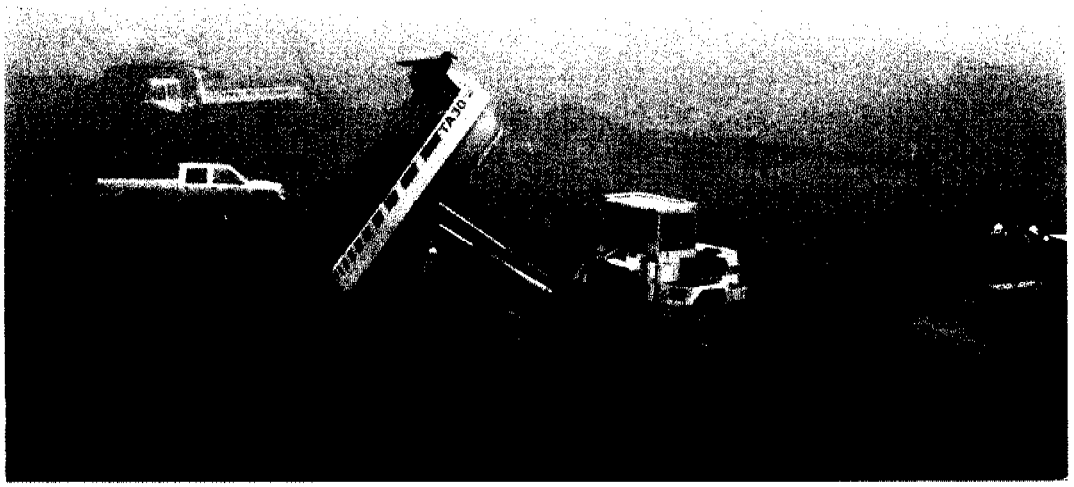

Figure 3-3
Rifle Range Road Mud Pit (Milrow)
Placing Intermediate Cover Soil

Figure 3-4
Rifle Range Road Mud Pit
Placing Geosynthetic Cover

Figure 3-5
Rifle Range Road Mud Pit (Milrow)
Placing Seed Mat Through Diversion Channel

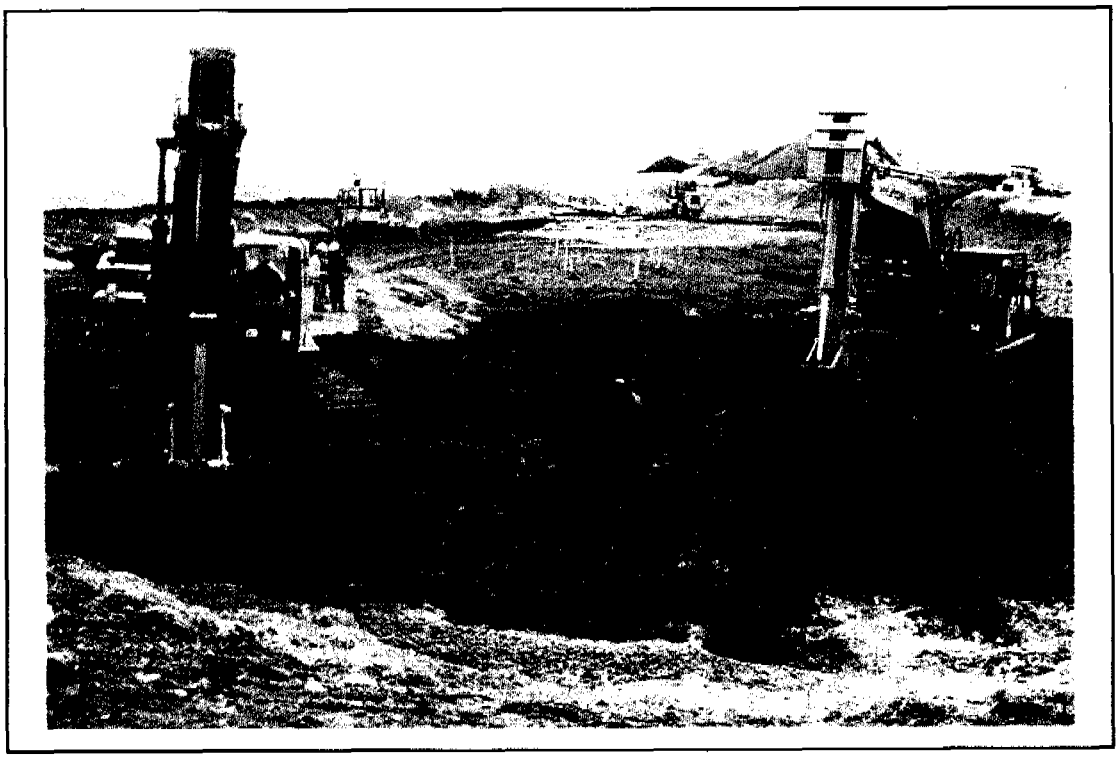

Figure 3-6
Cannikin North Mud Pit
Stabilizing Drilling Mud

Figure 3-7
Cannikin Ground Zero Mud Pit
Placing Geosynthetic Cover

Figure 3-8
Cannikin Ground Zero Mud Pit
Placing Seed Mat

Figure 3-9
Cannikin Ground Zero Mud Pit
Final Grades

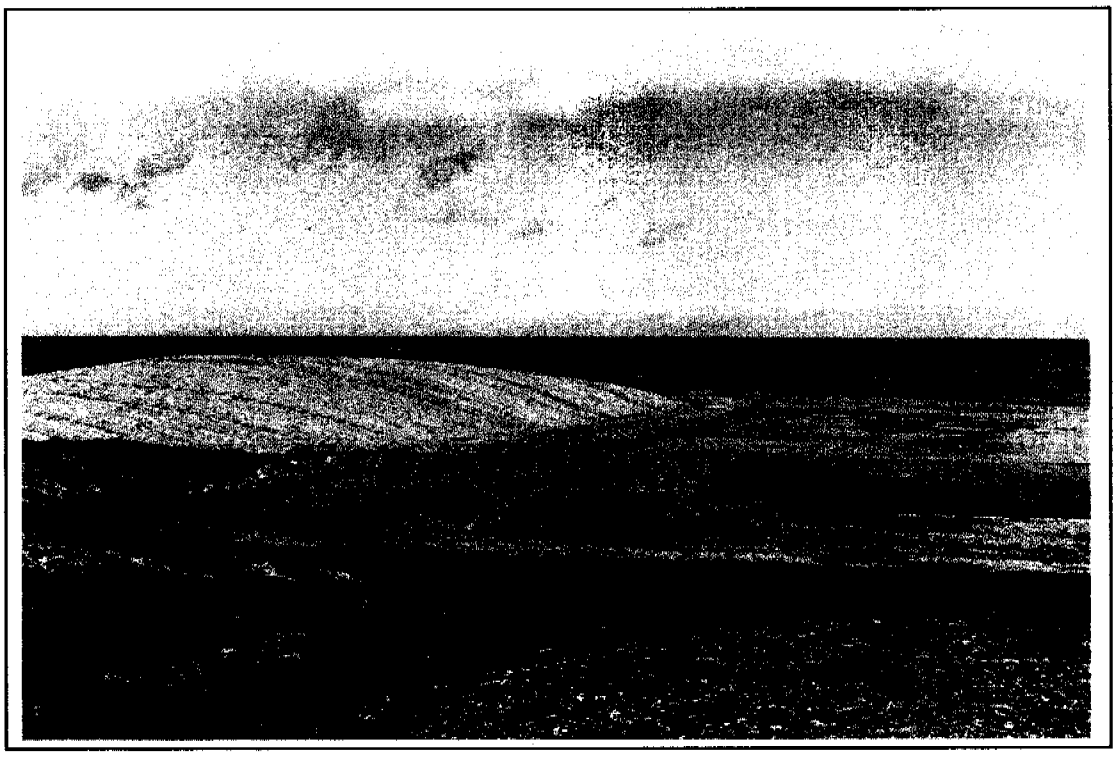

Figure 3-10
Cannikin Ground Zero Mud Pit
Final Grades

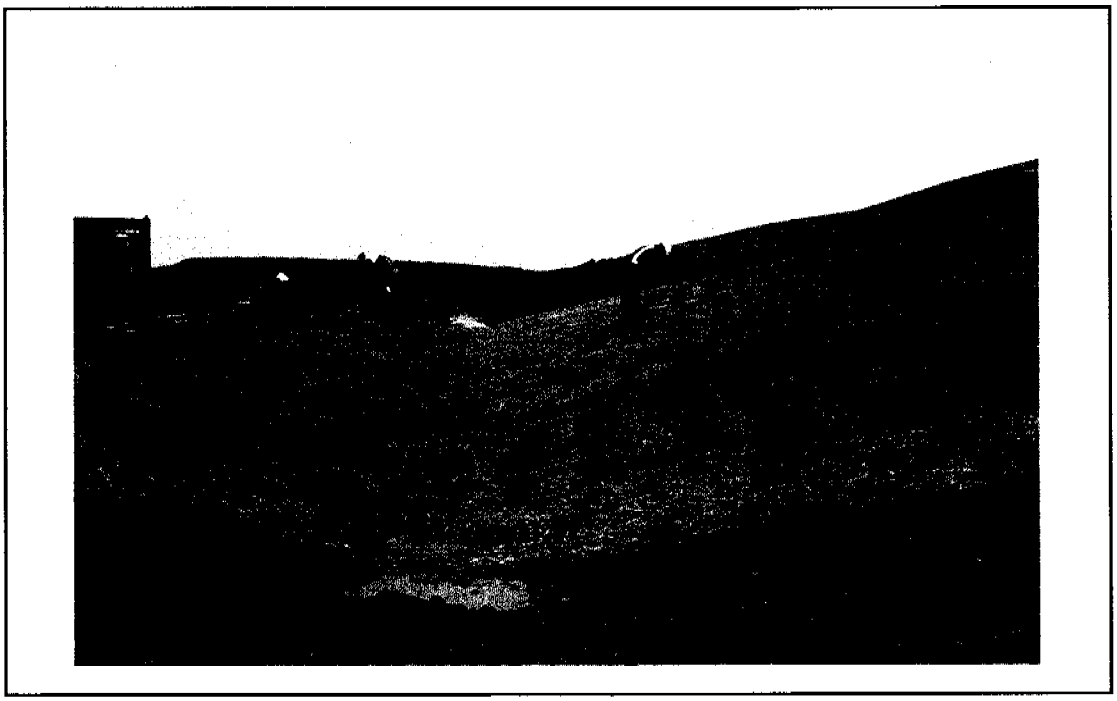

Figure 3-11
Long Shot Site
Placing Seed Mat Through Diversion Channel

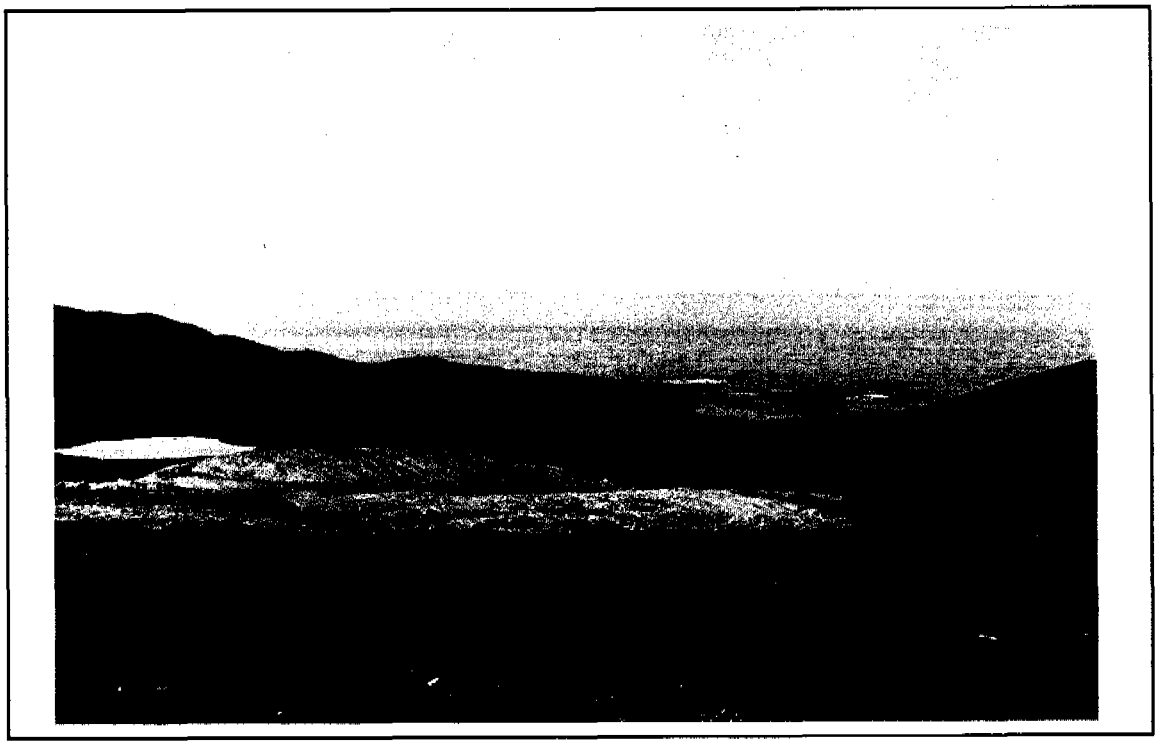

Figure 3-12
Drill Site F
Final Cover - Seed Mat in Place

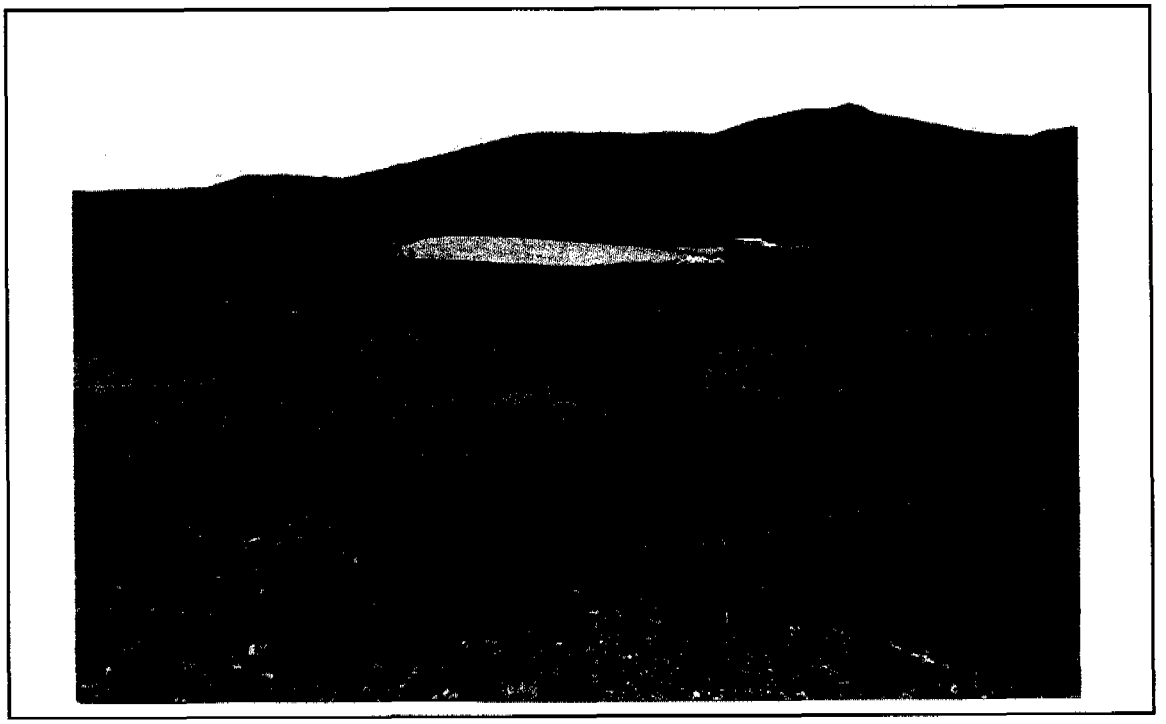

Figure 3-13
Drill Site E Mud Pit
Placing Seed Mat

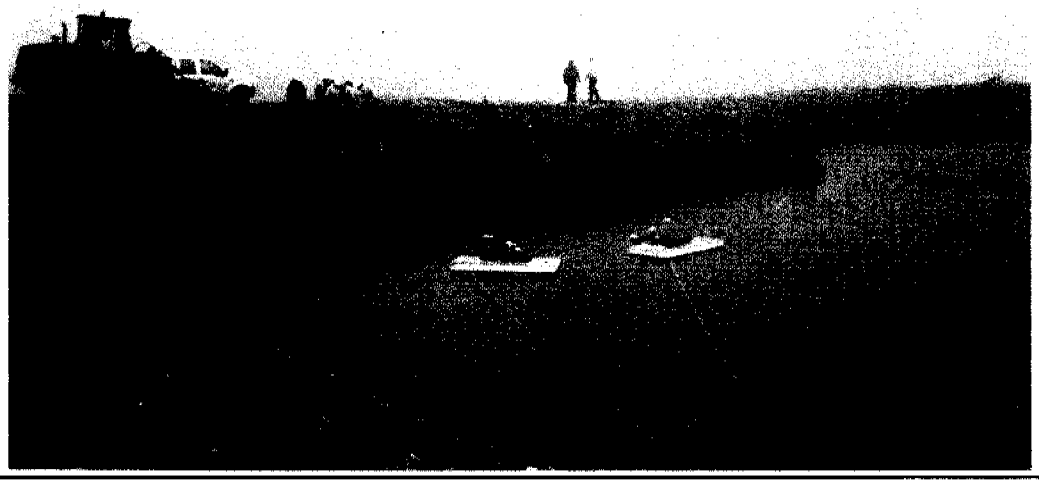

Figure 3-14
Drill Site D
Pumping Off Standing Water

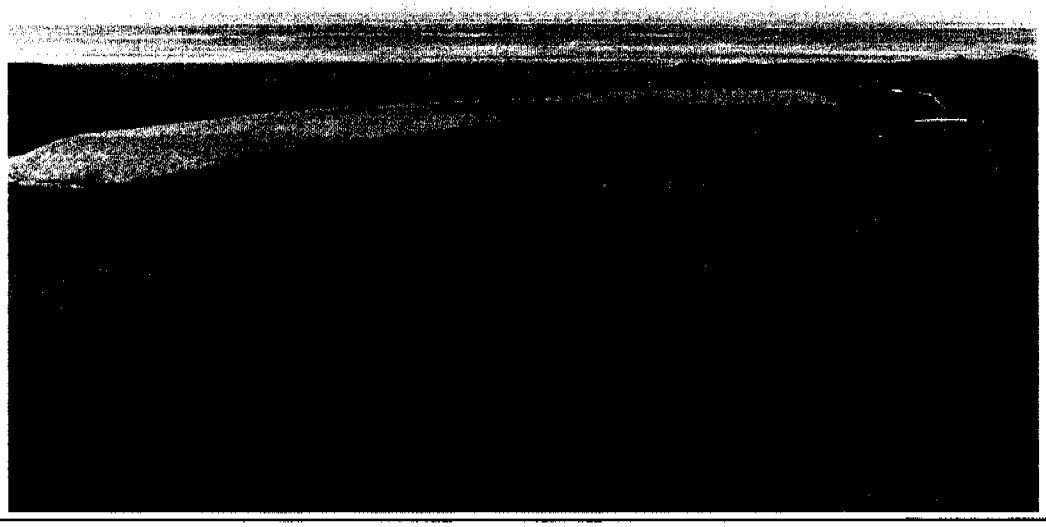

Figure 3-15
Drill Site D
Placing Seed Mat

Figure 3-16
Drill Site D
Energy Dissipater Outfall - Note Water Clarity

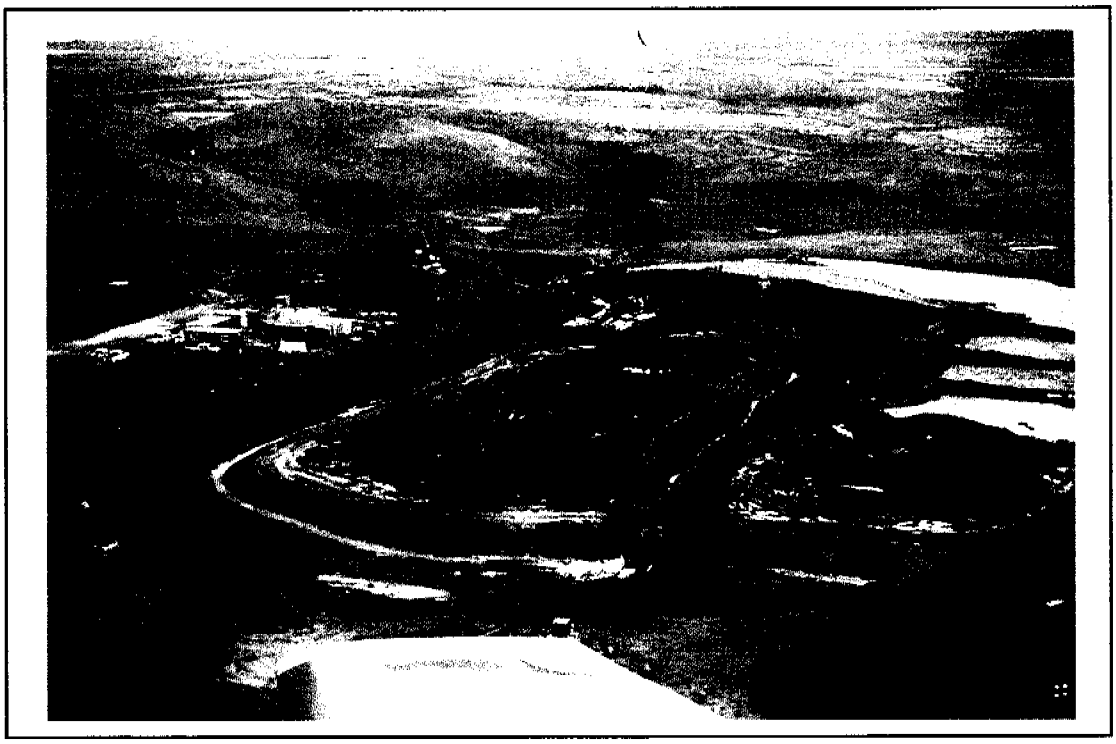

Figure 3-17
Drill Site D Mud Pit - Aerial View
Note Geosynthetic Cover Placement at Top of Photo

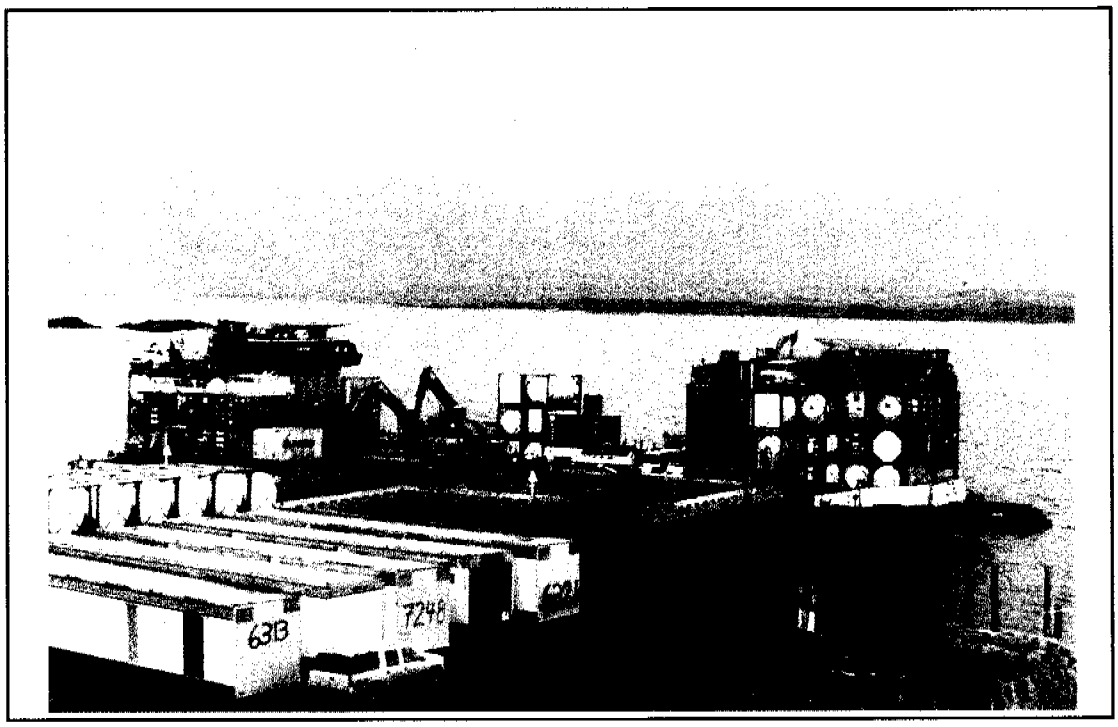

Figure 3-18
Demobilization of Remediation Equipment
Base Camp Barge Waiting in Harbor to be Loaded

4.0 References and Other Applicable Documents

Alaska Department of Environmental Conservation. 1999a. *Alaska Administrative Code*, Title 18, Chapter 70, "Water Quality Standards." Anchorage, AK.

Alaska Department of Environmental Conservation. 1999b. *Alaska Administrative Code*, Title 18, Chapter 75, "Oil and Hazardous Substances Pollution Control." Anchorage, AK.

Alaska Department of Environmental Conservation. 1999c. *Alaska Administrative Code*, Title 18, Chapter 78, "Underground Storage Tanks." Anchorage, AK.

Alaska Department of Environmental Conservation. 1999d. *Underground Storage Tank Procedures Manual.* Anchorage, AK.

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