National Missile Defense Deployment

Final
Environmental Impact Statement

Volume 1 of 4: Chapters 1-3

July 2000

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DEPARTMENT OF DEFENSE
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NATIONAL MISSILE DEFENSE JOINT PROGRAM OFFICE
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JND-A

DEC 0 8 2000

SUBJECT: Final Environmental Impact Statement for Deployment of the National Missile Defense System

The National Missile Defense Joint Program Office has completed the Final Environmental Impact Statement (FEIS) for the proposal to deploy the National Missile Defense System.

The FEIS contains additions and revisions to the Draft EIS, published previously, and provides responses to all comments documented in the public hearing transcripts and written comments received on the Draft EIS and Supplement to the Draft EIS.

Attached is a copy of the FEIS for your use. Questions concerning the FEIS or requests for additional copies may be forwarded to:

U.S. Army Space and Missile Defense Command
ATTENTION: SMDC-EN-V (Ms. Julia Hudson)
P.O. Box 1500
Huntsville, AL 35807-3801

Copies of the Draft EIS, Supplement to the Draft EIS along with the FEIS are available for review at information repositories provided on the attached list and can be found on the National Missile Defense EIS web site at www.acq.osd.mil/bmdo/bmdolink/html/nmd.html.

National Missile Defense:
Forging America's Shield

Harold V. Holmes
HAROLD V. HOLMES
Deputy for System Deployment

Attachment:
As stated

Alaska Library Locations		
Alaska Resources Library & Information Services 3150 C Street, Suite 100 Anchorage, AK 99503	Alaska State Library 344 W. 3rd Avenue Suite 125 Anchorage, AK 99501	Anderson School Library 116 West 1st Street Anderson, AK 99744
Delta Junction Library 2288 Deborah Street Delta Junction, AK 99737	Fairbanks North Star Borough Public Library Noel Wien Library 1215 Cowles Street Fairbanks, AK 99701-4313	Nenana Public Library P.O. Box 40 Nenana, AK 99760
Tri-Valley Community Library P.O. Box 400 Healy, AK 99743	University of Alaska, Anchorage Consortium Library 3211 Providence Drive Anchorage, AK 99508	University of Alaska, Fairbanks Elmer E. Rasmuson Library P.O. Box 756800 Fairbanks, AK 99775-6800
A. Holmes Johnson Memorial Library 319 Lower Mill Bay Road Kodiak, AK 99615	Tuzzy Consortium Library PO Box 749 Barrow, AK 99723	North Slope Borough School District Library/Media Center Pouch 169 Barrow, AK 99723
Z. J. Loussac Library 3600 Denali Street Anchorage, AK 99503-6093		

North Dakota Library Locations		
Cavalier County Library 600 5th Avenue Langdon, ND 58249	Cavalier Public Library 105 2nd Street South Cavalier, ND 58220	Grand Forks Library 2110 Library Circle Grand Forks, ND 58201
North Dakota State University Libraries 12 Ave. N. & Albrecht Blvd. Fargo, ND 58105-5599	Chester Fritz Library University of North Dakota Centennial & University Ave. P.O. Box 9000 Grand Forks, ND 58202-9000	

California Library Locations		
Barbo Branch Library 10321 Live Oak Blvd. Live Oak, CA 95953	Sutter County Library 750 Forbes Avenue Yuba City, CA 95991	Yuba City Library 303 2nd Street Marysville, CA 95901
Yuba College Library Yuba College Marysville, CA 95901	Beale Air Force Base Military Library Marysville, CA 95903	

Massachusetts Library Locations		
Falmouth Public Library Reference Section 123 Katherine Lee Bates Rd Falmouth, MA 02540	Jonathan Bourne Library 19 Sandwich Road Bourne, MA 02532	Mashpee Public Library Steeple Street, Mashpee Common Mashpee, MA 02649
Sandwich Public Library 142 Main Street Sandwich, MA 02563	Cape Cod Community College Library Ms. Jeanmarie Fraser, Librarian 2240 Iyanough Rd. West Barnstable, MA 02668-1599	Coast Guard/MWR Library Attn: Librarian Bldg 5205, Ent Street Air Station Cape Cod, MA 02542

NATIONAL MISSILE DEFENSE (NMD)
DEPLOYMENT
FINAL ENVIRONMENTAL IMPACT STATEMENT

Volume 1

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July 2000

Ballistic Missile Defense Organization

COVER SHEET
FINAL ENVIRONMENTAL IMPACT STATEMENT
NATIONAL MISSILE DEFENSE DEPLOYMENT

a. Lead Agency: Ballistic Missile Defense Organization (BMDO)

b. Preparing Agency: U.S. Army Space and Missile Defense Command

c. Cooperating Agencies: U.S. Army; U.S. Air Force; U.S. Navy; Federal Aviation Administration (FAA)

d. Proposed Action: Deployment of a National Missile Defense System

e. Affected Jurisdictions: Clear Air Force Station (AFS), Denali Borough, Alaska; Eareckson Air Station (AS), Shemya Island, Alaska; Eielson Air Force Base (AFB), Fairbanks North Star Borough, Alaska; Fort Greely, Alaska; Yukon Training Area, Fairbanks North Star Borough, Alaska; Cavalier AFS, Pembina County, North Dakota; Grand Forks AFB, Grand Forks County, North Dakota; Stanley R. Mickelsen Safeguard Complex (SRMSC) Missile Site Radar, Cavalier County, North Dakota; SRMSC Remote Sprint Launch Site 1, Ramsey County, North Dakota; SRMSC Remote Sprint Launch Site 2, Cavalier County, North Dakota; and SRMSC Remote Sprint Launch Site 4, Walsh County, North Dakota; Beale AFB, California; Cape Cod AFS, Massachusetts.

f. Inquiries on this document may be directed to: Ms. Julia Hudson, U.S. Army Space and Missile Defense Command, Attn: SMDC-EN-V, P.O. Box 1500, Huntsville, Alabama 35807-3801, (256) 955-4822

g. Designation: Final Environmental Impact Statement (FEIS)

h. Distribution/Availability: Approved for public release; distribution is unlimited (Distribution A)

i. Abstract: This EIS was prepared in accordance with the National Environmental Policy Act (NEPA), to analyze the potential environmental consequences of the No-action Alternative and Proposed Action. The No-action Alternative is not to deploy the NMD system. If the deployment decision made is not to deploy, the NMD program would use the time to enhance the existing technologies of the various system elements. The Proposed Action would be to deploy the NMD system. With the Proposed Action Alternative, NMD elements and element locations would be selected from the range of locations studied in the EIS (see item e above).

This FEIS addressees the potential environmental impacts that would result from activities that would occur under the No-action Alternative and Proposed Action. Environmental resource topics evaluated include air quality, airspace, biological resources, cultural resources, geology and soils, hazardous materials and hazardous waste, health and safety, land use and aesthetics, noise, socioeconomics, transportation, utilities, water resources, environmental justice, and subsistence. The potential cumulative effects of each of these resources were also evaluated.

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Executive Summary

EXECUTIVE SUMMARY

ES.1.1 INTRODUCTION

This environmental impact statement (EIS) examines the potential for impacts to the environment as a result of the potential deployment of a land-based National Missile Defense (NMD) system.

The NMD Joint Program Office of the Ballistic Missile Defense Organization is responsible for developing and deploying the NMD system. In the year 2000, there will be a Department of Defense (DOD) Deployment Readiness Review to review the technical readiness of NMD elements. Thereafter, the United States Government will determine whether the threat, developed capability, and other pertinent factors justify deploying an operational NMD system.

The NMD system would be a fixed, land-based, non-nuclear missile defense system with a land- and space-based detection system capable of responding to limited strategic ballistic missile threats to the United States. The NMD system would consist of five elements:

- Battle Management, Command, Control, and Communications, which includes the Battle Management, Command and Control (BMC2), the communication lines, and the In-Flight Interceptor Communications System (IFICS) Data Terminal as subelements
- Ground-Based Interceptor (GBI)
- X-Band Radar (XBR)
- Upgraded Early Warning Radar (UEWR)
- Satellite detection systems

This EIS analyzes the land-based NMD elements. The satellite detection system, Defense Support Program Satellites, is an existing system that is being replaced by the Air Force independent of an NMD decision.

ES.1.2 PURPOSE AND NEED FOR THE PROPOSED ACTION

The proliferation of weapons of mass destruction and technology of long-range missiles is increasing the threat to our national security. The purpose of the NMD program is defense of the United States against a threat of a limited strategic ballistic missile attack.

ES.1.3 NO-ACTION ALTERNATIVE AND PROPOSED ACTION

This section describes the Proposed Action and the No-action Alternative. The No-action Alternative is not to deploy the NMD system. If the initial decision made is not to deploy, the NMD program would use the time to enhance the existing technologies of the various system elements. The NMD program would also have the option to add new elements if and as they are developed. For the potential sites being considered for NMD deployment, the No-action Alternative would be a continuation of activities currently occurring or planned at those locations.

With the Proposed Action, NMD elements and element locations would be selected from the range of locations studied in the EIS. The potential NMD element deployment locations would make maximum use of existing DOD land. The following paragraphs detail potential regions and locations that the United States Government would consider as possible sites for each NMD element (figure ES-1).

All of the sites analyzed in this EIS meet the siting criteria for the respective NMD elements. However, some sites may be determined to be preferable to others for operational, environmental, and other reasons. Mission conflicts have been identified at two sites, Cavalier Air Force Station (AFS) and the Yukon Training Area, making it less likely that either of these sites would be selected. However, if either of these sites is selected, then the mission conflict would be resolved at that time. All of the identified sites are fully analyzed in this EIS to ensure maximum flexibility in the decision process.

The main NMD elements considered for deployment include the GBI, BMC2, IFICS Data Terminal, XBR, UEWRs, and the fiber optic cable line required to link some of the NMD elements. A brief description of each element is provided below. Figure ES-2 shows how the NMD elements would work together to intercept an incoming ballistic missile.

The Preferred Alternative would be Deployment of an NMD system at one GBI site with up to 100 silos. If this alternative is selected, the preferred site location for the GBI and BMC2 would be Fort Greely, Alaska. Under this configuration the XBR would be at Eareckson Air Station (AS) (Shemya Island), Alaska. Under the preferred alternative, the NMD system would make use of the existing Early Warning Radars upgraded for NMD and the existing satellite detection systems that would be in place at the time of deployment. Since the IFICS Data Terminals locations have not been identified, no preferred location has been selected. Table ES-1 provides an overview of the site locations for the preferred alternative analyzed in this EIS.

Ground-Based Interceptor (GBI)

- Clear AFS, Alaska
- Fort Greely, Alaska
- Yukon Training Area (Fort Wainwright)/Eielson AFB, Alaska
- Grand Forks AFB, North Dakota
- Stanley R. Mickelsen Safeguard Complex, North Dakota
  - Missile Site Radar (MSR)

Battle Management, Command and Control (BMC2)

- Clear AFS, Alaska
- Fort Greely, Alaska
- Yukon Training Area (Fort Wainwright)/Eielson AFB, Alaska
- Grand Forks AFB, North Dakota
- Stanley R. Mickelsen Safeguard Complex, North Dakota
  - Missile Site Radar (MSR)

X-Band Radar (XBR)

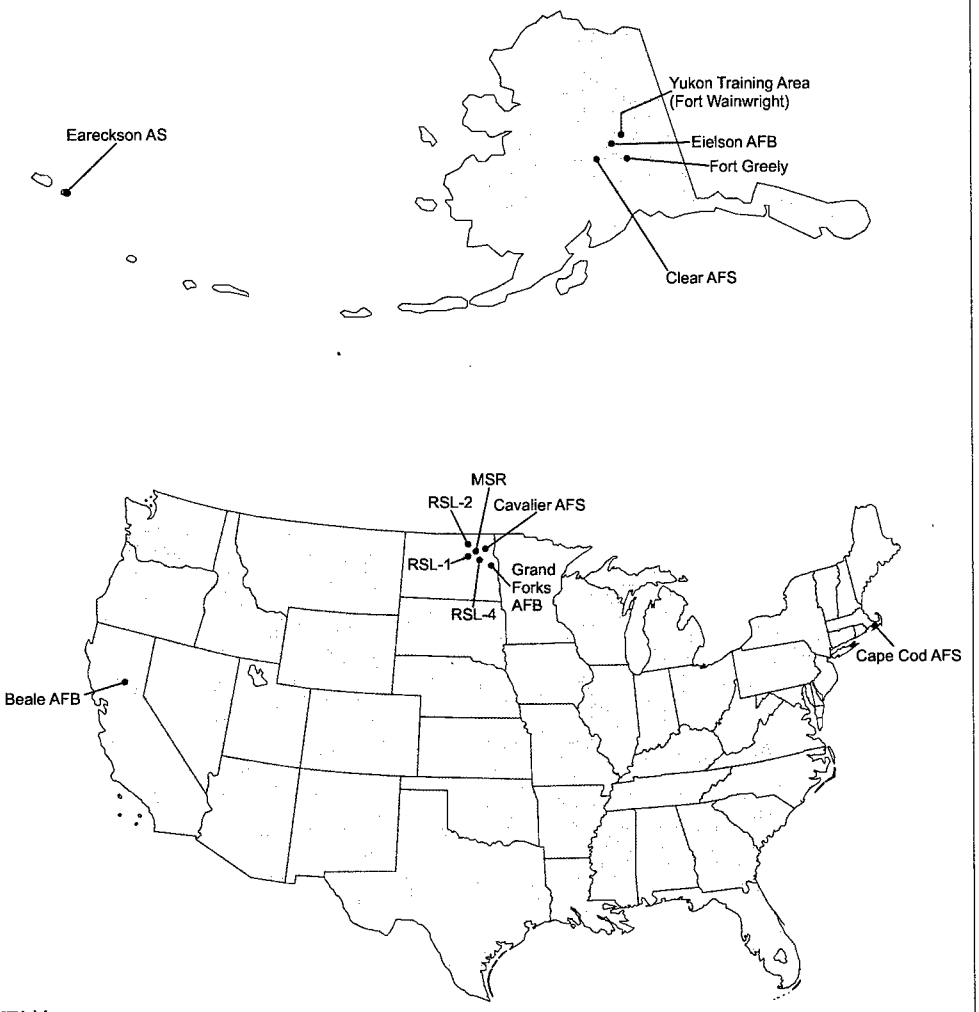
- Eareckson AS, Alaska
- Stanley R. Mickelsen Safeguard Complex, North Dakota
  - Cavalier AFS
  - Missile Site Radar (MSR)
  - Remote Sprint Launch Site (RSL) 1
  - Remote Sprint Launch Site (RSL) 2
  - Remote Sprint Launch Site (RSL) 4

In-Flight Interceptor Communications System (IFICS)*

- Alaska
- North Dakota

Upgraded Early Warning Radar (UEWR)**

- Clear AFS, Alaska
- Beale AFB, California
- Cape Cod AFS, Massachusetts



EXPLANATION

*Note: Identification of potential IFICS locations is still in progress. Locations depicted are those regions under consideration. Other regions may be identified depending on system requirements.

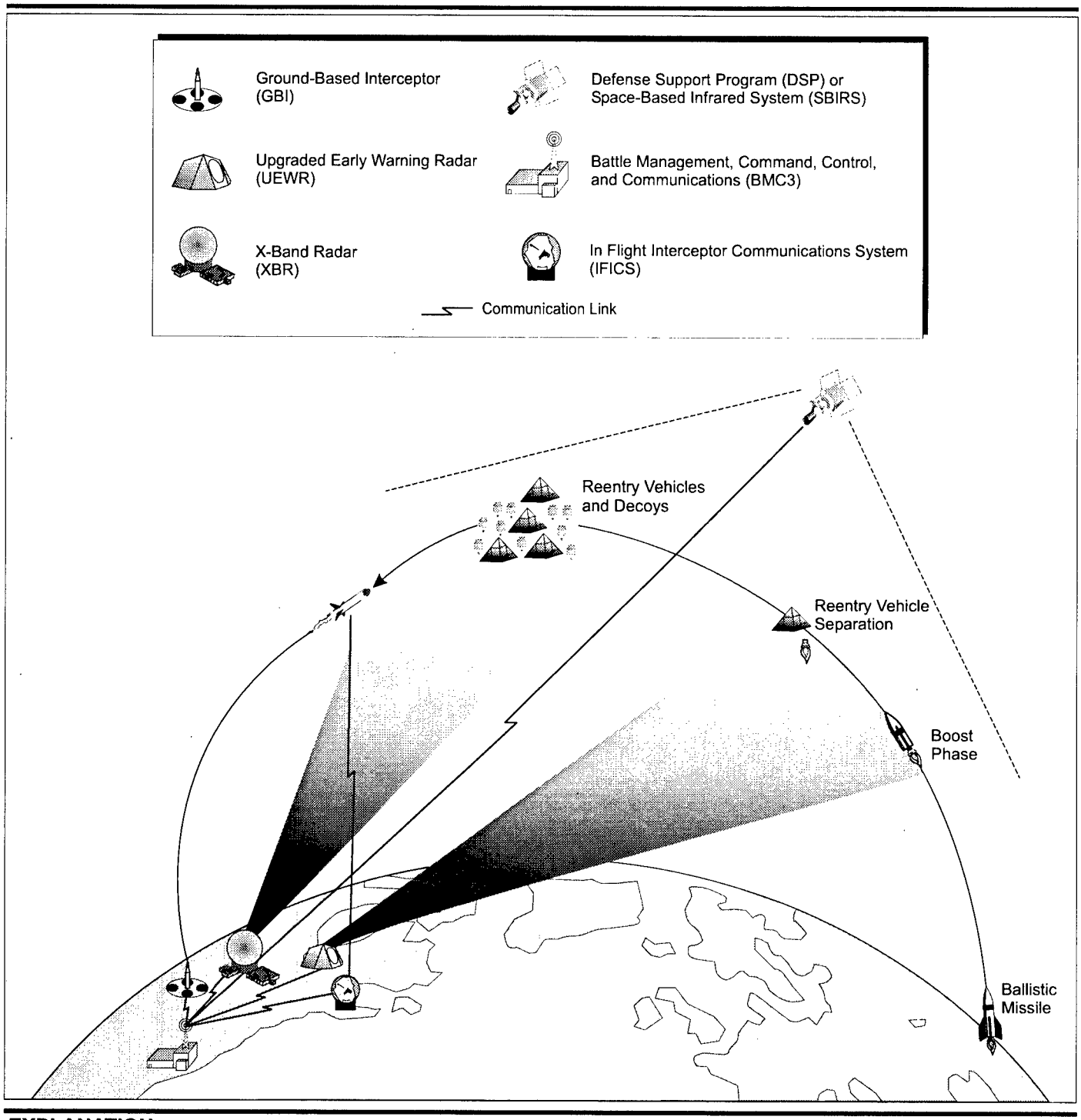
**Note: Identification of other potential locations outside of the United States is still in progress.

NORTH

Not to Scale

NMD Element Deployment Options

Figure ES-1



EXPLANATION

Land

Water

Note: Locations in this figure are for illustrative purposes only and are notional.

The NMD Concept of Operations

Figure ES-2

Table ES-1: NMD Deployment Preferred Alternative

GBI	BMC2	IFICS Data Terminal	XBR	UEWR	Space-Based Detection System
Preferred Alternative—1 GBI Site with up to 100 Silos					
Fort Greely, Alaska	Fort Greely, Alaska	Not Identified	Eareckson AS, Alaska	Beale AFB, California Cape Cod AFS, Massachusetts Clear AFS, Alaska	Defense Support Program/Space-Based Infrared System Satellites

Ground-Based Interceptor (GBI)

The GBI would remain in the underground launch silo until launch. Launches would occur only in defense of the United States from a ballistic missile attack. There would be no flight testing of the missiles at the NMD deployment site. The GBI site would contain launch silos and related support facilities. Under the Proposed Action, up to 100 GBI silos could be located at one of the locations shown in figure ES-1, or up to 100 silos could be deployed at both one site in Alaska and one site in North Dakota. When the GBI site becomes fully operational, the total site-related employment would be 250 to 360 direct jobs.

Battle Management Command and Control (BMC2)

The BMC2 is the "brains" of the NMD system. In the event of a launch against the United States, the NMD system would be controlled through the BMC2. The site location BMC2 subelement would be located with the NMD GBI element. BMC2 sites would require a total of approximately 30 personnel. A BMC2 site could be located at the locations shown in figure ES-1. Also, additional BMC2 facilities would be combined into the existing United States Space Command Communication and Control facilities at the Cheyenne Mountain AFS and Peterson Air Force Base (AFB), Colorado and Vandenberg AFB, California.

In-Flight Interceptor Communications System (IFICS) Data Terminal

The IFICS Data Terminal would be ground stations that provide communications links between the in-flight GBI and the BMC2. An IFICS Data Terminal would consist of a radio transmitter/receiver enclosed in a radome with an equipment shelter located adjacent to the transmitter and would require approximately 2 hectares (6 acres) of land or up to 7 hectares (17 acres) if two data terminals are required at one site. Approximately 14 IFICS Data Terminal sites could be required for the

NMD program. The operational requirements for the IFICS Data Terminal are still being identified. As such, the specific locations where the IFICS Data Terminal could be deployed have not yet been determined. Regions under study include Alaska and North Dakota. In addition, as the operational requirements are refined other regions may be identified. When possible, the IFICS Data Terminal would be located on or near existing DOD installations.

X-Band Radar (XBR)

The XBR would be a ground-based, multi-function radar. For NMD, it would perform tracking, discrimination, and kill assessments of incoming ballistic missile warheads. The XBR site would include a radar and associated support facilities. When the XBR site becomes fully operational, the total site-related employment would be approximately 105 direct jobs. Only one XBR would be deployed, and locations under consideration are shown in figure ES-1.

Upgraded Early Warning Radar (UEWR)

As part of the NMD system, there would be a requirement to upgrade the existing early warning radars at Clear AFS, Alaska, Beale AFB, California, and Cape Cod AFS, Massachusetts. These early warning radars, also referred to as "PAVE PAWS," are phased-array surveillance radars that are currently used to detect, track, and provide early warning of sea-launched ballistic missiles. They are also used to track satellites and space debris. Hardware and software modifications are planned for these existing radars in conjunction with the NMD system. For NMD, the upgrades would allow the acquisition, tracking, and classification of small objects near the horizon and provide data to other NMD elements using improved communications.

Fiber Optic Cable Lines/Utilities

Any deployment may require elements of the system to utilize existing fiber optic lines, power lines, and other utilities. Some existing lines and facilities used to support the deployed system may require modifications. Deployment of elements to some locations may require the acquisition of new rights-of-way and installation of new utility and fiber optic cable. Potential new land fiber optic cable line locations include North Dakota and Alaska and an oceanic fiber optic cable line along the Aleutian Islands, Alaska to Eareckson AS (Shemya Island), Alaska. In addition, redundant fiber optic cable lines may be required in some locations for security purposes.

ES.1.4 DECISION TO BE MADE

The decision to be made is whether to deploy an NMD system. A decision to deploy an NMD system would include the selection of deployment sites from among the alternatives considered in this EIS. This decision will be based on the analysis of the ballistic missile threat to the United States, technical maturity of the NMD system for deployment, operational effectiveness, affordability, strategic arms reduction objectives, and other factors including potential environmental impacts of deploying and operating the NMD system from the potential locations analyzed in this EIS. The EIS will provide the United States Government with the information necessary to properly account for the environmental impacts. At this time, a decision to commit to a program leading to deployment is not anticipated before mid-2000.

ES.1.5 SCOPE OF THE STUDY

This EIS analyzes the potential impacts of deployment and operation of the land-based NMD system. Under the Proposed Action, potential sites for each NMD element are evaluated as deployment options to be considered by the decisionmaker.

This EIS analyzes all of the deployment locations for the proposed GBI, BMC2, XBR, and UEWRs that have currently been identified in the United States. The operational requirements for the IFICS Data Terminal are still being identified. As such, the specific locations where the IFICS Data Terminal could be deployed have not yet been determined. Regions under study include Alaska and North Dakota. In addition, as the operational requirements are refined, other regions may be identified. Since specific sites have not been identified, a general programmatic description of the types of impacts that could be expected from deployment are included within this EIS. Once specific sites are identified, supplemental site-specific environmental analysis, as required, would be performed based on the initial analysis in this EIS. In addition, since not all of the sites have been finalized, the exact location of the fiber optic cable line is not known, but would be required around many of the NMD elements. Since the exact ground alignment of the fiber optic cable line has not been identified, a general programmatic description of the types of impacts that could be expected from the fiber optic cable line is included within this EIS. Once specific fiber optic cable line alignments are identified, supplemental site-specific environmental analysis, as required, would be performed based on the initial analysis in this EIS.

Operational (wartime) launches from the GBI site are not evaluated in this EIS. Missiles would not be test launched from the GBI deployment site.

Public Participation

The Notice of Intent to prepare an EIS for the deployment of the NMD program was published in the *Federal Register* on November 17, 1998. Notification of public scoping was also made through the local media as well as through letters to Federal, state, and local agencies and officials, interested groups and individuals, and American Indian Tribes and Alaska Native Organizations. A total of seven public scoping meetings in December 1998 were held in communities perceived to be affected by the NMD program. A total of 660 people attended these meetings. The main issues identified during the scoping process included:

- Airspace restrictions from XBR operation
- Construction and operation impacts on vegetation, wildlife, threatened and endangered species, wetlands, and fisheries
- Potential safety risks to the public from the transportation and operation of the GBI
- Electromagnetic radiation impacts to wildlife and the public
- Socioeconomic impacts and benefits from NMD deployment
- Construction and operation impacts on local water quality
- Increases in hazardous waste generation
- Increases in restricted public use around NMD deployment sites

The NMD Deployment Draft EIS public review and comment period began on October 1, 1999 with publication of the Notice of Availability in the *Federal Register*. This initiated the review period during which the public and interested agencies or organizations had the opportunity to review the Draft EIS and submit their comments. Copies of the Draft EIS were made available for review in local libraries in the areas affected and were provided to those who requested copies. Additionally, copies of the Draft EIS were provided to the appropriate Federal, state, and local agencies, and American Indian Tribes and Alaska Native Organizations. Comments on the Draft EIS were considered in the preparation of the Final EIS. Chapter 9 of the EIS contains a reproduction of all comments and responses to those comments. In addition to the Draft EIS review process, seven public hearings were held from October 26 through November 9, 1999 in the same locations as the public scoping meetings. A total of 679 people attended the public hearings.

ES.1.6 SUMMARY OF ENVIRONMENTAL IMPACTS

This section describes the potential environmental effects from implementing the No-action Alternative and the Proposed Action. The environment is analyzed in terms of 15 resource areas: air quality, airspace, biological resources, cultural resources, geology and soils,

hazardous materials and hazardous waste, health and safety, land use and aesthetics, noise, socioeconomics, transportation, utilities, water resources, environmental justice, and subsistence. Each resource area was addressed in the EIS at each location unless the No-action Alternative and Proposed Action activities at that location would not result in a foreseeable impact. The data presented in the EIS was commensurate with the importance of the potential impacts in order to provide the proper context for evaluating impacts. For some environmental resources, it was determined through initial evaluation that no impacts would occur at certain sites and these resources were only summarized within the EIS. Identified below by location are those resources areas from the 15 listed above where a potential environmental impact could occur from NMD deployment alternatives. If a resource from the 15 discussed above is not listed below, no environmental impacts would be anticipated from deployment. Tables ES-2 through ES-8 at the end of this executive summary provide an overview of the potential impacts from the NMD program for all locations and environmental resource areas for both the No-action Alternative and the Proposed Action.

ES.1.6.1 NO-ACTION ALTERNATIVE

Under the No-action Alternative, only the locations and environmental resources listed below were anticipated to have environmental impacts from continued ongoing operations. No impacts would be expected to the remaining locations and environmental resources.

Eielson AFB, Alaska—No-action Alternative

Land Use. There are currently no zoning conflicts with the adjoining areas of Eielson AFB; however, residential units in the community of Moose Creek are within the Clear and Approach Zones at the end of the runway, which is considered an incompatible land use.

Noise. The 1996 Air Installation Compatible Use Zone for Eielson AFB indicates that the community of Moose Creek, which has low density housing, falls within the day-night level equals 65 decibels A-weighted noise contour. Air Force land use recommendations suggest residential areas be located outside of the day-night level equals 65 decibels A-weighted contour. The local government, Eielson AFB, and the community of Moose Creek would be expected to use the Eielson AFB Air Installation Compatible Use Zone to assist in the land use planning and control process, and thus minimize future noise impacts.

Fort Greely, Alaska—No-action Alternative

Geology and Soils. Potential impacts of continued operations under the No-action Alternative were addressed in the *Alaska Army Lands Withdrawal Renewal Final Legislative Environmental Impact Statement*.

This EIS concluded that some soil damage from vehicles, weapons, and fires would occur. In addition, some soil erosion with net soil loss and water impacts would occur near training activities. Localized long-term damage to permafrost could occur as a result of ground training and fire damage from training. It was also determined that long-term training would result in potential cumulative impacts to soils.

Potential mitigation measures include conducting detailed soil surveys, refilling and leveling of foxholes, trench systems, tanks traps, hull-down positions, or explosive excavations; conducting vehicular stream crossings in designated areas only; and limiting cross-country vehicular travel. For permafrost protection, the Army would continue to follow existing management programs that identify and monitor permafrost areas so they can be restored when feasible.

Socioeconomics. Under the No-action Alternative, Fort Greely is being realigned. The reuse of the realigned portions of the base by the local community would represent the most important activity in terms of socioeconomic impacts. The preferred base reuse plan, characterized as Mixed Use Industrial with a correctional institution, is forecast to produce between 490 and 600 jobs. Clearly, the reuse plan proposes a positive future for Fort Greely. Assuming that the plan is fulfilled, a net loss of up to 150 jobs in the local community may still occur. The impact of this loss would likely lead to a fall in the local population and a decline in its wealth, as well as a fiscal loss for the community. If the reuse plan is not fulfilled, there would be a significant impact to the local population and economy.

Water Resources. Potential impacts to water resources were addressed in the *Alaska Army Lands Withdrawal Renewal Final Legislative Environmental Impact Statement*. That EIS concluded that off-road maneuvering, conducted in an area over a length of time, would result in increased runoff reaching the stream system in a shorter amount of time. The quantity of groundwater would not be impacted by ongoing activities; however, groundwater quality could be impacted by pollutant spills. The ongoing training maneuvers, if conducted repeatedly in the same area, could result in cumulative impacts to water resources.

Existing mitigation measures identified in the *Alaska Army Lands Withdrawal Renewal Final Legislative Environmental Impact Statement* require that certain environmental considerations be taken in planning, requesting, and operating ranges and training areas. The Integrated Training Area Management program would continue to be used to monitor and help to correct erosion and sedimentation problems. The Spill Prevention Control and Countermeasure Plan for Fort Greely documents methods used to prevent spills from reaching navigable waters and/or groundwater.

Yukon Training Area (Fort Wainwright), Alaska—No-action Alternative

Geology and Soils. Potential geology and soil impacts would be the same as described for Fort Greely.

Water Resources. Potential water resources impacts would be the same as described for Fort Greely.

ES.1.6.2 PROPOSED ACTION

Under the Proposed Action, only the locations and environmental resources listed below were anticipated to have environmental impacts from deployment of the NMD system. No impacts would be expected to the remaining locations and environmental resources. As noted in section 1.4, the Preferred Alternative would be for the GBI and BMC2 to be located at Fort Greely Alaska and the XBR at Eareckson AS, Alaska. The NMD system would make use of the existing early warning radars.

ES.1.6.2.1 Ground-Based Interceptor (GBI)

Clear AFS, Alaska—Ground-Based Interceptor

Biological Resources. Under the Proposed Action, no impacts would be expected to threatened or endangered species on Clear AFS. Construction activities could cause impacts to approximately 2.7 hectares (6.6 acres) of wetlands under the GBI Alternative Site A or 55 hectares (135 acres) under the Alternative B Site. These wetlands could potentially be affected by the project through filling, draining, trenching, and other general construction activities. Because wetlands generally provide wildlife habitat, any significant changes to these wetlands would likely result in subsequent impacts on wildlife of the area. Wetlands would be avoided to the extent practicable. Best Management Practices such as stabilizing fill slopes from erosion and the use of hay bales to filter sediment from storm water runoff would be implemented. Section 404 permits would be obtained if actual siting of the GBI field determines that wetlands would be affected and before any discharge of fill material. Compliance with the required wetland permits would also work to minimize impacts. Maintenance of wetland quality and value would be coordinated with applicable agencies. The permitting process would entail review of proposed activities and possible mitigations by all interested parties and applicable agencies.

Geology and Soils. Because of the well drained nature of the area soils, the presence of thaw unstable permafrost is not anticipated to be a problem. However, before design and construction, a comprehensive geotechnical investigation would be conducted to determine the exact nature of the soils in the area. In the unlikely event that thaw unstable permafrost were encountered during these investigations, the site layout

would be adjusted to minimize any impacts to these areas. These investigations would also determine the depth to groundwater. Depending on the depth, missile silos may be slightly elevated to avoid dewatering during construction and operations.

Health and Safety. Overall, there would be a minimal increase in health and safety risk from the deployment of the GBI at Clear AFS. With the safety procedures in place, the potential for a mishap during handling of the GBI is unlikely. In addition, there would be an emergency response team onsite, and the system has multiple safety systems built into the design such that multiple failures would be required for a liquid propellant leak to occur. However, in the unlikely event of a liquid propellant leak, there is the potential for health hazard from the gases to extend beyond the base boundary if the GBI Alternative Site B is selected for deployment at Clear AFS. Under the GBI Alternative A site the hazardous extent of the cloud would not exceed the base boundary or impact occupied areas on base. The hazardous extent of the cloud at Site B could exceed the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit up to 760 meters (2,493 feet) from the leak for nitrogen tetroxide. Exposure at these levels, given that most exposure would occur in open air conditions, would be mildly irritating to the eyes and nose and could include coughing. The most likely areas for this to occur would be within the GBI missile field and related facilities. The hazardous emission at Clear AFS would affect less than 122 hectares (302 acres) of land outside of the base boundary. This area is undeveloped, and there are no public structures or public roads. On-base this would include the administrative and housing areas. Overall, there would be minimal public health and safety risk.

Socioeconomics. It is anticipated that construction and operation of the GBI element at Clear AFS would provide an economic benefit to the surrounding regions. An average of 400 construction workers would be employed over a 5-year period, and operation of the system could employ as many as 255 workers.

The GBI construction program would generate additional income in the local economy in two ways. The first way is in the form of wages earned by the construction workers. A proportion of these wages would be spent locally on lodging, food, and transportation. Second, the construction program would include a proportion of locally purchased materials. These purchases, at local stores and from local suppliers, would generate additional income and jobs within the local economy. The construction cost of the GBI and its support facilities at this location would be approximately $611 million over a 5-year period, or an average of $122 million per year. It is expected that the construction would result in indirect local expenditures of $60 million per year for 5 years and would support an annual average of 600 non-contract jobs per year. While some of these jobs might be created in the communities of Denali

Borough, the majority would be in the main urban centers where much of the expenditure would be made, such as Fairbanks and Anchorage.

The 255 personnel required to carry out the operational phase would generate at least $7.0 million of direct income per year. Although not all of this would be spent locally, it would be expected that the benefit of this income in the local community would have a multiplied effect. Using current economic impact data for Clear AFS, it is estimated that approximately 77 jobs would be generated indirectly by the operational phase of the action. The majority of these jobs would be created in Fairbanks, the region's service center and only significant outlet for retail spending.

Fort Greely, Alaska—Ground-Based Interceptor

Health and Safety. As discussed above for Clear AFS, the potential for a GBI mishap is remote. However, in the unlikely event of a liquid propellant leak, there is the potential for health hazard from the gases to extend beyond the base boundary. The hazardous extent of the cloud could exceed the OSHA Permissible Exposure Limit up to 760 meters (2,493 feet) from the leak for nitrogen tetroxide. Exposure at these levels, given that most public exposure would occur in open air conditions, would be mildly irritating to the eyes and nose and could include coughing. The most likely areas for this to occur would be within the GBI missile field and related facilities. The hazardous emission at Fort Greely would only affect less than 14 hectares (35 acres) of land outside of the base boundary. This area is undeveloped, and there are no public structures or public roads. The hazardous emissions would not affect the Fort Greely cantonment area. Overall, there would be minimal public health and safety risk.

Socioeconomics. It is anticipated that construction and operation of the GBI element at Fort Greely would provide an economic benefit to the surrounding regions. An average of 400 construction workers would be employed over a 5-year period, and operation of the system could employ as many as 360 workers.

The GBI construction program would generate additional income in the local economy in two ways. The first way is in the form of wages earned by the construction workers. A proportion of these wages would be spent locally on lodging, food, and transportation. Second, the construction program would include a proportion of locally purchased materials. These purchases, at local stores and from local suppliers, would generate additional income and jobs within the local economy. The construction cost of the GBI and its support facilities at this location would be approximately $626 million over a 5-year period, or an average of $125 million per year. It is expected that the construction would result in indirect local expenditures of $62 million per year for 5 years

and would support an annual average of 620 non-contract jobs per year. While some of these jobs might be created in the communities surrounding Fort Greely, the majority would be in the main urban centers where much of the expenditure would be made, such as Fairbanks and Anchorage.

The 360 personnel required to carry out the operational phase would generate at least $9.7 million of direct income per year. Although not all of this would be spent locally, it would be expected that the benefit of this income in the local community would have a multiplied effect. Using current economic impact data for Fort Greely, it is estimated that approximately 108 jobs would be generated indirectly by the operational phase of the action. The majority of these jobs would be created in Fairbanks, the region's service center and only significant outlet for retail spending. However, this economic gain at Fort Greely would only offset the loss of jobs at the base as a result of the 1995 Base Realignment and Closure program. A base reuse plan was published in October 1998. The GBI at this site would be compatible with the plan and would, in fact, provide more jobs at Fort Greely than the plan forecasts for its military component. While not replacing all the jobs lost to Fort Greely as a result of the realignment, the GBI would be a considerable catalyst for the plan and would contribute substantially to its chances of success.

Yukon Training Area (Fort Wainwright)/Eielson AFB, Alaska—Ground-Based Interceptor

Biological Resources. Under the Proposed Action, no impacts would be expected to threatened or endangered species on the Yukon Training Area/Eielson AFB. Construction activities could cause impacts to approximately 46 hectares (113 acres) of wetlands on the Yukon Training Area considered as having low-value in a recent Alaska Corps of Engineers survey. Potential impacts to these wetlands and mitigation measures would be the same as described above for Clear AFS.

Cultural Resources. Site FAI 157 is located approximately 262 meters (860 feet) west of the westernmost boundary of the NMD GBI deployment site. Previous recommendations regarding this site indicate that if future activities in the area pose a potential threat to the site, additional studies should be undertaken. If avoidance of this site is not feasible during the conduct of NMD activities, adverse effects can be reduced to non-adverse levels through mitigation measures such as data recovery using appropriate archaeological practices.

Building 3425 (a warehouse) may be potentially eligible for listing in the National Register of Historic Places and could be affected by modifications from the NMD program. Appropriate mitigation measures would be developed in consultation with the Alaska SHPO and would be conducted in accordance with 36 Code of Federal Regulations 800.

Standard mitigation measures for adverse effects on historic buildings and structures include recordation. Recordation can be accomplished in a number of ways, among them documentation using the guidance provided by the Historic American Buildings Survey/Historic American Engineering Record division of the National Park Service.

Geology and Soils. Moderate impact is anticipated to the geology and soils at Yukon Training Area as a result of the Proposed Action. Construction of the GBI and support facilities would require disturbing approximately 243 hectares (600 acres) at the GBI site for grubbing and grading preparation. The relatively thick mantle of silt at the site is characterized as having moderate to very severe susceptibility to erosion, especially on steeper slopes. Best Management Practices would be used to reduce the potential for soil erosion at the GBI site. Once construction is complete and vegetation is replaced, there should be little soil erosion from operation of the site. Geotechnical investigations at the proposed site indicate the presence of permafrost on north facing slopes, which is typical for areas of discontinuous permafrost. Thawing of permafrost areas could result in subsidence, erosion, and gully formation. The thawing process could also affect water quality by increasing suspended sediment values if there is soil movement from the thawed area to a water body. To minimize impacts to permafrost during site design, permafrost areas would be avoided if possible.

Socioeconomics. Potential economic benefits from GBI deployment in the communities around the Yukon Training Area/Eielson AFB would be similar to those described for Clear AFS above.

Grand Forks AFB, North Dakota—Ground-Based Interceptor

Biological Resources. Under the Proposed Action, no impacts would be expected to threatened or endangered species on Grand Forks AFB. Construction activities associated with the Ordnance Training - 5 (OT-5) area alternative could cause impacts to approximately 5 hectares (12 acres) of wetlands. Potential impacts to these wetlands and mitigation measures would be the same as described above for Clear AFS.

Geology and Soils. The primary soil management issue is short-term wind erosion during ground-disturbing activities. Over the 2-year ground-disturbing period, Best Management Practices to minimize fugitive dust would be implemented. Once construction is complete and vegetation is replaced, there should be little soil erosion from operation of the site.

Health and Safety. As discussed above for Clear AFS, the potential for a GBI mishap is remote. However, in the unlikely event of a liquid propellant leak there is the potential for health hazard from the gases to extend beyond the base boundary from the only two areas on the base that can support GBI deployment. The hazardous emission at the Grand

Forks Weapons Storage Area GBI deployment alternative could exceed the OSHA Permissible Exposure Limit up to 107 hectares (264 acres) off-base. Exposure at these levels, given that most exposure would occur in open air conditions, would be mildly irritating to the eyes and nose and could include coughing. This area includes open land, three commercial buildings, two churches, one residential unit, and portions of U.S. Highway 2. A spill of the liquid propellant could affect these public facilities. If a spill were to occur, all potential hazard areas would be evacuated by emergency response personnel. On-base, the hazardous emission area from a spill of liquid propellant could include the family housing, administrative, and flightline areas.

For the OT-5 GBI deployment alternative at Grand Forks AFB, up to 306 hectares (757 acres) could be affected off-base from a liquid propellant spill. This area has one residential unit with the remainder of the area open farm land; any spill would require a search of the area so any persons present could be evacuated from the open farm land and the one residential unit. On-base the hazardous emission area from a spill of liquid propellant would include the alert apron area, which would also be evacuated if a spill occurs. Overall, given the limited buffer to occupied areas from both on-base and off-base areas, there is a greater health risk to the public from GBI operations at Grand Forks AFB than other GBI deployment sites.

Socioeconomics. It is anticipated that construction and operation of the GBI element at Grand Forks AFB would provide an economic benefit to the surrounding regions. For construction, an average of 250 construction workers would be employed over a 5-year period, and operation of the system could employ as many as 255 workers.

The GBI construction program would generate additional income in the local economy in two ways. The first way is in the form of wages earned by the construction workers. A proportion of these wages would be spent locally on lodging, food, and transportation. Second, the construction program would include a proportion of locally purchased materials. These purchases, at local stores and from local suppliers, would generate additional income and jobs within the local economy. The construction cost of the GBI and its support facilities at this location would be approximately $312 million over a 5-year period, or an average of $62 million per year. It is expected that the construction could result in indirect local expenditures of $30 million per year for 5 years and would support 300 indirect related jobs in the surrounding community per year.

The 255 personnel required to carry out the operational phase would generate at least $6.7 million of direct income per year. Although not all of this would be spent locally, it would be expected that the benefit of this income in the local community would have a multiplied effect. Using current economic impact data for Grand Forks AFB, it is estimated

that approximately 72 jobs would be generated indirectly by the operational phase of the action.

Missile Site Radar, North Dakota—Ground-Based Interceptor

Biological Resources. Under the Proposed Action, no impacts would be expected to vegetation, wildlife, or threatened or endangered species on the Missile Site Radar. Construction activities could cause impacts to Roaring Nancy Creek, which is considered a wetland, through project-related surface runoff. Appropriate storm water permitting would minimize potential soil erosion impacts to this area. If required, the wetland permitting process would recommend potential mitigation measures.

Cultural Resources. Deployment of the GBI at this location would require the demolition of some facilities eligible for listing on the National Register of Historic Places, which would constitute an adverse impact. However, any potential impact to these facilities has been mitigated through the preparation of a Historic American Engineering Record that was approved and accepted by the National Park Service and reviewed by the North Dakota SHPO.

Geology and Soils. Potential impacts would be similar to those described above for Grand Forks AFB.

Health and Safety. As discussed above for Clear AFS, the potential for a GBI mishap is remote. However, in the unlikely event of a liquid propellant leak, there is the potential for health hazard from the gases to extend beyond the base boundary. The hazardous emission at the Missile Site Radar could exceed the OSHA Permissible Exposure Limit for a distance of up to 225 hectares (557 acres) off-base. Exposure at these levels, given that most public exposure would occur in open air conditions, would be mildly irritating to the eyes and nose and could include coughing. Most of this area is open or farmland; however, there is a commercial and an unoccupied farm building within this area. A spill of the liquid propellant could affect these public facilities. If a spill were to occur, this area would be evacuated by emergency response personnel.

Socioeconomics. It is anticipated that construction and operation of the GBI element at the Missile Site Radar would provide an economic benefit to the surrounding regions. For construction, an average of 350 construction workers would be employed over a 5-year period, and operation of the system could employ as many as 360 workers.

The GBI construction program would generate additional income in the local economy in two ways. The first way is in the form of wages earned by the construction workers. A proportion of these wages would be spent locally on lodging, food, and transportation. Second, the construction program would include a proportion of locally purchased materials. These purchases, at local stores and from local suppliers, would generate

additional income and jobs within the local economy. The construction cost of the GBI and its support facilities at this location would be approximately $364 million over a 5-year period, or an average of $73 million per year. It is expected that the construction could result in indirect local expenditures of $36 million per year for 5 years and would support 360 indirect related jobs in the surrounding community per year.

The operational phase of the GBI deployment could employ as many as 360 personnel. The reason for the additional personnel at this location is to provide the support base function that already exists at Grand Forks AFB. These personnel would generate at least $9.1 million of direct income per year. It is estimated that approximately 100 jobs would be generated indirectly by the operational phase of the action that would provide an economic benefit to the local communities.

ES.1.6.2.2 Battle Management Command and Control (BMC2)

Clear AFS, Alaska—Battle Management Command and Control

Deployment of the BMC2 at Clear AFS would likely occur within the GBI deployment area, and construction would occur during the same timeframe. Potential impacts and mitigation measures for BMC2 deployment for biological resources and geology and soils would be similar to those described above for GBI deployment. No other impacts from BMC2 deployment would be anticipated.

Fort Greely, Alaska—Battle Management Command and Control

Deployment of the BMC2 at Fort Greely would likely occur within the GBI deployment area, and construction would occur during the same timeframe. Potential impacts and mitigation measures for BMC2 deployment would be similar to those described above for GBI deployment. No other impacts from BMC2 deployment would be anticipated.

Yukon Training Area (Fort Wainwright)/Eielson AFB, Alaska—Battle Management Command and Control

Deployment of the BMC2 at the Yukon Training Area/Eielson AFB would likely occur within the GBI deployment area, and construction would occur during the same timeframe. Potential impacts and mitigation measures for BMC2 deployment for biological resources, cultural resources, and geology and soils would be similar to those described above for GBI deployment. No other impacts from BMC2 deployment would be anticipated.

Grand Forks AFB, North Dakota—Battle Management Command and Control

Geology and Soils. Potential impacts to geology and soils from BMC2 deployment would be similar to those described above for GBI

deployment at Grand Forks AFB. No other impacts from BMC2 deployment would be anticipated.

Missile Site Radar, North Dakota—Battle Management Command and Control

Deployment of the BMC2 at the Missile Site Radar would likely occur within the GBI deployment area, and construction would occur during the same timeframe. Potential impacts and mitigation measures for BMC2 deployment for biological resources, cultural resources, and geology and soils would be similar to those described above for GBI deployment. No other impacts from BMC2 deployment would be anticipated.

ES.1.6.2.3 In-Flight Interceptor Communications System (IFICS) Data Terminal

It is expected that approximately 14 IFICS Data Terminal sites could be required for NMD deployment. The operational requirements for the IFICS Data Terminal are still being identified. As such, the specific locations where the IFICS Data Terminal could be deployed have not yet been determined. Regions under study include Alaska and North Dakota. In addition, as the operational requirements are refined, other regions may be identified. It is anticipated that DOD installations would be used to deploy IFICS Data Terminals because of the security and maintenance infrastructure they could provide; however, if no DOD installations are within the potential performance region required for an IFICS Data Terminal to operate, then other land would be investigated. Since specific sites have not been identified, provided below is a general description of the types of impacts that could be expected from deployment of an IFICS Data Terminal. Once specific sites are identified, supplemental site-specific environmental analysis, as required, would be performed based on the initial analysis in this EIS.

Overall, it is not expected that deployment of an IFICS Data Terminal would result in impacts to airspace, socioeconomics, transportation, or utilities. Construction and operation of the site would result in increased air emissions, but given the small amounts of emissions, no impact to air quality would be expected. During the siting process, sensitive biological and cultural resource areas would be avoided if possible, thus resulting in no adverse impacts to these resources. Given the limited amount of disturbance required for this site (7 hectares [17 acres]), minimal impacts to geology and soils, land use, and water resources would be expected. The site would require the use of minimal hazardous materials and would generate minimal hazardous waste, all of which would be handled in accordance with appropriate regulations. There are no health and safety issues related to the operation of the IFICS Data Terminal.

The new IFICS Data Terminal facility would be approximately 7 meters (20 feet) tall. Visual impacts could occur if the facilities were within

views of medium to high sensitivity public use areas and travel routes. Since the electrical generator required for the site would be enclosed within a shelter, minimal noise impacts would be expected. Because no adverse human health and environmental impacts would be expected from construction and operation, no environmental justice concerns have been identified. Given the small area required for deployment, it is not expected that construction or operation would affect subsistence resources in the State of Alaska if the IFICS Data Terminal is deployed in this state.

ES.1.6.2.4 X-Band Radar (XBR)

Eareckson AS, Alaska—X-Band Radar

Airspace. As a result of the deployment of the XBR at Eareckson AS, a radio frequency radiation area notice would be published on the appropriate aeronautical charts, notifying aircraft of 6.7-kilometer (3.6-nautical-mile) radius high energy radiation area around the proposed XBR radar site. The establishment of the high energy radiation area would not impose any flight restriction requirements; consequently, there would be no impacts to controlled and uncontrolled airspace, special use airspace, military training routes, en route airways and jet routes, airfields and airports, and air navigation and communications equipment in the region of influence.

In addition to charting the high energy radiation area notice on aeronautical charts, information of the high energy radiation area would be published in the Airport Facility section of *Supplement Alaska*, and local Notices to Airmen would be issued. Additionally, flight service personnel would brief pilots flying through the area about the high energy radiation area.

Other possible mitigation measures for further reducing the potential for airspace use conflicts include installation of a new airport surveillance radar to be used jointly with the Federal Aviation Administration's ATC radar system, or an embedded tracker that would provide a secondary function within the XBR to detect and locate aircraft within the high energy radiation area. Either system would trigger software modifications that would inhibit XBR radar transmissions from illuminating the aircraft.

Biological Resources. An initial study on the location of the threatened Aleutian Canada goose feeding areas was conducted as part of a Management Action Plan for Eareckson AS. This study identified the location of feeding and resting areas on the island. In 1999, the Air Force began a 3-year study to further determine the goose population during spring (mid April through mid June) and fall migrations (mid August through mid October) when the species is found on the island. Additional vegetation surveys to be conducted in 2000 will further refine

island populations and prime feeding areas. The studies are being conducted by the Air Force along with the U.S. Fish and Wildlife Service (USFWS) to assist in a bird aircraft strike hazard assessment. The purpose of the assessment is to minimize the potential safety hazard to aircraft from a bird strike during flight operations on Eareckson AS. The USFWS is allowing the Air Force to maintain vegetation on the island to minimize use by the Aleutian Canada goose. NMD related construction activities including equipment noise and limited blasting of quarry material and resulting new facilities could affect feeding and resting areas on the island. However, in discussions with the USFWS Alaska Maritime National Wildlife Refuge, it was concluded that NMD activities would not impact areas considered as critical habitat for the Aleutian Canada goose. Shemya Island is not considered critical habitat because of the need to minimize the bird strike hazard to aircraft and the existence of the Artic fox on the island. Additionally, the goose is in the final steps of being delisted, which is expected by the end of July 2000, prior to the start of NMD construction activities. If the Aleutian Canada goose is not delisted, additional consultation with the USFWS would be conducted (Boone, 2000—Personal communication with David Hasley, USASMDC, regarding the Aleutian Canada goose.)

Construction activities could cause impacts to approximately 12 hectares (30 acres) of wetlands. These wetlands could potentially be affected by the project through filling, draining, trenching, and other general construction activities. Because wetlands generally provide wildlife habitat, any significant changes to these wetlands would likely result in subsequent impacts on wildlife of the area. Wetlands would be avoided to the extent practicable. Best Management Practices such as stabilizing fill slopes from erosion and the use of sand bags to filter sediment from storm water runoff would be implemented. Section 404 permits will be obtained if actual siting determines that wetlands would be affected and before any discharge of fill material. Compliance with the required wetland permits would also work to minimize impacts. Maintenance of wetland quality and value would be coordinated with applicable agencies. The permitting process would entail review of proposed activities and possible mitigations by all interested parties and applicable agencies. Initial discussions with the USFWS, the land owner on Shemya, have indicated that there is no appropriate area on Shemya to mitigate potential impacts to wetlands. Therefore, the USFWS has initially proposed mitigation measures on other Aleutian Islands as follows: reintroduce the Everman's Rock Ptarmigan to Agattu from Attu, and study population and distribution of cormorants in the Near Islands.

Geology and Soils. Minor to moderate impacts are anticipated to the geology and soils at Eareckson AS as a result of the Proposed Action. Site excavations would expose underlying loam soils to potential erosion and would also create spoils of organic rich materials, which would have to be designed for alternative uses. Best Management Practices would

be used to reduce the potential for short-term soil erosion during construction. Various measures may be recommended to reduce water erosion of slopes, partially graded streets, and pads. Alternative recommendations may include minimizing the amount of area exposed during grubbing; using soil stabilizers to reduce fugitive dust; use of sandbags for diverting flow; creating sediment basins to control flow; and revegetating slopes and open areas as soon as possible to enhance long-term stability.

Health and Safety. Deployment of the XBR would not result in any risk to human health. Electromagnetic radiation levels would be below prescribed health based standards at the 150-meter (492-foot) controlled area boundary for the site. There is the potential safety risk to aircraft airborne systems and fly-by-wire aircraft out to 6.7 kilometers (3.6 nautical miles) from the deployment site. However, potential safety risks would be minimized through the establishment of a high energy radiation area warning on the appropriate aeronautical charts to inform pilots of the potential electromagnetic interference hazard to certain aircraft. In addition, there would be coordination with Federal Aviation Administration air traffic controllers.

Cavalier AFS, North Dakota—X-Band Radar

Airspace. As a result of the deployment of the XBR at Cavalier AFS, a radio frequency radiation area notice would be published on the appropriate aeronautical charts, notifying aircraft of 6.7-kilometer (3.6-nautical-mile) radius high energy radiation area around the proposed XBR radar site. The establishment of the high energy radiation area would not impose any flight restriction requirements; consequently, there would be no impacts to controlled and uncontrolled airspace, special use airspace, military training routes, en route airways and jet routes, airfields and airports, and air navigation and communications equipment in the region of influence.

In addition to charting the high energy radiation area notice on aeronautical charts, information of the high energy radiation area would be published in the Airport Facilities Directory and local Notices to Airmen would be issued. Additionally, flight service personnel would brief pilots flying through the area about the high energy radiation area.

Other possible mitigation measures for further reducing the potential for airspace use conflicts include the installation of a Federal Aviation Administration airport surveillance radar and its associated beacon, or the use of an embedded tracker that would provide a secondary function within the XBR, to detect and locate aircraft within the high energy radiation area. Either system would trigger software modifications that would inhibit XBR radar transmissions from illuminating the aircraft.

Cultural Resources. Deployment of the XBR at this location would require the demolition of the Perimeter Acquisition Radar, which is eligible for listing on the National Register of Historic Places, and would constitute an adverse impact. However, any potential impact to this facility has been mitigated through the preparation of a Historic American Engineering Record that was approved and accepted by the National Park Service and reviewed by the North Dakota SHPO.

Geology and Soils. The primary soil management issue is short-term wind erosion during ground-disturbing activities. Over the 2-year ground-disturbing period, Best Management Practices to minimize fugitive dust would be implemented. Once construction is complete and vegetation is replaced, there should be little soil erosion from operation of the site.

Health and Safety. Potential health and safety impacts for an XBR deployment at Cavalier AFS would be the same as described above for an XBR deployment at Eareckson AS.

Socioeconomics. It is anticipated that construction of the XBR element at Cavalier AFS would provide an economic benefit to the surrounding region. For construction, an average of 230 construction workers would be employed over a 3-year period, and operation of the system could employ as many as 105 workers.

The XBR construction program would generate additional income in the local economy in two ways. The first way is in the form of wages earned by the construction workers. A proportion of these wages would be spent locally on lodging, food, and transportation. Second, the construction program would include a proportion of locally purchased materials. These purchases, at local stores and from local suppliers, would generate additional income and jobs within the local economy. The construction cost of the XBR and its support facilities would be approximately $50 million over a 3-year period, or an average of $17 million per year. It is expected that the construction could result in indirect local expenditures of $8 million per year for 3 years and would support 80 indirect related jobs in the surrounding community per year.

The economic benefit from the operational phase of the XBR at Cavalier AFS would be offset by the closure of the existing Air Force mission at this site if NMD is implemented; therefore, the economic impacts on the surrounding area would be similar to current conditions, thus resulting in no change in the regional economic condition.

Missile Site Radar, North Dakota—X-Band Radar

Airspace. Potential airspace impacts would be the same as described above for an XBR deployment at Cavalier AFS.

Biological Resources. Under the Proposed Action, no adverse impacts would be expected to vegetation, wildlife, or threatened or endangered species on the Missile Site Radar. Construction activities could cause impacts to Roaring Nancy Creek, which is considered a wetland through project related surface runoff. Appropriate storm water permitting would minimize potential soil erosion impacts to this area. If required, the wetland permitting process would recommend potential mitigation measures.

Cultural Resources. Deployment of the XBR at this location would require the demolition of some facilities eligible for listing on the National Register of Historic Places which would constitute an adverse impact. However, any potential impact to these facilities has been mitigated through the preparation of a Historic American Engineering Record that was approved and accepted by the National Park Service and reviewed by the North Dakota SHPO.

Geology and Soils. Potential impacts to and mitigation measures for geology and soils at the Missile Site Radar for XBR deployment would be the same as described above for Cavalier AFS for XBR deployment.

Health and Safety. Potential health and safety impacts for an XBR deployment at the Missile Site Radar would be the same as described above for an XBR deployment at Eareckson AS.

Socioeconomics. It is anticipated that construction and operation of the XBR element at the Missile Site Radar would provide an economic benefit to the surrounding region. For construction, an average of 230 construction workers would be employed over a 3-year period, and operation of the system could employ as many as 105 workers.

The XBR construction program would generate additional income in the local economy in two ways. The first way is in the form of wages earned by the construction workers. A proportion of these wages would be spent locally on lodging, food, and transportation. Second, the construction program would include a proportion of locally purchased materials. These purchases, at local stores and from local suppliers, would generate additional income and jobs within the local economy. The construction cost of the XBR and its support facilities would be approximately $71 million over a 3-year period, or an average of $24 million per year. It is expected that the construction could result in indirect local expenditures of $12 million per year for 3 years and would support 120 indirect related jobs in the surrounding community per year.

The 105 personnel required to carry out the operational phase would generate at least $2.7 million of direct income per year. Although not all of this would be spent locally, it would be expected that the benefit of this income in the local community would have a multiplied effect. Using

current economic impact data, it is estimated that approximately 30 jobs would be generated indirectly by the operational phase of the action.

Remote Sprint Launch Site 1, North Dakota—X-Band Radar

Airspace. Potential airspace impacts would be the same as described above for an XBR deployment at Cavalier AFS.

Cultural Resources. Potential impacts to and mitigation measures for cultural resources at Remote Sprint Launch Site 1 for XBR deployment would be the same as described above for the Missile Site Radar for XBR deployment.

Geology and Soils. Potential impacts to and mitigation measures for geology and soils at Remote Sprint Launch Site 1 for XBR deployment would be the same as described above for Cavalier AFS for XBR deployment.

Health and Safety. Potential health and safety impacts for an XBR deployment at Remote Sprint Launch Site 1 would be the same as described above for an XBR deployment at Eareckson AS.

Socioeconomics. Potential economic benefits from XBR deployment in the communities around the Remote Sprint Launch Site 1 would be similar to those described for the Missile Site Radar.

Remote Sprint Launch Site 2, North Dakota—X-Band Radar

Potential impacts for XBR deployment at Remote Sprint Launch Site 2 would be similar to that described above for Remote Sprint Launch 1.

Remote Sprint Launch Site 4, North Dakota—X-Band Radar

Potential impacts for XBR deployment at Remote Sprint Launch Site 4 would be similar to that described above for Remote Sprint Launch 1.

ES.1.6.2.5 Upgraded Early Warning Radar (UEWR)

Human exposure to radio frequency emissions was estimated by calculations of the highest possible radio frequency power density that could be produced at ground level by the radar in publicly accessible areas. These calculations included assumptions about the operation of the radar to determine the maximum exposure potential. The results of these calculations were compared to the most applicable criteria, the American National Standards Institute/Institute of Electrical and Electronic Engineers Standard. The proposed upgrades would not change the radio frequency levels in the surrounding human environment from existing levels. The proposed upgrades also do not involve changes to the physical facilities that could increase the power or the proportion

of time that the radar is operating in each duty cycle. The public exposure to radio frequency radiation from the UEWRs over a 30-minute averaging period would be similar to that from the existing early warning radars. The radio frequency levels would still be below the recommended exposure limits. The Air Force is in the process of preparing an EIS to address modernization, maintenance, and sustainment of operations of the early warning radars.

ES.1.6.2.6 Fiber Optic Cable Line

Alaska—Fiber Optic Cable Line

Biological Resources. Because the project primarily involves laying the cable, with little activity later, there are not expected to be any long-term impacts to the marine biota, fishes, or marine birds.

Both short-term and long-term effects could occur to fisheries. The short-term effects would result from direct interference between the cable laying operation and fishing activities in the immediate vicinity. The locations of the ship, cable, and plow may all conflict with fishing activities, such as long line fishing gear and traps. These interference effects are likely to be of short duration, and in a very limited area compared to the vast areas nearby that would not be affected. Long-term impacts to fisheries are expected to be minimal. The fiber optic cable line would be buried beneath the seabed at depths where fishing equipment would be likely to come in contact with it, thereby reducing the potential for equipment to be snagged. The impacts to the terrestrial environment are expected to be short-term. Construction would affect terrestrial environments during trenching. Long-term impacts, however, are not expected. Efforts to protect stream and wetland environments would prevent adverse impacts. There are expected to be no impacts from the project to marine mammals, as there are no activities planned within the immediate vicinity of any rookery or haulout areas.

Potential impacts are possible, but not likely, for several threatened or endangered species or groups discussed. Activities too close to rookeries or feeding grounds could force sea lions to move away, lowering their potential for success. This is not likely, as the cable laying activities should remain outside of the area designated to protect them. Overall, there are not expected to be any cumulative impacts to endangered or threatened species or species of concern.

Potential mitigation to fisheries could include discussions with fishermen to minimize the length of cable crossing valuable fishing areas. Timing construction activities to avoid nesting and breeding periods would eliminate many impacts to the terrestrial environment. Trenching and other construction activities near streams could cause damage to spawning habitat due to excessive erosion, siltation, alteration of natural

drainage patterns, and water quality deterioration. These impacts can be minimized through mitigation measures, such as the use of filter fabric silt fences along construction areas and boring under the stream. Impacts on anadromous fish streams are only expected if trenching and/or construction occurs near the streams. Timing construction activities to avoid major spawning runs would eliminate most impacts.

To reduce potential disturbance to hauled out Steller sea lions, the cable-laying vessel would not operate within 5.6 kilometers (3 nautical miles) of the Steller sea lion rookeries or the major haulouts identified in the Gulf of Alaska or Bering Sea.

Subsistence. The most likely manner in which the project could impact community harvesters is if the project coincides with a community harvesting activity in time and area. Potential and perceived impacts to commercial and subsistence harvesters may be caused by resource damage or resource displacement or disturbance during harvesting times. Contact between fishing gear and the cable, although unlikely, may occur where the cable crosses undersea canyons or rocky substrates and cannot be buried. This would primarily occur with crabbers and longliners. If the project interferes with harvester efforts in traditional areas at normal times, harvesters may be required to increase their effort by spending longer time to harvest and traveling to other areas. Spending additional time and traveling further to harvest target species may increase the risk to harvesters as they go further into areas with which they are less familiar. Additional time and further distances traveled would increase the cost to the harvester. Meetings in the communities would facilitate discussions between project personnel and community harvesters related to key harvest areas, times of harvests, and proposed cable corridors and cable laying schedules.

North Dakota—Fiber Optic Cable Line

Biological Resources. Short-term impacts to vegetation, wildlife, and threatened and endangered species could occur from fiber optic cable line deployment in North Dakota. Some wildlife habitat, wetlands, and prairie potholes can be found along some of the roadways in North Dakota where the cable may be placed. This area provides important nesting habitat for migrating waterfowl, shorebirds, and animals. Wetlands could potentially be affected by the project through filling, draining, trenching, and other general construction activities. Because wetlands generally constitute valuable wildlife habitat, any significant changes to these wetlands would likely result in subsequent impacts on wildlife of the area. Potential mitigation measures to minimize wetland impacts once the fiber optic cable line alignment is defined would be developed through the permitting and consultation process.

Table ES-2: Summary of Environmental Impacts for the No-action Alternative

Resource Category	ALASKA SITES					NORTH DAKOTA SITES			
	Clear AFS	Eareckson AS	Eielson AFB	Fort Greely	Yukon Training Area	Cavalier AFS	Grand Forks AFB	Missile Site Radar	Remote Sprint Launch Sites 1, 2, and 4
Air Quality	No change to the region's current attainment status	No change to the region's current attainment status	No change to the region's current attainment status	No change to the region's current attainment status	No change to the region's current attainment status	No change to the region's current attainment status	No change to the region's current attainment status	No change to the region's current attainment status	No change to the region's current attainment status
Airspace	No change in airspace status or use	No change in airspace status or use	No change in airspace status or use	No change in airspace status or use	No change in airspace status or use	No change in airspace status or use	No change in airspace status or use	No change in airspace status or use	No change in airspace status or use
Biological Resources	No impacts to biological resources from continued operations	No impacts to biological resources from continued operations	Minimal impacts to wildlife and threatened and endangered species from aircraft activities. Plans are in place to minimize impacts	Minimal impacts to vegetation, wildlife, and threatened and endangered species from training activities. Plans are in place to minimize impacts	Minimal impacts to vegetation, wildlife, and threatened and endangered species from training activities. Plans are in place to minimize impacts	No impacts to biological resources from continued operations	No impacts to biological resources from continued operations	No impacts to biological resources from continued operations	No impacts to biological resources from continued operations
Cultural Resources	No impacts, resources would continue to be managed in accordance with cultural resource regulations	No impacts, resources would continue to be managed in accordance with cultural resource regulations	No impacts, resources would continue to be managed in accordance with cultural resource regulations	No impacts, resources would continue to be managed in accordance with cultural resource regulations	No impacts, resources would continue to be managed in accordance with cultural resource regulations	No impacts, resources would continue to be managed in accordance with cultural resource regulations	No impacts, resources would continue to be managed in accordance with cultural resource regulations	No impacts, resources would continue to be managed in accordance with cultural resource regulations	No impacts, resources would continue to be managed in accordance with cultural resource regulations
Geology and Soils	No impact	No impact	No impact	Potential for short-term and cumulative impact to soil and permafrost from training activities **Mitigation**: Reduce soil and permafrost impacts through best management practices	Potential for short-term and cumulative impact to soil and permafrost from training activities **Mitigation**: Reduce soil and permafrost impacts through best management practices	No impact	No impact	No impact	No impact
Hazardous Materials and Hazardous Waste Management	Continued use of hazardous materials and generation of hazardous waste in accordance with appropriate regulations. Continued remediation of hazardous waste sites	Continued use of hazardous materials and generation of hazardous waste in accordance with appropriate regulations. Continued remediation of hazardous waste sites	Continued use of hazardous materials and generation of hazardous waste in accordance with appropriate regulations. Continued remediation of hazardous waste sites	Continued use of hazardous materials and generation of hazardous waste in accordance with appropriate regulations. Continued remediation of hazardous waste sites	Continued use of hazardous materials and generation of hazardous waste in accordance with appropriate regulations. Continued remediation of hazardous waste sites	Continued use of hazardous materials and generation of hazardous waste in accordance with appropriate regulations. Continued remediation of hazardous waste sites	Continued use of hazardous materials and generation of hazardous waste in accordance with appropriate regulations. Continued remediation of hazardous waste sites	Continued use of hazardous materials and generation of hazardous waste in accordance with appropriate regulations. Continued remediation of hazardous waste sites	Continued use of hazardous materials and generation of hazardous waste in accordance with appropriate regulations. Continued remediation of hazardous waste sites

Table ES-2: Summary of Environmental Impacts for the No-action Alternative (Continued)

Resource Category	ALASKA SITES					NORTH DAKOTA SITES			
	Clear AFS	Eareckson AS	Eielson AFB	Fort Greely	Yukon Training Area	Cavalier AFS	Grand Forks AFB	Missile Site Radar	Remote Sprint Launch Sites 1, 2, and 4
Health and Safety	No impact	No impact	No impact	No impact	No impact	No impact	No impact	No impact	No impact
Land Use and Aesthetics	Current base activities are compatible with regional and local planning/zoning and surrounding on and off-base land uses	Current base activities are compatible with regional and local planning/zoning and surrounding on and off-base land uses	Incompatible residential land uses are within runway clear zone	Current base activities are compatible with regional and local planning/zoning and surrounding on and off-base land uses	Current base activities are compatible with regional and local planning/zoning and surrounding on and off-base land uses	Current base activities are compatible with regional and local planning/zoning and surrounding on and off-base land uses	Current base activities are compatible with regional and local planning/zoning and surrounding on and off-base land uses	Current base activities are compatible with regional and local planning/zoning and surrounding on and off-base land uses	Current base activities are compatible with regional and local planning/zoning and surrounding on and off-base land uses
Noise	No impact	No impact	Residential area of Moose Creek is within day-night level 65 decibels A-weighted noise contour from aircraft noise	No impact	No impact	No impact	No impact	No impact	No impact
Socioeconomics	Base operations would continue to provide economic benefits	No impact	Base operations would continue to provide economic benefits	Economic impact from loss of jobs associated with base realignment	Base operations would continue to provide economic benefits	Base operations would continue to provide economic benefits	Base operations would continue to provide economic benefits	No activities occur at this site; therefore, there are no economic benefits	No activities occur at these sites; therefore, there are no economic benefits
Transportation	No change to current level of service on roadways	No impact	No change to current level of service on roadways	No change to current level of service on roadways	No change to current level of service on roadways	No change to current level of service on roadways	No change to current level of service on roadways	No change to current level of service on roadways	No change to current level of service on roadways
Utilities	Utility systems are adequate to handle demand	Utility systems are adequate to handle demand	Utility systems are adequate to handle demand	Utility systems are adequate to handle demand	Utility systems are adequate to handle demand	Utility systems are adequate to handle demand	Utility systems are adequate to handle demand	Utility systems are adequate to handle demand	Utility systems are adequate to handle demand
Water Resources	No change to water resources in the region	No change to water resources in the region	No change to water resources in the region	Potential for impacts to water resources from military training activities **Mitigation**: Use existing management practices and storm water plans to reduce potential water impacts	Potential for impacts to water resources from military training activities **Mitigation**: Use existing management practices and storm water plans to reduce potential water impacts	No change to water resources in the region	No change to water resources in the region	No change to water resources in the region	No change to water resources in the region

Table ES-2: Summary of Environmental Impacts for the No-action Alternative (Continued)

Resource Category	ALASKA SITES					NORTH DAKOTA SITES			
	Clear AFS	Eareckson AS	Eielson AFB	Fort Greely	Yukon Training Area	Cavalier AFS	Grand Forks AFB	Missile Site Radar	Remote Sprint Launch Sites 1, 2, and 4
Environmental Justice	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected
Subsistence	No impact to subsistence uses in and around Clear AFS	Restricted access on the island precludes subsistence use	No impact to subsistence use in and around Eielson AFB	No impact to subsistence uses in and around Fort Greely	No impact to subsistence use in and around the Yukon Training Area	Not applicable to North Dakota	Not applicable to North Dakota	Not applicable to North Dakota	Not applicable to North Dakota

Table ES-3: Summary of Environmental Impacts for Deployment of the Ground-Based Interceptor

Resource Category	ALASKA SITES			NORTH DAKOTA SITES	
	Clear AFS	Fort Greely	Yukon Training Area/Eielson AFB	Grand Forks AFB	Missile Site Radar
Air Quality	Increase in air emissions from construction and operation would not affect the region's current attainment status. Will not affect Denali National Park visibility	Increase in air emissions from construction and operation would not affect the region's current attainment status	Increase in air emissions from construction and operation would not affect the region's current attainment status	Increase in air emissions from construction and operation would not affect the region's current attainment status	Increase in air emissions from construction and operation would not affect the region's current attainment status
Airspace	No impact	No impact	No impact	No impact	No impact
Biological Resources	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species. The potential exists to impact between 2.7 hectares (6.6 acres) and 55 hectares (135 acres) of wetlands depending on location selected **Mitigation**: Develop mitigation measures to wetlands through the consultation and permitting process	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species. No wetlands would be impacted	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species. The potential exists to impact 46 hectares (113 acres) of low-value wetlands **Mitigation**: Develop mitigation measures to wetlands through the consultation and permitting process	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species. The potential exists to impact 5 hectares (12 acres) of wetlands from OT-5 deployment alternative **Mitigation**: Develop mitigation measures to wetlands through the consultation and permitting process	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species. The potential exists for sedimentation to impact Roaring Nancy Creek which is a wetland **Mitigation**: Develop mitigation measures to wetlands through the consultation and permitting process
Cultural Resources	No adverse effects	No adverse effects	Potential effect on archaeological site and possible historic structure **Mitigation**: Consult with the State Historic Preservation Officer to minimize adverse effects. Mitigation could include recovery of data from archaeological site and recordation of possible historic structure	No impact	Adverse impact to historic structures has been mitigated through completed Historic American Engineering Record documentation
Geology and Soils	Minor increase in soil erosion would be localized to the construction site. Potential for deployment to affect some permafrost areas. Site design would minimize impacts by avoidance if possible **Mitigation**: Avoid permafrost areas as much as possible. Conduct detailed permafrost studies of potential deployment site. Design facilities to minimize impacts to permafrost	Minor increase in soil erosion would be localized to the construction site. Minimal impacts to permafrost	Short-term impacts from soil erosion during construction. Long-term impacts to permafrost at the deployment site which could result in subsidence, increase erosion, and gully formation **Mitigation**: Minimize soil erosion by implementation of standard erosion control techniques. Avoid permafrost areas as much as possible. Conduct detailed permafrost studies of potential deployment site. Design facilities to minimize impacts to permafrost	Short-term impacts from soil erosion during construction **Mitigation**: Minimize soil erosion by implementation of standard erosion control techniques	Short-term impacts from soil erosion during construction **Mitigation**: Minimize soil erosion by implementation of standard erosion control techniques

Table ES-3: Summary of Environmental Impacts for Deployment of the Ground-Based Interceptor (Continued)

Resource Category	ALASKA SITES			NORTH DAKOTA SITES	
	Clear AFS	Fort Greely	Yukon Training Area/Eielson AFB	Grand Forks AFB	Missile Site Radar
Hazardous Materials and Hazardous Waste Management	Increase in hazardous materials use and hazardous waste generation. All hazardous material and waste handled in accordance with appropriate regulations. Storage tanks would be subject to all appropriate regulations	Increase in hazardous materials use and hazardous waste generation. All hazardous material and waste handled in accordance with appropriate regulations. Storage tanks would be subject to all appropriate regulations	Increase in hazardous materials use and hazardous waste generation. All hazardous material and waste handled in accordance with appropriate regulations. Storage tanks would be subject to all appropriate regulations	Increase in hazardous materials use and hazardous waste generation. All hazardous material and waste handled in accordance with appropriate regulations. Storage tanks would be subject to all appropriate regulations	Increase in hazardous materials use and hazardous waste generation. All hazardous material and waste handled in accordance with appropriate regulations. Storage tanks would be subject to all appropriate regulations
Health and Safety	Minimal increase in health and safety risks. Potential for a GBI mishap during handling is unlikely. In the event of an unlikely accidental liquid propellant leak hazardous gases could exceed base boundary under the Alternative B Site affecting up to 122 hectares (302 acres); however, no occupied structures exist within this area. No off-base areas impacted under Alternative A Site **Mitigation**: Update mutual aid agreements with local fire departments to include additional hazards associated with GBI deployment	Minimal increase in health and safety risks. Potential for a GBI mishap during handling is unlikely. In the event of an unlikely accidental liquid propellant leak hazardous gases could exceed base boundary affecting up to 14 hectares (35 acres); however, no occupied structures exist within this area. GBI deployment would require revision to area fire protection status **Mitigation**: Change fire protection status from Full to Critical. Update mutual aid agreements with local fire departments to include additional hazards associated with GBI deployment	Minimal increase in health and safety risks. Potential for a GBI mishap during handling is unlikely. In the event of an unlikely accidental liquid propellant leak hazardous gases would not exceed base boundary. GBI deployment would require revision to area fire protection status **Mitigation**: Change fire protection status from Full to Critical. Update mutual aid agreements with local fire departments to include additional hazards associated with GBI deployment	Minimal increase in health and safety risks. Potential for a GBI mishap during handling is unlikely. In the event of an unlikely accidental liquid propellant leak hazardous gases could exceed base boundary affecting up to 107 hectares (264 acres) for weapon storage alternative (area includes three commercial structures, two churches, and one residential unit) and 306 hectares (757 acres) for OT-5 alternative (area includes one residential unit) **Mitigation**: Update mutual aid agreements with local fire departments to include additional hazards associated with GBI deployment	Minimal increase in health and safety risks. Potential for a GBI mishap during handling is unlikely. In the event of an unlikely accidental liquid propellant leak hazardous gases could exceed base boundary affecting up to 225 hectares (557 acres); this area includes one commercial structure and an unoccupied farm building. In addition, the explosive safety quantity distances associated with the GBI facilities exceed the base boundary which includes open agricultural lands **Mitigation**: Update mutual aid agreements with local fire departments to include additional hazards associated with GBI deployment. Review existing safety lease agreements for the site and determine if any modifications or addition would be required
Land Use and Aesthetics	Deployment of the GBI would be compatible with regional and local planning/zoning and surrounding on and off-base land uses	Deployment of the GBI would be compatible with regional and local planning/zoning and surrounding on and off-base land uses	Deployment of the GBI would be compatible with regional and local planning/zoning and surrounding on and off-base land uses	Deployment of the GBI would be compatible with regional and local planning/zoning and surrounding on and off-base land uses	Deployment of the GBI would be compatible with regional and local planning/zoning. Explosive safety quantity distances would exceed base boundary but would be compatible with the agricultural uses of the land **Mitigation**: To ensure future land use compatibility, review existing lease agreements for the site and determine if any modifications or addition would be required to ensure no structures would be built within the explosive safety quantity distances

Table ES-3: Summary of Environmental Impacts for Deployment of the Ground-Based Interceptor (Continued)

Resource Category	ALASKA SITES			NORTH DAKOTA SITES	
	Clear AFS	Fort Greely	Yukon Training Area/Eielson AFB	Grand Forks AFB	Missile Site Radar
Noise	No impact	No impact	No impact	Potential for short-term construction related noise disturbance to 2 churches and 1 residential unit from Weapon Storage Area alternative and 1 residential unit from the OT-5 alternative; however, no long-term impacts	Potential for short-term construction related noise disturbance to 2 residential units; however, no long-term impacts
Socioeconomics	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. No impact on public services	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. The economic benefit would help reduce the adverse economic impact as a result of base realignment at Fort Greely. No impact on public services	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. No impact on public services	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. No impact on public services	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. No impact on public services
Transportation	Level of service on the George Parks Highway would change from B to C as a result of temporary construction related impacts. The level of service would change back to B after construction.	Change in level of service from B to C in Delta Junction at intersection of state highways 2 and 4 as a result of potential long-term cumulative operational impacts	Level of service on the Richardson Highway would change from A to B as a result of temporary cumulative construction related impacts. The level of service would change back to A after construction	No change to level of service on roadways	Level of service on North Dakota highways 1 and 5 within Langdon would change from A to B as a result of cumulative temporary construction related impacts. Level of service would change back to A after construction
Utilities	Current utility systems have adequate capacity to support deployment	Current utility systems have adequate capacity to support deployment	Current utility systems have adequate capacity to support deployment	Current utility systems have adequate capacity to support deployment	Current utility systems have adequate capacity to support deployment
Water Resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources
Environmental Justice	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected
Subsistence	Decrease in the amount of land available for subsistence uses; however, the area is not a main subsistence use area in region due to limited access to the base	Decrease in the amount of land available for subsistence uses; however, the area is not a main subsistence use area in region	Decrease in the amount of land available for subsistence uses; however, the area is not a main subsistence use area in region	Not applicable to North Dakota	Not applicable to North Dakota

Table ES-4: Summary of Environmental Impacts for Deployment of the Battle Management Command and Control

Resource Category	ALASKA SITES			NORTH DAKOTA SITES	
	Clear AFS	Fort Greely	Yukon Training Area/ Eielson AFB	Grand Forks AFB	Missile Site Radar
Air Quality	Increase in air emissions from construction and operation would not affect the region's current attainment status. Will not affect Denali National Park visibility	Increase in air emissions from construction and operation would not affect the region's current attainment status	Increase in air emissions from construction and operation would not affect the region's current attainment status	Increase in air emissions from construction and operation would not affect the region's current attainment status	Increase in air emissions from construction and operation would not affect the region's current attainment status
Airspace	No impact	No impact	No impact	No impact	No impact
Biological Resources	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species. The potential exists to impact wetlands **Mitigation**: Develop mitigation measures to wetlands through the consultation and permitting process	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species. No wetlands would be impacted	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species. The potential exists to impact low-value wetlands **Mitigation**: Develop mitigation measures to wetlands through the consultation and permitting process	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species. No wetlands would be impacted	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species. The potential exists for sedimentation to impact Roaring Nancy Creek which is a wetland **Mitigation**: Develop mitigation measures to wetlands through the consultation and permitting process
Cultural Resources	No adverse effects	No adverse effects	Potential effect on archaeological site **Mitigation**: Consult with the State Historic Preservation Officer to minimize adverse effects. Mitigation could include recovery of data from archaeological site	No impact	Adverse impact to historic structures has been mitigated through completed Historic American Engineering Record documentation
Geology and Soils	Minor increase in soil erosion would be localized to the construction site. Potential for deployment to affect some permafrost areas. Site design would minimize impacts by avoidance if possible **Mitigation**: Avoid permafrost areas as much as possible. Conduct detailed permafrost studies of potential deployment site. Design facilities to minimize impacts to permafrost	Minor increase in soil erosion would be localized to the construction site. Potential for deployment to affect some permafrost areas. Site design would minimize impacts by avoidance if possible **Mitigation**: Avoid permafrost areas as much as possible. Conduct detailed permafrost studies of potential deployment site. Design facilities to minimize impacts to permafrost	Short-term impacts from soil erosion during construction. Long-term impacts to permafrost at the deployment site which could result in subsidence, increase erosion, and gully formation **Mitigation**: Minimize soil erosion by implementation of standard erosion control techniques. Avoid permafrost areas as much as possible. Conduct detailed permafrost studies of potential deployment site. Design facilities to minimize impacts to permafrost	Short-term impacts from soil erosion during construction **Mitigation**: Minimize soil erosion by implementation of standard erosion control techniques	Short-term impacts from soil erosion during construction **Mitigation**: Minimize soil erosion by implementation of standard erosion control techniques

Table ES-4: Summary of Environmental Impacts for Deployment of the Battle Management Command and Control (Continued)

Resource Category	ALASKA SITES			NORTH DAKOTA SITES	
	Clear AFS	Fort Greely	Yukon Training Area/ Eielson AFB	Grand Forks AFB	Missile Site Radar
Hazardous Materials and Hazardous Waste Management	No impact	No impact	No impact	No impact	No impact
Health and Safety	No impact	No impact	No impact	No impact	No impact
Land Use and Aesthetics	Deployment of the BMC2 would be compatible with regional and local planning/zoning and surrounding on and off-base land uses	Deployment of the BMC2 would be compatible with regional and local planning/zoning and surrounding on and off-base land uses	Deployment of the BMC2 would be compatible with regional and local planning/zoning and surrounding on and off-base land uses	Deployment of the BMC2 would be compatible with regional and local planning/zoning and surrounding on and off-base land uses	Deployment of the BMC2 would be compatible with regional and local planning/zoning and surrounding on and off-base land uses
Noise	No impact	No impact	No impact	No impact	No impact
Socioeconomics	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. No impact on public services	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities retail sales and tax base. The economic benefit would help reduce the adverse economic impact as a result of base realignment at Fort Greely. No impact on public services	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. No impact on public services	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. No impact on public services	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. No impact on public services
Transportation	Level of service on the George Parks Highway would change from B to C as a result of temporary construction related impacts. The level of service would change back to B after construction.	Change in level of service from B to C in Delta Junction at intersection of state highways 2 and 4 as a result of potential long-term cumulative operational impacts	Level of service on the Richardson Highway would change from A to B as a result of temporary cumulative construction related impacts. The level of service would change back to A after construction	No change to level of service on roadways	Level of service on North Dakota highways 1 and 5 within Langdon would change from A to B as a result of cumulative temporary construction related impacts. Level of service would change back to A after construction
Utilities	No impact	No impact	No impact	No impact	No impact
Water Resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources
Environmental Justice	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected
Subsistence	Decrease in the amount of land available for subsistence uses; however, the area is not a main subsistence use area in region due to limited access to the base	Decrease in the amount of land available for subsistence uses; however, the area is not a main subsistence use area in region	Decrease in the amount of land available for subsistence uses; however, the area is not a main subsistence use area in region	Not applicable to North Dakota	Not applicable to North Dakota

Table ES-5: Summary of Environmental Impacts for Deployment of the In-Flight Interceptor Communications System (IFICS) Data Terminal

Resource Category	Potential Environmental Impact
Air Quality	Increase in air emissions from construction and operation would be minimal. Operations emissions associated with electrical generator would not be expected to change air quality in deployment region
Airspace	Deployment would not require any change in airspace use in the deployment region
Biological Resources	Minimal impacts expected from the construction and operation of an IFICS Data Terminal site to vegetation, wildlife, threatened or endangered species, and wetlands. Sensitive biological areas would be avoided during the siting process. Annual test of system would not impact wildlife
Cultural Resources	Potential for construction to impact archaeological resources; however, sensitive cultural resource areas would be avoided during the siting process, if possible. Overall, no adverse impacts are expected
Geology and Soils	Minimal impacts expected from the construction and operation of an IFICS Data Terminal site. Construction related impacts would be short-term
Hazardous Materials and Hazardous Waste Management	Minimal use of hazardous materials and generation of hazardous waste at the deployment site. All hazardous material and waste handled in accordance with appropriate regulations. Storage tanks would be subject to all appropriate regulations
Health and Safety	During normal NMD operations, the IFICS Data Terminal would not transmit except during annual testing of the equipment. It is expected that a power/calibration test of the transmitter would occur once a year. During this test, electromagnetic radiation would be generated by the IFICS Data Terminal. Electromagnetic radiation levels would not exceed personnel exposure limits during the annual test at the site
Land Use and Aesthetics	This element would affect approximately 7 hectares (17 acres) of land. Due to this project only affecting such a small portion of land it should not drastically affect the land use regardless of where it is located. The NMD program would comply with all applicable Federal and state land use laws. The significance of visual impacts from a deployment site would depend on the sensitivity of the affected views, as well as visual dominance of facilities. Impacts could occur if the facilities were within views of medium to high sensitivity public use areas and travel routes. However, it is anticipated that the IFICS Data Terminal would be located on a DOD installation with similar facilities and limited public access resulting in no visual impacts
Noise	Minimal noise impacts expected from operation of electrical generator inside of a shelter
Socioeconomics	There would be a minimal security personnel force associated with deployment of an IFICS Data Terminal. In addition, construction of the site would create minimal construction related jobs. There would be no impact to local or regional socioeconomic resources
Transportation	There may be a minimal security personnel force associated with deployment of an IFICS Data Terminal; therefore, there would be minimal impact to local or regional transportation resources
Utilities	There may be a minimal site security force associated with operation of the IFICS Data Terminal. The site would require a small amount of electricity to operate. The site may have water connections or use bottled water for the security personnel. Overall, there would be no impact to utilities
Water Resources	Minimal impacts expected from the construction and operation of an IFICS Data Terminal site. Construction related impacts would be short-term
Environmental Justice	No adverse human health and environmental impacts would be expected from construction and operation of the IFICS Data Terminal. No environmental justice concerns have been identified
Subsistence	Given the small area required for deployment it is not expected that construction or operation would affect subsistence resources in the State of Alaska if the IFICS Data Terminal were deployed in this state

Table ES-6: Summary of Environmental Impacts for Deployment of the X-Band Radar

Resource Category	ALASKA SITE	NORTH DAKOTA SITES				
	Eareckson AS	**Cavalier AFS**	**Missile Site Radar**	**Remote Sprint Launch Site 1**	**Remote Sprint Launch Site 2**	**Remote Sprint Launch Site 4**
Air Quality	Increase in air emissions from construction and operation would not affect the region's current attainment status	Increase in air emissions from construction and operation would not affect the region's current attainment status	Increase in air emissions from construction and operation would not affect the region's current attainment status	Increase in air emissions from construction and operation would not affect the region's current attainment status	Increase in air emissions from construction and operation would not affect the region's current attainment status	Increase in air emissions from construction and operation would not affect the region's current attainment status
Airspace	Establishment of a high energy radiation area warning on aeronautical charts would not pose any flight restriction requirements; therefore, there would be no impacts to airspace	Establishment of a high energy radiation area warning on aeronautical charts would not pose any flight restriction requirements; therefore, there would be no impacts to airspace	Establishment of a high energy radiation area warning on aeronautical charts would not pose any flight restriction requirements; therefore, there would be no impacts to airspace	Establishment of a high energy radiation area warning on aeronautical charts would not pose any flight restriction requirements; therefore, there would be no impacts to airspace	Establishment of a high energy radiation area warning on aeronautical charts would not pose any flight restriction requirements; therefore, there would be no impacts to airspace.	Establishment of a high energy radiation area warning on aeronautical charts would not pose any flight restriction requirements; therefore, there would be no impacts to airspace
Biological Resources	No impacts from electromagnetic radiation. Approximately 12 hectares (30 acres) of wetlands impacted **Mitigation**: Develop mitigation measures to minimize impacts to wetlands through the consultation and permitting process	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species from construction or electromagnetic radiation. No wetlands would be impacted **Mitigation**: Clear vegetation within 15 meters (49 feet) of radar to reduce likelihood of wildlife using the area	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species from construction or electromagnetic radiation. The potential exists for sedimentation to impact Roaring Nancy Creek which is a wetland **Mitigation**: Clear vegetation within 15 meters (49 feet) of radar to reduce likelihood of wildlife using the area. Develop mitigation measures to wetlands through the consultation and permitting process	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species from construction or electromagnetic radiation. No wetlands would be impacted **Mitigation**: Clear vegetation within 15 meters (49 feet) of radar to reduce likelihood of wildlife using the area	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species from construction or electromagnetic radiation. No wetlands would be impacted **Mitigation**: Clear vegetation within 15 meters (49 feet) of radar to reduce likelihood of wildlife using the area	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species from construction or electromagnetic radiation. No wetlands would be impacted **Mitigation**: Clear vegetation within 15 meters (49 feet) of radar to reduce likelihood of wildlife using the area
Cultural Resources	No adverse effects	Adverse impact to historic structures has been mitigated through completed Historic American Engineering Record documentation	Adverse impact to historic structures has been mitigated through completed Historic American Engineering Record documentation	Adverse impact to historic structures has been mitigated through completed Historic American Engineering Record documentation	Adverse impact to historic structures has been mitigated through completed Historic American Engineering Record documentation	Adverse impact to historic structures has been mitigated through completed Historic American Engineering Record documentation
Geology and Soils	Short-term impacts from soil erosion during construction **Mitigation**: Minimize soil erosion by implementation of standard erosion control techniques	Short-term impacts from soil erosion during construction **Mitigation**: Minimize soil erosion by implementation of standard erosion control techniques	Short-term impacts from soil erosion during construction **Mitigation**: Minimize soil erosion by implementation of standard erosion control techniques	Short-term impacts from soil erosion during construction **Mitigation**: Minimize soil erosion by implementation of standard erosion control techniques	Short-term impacts from soil erosion during construction **Mitigation**: Minimize soil erosion by implementation of standard erosion control techniques	Short-term impacts from soil erosion during construction **Mitigation**: Minimize soil erosion by implementation of standard erosion control techniques

Table ES-6: Summary of Environmental Impacts for Deployment of the X-Band Radar (Continued)

Resource Category	ALASKA SITE	NORTH DAKOTA SITES				
	Eareckson AS	Cavalier AFS	Missile Site Radar	Remote Sprint Launch Site 1	Remote Sprint Launch Site 2	Remote Sprint Launch Site 4
Hazardous Materials and Hazardous Waste Management	Increase in hazardous materials use and hazardous waste generation. All hazardous material and waste handled in accordance with appropriate regulations. Storage tanks would be subject to all appropriate regulations	Increase in hazardous materials use and hazardous waste generation. All hazardous material and waste handled in accordance with appropriate regulations. Storage tanks would be subject to all appropriate regulations	Increase in hazardous materials use and hazardous waste generation. All hazardous material and waste handled in accordance with appropriate regulations. Storage tanks would be subject to all appropriate regulations	Increase in hazardous materials use and hazardous waste generation. All hazardous material and waste handled in accordance with appropriate regulations. Storage tanks would be subject to all appropriate regulations	Increase in hazardous materials use and hazardous waste generation. All hazardous material and waste handled in accordance with appropriate regulations. Storage tanks would be subject to all appropriate regulations	Increase in hazardous materials use and hazardous waste generation. All hazardous material and waste handled in accordance with appropriate regulations. Storage tanks would be subject to all appropriate regulations
Health and Safety	No risk to human health from electromagnetic radiation. Potential risk to aircraft airborne systems and fly-by-wire aircraft minimized through establishment of a high energy radiation area warning on aeronautical charts	No risk to human health from electromagnetic radiation. Potential risk to aircraft airborne systems and fly-by-wire aircraft minimized through establishment of a high energy radiation area warning on aeronautical charts	No risk to human health from electromagnetic radiation. Potential risk to aircraft airborne systems and fly-by-wire aircraft minimized through establishment of a high energy radiation area warning on aeronautical charts	No risk to human health from electromagnetic radiation. Potential risk to aircraft airborne systems and fly-by-wire aircraft minimized through establishment of a high energy radiation area warning on aeronautical charts	No risk to human health from electromagnetic radiation. Potential risk to aircraft airborne systems and fly-by-wire aircraft minimized through establishment of a high energy radiation area warning on aeronautical charts	No risk to human health from electromagnetic radiation. Potential risk to aircraft airborne systems and fly-by-wire aircraft minimized through establishment of a high energy radiation area warning on aeronautical charts
Land Use and Aesthetics	Deployment of the XBR would be compatible with regional and local planning/zoning and surrounding on and off-base land uses. Deployment would be consistent with the Alaska Coastal Management Program	Deployment of the XBR would be compatible with regional and local planning/zoning	Deployment of the XBR would be compatible with regional and local planning/zoning	Deployment of the XBR would be compatible with regional and local planning/zoning	Deployment of the XBR would be compatible with regional and local planning/zoning	Deployment of the XBR would be compatible with regional and local planning/zoning
Noise	No impact	No impact	Potential for short-term construction related noise disturbance to 2 residential units; however, no long-term impacts	No impact	No impact	No impact
Socioeconomics	Eareckson AS is a military installation on an island with no surrounding support services. No socioeconomic impacts would occur	Construction direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. No impact on public services. Operation of the XBR would replace the current Air Force mission resulting in no net change to the regional economy	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. No impact on public services	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. No impact on public services	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. No impact on public services	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. No impact on public services

Table ES-6: Summary of Environmental Impacts for Deployment of the X-Band Radar (Continued)

Resource Category	ALASKA SITE	NORTH DAKOTA SITES				
	Eareckson AS	Cavalier AFS	Missile Site Radar	Remote Sprint Launch Site 1	Remote Sprint Launch Site 2	Remote Sprint Launch Site 4
Transportation	No impact	Level of service on North Dakota highways 1 and 5 within Langdon would change from A to B as a result of cumulative temporary construction related impacts. Level of service would change back to A after construction	Level of service on North Dakota highways 1 and 5 within Langdon would change from A to B as a result of cumulative temporary construction related impacts. Level of service would change back to A after construction	Level of service on North Dakota highways 1 and 5 within Langdon would change from A to B as a result of cumulative temporary construction related impacts. Level of service would change back to A after construction	Level of service on North Dakota highways 1 and 5 within Langdon would change from A to B as a result of cumulative temporary construction related impacts. Level of service would change back to A after construction	Level of service on North Dakota highways 1 and 5 within Langdon would change from A to B as a result of cumulative temporary construction related impacts. Level of service would change back to A after construction
Utilities	Current utility systems have adequate capacity to support deployment	Current utility systems have adequate capacity to support deployment	Current utility systems have adequate capacity to support deployment	Current utility systems have adequate capacity to support deployment	Current utility systems have adequate capacity to support deployment	Current utility systems have adequate capacity to support deployment
Water Resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources
Environmental Justice	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected
Subsistence	Restricted access on the island precludes subsistence use	Not applicable to North Dakota	Not applicable to North Dakota	Not applicable to North Dakota	Not applicable to North Dakota	Not applicable to North Dakota

Table ES-7: Summary of Environmental Impacts for Deployment of the Fiber Optic Cable Line

Resource Category	Alaska	North Dakota
Air Quality	No impact	No impact
Airspace	No impact	No impact
Biological Resources	Short-term impact to invertebrates and fishes, no long-term impacts expected. Short-term disturbance of terrestrial animals and/or aquatic organisms and terrestrial and/or aquatic habitat, no-long term impacts expected. No direct adverse short or long-term impacts expected to marine mammals or birds. No expected consequences on threatened or endangered species **Mitigation**: Time construction activities to avoid nesting and breeding periods in the terrestrial environment. Use silt fences to minimize soil erosion impacts to streams (spawning habitat) on land crossings or avoid spawning season. Direct bore fiber optic lines under streams where possible. Avoid Steller sea lion rookeries or haul out areas by 5.6 kilometers (3 nautical miles)	Short-term impacts could occur to vegetation, wildlife, and threatened or endangered species. The potential exists for short-term impacts to wetlands along existing road and utility corridors **Mitigation**: Develop mitigation measures to wetlands through the consultation and permitting process. Avoid construction during nesting season.
Cultural Resources	Additional studies required to determine if historic properties may be affected **Mitigation**: Consult with the State Historic Preservation Officer to determine the requirement for additional studies	Additional studies required to determine if historic properties may be affected **Mitigation**: Consult with the State Historic Preservation Officer to determine the requirement for additional studies
Geology and Soils	Short-term disturbance to ocean floor and ground soils, no long-term impacts expected	Short-term disturbance to soils, no long-term impacts expected
Hazardous Materials and Hazardous Waste Management	No impact	No impact
Health and Safety	No impact	No impact
Land Use and Aesthetics	No impact	No impact
Noise	No impact	No impact
Socioeconomics	No impacts. See subsistence resources for potential impacts to fishermen	No impact
Transportation	No impact	No impact
Utilities	No impact	No impact
Water Resources	Short-term increase in sedimentation and degradation of ocean water quality, no long-term impacts expected	Short-term increase in sedimentation and degradation of surface water quality near fiber optic cable line, no long-term impacts expected
Environmental Justice	No impact	No impact
Subsistence	Short-term potential to displace subsistence resources resulting in diminished activities. Short-term change in fishermen's fishing activities **Mitigation**: Hold meetings in the affected communities to minimize impacts to harvesting time and harvesting areas	Not applicable

Table ES-8: Summary of Environmental Impacts for the Upgraded Early Warning Radars

Resource Category	ALASKA SITE Clear AFS	CALIFORNIA SITE Beale AFB	MASSACHUSETTS SITE Cape Cod AFS
Cultural Resources	**No-action Alternative**: No adverse effects **Proposed Action**: No adverse effects	**No-action Alternative**: No adverse effects **Proposed Action**: No adverse effects	**No-action Alternative**: No adverse effects **Proposed Action**: No adverse effects
Health and Safety	**No-action Alternative**: Public radio-frequency exposure levels would be below recommended exposure limits. No adverse effects from long-term exposure **Proposed Action**: Public radio-frequency exposure levels would be below recommended exposure limits. No adverse effects from long-term exposure	**No-action Alternative**: Public radio-frequency exposure levels would be below recommended exposure limits. No adverse effects from long-term exposure **Proposed Action**: Public radio-frequency exposure levels would be below recommended exposure limits. No adverse effects from long-term exposure	**No-action Alternative**: Public radio-frequency exposure levels would be below recommended exposure limits. No adverse effects from long-term exposure **Proposed Action**: Public radio-frequency exposure levels would be below recommended exposure limits. No adverse effects from long-term exposure

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1.0 Purpose and Need

1.0 PURPOSE AND NEED

1.1 INTRODUCTION

The National Environmental Policy Act (NEPA) of 1969 and the Council on Environmental Quality regulations implementing NEPA, Department of Defense (DOD) Instruction 4715.9, and the applicable service environmental regulations that implement these laws and regulations direct DOD officials to consider environmental consequences when authorizing and approving Federal actions. Accordingly, this environmental impact statement (EIS) examines the potential for impacts to the environment as a result of the potential deployment of a National Missile Defense (NMD) system. Appendix A presents acronyms, abbreviations, and a glossary of terms used in this document.

1.2 PROGRAM OVERVIEW

Within the DOD, the Ballistic Missile Defense Organization is responsible for managing, directing, and executing the Ballistic Missile Defense Program. The Ballistic Missile Defense Program focuses on three areas: Theater Missile Defenses to meet the existing missile threat to deployed U.S. and allied forces, NMD to negate limited strategic ballistic missile attacks against the United States, and advanced Ballistic Missile Defense technologies to improve the performance of theater and NMD systems. The NMD Joint Program Office of the Ballistic Missile Defense Organization is responsible for developing and deploying the NMD system.

The NMD program was originally a technology development effort. In 1996, at the direction of the Secretary of Defense, NMD was designated a Major Defense Acquisition Program and transitioned to an acquisition effort. Concurrently, the Ballistic Missile Defense Organization was tasked with developing a deployable system. In the year 2000, there will be a DOD Deployment Readiness Review to review the technical readiness of NMD elements. Thereafter, the United States Government will determine whether the threat, developed capability, and other pertinent factors justify deploying an operational NMD system. Should the deployment option not be exercised in the year 2000, improvements in NMD system element technology would continue.

The NMD system would be a fixed, land-based, non-nuclear missile defense system with a land and space-based detection system capable of responding to limited strategic ballistic missile threats to the United States. The NMD system would consist of five elements: Battle Management, Command, Control, and Communications (BMC3), which includes the Battle Management, Command and Control (BMC2), the

communication lines, and the In-Flight Interceptor Communications System (IFICS) Data Terminal as subelements; Ground-Based Interceptor (GBI); X-Band Radar (XBR); Upgraded Early Warning Radar (UEWR); and a space-based detection system. Depending on the capability available if or when a deployment decision is made, the satellite detection capability would either be the existing Defense Support Program early-warning satellites and/or Space-Based Infrared System (SBIRS) satellites currently being developed by the Air Force. The NMD elements considered for deployment are those land-based systems that include the GBI, BMC2, IFICS Data Terminal, XBR, and the fiber optic cable required to link some of the NMD elements.

1.3 PURPOSE AND NEED FOR THE PROPOSED ACTION

The proliferation of weapons of mass destruction and technology of long-range missiles is increasing the threat to our national security. The purpose of the NMD program is defense of the United States against a threat of a limited strategic ballistic missile attack.

1.4 DECISIONS TO BE MADE

The decision to be made is whether to deploy an NMD system. A decision to deploy an NMD system would include the selection of deployment sites from among the alternatives considered in this EIS (see section 2.0). This decision will be based on the analysis of the ballistic missile threat to the United States, technical maturity of the NMD system for deployment, operational effectiveness, affordability, strategic arms reduction objectives, and other factors, including potential environmental impacts of deploying and operating the NMD system from the potential locations analyzed in this EIS. The EIS will provide the U.S. Government with the information necessary to properly account for the environmental impacts. At this time, a decision to commit to a program leading to deployment is not anticipated before mid-2000 at the earliest. Figure 1.4-1 summarizes the decision that would be involved in deploying the NMD system.

1.5 COOPERATING AGENCIES

1.5.1 FEDERAL AGENCIES

In accordance with 40 Code of Federal Regulations (CFR) 1501.6, an invitation for cooperating agency status was extended to the U.S. Department of the Air Force, Navy, Army, and Federal Aviation Administration (FAA) for consultation, review, and comment on the EIS. Each agency accepted its respective invitation. Table 1.5-1 lists the

cooperating agencies that have potential deployment or development responsibilities for the NMD program.

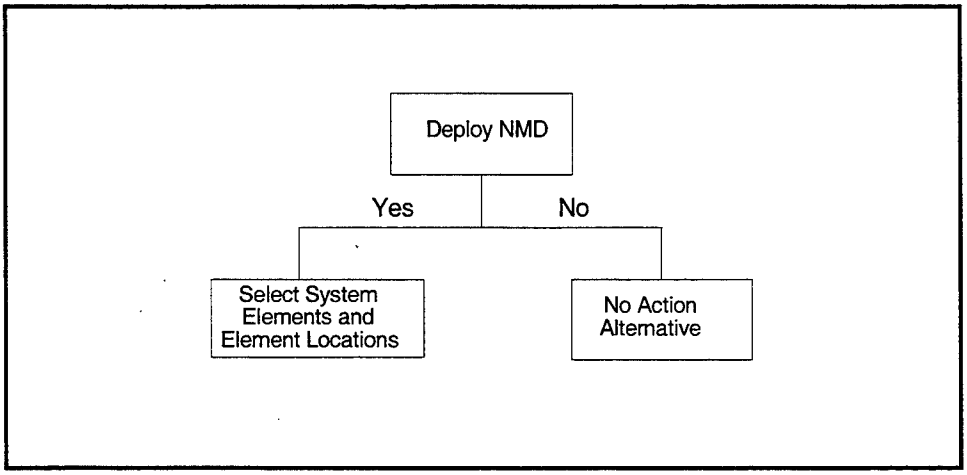


Figure 1.4-1: NMD Deployment Decision

Table 1.5-1: Cooperating Agencies

Cooperating Agency	NMD Element or Site	Purpose
Department of the Air Force	Space-Based Infrared System; X-Band Radars; Battle Management, Command, Control, and Communications	Element Development
	Defense Support Program Satellites; Upgraded Early Warning Radars	Existing Element
	Clear Air Force Station, Alaska	Potential NMD Deployment Site
	Eareckson Air Station, Alaska	Potential NMD Deployment Site
	Eielson Air Force Base, Alaska	Potential NMD Deployment Site
	Cavalier Air Force Station, North Dakota	Potential NMD Deployment Site
	Grand Forks Air Force Base, North Dakota	Potential NMD Deployment Site
Department of the Army	Ground-Based Interceptor; X-Band Radars; Battle Management, Command, Control, and Communications	Element Development
	Fort Greely, Alaska	Potential NMD Deployment Site
	Yukon Training Area, Alaska	Potential NMD Deployment Site
	Stanley R. Mickelsen Safeguard Complex, North Dakota	Potential NMD Deployment Site

1.6 SCOPE OF THIS ENVIRONMENTAL IMPACT STATEMENT

This EIS analyzes the potential impacts of deployment and operation of the land-based NMD system. Under the Proposed Action, potential sites for each NMD element are evaluated as deployment options to be considered by the decisionmaker. For the GBI, BMC2, and XBR elements, the EIS analyzes potential deployment sites in North Dakota and Alaska. The North Dakota sites fall within the deployment area under the 1972 Anti-Ballistic Missile Treaty. The Alaska sites fall within the geographic area that maximizes NMD system performance.

All of the sites analyzed in this EIS meet the siting criteria for the respective NMD elements. However, some sites may be determined to be preferable to others for operational, environmental, and other reasons. The Ballistic Missile Defense Organization has not identified preferred alternatives for siting the individual elements at this time. Mission conflicts have been identified at two sites, Cavalier Air Force Station (AFS) and the Yukon Training Area, making it less likely that either of these sites would be selected. However, if either of these sites is selected, then the mission conflict would be resolved at that time. All of the identified sites are fully analyzed in this EIS to ensure maximum flexibility in the decision process.

This EIS analyzes all of the candidate deployment locations for the proposed GBI, BMC2, XBR, and UEWRs that have been identified. The operational requirements for the IFICS Data Terminal are still being identified. As such, the specific locations where the IFICS Data Terminal could be deployed have not yet been determined. Regions under study include Alaska and North Dakota. In addition, as the operational requirements are refined, other regions may be identified. Since specific sites have not been identified, a general programmatic description of the types of impacts that could be expected from deployment is included within this EIS. Once specific candidate sites are identified, supplemental site-specific environmental analysis, as required, would be performed based on the initial analysis in this EIS. In addition, since not all sites and requirements have been finalized, the exact location of the fiber optic cable line to support the system is not known, but would be required around many of the NMD elements. Since the exact ground alignment of the fiber optic cable line has not been identified, a general programmatic description of the types of impacts that could be expected is provided in this EIS. Once the exact alignment is identified, supplemental site-specific analysis, as required, would be performed based on the initial analysis in this EIS.

Operational (wartime) launches from the GBI site are not evaluated in this EIS. Missiles would not be test launched from the GBI deployment site.

1.6.1 RELATED NMD ACTIONS

This NMD Deployment EIS is tiered from the *Ballistic Missile Defense Final Programmatic EIS* (Department of Defense, 1994). The Ballistic Missile Defense Organization Programmatic EIS examined environmental issues associated with broad research, development, and testing activities of the Ballistic Missile Defense Program, discussed the major highlights, and considered general classes of alternatives for the program. The Ballistic Missile Defense Program included Theater Missile Defense and NMD initiatives under the direction of the Ballistic Missile Defense Organization. The Programmatic EIS did not focus on project or site-specific environmental concerns. This NMD deployment EIS focuses on the site-specific environmental impacts from deployment and operation of an NMD system. Provided below are other actions related to NMD deployment.

Upgraded Early Warning Radars (UEWRs)

As part of the NMD system, there would be a requirement to upgrade the existing early warning radars at Clear AFS, Alaska, Beale Air Force Base (AFB), California, Cape Cod AFS, Massachusetts, and other potential locations to be determined. These early warning radars, also referred to as "PAVE PAWS," are phased-array surveillance radars and are currently used to detect, track, and provide early warning of sea-launched ballistic missiles. They are also used to track satellites and space debris. Hardware and software modifications are planned for these existing radars in conjunction with the NMD system. A detailed description of the proposed changes and potential environmental impacts was prepared as a Supplement to the NMD Deployment Draft EIS. The supplement was circulated for public and agency review. The analysis for the upgraded Early Warning Radar has been incorporated into this Final EIS as Appendix H—UEWR Analysis. The Air Force is in the process of preparing an EIS to address modernization, maintenance, and sustainment of operations of the Early Warning Radars.

One of the requirements of the NMD program is to protect the system from the high altitude electromagnetic pulse that could occur during a nuclear blast and cause components of the system to fail. All new components of the system would be built with high altitude electromagnetic pulse protection; however, some of the existing early warning system is not protected. The exact requirements for upgrading the existing system have not been developed but could include shielding the radar equipment, modernizing power plants and internal electronic components at the existing UEWR sites, and possible upgrading of some fiber optic cable terminals. It is likely that power plant

modernization would include replacing the existing facility with a more efficient, cleaner burning power plant. Once specific details of the modifications are defined, separate site-specific analysis, as required, would be performed.

Space-Based Infrared System (SBIRS) Satellites

SBIRS is currently being developed by the Air Force independently of the NMD program as part of the early warning satellite system upgrade, which would replace the Defense Support Program satellites. Since SBIRS would be deployed independently of an NMD decision, a detailed description and analysis of impacts was evaluated by the Air Force in the *Overview Environmental Assessment for the Space Based Infrared System (SBIRS)* (Department of the Air Force, 1996). It was concluded in the Finding of No Significant Impact that no significant impacts would occur from the SBIRS program. This action is, therefore, not analyzed in detail in this EIS.

NMD Ground-Based Interceptor (GBI) Integration

Initial integration of the GBI is occurring at Redstone Arsenal, Huntsville, Alabama as part of the developmental flight test program. This program involves modification to facilities at Redstone Arsenal and the integration of GBI components before proposed flight test activities at Vandenberg AFB, California, and U.S. Army Kwajalein Atoll, Republic of the Marshall Islands. The modification of facilities and assembly of the GBI at Redstone Arsenal was addressed in the *Environmental Assessment for the Integration, Assembly, Test, and Checkout of National Missile Defense Components at Redstone Arsenal, Alabama* (U.S. Army Space and Missile Defense Command, 1999). This Environmental Assessment (EA), which resulted in a Finding of No Significant Impact, also addressed long-term integration of the GBI for potential deployment of the NMD system and concluded that there would be no significant impacts from these activities at the integration facility on Redstone Arsenal; therefore, long-term integration of the GBI is not analyzed in detail in this EIS.

NMD Ground-Based Interceptor (GBI) Test Program

Developmental flight testing of the GBI is proposed to occur at Vandenberg AFB, California, and at U.S. Army Kwajalein Atoll, Republic of the Marshall Islands, before deployment of the NMD system. Booster verification tests at Vandenberg AFB were addressed in the *Environmental Assessment for Booster Verification Test at Vandenberg AFB, California* (Ballistic Missile Defense Organization, 1999). Booster verification tests and subsequent integration flight tests at Kwajalein Atoll were addressed in the *Record of Environmental Consideration for Infrastructure Modernization and Test Facilities Construction in Support*

of NMD GBI Booster Verification/Integrated Flight Test at Meck Island, U.S. Army Kwajalein Atoll, Republic of the Marshall Islands (U.S. Army Space and Missile Defense Command, 1999). This Record of Environmental Consideration also addressed long-term reliability testing of the GBI. Reliability testing consists of selectively removing an operational GBI from the deployment site and launching it from Kwajalein Atoll to ensure operational effectiveness of the system. Both the EA Finding of No Significant Impact and the Record of Environmental Consideration concluded that there would be no significant impacts from developmental testing at either Vandenberg AFB or Kwajalein Atoll or long-term reliability testing at Kwajalein Atoll; therefore, developmental testing and long-term reliability testing of the GBI are not analyzed in detail in this EIS.

In addition to the testing program discussed above, a launch cell simulator was required to conduct simulations and testing of the various components of the GBI element before flight testing. This launch cell simulator was located adjacent to Boeing's NMD Ground-Based Interceptor Development and Integration Laboratory facility, Huntsville, Alabama. The potential environmental impacts of the construction and operation of this facility were addressed in the *Environmental Assessment for Additional Facilities at the National Missile Defense Ground-Based Interceptor Development and Integration Laboratory, Huntsville, Alabama* (U.S. Army Space and Missile Defense Command, 1999). This EA and associated Finding of No Significant Impact concluded that there would be no significant impacts from these activities.

Dismantlement/Destruction of Stanley R. Mickelsen Safeguard Complex

Dismantlement or Destruction of the existing anti-ballistic missile system at the U.S. Army's Stanley R. Mickelsen Safeguard Complex (SRMSC) in North Dakota may be required in connection with a potential NMD deployment. In addition, the U.S. Army could decide to demolish some or all of these facilities (radars, launchers, and ancillary tactical facilities) in advance of, or for reasons unrelated to, an NMD deployment decision. The U.S. Army is currently preparing an EA in support of these contingencies; therefore, SRMSC Dismantlement or Destruction is not included within this EIS.

Production and Integration of the NMD System

As part of the deployment process, some of the NMD elements such as the GBI would require production and integration before deployment. Because a decision has not been made to deploy the NMD system, the location and requirements of the production and integration facilities have not been finalized. The production and integration facilities would make use of either existing or new buildings on government installations

or commercial property. The types of activities that would occur would be similar to any manufacturing type operation and would comply with Federal, state, and local environmental regulations. Once the requirements and locations of these facilities are finalized, the appropriate environmental documentation would be prepared.

1.6.2 RELATED ENVIRONMENTAL DOCUMENTATION

A number of other EISs and EAs were prepared previously to support the development of specific technologies that may be used as part of the NMD system. The information and analysis from these NEPA documents were used in the development of this EIS and are referenced in the appropriate sections. Chapter 7 provides a list of reference material cited in this EIS.

1.6.3 IMPACT ANALYSIS

Consistent with Council on Environmental Quality regulations, the scope of the analysis presented in this EIS was defined by the range of potential environmental impacts that would result from implementation of either the Proposed Action or the No-action Alternative (not deploying the NMD system). Resources that have a potential for impacts were considered in the EIS analysis so the decisionmakers will have sufficient evidence and analysis for evaluation of the potential effects of the NMD deployment alternatives. For this EIS, the environment is discussed in terms of 15 resource areas (see section 3.0). Each resource area is discussed in detail as required to address the potential for impacts at each location.

1.7 PUBLIC PARTICIPATION

1.7.1 SCOPING PROCESS

The Notice of Intent (appendix B) to prepare an EIS for the deployment of the NMD program was published in the *Federal Register* on November 17, 1998. Notification of public scoping was also made through the local media as well as through letters to Federal, state, and local agencies and officials, and interested groups and individuals.

Seven public scoping meetings were held from December 1–16, 1998. Table 1.7-1 lists the locations, dates, and number of attendees at the meetings.

Table 1.7-1: Scoping Meeting Locations, Dates, and Times

Meeting Location	Date	Times	Public Attendees (sign-ins)
Langdon, North Dakota	12/1/1998	5:00-8:00 p.m.	235
Grand Forks, North Dakota	12/2/1998	5:00-8:00 p.m.	70
Fairbanks, Alaska	12/7/1998	5:00-8:00 p.m.	94
Anderson, Alaska	12/8/1998	5:00-8:00 p.m.	59
Delta Junction, Alaska	12/9/1998	5:00-8:00 p.m.	102
Anchorage, Alaska	12/10/1998	5:00-8:00 p.m.	74
Arlington, Virginia	12/16/1998	3:00-8:00 p.m.	23

1.7.2 SCOPING ISSUES, QUESTIONS, AND CONCERNS

Public issues and concerns regarding the environment collected during the scoping process that helped determine the scope of this EIS involved the following areas:

- Airspace restrictions from XBR operation
- Construction and operation impacts on vegetation, wildlife, threatened and endangered species, wetlands, and fisheries
- Potential safety risks to the public from the transportation and operation of the GBI
- Electromagnetic radiation impacts to wildlife and the public
- Socioeconomic impacts and benefits from NMD deployment
- Construction and operation impacts on local water quality
- Increases in hazardous waste generation
- Increases in restricted public use around NMD deployment sites

1.7.3 DRAFT EIS PUBLIC REVIEW COMMENTS AND RESPONSES

The NMD Deployment Draft EIS public review and comment period began on October 1, 1999 with publication of the Notice of Availability in the *Federal Register*. This initiated a review period during which the public and interested agencies or organizations had the opportunity to review the Draft EIS and submit their comments. Copies of the Draft EIS were made available for review in local libraries in the areas affected and provided to those who requested copies (appendix C). Comments to the Draft EIS were considered in the preparation of the Final EIS. Chapter 9 of this EIS contains a reproduction of all comments and responses to those comments.

In addition to the Draft EIS review process, seven public hearings were held from October 26 through November 9, 1999. Chapter 9 of this EIS contains a reproduction of the transcripts of the public hearings and responses to comments. Table 1.7-2 lists the locations, dates, and number of attendees at the hearings.

Table 1.7-2: Public Hearing Locations, Dates, and Times

Meeting Location	Date	Times	Public Attendees (sign-ins)
Langdon, North Dakota	10/26/1999	6:00-8:00 p.m.	156
Grand Forks, North Dakota	10/27/1999	6:00-8:00 p.m.	39
Fairbanks, Alaska	11/1/1999	6:00-9:00 p.m.	128
Anderson, Alaska	11/2/1999	7:00-9:00 p.m.	61
Delta Junction, Alaska	11/3/1999	6:00-8:00 p.m.	200
Anchorage, Alaska	11/4/1999	6:00-8:00 p.m.	71
Arlington, Virginia	11/9/1999	6:00-8:00 p.m.	24

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2.0 Alternatives Including the Proposed Action

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

The decision to be supported by this NMD EIS is whether to deploy a land-based NMD system, to include a selection of sites from among the alternatives studied in this EIS. Information related to these decisions is described in this chapter under the NMD deployment concept, the No-action Alternative, and the NMD element deployment alternative site locations.

The Preferred Alternative would be deployment of an NMD system at one GBI site with up to 100 silos. If this alternative is selected, the preferred site location for the GBI and BMC2 would be Fort Greely, Alaska. Under this configuration, the XBR would be at Eareckson Air Station (AS) (Shemya Island), Alaska. Under the Preferred Alternative, the NMD system would make use of the existing Early Warning Radars upgraded for NMD and the existing satellite detection systems that would be in place at the time of deployment. Since the IFICS Data Terminals locations have not been identified, no preferred location has been selected. Table 2-1 provides an overview of the site locations for the Preferred Alternative analyzed in this EIS.

Table 2-1: NMD Deployment Preferred Alternative

GBI	BMC2	IFICS Data Terminal	XBR	UEWR	Space-Based Detection System
Preferred Alternative—1 GBI Site with up to 100 Silos					
Fort Greely, Alaska	Fort Greely, Alaska	Not Identified	Eareckson AS, Alaska	Beale AFB, California Cape Cod AFS, Massachusetts Clear AFS, Alaska	Defense Support Program/Space-Based Infrared System Satellites

2.1 NMD OBJECTIVES

The primary mission is defense of the United States against a limited strategic ballistic missile attack. The means to accomplish the NMD mission are as follows:

- Deploy an NMD system that meets the ballistic missile threat at the time of a deployment decision
- Detect and track the launch of enemy ballistic missiles

- Continue tracking of ballistic missiles using ground-based radars
- Engage and destroy the ballistic missile warhead by force of impact above the earth's atmosphere

2.2 NMD DEPLOYMENT CONCEPT

This section provides a general description of the NMD deployment concept, the primary and secondary support elements required for operation, personnel requirements, and operational activities for each element.

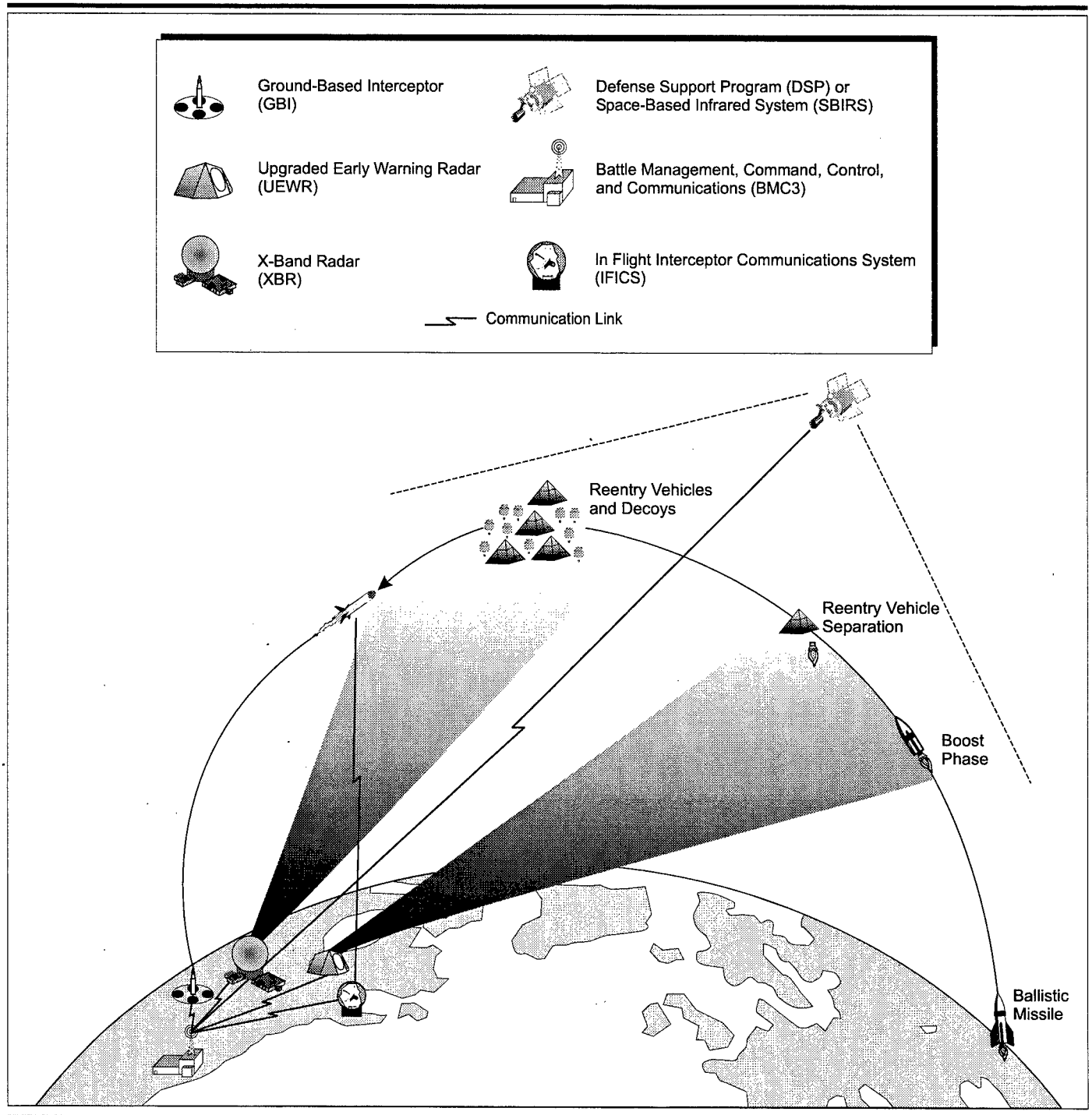
The NMD system would consist of five elements: GBIs; BMC3, which includes the BMC2, communication lines, and IFICS Data Terminal as subelements; XBRs; UEWR; and a satellite detection system (Defense Support Program satellites/SBIRS). All elements would work together to respond to a ballistic missile attack directed against the United States (figure 2.2-1). The NMD system would require deployment of the GBI, BMC2, IFICS Data Terminal, and fiber optic cable line. The NMD system would use the existing operational space-based detection system and UEWRs (table 2.2-1).

Table 2.2-1: NMD Deployment Element Requirements

NMD Element	NMD Element Requirement
Ground-Based Interceptor	1 site with up to 100 silos in Alaska or North Dakota; or 1 site with up to 100 silos in Alaska and 1 site with up to 100 silos in North Dakota
Battle Management, Command and Control	1 site with Ground-Based Interceptor
In-Flight Interceptor Communications System Data Terminal	Approximately 14 sites
X-Band Radar	1 site
Upgraded Early Warning Radar	Up to 5 sites using existing systems
Defense Support Program/Space-Based Infrared System	Space-based detection system

2.2.1 GROUND-BASED INTERCEPTORS

The GBI is the "weapon" of the NMD system. Its mission is to intercept incoming ballistic missile warheads outside the earth's atmosphere (exoatmospheric) and destroy them by force of the impact. No explosives or nuclear warheads would be used. During flight, the GBI is sent information from the NMD BMC2 to update the location of the incoming ballistic missile, enabling the GBI onboard sensor system to



EXPLANATION

Land

Water

Note: Locations in this figure are for illustrative purposes only and are notional.

The NMD Concept of Operations

Figure 2.2-1

identify and home-in on the target. The GBI element would include the interceptor and associated launch and support equipment, silos, facilities, and personnel. The GBI missile has two main components: an exoatmospheric kill vehicle and a solid propellant booster.

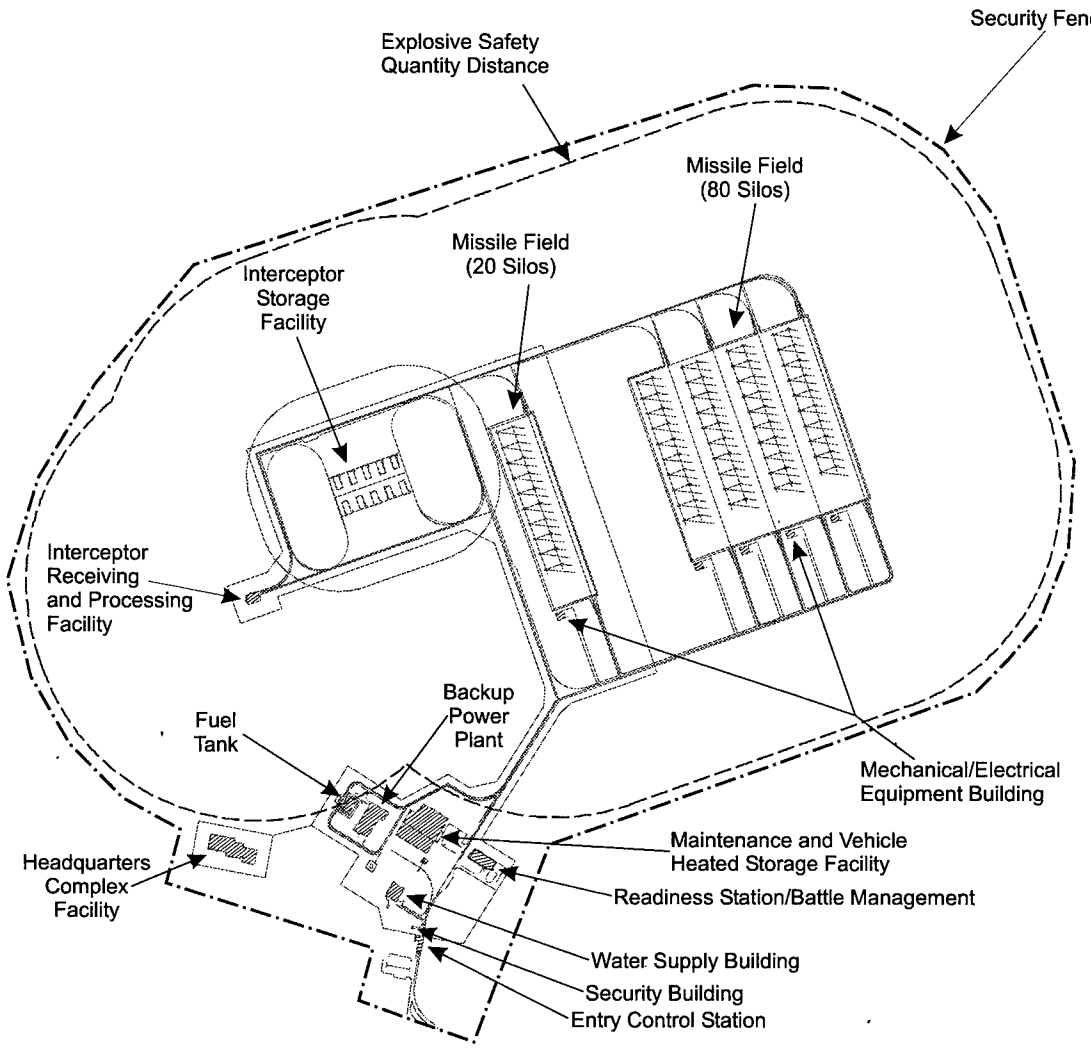
2.2.1.1 Ground-Based Interceptor Facility Design

Under the Proposed Action, up to 100 silos would be constructed at the GBI deployment site in either Alaska or North Dakota or up to 100 silos at one site in Alaska and up to 100 silos at one site in North Dakota. The GBI site would contain launch stations (silos), an Interceptor Receiving and Processing Facility, an Interceptor Storage Facility, and additional support facilities. Figure 2.2.1-1 and table 2.2.1-1 provide an overview of the GBI facilities. Because final designs of the GBI have not yet been completed, the final deployment facility requirements may change.

2.2.1.2 Operational Concept

The interceptor would remain in the underground launch silo until launch (figure 2.2.1-2). Launches would occur only in defense of the United States from a ballistic missile attack. There would be no flight testing of the missiles at the NMD deployment site. The GBI would be contained within a canister before shipment to the deployment site. The technical status of each missile would be monitored and required maintenance conducted onsite and/or at the contractor's offsite integration facility. Interceptors within the sealed canister in storage would be used to replace missiles requiring repair or selectively removed for reliability testing. Reliability testing would consist of removing the missile and inspecting for readiness. When the GBI site becomes fully operational, the total site-related employment would be 250 to 360 direct jobs. These jobs would consist of military and contractor support maintenance personnel. Operations at the GBI site would consist of maintenance of facilities, equipment, and missiles to ensure operational readiness of the system.

The GBI would consist of a multi-stage solid propellant booster and a non-nuclear exoatmospheric kill vehicle that would destroy an incoming warhead by force of impact. Each interceptor missile would contain between 12,700 and 19,278 kilograms (28,000 and 42,500 pounds) of class 1.1 or 1.3 propellant. The liquid propellants in the exoatmospheric kill vehicle, used for kill vehicle control, are expected to weigh approximately 9 to 14 kilograms (20 to 30 pounds). These liquid propellants would consist of monomethylhydrazine and nitrogen tetroxide. No storage or fueling of the liquid propellant would occur at the deployment site.



EXPLANATION

— — Explosive Safety Quantity Distance

—·— Security Fence

Ground-Based Interceptor, Conceptual Facility Layout

NORTH

Scale

0 656 1,312 Feet

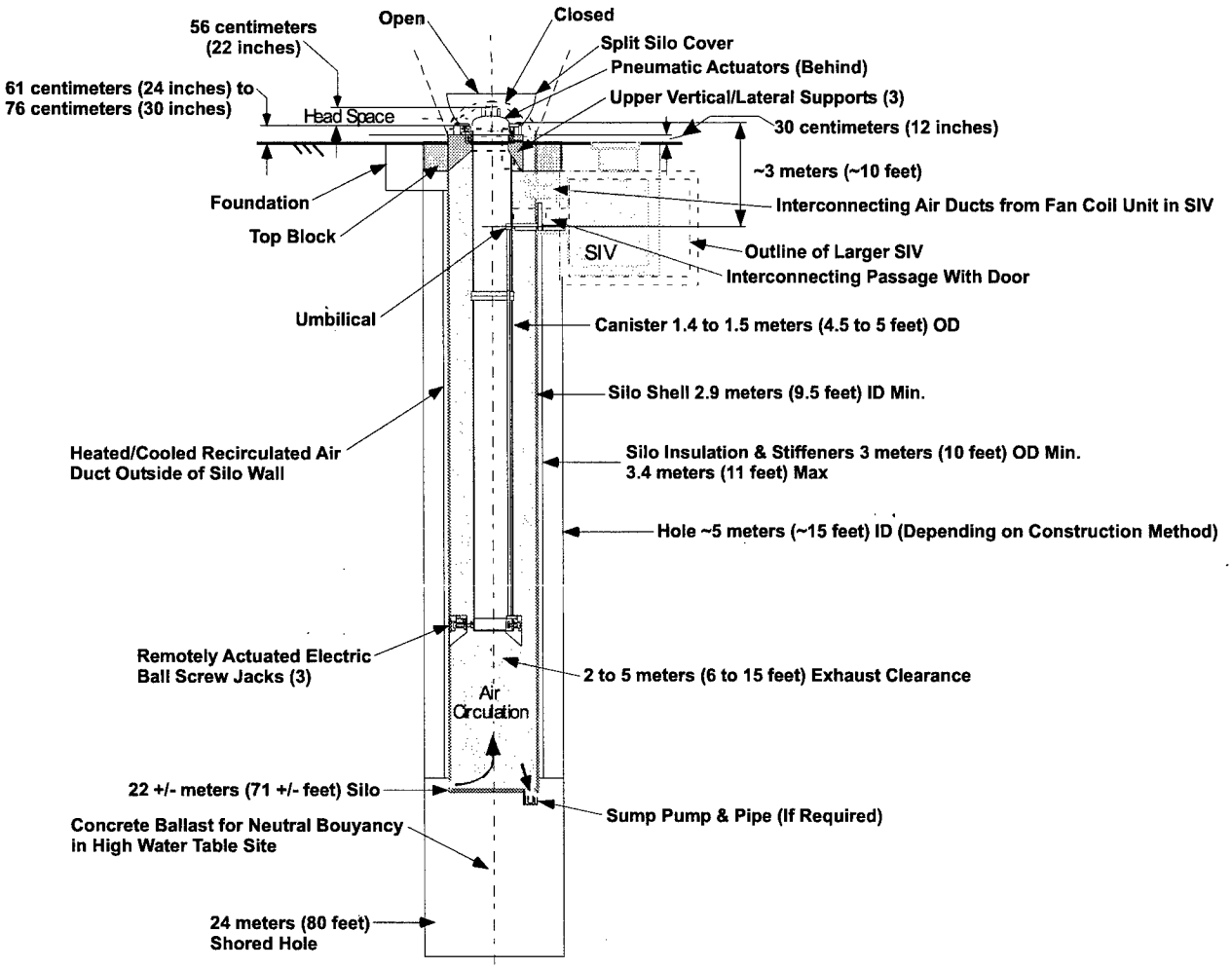
0 200 400 Meters

Figure 2.2.1-1

Table 2.2.1-1: Ground-Based Interceptor Facility Requirements

Facility	Facility Requirements[1]	Facility Activities
Missile Field	100 silos with interface vault; silos would be up to 479 meters (1,570 feet) from inhabited buildings and up to 171 meters (560 feet) from any other interceptor support facility	Ground-Based Interceptor launch area
Interceptor Receiving and Processing Facility	1,003 square meters (10,800 square feet); would be up to 479-meter (1,570-foot) explosive safety zone to inhabited facilities; up to 171-meter (560-foot) safety zone to storage facilities and silos	Missile receiving and checkout area; liquid propellant fuel leak handling area
Interceptor Storage Facilities	10 structures, 2,787 square meters (30,000 square feet) total; would be up to 479-meter (1,570-foot) explosive safety zone to inhabited facilities; up to 171-meter (560-foot) safety zone to storage facilities and silos	Provide storage for Ground-Based Interceptor in canister for extended periods
Readiness Station	2,323 square meters (25,000 square feet)	Operational center for Ground-Based Interceptor complex
Security Building	1,161 square meters (12,500 square feet)	Site security
Administration and Maintenance Facility	4,970 square meters (53,500 square feet)	Houses Ground-Based Interceptor maintenance and support functions
Mechanical/Electric Equipment Building	5 structures at 1,115 square meters (12,000 square feet) each	Maintenance facility
Entry Control Station	279 square meters (3,000 square feet)	Security entry point
Power Facility	4,180 square meters (45,000 square-feet)	Provides site electrical power
Headquarters Facility	1,486 square meters (16,000 square feet)	Site administration
Fuel Unloading Facility	46 square meters (500 square feet)	Fuel unloading
Water Supply Building	1,022 square meters (11,000 square feet)	Provides site water supply

[1] Facility size is approximate.



EXPLANATION

OD = Outside Diameter
ID = Inside Diameter
SIV = Silo Interface Vault

Ground-Based Interceptor Silo, Conceptual Layout

Not to Scale

Figure 2.2.1-2

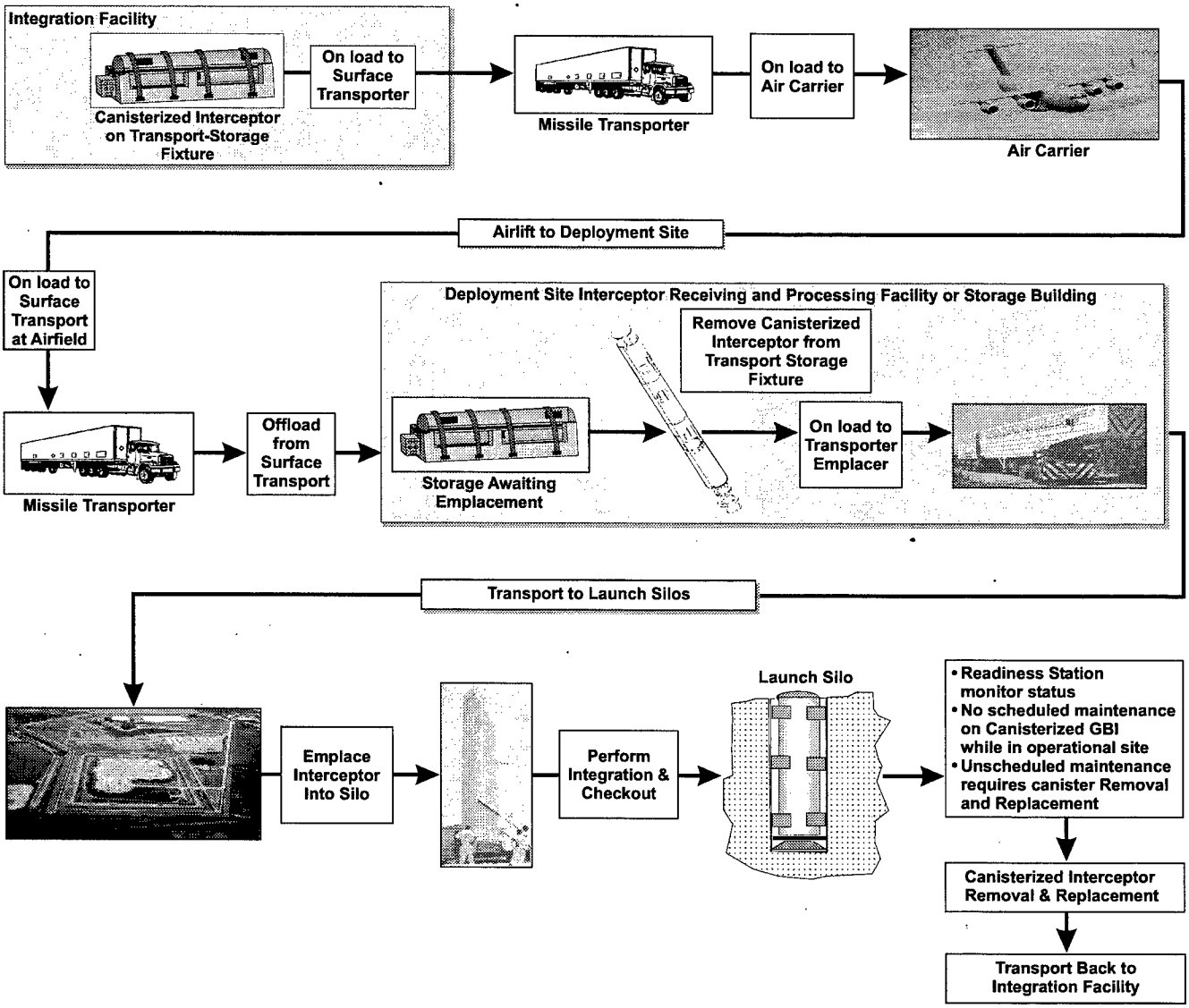
The entire GBI (solid propellant boosters and fueled exoatmospheric kill vehicle) would be integrated and loaded, ready for use, into a canister at the integration facility before shipment to the deployment site. This canister is a proven approach being used on the Trident and Peacekeeper programs. The canister would be shipped to the site in a specially designed container/transporter using commercial carriers or government transportation. The mode of transportation would be by aircraft, truck, or both, depending on the site selected. After the initial deployment flights of 50 for the 100 canisters, approximately 20 airlift operations (10 flights to deployment base and 10 return flights) could be expected per year as part of routine maintenance. A monitoring system would be installed on the canisters to provide timely and accurate notification on leakage. All shipping would be conducted in accordance with U.S. Department of Transportation regulations.

Once at the deployment site, the canister and GBI would be inspected at the Interceptor Receiving and Processing Facility for potential damage that may have occurred during shipment. Once the GBI is verified as operational within the canister, it will be transported to the silos using a transporter emplacer. Using the same procedures employed in Minuteman missile removal and emplacement, the canisterized interceptor would be inserted into and removed from the silo using the transporter emplacer. Figure 2.2.1-3 provides an overview of the transportation and deployment operations for the GBI. During operations, up to 10 canisterized interceptors would be stored in the Interceptor Storage Facilities for use as replacements. At all times there would be a system monitoring the liquid propellants on the GBI for potential leaks. Any leaks detected would be remediated quickly.

The GBI would depend on existing site infrastructure support if available, at the location selected. Once deployed, the GBI system would be essentially a dormant system. The GBI would use minimum dedicated utilities for environmental control of the silos, GBI storage, and activities associated with readiness. Power to the site would be by a combination of DOD and commercial offsite power facilities. Emergency power would be supplied by a backup battery system and onsite backup generators.

Hazardous Materials and Hazardous Waste/Wastewater Discharge

Hazardous materials that may be associated with the GBI site activation and deployment activities include protective coatings, lubricants and oils, motor and generator fuels, cleaning agents (isopropyl alcohol), backup power batteries, adhesives, and sealants. These materials would be used in periodic inspection and preventative maintenance to interceptor support systems, such as power supplies, environmental control systems communication systems, and security systems. If maintenance is required on the GBI itself, it would be returned to the manufacturer.



EXPLANATION
GBI = Ground-Based Interceptor

Ground-Based Interceptor Deployment Concept

Figure 2.2.1-3

Monomethylhydrazine and nitrogen tetroxide liquid propellants would be used in the GBI exoatmospheric kill vehicle. These materials would be contained within the kill vehicle and would not be released at the deployment site except in the unlikely event that a system leak occurred. A fully trained hazardous materials response team would be onsite to respond to such an event.

Water discharge would be associated with storm water runoff from the impervious surfaces built as part of the GBI site. Storm water runoff and wastewater discharge would be evaluated and appropriate treatment systems installed as required in accordance with local, state, and Federal requirements.

Safety Systems

Specific safety plans would be developed to ensure that each operation is in compliance with applicable regulations. Overall safety measures would be developed by the facility user to ensure the general public and site personnel would be provided an acceptable level of safety. Provided below are the main safety requirements that would be in place for the GBI site.

Fire Protection System. Fire protection, alarm, and fire suppression systems would be provided to all GBI facilities as appropriate.

Security. Security requirements are an integral component of program safety. Security measures would be incorporated within the project design and operational procedures. Elements of site security would include a perimeter security fence, clear zone, security lighting, security standby power, intrusion detection system, and security patrol roads. The security fence would be approximately 3 meters (10 feet) high. The clear zone on the inner side of the fence would contain remotely operated lights and cameras. On either side of the security fence, the surrounding vegetation would be cleared up to 46 meters (150 feet).

Quantity-Distance Criteria. Explosive Safety Quantity-Distance (ESQD) criteria are used to establish safe distances from explosive hazard areas to nonrelated facilities and roadways. These criteria are established by the DOD. For analysis purposes for this EIS, the ESQD for the GBI silos, the Interceptor Receiving, and Processing Facility and Interceptor Storage Facility was based on a 479-meter (1,570-foot) ESQD from inhabited buildings (see figure 2.2.1-1). However, once the GBI design testing is complete, the required ESQD in accordance with DOD criteria may be less than the 479-meter (1,570 foot) distance.

Launch Safety. To ensure an accidental launch of a GBI does not occur, the system would have a human in control at all times in addition to software and hardware safety systems. Additionally, stringent DOD

operating procedures, which prevent launch by any one person, would be followed.

2.2.2 BATTLE MANAGEMENT, COMMAND AND CONTROL

The BMC2, a subelement of the BMC3, is the "brains" of the NMD system. It supplies the means to plan, select, and adjust missions and courses of action. In the event of a launch against the United States, the NMD system would be controlled through the BMC2. The BMC2 subelement provides the extensive decision support systems, battle management displays, and situation awareness information. Surveillance satellites and ground radars locate targets and communicate tracking information to battle managers, who process the information and communicate target assignments to interceptors.

2.2.2.1 Battle Management, Command and Control Facility Design

The site location BMC2 subelement would be located with the GBI element. The primary facilities required for the BMC2 would occupy approximately 743 square meters (8,000 square feet) and would require electrical power from the base or the GBI site.

2.2.2.2 Operational Concept

The BMC2 operations would consist mostly of battle management functions associated with the NMD system and would act as the centralized point for readiness, monitoring, and maintenance. BMC2 provides the user system status displays, threat displays, predictive planning displays, and weapons control data to support NMD command and control decisionmaking and execution of these commands at the site level.

The Command-Level BMC2 site would be integrated into the Cheyenne Mountain Operations Center with connectivity to other BMC2 sites at one or more Service Component Centers (e.g., Air Force, Army, and Navy) and one site location deployed near the NMD main support base. BMC2 sites are planned to be operational 24 hours a day, and each node would require a total of approximately 30 personnel.

Hazardous Materials and Hazardous Waste/Wastewater Discharge

The primary facilities associated with BMC2 would be administrative in nature and would not use or generate any hazardous materials or waste except that associated with the operation of the electrical generator and backup batteries.

2.2.3 IN-FLIGHT INTERCEPTOR COMMUNICATIONS SYSTEM

The IFICS Data Terminal is a subelement of the BMC3 element and would be geographically distributed ground stations that provide communications links between the in-flight GBI and the BMC2.

Approximately 14 individual IFICS Data Terminal sites would be required to support the NMD system. Two IFICS Data Terminals are required per region to meet NMD reliability requirements. Four or more IFICS Data Terminals could be located at the GBI site to meet reliability and communication requirements. The location of the IFICS Data Terminal is based upon analysis of the regions from which a hostile ballistic missile could be launched against the United States.

2.2.3.1 In-Flight Interceptor Communications System Facility Data Terminal Design

An IFICS Data Terminal would be approximately 7 meters (20 feet) tall and would consist of a radio transmitter/receiver enclosed in an inflatable radome adjacent to the equipment shelters. The facilities required for an IFICS Data Terminal site are provided in figure 2.2.3-1 and table 2.2.3-1. An IFICS Data Terminal facility would require an area of 2 hectares (6 acres) or up to 7 hectares (17 acres) if two terminals are required at one site. Because final design of the IFICS Data Terminal has not yet been completed, the final deployment facility requirements may change.

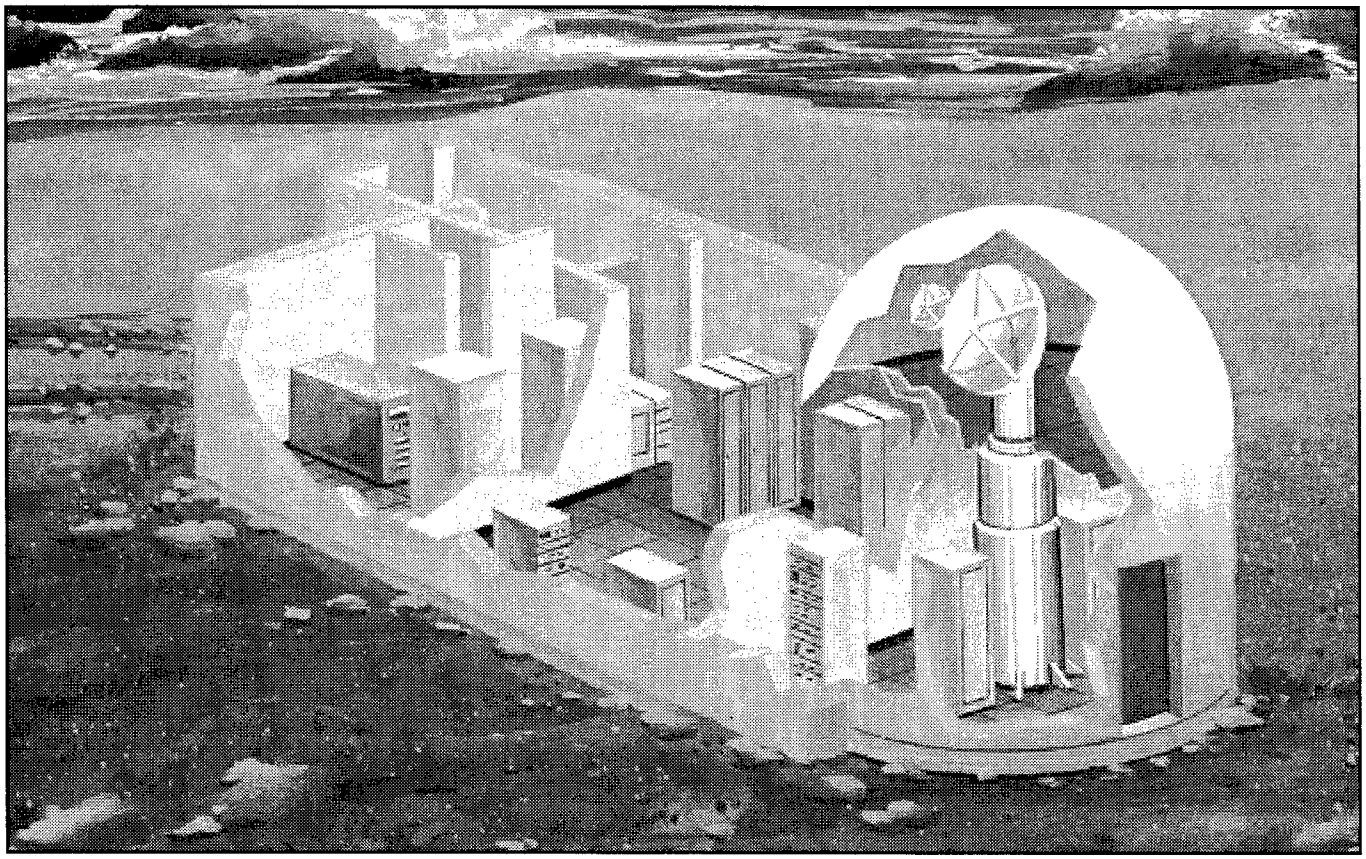
Table 2.2.3–1: In-Flight Interceptor Communications System Facility Requirements

Facility	Facility Requirements[1]	Facility Activities
IFICS Data Terminal Building	7-meter (20-foot) tall structure, total 186 square meters (2,000 square feet). Includes radome, equipment room, mechanical room with one 175-kilovolt generator with fuel tank.	Transmitter/receiver to in-flight Ground-Based Interceptors. Electronic equipment, provide backup electrical power, heating, and air conditioning
Vestibule	9 square meters (100 square feet)	Entry, restrooms
Perimeter Security and Surveillance	2.4-meter (8-foot) security fence with intrusion detection system	Provides site security

[1] Facility size is approximate.

2.2.3.2 Operational Concept

The IFICS Data Terminal is a radio transmitter that would not transmit except when a GBI would be launched to intercept an incoming ballistic missile warhead. Power to an IFICS Data Terminal site would be by commercial offsite power with emergency power being supplied by a backup battery system and onsite backup electrical generators; however,



In-Flight Interceptor Communications System, Conceptual Facility Layout

Figure 2.2.3-1

if required for remote sites without commercial power, the onsite electrical generators would operate full-time.

Hazardous Materials and Hazardous Waste/Wastewater Discharge

Other than the diesel fuel and occasional maintenance of the diesel powered electrical generator and associated backup batteries, no hazardous materials or waste would be stored or generated onsite. One piece of equipment used on the system consists of a klystron tube, which contains small amounts of beryllium. If maintenance is required, a new tube would be brought onsite and the replaced tube sent back to the manufacturer for repair. Depending on the site selected for deployment, either portable toilets or a sanitary discharge system may be required.

Safety Systems

Specific safety plans would be developed to ensure that each operation is in compliance with applicable regulations. Overall safety measures would be developed by the facility user to ensure the general public and temporary site maintenance personnel would be provided an acceptable level of safety.

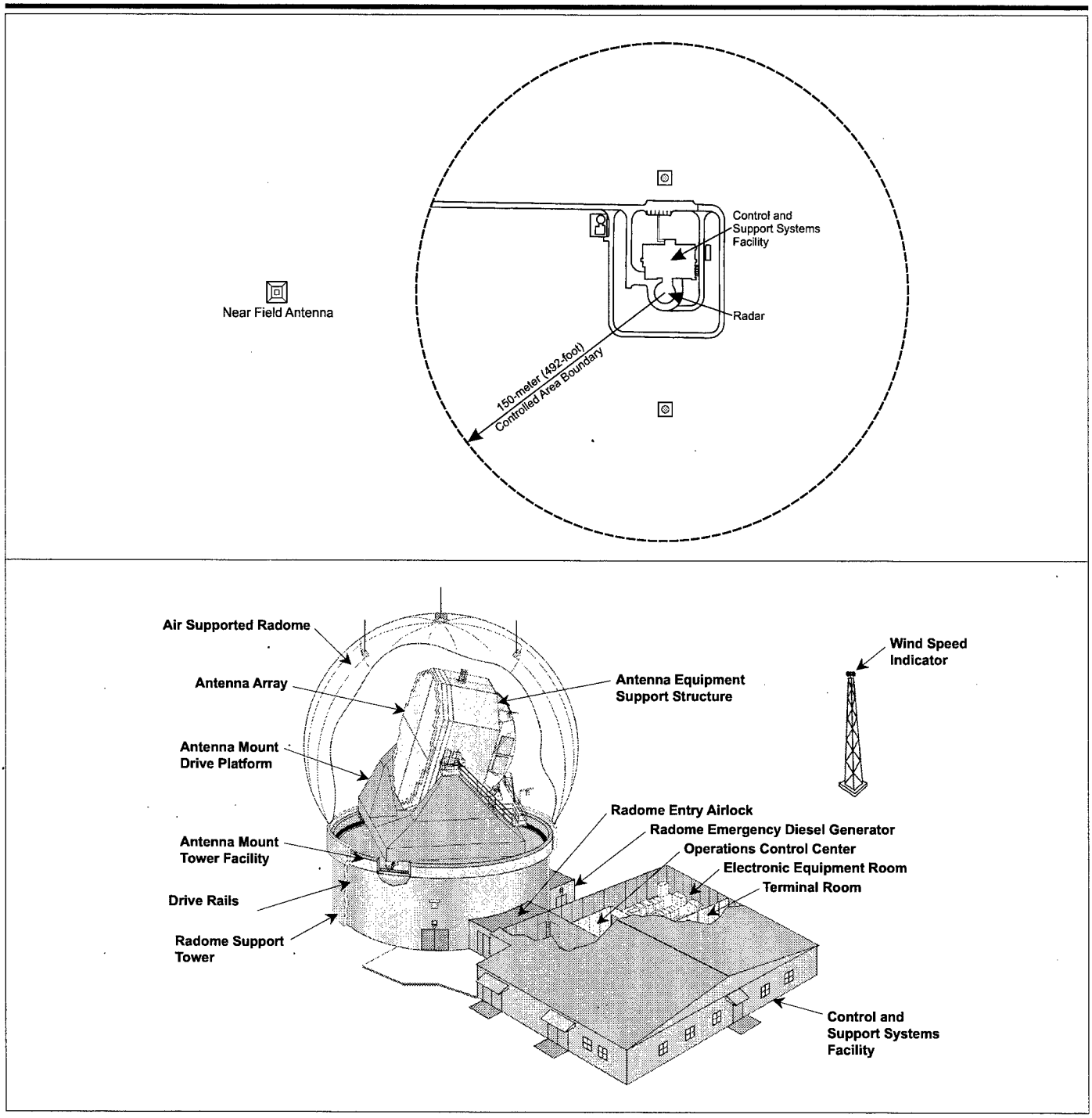
Security. Security requirements are an integral component of project safety. Elements of site security would include a perimeter security fence, clear zone, security lighting, security standby power, intrusion detection system, and security patrol roads. The security fence would be approximately 2.4 meters (8 feet) high. On either side of the security fence, the surrounding vegetation would be cleared to 15 meters (50 feet). Additional vegetation clearance may be required depending on line-of-sight requirements at each site.

2.2.4 X-BAND RADARS

The XBRs would be ground-based, multi-function radars. For NMD, they would perform tracking, discrimination, and kill assessments of incoming ballistic missile warheads. XBRs use high frequency and advanced radar signal processing technology to improve target resolution, which permits the radar to discriminate against threats. The XBR would provide data from earlier phases of an intercontinental ballistic missile's trajectory and real-time in-flight tracking data to the BMC2.

2.2.4.1 X-Band Radar Facility Design

The XBR site would include a radar on an antenna mount inner tower facility and associated support facilities, and a 150-meter (492-foot) controlled area boundary. These requirements would encompass an area of approximately 7 hectares (17 acres). The primary facilities required for the XBR site are provided in table 2.2.4-1 and figure 2.2.4-1.



EXPLANATION

Wind Speed Indicator

150-meter (492-foot) Controlled Area Boundary

X-Band Radar, Conceptual Facility Layout

Scale

0 148 296 Feet

0 46 91 Meters

Figure 2.2.4-1

Because final design of the XBR has not yet been completed, the final deployment facility requirements may change.

Table 2.2.4–1: X-Band Radar Facility Requirements

Facility	Facility Requirements[1]	Facility Activities
Radar	27-meter (90-foot) diameter antenna mount track tower; a 34-meter (110-foot) base diameter radome	Radar operations
Control and Support System Facility	5,574 square meters (60,000 square feet)	Provides operational control of radar and security
Near Field Antenna	18 meters (60 feet) tall; 4 to 5 meters (14 to 18 feet) square	Support radar test and calibration
Wind Speed Indicator Towers	Two 24-meter (80-foot) towers; 0.3-meter (1-foot) diameter; guy wires	Windspeed indicators for radome pressurization system

[1] Facility size is approximate.

2.2.4.2 Operational Concept

The XBR would be radiating during a ballistic missile threat, testing, exercises, training, or when supporting collateral missions such as tracking space debris or a Space Shuttle mission. When the XBR site becomes fully operational, the total site-related employment would be approximately 70 direct jobs (30 military and 40 contractors) depending on the site selected. Power to the site would be by commercial offsite power plants, if available, with emergency power being supplied by onsite backup electrical generators. If local and emergency power are not available, then onsite generators would be required for primary power. To maintain radar operating temperature, approximately 26,498 liters (7,000 gallons) of cooling water would be required. This cooling water would be in a closed looped system and consist of a 50/50 mixture of antifreeze (propylene glycol or ethylene glycol) and water, which would be replaced as required.

The XBR transmit/receive radiation pattern would be a narrow beam with most of the energy being contained within the main beam. Lesser amounts of energy could be emitted in the form of grating or side lobes in the area around the main beam. Each main beam would consist of a series of electromagnetic pulses. The main beam would be able to operate in 360 degrees. At no time would the beam be directed toward the ground.

Hazardous Materials and Hazardous Waste/Wastewater Discharge

Hazardous materials that may be expected to be associated with the XBR site activation and deployment activities include paints, lubricants and

oils, solvents, ethylene or propylene glycol, and fuel/backup batteries associated with power generation. Storm water runoff and wastewater discharge would be evaluated and appropriate treatment systems installed as required in accordance with local, state, and Federal requirements.

Safety Systems

Specific safety plans would be developed to ensure that each operation is in compliance with applicable regulations. Overall safety regulations would be developed by the facility user to ensure the general public and site personnel would be provided the required level of safety. The main safety requirements for the XBR site are provided below.

Fire Protection System. Fire protection, alarm, and fire suppression systems would be provided to the entire XBR complex.

Security. Security requirements are an integral component of project safety. Security measures would be incorporated within the project design and operational procedures. Elements of site security would include a perimeter security fence, clear zone, security lighting, security standby power, intrusion detection system, and security patrol roads. On either side of the security fence, the surrounding vegetation would be cleared up to 46 meters (150 feet).

Electromagnetic Radiation Safety Distances. Electromagnetic radiation (EMR) safety zone distance considerations are driven by concern for personnel, equipment, and environmental exposure to EMR. Positive actions would be taken in the operation of the XBR to ensure exposure levels are in accordance with safety guidelines. These controls would consist of the following:

- Ground level exposure to the main beam EMR would be eliminated by establishing a minimum beam elevation. This would eliminate hazardous EMR at ground level.
- Computer software programs would be used to ensure power densities would be in accordance with prescribed safety standards.
- The XBR would be sited or operational mitigations implemented so as not to interfere with sensitive electronic equipment, on-ground electroexplosive devices, or ordnance storage.

Airspace Requirements

Airspace around the XBR would be noted on aeronautical charts as a high energy radiation area to inform pilots of potential electromagnetic interference hazards to certain aircraft. This airspace would be approximately 6.7 kilometers (4.2 miles) around the radar unit.

2.2.5 UPGRADED EARLY WARNING RADAR

As part of the NMD system, there would be a requirement to upgrade the existing early warning radars at Clear AFS, Alaska, Beale AFB, California, Cape Cod AFS, Massachusetts, and other potential locations to be determined. These early warning radars, also referred to as "PAVE PAWS", are phased-array surveillance radars and are currently used to detect, track, and provide early warning of sea-launched ballistic missiles. They are also used to track satellites and space debris. Hardware and software modifications are planned for these existing radars in conjunction with the NMD system. A detailed description of the proposed changes and the potential environmental impacts was addressed in a Supplement to the NMD Deployment Draft EIS. The supplement was circulated for public and agency review. The final analysis for the upgraded Early Warning Radar has been incorporated into this Final EIS as Appendix H—UEWR Analysis. The Air Force is in the process of preparing an EIS to address modernization, maintenance, and sustainment of operations of the Early Warning Radars.

In addition, some of the existing early warning radars are not protected against high altitude electromagnetic pulse. The exact requirements for the radars have not been developed but could include shielding the radar equipment and modernizing power plants and internal electronic components of the radars. It is likely that power plant modernization would include replacing the existing facility with a more efficient, cleaner burning power plant. Once specific details of the modifications are defined, separate site-specific analysis, as required, would be performed.

2.2.6 EARLY WARNING SATELLITES

Existing Defense Support Program satellites provide the U.S. early-warning satellite capability. The satellites are comparatively simple, inertially fixed, geosynchronous earth orbit satellites with an unalterable scan pattern. For the NMD program, the Defense Support Program satellites would acquire and track ballistic missiles throughout their trajectory. The information from the satellites would be provided to the BMC2 subelement. SBIRS would replace the Defense Support Program satellites sometime in the next decade. NMD would use whichever system is in place when a deployment decision is made and can use a combination of the two if the transition is still in progress.

2.2.7 SPACE-BASED INFRARED SYSTEM

SBIRS would be an additional system that future NMD systems would utilize. SBIRS is currently being developed by the Air Force independently of NMD as part of the early warning satellite system upgrade, which would replace the Defense Support Program satellites. For the NMD program, the SBIRS constellation of sensor satellites would

acquire and track ballistic missiles throughout their trajectory. This information would provide the earliest possible trajectory estimate to the BMC2 subelement. See section 1.6.1 regarding environmental documentation prepared for this system.

2.2.8 NMD TESTING, TRAINING, AND EXERCISE CAPABILITY

For the NMD program, a Test, Training, and Exercise Capability would be implemented. This program would replicate the operational capability of the NMD system and would provide for system element integration and system personnel training for operation of the NMD system. This capability would require hardware (i.e., computers) and software to support the system testing and training. The Test, Training, and Exercise Capability would be located within the proposed GBI and XBR facilities required for NMD and within existing operational and test facilities and command centers that would support NMD. No modification to these facilities would be required except for the addition of computer and other simulation equipment. Some initial existing sites proposed for this training would include Cheyenne Mountain AFS and the Joint National Test Facility in Colorado; the Software Integration Facility, Huntsville, Alabama; Meck Island on Kwajalein Atoll; and within the proposed UEWR sites.

2.2.9 NMD SUPPORT FACILITIES/INFRASTRUCTURE

2.2.9.1 NMD Element Support Infrastructure

Depending on the deployment area selected, GBI, XBR, and BMC2 elements may require additional support infrastructure. Support facilities could include steam and heating plant, water supply, power generation, fuel storage area, sewage treatment, lodging and dining, readiness station, recreation, warehouse, vehicle storage and maintenance, fire station, and hazardous materials/waste storage. If the NMD element is located at or adjacent to an existing military installation with a support infrastructure in place, minor new support facilities could be required. If the NMD element is located at a remote location, then new support facilities for personnel and element operation would be required. Details about the support facilities are discussed under the potential element deployment sites. Personnel requirements to operate the support base could range from 50 to 150 depending on the facility requirements.

2.2.9.2 Fiber Optic Cable Line (Communication Lines)

To provide a communication link between the NMD system elements, fiber optic cable line would be required on both land and water. Some of the fiber optic lines currently exist and are in operation as part of the nationwide commercial telecommunication network. The new cable installation on land, whether installed below the surface or on the surface, will be per regional telecommunication specifications because

commercial providers would be installing and providing the NMD telecommunication service. For underwater ocean installations, the fiber optic cable line would be buried at a depth of 1 meter (3 feet) or more for ocean depths up to 1,372 meters (4,500 feet) to avoid interference with fishing equipment and activities. For ocean depths greater than 1,372 meters (4,500 feet), cable burial would not be necessary. The underwater installation would be performed by a commercial fiber optic cable line installation company per regional guidelines.

2.2.10 BASIC CONSTRUCTION REQUIREMENTS

For NMD, basic construction principles and off-site manufacturing would be used to reduce the effects of construction operations. Depending on the size of construction activities for a site, construction equipment laydown and staging areas would be established. During construction, this area would be fenced and used for the contractors' village, with temporary mobile offices, equipment storage, maintenance facilities, parking, and other construction needs.

General construction contractors requirements for the NMD construction period are provided in detail under each element site location description.

2.2.11 DECOMMISSIONING AND DISPOSAL

The NMD system is anticipated to be an active system that would remain in the DOD inventory for as long as there is a potential threat. However, the system may go through periodic improvements that may require decommissioning and disposal of obsolete elements or components. Upon reaching the conclusion of its effective service life, the element or component would be withdrawn from military service, decommissioned, and disposed. Some components could be evaluated for continued use by other U.S. Government agencies (for example, U.S. Customs, National Aeronautics and Space Administration), or as candidates for Foreign Military Sales. Various adaptive reuses could be analyzed and implemented if appropriate. If no appropriate requirements are identified, the NMD elements or components would be demilitarized and disposed of as excess to the needs of the Government. Demilitarization is the act of destroying a system's offensive and defensive capabilities to prevent the equipment from being used for its intended military purpose. Disposal is the process of redistributing, transferring, donating, selling, abandoning, destroying, or any other disposition of the property. Decommissioning of the site could also include removal of all structures and infrastructure and site restoration, as required.

Demilitarization of the components of the NMD system would be performed in accordance with DOD Directive 4160.21-M, *Defense Reutilization and Disposal*; DOD Directive 4160.21-M-1, *Defense*

Demilitarization Manual; procedures developed by the Command(s) responsible for managing the NMD system elements and associated equipment; and applicable state and local procedures.

Key items that could be demilitarized include explosives, propellants and propellant fillers, toxic materials, incendiary or smoke content, other military design features, and any features determined to be hazardous to the general public. In order to ensure freedom from explosive, toxic, incendiary, smoke, or design hazards, the process would be undertaken as economically as practicable and in accordance with existing environmental standards and safety and operational regulations.

The actual demilitarization and disposal of the components of the NMD system may be accomplished by a Government depot or contractor. The Command(s) responsible for managing each NMD element would initiate the demilitarization and disposal process. For the NMD program, a Pollution Prevention Plan is being prepared identifying all hazardous materials in the NMD system. A copy of this Pollution Prevention Plan would be provided to the depot or contractor performing the demilitarization and disposal. It would be the responsibility of the depot or contractor to identify, remove, segregate, package, and document all hazardous materials in the item. In the case of a depot, disposal of hazardous materials would be through Government channels as described below. When a contractor is utilized, hazardous material disposal would be processed through commercial channels in compliance with all Federal, state, and local laws.

When a depot performs the demilitarization and disposal functions, disposal of hazardous and nonhazardous materials (with the exception of any radioactive materials) would be through a Defense Reutilization and Marketing Office. The Defense Reutilization and Marketing Office would physically accept and process all property that falls within the Defense Reutilization and Marketing Office area of responsibility. The Defense Reutilization and Marketing Office would be responsible for disposing of hazardous materials in accordance with Federal, state, and local laws, utilizing best management practices.

Transportation of NMD system components to demilitarization and disposal locations from military units, training, and maintenance locations would be by commercial ground transportation in accordance with U.S. Department of Transportation, state, and local transportation and safety regulations and procedures. Transportation for some demilitarization and disposal could be performed by military aircraft in accordance with U.S. Department of Transportation and U.S. Air Force regulations and procedures, and/or by U.S. Navy, commercial, or U.S. Army ships in accordance with U.S. Department of Transportation and applicable regulations and procedures.

2.3 NO-ACTION ALTERNATIVE

The No-action Alternative is not to deploy the NMD system. If the deployment decision made is not to deploy, the NMD program would use the time to continue to enhance the existing technologies of the various system elements. The NMD program would also have the option to add new elements if and as they are developed.

Since the SBIRS Program requirements are independent of NMD, they would continue even if the decision is not to deploy the NMD system. Separate environmental documentation has been prepared by the Air Force for this program (see section 1.6.1).

For the potential sites being considered for NMD deployment, the No-action Alternative would be a continuation of activities currently occurring or planned at those locations. At the time a subsequent deployment decision is made, each site would be reviewed to determine if site conditions still permit deployment of the NMD elements.

2.4 PROPOSED ACTION

The Proposed Action is to deploy and operate an NMD system. Figure 2.4-1 provides an overview of the potential deployment locations of the NMD elements under the Proposed Action. NMD element deployment could make use of the existing SRMSC anti-ballistic missile site in North Dakota or selected military installations in Alaska. As system elements and threats continue to evolve, potential locations for system elements may change to meet system requirements; however, all sites will receive an appropriate environmental analysis.

Provided below are the NMD element deployment locations being considered for the NMD system for the Proposed Action. Under the Proposed Action, the United States Government would select the required elements from the locations described below. As noted in section 2.0, the Preferred Alternative would be for the GBI and BMC2 to be located at Fort Greely, Alaska and the XBR at Eareckson AS, Alaska. The NMD system would make use of the existing Early Warning Radars. A description of the potential UEWR locations for the Proposed Action is provided in appendix H.

2.4.1 GROUND-BASED INTERCEPTOR DEPLOYMENT ALTERNATIVES

For the NMD system, one GBI element deployment location in Alaska or North Dakota or one GBI site in both Alaska and North Dakota would be selected from the sites listed below.

Ground-Based Interceptor (GBI)

- Clear AFS, Alaska
- Fort Greely, Alaska
- Yukon Training Area (Fort Wainwright)/Eielson AFB, Alaska
- Grand Forks AFB, North Dakota
- Stanley R. Mickelsen Safeguard Complex, North Dakota
  - Missile Site Radar (MSR)

Battle Management, Command and Control (BMC2)

- Clear AFS, Alaska
- Fort Greely, Alaska
- Yukon Training Area (Fort Wainwright)/Eielson AFB, Alaska
- Grand Forks AFB, North Dakota
- Stanley R. Mickelsen Safeguard Complex, North Dakota
  - Missile Site Radar (MSR)

X-Band Radar (XBR)

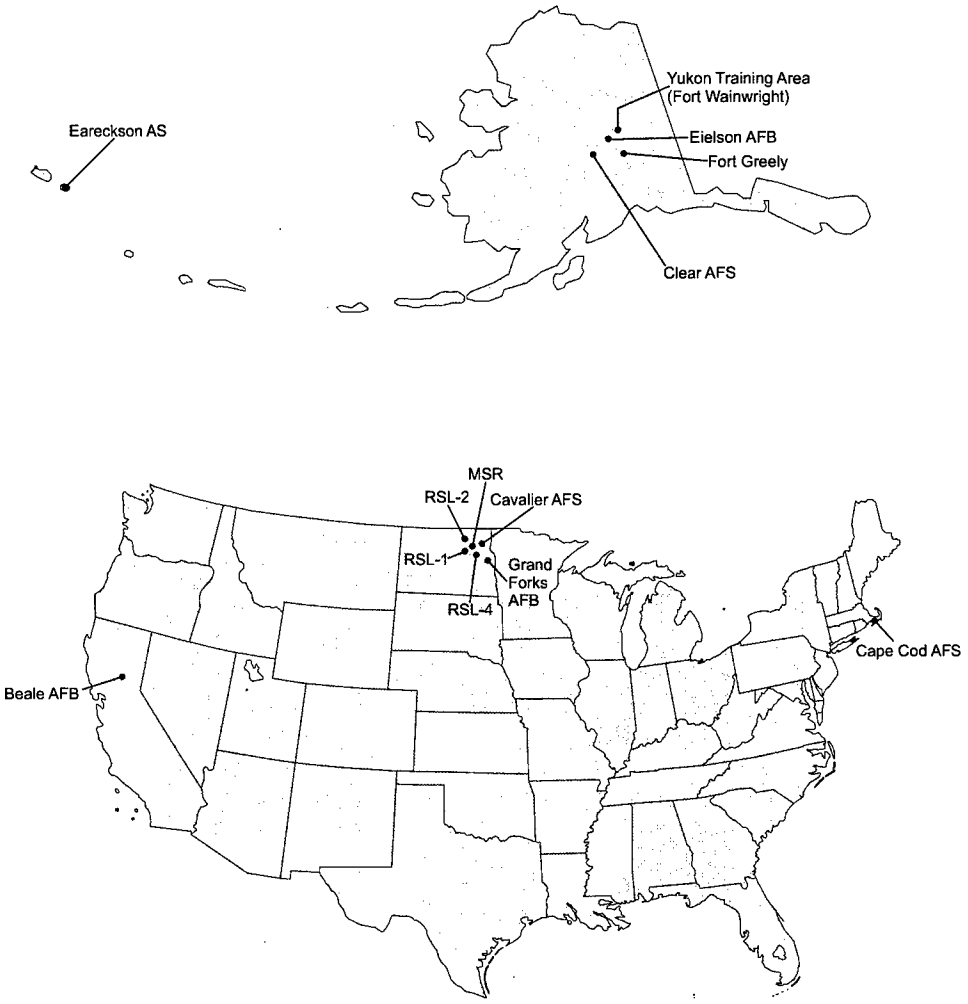
- Eareckson AS, Alaska
- Stanley R. Mickelsen Safeguard Complex, North Dakota
  - Cavalier AFS
  - Missile Site Radar (MSR)
  - Remote Sprint Launch Site (RSL) 1
  - Remote Sprint Launch Site (RSL) 2
  - Remote Sprint Launch Site (RSL) 4

In-Flight Interceptor Communications System (IFICS)*

- Alaska
- North Dakota

Upgraded Early Warning Radar (UEWR)**

- Clear AFS, Alaska
- Beale AFB, California
- Cape Cod AFS, Massachusetts



EXPLANATION

*Note: Identification of potential IFICS locations is still in progress. Locations depicted are those regions under consideration. Other regions may be identified depending on system requirements.

**Note: Identification of other potential locations outside of the United States is still in progress.

Not to Scale

NORTH

NMD Element Deployment Options

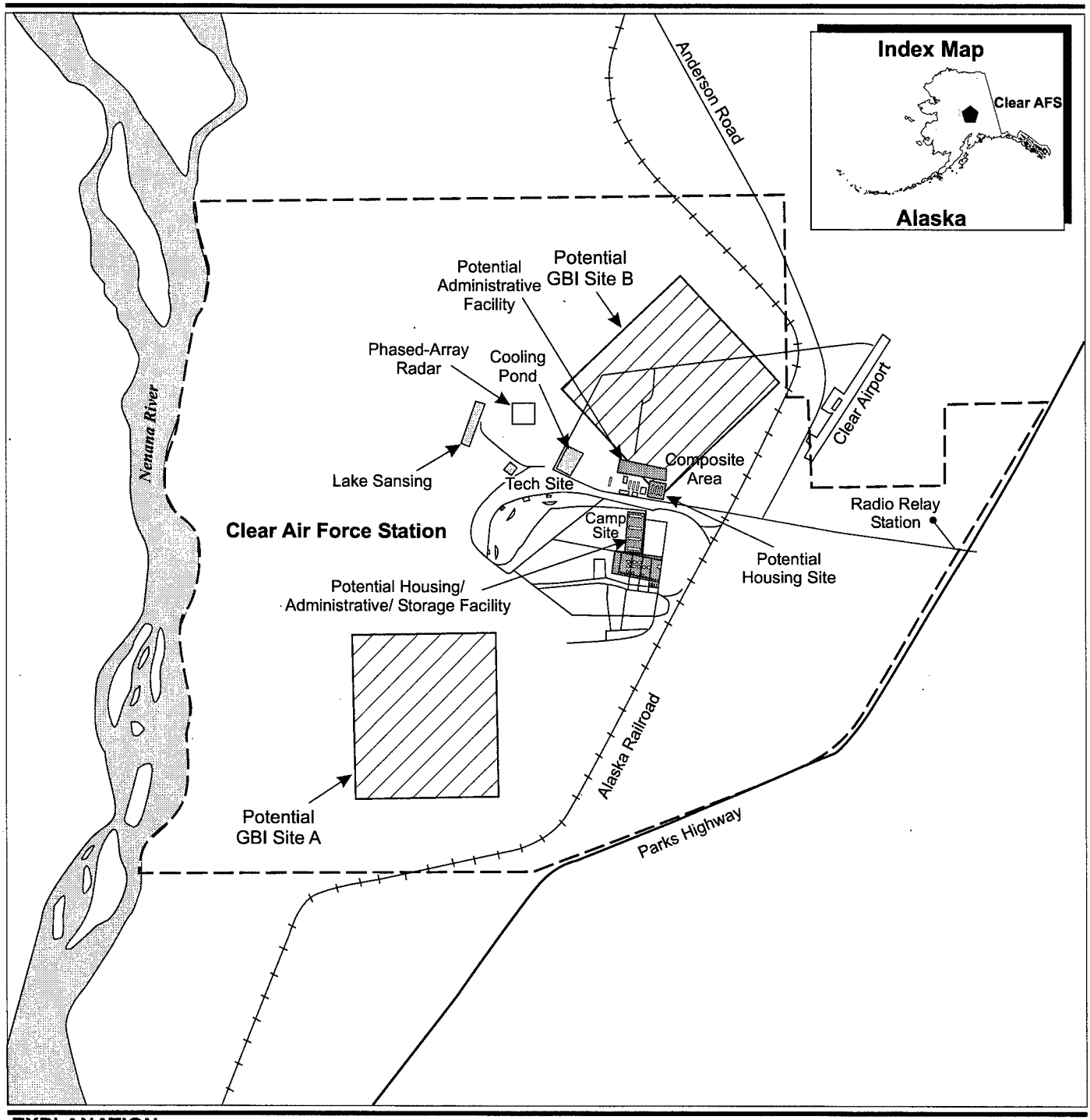
Figure 2.4-1

2.4.1.1 Clear AFS, Alaska

At Clear AFS, there are two potential locations for GBI deployment. Alternative A would be in the southern part of the installation, and Alternative B would be in the northeast corner (figure 2.4.1-1). GBI deployment would require the construction of new silos and support facilities (table 2.4.1-1). Given the amount of construction required, most of the proposed alternative deployment sites would be disturbed during construction activities. In addition, a new access road and utility corridors to either proposed site would need to be constructed.

Table 2.4.1–1: NMD System Facility Requirements, Ground-Based Interceptor, Clear AFS, Alaska

New Facilities	Existing Facilities Requiring Modifications (Building Number)
Launch Silos	870—Open Storage
Interceptor Receiving and Processing Facility	1, 3, 4, 26, 29, 35, 37, 40, 41, 42, 43, 48, 50, 51, 62, 65, 66, 79, 80, 82, 93, 720—Buildings and adjacent area known as Construction Camp
Interceptor Storage Facilities	
Headquarters Facility	
Silo Interface Vault	
Mechanical/Electrical Equipment Building	251—Fire Station
Administration and Maintenance Facility	100, 150, 196, 200-204, 209, 250, 280
Backup Power Generation with Fuel Storage	
Security (Fencing, Lighting, Monitoring Equipment)	
Equipment/Vehicle Storage Facilities	
Helicopter Pad	
Sewage Treatment (Septic Field)	
Housing/Dormitory/Dining	
Steam Plant	
Substation	
Readiness Station	
Security Building	
Warehouse	
Entry Control Station	
Roads/Utility Extensions/Water Wells	
Community Center	
Fuel Unloading Facility	
Water Supply Facility	



EXPLANATION

- Roads
- Water Area
- Ground-Based Interceptor Potential Site
- Potential Support Facilities
- Installation Boundary
- Railroads

NORTH

0 2,500 5,000 Feet

0 762 1,524 Meters

Potential Ground-Based Interceptor, Clear Air Force Station

Alaska

Figure 2.4.1-1

dp_clas_gbi_001_replacement

Construction Requirements

Once a deployment decision is made, construction activities at Clear AFS would take approximately 5 years, with the main construction effort occurring during the first 3 years. Construction would include both the GBI and BMC2. Most of the ground-disturbing activities would occur during the first 24 months. Construction and site activation personnel requirements would average 400, with a maximum of 600 during peak construction activities.

Approximately 243 hectares (600 acres) of undisturbed land would be graded during construction activities at Clear AFS to include the GBI silo field and related support facilities.

Operational Requirements

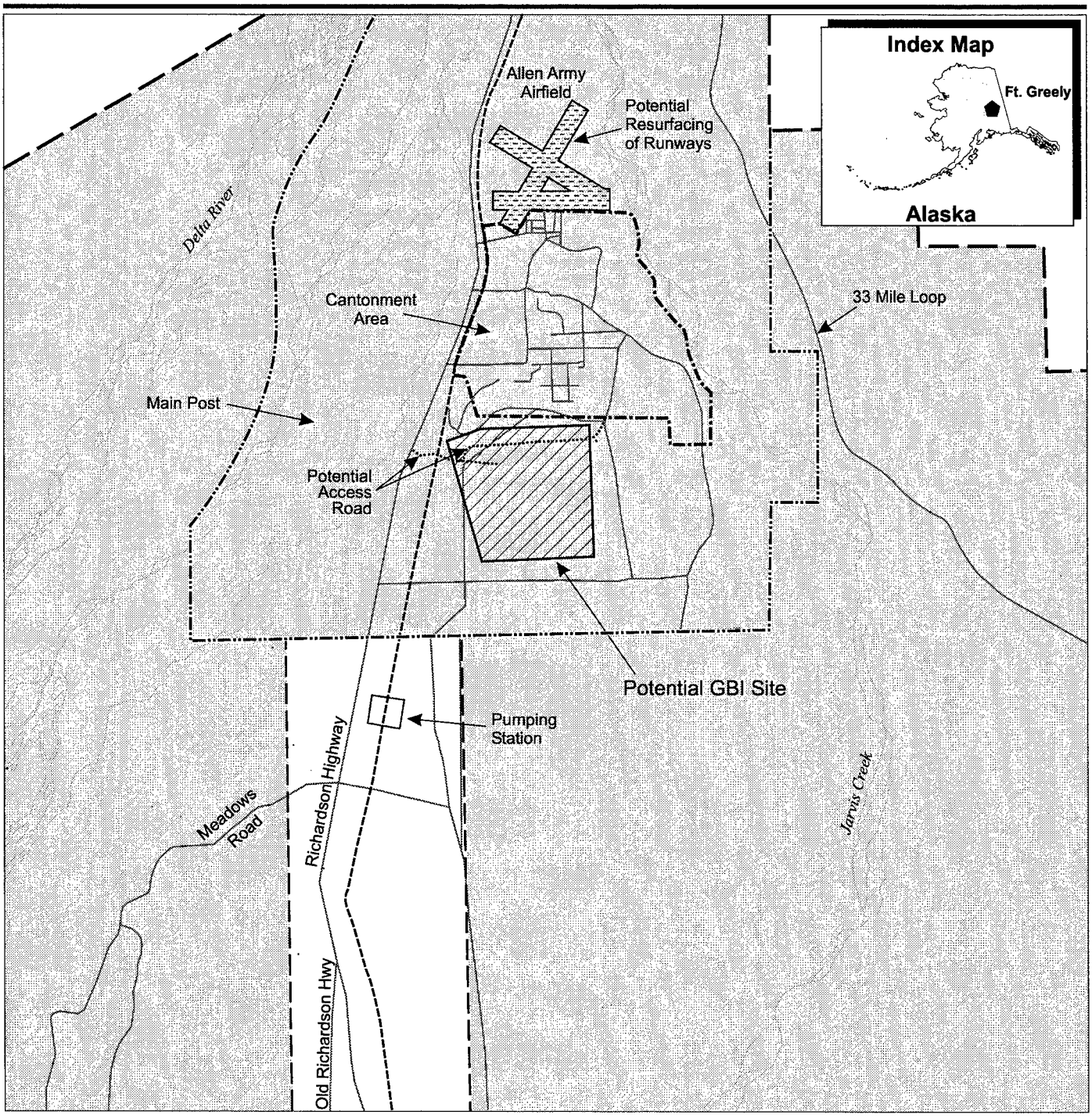
When the GBI site at Clear AFS becomes fully operational, the total site-related employment would be approximately 115 military and 90 contractor positions associated with the GBI element plus an additional 50 direct jobs associated with NMD base support functions. These jobs would include site maintenance and operations support, fire, and security personnel.

2.4.1.2 Fort Greely, Alaska

At Fort Greely, the potential location for the GBI element would be just south of the main base cantonment (figure 2.4.1-2). Table 2.4.1-2 provides an overview of the GBI facility requirements for Fort Greely. At the time of NMD deployment, there would be ample existing lodging and dining, morale, welfare, recreation, public works, and security facilities at Fort Greely to support the NMD mission. The existing dirt roads to the GBI site would need to be upgraded along with the installation of new utilities. In addition, several new roads may be constructed to the GBI site. If a decision is made to use the runway to receive GBI shipments, the runway would also need to be upgraded. The upgrade would include removing the existing pavement, reconstructing the base material, and installing new pavement to support heavy cargo aircraft. Additional upgrades could include new runway lights, instrument approach equipment, approach lights, and expanded apron areas.

Construction Requirements

Once a deployment decision is made, construction activities would take approximately 5 years, with the main construction effort occurring during the first 3 years. Construction would include both the GBI and BMC2. Most of the ground-disturbing activities would occur during the first 24 months. Construction and site activation personnel requirements would average 400, with a maximum of 650 during peak construction



EXPLANATION

- Fort Greely
- Ground-Based Interceptor Potential Site
- Runways
- Potential Access Roads
- Roads
- Rivers
- Installation Boundary
- Trans-Alaska Pipeline
- Main Post Boundary
- Cantonment Area Boundary

Scale 1:80,000

0 3,334 6,667 Feet

NORTH 0 1,016 2,032 Meters

dp_jarvis_gbi_001

Potential Ground-Based Interceptor, Fort Greely

Alaska

Figure 2.4.1-2

activities. This site would require additional construction personnel compared to other deployment sites to support runway reconstruction.

Table 2.4.1-2: NMD System Facility Requirements, Ground-Based Interceptor, Fort Greely, Alaska

New Facilities	Existing Facilities Requiring Modifications (Building Number)
Launch Silos	100—Hangar
Interceptor Receiving and Processing Facility	508, T-509, 601, 608, 612, 670—Warehouse/Storage and adjacent areas
Interceptor Storage Facilities	659-663, 702, 705-714, 804-806, 808-810, 812-814, 816-818, 825-827, 829-831, 833-835, 850-852, 854-856, 862-864, 875-877, 887-889, 895, 896, 910-946, 950-955—Housing
Headquarters Facility	
Silo Interface Vault	
Mechanical/Electrical Equipment Building	
Administration and Maintenance Facility	504—Fire Station
Backup Power Generation with Fuel Storage	605, 615, 626—Motor Pool
Security (Fencing, Lighting, Monitoring Equipment)	503, 630, 654, 655, 658, 853—Administration
Sewage Treatment (Septic Field)	Runway—remove and reconstruct
Steam Plant	101, 103, 106, 160, 162, 318-320, 338-341, 346, 347-354, 361, 609, 610, 628, 629, 635, 650-653, 656, 675, 701, 725, 801, 802, 820-822, 824, 845, 847
Substation	
Readiness Station	
Security Building	
Entry Control Station	
Roads/Utility Extensions/Water Wells	
Fuel Unloading Facility	
Water Supply Facility	

Approximately 243 hectares (600 acres) of undisturbed and previously disturbed land would be graded during construction activities at Fort Greely for the GBI silo field and associated support facilities.

Operational Requirements

When the GBI site becomes fully operational, the total site-related employment would be approximately 115 military and 95 contract positions associated with the GBI element plus an additional 150 direct jobs associated with NMD base support functions. Because there is a smaller number of base support personnel at Fort Greely, deployment would require more personnel than at other deployment locations. These jobs would include site maintenance and operations support, and security personnel.

2.4.1.3 Yukon Training Area (Fort Wainwright)/Eielson AFB

At the Yukon Training Area, the potential location for the GBI element would be just east of Eielson AFB at the Winter Camp Site (figure 2.4.1-3). The Yukon Training Area is a portion of Fort Wainwright located generally east of Eielson AFB. The Winter Camp Site is within the Yukon Training Area. Deployment at this site would require use of existing facilities on Eielson AFB and new silos, and the construction of new support facilities on both the Yukon Training Area and Eielson AFB (table 2.4.1-3). The existing dirt road (Manchu Trail) to the proposed site from Eielson AFB would have to be widened and upgraded to support transport of the GBI. The new utilities required to the site would be installed along the existing road during the road upgrade. Given the amount of construction required, most of the area within the potential deployment site would be disturbed during construction activities.

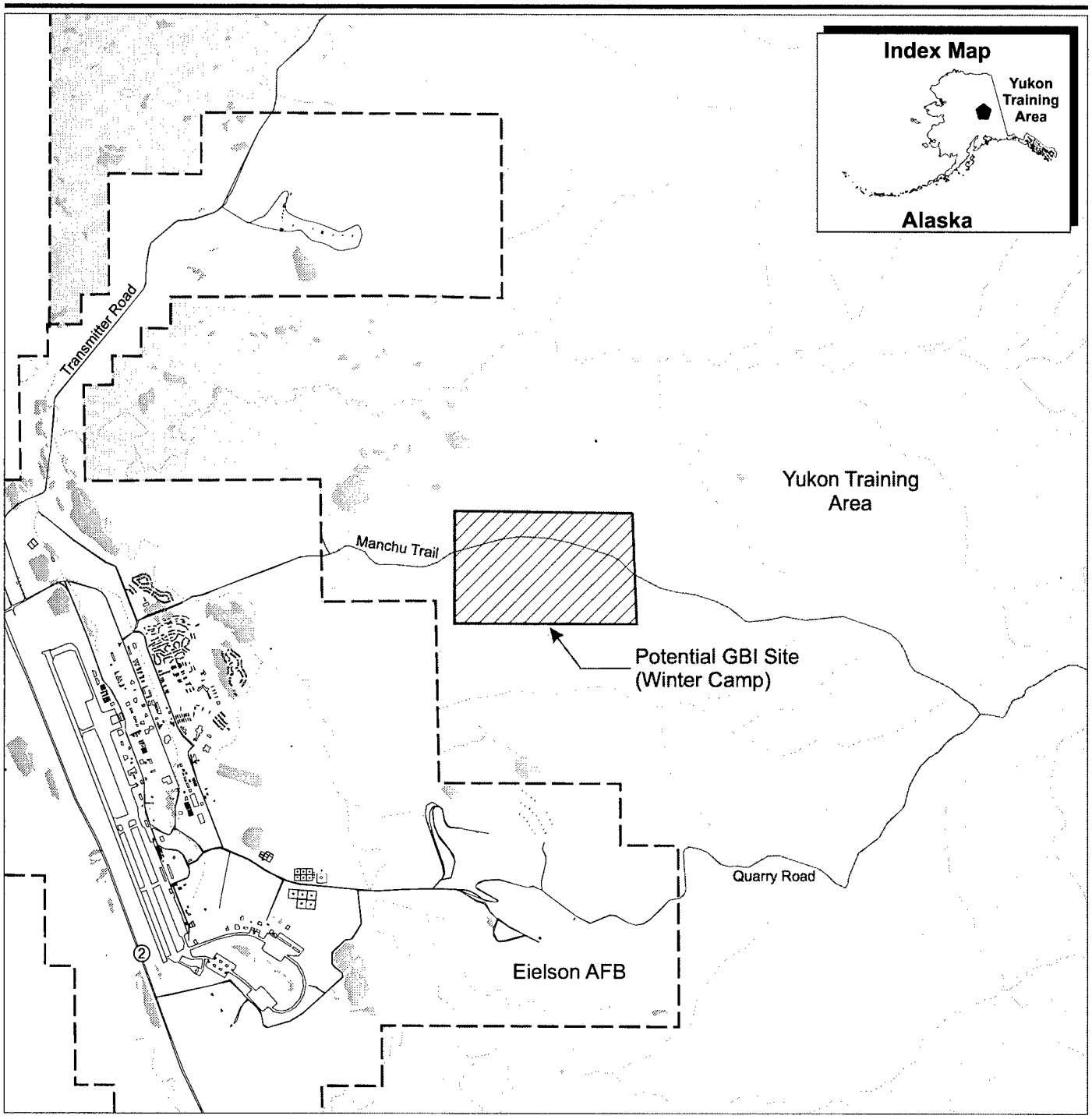
Construction Requirements

Once a deployment decision is made, construction activities would take approximately 5 years, with the main construction effort occurring during the first 3 years. Construction would include both the GBI and BMC2. Most of the ground-disturbing activities would occur during the first 24 months. Construction and site activation personnel requirements would average 400, with a maximum of 600 during peak construction activities.

Approximately 243 hectares (600 acres) of undisturbed and previously disturbed land would be graded during construction activities at the Yukon Training Area for the GBI silo field and associated support facilities.

Operational Requirements

When the GBI site becomes fully operational, the total site-related employment would be approximately 115 military and 90 contractor positions associated with the GBI element plus an additional 50 direct jobs associated with NMD base support functions. These jobs would include site maintenance and operations support, fire, and security personnel.



EXPLANATION

- Eielson AFB
- Yukon Training Area
- Ground-Based Interceptor Potential Site
- Roads
- Streams
- Installation Boundary
- Water Area

Scale 1:80,000

0 3,334 6,667 Feet

NORTH 0 1,016 2,032 Meters

dp_wincamp_gbi_001

Potential Ground-Based Interceptor, Yukon Training Area (Fort Wainwright)/ Eielson AFB

Alaska

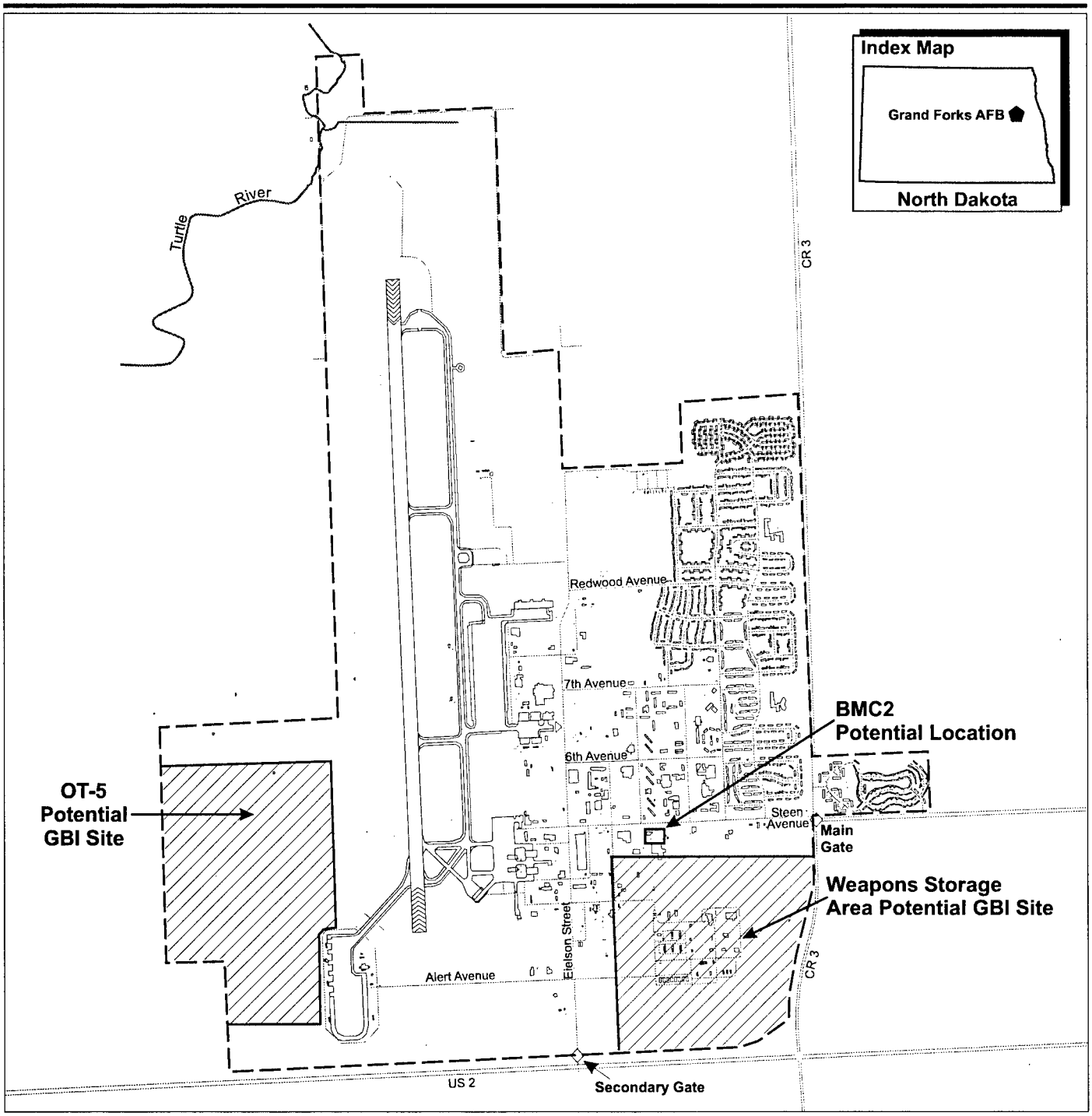
Figure 2.4.1-3

Table 2.4.1-3: NMD System Facility Requirements, Ground-Based Interceptor, Yukon Training Area/Eielson AFB, Alaska

New Facilities	Existing Facilities Requiring Modifications (Building Number)
Launch Silos	2171—Shop Space
Interceptor Receiving and Processing Facility	3425—Warehouse
Interceptor Storage Facilities	4280—Warehouse
Headquarters Facility	1206—Fire Station
Silo Interface Vault	
Mechanical/Electrical Equipment Building	Camping Area
Administration and Maintenance Facility	
Backup Power Generation with Fuel Storage	
Security (Fencing, Lighting, Monitoring Equipment)	
Readiness Station	
Sewage Treatment (Septic Tanks)	
Substation	
Steam Plant	
Security Building	
Entry Control Station	
Roads/Utility Extensions/Water Wells	
Fuel Unloading Facility	
Water Supply Facility	

2.4.1.4 Grand Forks AFB, North Dakota

At Grand Forks AFB, there are two potential locations for the GBI element: the Weapons Storage Area and the Ordnance Training Site 5 (OT-5) (figure 2.4.1-4). Table 2.4.1-4 provides an overview of the facility requirements for each potential GBI location at Grand Forks AFB. The Weapons Storage Area site is in the southeast corner of the base and the OT-5 area in the southwest corner of the base. The facilities required for all options would be the same except for the locations of GBI silos. In addition, there is the potential to use a combination of both sites, if required. At the time of NMD deployment, there would be ample existing lodging and dining, morale, welfare, recreation, public works, and security facilities to support the NMD mission without any new facilities or building modifications.



EXPLANATION

- Installation Boundary
- Ground Based Interceptor Potential Site
- Gate

OT-5 = Ordnance Training Site 5
CR = County Road
US = U.S. Highway

Scale 1:40,000

NORTH

0 1,667 3,333 Feet

0 508 1,016 Meters

Potential Ground-Based Interceptor and BMC2 Locations, Grand Forks Air Force Base

North Dakota

Figure 2.4.1-4

Table 2.4.1–4: NMD System Facility Requirements, Ground-Based Interceptor, Grand Forks AFB, North Dakota

New Facilities	Existing Facilities Requiring Modifications (Building Number)
Launch Silos	739, 740, 741, 742, and 743—Interceptor Storage Facility
Interceptor Receiving and Processing Facility	312 and 313—Training Facilities
Interceptor Storage Facilities	318—Warehouse
Headquarters Facility	204, 223, 225, 306, 402, 606, 714, 722, 743-750, 803
Silo Interface Vault	
Mechanical/Electrical Equipment Building	
Administration and Maintenance Facility	
Backup Power Generation with Fuel Storage	
Security (Fencing, Lighting, Monitoring Equipment)	
Readiness Station	
Entry Control Stations	
Security Building	
Roads/Utility Extensions	
Fuel Unloading Facility	
Water Supply Facility	
Fire Station	
Generator Building	

Construction Requirements

Once a deployment decision is made, construction activities at Grand Forks AFB would take approximately 5 years, with the main construction effort occurring during the first 3 years. Construction would include both the GBI and BMC2. Most of the ground-disturbing activities would occur during the first 24 months. Construction and site activation personnel requirements would average 250, with a maximum of 500 during peak construction activities.

For the OT-5 and Weapons Storage Area alternatives, approximately 162 hectares (400 acres) of previously disturbed land would be graded during construction activities at Grand Forks AFB.

Operational Requirements

When the GBI site at Grand Forks AFB becomes fully operational, the total site-related employment would be approximately 115 military and 90 contractor positions associated with the GBI element plus an additional 50 direct jobs associated with NMD base support functions.

These jobs would include site maintenance and operations support, fire, and security personnel.

2.4.1.5 SRMSC Missile Site Radar, North Dakota

GBI element deployment at the Missile Site Radar would require new silos and the construction of new support facilities. Figure 2.4.1-5 shows the proposed construction of new facilities at the Missile Site Radar. Given the amount of construction and demolition required, most of the site would be disturbed during construction activities. For the GBI element and support functions, the facilities listed in table 2.4.1-5 would be required at the site.

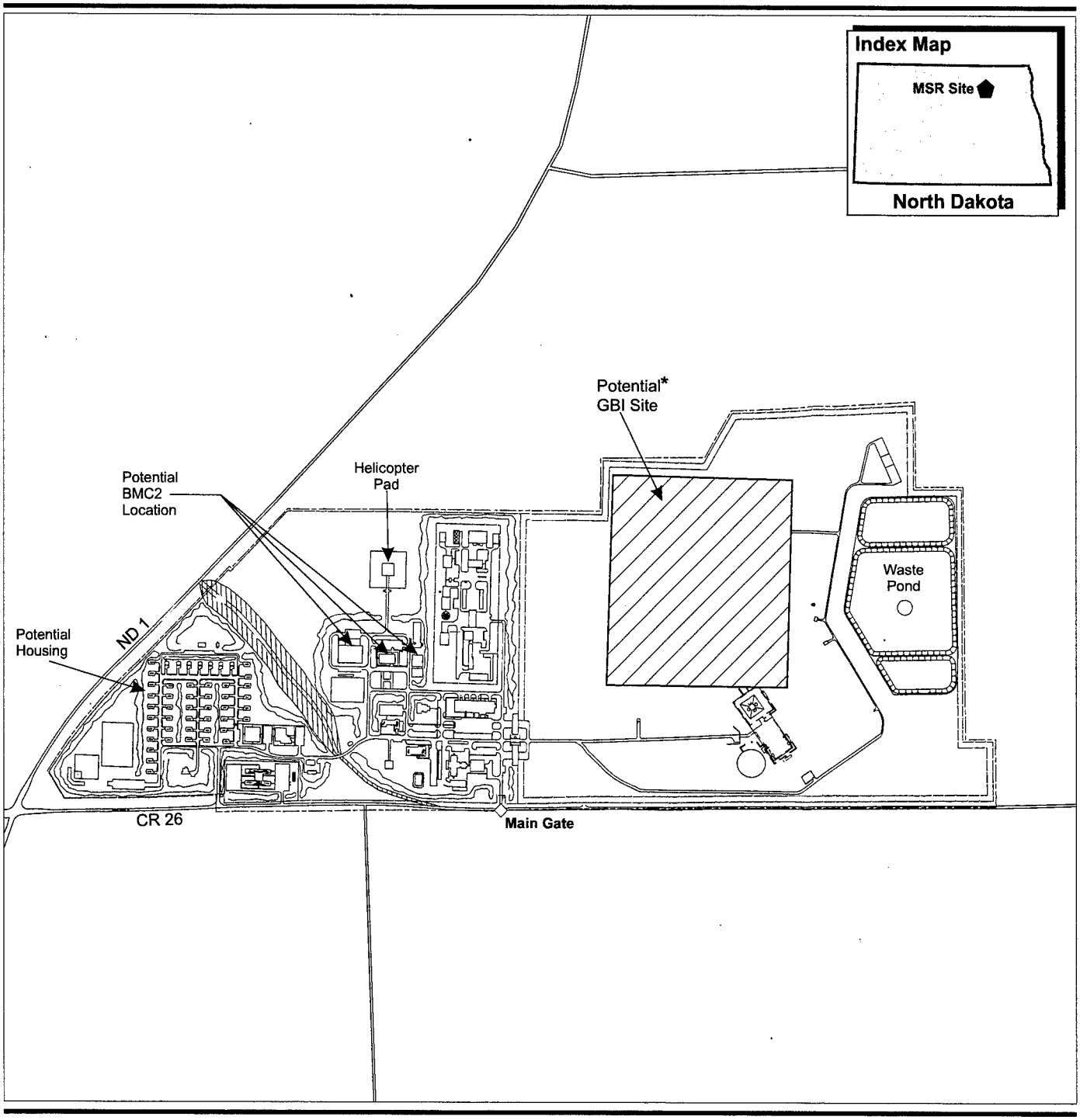
Construction Requirements

Once a deployment decision is made, construction activities would take approximately 5 years, with the main construction effort occurring during the first 3 years. Construction would include the GBI and BMC2. Most of the ground-disturbing activities would occur during the first 24 months. Construction and site activation personnel requirements would average 350, with a maximum of 625 during peak construction activities. This site requires additional construction personnel compared to the other deployment locations to support the additional facility requirements.

Approximately 170 hectares (420 acres) of previously disturbed land would be graded during construction activities. This area includes the GBI site for the silos and the surrounding area of the installation for support facilities.

Operational Requirements

When the GBI site becomes fully operational, the total site-related employment would be approximately 115 military and 95 contractor positions associated with the GBI element plus an additional 150 direct jobs associated with NMD base support functions. Because there are no current base support personnel at the Missile Site Radar, deployment would require more personnel than at other deployment locations. These jobs would include site maintenance and operations support, fire, and security personnel.



EXPLANATION

- Ground-Based Interceptor Potential Site
- ◇ Gate
- CR = County Road
- ND = North Dakota Highway
- ----- Installation Boundary

*Note: Depicts potential silo location. The entire Missile Site Radar facility would likely be modified for required GBI support facilities.

Scale
0 633 1,266 Feet
NORTH 0 193 386 Meters

Potential Ground-Based Interceptor and BMC2 Locations, Missile Site Radar

North Dakota

Figure 2.4.1-5

Table 2.4.1-5: NMD System Facility Requirements, Ground-Based Interceptor, Missile Site Radar, North Dakota

New Facilities	Existing Facilities Requiring Modifications (Building Number)
Launch Silos	346—Gym
Interceptor Receiving and Processing Facility	350—Community Center
Interceptor Storage Facility	340—Chapel
Headquarters Facility	301—Base Administration/Construction Headquarters
Silo Interface Vault	304—Construction Lab/Training Classroom
Mechanical/Electrical Equipment Building	385—Domestic Waste Stabilization Pond
Administration and Maintenance Facility	902—Sewage Pumping
Backup Power Generation with Fuel Storage	Storage/Warehouse Facility
Security (Fencing, Lighting, Monitoring Equipment)	
Munitions Igloos	
Hazardous Materials/Hazardous Waste Storage	
Equipment/Vehicle Storage Facilities	
Helicopter Pad	
Steam Plant	
Security Building	
Readiness Station	
Warehouse	
Housing	
Medical Clinic	
Vehicle Fueling Facility	
Water Quality Lab	
Fire and Public Works Facility	
Vehicle Parking Garage	
Roads/utility extensions	
Entry Control Station	

2.4.2 BMC2 DEPLOYMENT ALTERNATIVES

For the NMD system, only one BMC2 execution level element deployment location would be required from the sites listed below. As part of the NMD system, a Headquarters Complex would be located along with the GBI site. In addition, a Command Level and Service Component Command Center BMC2 nodes would be required for the NMD program. The Command Level BMC2 node would be located at Cheyenne Mountain AFS in Colorado and would consist of placing computer and communication equipment within existing rooms and may include some minor interior modifications. The Service Component Command BMC2 node could be located at both Peterson AFB, Colorado, and Vandenberg AFB, California. At Peterson AFB an annex would be connected to a headquarters facility. For Vandenberg AFB, computer and communication equipment would be installed in an existing room within Building 10577, which may require interior modifications. The BMC2 would be an administrative-type facility.

2.4.2.1 Clear AFS, Alaska

The BMC2 subelement would be located at this site if the GBI element is also constructed at Clear AFS. The BMC2 subelement would occupy an existing building or newly constructed facility and would require backup electrical power from the base or GBI site. If a new facility is required, it would be located within the potential GBI deployment area for Clear AFS. Overall construction requirements are discussed under the GBI element for this site.

Operational Requirements

When the BMC2 subelement becomes fully operational, the total site-related employment would be approximately 30 personnel.

2.4.2.2 Fort Greely, Alaska

The BMC2 subelement would be located at this site if the GBI element is also constructed at Fort Greely. The BMC2 subelement would occupy an existing building or a newly constructed facility and would require backup electrical power from the base or GBI site. If a new facility is required, it would be located within the potential GBI deployment area for Fort Greely. Overall construction requirements are discussed under the GBI element for this site.

Operational Requirements

Operational, personnel, and infrastructure requirements for the BMC2 subelement at this site would be the same as described for Clear AFS.

2.4.2.3 Yukon Training Area (Fort Wainwright)/Eielson AFB, Alaska

The BMC2 subelement would be located at this site if the GBI element is also constructed at the Yukon Training Area. The BMC2 subelement would occupy an existing building on Eielson AFB or a newly constructed facility and would require backup electrical power from the base or GBI site. If a new facility is required, it would be located within the potential GBI deployment area for the Yukon Training Area. Overall construction requirements are discussed under the GBI element for this site.

Operational Requirements

Operational, personnel, and infrastructure requirements for the BMC2 subelement at this site would be the same as described for Clear AFS.

2.4.2.4 Grand Forks AFB, North Dakota

The BMC2 subelement would be located at this site if the GBI element is also constructed at Grand Forks AFB. The BMC2 would be a newly constructed facility on the northern boundary of the NMD controlled area adjacent to Steen Avenue (see figure 2.4.1-4) or would utilize an existing structure, if available. The BMC2 facility would require backup electrical power from the base or GBI site. Overall construction requirements are discussed under the GBI element for this site.

Operational Requirements

Operational, personnel, and infrastructure requirements for the BMC2 subelement at this site would be the same as described for Clear AFS.

2.4.2.5 SRMSC Missile Site Radar, North Dakota

The BMC2 subelement would be located at this site if the GBI element is also constructed at the Missile Site Radar facility. This would require construction of a new BMC2 facility (see figure 2.4.1-5). The general construction requirements are discussed under the GBI element for this site. This facility would require backup electrical power from the base or GBI site.

Operational Requirements

Operational, personnel, and infrastructure requirements for the BMC2 subelement at this site would be the same as described for Clear AFS.

2.4.3 IN-FLIGHT INTERCEPTOR COMMUNICATIONS SYSTEM DEPLOYMENT ALTERNATIVES

For the NMD system, approximately 14 IFICS Data Terminal sites could be required. An IFICS Data Terminal site would encompass an area of approximately 2 hectares (6 acres) and up to 7 hectares (17 acres) for

two IFICS Data Terminals and require minimal construction activities. In addition, some vegetation may need to be removed around the facility to meet line-of-sight requirements. The operational requirements for the IFICS Data Terminal are still being identified. As such, the specific locations where the IFICS Data Terminal could be deployed have not yet been determined. Regions under study include Alaska and North Dakota. In addition, as the operational requirements are refined, other regions may be identified. It is anticipated that DOD installations would be used to deploy IFICS Data Terminals because of the security and maintenance infrastructure they could provide. However, if no DOD installations are within the potential performance region required for an IFICS Data Terminal to operate, then other land would be investigated. Once specific candidate sites are identified, separate site specific environmental analysis, as required, would be performed.

2.4.4 X-BAND RADAR DEPLOYMENT ALTERNATIVES

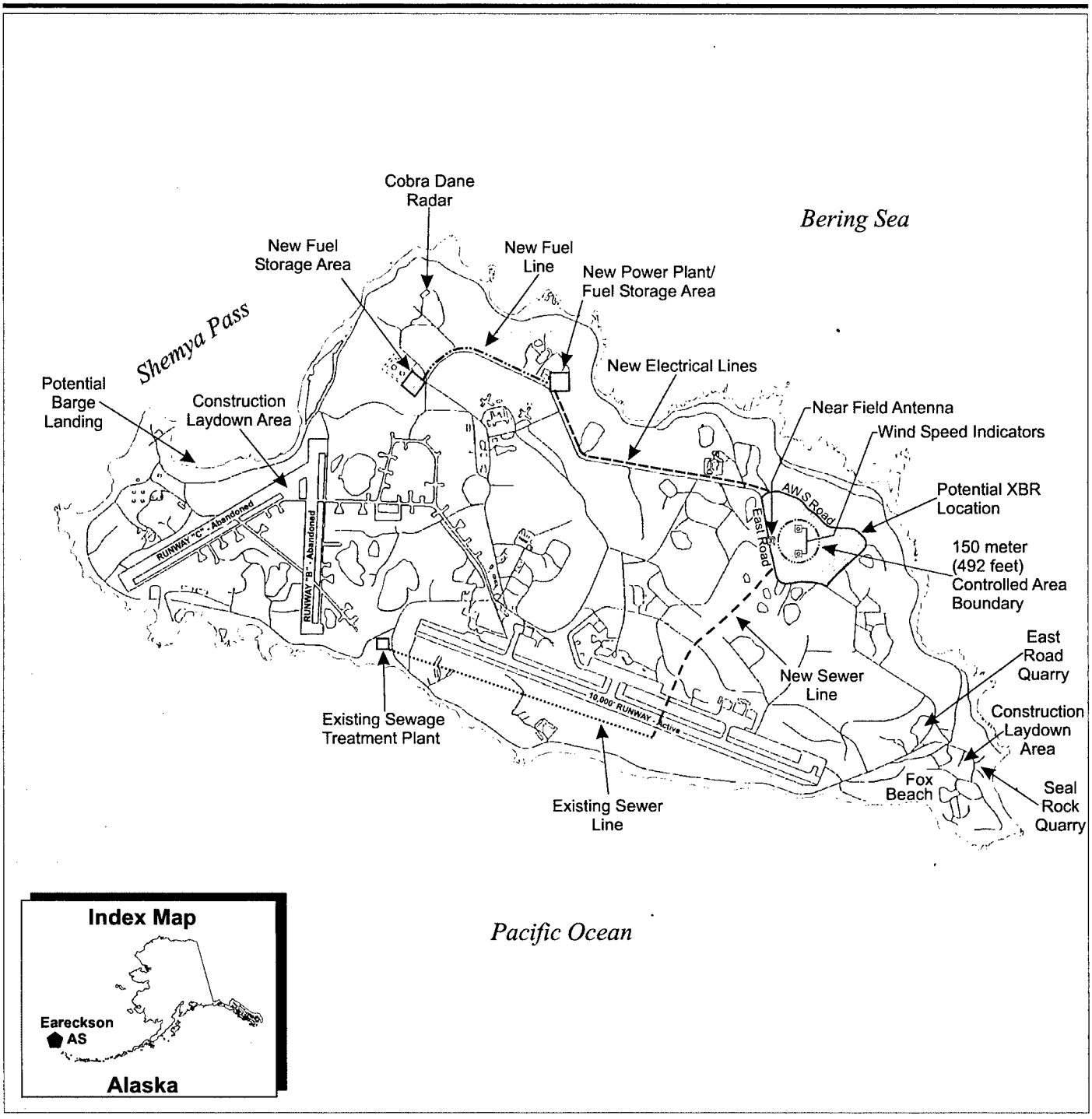
For the NMD system, an XBR element deployment location would be selected from the locations below. As part of the general construction requirements for the XBR, two temporary equipment storage facilities would be required during radar assembly. These facilities would be located next to the XBR during construction and removed once construction is complete.

2.4.4.1 Eareckson AS (Shemya Island), Alaska

The XBR would be constructed on the northeast part of the island between East Road and AWS Road. The new power plant would be located next to the existing power plant, and the new fuel storage areas would be adjacent to the existing storage area and the power plant. Table 2.4.4-1 shows the new support facilities and existing facilities required for an XBR at Eareckson AS. Some of the existing structures may require interior modifications. Figure 2.4.4-1 shows the basic facility layout. Existing water and sanitary sewer systems on the island would be utilized; however, new sewer lines would be required to the existing treatment plant. In addition, other utility lines (i.e., electrical) would be required but would follow existing utility corridors.

Construction Requirements

Once a deployment decision is made, construction activities would take approximately 3 years, with the main construction effort occurring during the first 2 years. Most of the ground-disturbing activities would occur during the first 24 months. Construction and site activation personnel requirements would average 230. Construction equipment and supplies would be shipped or airlifted to the island. Construction debris would be removed from the island by the construction contractor or incinerated. Construction would require limited blasting for fill



EXPLANATION

- Roads
- Land Area
- Water Area
- Potential XBR Location
- Controlled Area Boundary
- New Fuel Line
- New Electrical Lines
- New Sewer Line
- Existing Sewer Line
- Wind Speed Indicator
- Near Field Antenna

NORTH

Scale

0 1,738 3,475 Feet

0 530 1,059 Meters

Potential X-Band Radar Location, Eareckson Air Station

Alaska

Figure 2.4.4-1

material at Seal Rock Quarry on the southeast end of the island. In addition, up to two barges per year during construction may be beached to unload equipment and materials. This would require some dredging and moving of soils on the beach. Construction personnel would be housed in the existing Air Force facilities.

Table 2.4.4–1: X-Band Radar Facility Requirements, Eareckson AS, Alaska

New Facilities	Existing Facilities Requiring Modification (Building Number)
Radar Support Tower	617—Chapel
Control and Support Facility	616—Heavy Vehicle Maintenance
Power Generation Plant	600—Administration, Security, Lodging, Dining
Near Field Antenna	601-Gym
Wind Speed Indicator Towers	3050—Storage/Warehouse
Fuel Storage Area	490—Fire Station
Fire Water Storage	598—Construction Contractor Billeting
Fire Pump Buildings	3049—Power Plant
Perimeter Security and Surveillance	3062 (Demolition)
Power, Sewer, Water, and Fiber Optic Cable Lines	3063 (Demolition)
	211-213 (Demolition)
Vehicle Parking [1]	502, 521, 611, 700, 701, 753, 751, 1001

[1] Attached to Building 600

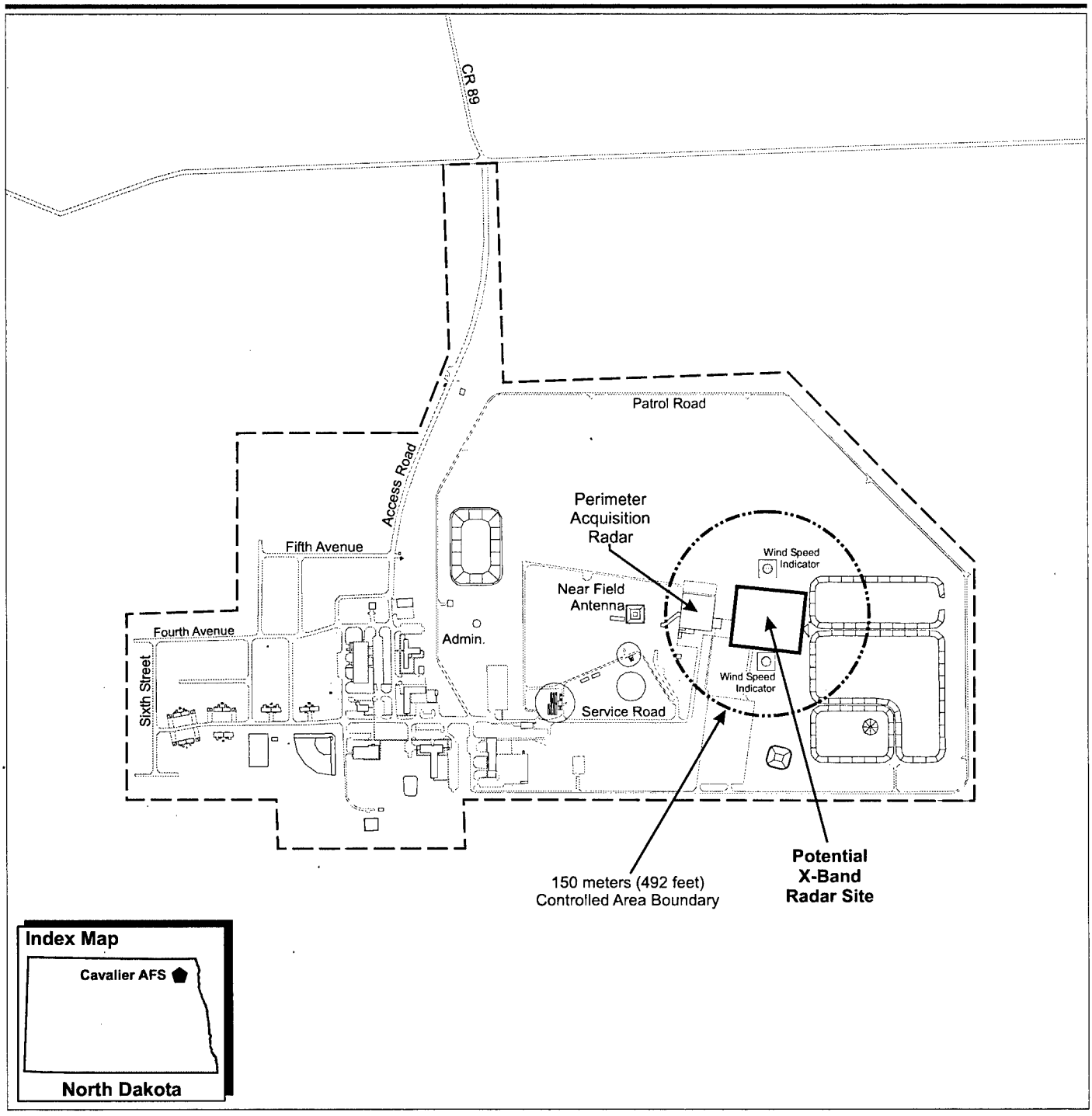
Approximately 12 hectares (30 acres) of land would be graded during construction activities. Any soil removal during construction on Eareckson AS would require analytical laboratory testing to ensure the soils are not contaminated.

Operational Requirements

When the XBR becomes fully operational, the total operations-related employment would be 70 personnel. In addition, another 35 personnel would be required to operate base support functions. All personnel would reside on-base. Fuel and other supplies would be brought to the island by barge or by air.

2.4.4.2 Cavalier AFS, North Dakota

The XBR would be located adjacent to the existing Perimeter Acquisition Radar Building, which would need to be demolished to allow for XBR operation (figure 2.4.4-2). The existing onsite infrastructure and support facilities should be adequate to meet facility requirements; however, there may be the need for a newly constructed power plant next to the XBR. The existing roads at the site may need improvement to handle the weight of the radar base during movement of the system for



EXPLANATION

- Controlled Area Boundary
- Installation Boundary
- Wind Speed Indicator
- Near Field Antenna
- CR = County Road

NORTH

Scale 1:11,000

0 459 917 Feet

0 140 280 Meters

Potential X-Band Radar Location, Cavalier Air Force Station

North Dakota

Figure 2.4.4-2

construction. No provisions for storm water detention would be made at this site.

Construction Requirements

Once a deployment decision is made, construction activities would take approximately 3 years, with the main construction effort occurring during the first 2 years. Most of the ground-disturbing activities would occur during the first 24 months. Construction and site activation personnel requirements would average 230. Approximately 1 hectare (3 acres) of previously disturbed land would be graded during construction activities. A maximum of 4 hectares (10 acres) at the site could be used for construction laydown.

Operational Requirements

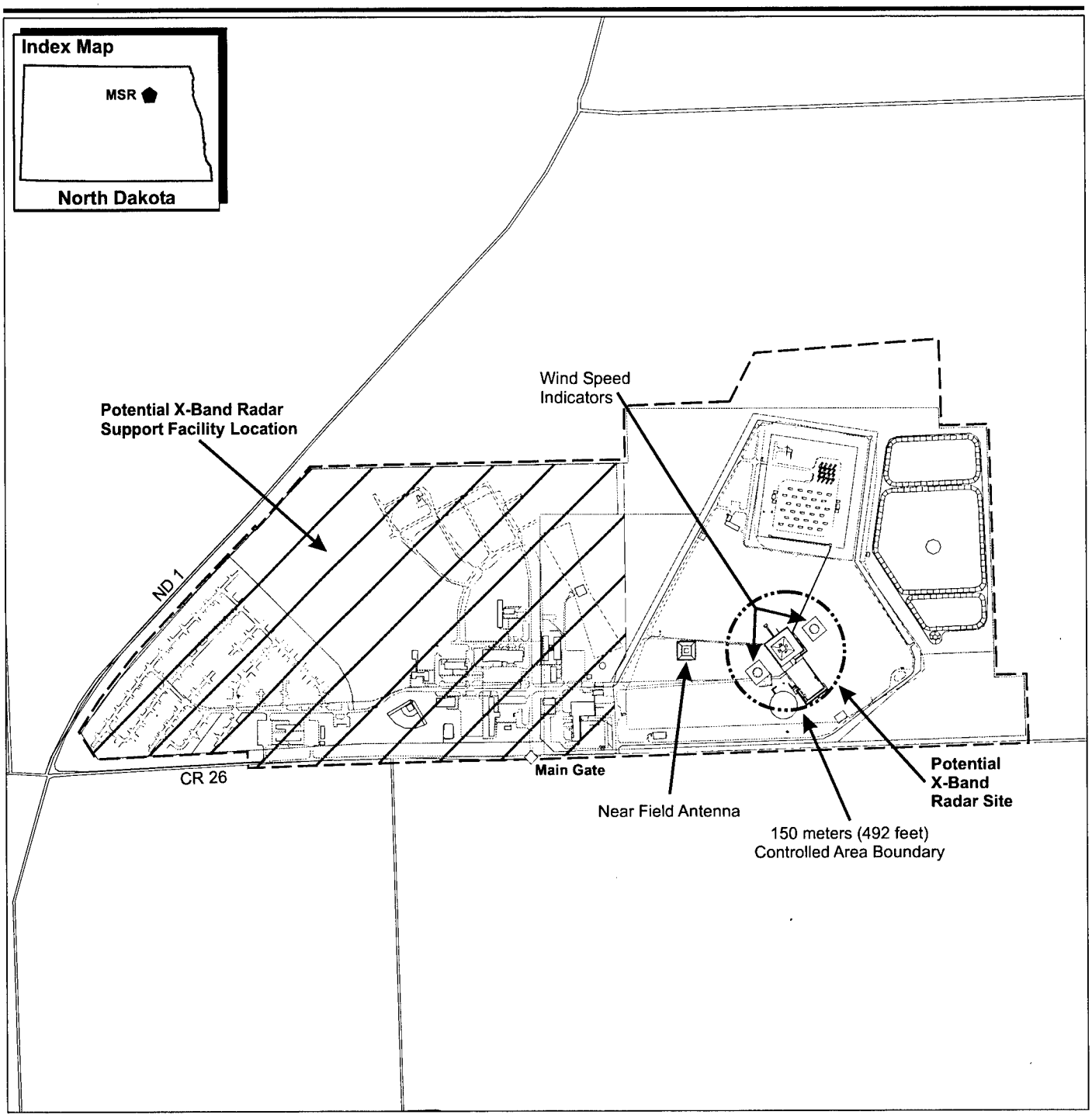
When the XBR becomes fully operational, the total operations-related employment would be 70 personnel. In addition, another 35 personnel would be required to operate base support functions.

2.4.4.3 SRMSC Missile Site Radar, North Dakota

The XBR would be located in the same location as the existing radar, requiring demolition of this facility. The XBR at this location would require the construction of support facilities as identified in table 2.4.4-2. In addition, most other facilities at this location would require demolition or modification. Figure 2.4.4-3 shows the basic facility layout. No provisions for storm water detention would be made at this site.

Table 2.4.4–2: X-Band Radar Facility Requirements, Missile Site Radar, North Dakota

New Facility Requirements	
Radar Support Tower	Parking Garages
Control and Maintenance Facility	Steam
Power Generation Plant	Warehouse
Near Field Antenna	Fire Station/Water Supply Facility/Fire Pump Building
Wind Speed Indicator Towers	Vehicle Storage and Maintenance
Fuel Storage Area	Vehicle Fueling
Perimeter Security and Surveillance	Instrument Flight Rules Helipad
Dining Facility	Hazardous Materials Storage Facility
Security	
Housing	
Utility Substation	



EXPLANATION

- Support Facility Location
- Installation Boundary
- Controlled Area Boundary
- Gate
- Wind Speed Indicator
- Near Field Antenna

CR = County Road
ND = North Dakota Highway

Scale 1:15,000

NORTH

0 625 1,250 Feet

0 191 381 Meters

Potential X-Band Radar Location, Missile Site Radar

North Dakota

Figure 2.4.4-3

Construction Requirements

Once a deployment decision is made, construction activities would take approximately 3 years, with the main construction effort occurring during the first 2 years. Most of the ground-disturbing activities would occur during the first 24 months. Construction and site activation personnel requirements would average 230.

Up to 20 hectares (50 acres) of previously disturbed land could be graded during construction activities at this site.

Operational Requirements

When the XBR becomes fully operational, the total operations-related employment would be 70 personnel. In addition, another 35 personnel would be required to operate base support functions.

2.4.4.4 SRMSC Remote Sprint Launch Site 1, North Dakota

The XBR would be totally contained within this existing site (figure 2.4.4-4). To deploy the radar unit, the existing missile silos and security building would require demolition. The abandoned launch control complex would remain, and the sewage lagoon would be enlarged and reactivated. The existing site access road would remain to service the site and would require no modification except resurfacing. A new water line would be located along the alignment from the county road adjacent to the site to the water treatment plant. The new facilities that would be required at this site are similar to those for the Missile Site Radar (see table 2.4.4-2). No provisions for storm water detention would be made at this site.

Construction Requirements

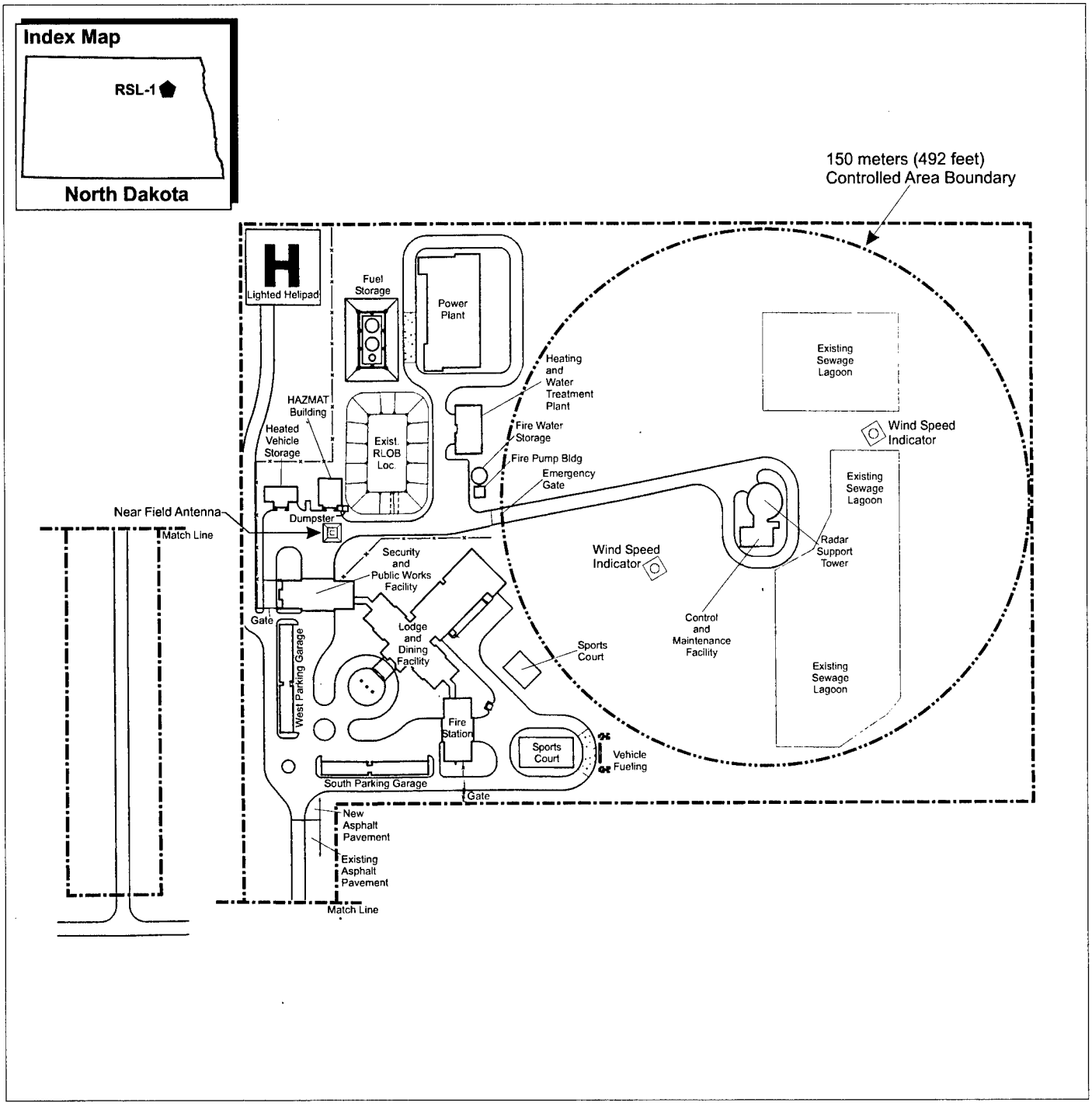
Most of the area contained within this 17-hectare (41-acre) site would be disturbed during construction activities, with ground-disturbing activities taking approximately 24 months. Construction and site activation personnel requirements would average 230.

Operational Requirements

When the XBR becomes fully operational, the total operations-related employment would be 70 personnel. In addition, another 35 personnel would be required to operate base support functions.

2.4.4.5 SRMSC Remote Sprint Launch Site 2, North Dakota

The XBR would be totally contained within this existing site (figure 2.4.4-5). To deploy the radar unit, all facilities at the site would require demolition except for the sewage lagoon, which would be enlarged and



EXPLANATION

- Controlled Area Boundary
- Wind Speed Indicator
- Near Field Antenna

RLOB = Remote Launch Operations Building

Potential X-Band Radar Location, Remote Sprint Launch Site 1

North Dakota

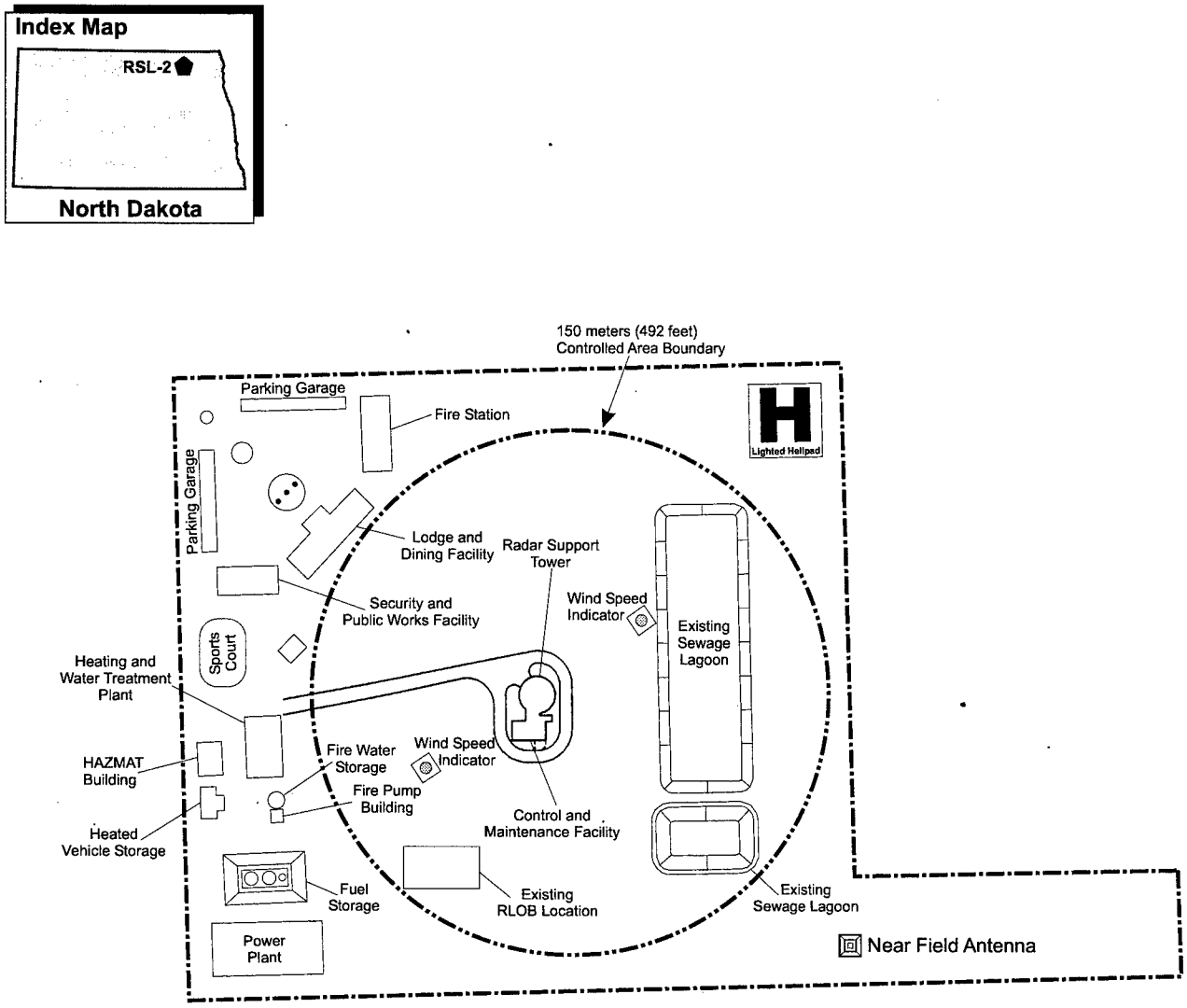
Scale

0 140 279 Feet

0 43 85 Meters

NORTH

Figure 2.4.4-4



EXPLANATION

- Controlled Area Boundary
- Wind Speed Indicator
- Near Field Antenna

RLOB = Remote Launch Operations Building

Scale 1:4,000

0 167 333 Feet

0 51 101 Meters

NORTH

Potential X-Band Radar Location, Remote Sprint Launch Site 2

North Dakota

Figure 2.4.4-5

dp_rsl2_xbr_001

reactivated. The existing site access road would remain to service the site and would require no modification except resurfacing. Water to the site would be obtained from the local water provider near the site. The new facilities that would be required at this site are similar to those for the Missile Site Radar (see table 2.4.4-2). No provisions for storm water detention would be made at this site.

Construction Requirements

Most of the area contained within this 15-hectare (36-acre) site would be disturbed during construction activities, with ground-disturbing activities taking approximately 24 months. Construction and site activation personnel requirements would average 230.

Operational Requirements

When the XBR becomes fully operational, the total operations-related employment would be 70 personnel. In addition, another 35 personnel would be required to operate base support functions.

2.4.4.6 SRMSC Remote Sprint Launch Site 4, North Dakota

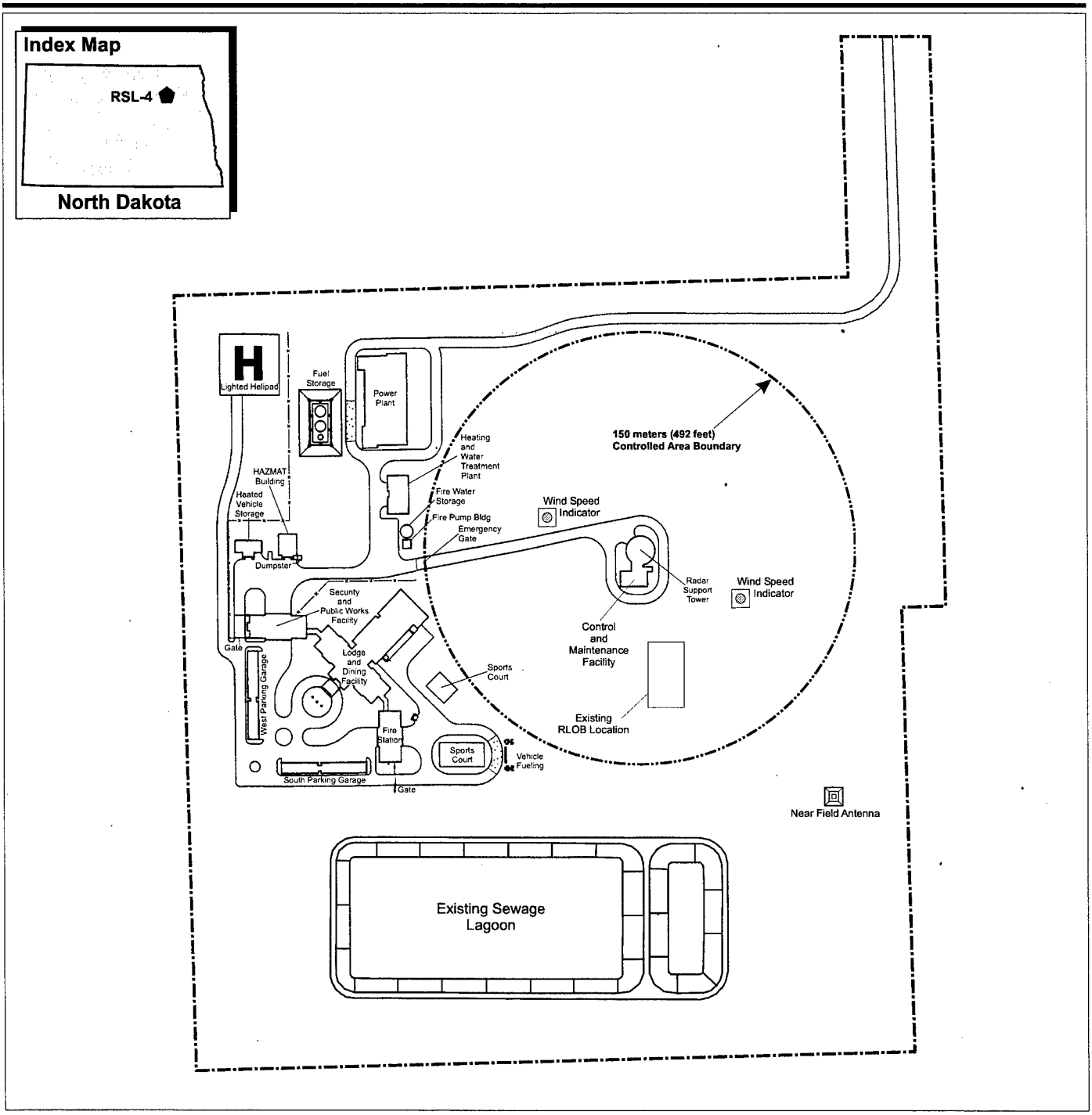
The XBR would be totally contained within this existing site (figure 2.4.4-6). To deploy the radar unit, all facilities at the site would require demolition except for the sewage lagoon, which would be enlarged and reactivated. The existing site access road would remain to service the site and would require no modification except resurfacing. Water to the site would be obtained from the local water provider near the site. The new facilities that would be required at this site are similar to those for the Missile Site Radar (see table 2.4.4-2). No provisions for storm water detention would be made at this site.

Construction Requirements

Most of the area contained within this 20-hectare (50-acre) site would be disturbed during construction activities, with ground-disturbing activities taking approximately 24 months. Construction and site activation personnel requirements would average 230.

Operational Requirements

When the XBR becomes fully operational, the total operations-related employment would be 70 personnel. In addition, another 35 personnel would be required to operate base support functions.



EXPLANATION

- Controlled Area Boundary
- Wind Speed Indicator
- Near Field Antenna

RLOB = Remote Launch Operations Building

Scale

0 180 360 Feet

0 55 110 Meters

NORTH

Potential X-Band Radar Location, Remote Sprint Launch Site 4

North Dakota

Figure 2.4.4-6

2.4.5 NMD SUPPORT FACILITIES AND INFRASTRUCTURE

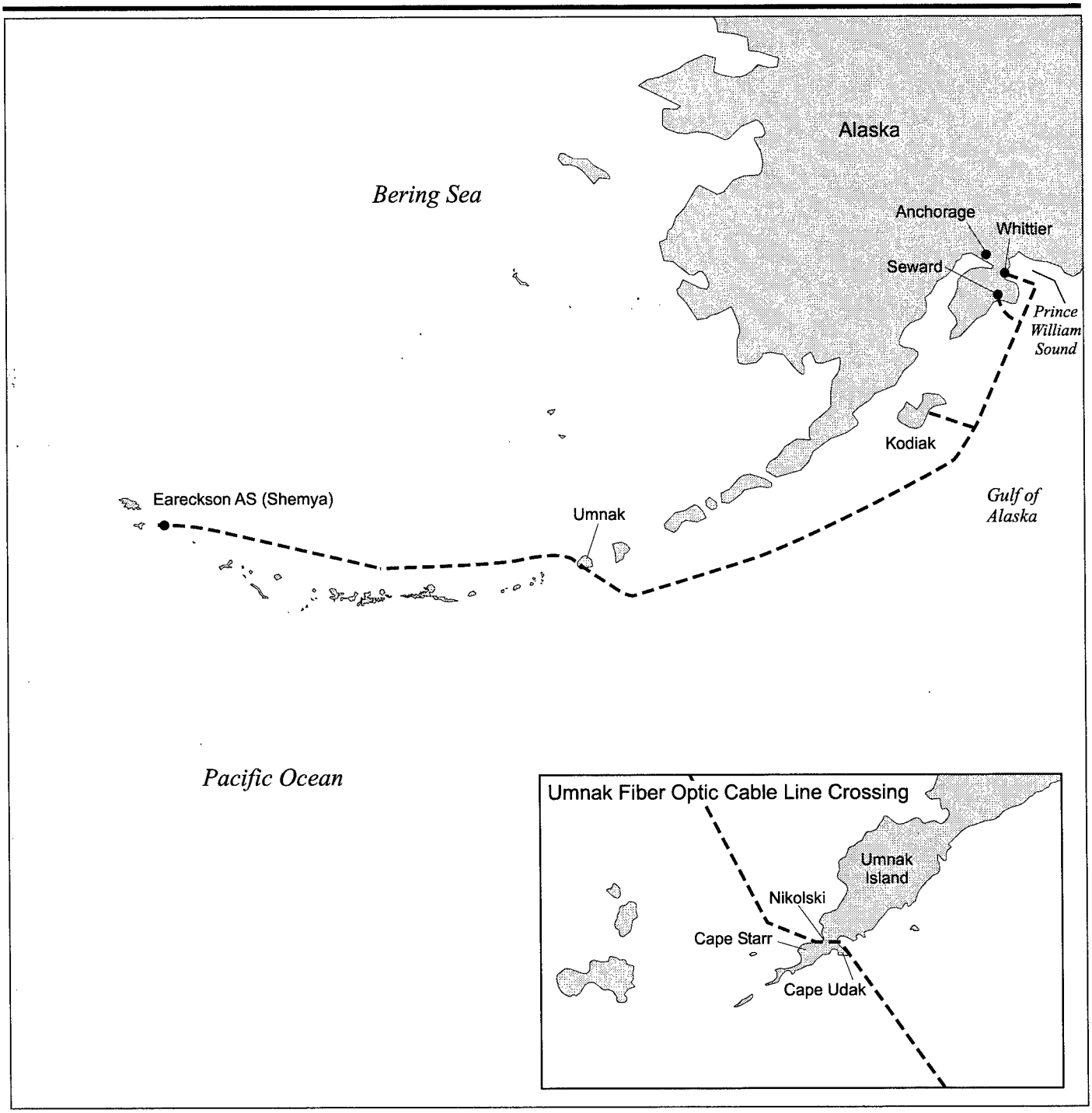
2.4.5.1 Fiber Optic Cable Line—Alaska

To provide a communication link between the elements that could be located in Alaska, new fiber optic cable line would be required for some elements in certain locations. For proposed Interior Alaska sites (i.e., Clear AFS, Fort Greely, Eielson AFB, and the Yukon Training Area), new fiber optic cable line would be connected to existing cable. This would require connections from the main line to the NMD element on that installation. In addition, some longer redundant lines may be needed to meet NMD reliability requirements. It is expected that the new fiber optic cable lines would utilize existing utility or road corridors when possible.

For proposed NMD elements in the Aleutian Islands, new fiber optic cable line would include a cable from Whittier or Seward to Eareckson AS (Shemya Island), Alaska. The cable would be laid during the summer months and would take approximately 30 to 90 days to install after a 30- to 90-day sea floor survey. In addition to this proposed route, a second redundant fiber optic cable line may be needed to meet NMD reliability requirements. The second route could be north of the Aleutian Islands or connect to existing fiber optic cable lines in the central Pacific or northwestern United States. Installation methods for this second route would be similar to those described for the Whittier or Seward to Eareckson AS route described below.

The fiber optic cable line to Eareckson AS from Whittier or Seward would be approximately 3,592 kilometers (2,232 miles) long (figure 2.4.5-1). This cable would primarily be placed underwater. The fiber optic cable line would be buried at a depth of 1 meter (3 feet) or more for depths up to 1,372 meters (4,500 feet) to avoid interference with fishing equipment and activities. For depths greater than 1,372 meters (4,500 feet), cable burial would not be necessary. The cable laying would be similar to any commercial fiber optic cable line operation (figure 2.4.5-2).

The cable route to Eareckson AS would start in Whittier or Seward using a pre-installed conduit. From the terminal building to the shoreline, the cable would be placed alongside an existing commercial fiber optic cable. From the shore, the cable would be placed in the ocean until making a landing on the Island of Kodiak north of the town of Monashka Bay. This would require crossing 457 meters (1,500 feet) of beach/land before reaching the existing utility corridors. From Kodiak, the cable would again be placed in the ocean until the Island of Umnak, where the cable would transition from the south side to the north side of the Aleutian Islands. The cable routed across the island would be along an existing dirt track. A terminal structure of 18 square meters (196 square feet) would be constructed on the island to which the cables would connect. This facility would include an electrical generator, batteries, and a diesel fuel



EXPLANATION

- Land Area
- Water Area
- Fiber Optic Cable Line

Scale 1:17,000,000

0 134 268 Miles

0 216 431 Kilometers

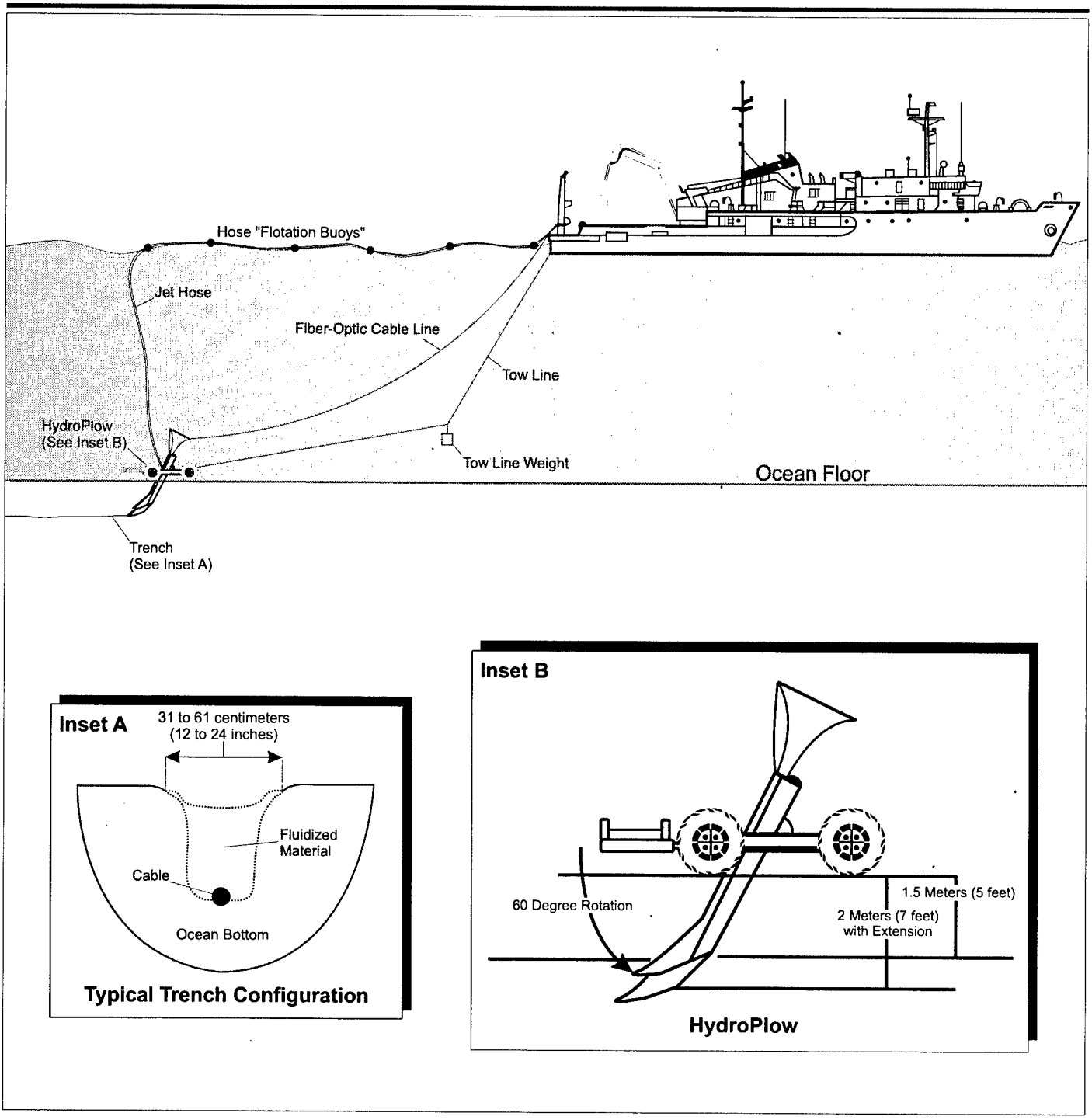
NORTH

dp_ak_fiber_001

Whittier or Seward to Eareckson Air Station Fiber Optic Cable Line Alignment

Alaska

Figure 2.4.5-1



EXPLANATION

For underwater depths of 1,371.6 meters (4,500 feet) or less.

Ocean Fiber Optic Cable Line Laying Concept

Alaska

Figure 2.4.5-2

Not to Scale

tank. From Umnak, the cable would then be laid to the Island of Shemya and would make landfall near the southeast end of the island (Fox Beach). Once on the island, the fiber optic cable line would follow existing utility corridors. Because the final ocean and land routes have not been completely surveyed for anomalies that may interfere with the cable, the final route may change.

2.4.5.2 Fiber Optic Cable Line—North Dakota

To provide a communication link between the elements, fiber optic cable line would be required if NMD elements are placed in the North Dakota region. To the extent possible, existing fiber optic cable line would be used. The new fiber optic cable line would be two separate cables with a minimum separation distance of 3 meters (10 feet). The cable would need to be from 2 to 3 meters (6 to 10 feet) below the surface because of ground freeze. No specific fiber optic cable line route has been sited for the potential North Dakota elements at this time. To the extent possible, fiber optic cable line would be located within existing roads, railway, and utility rights-of-way, with the cable being laid on both sides of the roadway, railway, and utility corridors to meet the required 3-meter (10-foot) separation distance. Placement would not affect local surface traffic except where the cable crosses an existing road network.

2.5 ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD

The following section briefly describes the methodology used to determine alternative potential deployment sites for NMD system elements. It also provides an overview of how certain sites were eliminated from further consideration.

Alaska

To fully satisfy NMD performance requirements, systems engineers determined that the GBI and XBR must be located within designated performance regions in Alaska. Alternative potential deployment locations were identified through the application of exclusionary criteria to DOD lands within these performance regions.

Ground-Based Interceptor. The performance region for the GBI was located in the northern half of Alaska. Within this area, 54 DOD-controlled lands were identified. These locations were evaluated against the following exclusionary criteria: special use lands, required parcel size for GBI deployment of up to 100 silos (243 hectares [600 acres]), sufficient usable land within the identified parcel, and availability of sufficient transportation modes to the location. Based on the application of these criteria, the only suitable locations were Clear AFS, Fort Greely, and the Yukon Training Area/Eielson AFB. The EIS analyzes several

potential sites at these locations. Because the other locations did not meet the exclusionary criteria, they were not addressed in this EIS.

Two potential GBI sites were initially identified at Fort Greely. However, one site (Area 5) was subsequently eliminated from further consideration because it was prone to seasonal flooding from Jarvis Creek. Four potential GBI sites were initially identified at the Yukon Training Area/Eielson AFB. Of these, three were subsequently eliminated from further consideration as follows: Engineer Hill offered poor prospects for construction, and facility layout would conflict with the mission of nearby Air Force Technical Application Center facilities. Bravo Battery and Charlie Battery offered poor road access, and existing site contamination would require a full construction season to remediate before any NMD GBI element construction.

X-Band Radar. The performance region for the XBR was determined to be the western end of the Aleutian Islands starting from Kiska Island. Within this area three DOD-controlled lands were identified. These locations were evaluated against exclusionary criteria tailored to the XBR, which included the four criteria used for GBI (with parcel size adjusted to 11 hectares [28 acres]), plus line of site and an EMR safety zone. Shemya Island was the only location that satisfied the line of sight criterion. Attu Research Site and Alaid Island Annex, the other two DOD-controlled lands within the performance region, did not pass this criterion and were excluded from further consideration on that basis. In an effort to expand the number of potential alternatives, the NMD program then considered the other, non-DOD, lands in the western Aleutians; however, none were determined to be feasible alternatives. The islands of Kiska, Buldir, Agattu, and the non-DOD owned portions of Attu are all designated as elements within the Alaska Maritime Wildlife Refuge and a designated wilderness area. In addition, because of its known volcanic activity, Kiska could not be considered suitable for a seismically sensitive, high-cost, system-critical NMD asset such as an XBR. In the case of the other islands, some mountaintops might provide the XBR clear line of sight. However, after considering these islands' wilderness designation as well as lack of infrastructure (roads, ports, power, quarters, personnel support services, communications, etc.) the NMD program determined that none could provide a superior alternative to Shemya Island, with its existing infrastructure and ongoing military mission. For this reason, the program opted not to pursue the legal actions needed to redesignate portions of one or more of these islands to permit their use for construction and operations of the XBR. For these reasons, Kiska, Buldir, Agattu, and Attu are classified as alternatives considered but not carried forward.

North Dakota

Sites in North Dakota were selected based on their location within the 1972 Anti-Ballistic Missile Treaty deployment area. Under the Treaty,

the main NMD elements (GBI and XBR) would have to be located within a 150-kilometer (93-mile) radius area centered around the former Minuteman field near Grand Forks AFB. DOD lands within this area were evaluated against the same siting criteria as noted for the Alaska sites. Within this area 199 DOD controlled locations were identified.

Ground-Based Interceptor. Of the 199 DOD sites identified within the region, only Grand Forks AFB had sufficient acreage to accommodate the GBI facilities. However, the Missile Site Radar, which only has 170 hectares (420 acres), was determined as being an acceptable site given its existing safety easements for adjacent properties.

X-Band Radar. Of the 199 DOD sites identified within the region, only Cavalier AFS, the Missile Site Radar, and Remote Sprint Launch Sites 1, 2 and 4 met all of the siting criteria. The other sites within the region were eliminated because of land size or line of sight criteria.

2.6 OTHER FUTURE ACTIONS IN THE REGIONS OF PROGRAM ACTIVITIES

This section provides an overview of other actions in the region or each alternative that could potentially contribute to cumulative impacts in conjunction with NMD deployment. In addition to the NMD program, other future proposed projects anticipated to occur during the same period as the NMD construction and operation were reviewed. Proposed projects considered as reasonably foreseeable were based on a review of installation and regional land use plans and discussions with installation and regional planners. Listed below are the projects that are being considered for cumulative impacts within this EIS. Existing activities are captured within the affected environment section of this EIS and the No-action Alternative.

Alaska

Clear AFS

- Construct Solid-State Phased Array Radar—expected completion date summer 2000

Eareckson AS

- Review of existing documentation shows that there are currently no major projects that may contribute to cumulative impacts in the timeframe of NMD construction. There may be some minor repairs and alterations to existing facilities.

Eielson AFB

- Construct Consolidated Munitions Facility in 1999

- Repair KC-135 Parking Ramp in 2000
- Repair Runway in 2000
- Construct Weapons and Release System Shop in 2001
- Construct Transportation Heavy Maintenance Facility in 2001
- Construct Phase 2 of Supply Complex in 2001
- Construct Vehicle Munitions Heated Parking in 2001
- Construct HAZWASTE Collection Facility in 2001
- Construct All-Weather Family Wellness Center in 2001
- Construct Aircraft Support Equipment Facility in 2002
- Construct Fuel Operations Facility in 2002
- Add/alter All-Weather Fitness Center in 2002
- Construct Munitions Storage/Inspection Facility in 2003
- Construct Munitions Assembly Facility in 2003
- Construct Fabrication Flight Consolidation Facility in 2003
- Add Security Lighting, Aircraft Parking Apron in 2003
- Construct Joint Deployment Processing Facility in 2003

Fort Greely

- Construct new power line from Richardson highway to the Alascom Microwave Site
- Potential public reuse of closed base cantonment area to include industrial, commercial, and institutional uses. Potential for a correctional facility.

Yukon Training Area

- Construct minor roads and extend power lines in various portions of the maneuver area
- Construct one new urban training site in several potential locations in the maneuver area
- Clear and expand Mock Airfield in the Stuart Creek Impact Area

North Dakota

Cavalier AFS

- Construct an addition to the Fitness Center in 2001
- Construct new parking lot and road in 2001
- Upgrade Community Center in 2002
- Construct four housing units in 2002

- Construct new Base Civil Engineering Self Help Center in 2003
- Demolish Buildings 705, 706, and 736 in 2002
- Construct new water treatment building in 2000
- Construct new unaccompanied enlisted personnel housing/unaccompanied officer personnel housing in 2003
- Construct new supply warehouse in 2000
- Potential dismantlement or destruction of Perimeter Acquisition Radar

Grand Forks AFB

- Construct new Commissary near the front gate in 2002
- Construct new Squadron Operations Facility near the flight line in 2005 (projected)
- Construct Extended Flightline Parking Ramp in 2002 (projected)
- Continue restoration of the city of Grand Forks from flood damage until 2002
- Continue restoration efforts of Devils Lake flooding

SRMSC Missile Site Radar

- Potential dismantlement or destruction of existing site facilities

SRMSC Remote Sprint Launch Site 1

- Potential dismantlement or destruction of existing site facilities

SRMSC Remote Sprint Launch Site 2

- Potential dismantlement or destruction of existing site facilities

SRMSC Remote Sprint Launch Site 4

- Potential dismantlement or destruction of existing site facilities

2.7 COMPARISON OF ENVIRONMENTAL IMPACTS

A summary comparison of the environmental impacts for the alternatives, along with their potential mitigation, for each resource affected over the study period is presented in tables 2.7-1 through 2.7-7. Impacts to the environment are described briefly in the summary and discussed in detail in chapter 4.0. The potential impacts of the No-action Alternative provide the baseline in which to compare the potential environmental consequences of NMD deployment and operation.

Table 2.7-1: Summary of Environmental Impacts for the No-action Alternative

Resource Category	ALASKA SITES					NORTH DAKOTA SITES			
	Clear AFS	Eareckson AS	Eielson AFB	Fort Greely	Yukon Training Area	Cavalier AFS	Grand Forks AFB	Missile Site Radar	Remote Sprint Launch Sites 1, 2, and 4
Air Quality	No change to the region's current attainment status	No change to the region's current attainment status	No change to the region's current attainment status	No change to the region's current attainment status	No change to the region's current attainment status	No change to the region's current attainment status	No change to the region's current attainment status	No change to the region's current attainment status	No change to the region's current attainment status
Airspace	No change in airspace status or use	No change in airspace status or use	No change in airspace status or use	No change in airspace status or use	No change in airspace status or use	No change in airspace status or use	No change in airspace status or use	No change in airspace status or use	No change in airspace status or use
Biological Resources	No impacts to biological resources from continued operations	No impacts to biological resources from continued operations	Minimal impacts to wildlife and threatened and endangered species from aircraft activities. Plans are in place to minimize impacts	Minimal impacts to vegetation, wildlife, and threatened and endangered species from training activities. Plans are in place to minimize impacts	Minimal impacts to vegetation, wildlife, and threatened and endangered species from training activities. Plans are in place to minimize impacts	No impacts to biological resources from continued operations	No impacts to biological resources from continued operations	No impacts to biological resources from continued operations	No impacts to biological resources from continued operations
Cultural Resources	No impacts, resources would continue to be managed in accordance with cultural resource regulations	No impacts, resources would continue to be managed in accordance with cultural resource regulations	No impacts, resources would continue to be managed in accordance with cultural resource regulations	No impacts, resources would continue to be managed in accordance with cultural resource regulations	No impacts, resources would continue to be managed in accordance with cultural resource regulations	No impacts, resources would continue to be managed in accordance with cultural resource regulations	No impacts, resources would continue to be managed in accordance with cultural resource regulations	No impacts, resources would continue to be managed in accordance with cultural resource regulations	No impacts, resources would continue to be managed in accordance with cultural resource regulations
Geology and Soils	No impact	No impact	No impact	Potential for short-term and cumulative impact to soil and permafrost from training activities **Mitigation**: Reduce soil and permafrost impacts through best management practices	Potential for short-term and cumulative impact to soil and permafrost from training activities **Mitigation**: Reduce soil and permafrost impacts through best management practices	No impact	No impact	No impact	No impact
Hazardous Materials and Hazardous Waste Management	Continued use of hazardous materials and generation of hazardous waste in accordance with appropriate regulations. Continued remediation of hazardous waste sites	Continued use of hazardous materials and generation of hazardous waste in accordance with appropriate regulations. Continued remediation of hazardous waste sites	Continued use of hazardous materials and generation of hazardous waste in accordance with appropriate regulations. Continued remediation of hazardous waste sites	Continued use of hazardous materials and generation of hazardous waste in accordance with appropriate regulations. Continued remediation of hazardous waste sites	Continued use of hazardous materials and generation of hazardous waste in accordance with appropriate regulations. Continued remediation of hazardous waste sites	Continued use of hazardous materials and generation of hazardous waste in accordance with appropriate regulations. Continued remediation of hazardous waste sites	Continued use of hazardous materials and generation of hazardous waste in accordance with appropriate regulations. Continued remediation of hazardous waste sites	Continued use of hazardous materials and generation of hazardous waste in accordance with appropriate regulations. Continued remediation of hazardous waste sites	Continued use of hazardous materials and generation of hazardous waste in accordance with appropriate regulations. Continued remediation of hazardous waste sites

Table 2.7-1: Summary of Environmental Impacts for the No-action Alternative (Continued)

Resource Category	ALASKA SITES					NORTH DAKOTA SITES			
	Clear AFS	Eareckson AS	Eielson AFB	Fort Greely	Yukon Training Area	Cavalier AFS	Grand Forks AFB	Missile Site Radar	Remote Sprint Launch Sites 1, 2, and 4
Health and Safety	No impact	No impact	No impact	No impact	No impact	No impact	No impact	No impact	No impact
Land Use and Aesthetics	Current base activities are compatible with regional and local planning/zoning and surrounding on and off-base land uses	Current base activities are compatible with regional and local planning/zoning and surrounding on and off-base land uses	Incompatible residential land uses are within runway clear zone	Current base activities are compatible with regional and local planning/zoning and surrounding on and off-base land uses	Current base activities are compatible with regional and local planning/zoning and surrounding on and off-base land uses	Current base activities are compatible with regional and local planning/zoning and surrounding on and off-base land uses	Current base activities are compatible with regional and local planning/zoning and surrounding on and off-base land uses	Current base activities are compatible with regional and local planning/zoning and surrounding on and off-base land uses	Current base activities are compatible with regional and local planning/zoning and surrounding on and off-base land uses
Noise	No impact	No impact	Residential area of Moose Creek is within day-night level 65 decibels A-weighted noise contour from aircraft noise	No impact	No impact	No impact	No impact	No impact	No impact
Socioeconomics	Base operations would continue to provide economic benefits	No impact	Base operations would continue to provide economic benefits	Economic impact from loss of jobs associated with base realignment	Base operations would continue to provide economic benefits	Base operations would continue to provide economic benefits	Base operations would continue to provide economic benefits	No activities occur at this site; therefore, there are no economic benefits	No activities occur at these sites; therefore, there are no economic benefits
Transportation	No change to current level of service on roadways	No impact	No change to current level of service on roadways	No change to current level of service on roadways	No change to current level of service on roadways	No change to current level of service on roadways	No change to current level of service on roadways	No change to current level of service on roadways	No change to current level of service on roadways
Utilities	Utility systems are adequate to handle demand	Utility systems are adequate to handle demand	Utility systems are adequate to handle demand	Utility systems are adequate to handle demand	Utility systems are adequate to handle demand	Utility systems are adequate to handle demand	Utility systems are adequate to handle demand	Utility systems are adequate to handle demand	Utility systems are adequate to handle demand
Water Resources	No change to water resources in the region	No change to water resources in the region	No change to water resources in the region	Potential for impacts to water resources from military training activities **Mitigation**: Use existing management practices and storm water plans to reduce potential water impacts	Potential for impacts to water resources from military training activities **Mitigation**: Use existing management practices and storm water plans to reduce potential water impacts	No change to water resources in the region	No change to water resources in the region	No change to water resources in the region	No change to water resources in the region

Table 2.7-1: Summary of Environmental Impacts for the No-action Alternative (Continued)

Resource Category	ALASKA SITES					NORTH DAKOTA SITES			
	Clear AFS	Eareckson AS	Eielson AFB	Fort Greely	Yukon Training Area	Cavalier AFS	Grand Forks AFB	Missile Site Radar	Remote Sprint Launch Sites 1, 2, and 4
Environmental Justice	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected
Subsistence	No impact to subsistence uses in and around Clear AFS	Restricted access on the island precludes subsistence use	No impact to subsistence use in and around Eielson AFB	No impact to subsistence uses in and around Fort Greely	No impact to subsistence use in and around the Yukon Training Area	Not applicable to North Dakota	Not applicable to North Dakota	Not applicable to North Dakota	Not applicable to North Dakota

Table 2.7-2: Summary of Environmental Impacts for Deployment of the Ground-Based Interceptor

Resource Category	ALASKA SITES			NORTH DAKOTA SITES	
	Clear AFS	Fort Greely	Yukon Training Area/Eielson AFB	Grand Forks AFB	Missile Site Radar
Air Quality	Increase in air emissions from construction and operation would not affect the region's current attainment status. Will not affect Denali National Park visibility	Increase in air emissions from construction and operation would not affect the region's current attainment status	Increase in air emissions from construction and operation would not affect the region's current attainment status	Increase in air emissions from construction and operation would not affect the region's current attainment status	Increase in air emissions from construction and operation would not affect the region's current attainment status
Airspace	No impact	No impact	No impact	No impact	No impact
Biological Resources	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species. The potential exists to impact between 2.7 hectares (6.6 acres) and 55 hectares (135 acres) of wetlands depending on location selected **Mitigation:** Develop mitigation measures to wetlands through the consultation and permitting process	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species. No wetlands would be impacted	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species. The potential exists to impact 46 hectares (113 acres) of low-value wetlands **Mitigation**: Develop mitigation measures to wetlands through the consultation and permitting process	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species. The potential exists to impact 5 hectares (12 acres) of wetlands from OT-5 deployment alternative **Mitigation**: Develop mitigation measures to wetlands through the consultation and permitting process	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species. The potential exists for sedimentation to impact Roaring Nancy Creek which is a wetland **Mitigation:** Develop mitigation measures to wetlands through the consultation and permitting process
Cultural Resources	No adverse effects	No adverse effects	Potential effect on archaeological site and possible historic structure **Mitigation**: Consult with the State Historic Preservation Officer to minimize adverse effects. Mitigation could include recovery of data from archaeological site and recordation of possible historic structure	No impact	Adverse impact to historic structures has been mitigated through completed Historic American Engineering Record documentation
Geology and Soils	Minor increase in soil erosion would be localized to the construction site. Potential for deployment to affect some permafrost areas. Site design would minimize impacts by avoidance if possible **Mitigation:** Avoid permafrost areas as much as possible. Conduct detailed permafrost studies of potential deployment site. Design facilities to minimize impacts to permafrost	Minor increase in soil erosion would be localized to the construction site. Minimal impact to permafrost	Short-term impacts from soil erosion during construction. Long-term impacts to permafrost at the deployment site which could result in subsidence, increase erosion, and gully formation **Mitigation**: Minimize soil erosion by implementation of standard erosion control techniques. Avoid permafrost areas as much as possible. Conduct detailed permafrost studies of potential deployment site. Design facilities to minimize impacts to permafrost	Short-term impacts from soil erosion during construction **Mitigation**: Minimize soil erosion by implementation of standard erosion control techniques	Short-term impacts from soil erosion during construction **Mitigation**: Minimize soil erosion by implementation of standard erosion control techniques

Table 2.7-2: Summary of Environmental Impacts for Deployment of the Ground-Based Interceptor (Continued)

Resource Category	ALASKA SITES			NORTH DAKOTA SITES	
	Clear AFS	Fort Greely	Yukon Training Area/Eielson AFB	Grand Forks AFB	Missile Site Radar
Hazardous Materials and Hazardous Waste Management	Increase in hazardous materials use and hazardous waste generation. All hazardous material and waste handled in accordance with appropriate regulations. Storage tanks would be subject to all appropriate regulations	Increase in hazardous materials use and hazardous waste generation. All hazardous material and waste handled in accordance with appropriate regulations. Storage tanks would be subject to all appropriate regulations	Increase in hazardous materials use and hazardous waste generation. All hazardous material and waste handled in accordance with appropriate regulations. Storage tanks would be subject to all appropriate regulations	Increase in hazardous materials use and hazardous waste generation. All hazardous material and waste handled in accordance with appropriate regulations. Storage tanks would be subject to all appropriate regulations	Increase in hazardous materials use and hazardous waste generation. All hazardous material and waste handled in accordance with appropriate regulations. Storage tanks would be subject to all appropriate regulations
Health and Safety	Minimal increase in health and safety risks. Potential for a GBI mishap during handling is unlikely. In the event of an unlikely accidental liquid propellant leak hazardous gases could exceed base boundary under the Alternative B Site affecting up to 122 hectares (302 acres); however, no occupied structures exist within this area. No off-base areas impacted under Alternative A Site **Mitigation**: Update mutual aid agreements with local fire departments to include additional hazards associated with GBI deployment	Minimal increase in health and safety risks. Potential for a GBI mishap during handling is unlikely. In the event of an unlikely accidental liquid propellant leak hazardous gases could exceed base boundary affecting up to 14 hectares (35 acres); however, no occupied structures exist within this area. GBI Deployment would require revision to area fire protection status **Mitigation**: Change fire protection status from Full to Critical. Update mutual aid agreements with local fire departments to include additional hazards associated with GBI deployment	Minimal increase in health and safety risks. Potential for a GBI mishap during handling is unlikely. In the event of an unlikely accidental liquid propellant leak hazardous gases would not exceed base boundary. GBI Deployment would require revision to area fire protection status **Mitigation**: Change fire protection status from Full to Critical. Update mutual aid agreements with local fire departments to include additional hazards associated with GBI deployment	Minimal increase in health and safety risks. Potential for a GBI mishap during handling is unlikely. In the event of an unlikely accidental liquid propellant leak hazardous gases could exceed base boundary* affecting up to 107 hectares (264 acres) for weapon storage alternative (area includes three commercial structures, two churches, and one residential unit) and 306 hectares (757 acres) for OT-5 alternative (area includes one residential unit) **Mitigation**: Update mutual aid agreements with local fire departments to include additional hazards associated with GBI deployment	Minimal increase in health and safety risks. Potential for a GBI mishap during handling is unlikely. In the event of an unlikely accidental liquid propellant leak hazardous gases could exceed base boundary affecting up to 225 hectares (557 acres); this area includes one commercial structure and an unoccupied farm building. In addition, the explosive safety quantity distances associated with the GBI facilities exceed the base boundary which includes open agricultural lands **Mitigation**: Update mutual aid agreements with local fire departments to include additional hazards associated with GBI deployment. Review existing safety lease agreements for the site and determine if any modifications or addition would be required
Land Use and Aesthetics	Deployment of the GBI would be compatible with regional and local planning/zoning and surrounding on and off-base land uses	Deployment of the GBI would be compatible with regional and local planning/zoning and surrounding on and off-base land uses	Deployment of the GBI would be compatible with regional and local planning/zoning and surrounding on and off-base land uses	Deployment of the GBI would be compatible with regional and local planning/zoning and surrounding on and off-base land uses	Deployment of the GBI would be compatible with regional and local planning/zoning. Explosive safety quantity distances would exceed base boundary but would be compatible with the agricultural uses of the land **Mitigation**: To ensure future land use compatibility, review existing lease agreements for the site and determine if any modifications or addition would be required to ensure no structures would be built within the explosive safety quantity distances

Table 2.7-2: Summary of Environmental Impacts for Deployment of the Ground-Based Interceptor (Continued)

Resource Category	ALASKA SITES			NORTH DAKOTA SITES	
	Clear AFS	Fort Greely	Yukon Training Area/Eielson AFB	Grand Forks AFB	Missile Site Radar
Noise	No impact	No impact	No impact	Potential for short-term construction related noise disturbance to 2 churches and 1 residential unit from Weapon Storage Area alternative and 1 residential unit from the OT-5 alternative; however, no long-term impacts	Potential for short-term construction related noise disturbance to 2 residential units; however, no long-term impacts
Socioeconomics	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. No impact on public services	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. The economic benefit would help reduce the adverse economic impact as a result of base realignment at Fort Greely. No impact on public services	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. No impact on public services	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities retail sales and tax base. No impact on public services	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. No impact on public services
Transportation	Level of service on the George Parks Highway would change from B to C as a result of temporary construction related impacts. The level of service would change back to B after construction	Change in level of service from B to C in Delta Junction at intersection of state highways 2 and 4 as a result of potential long-term cumulative operational impacts	Level of service on the Richardson Highway would change from A to B as a result of temporary cumulative construction related impacts. The level of service would change back to A after construction	No change to level of service on roadways	Level of service on North Dakota highways 1 and 5 within Langdon would change from A to B as a result of cumulative temporary construction related impacts. Level of service would change back to A after construction
Utilities	Current utility systems have adequate capacity to support deployment	Current utility systems have adequate capacity to support deployment	Current utility systems have adequate capacity to support deployment	Current utility systems have adequate capacity to support deployment	Current utility systems have adequate capacity to support deployment
Water Resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources
Environmental Justice	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected
Subsistence	Decrease in the amount of land available for subsistence uses; however, the area is not a main subsistence use area in region due to limited access to the base	Decrease in the amount of land available for subsistence uses; however, the area is not a main subsistence use area in region	Decrease in the amount of land available for subsistence uses; however, the area is not a main subsistence use area in region	Not applicable to North Dakota	Not applicable to North Dakota

Table 2.7-3: Summary of Environmental Impacts for Deployment of the Battle Management Command and Control

Resource Category	ALASKA SITES			NORTH DAKOTA SITES	
	Clear AFS	Fort Greely	Yukon Training Area/ Eielson AFB	Grand Forks AFB	Missile Site Radar
Air Quality	Increase in air emissions from construction and operation would not affect the region's current attainment status. Will not affect Denali National Park visibility	Increase in air emissions from construction and operation would not affect the region's current attainment status	Increase in air emissions from construction and operation would not affect the region's current attainment status	Increase in air emissions from construction and operation would not affect the region's current attainment status	Increase in air emissions from construction and operation would not affect the region's current attainment status
Airspace	No impact	No impact	No impact	No impact	No impact
Biological Resources	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species. The potential exists to impact wetlands **Mitigation**: Develop mitigation measures to wetlands through the consultation and permitting process	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species. No wetlands would be impacted	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species. The potential exists to impact low-value wetlands **Mitigation**: Develop mitigation measures to wetlands through the consultation and permitting process	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species. No wetlands would be impacted	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species. The potential exists for sedimentation to impact Roaring Nancy Creek which is a wetland **Mitigation**: Develop mitigation measures to wetlands through the consultation and permitting process
Cultural Resources	No adverse effects	No adverse effects	Potential effect on archaeological site **Mitigation**: Consult with the State Historic Preservation Officer to minimize adverse effects. Mitigation could include recovery of data from archaeological site	No impact	Adverse impact to historic structures has been mitigated through completed Historic American Engineering Record documentation
Geology and Soils	Minor increase in soil erosion would be localized to the construction site. Potential for deployment to affect some permafrost areas. Site design would minimize impacts by avoidance if possible **Mitigation**: Avoid permafrost areas as much as possible. Conduct detailed permafrost studies of potential deployment site. Design facilities to minimize impacts to permafrost	Minor increase in soil erosion would be localized to the construction site. Potential for deployment to affect some permafrost areas. Site design would minimize impacts by avoidance if possible **Mitigation**: Avoid permafrost areas as much as possible. Conduct detailed permafrost studies of potential deployment site. Design facilities to minimize impacts to permafrost	Short-term impacts from soil erosion during construction. Long-term impacts to permafrost at the deployment site which could result in subsidence, increase erosion, and gully formation **Mitigation**: Minimize soil erosion by implementation of standard erosion control techniques. Avoid permafrost areas as much as possible. Conduct detailed permafrost studies of potential deployment site. Design facilities to minimize impacts to permafrost	Short-term impacts from soil erosion during construction **Mitigation**: Minimize soil erosion by implementation of standard erosion control techniques	Short-term impacts from soil erosion during construction **Mitigation**: Minimize soil erosion by implementation of standard erosion control techniques

Table 2.7-3: Summary of Environmental Impacts for Deployment of the Battle Management Command and Control (Continued)

Resource Category	ALASKA SITES			NORTH DAKOTA SITES	
	Clear AFS	Fort Greely	Yukon Training Area/ Eielson AFB	Grand Forks AFB	Missile Site Radar
Hazardous Materials and Hazardous Waste Management	No impact	No impact	No impact	No impact	No impact
Health and Safety	No impact	No impact	No impact	No impact	No impact
Land Use and Aesthetics	Deployment of the BMC2 would be compatible with regional and local planning/zoning and surrounding on and off-base land uses	Deployment of the BMC2 would be compatible with regional and local planning/zoning and surrounding on and off-base land uses	Deployment of the BMC2 would be compatible with regional and local planning/zoning and surrounding on and off-base land uses	Deployment of the BMC2 would be compatible with regional and local planning/zoning and surrounding on and off-base land uses	Deployment of the BMC2 would be compatible with regional and local planning/zoning and surrounding on and off-base land uses
Noise	No impact	No impact	No impact	No impact	No impact
Socioeconomics	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. No impact on public services	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. The economic benefit would help reduce the adverse economic impact as a result of base realignment at Fort Greely. No impact on public services	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. No impact on public services	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. No impact on public services	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. No impact on public services
Transportation	Level of service on the George Parks Highway would change from B to C as a result of temporary construction related impacts. The level of service would change back to B after construction.	Change in level of service from B to C in Delta Junction at intersection of state highways 2 and 4 as a result of potential long-term cumulative operational impacts	Level of service on the Richardson Highway would change from A to B as a result of temporary cumulative construction related impacts. The level of service would change back to A after construction	No change to level of service on roadways	Level of service on North Dakota highways 1 and 5 within Langdon would change from A to B as a result of cumulative temporary construction related impacts. Level of service would change back to A after construction
Utilities	No impact	No impact	No impact	No impact	No impact
Water Resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources
Environmental Justice	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected
Subsistence	Decrease in the amount of land available for subsistence uses; however, the area is not a main subsistence use area in region due to limited access to the base	Decrease in the amount of land available for subsistence uses; however, the area is not a main subsistence use area in region	Decrease in the amount of land available for subsistence uses; however, the area is not a main subsistence use area in region	Not applicable to North Dakota	Not applicable to North Dakota

Table 2.7-4: Summary of Environmental Impacts for Deployment of the In-Flight Interceptor Communications System (IFICS) Data Terminal

Resource Category	Potential Environmental Impact
Air Quality	Increase in air emissions from construction and operation would be minimal. Operations emissions associated with electrical generator would not be expected to change air quality in deployment region
Airspace	Deployment would not require any change in airspace use in the deployment region
Biological Resources	Minimal impacts expected from the construction and operation of an IFICS Data Terminal site to vegetation, wildlife, threatened or endangered species, and wetlands. Sensitive biological areas would be avoided during the siting process. Annual test of system would not impact wildlife
Cultural Resources	Potential for construction to impact archaeological resources; however, sensitive cultural resource areas would be avoided during the siting process, if possible. Overall, no adverse impacts are expected
Geology and Soils	Minimal impacts expected from the construction and operation of an IFICS Data Terminal site. Construction related impacts would be short-term
Hazardous Materials and Hazardous Waste Management	Minimal use of hazardous materials and generation of hazardous waste at the deployment site. All hazardous material and waste handled in accordance with appropriate regulations. Storage tanks would be subject to all appropriate regulations
Health and Safety	During normal NMD operations, the IFICS Data Terminal would not transmit except during annual testing of the equipment. It is expected that a power/calibration test of the transmitter would occur once a year. During this test, electromagnetic radiation would be generated by the IFICS Data Terminal. Electromagnetic radiation levels would not exceed personnel exposure limits during the annual test at the site
Land Use and Aesthetics	This element would affect approximately 7 hectares (17 acres) of land. Due to this project only affecting such a small portion of land it should not drastically affect the land use regardless of where it is located. The NMD program would comply with all applicable Federal and state land use laws. The significance of visual impacts from a deployment site would depend on the sensitivity of the affected views, as well as visual dominance of facilities. Impacts could occur if the facilities were within views of medium to high sensitivity public use areas and travel routes. However, it is anticipated that the IFICS Data Terminal would be located on a DOD installation with similar facilities and limited public access resulting in no visual impacts
Noise	Minimal noise impacts expected from operation of electrical generator inside of a shelter
Socioeconomics	There would be a minimal security personnel force associated with deployment of an IFICS Data Terminal. In addition, construction of the site would create minimal construction related jobs. There would be no impact to local or regional socioeconomic resources
Transportation	There may be a minimal security personnel force associated with deployment of an IFICS Data Terminal; therefore, there would be minimal impact to local or regional transportation resources
Utilities	There may be a minimal site security force associated with operation of the IFICS Data Terminal. The site would require a small amount of electricity to operate. The site may have water connections or use bottled water for the security personnel. Overall, there would be no impact to utilities
Water Resources	Minimal impacts expected from the construction and operation of an IFICS Data Terminal site. Construction related impacts would be short-term
Environmental Justice	No adverse human health and environmental impacts would be expected from construction and operation of the IFICS Data Terminal. No environmental justice concerns have been identified
Subsistence	Given the small area required for deployment it is not expected that construction or operation would affect subsistence resources in the State of Alaska if the IFICS Data Terminal were deployed in this state

Table 2.7-5: Summary of Environmental Impacts for Deployment of the X-Band Radar

Resource Category	ALASKA SITE	NORTH DAKOTA SITES				
	Eareckson AS	Cavalier AFS	Missile Site Radar	Remote Sprint Launch Site 1	Remote Sprint Launch Site 2	Remote Sprint Launch Site 4
Air Quality	Increase in air emissions from construction and operation would not affect the region's current attainment status	Increase in air emissions from construction and operation would not affect the region's current attainment status	Increase in air emissions from construction and operation would not affect the region's current attainment status	Increase in air emissions from construction and operation would not affect the region's current attainment status	Increase in air emissions from construction and operation would not affect the region's current attainment status	Increase in air emissions from construction and operation would not affect the region's current attainment status
Airspace	Establishment of a high energy radiation area warning on aeronautical charts would not pose any flight restriction requirements; therefore, there would be no impacts to airspace	Establishment of a high energy radiation area warning on aeronautical charts would not pose any flight restriction requirements; therefore, there would be no impacts to airspace	Establishment of a high energy radiation area warning on aeronautical charts would not pose any flight restriction requirements; therefore, there would be no impacts to airspace	Establishment of a high energy radiation area warning on aeronautical charts would not pose any flight restriction requirements; therefore, there would be no impacts to airspace	Establishment of a high energy radiation area warning on aeronautical charts would not pose any flight restriction requirements; therefore, there would be no impacts to airspace	Establishment of a high energy radiation area warning on aeronautical charts would not pose any flight restriction requirements; therefore, there would be no impacts to airspace
Biological Resources	No impacts from electromagnetic radiation. Approximately 12 hectares (30 acres) of wetlands impacted **Mitigation**: Develop mitigation measures to minimize impacts to wetlands through the consultation and permitting process	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species from construction or electromagnetic radiation. No wetlands would be impacted **Mitigation**: Clear vegetation within 15 meters (49 feet) of radar to reduce likelihood of wildlife using the area	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species from construction or electromagnetic radiation. The potential exists for sedimentation to impact Roaring Nancy Creek which is a wetland **Mitigation**: Clear vegetation within 15 meters (49 feet) of radar to reduce likelihood of wildlife using the area. Develop mitigation measures to wetlands through the consultation and permitting process	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species from construction or electromagnetic radiation. No wetlands would be impacted **Mitigation**: Clear vegetation within 15 meters (49 feet) of radar to reduce likelihood of wildlife using the area	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species from construction or electromagnetic radiation. No wetlands would be impacted **Mitigation**: Clear vegetation within 15 meters (49 feet) of radar to reduce likelihood of wildlife using the area	Minimal impacts are expected to vegetation, wildlife, and threatened or endangered species from construction or electromagnetic radiation. No wetlands would be impacted **Mitigation**: Clear vegetation within 15 meters (49 feet) of radar to reduce likelihood of wildlife using the area
Cultural Resources	No adverse effects	Adverse impact to historic structures has been mitigated through completed Historic American Engineering Record documentation	Adverse impact to historic structures has been mitigated through completed Historic American Engineering Record documentation	Adverse impact to historic structures has been mitigated through completed Historic American Engineering Record documentation	Adverse impact to historic structures has been mitigated through completed Historic American Engineering Record documentation	Adverse impact to historic structures has been mitigated through completed Historic American Engineering Record documentation
Geology and Soils	Short-term impacts from soil erosion during construction **Mitigation**: Minimize soil erosion by implementation of standard erosion control techniques	Short-term impacts from soil erosion during construction **Mitigation**: Minimize soil erosion by implementation of standard erosion control techniques	Short-term impacts from soil erosion during construction **Mitigation**: Minimize soil erosion by implementation of standard erosion control techniques	Short-term impacts from soil erosion during construction **Mitigation**: Minimize soil erosion by implementation of standard erosion control techniques	Short-term impacts from soil erosion during construction **Mitigation**: Minimize soil erosion by implementation of standard erosion control techniques	Short-term impacts from soil erosion during construction **Mitigation**: Minimize soil erosion by implementation of standard erosion control techniques

Table 2.7-5: Summary of Environmental Impacts for Deployment of the X-Band Radar (Continued)

Resource Category	ALASKA SITE	NORTH DAKOTA SITES				
	Eareckson AS	Cavalier AFS	Missile Site Radar	Remote Sprint Launch Site 1	Remote Sprint Launch Site 2	Remote Sprint Launch Site 4
Hazardous Materials and Hazardous Waste Management	Increase in hazardous materials use and hazardous waste generation. All hazardous material and waste handled in accordance with appropriate regulations. Storage tanks would be subject to all appropriate regulations	Increase in hazardous materials use and hazardous waste generation. All hazardous material and waste handled in accordance with appropriate regulations. Storage tanks would be subject to all appropriate regulations	Increase in hazardous materials use and hazardous waste generation. All hazardous material and waste handled in accordance with appropriate regulations. Storage tanks would be subject to all appropriate regulations	Increase in hazardous materials use and hazardous waste generation. All hazardous material and waste handled in accordance with appropriate regulations. Storage tanks would be subject to all appropriate regulations	Increase in hazardous materials use and hazardous waste generation. All hazardous material and waste handled in accordance with appropriate regulations. Storage tanks would be subject to all appropriate regulations	Increase in hazardous materials use and hazardous waste generation. All hazardous material and waste handled in accordance with appropriate regulations. Storage tanks would be subject to all appropriate regulations
Health and Safety	No risk to human health from electromagnetic radiation. Potential risk to aircraft airborne systems and fly-by-wire aircraft minimized through establishment of a high energy radiation area warning on aeronautical charts	No risk to human health from electromagnetic radiation. Potential risk to aircraft airborne systems and fly-by-wire aircraft minimized through establishment of a high energy radiation area warning on aeronautical charts	No risk to human health from electromagnetic radiation. Potential risk to aircraft airborne systems and fly-by-wire aircraft minimized through establishment of a high energy radiation area warning on aeronautical charts	No risk to human health from electromagnetic radiation. Potential risk to aircraft airborne systems and fly-by-wire aircraft minimized through establishment of a high energy radiation area warning on aeronautical charts	No risk to human health from electromagnetic radiation. Potential risk to aircraft airborne systems and fly-by-wire aircraft minimized through establishment of a high energy radiation area warning on aeronautical charts	No risk to human health from electromagnetic radiation. Potential risk to aircraft airborne systems and fly-by-wire aircraft minimized through establishment of a high energy radiation area warning on aeronautical charts
Land Use and Aesthetics	Deployment of the XBR would be compatible with regional and local planning/zoning and surrounding on and off-base land uses. Deployment would be consistent with the Alaska Coastal Management Program	Deployment of the XBR would be compatible with regional and local planning/zoning	Deployment of the XBR would be compatible with regional and local planning/zoning	Deployment of the XBR would be compatible with regional and local planning/zoning	Deployment of the XBR would be compatible with regional and local planning/zoning	Deployment of the XBR would be compatible with regional and local planning/zoning
Noise	No impact	No impact	Potential for short-term construction related noise disturbance to 2 residential units; however, no long-term impacts	No impact	No impact	No impact
Socioeconomics	Eareckson AS is a military installation on an island with no surrounding support services. No socioeconomic impacts would occur	Construction direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. No impact on public services. Operation of the XBR would replace the current Air Force mission resulting in no net change to the regional economy	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. No impact on public services	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. No impact on public services	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. No impact on public services	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. No impact on public services

Table 2.7-5: Summary of Environmental Impacts for Deployment of the X-Band Radar (Continued)

Resource Category	ALASKA SITE	NORTH DAKOTA SITES				
	Eareckson AS	Cavalier AFS	Missile Site Radar	Remote Sprint Launch Site 1	Remote Sprint Launch Site 2	Remote Sprint Launch Site 4
Transportation	No impact	Level of service on North Dakota highways 1 and 5 within Langdon would change from A to B as a result of cumulative temporary construction related impacts. Level of service would change back to A after construction	Level of service on North Dakota highways 1 and 5 within Langdon would change from A to B as a result of cumulative temporary construction related impacts. Level of service would change back to A after construction	Level of service on North Dakota highways 1 and 5 within Langdon would change from A to B as a result of cumulative temporary construction related impacts. Level of service would change back to A after construction	Level of service on North Dakota highways 1 and 5 within Langdon would change from A to B as a result of cumulative temporary construction related impacts. Level of service would change back to A after construction	Level of service on North Dakota highways 1 and 5 within Langdon would change from A to B as a result of cumulative temporary construction related impacts. Level of service would change back to A after construction
Utilities	Current utility systems have adequate capacity to support deployment	Current utility systems have adequate capacity to support deployment	Current utility systems have adequate capacity to support deployment	Current utility systems have adequate capacity to support deployment	Current utility systems have adequate capacity to support deployment	Current utility systems have adequate capacity to support deployment
Water Resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Minor potential for short-term increase in sediment in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources
Environmental Justice	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected	No low-income or minority populations would be disproportionately affected
Subsistence	Restricted access on the island precludes subsistence use	Not applicable to North Dakota	Not applicable to North Dakota	Not applicable to North Dakota	Not applicable to North Dakota	Not applicable to North Dakota

Table 2.7-6: Summary of Environmental Impacts for Deployment of the Fiber Optic Cable Line

Resource Category	Alaska	North Dakota
Air Quality	No impact	No impact
Airspace	No impact	No impact
Biological Resources	Short-term impact to invertebrates and fishes, no long-term impacts expected. Short-term disturbance of terrestrial animals and/or aquatic organisms and terrestrial and/or aquatic habitat, no long-term impacts expected. No direct adverse short or long-term impacts expected to marine mammals or birds. No expected consequences on threatened or endangered species **Mitigation**: Time construction activities to avoid nesting and breeding periods in the terrestrial environment. Use silt fences to minimize soil erosion impacts to streams (spawning habitat) on land crossings or avoid spawning season. Direct bore fiber optic lines under streams where possible. Avoid Steller sea lion rookeries or haul out areas by 5.6 kilometers (3 nautical miles)	Short-term impacts could occur to vegetation, wildlife, and threatened or endangered species. The potential exists for short-term impacts to wetlands along existing road and utility corridors **Mitigation**: Develop mitigation measures to wetlands through the consultation and permitting process. Avoid construction during nesting season.
Cultural Resources	Additional studies required to determine if historic properties may be affected **Mitigation**: Consult with the State Historic Preservation Officer to determine the requirement for additional studies	Additional studies required to determine if historic properties may be affected **Mitigation**: Consult with the State Historic Preservation Officer to determine the requirement for additional studies
Geology and Soils	Short-term disturbance to ocean floor and ground soils, no long-term impacts expected	Short-term disturbance to soils, no long-term impacts expected
Hazardous Materials and Hazardous Waste Management	No impact	No impact
Health and Safety	No impact	No impact
Land Use and Aesthetics	No impact	No impact
Noise	No impact	No impact
Socioeconomics	No impacts. See subsistence resources for potential impacts to fishermen	No impact
Transportation	No impact	No impact
Utilities	No impact	No impact
Water Resources	Short-term increase in sedimentation and degradation of ocean water quality, no long-term impacts expected	Short-term increase in sedimentation and degradation of surface water quality near fiber optic cable line, no long-term impacts expected
Environmental Justice	No impact	No impact
Subsistence	Short-term potential to displace subsistence resources resulting in diminished activities. Short-term change in fishermen's fishing activities **Mitigation**: Hold meetings in the affected communities to minimize impacts to harvesting time and harvesting areas	Not applicable

Table 2.7-7: Summary of Environmental Impacts for the Upgraded Early Warning Radars

Resource Category	ALASKA SITE Clear AFS	CALIFORNIA SITE Beale AFB	MASSACHUSETTS SITE Cape Cod AFS
Cultural Resources	**No-action Alternative**: No adverse effects **Proposed Action**: No adverse effects	**No-action Alternative**: No adverse effects **Proposed Action**: No adverse effects	**No-action Alternative**: No adverse effects **Proposed Action**: No adverse effects
Health and Safety	**No-action Alternative**: Public radio frequency exposure levels would be below recommended exposure limits. No adverse effects from long-term exposure **Proposed Action**: Public radio frequency exposure levels would be below recommended exposure limits. No adverse effects from long-term exposure	**No-action Alternative**: Public radio frequency exposure levels would be below recommended exposure limits. No adverse effects from long-term exposure **Proposed Action**: Public radio frequency exposure levels would be below recommended exposure limits. No adverse effects from long-term exposure	**No-action Alternative**: Public radio frequency exposure levels would be below recommended exposure limits. No adverse effects from long-term exposure **Proposed Action**: Public radio frequency exposure levels would be below recommended exposure limits. No adverse effects from long-term exposure

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3.0 Affected Environment

3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter describes the environmental conditions of the potential NMD deployment sites and their regions of influence (ROIs). The information provided serves as a baseline from which to identify and evaluate environmental changes resulting from the construction and operation of an NMD system. The affected environment is discussed in terms of 15 resource areas: air quality, airspace, biological resources, cultural resources, geology and soils, hazardous materials and hazardous waste management, health and safety, land use and aesthetics, noise, socioeconomics, transportation, utilities, water resources, and environmental justice. In addition, subsistence resources are discussed for potential Alaska sites. Each resource area is discussed at each location unless the proposed activities at that location would not foreseeably result in an impact. The data presented are commensurate with the importance of the potential impacts in order to provide the proper context for evaluating impacts.

For those resources included in the affected environment, an ROI will be defined for each affected resource and will determine the geographical area to be addressed as the environmental setting.

Provided below is a brief description of the location, history, and current status of each potential NMD deployment location.

3.1.1 ALASKA INSTALLATIONS

Clear AFS

Clear AFS is about 126 kilometers (78 miles) southwest of Fairbanks in the Denali Borough near the community of Anderson. The site currently consists of approximately 4,760 hectares (11,542 acres). The Clear AFS area was first used by the Army shortly after World War II, when an airstrip was built for B-36 bombers. Construction of the existing Ballistic Missile Early Warning System radar began in 1958, and the radar has been in operation since 1961. The current radar system will be replaced by a phased array radar by the end of 2000, independent of NMD. The role of Clear AFS is to detect and provide early warning and assessment of a ballistic missile attack and to provide space surveillance tracking for satellites and space objects. (Clear Air Station, 1993—Comprehensive Planning Framework)

Eareckson AS

Eareckson AS (formerly known as Shemya AFB) is on Shemya Island about 2,414 kilometers (1,500 miles) from Anchorage, Alaska, and is part of the Near Islands group at the tip of the Aleutian Island chain. Shemya Island occupies approximately 1,425 hectares (3,520 acres) and is part of the Alaska Maritime National Wildlife Refuge admistered by the USFWS. The island was first occupied by the military on May 28, 1943, to retake nearby Attu Island from the Japanese. The island has been developed by the military and continues to operate as an early warning radar site whose principal purpose involves monitoring space and missile activities. The base is under control of the Eareckson AS Program Management Office, part of the 611th Air Support Group at Elmendorf AFB.

Eielson AFB

Eielson AFB is located approximately 37 kilometers (23 miles) southeast of Fairbanks, and about 14 kilometers (9 miles) southeast of the city of North Pole within the Fairbanks North Star Borough. The main base consists of approximately 8,021 hectares (19,820 acres). (Gori, 1999—Comments received by EDAW, Inc., regarding the NMD Deployment Coordinating Draft EIS). It also manages an additional 15,098 hectares (37,309 acres) at four other locations. (Eielson AFB, 1998—Integrated Natural Resources Management Plan)

Mile 26 (now Eielson AFB) was originally constructed in 1943 as a satellite location for Ladd Field (now Fort Wainwright). In 1946, military planners decided that because of the Cold War, a strategic bomber base was needed in Interior Alaska. Eielson AFB was eventually chosen. The two runways at Mile 26 were increased to 4,420 meters (14,500 feet), and buildings were constructed to house the planes. On February 4, 1948, the Air Force changed the name of Mile 26 to Eielson AFB. (Eielson AFB, 1998—Integrated Natural Resources Management Plan)

The current mission of Eielson AFB and the 354th Fighter Wing is to "Prepare, provide, and support combat ready forces...any time, any place." The primary mission has evolved from one of support of both rotating and assigned strategic air assets to one of supporting permanently-assigned fighter aircraft for close air support, air interdiction, and support of ground forces; as well as hosting the Air Force's premier tactical training exercises, COPE THUNDER. (Eielson AFB, 1998—Integrated Natural Resources Management Plan)

Fort Greely

Fort Greely is approximately 172 kilometers (107 miles) southeast of Fairbanks and just south of the community of Delta Junction in an

unincorporated borough. Fort Greely is about 267,519 hectares (661,051 acres), most of which was withdrawn from the Bureau of Land Management. Fort Greely consists of the Main Post, two large training areas—Fort Greely West Training Area and Fort Greely East Training Area—and three outlying sites in the area—Gerstle River Test Site, Black River Training Site, and Whistler Creek Climbing Area. (U.S. Army Alaska, 1997—Draft Integrated Natural Resources Management Plan 1997–2001)

Fort Greely originated as Station 17, Alaskan Wing, Air Transport Command, later known as the Allen Army Airfield. The first Army units set up camp in 1942. It served as a rest and refueling stop for pilots en route to Ladd Army Field during World War II. Several name changes occurred until it finally became Fort Greely on August 6, 1955. Fort Greely's lands are used for testing and evaluation of weapons and equipment under conditions of extreme cold, training forces for action in Arctic and subarctic regions in the event of war, and for infantry training by the U.S. Army Alaska. (U.S. Army Alaska, 1997—Draft Integrated Natural Resources Management Plan 1997–2001)

Approximately 741 hectares (1,830 acres) of Fort Greely will be excessed in 2001. This area contains most buildings on the base. (Gori, 1999—Comments received by EDAW, Inc., regarding the NMD Deployment Coordinating Draft DEIS)

Yukon Training Area (Fort Wainwright)

The Yukon Training Area is a part of Fort Wainwright and is about 24 kilometers (15 miles) southeast of the main post. The Yukon Training Area is located in the Fairbanks North Star Borough about 40 kilometers (25 miles) southeast of Fairbanks. All branches of the armed forces utilize this 100,362-hectare (248,000-acre) site (U.S. Army Corps of Engineers, 1987—Master Plan Report, Fort Wainwright, Alaska). The Yukon Training Area is roughly broken down into three parcels. One area is the Stuart Creek Impact Area, which is roughly a 10-kilometer (6-mile) square tract into which the Army and Air Force fire munitions. Because of the extensive use of this area, it is restricted from public use. Another area, the Air Force Technical Applications Center site that lies immediately east of Transmitter Road in the northwest section of the Yukon Training Area, consists of about 8,802 hectares (21,750 acres). It is jointly utilized by the Army and the Air Force Technical Applications Center. Within this large parcel, 971 hectares (2,400 acres) of land are used exclusively by the Air Force Technical Applications Center (Department of the Army, 1989—Permit of Usage of Air Force Technical Applications Center Site, Fort Wainwright Maneuver Area, Alaska). The remainder of the Yukon Training Area is designated as training areas used for various mortar, artillery, and maneuver exercises. (U.S. Department

of the Interior and U.S. Department of Defense, 1994—Fort Wainwright Yukon Maneuver Area, Proposed Resource Management Plan, Final EIS)

3.1.2 NORTH DAKOTA INSTALLATIONS

Cavalier AFS

Cavalier AFS is approximately 23 kilometers (14 miles) west of the town of Cavalier in Pembina County. The 113-hectare (278-acre) site was leased from the U.S. Army by the U.S. Air Force in 1977 and named the Cavalier AFS. The site is in use as part of the Spacetrack Missile Warning system and has no missile fields associated with it. The original purpose of the radar at Cavalier AFS was to detect missiles launched at the United States from the north. Some of the site's buildings were hardened against nuclear effects and had the ability to operate autonomously while "buttoned-up" against a nuclear blast. The site currently consists of the main radar and numerous support facilities and residential units.

Grand Forks AFB

Grand Forks AFB is on 1,954 hectares (4,830 acres) in eastern North Dakota about 23 kilometers (14 miles) west of Grand Forks in Grand Forks County. Grand Forks was chosen in 1954 as the site for an Air Defense Command Base. Construction began in 1956, with initial operations commencing in 1960. The 319th Air Force Refueling Wing is the major organization currently at Grand Forks AFB (Grand Forks AFB, 1995—Management Action Plan).

As the first core air refueling wing in the Air Mobility Command, the 319th Air Refueling Wing "Warrior of the North" guarantees global engagement by providing extended range in the air. The 319th Air Refueling Wing regularly supports deployments and multinational operations from bases in England, France, Italy, Turkey, and the Arabian Gulf region as well as counter-drug operations in Panama (Grand Forks AFB, 1996—Global Reach for America, Installation Guide).

Since activated in 1942 as the 321st Bombardment Group, the mission of the 321st Missile Group has evolved from flying a variety of medium and heavy bomber aircraft to nuclear deterrence with the Minuteman III intercontinental ballistic missile system. The 321st Missile Group controlled 150 Minuteman missiles spread out over 19,425 square kilometers (7,500 square miles) of prairie in eastern North Dakota (U.S. Department of the Air Force, 1997—Grand Forks AFB General Plan). On July 1, 1995, the Base Realignment and Closure (BRAC) Commission announced a recommendation to inactivate the 321st Missile Group. All rocket motors, reentry systems, and missile guidance systems have been removed.

Missile Site Radar

The 175-hectare (432-acre) Missile Site Radar is adjacent to Nekoma in Cavalier County, approximately 21 kilometers (13 miles) from Langdon. Construction of the Missile Site Radar was completed in October 1974. The complex reached initial operational capability in April 1975 and full operational capability in September 1975. The site originally consisted of a radar and missile field of 30 launchers for Spartan long-range, nuclear-warhead missiles, and 16 launchers for Sprint short-range, nuclear missiles. The Missile Site Radar had a dual purpose: to acquire targets and to control launch and guidance of interceptors to their targets. Buildings in the Tactical Area portion of the site were hardened against nuclear attack. Between December 1975 and 1977, all missiles were removed from the Missile Site Radar, the silos were sealed, and some tactical buildings were salvaged. The site is currently inactive.

Remote Sprint Launch Site 1

Remote Sprint Launch Site 1 is in northern Ramsey County, 5 kilometers (3 miles) east of Hampden. The site occupies approximately 17 hectares (41 acres) and is composed of a sentry station, heat sink, waste stabilization ponds, a Sprint missile launch area containing 12 launch stations, and a Remote Launch Operations Building. Construction of Remote Sprint Launch Site 1 was completed in October 1974. The complex reached initial operational capability in April 1975 and full operational capability in September 1975. By 1977, all missiles had been removed from the silo launchers, the silos were sealed, and buildings were salvaged and sealed. The site is currently inactive.

Remote Sprint Launch Site 2

Remote Sprint Launch Site 2 is in Cavalier County, 13 kilometers (8 miles) northwest of Langdon. The site occupies approximately 15 hectares (36 acres). The layout and operational dates for Remote Sprint Launch Site 2 are similar to Remote Sprint Launch Site 1. The site is currently inactive.

Remote Sprint Launch Site 4

Remote Sprint Launch Site 4 is approximately 3 kilometers (2 miles) southwest of Fairdale, in Walsh County, approximately 135 kilometers (84 miles) from Grand Forks AFB. The site occupies approximately 20 hectares (50 acres). The layout and operational dates for Remote Sprint Launch Site 4 are similar to Remote Sprint Launch Site 1. The site is currently inactive.

3.2 AIR QUALITY

Air quality in a given area is a function of the area itself (size and topography), the prevailing weather patterns (meteorology and climate), and the pollutants released (specific pollutant, rate and frequency of release, and location of release). Air quality is described in terms of the concentrations of various pollutants in a given area of the atmosphere. This is generally expressed in terms of parts per million (ppm), milligrams per cubic meter, or micrograms per cubic meter. The lower the overall concentration of a specific pollutant (whether from natural sources or man-made), the better the air quality in that area. The significance of a pollutant concentration is determined by comparison to Federal, state, and/or local air quality standards. The significance of pollutant concentrations for pollutants with no applicable ambient air quality standard (AAQS) is determined by comparison with health-based guidelines.

The ROI for air quality includes the geographic airshed in which the emissions would occur. This broad area encompasses both direct, immediate impacts due to criteria pollutants and hazardous air pollutants that generally disperse within a few miles of the emissions source, and indirect, delayed impacts due to precursor actions (primarily ozone precursors) that can delay impacts for several hours.

Climate and Meteorology

Climatic and meteorological data for the air quality analysis include wind direction and speed, precipitation levels, temperature and relative humidity, occurrence of severe storms, and atmospheric turbulence. Wind direction and speed have a direct impact on the path and dispersion rate of airborne pollutants. Precipitation tends to wash pollutants out of the atmosphere. Temperature and humidity indirectly influence the dispersion of pollutants through their influence on the physical aspects of the atmosphere (temperature inversions and atmospheric stability being prime examples).

Federal Regulatory Framework

Air quality is regulated under Title 40 CFR 50-99. The National Ambient Air Quality Standards (NAAQS) (40 CFR 50) have been promulgated to protect public health and welfare and represent maximum ambient concentrations that are allowable in a given area. Ambient air in these regulations is defined as "that portion of the atmosphere, external to buildings, to which the general public has access" (40 CFR 50.1). The NAAQS address seven pollutants, termed criteria pollutants. These criteria pollutants are: carbon monoxide, lead, oxides of nitrogen (nitrogen dioxide), ozone, particulate matter with a mean aerodynamic diameter less than or equal to a nominal 10 micrometers (PM-10),

particulate matter with a mean aerodynamic diameter less than or equal to a nominal 2.5 micrometers (PM-2.5), and sulfur dioxide.

Areas that violate the NAAQS are designated as "nonattainment" areas for the relevant pollutant(s). Areas that meet the NAAQS are designated as "attainment" areas. Those areas for which measurements were not made are termed "unclassifiable" and are assumed to be in attainment. Nonattainment areas that attain the NAAQS and are redesignated as being in attainment are required to be addressed in the State Implementation Plan to provide for monitoring of the air quality and maintenance of the attainment status for at least 10 years. These areas are described as "maintenance" areas.

Federal actions are required to conform to any applicable State Implementation Plan (approved or promulgated under Section 110 of the Clean Air Act). If the action is to take place in a non-attainment or maintenance area, it is subject to a General Conformity determination as indicated in 40 CFR 51. This determination can take one of three forms. If the action meets certain criteria, it may be specifically exempted. Most exemptions cover administrative-type actions; however, recurring activities, emergencies, and certain research and development activities are also exempted. If the action is determined to emit pollutants below specified *de minimis* thresholds and the potential emission levels are not regionally significant (less than 10 percent of the region's emissions for a particular pollutant), the action can be assumed to conform to the State Implementation Plan. For actions that do not fall under either of these two categories, a complete conformity determination must be made. Specifics of this process are listed in 40 CFR 51 Subpart W.

In addition to those pollutants addressed by the NAAQS, Federal regulations address emissions of hazardous air pollutants (Clean Air Act, Section 112(b)). Under Federal law, hazardous air pollutants are those air pollutants to which no AAQS is applicable and that were established by Congress in the list in Section 112 of the Clean Air Act. There are currently 188 hazardous air pollutants listed, including, but not limited to, the pollutants controlled by the National Emissions Standards for Hazardous Air Pollutants (NESHAP) program (40 CFR 61 and 63).

Title V of the Clean Air Act Amendments of 1990 requires all major stationary sources to file an operating permit application. The resultant operating permit (Title V Air Permit) incorporates all applicable Federal requirements under the Clean Air Act affecting the respective source. A source is defined as a major source if it has the potential to emit any of the following:

- 91 metric tons (100 tons) per year of any regulated pollutant in an area in attainment for that pollutant

- 9.1 metric tons (10 tons) per year of any one of the 188 hazardous air pollutants
- 23 metric tons (25 tons) per year of total hazardous air pollutants

In non-attainment areas, these thresholds are lower for specific pollutants. For example, the major source threshold for volatile organic compounds in an area classified as being in "serious ozone non-attainment" is 45 metric tons (50 tons) per year rather than 91 metric tons (100 tons) per year.

New or modified major sources in attainment areas would also be subject to Prevention of Significant Deterioration (PSD) review as presented in 40 CFR 51.166 in order to ensure the continued maintenance of a high air quality baseline standard. For the purpose of determining whether a source is subject to a PSD review, "new or modified major source" means:

(1) Any of the stationary sources of air pollutants listed in 40 CFR 51.166(b)(1)(I)(a) which emits, or has the potential to emit, 91 metric tons (100 tons) per year or more of any pollutant subject to regulation under the Clean Air Act

(2) Any stationary source which emits, or has the potential to emit, 227 metric tons (250 tons) per year or more of any air pollutant subject to regulation under the Clean Air Act

(3) Any physical change that would occur at a non-major stationary source if the change would constitute a major source in and of itself

Emissions from new or modified major sources are controlled using Best Available Control Technology. Geographical areas are ranked into three categories for purposes of PSD review. Class I areas are those areas where any appreciable deterioration of air quality would be considered significant. These areas include certain national parks and wilderness areas. Class II is the default classification. Class II areas can allow for moderate, well-controlled industrial growth. Under certain circumstances, states may reclassify areas as Class III. These areas allow for greater industrial development. The overall air quality impacts due to the source in question in combination with other sources in the area subject to PSD review must not exceed the area's allowable incremental increases identified in table 3.2-1.

Table 3.2-1: Permissible PSD Incremental Increase (by Area Classification)

Pollutant	Averaging Time	Maximum Allowable Increase (micrograms per cubic meter)		
		Class I	Class II	Class III
Nitrogen Dioxide	Annual	2.5	25	50
Sulfur Dioxide	Annual	2	20	40
	24-hour	5	91	182
	3-hour	25	512	700
PM-10	Annual	4	17	34
	24-hour	8	30	60

Source: 40 CFR 51.166, revised as of July 1, 1995.

Note: PM-10 = particulate matter with a mean aerodynamic diameter equal to or less than a nominal 10 micrometers

3.2.1 ALASKA INSTALLATIONS

State Regulatory Framework

Alaska has established state AAQS. Emissions of air pollutants from operations in Alaska are limited to the more restrictive standard (Federal or state). Table 3.2-2 compares the NAAQS and the Alaska state AAQS.

Climate and Meteorology

Interior Alaska has a continental or subarctic climate characterized by long cold winters, short mild summers, and significant changes in the daily pattern throughout the year. Temperature averages in the Alaskan interior range from approximately 16° Celsius (C) (60° Fahrenheit [F]) in July to approximately -24° C (-12° F) in January. However, temperature extremes can vary from a low of approximately -51°C (-60°F) in the winter to a high of nearly 38°C (100°F) in the summer. Mean annual precipitation is approximately 33 centimeters (13 inches), with the majority occurring in the July through September timeframe. (U.S. Department of the Air Force, 1997—EA for Radar Upgrade Clear AFS, Alaska). Early summer is often dry with an increased hazard of fires. Prevailing winds in the vicinity west of Fairbanks are from the south–southeast and normally range from 0 to 21 kilometers (0 to 13 miles) per hour (U.S. Department of the Air Force, 1997—EA for Radar Upgrade Clear AFS, Alaska). However, in the area east of Fairbanks, there is much less wind, and it normally occurs from the north, except during June and July when it is from the southwest. In this area, winds average approximately 8 kilometers (5 miles) per hour. (U.S. Army Corps of Engineers, 1990—The Use and Environmental Impacts of Airboats on the Tanana Flats, Fort Wainwright, Alaska)

Table 3.2-2: Federal and Alaska State Ambient Air Quality Standards

Pollutant	Averaging Time	Alaska State Standard	National Primary Standard	National Secondary Standard
Carbon Monoxide	8-hour	10 mg/m^3 (9 ppm)	10 mg/m^3 (9 ppm)	None
	1-hour	40 mg/m^3 (35 ppm)	40 mg/m^3 (35 ppm)	None
Lead	Quarterly[1]	1.5 µg/m^3	1.5 µg/m^3	Same as Primary
Nitrogen Dioxide	Annual[1]	100 µg/m^3 (0.053 ppm)	100 µg/m^3 (0.053 ppm)	Same as Primary
Ozone	8-hour[2]	None	164 µg/m^3 (0.084 ppm)	Same as Primary
	1-hour	235 µg/m^3 (0.12 ppm)	235 µg/m^3 (0.12 ppm)	Same as Primary
PM-2.5	Annual[3]	None	15 µg/m^3	Same as Primary
	24-hour[4]	None	65 µg/m^3	Same as Primary
PM-10	Annual	50 µg/m^3	50 µg/m^3	Same as Primary
	24-hour[5]	150 µg/m^3	150 µg/m^3	Same as Primary
Sulfur Oxides[6]	Annual[1]	80 µg/m^3 (0.03 ppm)	80 µg/m^3 (0.03 ppm)	None
	24-hour	365 µg/m^3 (0.14 ppm)	365 µg/m^3 (0.14 ppm)	None
	3-hour	1,300 µg/m^3 (0.5 ppm)	None	1,300 µg/m^3 (0.5 ppm)
Reduced Sulfur[6]	30-minute	50 µg/m^3 (0.02 ppm)	None	None
Ammonia	8-hour	2.1 mg/m^3 (3.0 ppm)	None	None

Sources: 40 CFR 50.9; 18 AAC 50; U.S. Environmental Protection Agency, 1998—EPA's Updated Air Quality Standards for Smog and Particulate Matter.

[1]Calculated as the arithmetic mean

[2]Calculated as the 3-year average of the fourth highest daily maximum 8-hour ozone concentration

[3]Calculated as the 3-year average of annual arithmetic means

[4]Calculated as the 98th percentile of 24-hour PM-2.5 concentrations in a year (averaged over 3 years) at the population-oriented monitoring site with the highest measured values in the area.

[5]Calculated as the 99th percentile of 24-hour PM-10 concentrations in a year (averaged over 3 years)

[6] Measured as Sulfur Dioxide

Note: mg/m^3 = milligrams per cubic meter, µg/m^3 = micrograms per cubic meter, PM-10 = particulate matter with a mean aerodynamic diameter equal to not less than a nominal 10 micrometers, ppm = parts per million

The initial dispersion of pollutants generally occurs in the near-ground atmospheric mixing layer. The depth of this mixing layer is known as the mixing height and varies substantially depending upon atmospheric conditions. Turbulence caused by heat from the sun is a prime source of atmospheric instability. As such, the mixing height is generally highest during afternoon hours and lowest in the evening or early morning. However, temperature inversions (a common winter occurrence) may cause extended periods of low mixing heights. Low mixing heights may adversely affect regional air quality until the inversion is lifted. Average mixing heights near Fairbanks range from a low of approximately 198 meters (650 feet) on winter mornings to a high of approximately 604 meters (1,980 feet) on summer afternoons. However, actual mixing heights on any given day can vary widely from these values. As an example, in 1991, morning inversions in the area near Fairbanks ranged

from 5 meters (16 feet) to more than 1,980 meters (6,500 feet) and afternoon inversions from 8 meters (26 feet) to higher than 3,690 meters (12,110 feet). Multiple inversion layers are common occurrences in the winter, and resultant mixing occurs primarily in a horizontal plane with only minimal vertical mixing. (U.S. Department of the Air Force, 1995—EIS, Alaska Military Operations Areas)

The climate and meteorology of coastal Alaska and the Aleutian Island chain differs significantly from that described above. The climate and meteorology of these sites are described in the appropriate section.

Regional Air Quality

Air quality in Alaska is generally very good, with the notable exception of two carbon monoxide nonattainment areas in and around urban areas of Anchorage and Fairbanks. The Fairbanks nonattainment area includes a small area in North Pole that is separated geographically from the Fairbanks nonattainment area, and specifically does not include Eielson AFB.

Several emissions sources in the vicinity of Fairbanks account for much of the regional background levels of nitrogen oxides and sulfur dioxide.

The excessively high carbon monoxide levels have been attributed mainly to motor vehicle use. Temperature inversions, low winter mixing heights, and decreased motor efficiency associated with the cold weather are all factors that contribute to higher pollutant concentrations for longer periods of time. Vehicle inspection and maintenance programs have been instituted and have been partially successful in reducing the incidence of exceedances in Alaska.

Alaska has four PSD Class I areas. Only one of these, Denali National Park and Preserve, is in the ROI for the Proposed Action. All other areas in Alaska are Class II for purposes of PSD review. Denali National Park and Preserve is located approximately 180 kilometers (110 miles) southwest of Eielson AFB.

3.2.1.1 Clear AFS—Air Quality

This section describes the air quality in the vicinity of Clear AFS. The ROI for air quality includes the geographic airshed in which the emissions would occur and is further defined in section 3.2. Federal regulations applicable to air quality are described in section 3.2, and state regulations are described in section 3.2.1. The climate and meteorology presented in section 3.2.1 apply to Clear AFS and its immediate environment. Clear AFS is in attainment for all NAAQS and state AAQS and should be evaluated as a PSD Class II area.

Denali National Park is a Class I PSD area located approximately 40 kilometers (25 miles) south of Clear AFS. It would be within the base's air quality ROI. All other areas within the ROI are Class II for PSD determination purposes.

Existing Emissions Sources

Clear AFS operates under a permit shield while the Title V Air Permit application is under review. Clear AFS generates its own energy through a series of coal-fired steam turbine generators, which is also used for heating a portion of the base. Smaller fuel-oil furnaces are used in those areas not heated by the power plant's steam. Emergency power is provided through a series of diesel-fuel generators. There is also an emergency water pump to maintain the availability of water on Clear AFS. The cafeteria operates a solid waste incinerator to dispose of dry waste generated from cafeteria operations packaging. Various shops and operational sites on-station generate a variety of hazardous air pollutants and volatile organic compounds, which may act as ozone precursors. Clear AFS is a major source of hazardous air pollutants. Table 3.2-3 summarizes the 1997 air emissions inventory for Clear AFS. (Air Force Space Command, 1998—1997 Air Emissions Inventory, Clear AS, Alaska)

3.2.1.2 Eareckson AS—Air Quality

This section describes the air quality in the vicinity of Eareckson AS, which effectively encompasses the entire island of Shemya, Alaska. The ROI for air quality includes the geographic airshed in which the emissions would occur and is further described in section 3.2. Federal regulations applicable to air quality are described in section 3.2, and state regulations are described in section 3.2.1.

Climate and Meteorology

Shemya Island has a maritime climate, characterized by long, moderately cold winters and short, cool summers. Winter winds average approximately 35 kilometers per hour (22 miles per hour) and have been known to reach 182 kilometers per hour (113 miles per hour). Summer winds are comparatively mild, generally ranging between 21 to 24 kilometers per hour (13 to 15 miles per hour). Temperatures range from approximately -4 to +2°C (25 to 35°F) in the winter up to approximately 6 to 12°C (44 to 54°F) in the summer. Shemya Island receives some form of precipitation nearly every day of the year and averages approximately 76 centimeters (30 inches) annually. Winter precipitation is generally in the form of snow, ice, or a mixture of the two. In the summer, misty rain, light drizzle, and heavy fog are common. (U.S. Department of the Air Force, 1997—Final Installation-Wide Environmental Baseline Survey, Eareckson AS, Alaska)

Table 3.2-3: 1997 Air Emissions Inventory—Clear AFS

Emission Source	Emissions (Metric Tons [Tons] per Year)					
	Carbon Monoxide	Oxides of Nitrogen	Oxides of Sulfur	PM-10	VOC	HAP
Power Plant Boilers	177.22 (195.35)	485.58 (535.26)	236.01 (260.16)	57.06 (62.90)	1.78 (1.96)	48.26 (53.20)
Diesel Generators	0.14 (0.16)	0.57 (0.63)	0.06 (0.07)	0.02 (0.02)	0.03 (0.03)	<0.01 (<0.01)
Emergency Water Pump	<0.01 (<0.01)	0.03 (0.03)	<0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)
Furnaces	0.21 (0.23)	0.84 (0.93)	2.43 (2.68)	0.05 (0.05)	0.02 (0.02)	<0.01 (<0.01)
Cafeteria Incinerator	0.13 (0.14)	0.05 (0.06)	0.10 (0.09)	0.05 (0.06)	0.04 (0.04)	<0.01 (<0.01)
Vehicle Fueling	--	--	--	--	0.06 (0.07)	0.03 (0.03)
Storage Tanks	--	--	--	--	0.06 (0.07)	0.01 (0.01)
Coal Handling	--	--	--	0.04 (0.04)	--	<0.01 (<0.01)
Landfill	--	--	--	--	0.68 (0.75)	0.15 (0.16)
Fire Training	0.18 (0.20)	<0.01 (<0.01)	--	--	0.03 (0.03)	--
Shop Chemical Usage	--	--	--	--	1.59 (1.75)	0.20 (0.22)
Total	177.89 (196.09)	487.09 (536.92)	238.60 (263.01)	57.23 (63.09)	4.29 (4.73)	48.64 (53.62)

Source: Air Force Space Command, 1998—1997 Air Emissions Inventory, Clear AS, Alaska.

Note: HAP= hazardous air pollutant, PM-10 = particulate matter with a mean aerodynamic diameter equal to or less than a nominal 10 micrometers, VOC = volatile organic compound

Regional Air Quality

The only significant source of emissions in the vicinity of Shemya Island is Eareckson AS, which operates within the restrictions of its Title V Air Permit. As such, the area is assumed to be in attainment for the NAAQS and state AAQS. The U.S. EPA has classified Shemya Island (and the vicinity of Eareckson AS) as Class II for PSD review purposes. There are no Class I areas within the ROI.

Existing Emissions Sources

Eareckson AS is classified as a major emissions source and maintains a Title V Air Permit issued by the Alaska Department of Environmental

Conservation. An air emissions inventory was conducted before the conversion of Eareckson AS from an active base to caretaker status. Table 3.2-4 summarizes the estimated maximum annual emissions anticipated at Eareckson AS while in caretaker status. Eareckson AS is not a major source of hazardous air pollutants.

Table 3.2-4: Air Emissions Inventory—Eareckson AS

Emission Source	Emissions (Metric Tons [Tons] per Year)					
	Carbon Monoxide	Oxides of Nitrogen	Oxides of Sulfur	PM-10	VOC	HAP
Boilers, Generators, and Furnaces	91.16 (100.49)	349.09 (384.81)	27.81 (30.65)	5.72 (6.30)	11.26 (12.41)	0.19 (0.21)
Fuel Storage and Handling	--	--	--	--	3.63 (4.00)	0.38 (0.42)
Miscellaneous Sources	--	--	--	3.57 (3.93)	--	0
Total	91.16 (100.49)	349.09 (384.81)	27.81 (30.65)	9.29 (10.23)	14.89 (16.41)	0.57 (0.63)

Source: U.S. Department of the Air Force, 1995—Eareckson AS 1993/1994 Emissions Survey Final Report.

Note: The values presented here are based on caretaker status and the use of Diesel Fuel-8 as the sole fuel source.

PM-10 = particulate matter with a mean aerodynamic diameter equal to or less than a nominal 10 micrometers, VOC = volatile organic compound, HAP = hazardous air pollutant

3.2.1.3 Eielson AFB—Air Quality

This section describes the air quality in the vicinity of Eielson AFB. The ROI for air quality includes the geographic airshed in which the emissions would occur and is further defined in section 3.2. Federal regulations applicable to air quality are described in section 3.2, and state regulations are described in section 3.2.1. The climate and meteorology presented in section 3.2.1 apply to Eielson AFB and its immediate environment. The regional air quality is described in section 3.2. Eielson AFB is in attainment for all NAAQS and state AAQS and should be evaluated as a PSD Class II area.

Existing Emissions Sources

Eielson AFB is classified as a major emissions source and is in the process of obtaining a Title V Air Permit through the Alaska Department of Environmental Conservation. Table 3.2-5 summarizes the 1997 emissions summary for Eielson AFB. Eielson AFB is a major source of hazardous air pollutants.

Table 3.2-5: 1997 Air Emission Inventory—Eielson AFB

Emission Source	Emissions (Metric Tons [Tons] per year)					
	Carbon Monoxide	Oxides of Nitrogen	Oxides of Sulfur	Particulate Matter	VOC	HAP
Coal Boilers	412.1 (454.3)	1,129.0 (1,244.5)	783.9 (864.1)	300.7 (331.5)	4.1 (4.5)	121.12 (133.51)
Oil Boilers	0.5 (0.5)	1.9 (2.1)	6.7 (7.4)	0.1 (0.1)	0.05 (0.06)	0
Large Engines (>450 kilowatts)	3.6 (4.0)	16.5 (18.2)	0.5 (0.6)	0.3 (0.3)	0.5 (0.5)	0.02 (0.02)
Small Engines (<450 kilowatts)	0.3 (0.3)	1.3 (1.4)	0.1 (0.1)	0.1 (0.1)	0	0
Waste Incinerator	<0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)	0	<0.01 (<0.01)
Hush House	3.6 (4.00)	3.8 (4.2)	0.2 (0.2)	0.1 (0.1)	0.8 (0.9)	0.19 (0.21)
Commercial Gas Stations	0	0	0	0	22.1 (24.4)	1.31 (1.44)
Base-wide Evaporative Emissions	0	0	0	0	3.1 (3.4)	3.05 (3.36)
Radio Direction Finding (RDF) Machine	0	0	0	0.5 (0.5)	0	0
Wastewater Treatment Plant	0	0	0	0	1.6 (1.8)	0
Unpaved Roads	0	0	0	6.9 (7.6)	0	0
Ozone Depleting Chemicals	0	0	0	0	13.3 (14.7)	13.36 (14.73)
Gravel Quarries	0	0	0	0.03 (0.03)	0	0
Fuel Handling: Other Gasoline	0	0	0	0	2.4 (2.7)	0.15 (0.16)
Fuel Handling: Diesel	0	0	0	0	0.3 (0.3)	0
Fuel Handling: JP-8	0	0	0	0	0.7 (0.8)	0.22 (0.24)
Fuel Handling: JP-4	0	0	0	0	0.6 (0.7)	0
Insignificant Boilers	0.21 (0.23)	0.82 (0.90)	0.87 (0.96)	0.08 (0.09)	0.03 (0.03)	<0.01 (<0.01)
Insignificant Generators	0.02 (0.02)	0.06 (0.07)	<0.01 (<0.01)	0.01 (0.01)	<0.01 (<0.01)	0

Table 3.2-5: 1997 Air Emission Inventory—Eielson AFB (Continued)

Emission Source	Emissions (Metric Tons [Tons] per year)					
	Carbon Monoxide	Oxides of Nitrogen	Oxides of Sulfur	Particulate Matter	VOC	HAP
Wood Shop Cyclones	0	0	0	<0.01 (<0.01)	0	0
Smart Ash Burners	<0.01 (0.01)	<0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)	0	0
Ethylene Glycol (De-icer)	0	0	0	0	0.03 (0.03)	0.05 (0.06)
Wastewater Treatment Plant Flare	0.15 (0.16)	0.03 (0.03)	0	0.02 (0.02)	0.05 (0.06)	0
Coal Handling	0	0	0	0.3 (0.3)	0	0
Miscellaneous Exempt Emissions Units	0.18 (2.0)	0.9 (1.0)	0.9 (1.0)	1.8 (2.0)	0.9 (1.0)	0.91 (1.00)
Totals	422.29 (465.5)	1,154.3 (1,272.4)	793.2 (874.3)	310.80 (342.6)	50.9 (56.1)	140.38 (154.74)

Source: U.S. Department of the Air Force, 1998—Draft Emissions Inventory Report for Calendar Year 1998, Eielson AFB.

Note: HAP = hazardous air pollutant, VOC = volatile organic compound

Although the base itself is located in an attainment area, the Fairbanks North Star Borough is in nonattainment for carbon monoxide. During episodes of cold winter weather, atmospheric inversions may trap contaminants and cause exceedances of the NAAQS or state AAQS. According to Fairbanks North Star Borough studies, approximately 90 percent of all carbon monoxide produced within the borough is from vehicles. (U.S. Department of the Air Force, 1992—EA, Upgrade Eielson Sewage Treatment Plant, Eielson AFB) Denali National Park, a Class I PSD area, is approximately 180 kilometers (110 miles) from Eielson AFB, and would be within the base's ROI.

The base recently conducted a PSD review and obtained a PSD Operating Permit that addresses emissions of nitrogen oxides. This application restricts oil-fired boilers installed after 1981 to an overall average 50-percent utility and restricts diesel engines installed since 1981 (other than the 25-megawatt power plant generator) to an overall average of 500 hours of operation per year. These two operating limitations avoid triggering the PSD applicability threshold for sulfur dioxide and reduce the potential-to-emit level for nitrogen oxides from engines installed since 1981. (U.S. Department of the Air Force, 1999—PSD Operating Permit, Eielson AFB)

3.2.1.4 Fort Greely—Air Quality

This section describes the air quality in the vicinity of Fort Greely. The ROI for air quality includes the geographic airshed in which the emissions would occur and is further defined in section 3.2. Federal regulations applicable to air quality are described in section 3.2, and state regulations are described in section 3.2.1. The climate and meteorology presented in section 3.2.1 are generally representative of the Fort Greely area, though wind speeds are higher here, averaging approximately 18 kilometers (11 miles) per hour and are generally southerly along the Delta River in the summer. (U.S. Department of the Army, 1980—EIS Concerning Proposed Land Withdrawal for the 172nd Infantry Brigade (Alaska) at Fort Greely)

Regional Air Quality

Fort Greely is approximately 172 kilometers (107 miles) southeast of Fairbanks, Alaska. As such, it is removed from many of the sources that disrupt air quality in the Fairbanks region. Principal sources of air pollution in the Fort Greely area are vehicles and the burning of various fuels for heat and/or power. Air quality parameters, primarily particulate levels, tend to deteriorate during the summer months due to wildfire smoke and high winds blowing dust. Ice fog, frozen vapor from internal combustion engines, affects air quality and visibility when air temperatures are below -34°C (-30°F). The overall air quality is good, and the area is in attainment (or unclassifiable) for all NAAQS and state AAQS (U.S. Army Center for Health Promotion and Preventive Medicine, 1996—Air Pollution Emission Statement No. 43-21-5681-96). The Fort Greely area is considered a PSD Class II area.

Existing Emissions Sources

Fort Greely is a major emissions source and has submitted an application for a Title V Air Permit to the Alaska Department of Environmental Conservation. Fort Greely is not a major source of hazardous air pollutants. Table 3.2-6 summarizes the assessable emissions as of December 7, 1997.

3.2.1.5 Yukon Training Area (Fort Wainwright)—Air Quality

This section describes the air quality in the vicinity of the Yukon Training Area. The ROI for air quality includes the geographic airshed in which the emissions would occur and is further defined in section 3.2. Federal regulations applicable to air quality are described in section 3.2, and state regulations are described in section 3.2.1.

Table 3.2-6: Fort Greely Assessable Emissions Summary—1997

Emission Source		Emissions (Metric Tons [Tons] per Year)					
		Carbon Monoxide	Oxides of Nitrogen	Oxides of Sulfur	PM-10	VOC	HAP
1	2-Industrial Boilers, 57.9 × 106 BTU/hour	2.77 (3.05)	11.07 (12.20)	6.29 (6.93)	0.56 (0.62)	0.11 (0.12)	--
2	Industrial Boilers, 67.3 × 106 BTU/hour	1.39 (1.53)	5.53 (6.10)	3.15 (3.47)	0.28 (0.31)	0.05 (0.06)	--
3-5	(3) Generators, 1,000-kilowatt	1.52 (1.68)	5.69 (6.27)	0.16 (0.18)	0.11 (0.12)	0.16 (0.18)	--
6-7	(2) Generators, 1,250-kilowatt	1.25 (1.38)	4.74 (5.22)	0.13 (0.14)	0.09 (0.10)	0.13 (0.14)	--
8	3-Generators, 125-kilowatt	3.12 (3.44)	14.46 (15.94)	0.95 (1.05)	1.02 (1.12)	1.18 (1.30)	--
9	Open Burn Pit	91.04 (100.35)	6.42 (7.08)	1.07 (1.18)	17.14 (18.89)	32.13 (35.42)	--
10	Aboveground Storage Tank–Diesel–76,000-liter (20,000-gallon)	0	0	0	0	<0.01 (<0.01)	--
11	2-Underground Storage Tanks–Diesel–130,000-liter (35,000-gallon)	0	0	0	0	0.02 (0.02)	
12	Underground Storage Tank–Diesel–110,000-liter (30,000-gallon)	0	0	0	0	<0.01 (<0.01)	--
13	Underground Storage Tank–Diesel–57,000-liter (15,000-gallon)	0	0	0	0	<0.01 (<0.01)	--
14	Underground Storage Tank–JP-4–76,000-liter (20,000-gallon)	0	0	0	0	0.45 (0.50)	--
15	Aboveground Storage Tank–Diesel–2,390,000-liter (630,000-gallon)	0	0	0	0	0.05 (0.06)	--
16	Prescribed Burning/Firefighter Training	3,225.22 (3,555.20)	72.57 (80.00)	--	299.01 (329.60)	--	--
17	Ozone Depleting Chemicals	0	0	0	0	0	0.27 (0.30)
18	Fugitive Dust	0	0	0	1.42 (1.56)	0	--
19	Municipal Landfill	0	0	0	0	0.36 (0.40)	--
--	Miscellaneous Insignificant Sources	0.84 (0.93)	3.32 (3.66)	1.36 (1.50)	0.57 (0.63)	2.66 (2.93)	--
Total		3,327.15 (3,667.56)	123.80 (136.47)	13.11 (14.45)	320.19 (352.95)	37.34 (41.16)	0.27 (0.30)

Source: U.S. Army Center for Health Promotion and Preventive Medicine, 1997—Title V Permit Application Fort Greely, Alaska

Note: PM-10 = Particulate matter with a mean aerodynamic diameter equal to or less than a nominal 10 micrometers, VOC = volatile organic compound, HAP = hazardous air pollutant, BTU = British Thermal Unit

The Yukon Training Area is to the east of Eielson AFB. The climate and meteorology presented in section 3.2.1 provide an accurate description of the Yukon Training Area. The area is in attainment for all NAAQS and state AAQS and is physically removed from the Fairbanks carbon monoxide non-attainment area. The Yukon Training area is considered a PSD Class II area.

Existing Emissions Sources

The Yukon Training Area is an undeveloped area currently used for a variety of military exercise and training activities. These activities include heavy machinery movements, low-level overflights by aircraft or helicopters, and troop movements. The primary emissions sources in the area are vehicles, aircraft, and occasional portable power generators. No emissions inventory has been identified for this site.

3.2.2 NORTH DAKOTA INSTALLATIONS

State Regulatory Framework

The North Dakota Department of Health has established state AAQS designed to maintain public health and welfare. These standards are either equivalent to or stricter than the NAAQS. In addition to the pollutants covered by the NAAQS, the North Dakota state AAQS include hydrogen sulfide. Table 3.2-7 compares the NAAQS and the North Dakota state AAQS.

Climate and Meteorology

The normal average annual temperature in North Dakota ranges from approximately 3°C (37°F) in the northeast to 6°C (43°F) along the southern border. It ranges from approximately –17°C (2°F) in January to approximately 19°C (67°F) in July. Winter temperatures in northeast North Dakota are among the coldest in the contiguous United States, and the normal winter temperatures in the southwestern portion still compare with temperatures found in northern Iowa or upstate New York. Summer temperatures above 32°C (90°F) occur in northeast North Dakota, on average, only 8 days annually. (Jensen, undated—Climate of North Dakota)

Average snowfall in North Dakota ranges from less than 66 centimeters (26 inches) to approximately 97 centimeters (38 inches). The northeast portion of the state generally receives amounts in the high end of this range. However, the average maximum snow depth during the winter season is only 23 to 38 centimeters (9 to 15 inches). This level varies substantially from year to year. (Jensen, undated—Climate of North Dakota)

Table 3.2-7: Federal and North Dakota State Ambient Air Quality Standards

Pollutant	Averaging Time	North Dakota Standard	National Primary Standard	National Secondary Standard
Carbon Monoxide	8-hour	10 mg/m^3 (9 ppm)	10 mg/m^3 (9 ppm)	None
	1-hour	40 mg/m^3 (35 ppm)	40 mg/m^3 (35 ppm)	None
Hydrogen Sulfide	3-month[1]	28 µg/m^3 (0.02 ppm)	None	None
	24-hour	140 µg/m^3 (0.10 ppm)	None	None
	1-hour	280 µg/m^3 (0.20 ppm)	None	None
	Instantaneous[2]	14 mg/m^3 (10 ppm)	None	None
Lead	Quarterly[1]	1.5 µg/m^3	1.5 µg/m^3	Same as Primary
Nitrogen Dioxide	Annual[1]	100 µg/m^3 (0.053 ppm)	100 µg/m^3 (0.053 ppm)	Same as Primary
Ozone	8-hour[3]	None	164 µg/m^3 (0.084 ppm)	Same as Primary
	1-hour	235 µg/m^3 (0.12 ppm)	235 µg/m^3 (0.12 ppm)	Same as Primary
PM-2.5	Annual[4]	None	15 µg/m^3	Same as Primary
	24-hour[5]	None	65 µg/m^3	Same as Primary
PM-10	Annual	50 µg/m^3	50 µg/m^3	Same as Primary
	24-hour[6]	150 µg/m^3	150 µg/m^3	Same as Primary
Sulfur Oxides[7]	Annual[1]	60 µg/m^3 (0.023 ppm)	80 µg/m^3 (0.03 ppm)	None
	24-hour	260 µg/m^3 (0.099 ppm)	365 µg/m^3 (0.14 ppm)	None
	1-hour	715 µg/m^3 (0.273 ppm)	None	None
	3-hour	None	None	1,300 µg/m^3 (0.5 ppm)

Sources: 40 CFR 50.9; NDACP 33-15-02; U.S. Environmental Protection Agency, 1998—EPA's Updated Air Quality Standards for Smog and Particulate Matter.

[1]Calculated as the arithmetic mean

[2]Ceiling level, not to be exceeded at any point in time.

[3]Calculated as the 3-year average of the fourth highest daily maximum 8-hour ozone concentration

[4]Calculated as the 3-year average of annual arithmetic means

[5]Calculated as the 98th percentile of 24-hour PM-2.5 concentrations in a year (averaged over 3 years) at the population-oriented monitoring site with the highest measured values in the area.

[6]Calculated as the 99th percentile of 24-hour PM-10 concentrations in a year (averaged over 3 years)

[7] Measured as sulfur dioxide

Note: mg/m^3 = milligrams per cubic meter, µg/m^3 = micrograms per cubic meter, PM-10 = particulate matter with a mean aerodynamic diameter equal to or less than a nominal 10 micrometers, PM-2.5 = particulate matter with a mean aerodynamic diameter equal to or less than a nominal 2.5 micrometers, ppm = parts per million

Average annual precipitation in North Dakota ranges from approximately 33 centimeters (13 inches) to more than 51 centimeters (20 inches), with northeast North Dakota again being in the high end of that average. The majority of the rain falls in the summer. June is generally the wettest month with an average of approximately 8 centimeters (3 inches) of precipitation. (Jensen, undated—Climate of North Dakota)

Relative humidity is one of the primary indicators of atmospheric turbulence. It ranges from approximately 51 to 74 percent in North Dakota, with the northeast generally at the lower end of the scale. (Jensen, undated—Climate of North Dakota)

Wind in North Dakota generally originates from the northwest and averages approximately 16 kilometers (10 miles) per hour.

The initial dispersion of pollutants generally occurs in the near-ground atmospheric mixing layer. The depth of this mixing layer is known as the mixing height and varies substantially depending upon atmospheric conditions. Turbulence caused by heat from the sun is a prime source of atmospheric instability. As such, the mixing height is generally highest during afternoon hours and lowest in the evening or early morning. However, temperature inversions (generally a winter occurrence) may cause extended periods of low mixing heights. Low mixing heights may adversely affect regional air quality until the inversion is lifted. The mixing heights in northeast North Dakota range from an average of approximately 280 meters (900 feet) on winter mornings to approximately 1,900 meters (6,200 feet) on summer afternoons. (U.S. EPA, 1972—Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution Throughout the Contiguous United States)

Regional Air Quality

The *1997 Air Quality Monitoring Report* (North Dakota Health Department, 1999) indicates that all regions in North Dakota are in attainment or unclassifiable for all NAAQS. The state monitored air quality at 13 locations, and industry maintained another 10 pollutant-specific monitors. No exceedances of NAAQS or state AAQS were recorded in the ROIs. All areas within the ROIs are designated by the U.S. Environmental Protection Agency (U.S. EPA) as Class II for PSD purposes. There are no Class I areas within the ROIs.

3.2.2.1 Cavalier AFS—Air Quality

This section describes the air quality in the vicinity of Cavalier AFS. The ROI for air quality includes the geographic airshed in which the emissions would occur and is further defined in section 3.2. Federal regulations applicable to air quality are described in section 3.2, and North Dakota state regulations are described in section 3.2.2. The climate of North Dakota varies little throughout the state and is described in section 3.2.2. The Cavalier AFS region is considered a PSD Class II area.

Existing Emissions Sources

Cavalier AFS is classified as a major emissions source and maintains a Title V Air Pollution Control Permit issued by the North Dakota Department of Health. Table 3.2-8 summarizes the emissions from the significant emissions sources regulated by the permit. It does not include those units or activities classified as insignificant by the North Dakota Department of Health. Non-permitted sources and activities at Cavalier AFS that are covered by the Title V Air Permit as insignificant emissions sources include maintenance equipment and activities, construction

equipment, and fueling operations (North Dakota Department of Health, 1997—Air Pollution Control Title V Permit to Operate, Cavalier AS). No reportable levels of hazardous air pollutants were identified in the emissions summary for Cavalier AFS (Department of the Air Force, 1998—1997 Annual Emissions Inventory Report, Cavalier AS). Cavalier AFS is not considered a major source of hazardous air pollutants.

Table 3.2-8: 1997 Air Emissions Inventory—Cavalier AFS

Emission Source	Emissions (Metric Tons [Tons] per Year)					
	Carbon Monoxide	Oxides of Nitrogen	Oxides of Sulfur	PM-10	VOC	HAP[1]
Dual-fuel Boiler 11.64x106 BTU/hour	0.28 (0.31)	1.14 (1.26)	0.05 (0.05)	0.04 (0.04)	0.02 (0.02)	--
5 Dual-fuel Generators, 3 Megawatts each	47.06 (51.88)	184.68 (203.57)	2.98 (3.28)	2.96 (3.26)	35.74 (39.40)	--
Emergency Generators	0.01 (0.01)	0.04 (0.04)	<0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)	--
Air Compressor 200 Horsepower	<0.01 (<0.01)	0.03 (0.03)	<0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)	--
Fire Water Pump (2 each)	<0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)	--
Total	47.36 (52.21)	185.88 (204.90)	3.03 (3.34)	3.00 (3.31)	35.77 (39.43)	--

Source: Department of the Air Force, 1998—Annual Emissions Inventory Report, Cavalier AS.

[1] There were no reportable HAPs emissions listed in the Title V Emissions Survey for Cavalier AFS.

Note: BTU = British Thermal Unit, PM-10 = particulate matter with a mean aerodynamic diameter equal to or less than a nominal 10 micrometers, VOC = volatile organic compound, HAP = hazardous air pollutant

3.2.2.2 Grand Forks AFB—Air Quality

This section describes the air quality in the vicinity of Grand Forks AFB. The ROI for air quality includes the geographic airshed in which the emissions would occur and is further defined in section 3.2. Federal regulations applicable to air quality are described in section 3.2, and North Dakota state regulations are described in section 3.2.2. The climate of North Dakota varies little throughout the state and is described in section 3.2.2. The vicinity of Grand Forks AFB is in attainment for all NAAQS and state AAQS and is considered a PSD Class II area.

Existing Emissions Sources

Grand Forks AFB has several stationary pollutant emissions sources and is classified as a major emissions source as defined in section 3.2. The Title V Air Permit issued to Grand Forks AFB by the North Dakota state

Department of Health in October 1997 restricts permissible emissions on the base. This permit delineates the permissible emissions from each potentially significant stationary emission source. It specifies air pollution control measures required, record keeping measures, and annual reporting requirements. This permit also addresses insignificant emissions units and activities. Table 3.2-9 summarizes the results reported in the 1997 emissions inventory. Grand Forks AFB is not considered a major source of hazardous air pollutants. (Department of the Air Force, 1998—Annual Emissions Inventory Report, Grand Forks AFB)

Table 3.2-9: 1997 Air Emissions Inventory—Grand Forks AFB

Emission Source	Emissions (Metric Tons [Tons] per Year)					
	Carbon Monoxide	Oxides of Nitrogen	Oxides of Sulfur	PM-10	VOC	HAP
2 Jet Kerosene Storage Tank	--	--	--	--	0.02 (0.02)	--
3 Dual-fuel Boilers–42 ×106 BTU/hour each	0.72 (0.79)	8.78 (9.68)	0.64 (0.71)	0.12 (0.13)	0.03 (0.03)	--
7 Dual-fuel Boilers–18.75 ×106 BTU/hour each	8.35 (9.20)	112.28 (123.77)	1.57 (1.73)	1.11 (1.23)	0.35 (0.39)	--
Oil-fired Boiler – 10.5 ×106 BTU/hour	0.02 (0.02)	0.07 (0.08)	0.10 (0.11)	<0.01 (<0.01)	<0.01 (<0.01)	--
Incinerator	0.01 (0.01)	0.18 (0.20)	<0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)	--
Natural Gas Boiler–5.021 ×106 BTU/hour	<0.01 (<0.01)	0.05 (0.06)	<0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)	--
Natural Gas Boiler–1.15 ×106 BTU/hour	<0.01 (<0.01)	0.05 (0.06)	<0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)	--
Emergency Generators	2.29 (2.52)	10.51 (11.59)	1.96 (2.16)	0.42 (0.46)	0.61 (0.67)	--
Fire Training	--	--	--	--	--	0.57 (0.63)[1]
Paint Booth	--	--	--	--	--	0.62 (0.68)[2]
Medical Waste Incinerator	--	--	--	--	--	0.09 (0.10)[3]
Total	11.39 (12.55)	131.94 (145.44)	4.28 (4.72)	1.66 (1.83)	10.17 (11.21)	1.28 (1.41)

Source: Department of the Air Force, 1998—Annual Emissions Inventory Report, Grand Forks AFB.

Note: BTU = British Thermal Unit, HAP = hazardous air pollutant, PM-10 = particulate matter with a mean aerodynamic diameter equal to or less than a nominal 10 micrometers, VOC = volatile organic compound

[1] Formaldehyde

[2] Methyl ethyl ketone

[3] Hydrogen chloride

3.2.2.3 Missile Site Radar—Air Quality

This section describes the air quality in the vicinity of the Missile Site Radar. The ROI for air quality includes the geographic airshed in which the emissions would occur. This broad area encompasses both direct, immediate impacts due to criteria pollutants and hazardous air pollutants that generally disperse within a few miles of the emissions source, and indirect, delayed impacts due to precursor actions (primarily ozone precursors) that can delay impacts for several hours. Federal regulations applicable to air quality are described in section 3.2, and state regulations are described in section 3.2.2. The climate of North Dakota varies little throughout the state and is described in section 3.2.2. The area is in attainment for all NAAQS and state AAQS and is considered a PSD Class II area.

Existing Emissions Sources

The Missile Site Radar is currently in caretaker status. As such, emissions are minimal and are limited to groundskeeping, security activities, and minimal maintenance of used buildings.

3.2.2.4 Remote Sprint Launch Site 1—Air Quality

The air quality and emission sources at Remote Sprint Launch Site 1 are similar to those described for the Missile Site Radar.

3.2.2.5 Remote Sprint Launch Site 2—Air Quality

The air quality and emission sources at Remote Sprint Launch Site 2 are similar to those described for the Missile Site Radar.

3.2.2.6 Remote Sprint Launch Site 4—Air Quality

The air quality and emission sources at Remote Sprint Launch Site 4 are similar to those described for the Missile Site Radar.

3.3 AIRSPACE

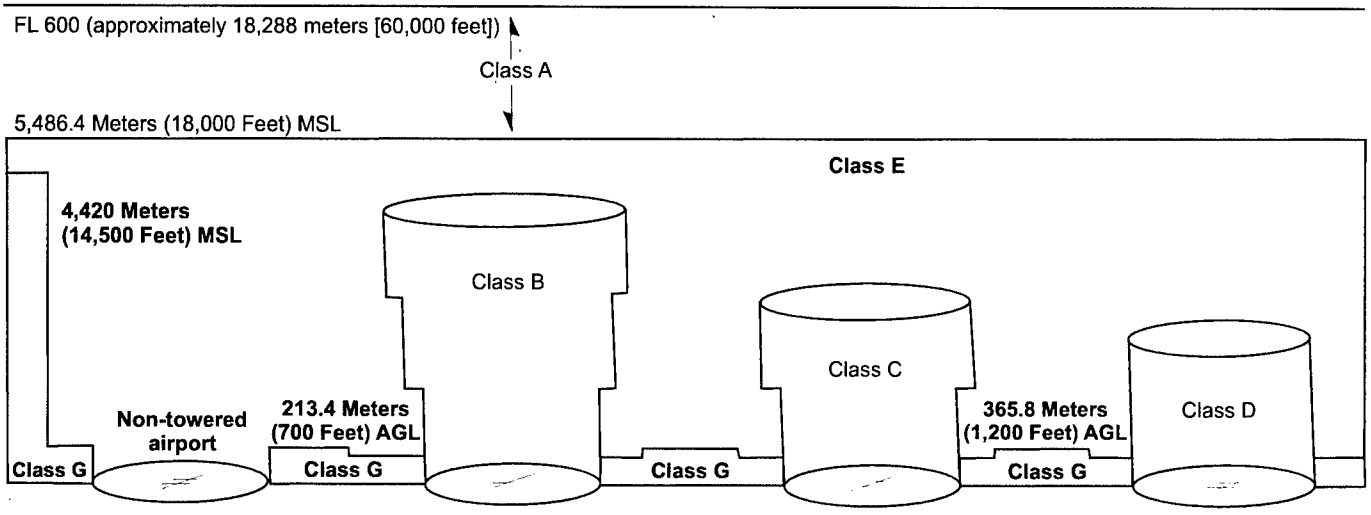
Airspace, or that space which lies above a nation and comes under its jurisdiction, is generally viewed as being unlimited. However, it is a finite resource that can be defined vertically and horizontally, as well as temporally, when describing its use for aviation purposes. The scheduling, or time dimension, is a very important factor in airspace management and air traffic control.

Under Public Law 85-725, the FAA is charged with the safe and efficient use of the nation's airspace and has established certain criteria and limits to its use. The method used to provide this service is the National Airspace System. This system is "...a common network of U.S. airspace; air navigation facilities, equipment and services, airports or landing areas; aeronautical charts, information and services; rules, regulations and procedures, technical information and manpower and material" (Aeronautical Information Manual, 1998—FAR/AIM 98).

Airspace for this EIS only covers those installations where an XBR could be deployed as part of the NMD program. Since there would be no change in airspace as a result of GBI or BMC2 deployment, those installations where these elements could be deployed are not addressed in the airspace resource area.

Types of Airspace

Controlled and Uncontrolled Airspace. Controlled and uncontrolled airspace is divided into six classes, dependent upon location, use, and degree of control. Figure 3.3-1 depicts the various classes of controlled airspace. Class A airspace, which is not specifically charted, is generally, that airspace from 5,486 meters (18,000 feet) mean sea level up to and including flight level 600 (18,288 meters or 60,000 feet). Unless otherwise authorized, all aircraft must be operated under instrument flight rules. Class B airspace is, generally, that airspace from the surface to 3,048 meters (10,000 feet) mean sea level surrounding the nation's busiest airports in terms of instrument flight rules operations or passenger enplanements. An air traffic control clearance is required for all aircraft to operate in the area, and all aircraft that are so cleared receive separation services within the airspace. Class C airspace is, generally, that airspace from the surface to 1,219 meters (4,000 feet) above the airport elevation surrounding those airports that have an operational control tower, are serviced by a radar approach control, and that have a certain number of instrument flight rules operations or passenger enplanements. Class D airspace is, generally, that airspace from the surface to 762 meters (2,500 feet) above the airport elevation surrounding those airports that have an operational control tower. Class E airspace is controlled airspace that is not Class, A, Class B, Class C, or Class D airspace.



Approximate maximum ceilings:
Class B: 3,048 Meters (10,000 Feet) MSL
Class C: 1,219.2 Meters (4,000 Feet) AGL
Class D: 762 Meters (2,500 Feet) AGL

EXPLANATION

AGL = Above Ground Level
FL = Flight Level
MSL = Above Mean Sea Level

The Six Classes of Non-Military Airspace

Figure 3.3-1

Not to Scale

Uncontrolled airspace, or Class G airspace, has no specific definition but generally refers to airspace not otherwise designated. No air traffic control service to aircraft operating under either instrument or visual flight rules is provided other than possible traffic advisories when the air traffic control workload permits and radio communications can be established (Illman, 1993—The Pilot's Air Traffic Control Handbook).

Special Use Airspace. Complementing the classes of controlled and uncontrolled airspace described above are several types of special use airspace used by the military to meet its particular needs. Special use airspace consists of that airspace wherein activities must be confined because of their nature, or wherein limitations are imposed upon aircraft operations that are not a part of these activities, or both. Except for Controlled Firing Areas, special use airspace areas are depicted on aeronautical charts, which also include hours of operation, altitudes, and the controlling agency. Only the kinds of special use airspace found in the ROI are described. These include:

- Restricted Areas contain airspace identified by an area on the surface of the earth within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Activities within these areas must be confined, because of their nature, or limitations imposed upon aircraft operations that are not a part of these activities, or both. Restricted Areas denote the existence of unusual, often invisible, hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. Restricted Areas are published in the Federal Register and constitute Federal Aviation Regulation (FAR) Part 73. (Aeronautical Information Manual, 1998—FAR/AIM 98)
- Military Operations Areas consist of airspace of defined vertical and lateral limits established for the purpose of separating certain non-hazardous military training activities from instrument flight rules traffic and to identify for visual flight rules traffic where these activities are conducted. Whenever a military operations area is being used, non-participating instrument flight rules traffic may be cleared through a military operations area if instrument flight rules separation can be provided by Air Traffic Control. Otherwise, Air Traffic Control will reroute or restrict non-participating instrument flight rules traffic (Aeronautical Information Manual, 1998—FAR/AIM 98).

Other Airspace Areas. Other types of airspace include airport advisory areas, military training routes, temporary flight restrictions areas, flight limitations/prohibitions areas, parachute jump aircraft operations areas, published visual flight rules routes, and terminal radar service areas (Aeronautical Information Manual, 1998 FAR/AIM 98). Of these, military training routes are described below:

- Military Training Routes, a joint venture by the FAA and the DOD, are mutually developed for use by the military for the purpose of conducting low-altitude, high speed training. The routes above 457 meters (1,500 feet) above ground level are developed to be flown, to the maximum extent possible, under instrument flight rules. The routes at 457 meters (1,500 feet) above ground level and below are generally developed to be flown under visual flight rules. Generally, military training routes are established below 3,048 meters (10,000 feet) mean sea level for operations at speeds in excess of 463 kilometers per hour (250 knots). However, route segments may be defined at higher altitudes for purposes of route continuity (Aeronautical Information Manual, 1996—FAR/AIM 98). In addition to the instrument and visual flight rules routes, there are slow speed low altitude routes used for military air operations at or below 457 meters (1,500 feet) at airspeeds of 463 kilometers per hour (250 knots) or less (National Imagery and Mapping Agency, 1998—DOD Flight Information Publication).

3.3.1 ALASKA INSTALLATIONS

3.3.1.1 Eareckson AS—Airspace

The ROI is defined as that area that could be affected by either the ongoing No-action Alternative activities or that could potentially be affected by the Proposed Action. For the purposes of this document it is that airspace within approximately 185 kilometers (100 nautical miles) of the proposed XBR on Shemya Island, in the western Aleutian Islands, Alaska. A description of the airspace resource is given in section 3.3.

The affected airspace use environment in the western Aleutian Islands airspace ROI is described below in terms of its principal attributes, namely: controlled and uncontrolled airspace; special use airspace, military training routes, en route airways and jet routes, airports and airfields, air navigation facilities, and air traffic control.

Controlled and Uncontrolled Airspace

The ROI is composed of Class A airspace from 5,486 meters (18,000 feet) mean sea level up to and including flight level 600 (18,288 meters or 60,000 feet). Below 5,486 meters (18,000 feet), the ROI is composed largely of Class G (uncontrolled) airspace, except for the area around Eareckson AS which is Class E airspace. The Class E airspace extends upward from 213 meters (700 feet) above the surface within a 13-kilometer (6.9-nautical-mile) radius of Eareckson AS, and includes that airspace extending upward from 366 meters (1,200 feet) above the surface within a 48.5-kilometer (26.2-nautical-mile) radius of Eareckson AS, excluding that airspace more than 22 kilometers (12 nautical miles)

from the shoreline. There is no Class B airspace, which usually surrounds the busiest airports, Class C or Class D airspace in the ROI.

Special Use Airspace

There is no special use airspace in the Western Aleutian Islands airspace ROI.

Military Training Routes

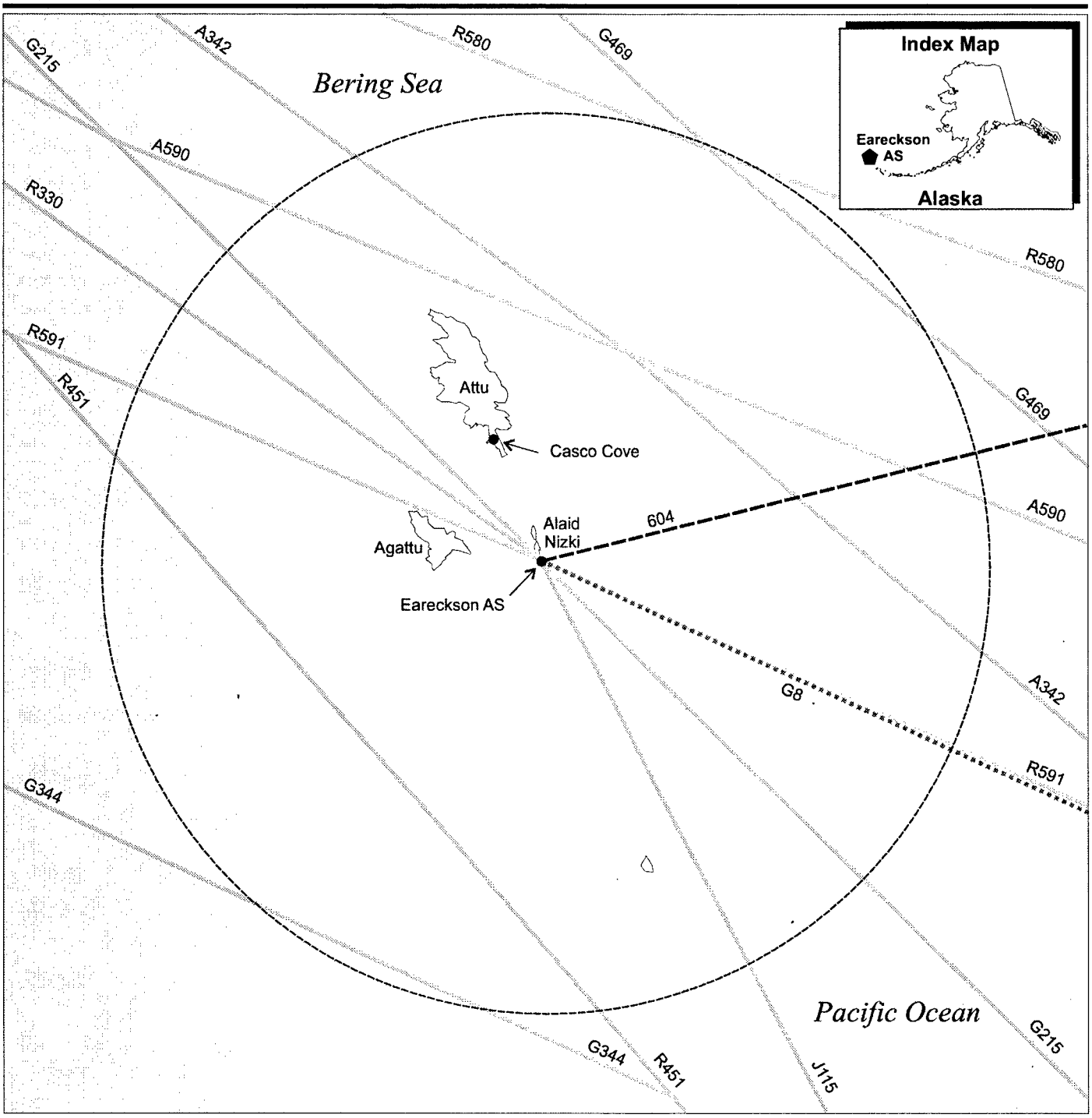
Although there are no Military Training Routes in the ROI, there is a Military Instrument Flight Rules route (route 604) from St. Paul Island to Eareckson AS. Military Instrument Flight Rule routes are a military backup to the civilian (FAA) system and are used by military aircraft.

En route Airways and Jet Routes

There is one en route low altitude airway, G8, connecting Shemya with Adak Island to the east, in the ROI. Located on the great circle route from North America to the Far East, there are many en route high altitude jet routes that cross the Western Aleutian Islands airspace ROI (figure 3.3-2).

As an alternative to aircraft flying above 8,839 meters (29,000 feet) following the published, preferred instrument flight rules routes (shown in figure 3.3-2), the FAA is gradually permitting aircraft to select their own routes as alternatives. This "Free Flight" program is an innovative concept designed to enhance the safety and efficiency of the National Airspace System. The concept moves the National Airspace System from a centralized command-and-control system between pilots and air traffic controllers to a distributed system that allows pilots, whenever practical, to choose their own route and file a flight plan that follows the most efficient and economical route. (Federal Aviation Administration, 1997—Free Flight)

Free Flight is already underway, and the plan for full implementation will occur as procedures are modified and technologies become available and are acquired by users and service providers. This incremental approach balances the needs of the aviation community and the expected resources of both the FAA and the users. The Central Pacific Oceanic Program is one of two current Free Flight programs underway. In the airspace over the Central Pacific, advanced satellite voice and data communications are being used to provide faster and more reliable transmission to enable reductions in vertical, lateral, and longitudinal separation, more direct flights and tracks, and faster altitude clearances. (Federal Aviation Administration, 1997—Free Flight). With the full implementation of this program, the amount of airspace in the ROI that is likely to be clear of traffic, will decrease as pilots, whenever practical, choose their own route and file a flight plan that follows the most efficient and economical route, rather than following the published



EXPLANATION

- 185 Kilometer (100 Nautical Mile) Region of Influence
- High Altitude Airways
- Low Altitude Airways(G8)
- Military Instrument Flight Rule Route
- Airport

Scale 1:2,500,000

0 20 40 Miles

NORTH 0 32 64 Kilometers

Low and High Altitude En Route Airways and Jet Routes, Western Aleutians

Alaska

Figure 3.3-2

preferred instrument flight rules routes across the Pacific Ocean shown in figure 3.3-2.

Airports/Airfields

There are two military airports/airfields in the Western Aleutian Islands airspace ROI: Eareckson AS on Shemya Island, and Casco Cove Coast Guard Station on Attu Island approximately 61 kilometers (33 nautical miles) west of Eareckson AS (figure 3.3-2). The instrument approach and standard instrument departure tracks into and out of Eareckson AS are to the east, southeast, west, and southwest (National Ocean Service, 1998—U.S. Terminal Procedures, Alaska). There are no public airports or private airfields/airstrips in the ROI.

Air Navigation and Communications Facilities

Both Eareckson AS and Casco Cove Coast Guard Station are the sites of non-directional radiobeacons. In addition, Eareckson AS is the site of a Very High Frequency (VHF) Omni-Directional Range/Tactical Air Navigation facility, an airport surveillance radar (AN/GPN-20), and an instrument landing system. Non-directional radiobeacons are low or medium frequency radio beacons that transmit non-directional signals whereby the pilot of an aircraft properly equipped can determine bearings and "home" on the station. These non-directional radiobeacon facilities normally operate in the frequency band of 190 to 535 kilohertz and transmit a continuous carrier with either 400 or 1,020 hertz modulation (Aeronautical Information Manual, 1998—FAR/AIM 98). The AN/GPN-20 airport surveillance radar operates in the 2,750 to 2,850 megahertz frequency band (Joint Spectrum Center, undated—The Aleutian Island of Shemya). The instrument landing system is designed to provide an approach path for exact alignment and descent of an aircraft on final approach to a runway. The ground equipment consists of two highly directional transmitting systems known as the localizer and glideslope. The localizer operates in a frequency range of 108.10 to 111.95 megahertz, and the glideslope operates from 329.15 to 335 megahertz.

The VHF omni-directional range/tactical air navigation facility consists of two components, a VHF Omni-Directional Range air navigation radio aid operating within the 108.0 to 117.95 megahertz frequency band, and a Tactical Air Navigation azimuth and distance system, operating in the ultra high frequency (UHF) band of frequencies, located at one site as a unified navigational aid (Aeronautical Information Manual, 1998-FAR/AIM 98).

One of the four FAA Long Range Navigation radio transmitters in the North Pacific Chain, which operate at the 100 kilohertz frequency, is located on Attu Island. The other three transmitters are well outside the ROI in Saint Paul, Kodiak, and Port Clarence, Alaska (Aeronautical Information Manual, 1998—FAR/AIM 98). There are no other air

navigation or communications facilities, including air route surveillance radars, which track aircraft en route and operate in the L-Band (1 to 2 gigahertz) in the Western Aleutian Islands airspace ROI.

Air Traffic Control

The Western Aleutian Islands airspace ROI lies within the Anchorage Oceanic Control Area/Flight Information Region (CTA/FIR) and within the U.S. Alaskan Air Defense Identification Zone. In the Class A (positive control areas) airspace from 5,486 to 18,288 meters (18,000 to 60,000 feet) all operations are conducted under instrument flight rules procedures and are subject to air traffic control clearances and instructions. Aircraft separation and safety advisories are provided by air traffic control, the Anchorage Air Route Traffic Control Center. In Class E airspace (general controlled airspace), below 5,486 meters (18,000 feet), operations may be either under instrument flight rules or visual flight rules: separation service is provided to aircraft operating under instrument flight rules only, and to the extent practicable, traffic advisories to aircraft operating under visual flight rules, by the Anchorage Air Route Traffic Control Centers. For Class G airspace (uncontrolled airspace), operations may be either under instrument or visual flight rules, but no air traffic control service is available.

The airspace beyond the 22-kilometer (12-nautical-mile) limit is in international airspace. In this airspace outside U.S. territory, FAA air traffic service is provided in accordance with Article 12 and Annex 11 of the International Civil Aviation Organization (ICAO) Convention. Because it is in international airspace, the procedures of the ICAO, outlined in ICAO Document 444, Rules of the Air and Air Traffic Services, are followed (ICAO, 1985—Procedures for Air Navigation Services; 1994—Amendment No. 5 to the Procedures for Air Navigation Services). ICAO Document 444 is the equivalent air traffic control manual to FAA Handbook 7110.65, Air Traffic Control. The FAA acts as the United States agent for aeronautical information to the ICAO, and air traffic in the ROI is managed by the Anchorage Air Route Traffic Control Centers.

3.3.2 NORTH DAKOTA INSTALLATIONS

3.3.2.1 Cavalier AFS—Airspace

The ROI is defined as that area that could be affected by either the ongoing No-action Alternative activities or that could potentially be affected by the Proposed Action. For the purposes of this document, it is that airspace within approximately 185 kilometers (100 nautical miles) of the proposed XBR sites in North Dakota.

The affected airspace use environment in the North Dakota airspace ROI is described below in terms of its principal attributes, namely: controlled and uncontrolled airspace, special use airspace, military training routes,

en route airways and jet routes, airports and airfields, air navigation facilities, and air traffic control.

Controlled and Uncontrolled Airspace

The ROI is composed of Class A airspace from 5,486 meters (18,000 feet) mean sea level up to and including flight level 600 (18,288 meters or 60,000 feet). Below 5,486 meters (18,000 feet), the ROI is composed largely of Class E airspace with a floor of 366 meters (1,200 feet) or greater above the surface, except for the areas around Grand Forks International, Fargo, Jamestown and the larger municipal airports, and Grand Forks AFB where the floor is 213 meters (700 feet) above the surface. There is no Class B airspace, which usually surrounds the busiest airports, or Class C airspace in the ROI. Grand Forks International, Grand Forks AFB, and Fargo airports are surrounded by Class D airspace with ceilings of 1,006 and 1,036 meters (3,300 and 3,400 feet), respectively. In Canada, Winnipeg International and Southport airports are also surrounded by Class D airspace.

The ROI has some large areas of uncontrolled, or Class G, airspace immediately above and to the west, south, southwest, and northwest of the proposed radar sites.

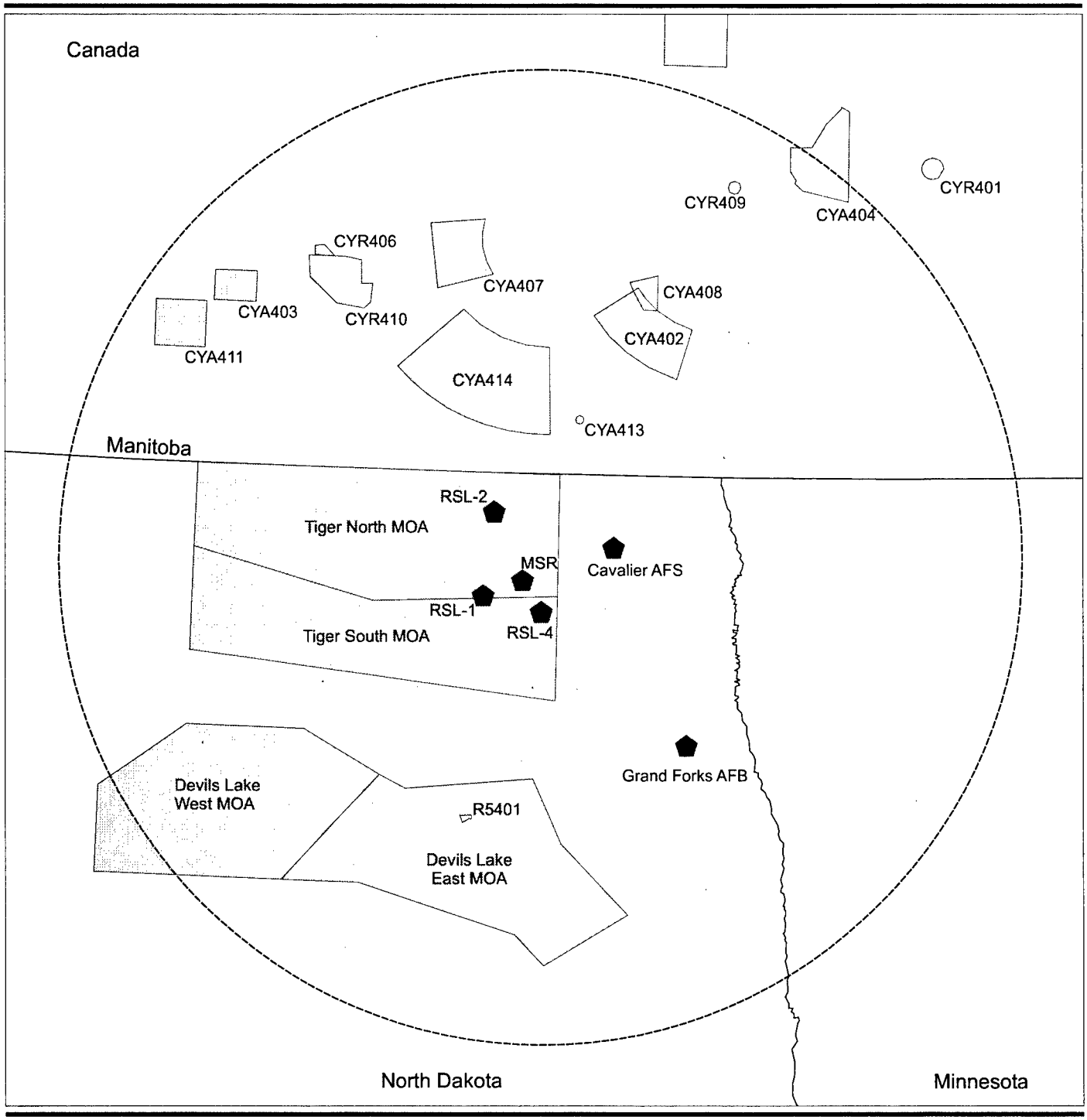
Special Use Airspace

The special use airspace in the ROI consists of the R-5401 Restricted Area southeast of Devils Lake in the Devils Lake East Military Operations Area, the Tiger North and Tiger South Military Operations Area, and the Devils Lake East and Devils Lake West Military Operations Area in the United States. Restricted areas in Canada include the Canadian Restricted Area CYR-406 and CYR-410 areas just southeast of Brandon, and the Canadian Restricted Area CYR-409 area north of Winnipeg (figure 3.3-3). The Canadian airspace portion of the ROI also has a number of Advisory Areas.

Table 3.3-1 provides a listing of the special use airspace and their effective altitudes, times used, and their manager/scheduler. There are no Prohibited, Alert, or Controlled Firing Areas special use airspace areas in the ROI.

Military Training Routes

There are four instrument flight rules Military Training Routes in the ROI (figure 3.3-4). All four routes are designated such that the military assumes responsibility for separation of aircraft operations established by coordinated scheduling. There are no visual flight rules Military Training Routes or Slow Speed Low Altitude Training Routes in the ROI. (National Imagery and Mapping Agency, 1998—DOD Flight Information Publication)



EXPLANATION

----- 185 Kilometer (100 Nautical Mile) Region of Influence

Special Use Airspace

Potential NMD Sites

Special Use Airspace

North Dakota

NORTH

Scale 1:2,500,000

0 20 40 Miles

0 32 64 Kilometers

Figure 3.3-3

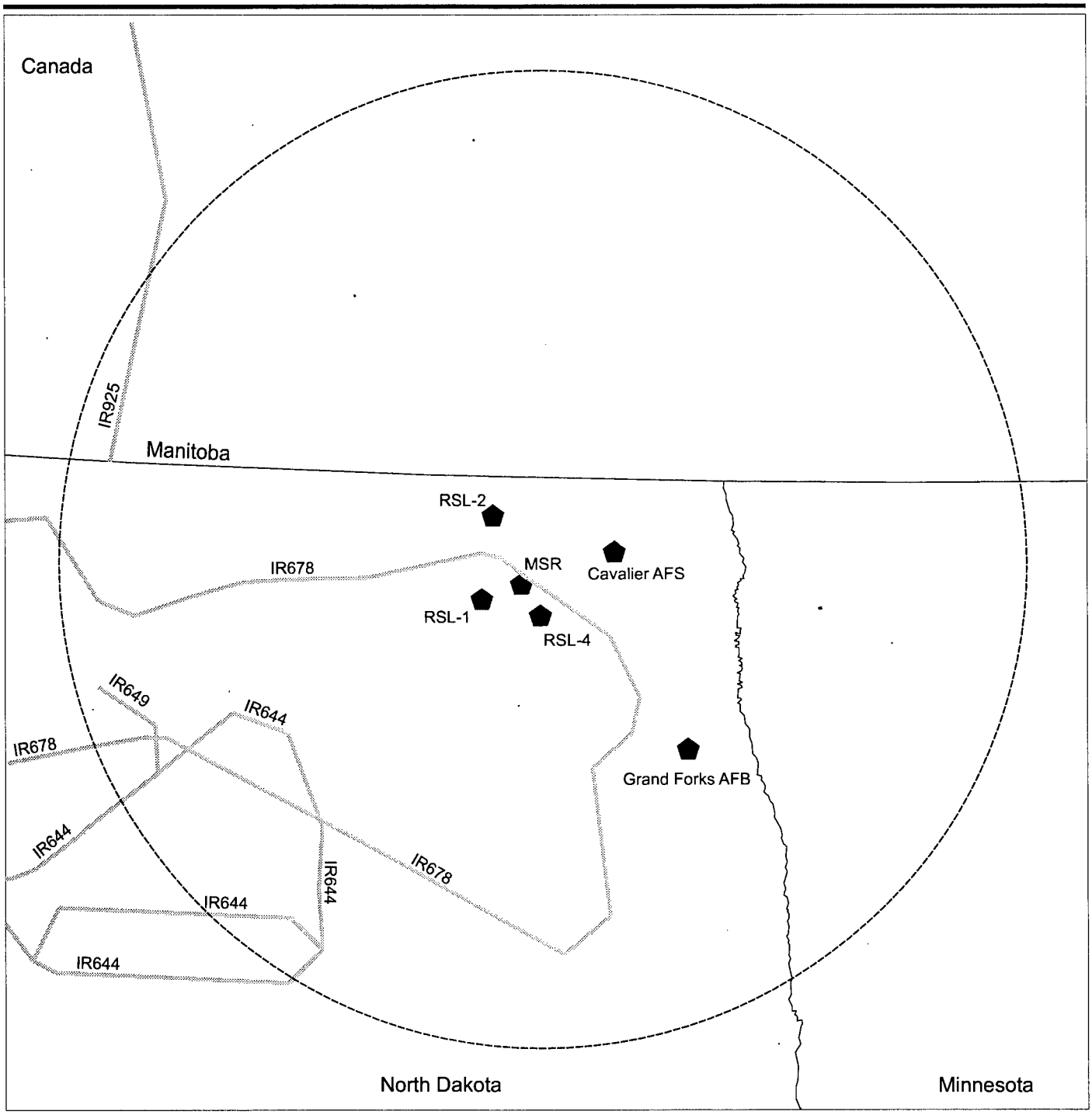
Table 3.3-1: Special Use Airspace in the North Dakota Airspace Use ROI

Number	Effective Altitude in meters (feet)	Times Used		Controlling Agency
		Days	Hours	
R-5401	To 1,524 (5,000)	By NOTAM	By NOTAM	Minneapolis CNTR/FSS
CYR 406	To 1,219 (4,000)	Continuous[1]	Continuous[1]	No A/G[2]
CYR 409	To 396 (1,300)	Continuous[1]	Continuous[1]	Winnipeg CZWG
CYR 410	To 8,534 (28,000)	Continuous[1]	Continuous[1]	No A/G[2]
	To 10,668 (35,000)	By NOTAM	By NOTAM	No A/G[2]
CYA 403(T)	To 1,829 (6,000)	Continuous[3]	Continuous[3]	Winnipeg CZWG
CYA 411(A)	1,067 to 3,048 (3,500 to 10,000)	Continuous[3]	Continuous[3]	Winnipeg CZWG
CYA 402(M)	1,524 to 3,810 (5,000 to 12,500)	Mon-Fri	1400-2200[4]	Winnipeg CZWG
CYA 404(T)	To 1,219 (4,000)	Continuous[3]	Continuous[3]	Winnipeg CZWG
CYA 407(T)	To 2,438 (8,000)	Mon-Fri	1400-2300[5]	Winnipeg CZWG
CYA 408(S)	To below 914 (3,000)	Continuous[3]	Continuous[3]	Winnipeg CZWG
CYA 413(P)	To 1,524 (5,000)[6]	Continuous[3]	Continuous[3]	Winnipeg CZWG
CYA 414(T)	1,524 to 3,810 (5,000 to 12,500)	Intermittent	By NOTAM	Winnipeg CZWG
CYA 420(T)	To 1,829 (6,000)	Continuous[3]	Continuous[3]	Winnipeg CZWG
Tiger North Military Operations Area	91 (300) AGL[7]	Intermittent	By NOTAM	Minneapolis CNTR/FSS
Tiger South Military Operations Area	1,829 (6,000)[7]	Intermittent	By NOTAM	Minneapolis CNTR/FSS
Devils Lake East Military Operations Area	1,067 (3,500)[7]	Intermittent	By NOTAM	Minneapolis CNTR/FSS
Devils Lake West Military Operations Area	1,219 (4,000)[7]	Intermittent	By NOTAM	Minneapolis CNTR/FSS

Source: National Ocean Service, 1998—L-10 IFR Enroute Low Altitude Aeronautical Chart; Department of Natural Resources (Canada), 1998—LO 4 Enroute Low Altitude Chart.

[1] Continuous = 24 hours a day and/or 7 days a week
[2] No A/G = No air/ground communications
[3] Continuous = Daylight hours
[4] 1300 to 2100 during daylight savings time
[5] 1300 to 2200 during daylight savings time
[6] April through October 31, to 12,000 by NOTAM
[7] To but not including 5,486 meters (18,000 feet)

AGL = Above Ground Level
CNTR = Center
CYA = Canadian Advisory Area (Activity Code A = Acrobatic, M = Military Operations, P = Parachuting, S = Soaring, T = Training)
CYR = Canadian Restricted Area
CZWG = Winnipeg-Area Control Center Call Number
FSS = Flight Service Station
NOTAM = Notice to Airmen
R = Restricted



EXPLANATION

----- 185 Kilometer (100 Nautical Mile) Region of Influence

Military Training Routes

Potential NMD Sites

Military Training Routes

North Dakota

Scale 1:2,500,000

0 20 40 Miles

0 32 64 Kilometers

NORTH

Figure 3.3-4

as_nd_002

En Route Airways and Jet Routes

The airspace use ROI has a number of instrument flight rules en route low altitude airways used by commercial air traffic that pass through the ROI (figure 3.3-5). An accounting of the number of flights using each airway is not maintained. Although relatively remote from the majority of high altitude jet routes that crisscross the country, the ROI has a number of them, which are shown in figure 3.3-6.

Airports/Airfields

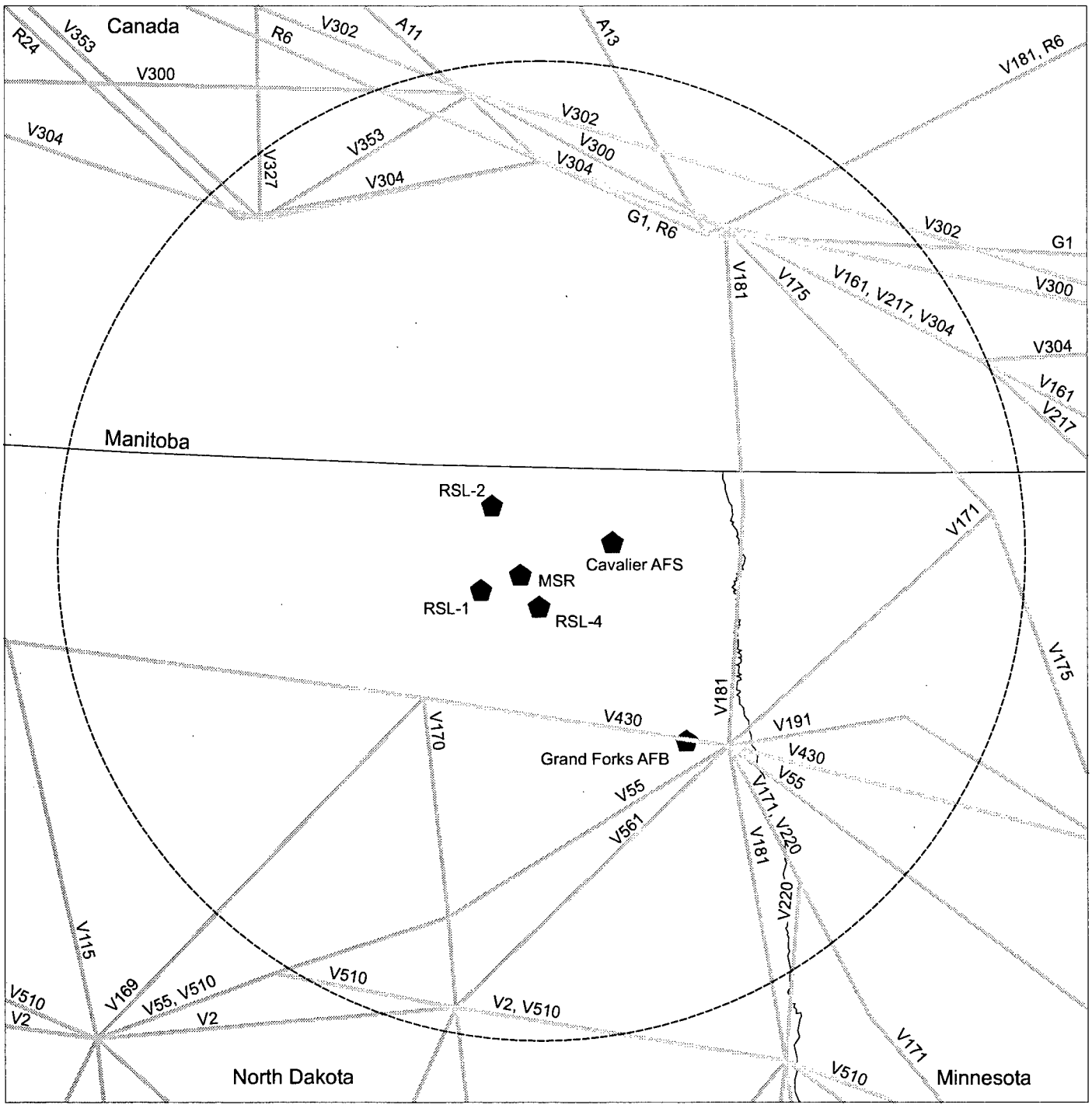
There is one Commercial Service I (General Transport) FAA classification airport in the ROI: Grand Forks International to the southeast, and one major Canadian airport, Winnipeg International, to the northeast. Commercial Service I airports provide scheduled passenger services by transport aircraft and qualify for Federal primary airport improvement funding. Grand Forks International had 318,000 airport operations in 1995, with 450,000 projected for 2000. (North Dakota Aeronautics Commission, undated—North Dakota Aviation System Plan Executive Report). Winnipeg International Airport in Manitoba, with close to 3 million passenger arrivals/departures in 1997, is the sixth busiest airport in Canada (Winnipeg Airport Authority, 1998—Winnipeg International Airport).

There are two Commercial Service II (Basic Transport) airports that provide scheduled passenger service by commuter aircraft in the ROI: Devils Lake, to the southwest of the proposed radar sites, and Jamestown, to the south. Devils Lake had 22,000 operations in 1995 with 24,000 projected for 2000, and Jamestown had 39,000 operations in 1995 with 44,000 projected for 2000 (North Dakota Aeronautics Commission, undated—North Dakota Aviation System Plan Executive Report). Thief River Falls airport, in Minnesota, is also a commercial service airport. In addition to these commercial service airports, there are a number of general aviation airports and private airstrips in the ROI (figure 3.3-7).

In addition to the airports and airfields identified above, the ROI has one Air Force base, Grand Forks AFB. Grand Forks AFB is home to the 319th Air Refueling Wing and the 321st Missile Group. Minot AFB, just outside of the ROI to the west, is home to the 5th Bomb and the 91st Space Wing.

Air Navigation and Communications Facilities

A number of air navigation facilities are distributed throughout the ROI, including: non-directional radiobeacons and non-directional radiobeacons-distance measuring equipment facilities, and VHF Omni-Directional Range/Tactical Air Navigation facilities.



EXPLANATION

----- 185 Kilometer (100 Nautical Mile) Region of Influence

Low Altitude Airways

Potential NMD Sites

Low Altitude Airways

North Dakota

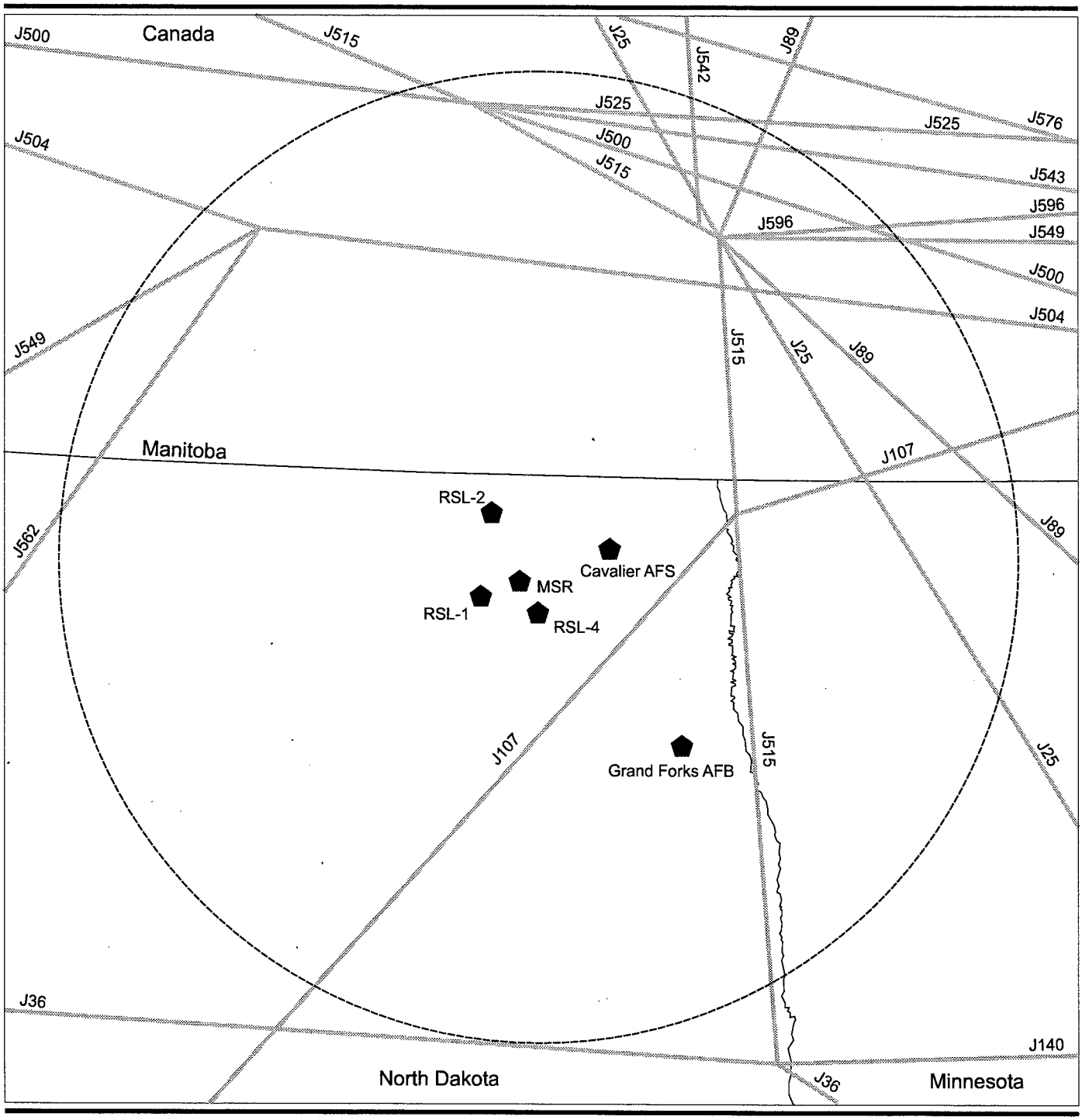
Scale 1:2,500,000

0 20 40 Miles

0 32 64 Kilometers

NORTH

Figure 3.3-5



EXPLANATION

----- 185 Kilometer (100 Nautical Mile) Region of influence

High Altitude Airways

Potential NMD Sites

High Altitude Jet Routes

North Dakota

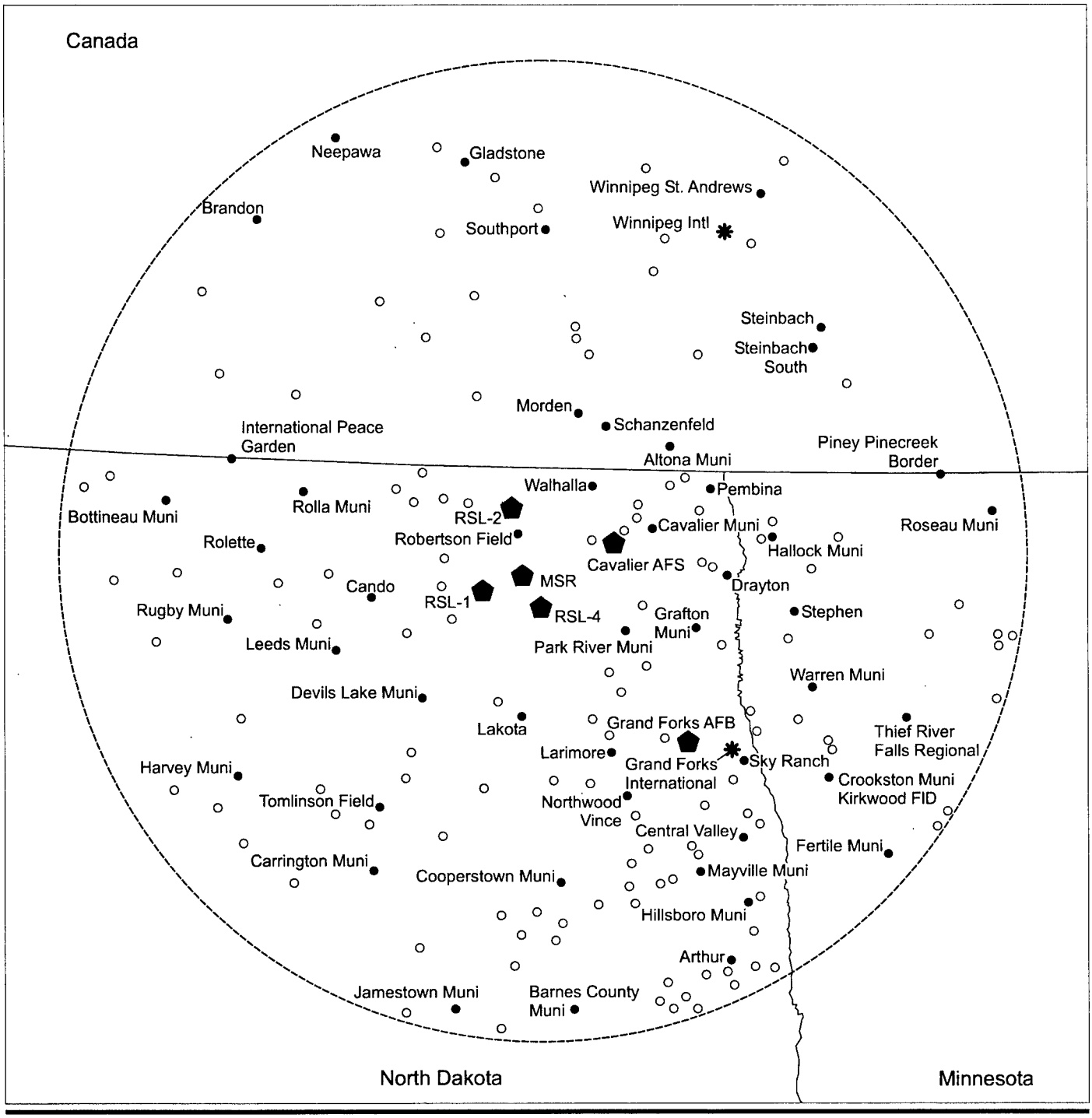
Scale 1:2,500,000

0 20 40 Miles

NORTH 0 32 64 Kilometers

Figure 3.3-6

as_nd_004



EXPLANATION

----- 185 Kilometer (100 Nautical Mile) Region of Influence

⬟ Potential NMD Sites

✱ Major International Airports

● Municipal Airports

○ Private Airfields

Scale 1:2,500,000

0 20 40 Miles

0 32 64 Kilometers

NORTH

Airports/Airfields

North Dakota

Figure 3.3-7

Non-directional radiobeacons are low or medium frequency radio beacons that transmit non-directional signals whereby the pilot of an aircraft properly equipped can determine bearings and "home" on the station. These facilities normally operate in the frequency band of 190 to 535 kilohertz and transmit a continuous carrier with either 400 or 1,020 hertz modulation. Distance measuring equipment is airborne and ground equipment used to measure, in nautical miles, the slant range distance of an aircraft from the distance measuring equipment navigational aid. Distance measuring equipment operates on frequencies in the UHF spectrum between 962 and 1,213 megahertz (Aeronautical Information Manual, 1998—FAR/AIM 98).

The VHF Omni-Directional Range/Tactical Air Navigation facilities consist of two components, a VHF Omni-Directional Range air navigation radio aid operating within the 108.0 to 117.95 megahertz frequency band, and a Tactical Air Navigation azimuth and distance system, operating in the UHF band of frequencies, located at one site as a unified navigational aid (Aeronautical Information Manual, 1998—FAR/AIM 98).

There is only one airport surveillance radar (Grand Forks AFB), which operates in the S-Band (2 to 4 gigahertz), and no air route surveillance radars, which track aircraft en route and operate in the L-Band (1 to 2 gigahertz), in the North Dakota airspace ROI (National Ocean Service, 1998—L-10 IFR Enroute Low Altitude Aeronautical Chart). Both Cavalier and Langdon airports in North Dakota will be implementing global positioning system approach operations in the near future. The four FAA Long Range Navigation radio transmitters in the North Central U.S. Chain, which operate at the 100 kilohertz frequency, are located well outside the ROI in Baudette, Minnesota; Gillette, Wyoming; Havre, Montana; and Williams Lake, British Columbia, Canada (Aeronautical Information Manual, 1998—FAR/AIM 98). The Very Low Frequency band OMEGA transmitting station in Lamoure, North Dakota, well outside the airspace ROI, is no longer operational (U.S. Coast Guard, 1998—Navigation Center).

Air Traffic Control

In the Class A (positive control areas) airspace from 5,486 to 18,288 meters (18,000 to 60,000 feet), all operations are conducted under instrument flight rules and are subject to air traffic control clearances and instructions. Aircraft separation and safety advisories are provided by air traffic control, the Minneapolis Air Route Traffic Control Center in the United States, and the Winnipeg Air Route Traffic Control Center in Canada. In Class E airspace (general controlled airspace), below 5,486 meters (18,000 feet), operations may be either instrument or visual flight rules: separation service is provided to aircraft operating under instrument flight rules only, and to the extent practicable, traffic advisories to aircraft operating under visual flight rules, by the

Minneapolis and Winnipeg Air Route Traffic Control Centers. For the Class G airspace (uncontrolled airspace), operations may be under either instrument or visual flight rules, but no air traffic control service is available.

In the Class D airspace surrounding the Commercial Service I (General Transport) airports of Grand Forks International and Fargo airports, and Grand Forks AFB in the United States, and Winnipeg and Southport airports in Canada, operations may be under either instrument or visual flight rules, with all aircraft subject to air traffic control clearances and instructions. Air traffic control separation service is provided to aircraft under instrument flight rules only, but all aircraft are given traffic advisories and, on request, conflict resolution instructions.

Airspace in the R-5401 Restricted Area, the Tiger North, Tiger South Military Operating Areas, and the Devils Lake East and Devils Lake West Military Operating Areas is controlled by the Minneapolis Air Route Traffic Control Center. The special use airspace in the Canadian portion of the airspace ROI is controlled by Winnipeg Area Control Center.

3.3.2.2 Missile Site Radar—Airspace

The airspace ROI is identical to the ROI described for Cavalier AFS in section 3.3.2.1.

3.3.2.3 Remote Sprint Launch Site 1—Airspace

The airspace ROI is identical to the ROI described for Cavalier AFS in section 3.3.2.1.

3.3.2.4 Remote Sprint Launch Site 2—Airspace

The airspace ROI is identical to the ROI described for Cavalier AFS in section 3.3.2.1.

3.3.2.5 Remote Sprint Launch Site 4—Airspace

The airspace ROI is identical to the ROI described for Cavalier AFS in section 3.3.2.1.

3.4 BIOLOGICAL RESOURCES

Native or naturalized vegetation, wildlife, and the habitats in which they occur are collectively referred to as biological resources. Existing information on plant and animal species and habitat types in the vicinity of the proposed sites was reviewed with special emphasis on the presence of any species listed as rare, threatened, or endangered by Federal or state agencies to assess their sensitivity to the effects of the Proposed Action. Biological studies consisted of literature review, field reconnaissance, agency consultation, and map documentation. Site visits to the Alaska and North Dakota project areas were also conducted in June and July 1998. For the purpose of discussion, biological resources have been divided into the areas of vegetation, wildlife, threatened and endangered species, and sensitive habitats.

3.4.1 ALASKA INSTALLATIONS

The following sections describe biological resources for the NMD alternatives in Alaska and their surrounding areas. Clear AFS, Eareckson AS, Eielson AFB, Fort Greely, the Yukon Training Area, and the ocean around the Aleutian Islands for the fiber optic cable line are potential alternatives for the NMD program.

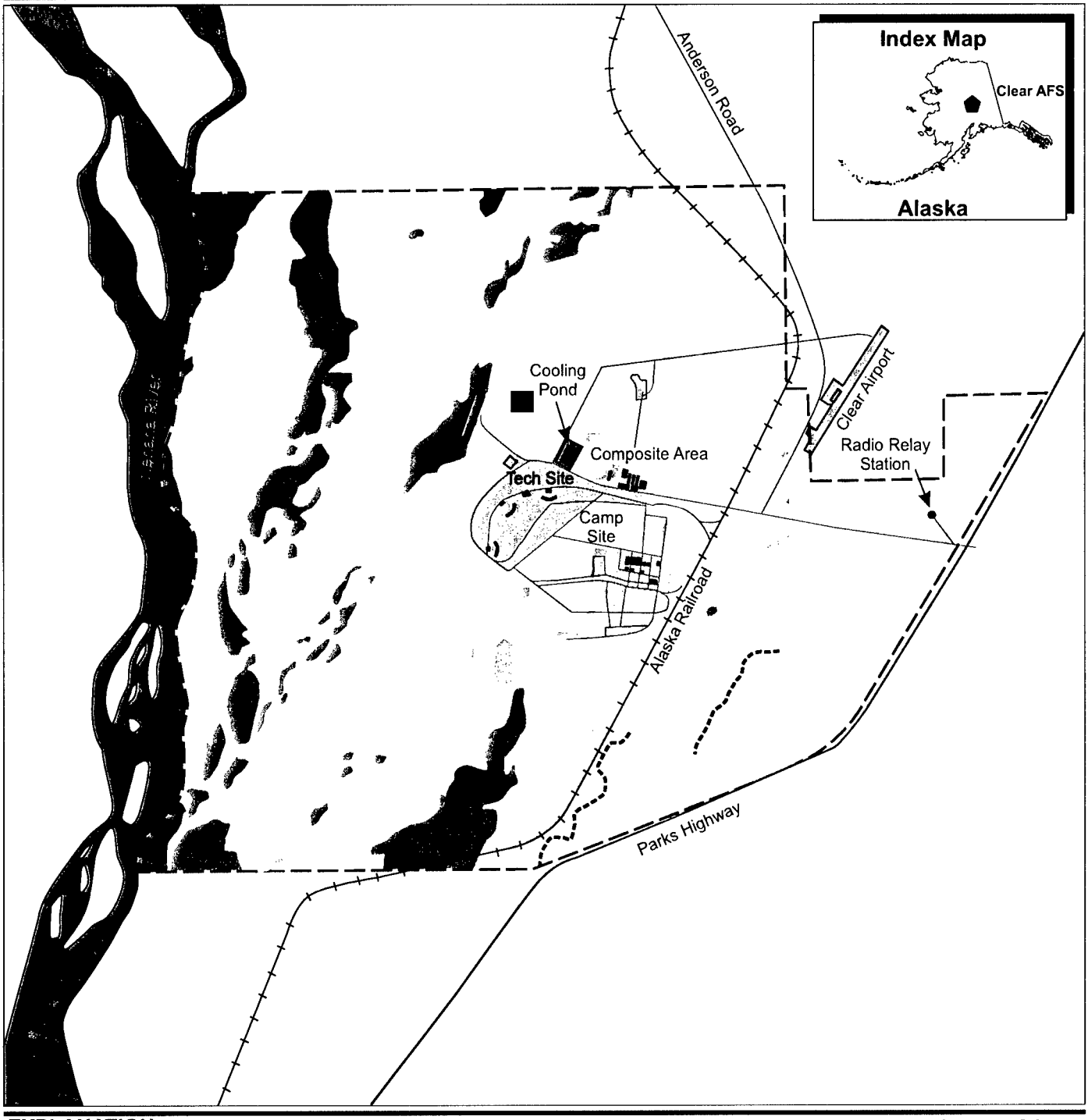
3.4.1.1 Clear AFS—Biological Resources

This section describes biological resources at Clear AFS, located southwest of Fairbanks in Interior Alaska. The ROI includes areas that may potentially be affected by construction activities and deployment of the GBI (approximately 243 hectares [600 acres]) and dormitories. The ROI includes Clear AFS and surrounding areas. Existing facilities within the main base cantonment area may also be used. A site visit to the project area was conducted in July 1998.

Vegetation

The predominant vegetative cover on proposed Site A is tall aspen forest that shows evidence of fire. Small areas of gravel barren are also present along the southern edge of this site. Vegetation at Site B consists mainly of aspen-black spruce forest, black spruce forest and woodland, and aspen-birch forest. Figure 3.4-1 indicates the location of plant cover types within the proposed project area. (Clear AS, 1996—Biodiversity Survey of Clear AS, Alaska)

Gravel barren communities are not common in central Alaska but are present in much of the western portion of Clear AFS (U.S. Department of the Air Force, 1997—EA for Radar Upgrade, Clear AS, Alaska). Gravel



EXPLANATION

- Roads
- Water Area
- Installation Boundary
- Railroads
- Linear Aspen and Birch Forest
- Phased-Array Radar
- Human Disturbance
- Aspen-Birch Forest
- Aspen-Black Spruce Forest
- Black Spruce Forest and Woodland
- Spruce Woodland on Gravel
- Gravel Barrens and Floodplain
- Floodplain Deciduous and White Spruce Forest

Scale
0 2,500 5,000 Feet
0 762 1,524 Meters

NORTH

br_clas_001_color

Vegetation, Clear Air Force Station

Alaska

Figure 3.4-1

barrens, characterized by dry meadows and dwarf woodlands, tend to occur where the fine soil cap is nearly absent. The community supports a variety of lichens and mosses at ground level and scattered black spruce (*Picea mariana*) and white spruce *(Picea glauca*). (Clear AS, 1996—Biodiversity Survey of Clear AS, Alaska)

Soil type and natural disturbance affect the vegetative community diversity at Clear AFS. The two dominant disturbance factors are fire in upland areas and flooding along the Nenana River. A wildfire swept the area in 1956 just before initial construction of Clear AFS (U.S. Department of the Air Force, 1997—Supplemental EA for Radar Upgrade, Clear AS, Alaska). Appendix F, table F-1, lists species of vegetation identified at Clear AFS during a biodiversity study conducted in 1995. (Clear AS, 1996—Biodiversity Survey of Clear AS, Alaska)

Aspen (*Populus* species [spp.]) forests are found in locations with a thin layer of sandy loam. Aspen occurs on permafrost-free soils for several decades after a fire and is gradually invaded by a black spruce understory that encourages permafrost or a persistent seasonal frost. A cooler soil condition combined with a slowed decomposition rate of forest litter and resulting low nutrient availability is gradually removing the aspen. (Clear AS, 1996—Biodiversity Survey of Clear AS, Alaska)

The majority of the vegetation in the cantonment and construction camp areas has been cleared, landscaped, or otherwise disturbed. Black spruce and aspen forest showing evidence of fire remains in isolated pockets throughout both areas of human activity and disturbance. (Clear AS, 1996—Biodiversity Survey of Clear AS, Alaska)

Several plant species considered uncommon by the State of Alaska were identified at Clear AFS during a recent biodiversity survey. These species, primarily found along the Nenana River, are Williams' milkvetch (*Astragalus williamsii*), Setchell's willow (*Salix setchelliana*), sandbar willow (*Salix interior*), and Williams' campion (*Silene menziesii* ssp. *williamsii*). (Clear AS, 1996—Biodiversity Survey of Clear AS, Alaska)

Wildlife

The glacially fed Nenana River, which runs the entire length of the western border of Clear AFS, is a designated anadromous fish stream (Alaska Department of Fish and Game, 1999—Comments received by EDAW, Inc. regarding the Draft EIS). It serves as a migratory route and spawning area for some anadromous fish species, such as chinook, chum, and coho salmon, but it is not part of the installation.

The wildlife at Clear AFS is typical of the fairly undisturbed nature of the station and its vicinity. Appendix F, table F-2, lists species of wildlife potentially occurring at the station. Mammals commonly observed

throughout the area include red fox (*Vulpes vulpes*), coyote (*Canis latrans*), black bear (*Ursus americanus*), brown/grizzly bear (*Ursus arctos*), snowshoe hare (*Lepus americanus*), red squirrel (*Tamiasciurus hudsonicus*), porcupine (*Erethizon dorsatum*), mink (*Mustela vision*), marten (*Martes americana*), beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), and moose (*Alces alces*). (U.S. Department of the Air Force, 1997—EA for Radar Upgrade, Clear AS, Alaska) No suitable habitat for caribou (*Rangifer tarandus*) exists at the station. (Clear AS, 1996—Biodiversity Survey of Clear AS, Alaska)

Clear AFS provides foraging, migrating, and nesting habitat for a variety of bird species (U.S. Department of the Air Force, 1997—EA for Radar Upgrade, Clear AS). Birds commonly observed include ruffed grouse (*Bonasa umbellus*), Canada goose (*Branta canadensis*), mallard (*Anas platyrhyncos*), cliff swallow (*Hirundo pyrrhonota*), American robin (*Turdus migratorius*), yellow-rumped warbler (*Dendroica petechia*), and dark-eyed junco (*Junco hyemalis*). (Clear AS, 1996—Biodiversity Survey of Clear AS, Alaska)

The Nenana River valley, which lies within the Tanana River Basin, is an important migratory route for waterfowl and other birds. Species observed during migration include sandhill crane (*Grus canadensis*), Canada goose, belted kingfisher (*Ceryle alcyon*), numerous swallows and warblers, red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverious*), great horned owl (*Bubo virginianus*), spotted sandpiper (*Actitis macularia*), and green-winged teal (*Anas crecca*). (U.S. Department of the Air Force, 1997—EA for Radar Upgrade, Clear AS, Alaska)

During a survey conducted in 1996, blackpoll warbler (*Dendroica striata*) and gray-cheeked thrush (*Catharus minimus*) were observed. The Alaska Department of Fish and Game lists these two bird species as species of special concern (Argonne National Laboratory, 1999—Abstract-Biodiversity Survey of Clear Air Station, Alaska). Neither species was found within the proposed project sites (Clear AS, 1996—Biodiversity Survey of Clear AS, Alaska). Two other state species of special concern are the olive-sided flycatcher (*Contopus borealis*) and Townsend's warbler (*Dendroica townsendi*) have been observed on Clear AFS. (U.S. Department of the Interior, 1999—Comments received on the Draft EIS)

Hunting and trapping are currently permitted throughout the proposed project site for base personnel and their families only. (Clear Air Force Station, 1993—Comprehensive Planning Framework)

As the majority of the vegetation in the cantonment and construction camp areas has been cleared, landscaped, or otherwise disturbed, very little wildlife habitat remains.

Threatened and Endangered Species

No federally listed threatened, endangered, or candidate species of vegetation or wildlife are found at Clear AFS (U.S. Department of the Air Force, 1997—EA for Radar Upgrade, Clear AS, Alaska). No critical habitat has been identified on Clear AFS (Alaska Department of Fish and Game, 1999—State of Alaska Refuges, Critical Habitat Areas and Sanctuaries).

The range of the recently delisted American peregrine falcon (*Falco peregrinus anatum*) includes Clear AFS, but none have been observed near the proposed site or on Clear AFS (Clear AS, 1996—Biodiversity Survey of Clear AS, Alaska).

Sensitive Habitat

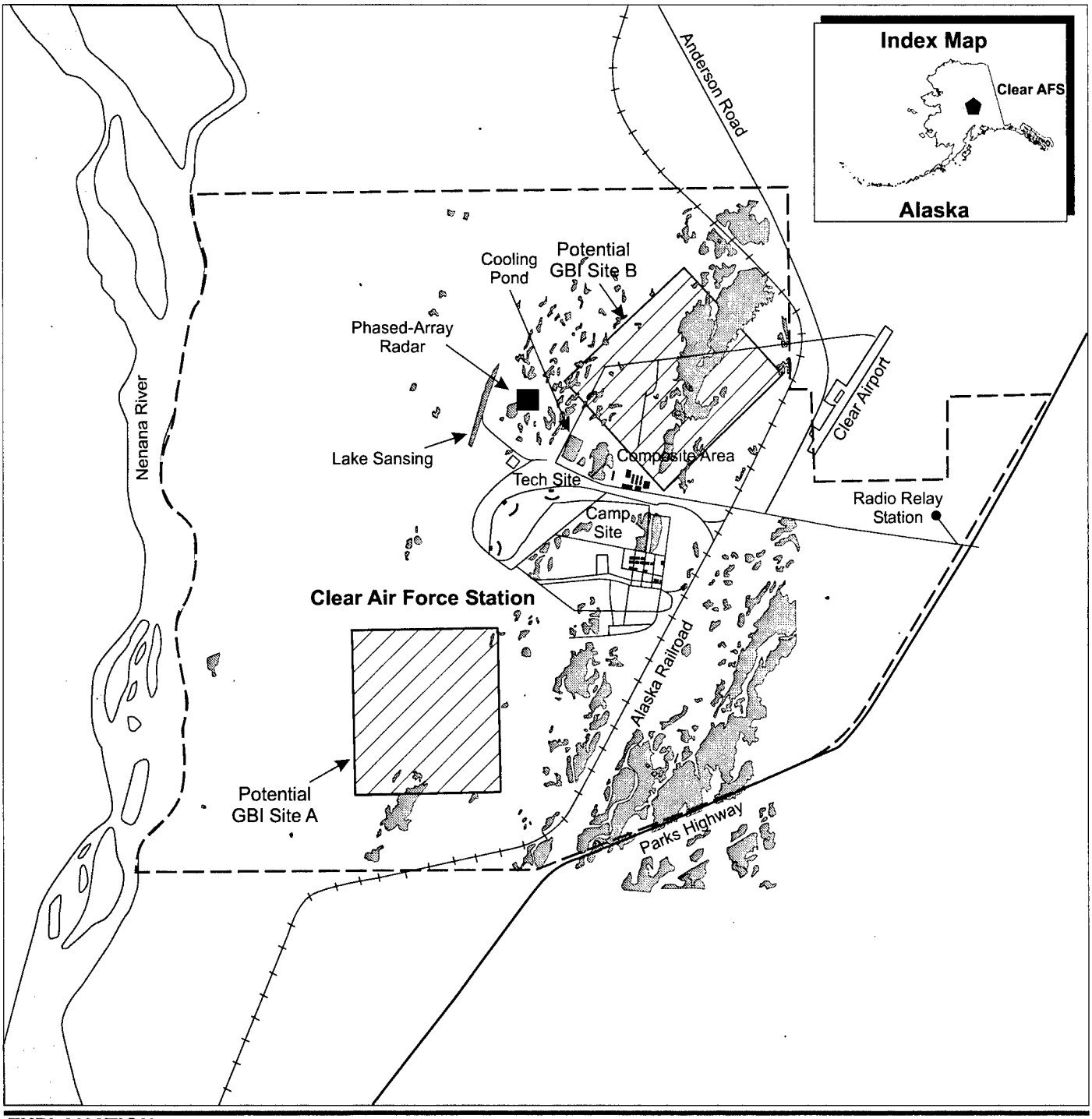
Sensitive habitat usually includes wetlands, plant communities that are unusual or of limited distribution, and important wildlife seasonal use areas, such as migration routes and breeding areas.

Wetlands are defined by the U.S. Army Corps of Engineers as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." Wetlands (figure 3.4-2) cover approximately 9.5 percent of Clear AFS. Most of these wetlands are classified as riverine wetlands and occur along the channel of the Nenana River. The remaining wetlands include palustrine (non-flowing water) wetlands. (Clear AS, 1996—Biodiversity Survey of Clear AS, Alaska)

A small area (2.7 hectares [6.6 acres]) of palustrine scrub/shrub, broad-leaved deciduous, PSS1, wetlands is located within the area proposed for the location of Site A. Proposed Site B is located within an area where PSS1/4B palustrine scrub/shrub, broad-leaved deciduous/needle-leaved evergreen, saturated wetlands are more prevalent, approximately 55 hectares (135 acres). Wetlands are also located within the 0.4-hectare (1-acre) area proposed for housing and administrative facilities. (U.S. Fish and Wildlife Service, undated—National Wetlands Inventory)

The gravel barrens located on Clear AFS may be considered as unusual communities since they do not normally occur in central Alaska. While possessing unique plants, there is no evidence that gravel barrens provide critical habitat for wildlife. (Clear AS, 1996—Biodiversity Survey of Clear AS, Alaska)

As described above in the discussion of wildlife at Clear AFS, the Nenana River valley is an important migratory route for waterfowl and other birds (U.S. Department of the Air Force, 1997—EA for Radar Upgrade, Clear AS, Alaska).



EXPLANATION

- Roads
- Water Area
- Wetlands*
- Installation Boundary
- Railroads

* Note: This figure only depicts wetlands within or adjacent to potential GBI sites and is not inclusive of all wetlands on Clear AFS.

Scale
0 2,500 5,000 Feet
0 762 1,524 Meters

NORTH

Wetlands, Clear Air Force Station

Alaska

Figure 3.4-2

br_clas_003

3.4.1.2 Eareckson AS—Biological Resources

This section describes biological resources at Eareckson AS, located on Shemya Island, Alaska. The ROI includes the entire island, including the area that may potentially be affected by construction activities and deployment or operation of the XBR (approximately 12 hectares [30 acres]). This ROI includes the wildlife that may use the area around the island. Existing facilities within the main base cantonment area may also be used. A site visit to the project area was conducted in April 1998.

Vegetation

The predominant vegetative cover on Shemya Island consists of beach grass (*Elymus arenarius*) grasslands that tend to colonize disturbed areas and remnants of crowberry tundra. The tundra is composed mainly of grasses, sedges, heath, and composite families. An almost continuous mat of mosses and lichens characterizes the tundra. Cottongrass (*Eriophorom russeoium*) may predominate in poorly drained areas.

Dwarf shrubs such as crowberry (*Empetrum nigrum*), cloudberry (*Rubus chamaemorus*), lapland cornel (*Cornus suecica*), and blueberry (*Vaccinium* species [spp.]) are located at higher elevations with better drainage. Forbs such as bistort (*Polygonum viviparum*), buttercup (*Ranunculus* spp.), lousewort (*Pedicularis chamissonis*), monkshood (*Aconitium maximum*), and violet (*Viola langsdorffii*) are scattered throughout the area. There are no large native trees. Only a few Sitka spruce (*Picea sitchensis*), introduced by the Russians in 1805, exist on the island today. Other trees introduced by Americans during World War II have resulted in small groves on the island. (U.S. Air Force, 1995—Natural Resources Plan Eareckson AS)

Beach grass dominates the beach community that inhabits shorelines within bays, inlets, and coves of the island. Other plants inhabiting this area are beach pea (*Lathyrus japonica*), seabeach sandwort (*Honckenya peploides*), cow parsnip (*Heracleum lanatum*), cinquefoil (*Potentilla* spp.), and species of sedge (*Carex* spp.). Grasslands are often more than 1 meter (3 feet) high during the summer and are very dense near sea level. (U.S. Air Force, 1995—Natural Resources Plan Eareckson AS)

Kelp and eelgrass (*Zostera marina*) beds occur in coastal waters of Shemya Island. Eelgrass beds are confined to lagoons and estuaries and are an important food source for waterfowl and invertebrates. Eelgrass beds also provide food and rearing habitat for juvenile groundfish and salmon. Pondweed (*Potamogeton alpinus*), water milfoil (*Myriophyllum spicatum*), and mare's tail (*Hippuris vulgaris*) are the primary freshwater vegetation. Large mosses and leafy liverworts are located in freshwater streams. (U.S. Air Force, 1995—Natural Resources Plan Eareckson AS)

Figure 3.4-3 indicates the location of plant cover types within the proposed project area. Appendix F, table F-3, lists additional vegetative species observed at Eareckson AS.

Wildlife

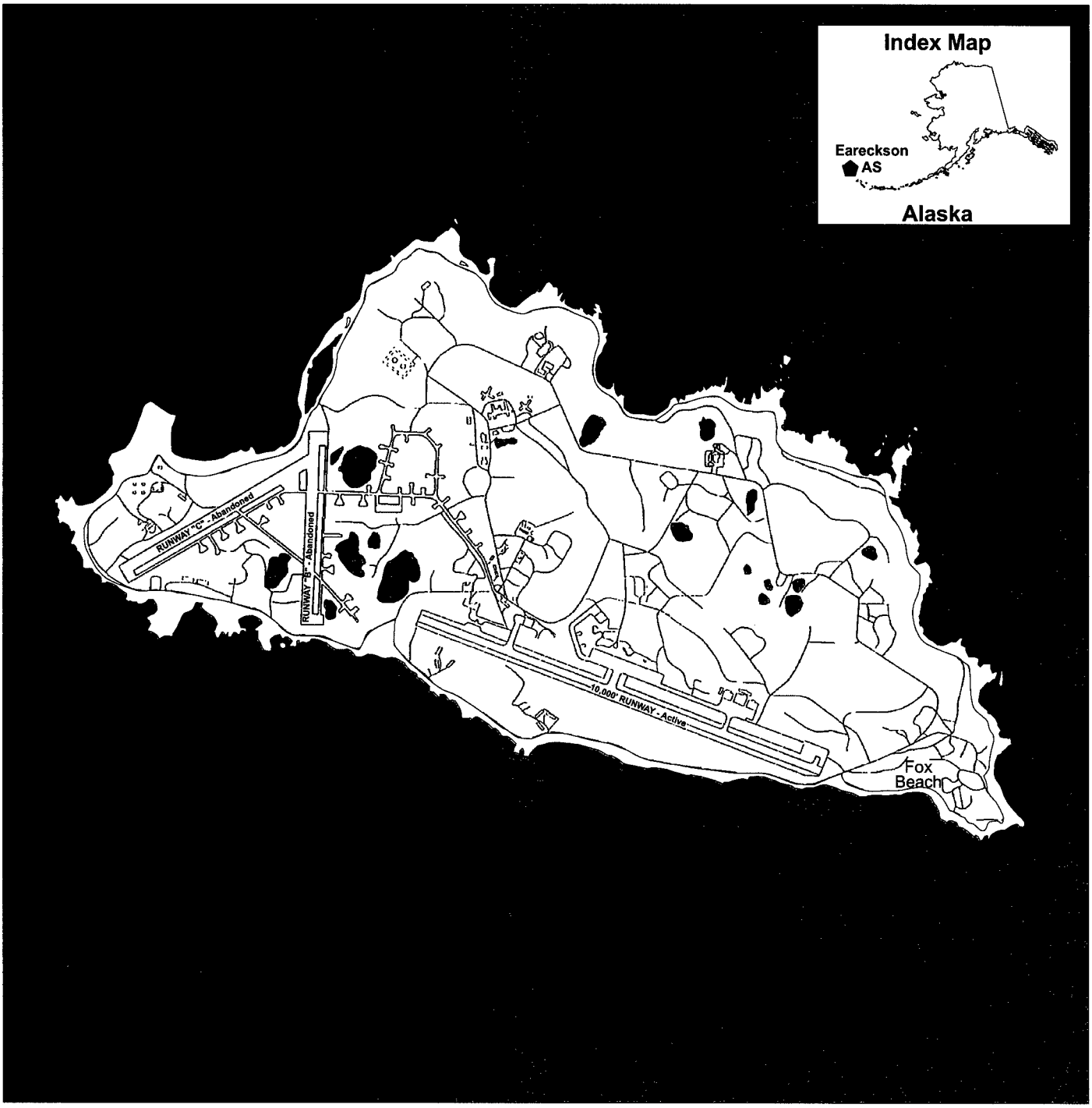
Anadromous fish of the Near Islands include pink, chum, sockeye, and coho salmon. Shemya Island, however, has no salmon runs (U.S. Air Force, 1995—Natural Resources Plan Eareckson AS).

There are no indigenous terrestrial mammals on Shemya Island. The blue phase arctic fox (*Alopex lagopus*) is the largest mammal on the island and was introduced in 1911. The foxes are found in areas on the island where garbage or other food sources are available. The other terrestrial mammals are introduced rodents. No native rodents or insects are known to occur on the island. (U.S. Air Force, 1995—Natural Resources Plan Eareckson AS; U.S. Air Force, undated—EA for Construction of a Composite Environmental Waste Facility)

Shemya Island is along the migratory route of many North American shorebirds and waterfowl. Its rocky cliffs provide ideal habitat for seabird colonies and roosting sites for the Peale's peregrine falcon (*Falco peregrinus peali*). Pelagic cormorants (*Phalacrocorax pelagicus*), red-faced cormorants (*Phalacrocorax urile*), and tufted puffins (*Fratercula cirrhata*) nest offshore on islets located on the north side of Shemya Island, but seabirds have been mainly extirpated from the main island by introduced foxes and rats. (U.S. Air Force, 1995—Natural Resources Plan Eareckson AS)

Waterfowl use the lakes of Shemya Island as feeding and resting places during migration. Large numbers of gulls rest on the runways in the fall after their young fledge from offshore colonies. The emperor goose (*Chen canagica*), a species on the decline, primarily uses the northern shore intertidal areas, but can be found around the entire perimeter of the island. Harlequin ducks (*Histronicus histronicus*) and common eiders (*Somateria mollissima*) are often seen in salt water surrounding the island. The north shore bluffs provide important resting habitat for migrating Asiatic songbirds. Appendix F, table F-4, lists some of the bird species commonly seen on Shemya Island. Appendix F, table F-5, lists fish species found on and around the island. (U.S. Air Force, 1995—Natural Resources Plan Eareckson AS)

Several marine mammals are located along the rocky coast of the island and offshore. The sea otter (*Enhydra lutris*) uses the southwest coastal kelp beds of Shemya Island for feeding, pupping (March through May), and as haulout grounds. Populations began increasing when all sea otter hunting was prohibited after 1960. Harbor seals (*Phoca vitulina*), which are typically found on the surface, can be found as deep as 55 meters



EXPLANATION

- Roads
- Water Area
- Beach Grass
- Grasses, Sedges, Heath, and Dwarf Shrubs

NORTH

Scale
0 1,738 3,475 Feet
0 530 1,059 Meters

br_eas_002_color

Vegetation, Eareckson Air Station

Alaska

Figure 3.4-3

(180 feet) while feeding. They are adaptable to a wide range of conditions, with water clarity ranging from highly turbid to very clear. They are scarce, in general in the Near Islands area, and tend to be concentrated from the South Alaska Peninsula to Unimak Island. Harbor seals have been observed along the northwest coastline of Shemya Island (U.S. Air Force, 1995—Draft Management Action Plan, Eareckson AS). Other marine mammals located near Shemya Island are discussed in the threatened and endangered section below. (U.S. Air Force, 1995—Natural Resources Plan Eareckson AS)

Threatened and Endangered Species

Species with Federal or state status that potentially occur in the area of Eareckson AS are listed in table 3.4-1. The Steller sea lion (*Eumetopias jubatus*) is the most abundant marine mammal species found in the area. Haul out occurs on offshore islands northeast of Shemya Island. Two haul out grounds have been located on the north and northwest ends of the island. (U.S. Air Force, 1995—Natural Resources Plan Eareckson AS)

The blue whale (*Balaena musculus*), bowhead whale (*Balaena mysticetus*), fin whale (*Balaenoptera physalus*), humpback whale (*Megaptera novaeangliae*), northern right whale (*Eubalaena glacialis*), and sperm whale (*Physeter macrocephalus*) are seasonal visitors to the waters surrounding Shemya Island. Bowhead and humpback whales may be observed passing by the shore during migration in May and October (Augustine, 2000—Personal communication with 611 CES/CEVP regarding natural resources at Eareckson AS). Northern right and sperm whales can be observed in the area from April to September. The blue and fin whales may be observed feeding in the area during the summer. (U.S. Air Force, 1995—Natural Resources Plan Eareckson AS)

The Aleutian Canada goose *(Branta canadensis leucopareia)*, is currently a threatened species. However, the goose is in the final steps of being delisted, which is expected by the end of July 2000 (Boone, 2000—Personal communication with the USFWS regarding the Aleutian Canada goose). A 3-year study on the threatened Aleutian Canada goose on Eareckson AS is ongoing to determine the population during spring (mid April through mid June) and fall migrations (mid August through mid October) when the species is found on Shemya Island. The study will determine island populations and prime feeding areas. As of fall of 1999, the exact feeding locations on the island have not been determined, but will be determined once future vegetation studies are conducted in 2000. The goose is found on the island from mid April through mid June and mid August through Mid October. At any one time 700 Aleutian Canada geese use Shemya Island for non-breeding activities, such as staging,

Table 3.4-1: Sensitive Species with Federal or State Status Under the Endangered Species Act Potentially Occurring in Project Areas

Scientific Name	Common Name	Status		Habitat and Distribution
		State	Federal	
Birds				
Branta canadensis leocopareia	Aleutian Canada goose	--	T	Visitor to Shemya Island from May–June and August–October to feed and for other non-breeding activities
Phoebastria albatrus	Short-tailed albatross	E	E	Unlikely visitor to Shemya Island; observed during the summer months in the Aleutian Islands, Bering Sea, and Gulf of Alaska
Somateria fischeri	Spectacled eider	--	T	Observed during the winter months off the shore of Shemya Island where water depth is approximately 30 meters (99 feet)
Polysticta stelleri	Steller's eider	--	T[1]	Occasional visitor to intertidal waters of Shemya Island during the winter months
Mammals				
Balaena mysticetus	Bowhead whale	E	E	Seasonal visitor to the waters surrounding Shemya Island, usually observed during migration in May and October
Balaenoptera musculus	Blue whale	--	E	Seasonal visitor to the waters surrounding Shemya Island during the summer months
Balaenoptera physalus	Fin whale	E	E	Seasonal visitor to the waters surrounding Shemya Island during the summer months
Megaptera novaeangliae	Humpback whale	E	E	Seasonal visitor to the waters surrounding Shemya Island, usually observed during migration in May and October
Eubalaena glacialis	Northern right whale	E	E	Seasonal visitor to the waters surrounding Shemya Island, usually observed from April to September
Physeter macrocephalus	Sperm whale	E	E	Seasonal visitor to the waters surrounding Shemya Island, usually observed from April to September
Eumetopias jubatue	Steller sea lion	E	T	Haul out grounds on offshore islands northeast of Shemya Island and on the north and northwest ends of the island

Source: U.S. Fish and Wildlife Service, 1996—Alaska Region, The Great Land; Alaska Department of Fish and Game, 1997—State of Alaska Endangered Species List.

[1] Only the North American breeding population is considered threatened.

– = Not listed
E = Endangered
T = Threatened

resting, and feeding during migration. The location of the goose's preferred feeding areas is directly associated with the availability of the preferred food. They feed on upland and wetland vegetation, including grass sprouts in the spring and crowberries (*Empetrum nigrum*) in the fall. Feeding occurs over the entire island primarily during daylight hours. The geese return to neighboring predator-free islands for the night. The geese do not nest on Shemya Island, and the island is not suitable for nesting recovery efforts due to the presence of humans, rodents, and blue phase arctic fox. (Augustine, 2000—Personal communication with 611 CES/CEVP regarding natural resources at Eareckson AS)

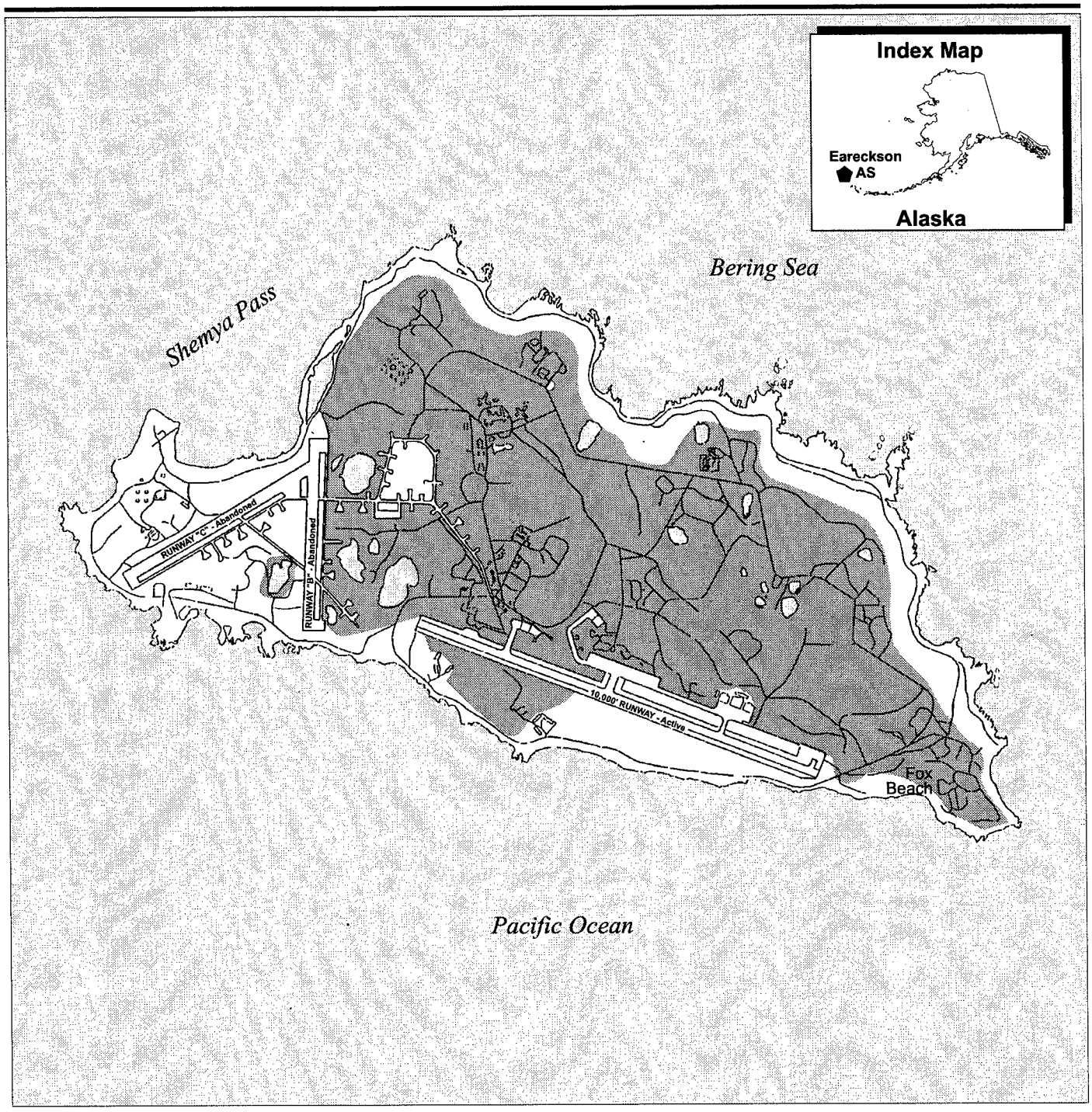
The short-tailed albatross *(Diomedea albatrus)* is a very large seabird with narrow 2-meter- (7-foot-) long wings. Most summer sightings of this albatross are in the Aleutian Islands, Bering Sea, and Gulf of Alaska. Its presence on Shemya Island is considered unlikely. The short-tailed albatross is officially listed as a proposed candidate species in Alaska (endangered only on the high seas and in Japan and Russia). This species has been proposed for listing for the near-shore areas, 5 kilometers (3 miles) out from U.S. shores, to correct an administrative oversight. The preferred habitat of the short-tailed albatross is offshore marine waters. This species has been identified pelagically; however, its presence on Shemya Island is unlikely. This species, however, occurs within 5 kilometers (3 miles) of Shemya Island. There are no land management requirements or issues associated with this species. (Augustine, 2000—Personal communication with 611 CES/CEVP regarding natural resources at Eareckson AS)

The spectacled eider (*Somateria fischeri*), a threatened large-bodied, marine, diving duck may be observed offshore during the winter. (U.S. Fish and Wildlife Service, 1993—Final Rule to List Spectacled Eider; U.S. Air Force, 1995—Natural Resources Plan Eareckson AS)

The Steller's eider (*Polysticta stelleri*), a marine, diving duck, is the smallest of four eider species (U.S. Fish and Wildlife Service, 1996—Steller's Eider). The only known regularly occupied nesting area of the Steller's eider in Alaska is now near Barrow (U.S. Fish and Wildlife Service, 1996—Steller's Eider). This eider species may occur in intertidal waters of Shemya Island during the winter (U.S. Air Force, 1995—Natural Resources Plan Eareckson AS).

Sensitive Habitat

A U.S. Army Corps of Engineers wetland delineation was completed in 1986. A substantial portion of Eareckson AS (80 percent) falls within a wetlands classification under criteria applied by the U.S. Army Corps of Engineers (figure 3.4-4). Beaches, cliffs, lakes, disturbed areas west of the abandoned Runway B, areas around Runway 10-28 and slopes south



EXPLANATION

- Roads
- Land Area
- Water Area
- Wetlands

Scale

0 1,738 3,475 Feet

NORTH

0 530 1,059 Meters

br_eas_001

Wetlands, Eareckson Air Station

Alaska

Figure 3.4-4

of this runway, and other areas altered by construction of roads, building pads, and structures are the only areas excluded from wetlands classification. (U.S. Air Force, undated—EA for Construction of Composite Environmental Waste Facility; U.S. Air Force, 1995—Natural Resources Plan Eareckson AS)

The USFWS has indicated the Upper, Middle, and Lower Lake system is of interest for its ability to support migratory birds and provide a resting place. Asian birds, not seen elsewhere in the United States, are often blown off course during migration by storms and appear to be attracted by the airfield lights located in the vicinity of the lakes at Eareckson AS. (U.S. Air Force, 1995—Natural Resources Plan Eareckson AS)

Shemya Island is part of the Alaska Maritime National Wildlife Refuge administered by the USFWS, and as such, the Department of the Interior exercises real property jurisdiction over Shemya Island. The purposes of the refuge include (1) conserving wildlife habitats in their natural diversity, (2) fulfilling international treaty obligations of the United States with respect to fish and wildlife, (3) providing for a subsistence opportunity by local residents, (4) providing a national and international program of scientific research on marine resources, and (5) ensuring water quality and quantity within the refuge. The U.S. Air Force operates Eareckson AS under the authority of the original 1913 executive order withdrawing Shemya Island for refuge purposes. The U.S. Air Force exercises real property jurisdiction, custody, and control over Shemya Island. Consequently, the Department of the Interior and the Air Force have overlapping real property jurisdiction on Shemya Island. The refuge consists of 1.8 million hectares (4.5 million acres) and is used by about 75 percent of Alaska's marine birds. (U.S. Fish and Wildlife Service, 1997—Alaska Maritime National Wildlife Refuge)

3.4.1.3 Eielson AFB—Biological Resources

Eielson AFB is in the Tanana River Valley between the Alaska Range and the Yukon-Tanana Uplands. The base is located along the northern bank of the Tanana River on a flat floodplain terrace (U.S. Air Force, 1997—EA, Gravel Borrow Pit in the North Area of Eielson AFB). The base is surrounded by undeveloped military land on the north, east, and west (Eielson AFB, 1998—Integrated Natural Resources Management Plan).

The ROI includes existing facilities within the main base cantonment area (figure 2.4.1-3). Additional facilities within the cantonment area may also be constructed. A site visit to the proposed project area was conducted in July 1998.

Vegetation

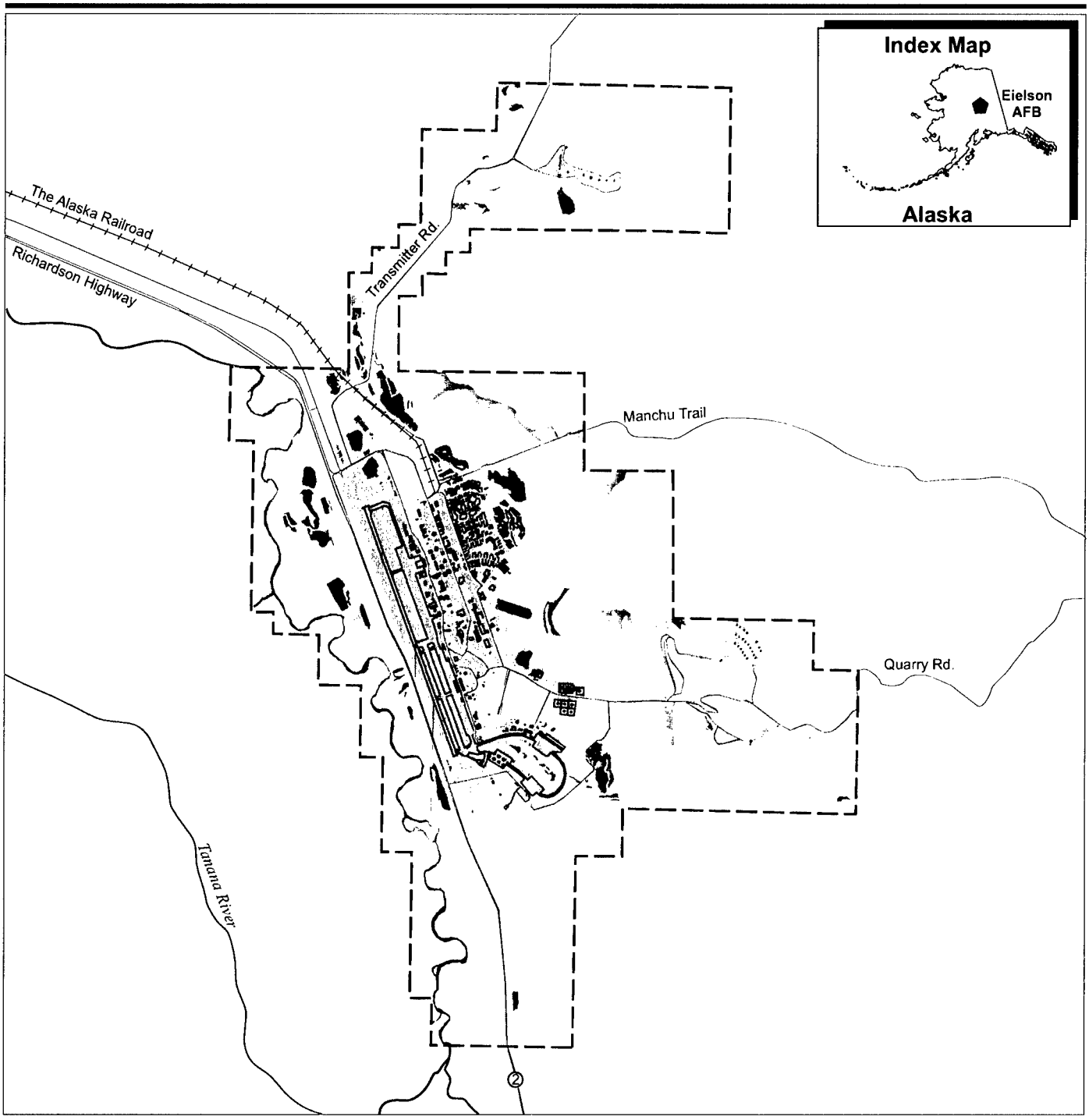
The vegetation of Eielson AFB, as with the Tanana River Valley and the lowlands of Interior Alaska in general, is composed of boreal (or taiga)

habitat. There are also extensive stands of deciduous forests of paper birch (*Betula papyrifera*), quaking aspen (*Populus tremuloides*), and balsam poplar (*Populus balsamifera*). The presence of black spruce and bogs usually indicates an area underlain by permafrost. Paper birch, quaking aspen, and white spruce generally develop on permafrost-free soils. Figure 3.4-5 indicates the location of vegetation types within the proposed project area. (Eielson AFB, 1998—Integrated Natural Resources Management Plan)

The majority of Eielson AFB has experienced very little human disturbance or alteration. Much of the forested area is old-growth forest ranging in age from 85 to 115 years. (Eielson AFB, 1998—Integrated Natural Resources Management Plan)

The project area is composed primarily of land categorized as improved ground (intensive maintenance), semi-improved ground (periodic maintenance), or land under facilities (such as buildings, structures, roads, or pavement). Appendix F, table F-6, lists species of vegetation observed at Eielson AFB. Improved ground includes mowed fields usually adjacent to housing, administrative buildings, or associated facilities within the cantonment area. These fields are generally composed of Kentucky bluegrass (*Poa protensis*), common dandelion (*Taraxacum officinale*), alsike clover (*Trifolium hybridum*), and assorted weedy species. Ornamental trees are commonly chokecherry (*Prunus virginiana*), lodgepole pine (*Pinus contorta*), scotch pine (*Pinus sylvestris*), white spruce, and paper birch. Common shrubs are cotoneaster (*Cotoneaster* spp.), lilac (*Syringa* spp.), and shrubby cinquefoil (*Potentilla fruiticosa*). (Eielson AFB, 1998—Integrated Natural Resources Management Plan)

Semi-improved ground is generally not well organized into specific plant communities. The areas include unpaved ground within and around the airfield, tank farms, and similar facilities. Most semi-improved ground is maintained in an early stage of succession due to annual mowing and brush control measures. Vegetation varies with soil conditions, amount of disturbance or fill material, and presence of ditches or other wet areas. The dominant cover commonly consists of tickle grass (*Agrostis scabra*), foxtail barley (*Hordeum jubatum*), Kentucky bluegrass, alsike clover, Canada goldenrod (*Solidago canadensis*), and yarrow (*Achillea millefolium*). Along the runway, common fireweed (*Epilobium angustifolium*) and alpine sweet-vetch (*Hedysarum alpinum*) are abundant. Patches of smooth brome (*Bromus inermis*) are also common in open, seeded areas. (Eielson AFB, 1998—Integrated Natural Resources Management Plan)



EXPLANATION

- Roads
- Water Area
- Installation Boundary
- Railroads
- Human Disturbance
- Broadleaf Forest
- Mixed Forest
- Black Spruce Forest
- Fresh Sedge Marsh
- Sedge Grass Meadow
- Shrub/Birch Shrub and Serial Herb

NORTH

Scale
0 .8 1.6 Miles
0 1.25 2.5 Kilometers

br_eafb_001_color

Vegetation, Eielson Air Force Base

Alaska

Figure 3.4-5

Surveys for two plant species considered rare by the State of Alaska have been conducted (U.S. Department of the Air Force, 1994 Biological Surveys, Final Report). These species, glaucus goosefoot (*Chenopodium glaucus*) and Alaskan paintbrush (*Castelleja annua*), are known to occur in the Fairbanks area. No population of either species was located during field surveys. Neither species is expected to occur within the proposed project area.

Wildlife

Eielson AFB supports habitat for most of the indigenous wildlife found in Interior Alaska, primarily in the areas undisturbed by human intervention or military operations. (Eielson AFB, 1998—Integrated Natural Resources Management Plan)

The Tanana Valley provides summer breeding habitat for a variety of migratory birds, in addition to the many year-round residents. Some of the most common species include spruce grouse (*Dendragapus canadensis*), ruffed grouse, great horned owl, red-tailed hawk, sharp-shinned hawk (*Accipiter striatus*), American kestrel, willow ptarmigan (*Lagopus lagopus*), northern goshawk (*Accipeter gentilis*), rock ptarmigan (*Lagopus mutus*), and a wide variety of waterfowl. (Eielson AFB, 1998—Integrated Natural Resources Management Plan)

A key role in the ecosystems of Eielson AFB and the surrounding areas is played by 32 species of mammals common to the vicinity. Some of the more important or abundant species include moose, black bear, brown/grizzly bear, snowshoe hare, marten, meadow vole (*Microtus pennsylvanicus*), red-back vole (*Clethrionomys rutilus*), meadow jumping mice (*Zapus hudsonius*), red squirrel, beaver, muskrat, and mink. North American lynx (*Felis lynx canadensis*) are occasionally trapped on Eielson AFB, and the population estimates for the area vary between 3 and 36 individuals. (Eielson AFB, 1998—Integrated Natural Resources Management Plan)

Small game hunting and trapping are allowed on Eielson AFB. Moose hunting by bow and arrow is also allowed. A permit is required for both base personnel and the public. No hunting is allowed within the cantonment area. (Eielson AFB, 1998—Integrated Natural Resources Management Plan)

No habitat for the majority of wildlife species found at Eielson AFB occurs within the project area. Sporadic areas of black spruce and old field habitat border the runway and cantonment area. This habitat can support coyote, red fox, red squirrel, common raven (*Corvus corax*), ruffed grouse, and a variety of waterfowl in the open water areas. Appendix F, table F-7, lists wildlife species observed at Eielson AFB.

Anadromous fish in French Creek and Piledriver Slough on Eielson AFB include king and chum salmon (Eielson AFB, 1998—Integrated Natural Resources Management Plan).

Threatened and Endangered Species

No threatened or endangered species have been identified on lands managed by Eielson AFB (Eielson AFB, 1998—Integrated Natural Resources Management Plan). The recently delisted American peregrine falcon and arctic peregrine falcon (*Falco peregrinus tundrius*) are known to occasionally pass through the base. (U.S. Department of the Air Force, 1998—EA for Test Drop and Recovery of Two Simulated B61-11 Units on Stuart Creek Impact Area)

Sensitive Habitat

Approximately 51 percent of Eielson AFB is composed of wetlands (figure 3.4-6). The most common type of vegetated wetlands is black spruce wetlands. Most of the wetlands on base have wet soils due to poor drainage caused by permafrost. No wetlands, however, are located in the area proposed for use by the NMD program. (Eielson Air Force Base, 1998—Integrated Natural Resources Management Plan)

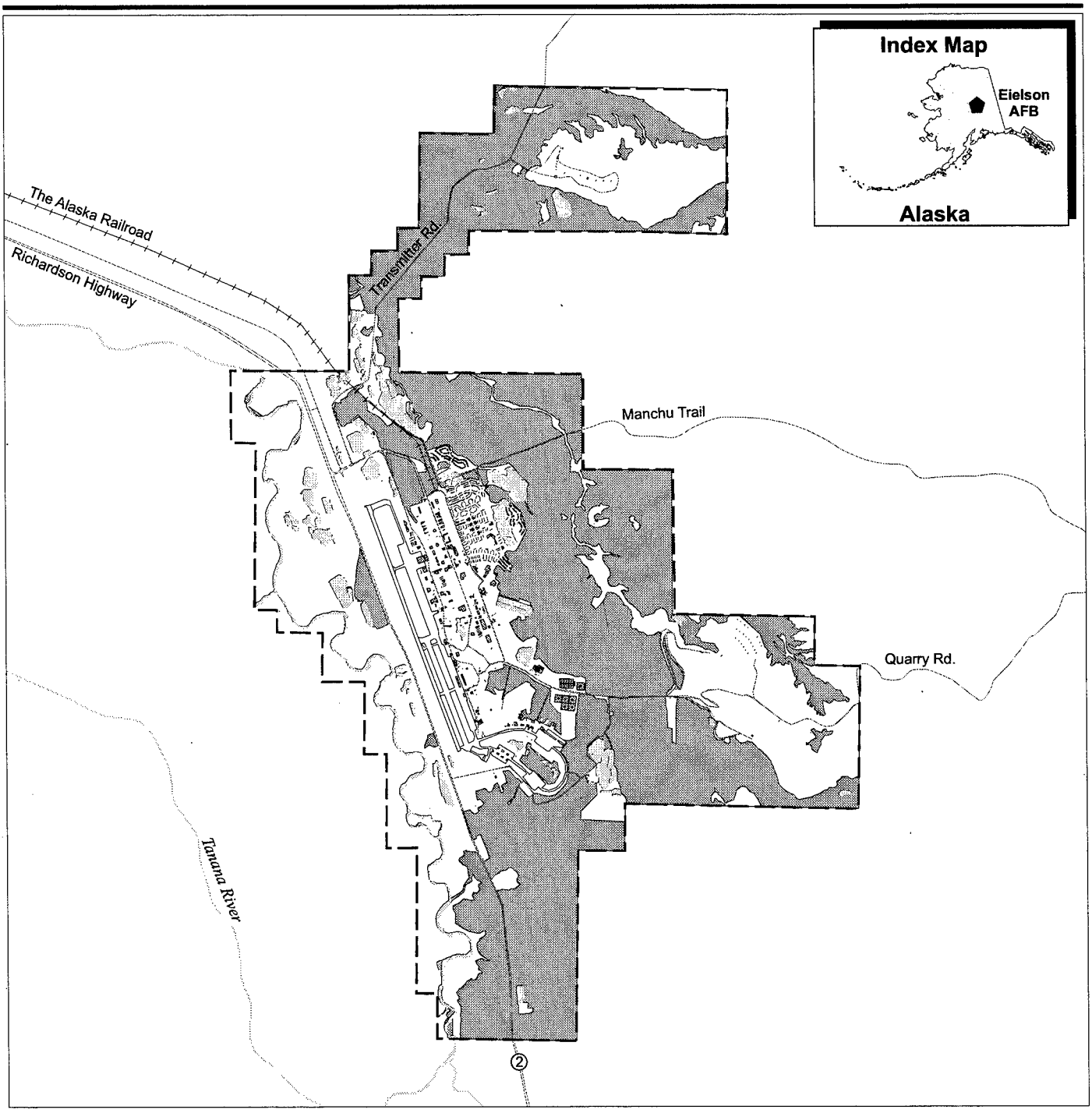
3.4.1.4 Fort Greely—Biological Resources

Fort Greely is located southeast of Fairbanks within the Tanana River valley. The Fort Greely region is mostly flat, sloping gently northwest toward the Tanana River. The base lies completely within the Tanana River valley and is bordered on the south by the Alaska Range. (U.S. Army Alaska, 1998—Oil Discharge Prevention and Contingency Plan)

The ROI includes areas that may potentially be affected by construction activities and deployment or operation of the GBI (approximately 243 hectares [600 acres]). This ROI includes Fort Greely and the surrounding areas. A site visit to the project area was conducted in July 1998.

Vegetation

Provided below is a description of the vegetation at the proposed NMD site at Fort Greely and surrounding area based on a 1998 site visit. However, in June 1999, a wildfire burned through the area, and as a result, all vegetation within the site was burned.



EXPLANATION

- Roads
- Water Area
- Railroads
- Installation Boundary
- Uplands
- Vegetated Wetlands

Scale
0 .8 1.6 Miles
0 1.25 2.5 Kilometers
NORTH

br_eafb_002

Wetlands, Eielson Air Force Base

Alaska

Figure 3.4-6

The predominant vegetation at the proposed site is low growing spruce forest, which is common throughout Interior Alaska (U.S. Department of the Army, 1997—EA, Construct Munitions Storage Facility, Cold Regions Test Center, Bolio Lake). Figure 3.4-7 indicates the location of vegetation types within the proposed project area. Dominant tree species are black spruce and balsam poplar. The understory and groundcover consist of *Vaccinium* spp., marsh laborador tea (*Ledum palustris*), crowberry, and a variety of mosses and lichens.

Appendix F, table F-8, lists species of vegetation observed at Fort Greely.

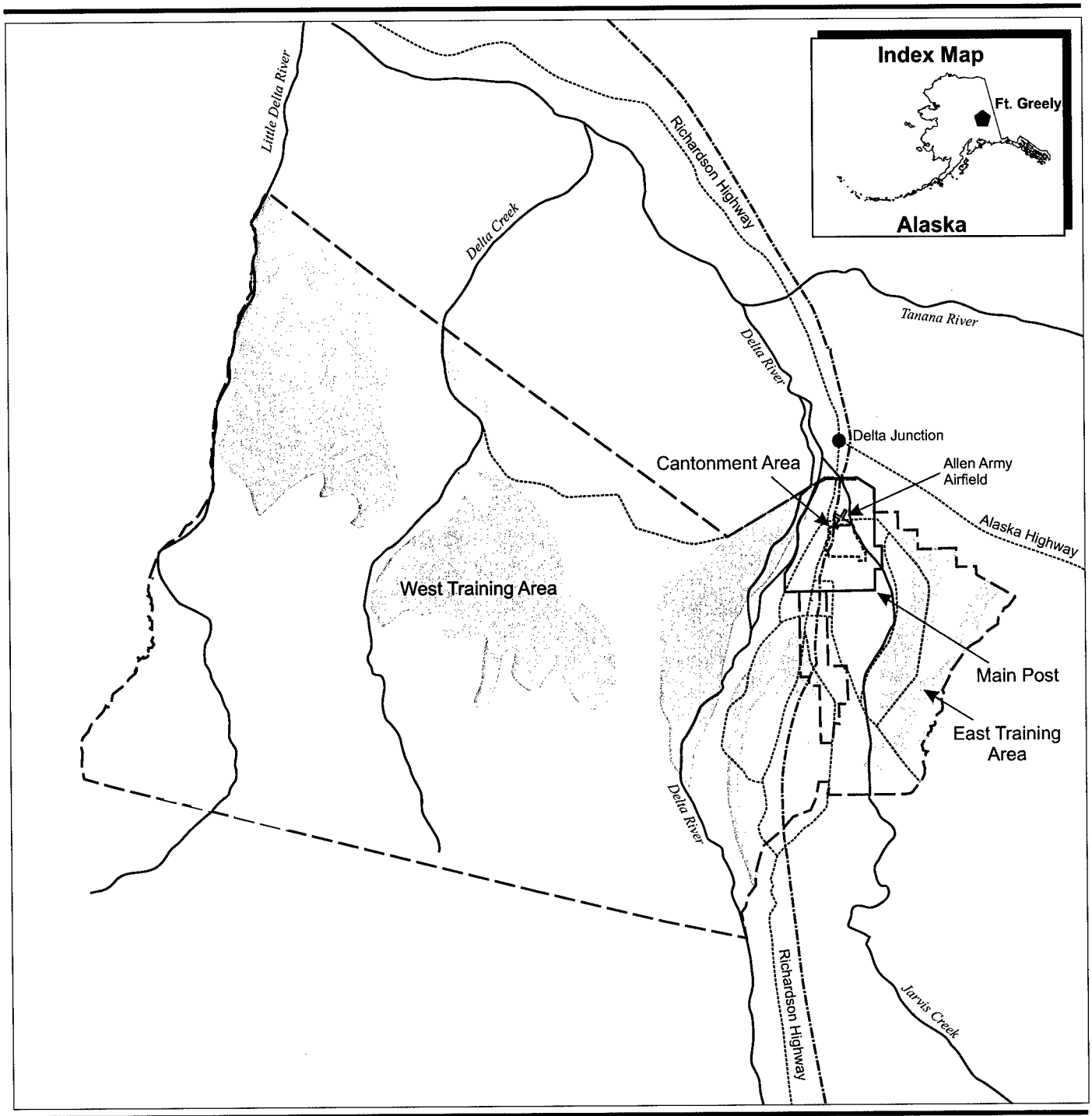
Black spruce communities generally occur on poorly drained lowland and permafrost sites. At Fort Greely, approximately one-third of the base is lowland black spruce interspersed with about 40 percent heath bog communities. (U.S. Department of the Army, 1980—EIS Concerning Proposed Land Withdrawal for the 172nd Infantry Brigade (Alaska) at Fort Greely)

Environmental factors influencing vegetative cover in the region are long, cold winters, a shortened growing season, and wildfires (U.S. Department of the Army, 1997—EA, Construct Munitions Storage Facility, Cold Regions Test Center, Bolio Lake). Much of the land at Fort Greely has been burned over the years (U.S. Department of the Army, 1980—EIS Concerning Proposed Land Withdrawal for the 172nd Infantry Brigade (Alaska) at Fort Greely).

Native vegetation was removed from the majority of the cantonment area during the 1950s. The area has been landscaped and maintained by mowing. A few isolated pockets of forest do remain, particularly north of the airfield. (U.S. Department of the Army, 1997—Preliminary Draft EA for the Disposal and Reuse of Surplus Property at Fort Greely, Alaska)

Wildlife

Numerous lakes and ponds and four glacially fed major streams, Little Delta River, Delta Creek, Delta River, and Jarvis Creek, are located on Fort Greely. The major streams flow north to the Tanana River. However, there is relatively little quality habitat for fish streams. These streams are silt laden and do not provide a fishery on the installation, although Arctic grayling migrate through them. Coho salmon occur in the mouth of the Delta River occasionally, and it is an important area for spawning runs of fall chum salmon (U.S. Department of the Army, 1980—EIS Concerning Proposed Land Withdrawal for the 172nd Infantry Brigade (Alaska) at Fort Greely). No important spawning streams are located on the installation. (U.S. Department of the Interior and U.S. Department of Defense, 1994—Fort Greely, Proposed Resource Management Plan, Final EIS)



EXPLANATION

- Roads and Major Trails
- Rivers
- Installation Boundary
- Trans-Alaska Pipeline
- Cantonment Area
- Main Post Boundary
- Mixed Forest
- Tundra/Barren
- Coniferous
- Deciduous/High Brush
- Muskeg
- City

Scale 1:500,000

0 4 7.9 Miles

0 6.4 12.7 Kilometers

NORTH

br_fge_001_color

Vegetation, Fort Greely

Alaska

Figure 3.4-7

Fort Greely supports the largest number of game species found at any military installation within the United States. Due to factors such as an unobtrusive military mission and a diversity of habitats, most of the indigenous species of wildlife found in Interior Alaska are represented at Fort Greely. The majority of research and management has been focused on big game species. (U.S. Army Alaska, 1997—Draft Integrated Natural Resources Management Plan)

No wildlife studies or population inventories have been conducted at Fort Greely. The most common big game species within the project area include moose, bison (*Bison bison*), and barren ground caribou. The moose, Delta bison herd, and Delta caribou herd are considered the most valuable species at Fort Greely. (U.S. Department of the Army, 1980—EIS Concerning Proposed Land Withdrawal for the 172nd Infantry Brigade (Alaska) at Fort Greely)

Commonly occurring predators in the project area include grizzly bear, black bear, gray wolf (*Canis lupus*), red fox, marten, coyote, and wolverine (*Gulo luscus*). Additional species trapped for fur at Fort Greely are mink, muskrat, snowshoe hare, beaver, and red squirrel. Avian species occurring within the project area are the common raven, willow ptarmigan (*Lagopus lagopus*), rock ptarmigan (*Lagopus mutus*), spruce grouse (*Dendragopus canadensis*), and ruffed grouse. (U.S. Department of the Army, 1980—EIS Concerning Proposed Land Withdrawal for the 172nd Infantry Brigade (Alaska) at Fort Greely)

Fort Greely has been recognized for its quality moose and grouse hunting programs. In addition, it offers one of the only opportunities in the world to hunt bison. Hunting is open to both post personnel and the public by permit only. Bag limits, open hunting seasons, and open hunting areas are carefully managed by species, and are adjusted yearly. (U.S. Army Alaska, 1997—Draft Integrated Natural Resources Management Plan)

The cantonment area at Fort Greely does not provide quality wildlife habitat compared to the surrounding undeveloped areas. Resident wildlife is limited to small rodents and bats, such as the little brown bat (*Myotis lucifugus*). A variety of songbirds may feed in developed areas during daylight hours. (U.S. Department of the Army, 1980—EIS Concerning Proposed Land Withdrawal for the 172nd Infantry Brigade (Alaska) at Fort Greely)

Three of the most common species observed at Fort Greely in many different ecosystems are the coyote, red fox, and raven (U.S. Department of the Army, 1997—Preliminary Draft EA for the Disposal and Reuse of Surplus Property at Fort Greely, Alaska).

Appendix F, table F-9, lists wildlife species observed at Fort Greely.

Threatened and Endangered Species

No federally listed threatened, endangered, or candidate species of vegetation are found in Interior Alaska (U.S. Army Alaska, 1997—Draft Integrated Natural Resources Management Plan).

There are no known threatened or endangered wildlife species occurring on Fort Greely (U.S. Department of the Interior and U.S. Department of Defense, 1994—Fort Greely, Proposed Resource Management Plan, Final EIS). However, the recently delisted American peregrine falcon and arctic peregrine falcon migrate through Fort Greely during the spring and fall migration periods (U.S. Army Alaska, 1998—Oil Discharge Prevention and Contingency Plan). The nearest known nests are along the Tanana River, and no nest sites have been identified at Fort Greely. There have been no confirmed sightings of either species within 16 kilometers (10 miles) of Fort Greely (U.S. Department of the Army, 1997—Preliminary Draft EA for the Disposal and Reuse of Surplus Property at Fort Greely, Alaska).

Sensitive Habitat

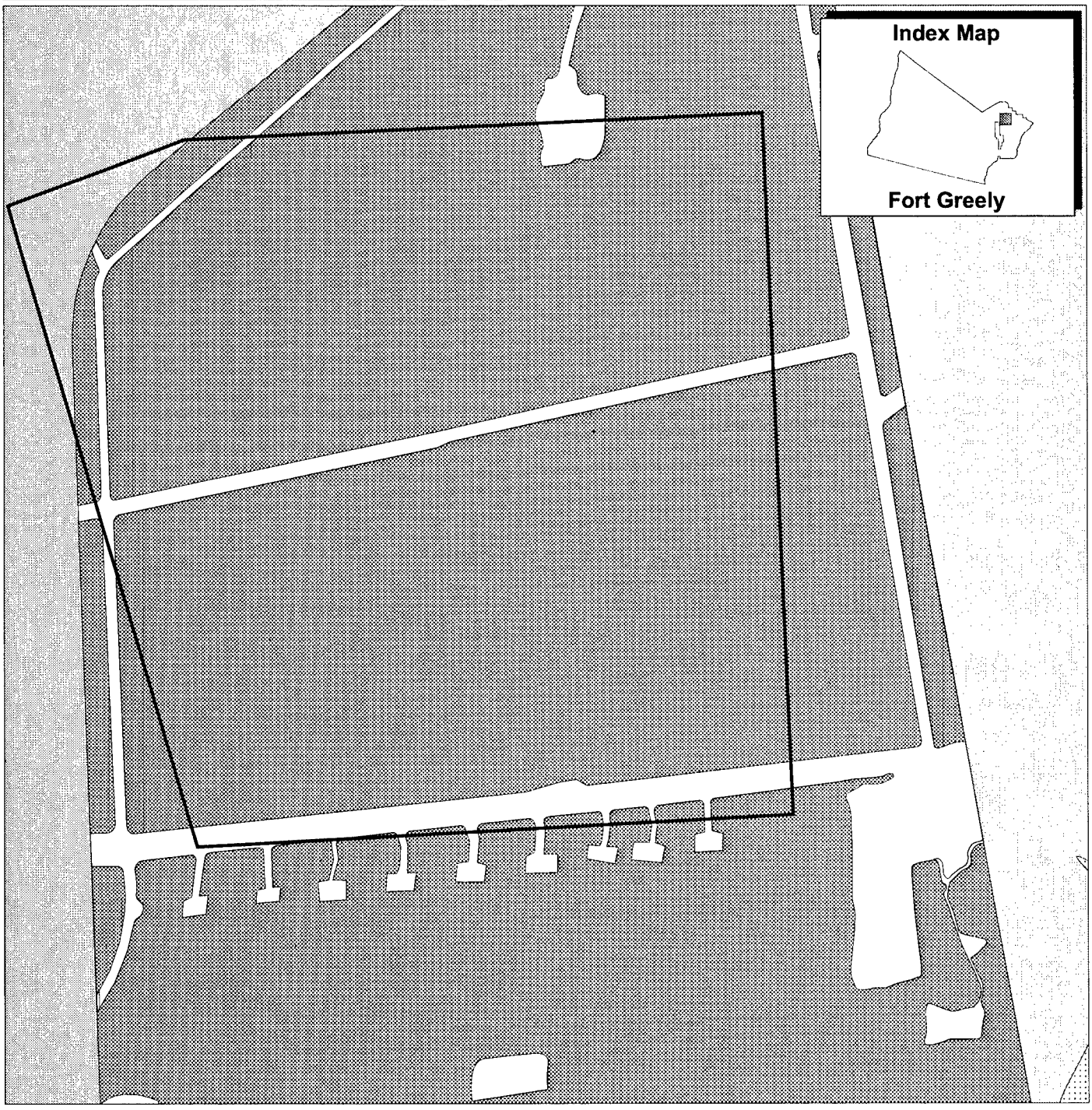
As shown in figure 3.4-8, there are no wetlands within the proposed GBI site. The nearest wetland is approximately 563 meters (1,848 feet) from the southeastern corner of the proposed site. This wetland consists of a palustrine shrub wetland and was assessed as having a low value. The wetland does not contribute significantly to the local diversity of fish but does provide habitat for wildlife. This wetland does not contribute substantially to abiotic resources such as flood control, groundwater recharge, or sediment or toxicant retention (U.S. Army Corps of Engineers, 1999—Wetland Delineation and Site Characterization for Military Sites, Alaska, Area 6—Fort Greely).

3.4.1.5 Yukon Training Area (Fort Wainwright)—Biological Resources

This section describes biological resources at the Yukon Training Area, located southeast of Fairbanks. The ROI includes areas that may potentially be affected by construction activities and deployment of the GBI (approximately 243 hectares [600 acres]). This ROI also includes the Yukon Training Area surrounding the potential GBI site. A site visit to the project area was conducted in July 1998.

Vegetation

The forested areas of the Yukon Training Area are a part of Alaska's taiga, which is defined as subarctic and subalpine forested areas adjacent to areas of treeless tundra. The predominant vegetation at the proposed site is deciduous forest, characterized by birch, quaking aspen, and balsam poplar on south-facing slopes. In low areas where the soils drain



EXPLANATION

- Ground-Based Interceptor Site Boundary
- Fort Greely
- Upland
- Developed/Disturbed, Upland
- Wetland (Palustrine, Scrub-Shrub, Broad-Leaved Deciduous)

Scale 1:15,000

0 621 1,242 Feet

0 190 379 Meters

NORTH

Wetlands, Potential GBI Site, Fort Greely

Alaska

Figure 3.4-8

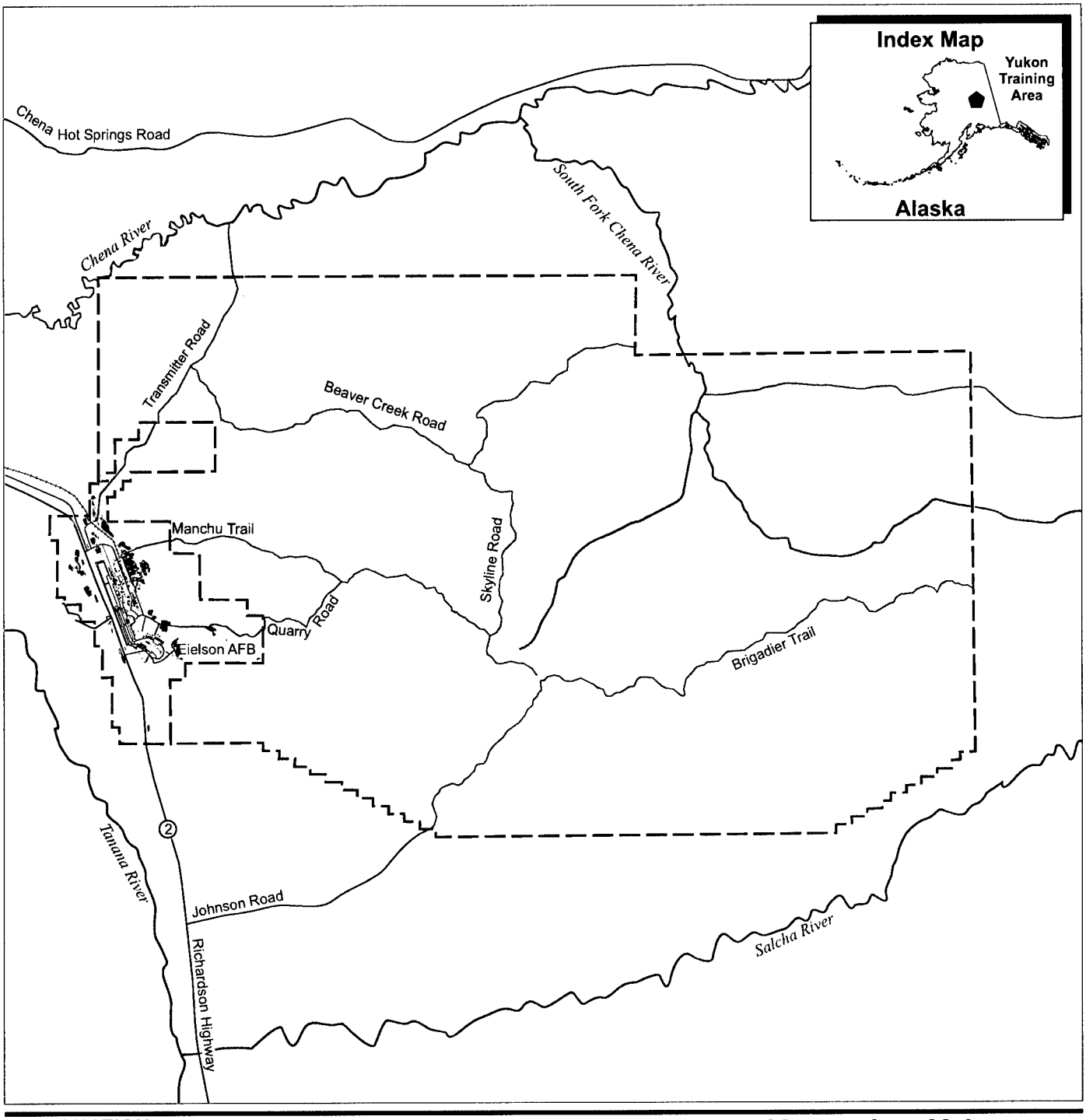
more slowly, white spruce and black spruce are found mixed with the hardwoods. (U.S. Department of the Army, 1997—EA BRAC 95 Realignment of Personnel and Military Functions to Fort Wainwright, Alaska)

Taiga forest communities typically support a low species diversity of four to five tree species and a more developed understory and groundcover layer. These layers commonly contain buffaloberry (*Shepherdia canadensis*), American red currant (*Ribes triste*), high-bush cranberry (*Viburnum opulus*), bunchberry (*Cornus canadensis*), bearberry (*Arctostaphylos uva-ursa*), Labrador tea (*Ledum groenlandicum*), bush cinquefoil, twinflower (*Linnaea borealis*), horsetail (*Equisetum arvense*), tall bluebell (*Mertensia paniculata*), and wintergreen (*Pyrola asarifolia*) in deciduous forests. (U.S. Department of the Army, 1979—Draft EIS concerning Proposed Land Withdrawal for the 172nd Infantry Brigade (Alaska) at Fort Wainwright)

Figure 3.4-9 depicts the location of vegetation types within the proposed project area. Appendix F, table F-10, lists species of vegetation observed at the Yukon Training Area.

Wildlife

Aquatic habitat in the Yukon Training Area is limited; Moose Creek is the closest water body to the area proposed for use (U.S. Department of the Interior and U.S. Department of Defense, 1994—Fort Wainwright Yukon Maneuver Area, Proposed Resource Management Plan Final EIS). No data is available that indicates salmon spawning within the installation (U.S. Department of the Army, 1979—Draft EIS Concerning Proposed Land Withdrawal for the 172nd Infantry Brigade (Alaska) at Fort Wainwright). Wildlife species common to the proposed project area within the Yukon Training Area are essentially forest-dwellers, as this is the predominant habitat type. Species common to all habitats at the Yukon Training Area are the coyote, red fox, and common raven. Mammals found in the deciduous forest include deer mouse (*Peromyscus maniculatus*), pygmy shrew (*Microsorex hoyi*), arctic shrew (*Sorex arcticus*), ermine (*Mustela erminea*), porcupine (*Erethizon dorsatum*), red squirrel, marten, black bear, brown/grizzly bear, moose, and lynx. Bird species observed include great horned owl, red-tailed hawk, gray jay (*Perisoreus canadensis*), spruce grouse (*Dendragapus canadensis*), ruffed grouse, hairy woodpecker (*Dendrocopos villosus*), hermit thrush (*Hylocichla guttata*), varied thrush (*Ixoreus naevius*), Swainson's thrush (*Catharus ustulata*), and black-capped chickadee (*Parus atricapillus*). (U.S. Department of the Army, 1997—EA BRAC 95 Realignment of Personnel and Military Functions to Fort Wainwright, Alaska) The olive-sided flycatcher (*Contopus borealis*), gray-checked thrush (*Catharus*



Vegetation, Yukon Training Area

Alaska

Figure 3.4-9

br_yukon_001_color

minimus), Townsend's warbler (*Dendroica townsendi*), and blackpoll warbler (*Dendroica striata*), all state species of concern, have been observed on the Yukon Training Area (U.S. Department of the Interior, 1999—comments received on the Draft EIS).

Mature forests generally provide poor habitat for moose, as there is little preferred browse. However, the Winter Camp provides some habitat for moose. (U.S. Department of the Army, 1979—Draft EIS concerning Proposed Land Withdrawal for the 172nd Infantry Brigade (Alaska) at Fort Wainwright)

Migratory birds observed in the vicinity of the proposed sites include a variety of swallows, thrushes, sparrows, and warblers (Department of the Army, 1996—Environmental Stewardship/Environmental Protection).

The Yukon Training Area is in the same region as Fort Greely and is within the same hunting district. The major difference is the absence of bison habitat in the area. Hunting is open both to post personnel and the public by permit only. Bag limits, open hunting seasons, and open hunting areas are carefully managed by species and are adjusted yearly.

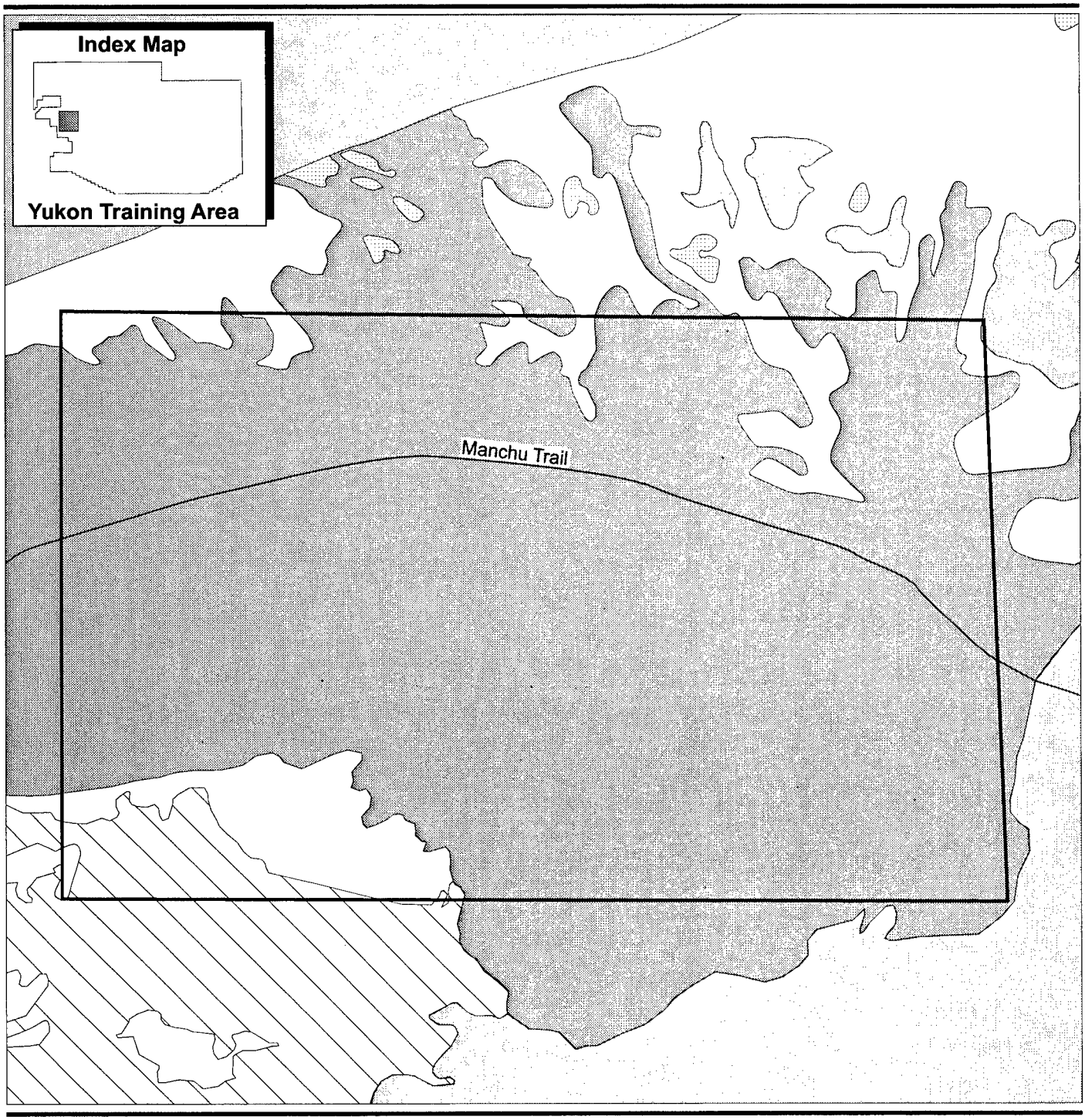
Appendix F, table F-11, lists wildlife species observed at the Yukon Training Area.

Threatened and Endangered Species

No federally-listed threatened, endangered, or candidate species have been found within the Yukon Training Area (U.S. Department of the Interior and U.S. Department of Defense, 1994—Fort Wainwright Yukon Maneuver Area, Proposed Resource Management Plan Final EIS). However, the recently delisted American peregrine falcon may travel through the area or nest in the vicinity of the Salcha River bluffs (Department of the Army, 1998—EA, Beddown of a Chemical Company and Utilization of M3A4 Smoke Generators at Fort Wainwright, Alaska).

Sensitive Habitat

The functions and values of wetlands and other waters in the Yukon Training Area at the proposed GBI site (figure 3.4-10) were evaluated in accordance with the rapid assessment methodology. The Rapid Assessment of Wetland Functions and Values evaluates the physical, biological, and human resource values of various landform and vegetation classes. Each type of wetland present in the area was evaluated with respect to the assessment criteria, such as groundwater recharge and discharge, water quality, and fish and wildlife habitat. Those types with a greater abundance of critical indicators were ranked higher; a general lack of indicators was scored lower. Each type was then given a ranking of High, Moderate, or Low for each of the 11 assessment criteria. (U.S.



EXPLANATION

- Roads
- Ground-Based Interceptor Site Boundary
- Yukon Training Area
- Upland
- Wetland Disturbed (Palustrine, Scrub-Shrub, Broad-Leaved Deciduous)
- Wetland (Palustrine, Scrub-Shrub, Broad-Leaved Deciduous)
- Wetland (Palustrine, Scrub-Shrub, Broad-Leaved Deciduous/Needle-Leaved Evergreen)

Scale 1:15,000

0 621 1,242 Feet

0 190 379 Meters

NORTH

br_yukon_002

Wetlands, Potential GBI Site, Yukon Training Area

Alaska

Figure 3.4-10

Army Corps of Engineers, 1999—Wetland Delineation and Site Characterization for Military Sites, Alaska, Area 4—Fort Wainwright)

Palustrine, scrub-shrub, broad-leaved deciduous (PSS1) wetlands are abundant throughout the site (12 hectares [29 acres]). Dominant vegetation consists of grasses, willow, resin birch, cranberry, and moss. Soils consist of a shallow organic layer underlain by sandy loam. Water is found approximately 15 to 30 centimeters (6 to 12 inches) below the surface. (U.S. Army Corps of Engineers, 1999—Wetland Delineation and Site Characterization for Military Sites, Alaska, Area 4—Fort Wainwright)

Palustrine, scrub-shrub, broad-leaved deciduous/needle-leaved evergreen (PSS1/4) wetlands are also abundant throughout the vicinity of the site (34 hectares [84 acres]). Dominant vegetation consists of grasses, willow, cranberry, black spruce, and moss. Soils consist of a shallow layer underlain by sandy loam. Although in many areas no water was found beneath the immediate surface, the soil was thoroughly saturated during the U.S. Army Corps of Engineers study. (U.S. Army Corps of Engineers, 1999—Wetland Delineation and Site Characterization for Military Sites, Alaska, Area 4—Fort Wainwright)

The site consists of an elevated ridge vegetated by uplands. On either side of the ridge is a series of expansive PSS1 and PSS1/4 wetlands. These wetlands likely provide habitat for moose and water-associated birds. Overall, the PSS1 and PSS1/4 wetland types were assessed as having a low value. These wetlands do not contribute significantly to the local diversity of fish but do provide habitat for wildlife. Neither wetland contributes substantially to abiotic resources such as flood control, groundwater recharge, or sediment or toxicant retention. (U.S. Army Corps of Engineers, 1999—Wetland Delineation and Site Characterization for Military Sites, Alaska, Area 4—Fort Wainwright)

3.4.1.6 Alaska—Fiber Optic Cable Line—Biological Resources

3.4.1.6.1 Plankton, Algae, and Invertebrates

Marine phytoplankton are single celled oceanic plants. They are found for at least part of their lives in the water column (pelagic), although a few species live on the sea floor (benthic). Phytoplankton provide the majority of primary production in the food webs of ocean environments. Primary production in the water column is the net increase in plant matter produced by the phytoplankton.

Zooplankton are single and multi-celled animals that live passively or semi-passively in the water column. Most species of marine animals spend a portion of their lives in plankton waters (U.S. Department of the Interior, 1977—Draft EIS, Proposed Outer Continental Shelf Oil and Gas Lease Sale). Zooplankton are extremely important to the diet of marine mammals and young fishes.

Marine algae normally include those species that spend their adult lives attached to a substrate. They are generally large enough to see with the naked eye. There are three basic groups of marine algae: the green algae (chlorophyta), the brown algae or kelps (phaeophyta) and the red algae (rhodophyta).

Prince William Sound

Plankton. Primary production reported for the nearby Gulf of Alaska (U.S. Department of the Interior, 1974—The Western Gulf of Alaska) ranges from 18 to 408 milligrams carbon per square meter per day (0.0005 to 0.012 ounces carbon per square yard per day). These are integrated values for the entire photic zone in June and July. Values from Motoda and Minoda (1974) are 229 milligrams carbon per square meter per day (0.007 ounces per square yard per day) in March and 290 milligrams carbon per square meter per day (0.0086 ounces carbon per square yard per day) in early summer in the western Gulf of Alaska. Winter values are much lower, as much less light is available. Motoda and Minoda (1974) provide one mid-winter value for the North Pacific, 71 milligrams carbon per square meter per day (0.002 ounces carbon per square yard per day). The range measures at the surface south of Unimak Pass was 0.15 to 1.95 milligrams carbon per square meter per hour (0.000004 to 0.00005 ounces carbon per square yard per hour), while values from the continental shelf near Kodiak Island ranged from 0.39 to 2.80 milligrams carbon per square meter per hour (0.00001 to 0.00007 ounces carbon per square yard per hour).

Phytoplankton found in Prince William Sound are similar to those found in the Gulf of Alaska (U.S. Department of the Interior, 1974—The Western Gulf of Alaska). They include over 80 species of diatoms. Dominant genera include *Chaetoceros* and *Thalassiosira*. There are also about 20 species of dinoflagellates, predominately *Ceratium*, *Dinophysis*, and *Peridinium* spp.

The dominant species of zooplankton in Prince William Sound include jellyfish, chaetognaths, annelid worms, numerous amphipods, copepods and molluscs.

Algae. Marine algae fix carbon as food for many other species—directly as live food or indirectly as detritus. They are an important component of the habitat for many species of invertebrates and fishes. Algae are found covering most intertidal and shallow subtidal rocky habitats, and fill a basic role in the food webs of these habitats. The only algae that are found in the deeper waters are drift that is moving downward from the shallows and surface areas. The lack of light penetration limits algal growth to less than 30 meters (100 feet) below the sea's surface; and under the best conditions, little algal growth occurs below 18 to 21 meters (60 to 70 feet) below the sea's surface.

The most common intertidal alga found in Prince William Sound is rockweed, *Fucus gardneri* (*F. distichus*). Bull kelp (*Nereocystis leutkeana*), a highly visible kelp species that grows to the surface forming a dense canopy, is also found in Prince William Sound. (U.S. Department of the Interior, 1974—The Western Gulf of Alaska)

Invertebrates. Intertidal benthic invertebrates are numerous along the shorelines of Prince William Sound. Habitats for these species range from fine silts and clay to solid rock outcrops. Included in the identified groupings are protozoans, poriferans (sponges), coelenterates (corals, anemones, and hydroids), molluscs (snails and clams), annelid worms, crustaceans (crabs and shrimps), echinoderms (seastars and urchins), and several minor phyla (U.S. Department of the Interior, 1974—The Western Gulf of Alaska). The largest group by species is the molluscs. Limpets, clams, mussels, chitons, and snails are all found in the intertidal zone. Also common are annelid worms, crustaceans, and echinoderms (sea stars, urchins, and sea cucumbers).

Subtidal benthic marine invertebrates are found in great numbers throughout Prince William Sound. They encompass both sessile (attached to the bottom) and motile (mobile) species. They are found both on hard and soft substrates. Commonly represented forms include sponges, coelenterates, worms, crustaceans, molluscs, and echinoderms.

Gulf of Alaska

Plankton. Primary phytoplankton production reported for the Gulf of Alaska (U.S. Department of the Interior, 1974—The Western Gulf of Alaska) ranges from 18 to 408 milligrams carbon per square meter per day (0.0005 to 0.012 ounces carbon per square foot per day). These are integrated values for the photic zone at a station south of Unimak Pass in June and July. Values from Motoda and Minoda (1974) were 747 milligrams per square meter per day (0.022 ounces per square foot per day) in March and 290 milligrams per square meter per day (0.009 ounces per square foot per day) in early summer. Winter values are much lower since there is considerably less sunlight. Motoda and Minoda (1974) reported one mid-winter value for the North Pacific of 71 milligrams per square meter per day (0.002 ounces per square foot per day). The range of surface phytoplankton production south of Unimak Pass was 0.15 to 1.95 milligrams carbon per cubic meter per hour (0.000004 to 0.00005 ounces carbon per cubic foot per hour), whereas production values from the Continental Shelf south of Kodiak Island ranged from 0.39 to 2.80 milligrams carbon per cubic meter per hour (0.0005 to 0.012 ounces carbon per cubic foot per hour).

Phytoplankton in the Gulf of Alaska include 86 species of diatoms (U.S. Department of the Interior, 1974—The Western Gulf of Alaska). The dominant species are *Chaetoceros* (21 spp.) and *Thalassiosira* (8 spp.).

Also, in the Gulf of Alaska there are 21 species of the less common dinoflagellates, predominately *Ceratium* spp. (5 spp.), *Dinophysis* (7 spp.) and *Peridinium* (6 spp.). Around Unimak Island, the most common species were the temperate, near-surface, open-ocean diatoms, including *Asterionella japonica, Thalassiosira nordenskioldii, Chaetoceros debilis,* and *Buddulphia aurita.*

The dominant species of zooplankton in the Gulf of Alaska (U.S. Department of the Interior, 1974—The Western Gulf of Alaska) include one species of jellyfish, one chaetognath, one annelid worm, numerous amphipods, nine species of copepods, and three molluscs. A common method for reporting zooplankton density is biomass volume in the water column. Values are presented as cubic centimeters of zooplankton biomass per 1,000 cubic meters of water (cubic inches of zooplankton biomass per 1,000 cubic yards of water). Density ranges from less than 50 to over 400 cubic centimeters per 1,000 cubic meters (0.09 to 0.72 cubic inches of zooplankton biomass per 1,000 cubic yards of water). The highest volumes of zooplankton were found in the coastal inshore waters. Levels below 50 cubic centimeters per 1,000 cubic meters (0.09 cubic inch per 1,000 cubic feet) were mostly offshore above the abyssal plain. Copepods form 85 percent of zooplankton by number. Densities decrease with distance offshore.

Algae. For the Gulf of Alaska, the U.S. Department of the Interior (1974) lists five species of green algae (*chlorophyta*), 31 species of brown algae (*phaeophyta*), and 11 species of red algae (*rhodophyta*). Fewer of these species are found in Prince William Sound and in the Bering Sea. The most common intertidal alga found in the Gulf of Alaska is rockweed. Bull kelp is a highly visible kelp species growing to the surface and forming a dense canopy that has been reported as far west in the Gulf of Alaska as Unimak Island. Less visible from the surface, but common in the shallow subtidal areas, are several large-bladed kelps (seven *Laminaria* spp. and six *Alaria* spp.) and several coralline red algae. Eelgrass (*Zostera marina*) is found in protected silty or sandy intertidal and shallow subtidal habitats. (U.S. Department of the Interior, 1974—The Western Gulf of Alaska)

In the western area of the Gulf of Alaska, 14 species of green algae, 28 species of brown algae, and 74 species of red algae have been identified (Lebednik and Palmisano, 1977—Ecology of Marine Algae). Green algae are found mostly in the upper intertidal area; *Fucus gardneri*, a brown alga, is the dominant species found in the midlevel of the intertidal area; and *Alaria* spp. and *Laminaria spp.* are primarily found in the subtidal region. Both the *Alaria* and *Laminaria* species are brown algae and are commonly called kelps. Several species of *porphyra* and coralline red algae are also common in the intertidal areas. The *porphyra* species are fleshy red algae, and the corallines are encrusting or articulate. The coralline red algae are also found to depths of greater than 30 meters

(100 feet). The bull kelp was found at Amchitka only as drift. Presumably, the western limit for growth is to the east, possibly as far as the tip of the Alaska Peninsula. The geographic distributions of the algae found include 23 percent from the Atlantic-arctic area, 49 percent from the western North Pacific, 39 percent from the eastern Pacific, and 10 percent are endemic to the Aleutian Chain.

Invertebrates. Intertidal benthic invertebrates are numerous along the shorelines of the Gulf of Alaska. Habitats for these species range from fine silts and clay to solid rock outcrops. Included in the identified groupings are protozoans, poriferans, coelenterates, molluscs, annelid worms, crustaceans, echinoderms, and several minor phyla (U.S. Department of the Interior, 1974—The Western Gulf of Alaska). The largest group by species is the molluscs with 42 species of limpets, clams, mussels, chitons, and snails. Also common are annelid worms that are represented by 21 species; arthropods, with 20 species of crabs, hermit crabs, and barnacles; and echinoderms, with 15 species of sea stars, urchins, and sea cucumbers.

Subtidal benthic marine invertebrates are found in great numbers throughout the Gulf of Alaska. They encompass both attached and mobile species. They are found both on hard and soft substrates. Commonly represented forms include sponges, coelenterates, worms, crustaceans, molluscs, and echinoderms. Species identified from soft substrate areas of the Kodiak Island region include 45 species of molluscs, 37 polychaete worms, 14 species of crustaceans, and 23 echinoderms. Additional groupings listed include five species of sipunculid worms and three brachiopods.

Shellfishes, particularly crabs, form a major biological component in the Gulf of Alaska and the Bering Sea. Commercially important crustaceans include red king crab (*Paralithodes camschatica*), blue king crab (*P. platypus*), brown king crab (*Lithodes aquespina*), scarlet king crab (*L. couesi*), Tanner (Snow) crabs (*Chionoecetes bairdi, C. opilio, C. tanneri, C. angulatus*), Dungeness crab (*Cancer magister*), and Korean hair crab (*Erimacrus isembeckii*). The shrimps include four species of pandalids; they are pink shrimp (*Pandalus borealis*), humpy shrimp (*P. goniurus*), sidestripe shrimp (*P. dispar*), and coonstripe shrimp (*P. hypsinotus*).

King crabs are found across the Gulf of Alaska and the eastern Bering Sea. They are typically found at depths from 100 to 550 meters (330 to 1,800 feet). They spawn in shallow water in the spring, and then move offshore to feed during the summer. Juveniles are released to the inshore plankton, where they stay for approximately 10 weeks. They then settle in the shallow coastal waters to live for several years. At times, juveniles form "pods" in the shallow waters; these pods may contain several thousand individuals. The longest of these snake-like pods to be measured was 7.3 meters (24 feet) long (U.S. Department of

the Interior, 1984—Final EIS, Proposed Gulf of Alaska/Cook Inlet Lease Sale 88). They eat plankton as larvae, then switch to diatoms, algae, protozoans, ostracods, echinoderms, small molluscs, hydroids, and sponges as juveniles. Food for adults consists of bivalves, snails, brittle stars, polychaete worms, Tanner crabs, and probably decaying fish and marine mammals.

Tanner and king crabs are found in similar habitats. The Tanner crabs exhibit spawning behavior that is similar to that exhibited by the king crabs, although slightly later in the year. During the spring, the Tanner crabs move inshore where the females release the egg masses that they had been carrying for 11 months. They then move back to deeper waters to feed for the rest of the year. Larvae stay in the nearshore water column for 60 to 90 days and then settle to the bottom. Pelagic larvae feed on phyto- and zooplankton. On the sea floor, they switch to a diet of benthic diatoms, macroalgae, hydroids, and detritus. Adult Tanner crabs feed on dead and decaying invertebrates and fishes on the sea floor, as well as on clams, hermit crabs, and brittle stars (U.S. Department of the Interior, 1985—Final EIS, Proposed St. George Basin Lease Sale 89).

Dungeness crabs are found in the Gulf of Alaska and were formerly found throughout Prince William Sound. This is a coastal species, found in bays, inlets, and other nearshore waters. They are found from the intertidal region to a depth of 90 meters (300 feet). Release of larvae occurs in the spring. The larvae spend 3 to 4 months in the plankton before settling to the bottom. Larvae consume phytoplankton and small zooplankton. After settling to the sea bottom, they consume shrimps, smaller crabs, barnacles, clams, and polychaetes (U.S. Department of the Interior, 1984—Final EIS, Proposed Gulf of Alaska/Cook Inlet Lease Sale 88).

As noted above, there are four commercially important species of shrimps in the Gulf of Alaska. Of these four, pink shrimp provide for the majority of the catch. Shrimp species spend their days on the bottom, and move up into the water column at night to feed on larval crabs and other zooplankton. They can be found during the night from near surface to a depth of at least 460 meters (1,500 feet). Location and depth depend on species, substrate, and oceanographic conditions.

Other commercially important benthic invertebrates include scallops and clams. *Patinopecten caurinus*, the weathervane scallop, is the only one of eight species found in the Gulf of Alaska sufficiently large and in sufficient numbers that they are fished. They are found in dense, discrete beds on the continental shelf in the Gulf of Alaska. Greatest densities are found at depths of 55 to 130 meters (180 to 425 feet). Spawning occurs in June and July. They are filter feeders, consuming phytoplankton, small zooplankton, and detritus. Fertilized eggs settle to the bottom. After 2 to 3 days, larvae hatch and enter the plankton for 2

to 3 weeks. They then settle to the bottom, transforming into juveniles. Scallops are found in areas with mud, clay, sand, or gravel substrate. Rocky substrates are not fished due to high gear losses in these areas. Because of this, it is not known whether scallops are also found in high densities on rocky substrates. (U.S. Department of the Interior, 1974—The Western Gulf of Alaska; 1984—Final EIS, Proposed Gulf of Alaska/Cook Inlet Lease Sale 88)

Bering Sea

Plankton. Primary production measurements in the Bering Sea water column range from near zero—due to the winter ice pack—to 2,400 milligrams per square meter per day (0.07 ounces per square yard per day) (McAlister and Favorite, 1977—Oceanography). Values along the north side of the Aleutian Chain range from 38 at Amchitka Island in February to 686 milligrams per square meter per day (0.001 to 0.02 ounces per square yard per day) off Adak Island in late spring-summer. Further offshore in the Bering Sea, phytoplankton production values range from 133 milligrams per square meter per day (0.004 ounces per square yard per day) in February to 327 milligrams per square meter per day (1,068 ounces per square foot per day) in June. These variations, especially nearshore, reflect the annual seasonal climatic changes that these areas undergo. Summer hourly rates at the surface range from 1 to 5 milligrams per cubic meter per hour (0.00003 to 0.0001 ounces per cubic yard per hour). Most values, however, fall below 2 milligrams per cubic meter per hour (0.00005 ounces per cubic yard per hour) (Motoda and Minoda, 1974—Plankton of the Bering Sea).

There are 74 species of diatoms listed for the Bering Sea (Motoda and Minoda, 1974—Plankton of the Bering Sea). The dominant species include nine species of *Chaetoceros* and three species of *Nitzschia*. Sixteen species of dinoflagellates exist in the Bering Sea—nine of these are in the genus *Peridinium*, six are *Ceratium* spp., and one is a species of *Dinophysis*.

Zooplankton in the Bering Sea include foraminiferans, radiolarians, tintinnoides, siphonophores, scyphomedusae, pteropods, polychaetes, chaetognaths, copepods, amphipods, mysids, euphausids, and appendicularians. By volume, the dominant groups include 29 species of calenoid copepods in 18 genera, 19 species of euphausids (*malacostraca*), and 3 species of Chaetognaths. By volume, copepods comprise 85.2 percent, chaetognaths 5.2 percent, and amphipods 2.4 percent of a typical trawl. Of the zooplankton, copepods have received the most study due to their importance as forage for fishes and because they are the most prevalent species. Many of the species of zooplankton listed are the same as those that are found in the Gulf. Volume density reported (U.S. Department of the Interior, 1974—The Western Gulf of Alaska) is over 800 cubic centimeters per 1,000 cubic meters (1.4 cubic

inches per 1,000 cubic feet). The highest density of zooplankton in the Bering Sea is found along the western Alaskan shoreline. Moderate densities, generally below 200 cubic centimeters per 1,000 cubic meters (0.35 cubic inch per 1,000 cubic feet), are found in the water column over the deeper areas of the abyssal plain of the southern Bering Sea.

Algae. Types of algae found in the Bering Sea are similar to those discussed above under the Gulf of Alaska. The same species of algae are found in the southern Bering Sea along the Aleutian Chain. The areas further north contain much less intertidal and subtidal macroalgae.

Invertebrates. Subtidal benthic marine invertebrates are found in great numbers throughout the Bering Sea. They encompass both attached and mobile species. They are found both on hard and soft substrates. Commonly represented forms include sponges, coelenterates, worms, crustaceans, molluscs, and echinoderms (U.S. Department of the Interior, 1985—Final EIS Proposed Northern Aleutian Basin Lease Sale 92). Species identified from soft substrate areas of the southern Bering Sea region include 130 species of molluscs, 143 polychaete worms, 76 species of crustaceans, and 28 echinoderms.

Shellfishes, particularly crabs, form a major biological component in the Bering Sea. Commercially important crustaceans are similar to those discussed above under the Gulf of Alaska.

King crabs and Tanner crabs are found across the eastern Bering Sea. They are typically found at depths from 100 to 550 meters (330 to 1,800 feet) and are discussed above under the Gulf of Alaska.

Only limited information is available for the Korean hair crab that is found along the Aleutian Chain and in shallow areas throughout the Bering Sea. Larvae are released into the plankton in the spring, where they stay for about 5 months (U.S. Department of the Interior, 1985—Final EIS, Proposed St. George Basin Lease Sale 89).

Shrimp species spend their days on the bottom, and move up into the water column at night to feed on larval crabs and other zooplankton. They can be found during the night from near surface to a depth of at least 460 meters (1,500 feet). Location and depth depend on species, substrate, and oceanographic conditions.

Other commercially important benthic invertebrates including scallops and clams are discussed above under the Gulf of Alaska.

Clam resources in the Bering Sea include six species. The primary species of commercial interest is the surf clam (*Spisula polynyma*). The surf clam is widely distributed from the intertidal region to the edge of the continental shelf. Species of less interest include razor (*Siliqua patula*), butter (*Saxidomus gigantea*), softshell (*Mya sp.*), littleneck

(*Protothaca staminea*) and Macoma clams (*Macoma spp.*). All clams broadcast pelagic sperm and eggs into the water column, where fertilization occurs. The larval stage lasts several months before they settle to soft substrate of the sea floor as juveniles.

3.4.1.6.2 Fishes

Prince William Sound

The fish communities and many of the species discussed below are found throughout Prince William Sound, the Gulf of Alaska, and the Bering Sea. Studies in the western Gulf of Alaska identified 96 species of fishes (Simenstad, Isakson and Nakatani, 1977—Marine Fish Communities). Included were 2 species of sharks, 3 rays, 6 salmonids, 3 cods, 7 rockfishes, 18 sculpins, and 6 flatfishes. Most of the rest of the fishes identified are small demersal species, bottom dwellers that generally lack swim bladders.

The fish communities were separated into seven fairly distinct habitats. These are the epipelagic, mesopelagic, offshore demersal (rock/sponge), offshore demersal (sand/gravel), inshore (sand/gravel), inshore (rock/algae), and littoral (intertidal) communities. The epipelagic community consists of 11 species, living offshore in less than 200 meters (650 feet) of water. The salmon species are dominant among these.

The mesopelagic community has 18 species that typically live between 200 to 1,000 meters (650 and 3,300 feet) deep. Most of these are deep ocean species, typically with bioluminescent organs for communication, and often unique feeding appendages. Occurrence is closely related to presence of the shrimps they prey upon.

The dominant features of the offshore demersal (rock/sponge) community are rocky substrate covered by sessile (attached to the bottom) invertebrates, such as sponges, cold water corals, and tunicates. Water depths are typically 55 to 180 meters (180 to 600 feet), but may include much shallower and deeper water on shoals and in canyons. Eight species dominate this environment, with many more found there at times. The dominants include sculpins, pollock, and the rockfishes. Difficulties caused by entanglement of gear with the rocky bottom make this a poorly sampled region, resulting in difficulties identifying the species present.

The offshore demersal (sand/gravel) community also typically encompasses depths from 55 to 180 meters (180 to 600 feet). There is little stabilized benthic growth, leaving a fairly uniform substrate. The fish community is dominated by Pacific cod and Pacific halibut. Other flatfishes and small demersal fishes are common. The inshore (sand/gravel) habitat is similar to the offshore sand/gravel habitat, in that most of the substrate is uniform. It is found mostly in protected areas, such as bays. Pacific cod, pollock, and Pacific halibut dominate during

the summer. Other flatfishes and small demersal fishes were also found. Time spent in this habitat during the rest of the year is not known, as conditions make sampling very difficult during the winter.

The inshore (rock/algae) is found from the low tide line out to about 100 meters (330 feet). It is composed of rocky ridges, canyons, cliffs, exposed rock outcrops, and flat rock benches. Attached algae and invertebrates cover the substrate and add additional variations to an already diverse environment. Included are kelp forests, which increase habitat to include the water column. Most of the fishes found here are demersal. They include greenlings, sculpins, rockfishes, and a wide variety of other species. High variability among species present at different sites makes this a loose aggregation more than a consistent community. Few fishes are found here during the winter, when wave activity increases dramatically.

The littoral (intertidal) community consists of the species found in tide pools and nearshore surge channels. It provides a nursery for a wide variety of juvenile fishes, as well as for adults of several species. Six species of sculpins and other small demersals dominate the tidepools. Species typically found in subtidal areas move up into the littoral zone to feed during high tides. Reductions in algal cover and food sources during the winter, combined with severe physical conditions, push many of these fishes down into subtidal areas to overwinter.

Gulf of Alaska

The fish communities found throughout the Gulf of Alaska are the same as those discussed above under Prince William Sound.

Bering Sea

The fish communities found throughout the Bering Sea are similar to those discussed above under Prince William Sound.

Identifications of about 300 species have been made for the Bering Sea (Wilimovsky, 1974—Fishes of the Bering Sea). Of these, most are considered to be boreal species, rather than primarily from the arctic. The nearshore fishes of the Aleutian Chain and the Alaska Peninsula are predominantly from the eastern Pacific. The southern Bering Sea, around Bower's Ridge, has a unique community of fishes, many of which are not found elsewhere.

The dominant groups throughout the Bering Sea are the sculpins and other small demersal fishes. Sculpins account for 22 percent (66 species) of the 300 species found, while 4 other families of demersal fishes account for 34 percent (102 species). These are the liparids, stichaeds, zoarcids, and the agonids. Flatfishes account for 8 percent (24 species), rockfishes for 5 percent (15 species), and salmonids for 4

percent (12 species). These totals include the species found at all depths throughout the Bering Sea in all seasons. (Wilimovsky, 1974—Fishes of the Bering Sea)

3.4.1.6.3 Fisheries

The route for the proposed fiber optic cable line traverses some of the world's richest marine fishing grounds. Harvesting of shellfish and finfish is a year round activity in the Gulf of Alaska and Bering Sea/Aleutian Islands regions. Vessels range from small skiffs that fish in more protected coastal waters to longliners, trawler vessels, and factory trawlers over 60 meters (200 feet) long that harvest crab and groundfish from offshore waters. During summer, thousands of salmon fishing vessels, including small skiffs and medium sized purse seine and gillnet vessels, fish coastal waters for five species of salmon. During winter months, trawl and crab pot vessels fish the nearshore and offshore Gulf of Alaska and the Bering Sea for groundfish and crab.

In 1997, Dutch Harbor received the largest commercial fishery landings of any port in the United States with 2 million kilograms (4.4 million pounds) of product landed (U.S. Department of Commerce, 1998—Fisheries of the United States). Dutch Harbor's landings also were the nation's most valuable at $122.6 million. Landings in Kodiak were sixth in quantity at 125.8 million kilograms (277.5 million pounds) and third in value in 1997 ($88.6 million) (U.S. Department of Commerce, 1998—Fishes of the United States). The total annual processed value of fishery products harvested from offshore waters in Alaska's Exclusive Economic Zone is $1.1 to 1.4 billion (U.S. Department of Commerce, 1998—Fisheries of the United States). The study area encompasses nearly all of the fisheries that generate this value. Statistics on catch levels by fishery, effort expended in fishery categories, and economic values of these fisheries can be reviewed in North Pacific Fisheries Management Council documents (North Pacific Fisheries Management Council, 1998—Stock Assessments of the Gulf of Alaska, and Bering Sea and Aleutian Islands Regions).

The North Pacific Fisheries Management Council and National Marine Fisheries Service (NMFS) are currently evaluating areas in the Gulf of Alaska and Bering Sea/Aleutian Islands for consideration as Essential Fish Habitat. The Magnuson-Stevens Fishery Conservation and Management Act reauthorization requires this effort. Essential Fish Habitat includes all life history stages of each managed species and includes those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. The purpose of assessing Essential Fish Habitat for species managed by these agencies is so that Councils and NMFS, when setting annual fishing quotas and regulations, will consider fish habitat concerns along with socioeconomic and other concerns. Considerable amounts of descriptive background material on what may constitute

Essential Fish Habitat for various species of shellfish and finfish harvested in marine waters of Alaska's state waters and Exclusive Economic Zone is provided in North Pacific Fisheries Management Council documents (North Pacific Fisheries Management Council, 1998—Draft EA for Amendments to the Fishery Management Plan; Essential Fish Habitat Assessment Report for the Gulf of Alaska, and the Bering Sea and Aleutian Islands Regions).

The State of Alaska manages all fisheries that occur within 5 kilometers (3 miles) of the Alaskan coast, and also several shellfish fisheries further offshore. Fisheries in Federal waters (the Exclusive Economic Zone), beyond 5 kilometers (3 miles), are managed by the Federal government. Following are descriptions of shellfish and finfish fisheries that occur in the project area.

Prince William Sound

All fisheries in Prince William Sound are under the direction of the Alaska Department of Fish and Game.

Shellfish. The only shellfish fishery open in the project east of Kodiak Island in Prince William Sound is for sidestripe shrimp (*Pandalus dispar*). It is a trawl fishery, with few vessels participating. The fishery occurs primarily in the northwest part of the Sound, with some effort west of Knight Island (Trowbridge, 1998—Personal communication).

Finfish. Finfish fisheries that may be affected by the proposed project include herring, salmon, and groundfish. Herring are fished commercially, but only in the northeast part of the sound, well away from the project area. Five species of salmon are harvested in the sound by gill net or purse seine. These fisheries are conducted in inshore coastal areas. These fisheries occur from May through August.

A limited pollock (*Theragra chalcogramma*) fishery occurs in southwestern Prince William Sound. The harvest in this area is around 2 million kilograms (4.4 million pounds) annually. There is also a fishery in the region outside Resurrection Bay to Day Harbor. This fishery takes approximately 4 million kilograms (9 million pounds) annually (Trowbridge, 1998—Personal communication). The pollock fishery in the Sound is open only in January.

Pacific cod (*Gadus macrocephalus*) are fished with longlines and pots. Some jig fishing occurs in shallow, inshore waters. Jig gear generally does not contact the sea floor. Gear limits per vessel are 60 pots or 5 jigs (Trowbridge, 1998—Personal communication).

The first Pacific cod fishing season in state waters is January to March, concurrent with the season in Federal waters. A week later, the fishery in state waters reopens and continues through the remainder of the year.

With gear limitations currently in effect, the catch for this fishery continues well below its potential (Trowbridge, 1998—Personal communication).

Fishing generally occurs in waters less than 110 meters (60 fathoms) deep. The primary Prince William Sound fishing area is in deep waters of the central Sound. The catch of Pacific cod from Prince William Sound is approximately 0.6 to 0.9 million kilograms (1.3 to 2.0 million pounds) (Trowbridge, 1998—Personal communication).

Sablefish (*Anoplopoma fimbria*) fisheries in Prince William Sound are under a limited entry system, and approximately 65 vessels participate. This fishery is under Individual Transferable Quota regulations, with each fisherman allowed a percentage of the allowable catch based on past history with the fishery (Trowbridge, 1998—Personal communication).

The Sound fishery opens May 1 and continues for 1 or 2 days. This derby fishery occurs in deeper waters of the Sound, including the east side of Lone Island and Knight Island Pass. The Cook Inlet fishery opens March 15 (Trowbridge, 1998—Personal communication). Very little effort is expended by commercial fishermen on rockfish in this area.

Gulf of Alaska

Shellfish. Commercial shellfish fishing in the Gulf of Alaska includes king crab (three principal spp.), Tanner crab (four spp.), Dungeness crab, and scallops. Several minor fisheries occur for other species of crab, snails, shrimp, clams, octopus, sea cucumbers, and sea urchins (Alaska Department of Fish and Game, 1998—Annual Management Report for the Shellfish Fisheries of the Westward Region).

King crab traditionally provided one of the largest and richest fisheries in Alaska. Red king crab in most areas of Alaska are at low population levels, and no fishing occurs at present. Brown, or golden, king crab were historically harvested from the Kodiak Island area. The fishery for this species is presently limited, and there are no commercial openings in the Gulf of Alaska.

King crabs are fished using heavy mesh-covered pots attached to surface buoys. Red and blue king crab fisheries use 4-square-meter (43-square-foot) pots fished from single lines. Brown and scarlet king crab are harvested by smaller pots set on longlines (North Pacific Fisheries Management Council, 1998—Essential Fish Habitat Assessment Report for the Bering Sea and Aleutian Islands King and Tanner Crabs).

There is a limited Tanner crab fishery in the Gulf of Alaska west of Kodiak Island. Tanner crabs were historically abundant in state waters, but harvests are limited at present, with most of the state closed due to low stocks. Tanner crabs are harvested with 4-square-meter (43-square-

foot) mesh-covered pots fished with single lines attached to surface buoys. (Alaska Department of Fish and Game, 1998—Commercial Shellfish Fishing Regulations, 1998–1999)

Dungeness crab are fished in shallow waters. Around Kodiak District and the Alaska Peninsula the season runs from May or June until January. The harvest in 1996 was 349,266 kilograms (770,000 pounds). The principal gear type used is the Dungeness pot. They are fished as individual buoyed pots. (Alaska Department of Fish and Game, 1998—Commercial Shellfish Fishing Regulations, 1998–1999)

The Alaskan fisheries for weathervane scallops primarily occur in waters 73 to 110 meters (40 to 60 fathoms) in depth (Alaska Department of Fish and Game, 1998) on the Continental Shelf. Most vessels are specialized for pulling dredges across the sea floor. Weathervane scallops are fished around Kodiak Island and along the Alaska Peninsula (Alaska Department of Fish and Game, 1998—Annual Management Report for the Shellfish Fisheries of the Westward Region).

A very small fishery occurred for pink scallops in the Dutch Harbor in 1991 and 1992. These catch data are confidential (North Pacific Fisheries Management Council, 1997—Stock Assessment and Fishery Evaluation Report for the Scallop Fisheries off Alaska).

A variety of other species are harvested to a limited extent under commercial shellfish regulations established by the state. Shrimp fishing in Kodiak Island bays is conducted for spot shrimp using pots, but landings are very small. (Alaska Department of Fish and Game, 1998— Annual Management Report for the Shellfish Fisheries of the Westward Region)

Sea cucumbers (*Parastichopus californicus*) and sea urchins, primarily the green urchin, *Strongylocentrotus droebachiensis*, are harvested in small numbers by divers or with rakes from shallow waters around Kodiak Island.

Octopus (*Octopus dofleini*) is harvested incidental to Pacific cod trawl and pot fisheries in the Kodiak and Alaska Peninsula Districts. Octopus is utilized for bait and a food product (Alaska Department of Fish and Game, 1998—Annual Management Report for the Shellfish Fisheries of the Westward Region).

Two species of squid are harvested around the Aleutian Islands, *Berryteuthis magister* and *Onychoteuthis borealijanpoicus*. Squid are taken as bycatch in other trawl fisheries, primarily the pollock fishery (Witherell, 1996—Groundfish of the Bering Sea and Aleutian Islands).

Other fisheries in the study area have included snails (*Neptunea* sp.), razor clams (*Siliqua* sp.), and the crab *Paralomis multispina*. Of these, only snails are harvested at present. Pots are the fishing gear permitted

for harvesting snails (Alaska Department of Fish and Game, 1998—Annual Management Report for the Shellfish Fisheries of the Westward Region).

Finfish. Pacific herring are harvested by purse seine and gill net from coastal waters in portions of the study area. Herring fisheries occur around Kodiak Island and the Alaska Peninsula. These fisheries occur in April and early May.

Five species of salmon are harvested in this region from May through August by gill net or purse seine. These fisheries are conducted in inshore coastal areas.

Groundfish include all species of cod, pollock, flatfish, rockfish, and other species harvested by trawl, pot, or jig. No on-bottom trawl gear is permitted in state waters of the Gulf of Alaska. Fishing is by pelagic trawls, pot gear, or jigs (Trowbridge, 1998—Personal communication). In Federal waters bottom trawls are used extensively.

Walleye pollock are the most abundant species of groundfish targeted in the commercial fisheries of the North Pacific Ocean. Fisheries for pollock occur throughout the Gulf of Alaska and the Aleutian Islands.

Pollock occur along the outer Continental Shelf and Slope during winter. They migrate into shallower waters and aggregate for spawning in late winter and spring. Vessels fishing for pollock mostly use bottom trawls that fish on or near the bottom. A limited quantity of pollock is landed from longline gear. In the Gulf of Alaska about 100 trawl vessels participate in the pollock fishery, while in the Aleutian Islands and Bering Sea area about 160 vessels participate (Kinoshita et al. 1997—Economic Status of the Groundfish Fisheries off Alaska).

Harvest from state waters has increased in recent years to over 30 percent of the combined state/Federal quota (Jackson and Urban, 1998—Westward Region Report on 1997 State Managed Pacific Cod Fishery, No. 4K96-50). Approximately 14 million kilograms (31 million pounds) of pollock were harvested from the state waters in the Gulf of Alaska in 1995 (Jackson and Urban, 1998—Westward Region Report on 1997 State Managed Pacific Cod Fishery, No. 4K96-50).

In the Gulf of Alaska, the 1997 pollock season opened on January 20 and closed between late January and early March, depending on the area. Short openings also occurred in June and September in specific areas (DiCosimo, 1998—Groundfish of the Gulf of Alaska).

The state cod fishery in 1997 occurred in three areas: around Kodiak, the Chignik Area, and the south side of the Alaska Peninsula area. The Kodiak fishery opened April 4 with closures as quota allocated to various gear types were reached; 3.4 million kilograms (7.5 million pounds) were

harvested by pot and jig gear. In the Chignik Area, the fishery opened April 15, and limited interest by pot and jig vessels resulted in a total harvest of 0.5 million kilograms (1.1 million pounds). The south Alaska Peninsula fishery opened April 4 with both pot and jig vessels participating and was closed December 22; harvest was nearly 4.3 million kilograms (9.4 million pounds) (Jackson and Urban, 1998—Westward Region Report on 1997 State Managed Pacific Cod Fishery, No. 4K98-2).

Pacific cod are harvested offshore in the Gulf of Alaska and Aleutian Islands by longline, trawl, pot, and jig gear. Cod fishing in the Gulf of Alaska occurs in the central and western gulf (North Pacific Fishery Management Council, 1998—Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Gulf of Alaska). Cod are fished from January to March. Additional openings occur in late summer and fall, depending on area (DiCosimo, 1998—Groundfish of the Gulf of Alaska). Fishing vessels participating in the offshore Pacific cod fishery in the Gulf include approximately 125 trawl vessels, 350 longline vessels, and 150 pot vessels (Kinoshita et al., 1997—Economic Status of the Groundfish Fisheries off Alaska).

Rockfish fisheries are generally managed by species groups that have similar values, abundance, or habitat use patterns. Some species are pelagic and live in the water column, while others are demersal and inhabit the benthic zone. Among the demersal assemblages, some are shallow water species, others inhabit deeper waters.

Several species of rockfish are harvested in state waters. They are grouped according to their habitat preferences. The most abundant species harvested in state waters is the black rockfish (*Sebastes melanops*), which is part of the assemblage of midwater schooling fishes. This fishery started in the early 1990s with small vessels fishing with jig gear. Effort has increased and expanded from a few areas around Kodiak to a larger area westward along the Alaska Peninsula (Jackson and Urban, 1998—Westward Region Report on 1997 State Managed Pacific Cod Fishery, No. 4K96-50). The season for pelagic shelf rockfish in state waters is open year round.

Pacific ocean perch (*Sebastes aleutus*) and related demersal species inhabit the outer Continental Shelf and Slope. They are long-lived species that may live up to 90 years (Witherell, 1996—Groundfish of the Bering Sea and Aleutian Islands Area). The fishery is conducted by trawling vessels.

The offshore pelagic shelf rockfish complex is managed as a group in the Gulf of Alaska, and consists of species that typically are midwater. The Dusky rockfish (*Sebastes ciliatus*) is the predominant species in the complex (DiCosimo, 1998—Groundfish of the Gulf of Alaska). The

fishery is conducted by both shore-based trawlers and larger catcher-processors.

The thornyhead rockfish assemblage includes the shortspine (*Sebastolobus alaskanus*) and longspine (*S. altivalis*) rockfish. These species inhabit deep waters along the Continental Shelf edge and slope; shortspine thornyheads are the most abundant (DiCosimo, 1998—Groundfish of the Gulf of Alaska). They are taken primarily as bycatch in bottom trawl and longline fisheries for other species. A large exploitable biomass is available, but little is harvested.

There is a complex of other species managed as an assemblage that includes at least 30 species of *Sebastes* (DiCosimo, 1998—Groundfish of the Gulf of Alaska). Little is known about the biology of this group. A fairly small percentage of the available harvestable biomass is taken each year. In the Bering Sea/Aleutian Islands, this group includes *Sebastolobus* and *Sebastes* rockfish not included with the Pacific ocean perch complex.

The Pacific halibut (*Hippoglossus stenolepis*) is a large flatfish harvested on the Continental Shelf throughout the North Pacific Ocean, primarily in the Gulf of Alaska (International Pacific Halibut Commission, 1987—The Pacific Halibut: Biology, Fishery, and Management). This species is managed internationally by the International Pacific Halibut Commission and the North Pacific Fisheries Management Council. The largest fisheries occur in Alaskan waters of the Gulf of Alaska, with smaller fisheries in the Bering Sea and offshore from British Columbia and Washington/Oregon. Halibut are harvested by longline gear only, and the fishery is conducted as an Individual Transferable Quota fishery in Alaska. The season is from March 15 through November 15 in Alaska.

The halibut commercial harvest throughout its range was 21.5 million kilograms (47.3 million pounds) in 1996 (International Pacific Halibut Commission, 1997—Annual Report, 1996) and 29 million kilograms (63.9 million pounds) in 1997 (Gilroy, 1998—Personal communication). Preliminary catch data for the 1998 fishery indicate a commercial catch of 30.5 million kilograms (67.3 million pounds), with the majority of the catch from the central Gulf of Alaska (Gilroy, 1998—Personal communication).

Flatfish, with the exception of halibut, are managed as groups of species according to abundance levels, value, and habitat use patterns. They are harvested by trawl. In state waters, shallow water flatfish harvested include sole, flounder, and plaice. Harvest of shallow water flatfish in 1995 was approximately 0.8 million kilograms (1.7 million pounds) from the Central Gulf of Alaska, and 5,443 kilograms (12,000 pounds) from the western gulf. (Jackson and Urban, 1998—Westward Region Report on 1997 State Managed Pacific Cod Fishery, No. 4K96-50)

Flatfish harvested offshore in the Gulf of Alaska include several species of flounder, sole, sand dabs, plaice, and turbot. A large biomass of these species exists, but most are exploited at a low level.

Sablefish, or black cod (*Anoplopoma fimbria*), are managed as a directed fishery in the Gulf of Alaska. They are long lived, and occur along the outer Continental Shelf and Slope in waters deeper than 900 meters (3,000 feet). They are harvested primarily by longline, and are under an Individual Transferable Quota program in all Federal waters. Some are harvested as trawl bycatch or by pot gear. The fishery occurs from March 15 to November 15, concurrent with the halibut Individual Fisheries Quota fishery. Qualified individual fishermen are allocated a percentage of the annual allowable harvest level and can fish for sablefish until their individual quota is caught.

Atka mackerel (*Pleurogrammus monopterygius*) is a schooling, semi-demersal species found primarily around the Aleutian Islands. The fishery is conducted primarily by larger factory trawlers (Witherell, 1996—Groundfish of the Bering Sea and Aleutian Islands Area). Due to low stock abundance in the Gulf of Alaska, Atka mackerel was a bycatch only fishery in 1997 (DiCosimo, 1998—Groundfish of the Gulf of Alaska).

Bering Sea

Shellfish. Shellfish in the Bering Sea include king crab (three principal spp.), Tanner crab (four spp.), Dungeness crab (*Cancer magister*) and scallops. Several minor fisheries occur for other species of crab, snails, shrimp, clams, octopus, sea cucumbers, and sea urchins (Alaska Department of Fish and Game, 1998—Annual Management Report for the Shellfish Fisheries of the Westward Region).

King crab fisheries are discussed above under the Gulf of Alaska. Brown king crab, also called golden king crab, was historically harvested from the Kodiak Island area. The fishery for this species is presently limited to the Aleutian Islands, with 2.6 million kilograms (5.8 million pounds) harvested in 1996. The fishery occurs in fall and winter. Scarlet king crab is found in the Bering Sea and around the Aleutian Islands. Little is known of this species, and limited fisheries occur under special permit from the state.

Several species of Tanner crab are harvested in the Bering Sea. Tanner crabs were historically abundant, but harvests are limited at present, with most of the state closed due to low stocks. Snow crabs (*Chionoecetes opilio*), are harvested primarily in the Bering Sea. The 1997 fishery occurred from January to March, with 227 vessels taking approximately 53 million kilograms (117 million pounds) of crab. Limited fisheries also occur in the Bering Sea for the grooved and triangle Tanner crab (*Chionoecetes tanneri* and *C. angulatus*). Fisheries for these two species

are by special permit only, and in 1997 no vessels registered to participate. (Alaska Department of Fish and Game, 1998—Annual Management Report for the Shellfish Fisheries of the Westward Region)

Tanner and snow crabs are harvested with 2-square-meter (7- or 8-square-foot) mesh-covered pots fished with single lines attached to surface buoys. Grooved and triangular Tanner crabs are harvested with smaller pots attached to longlines (Alaska Department of Fish and Game, 1998—Commercial Shellfish Fishing Regulation, 1998–1999).

Dungeness crabs are fished in shallow waters. In the Aleutian Islands and Bering Sea, Dungeness crabs are harvested in very limited numbers (Alaska Department of Fish and Game, 1998—Annual Management Report for the Shellfish Fisheries of the Westward Region). The principal gear type used is the Dungeness pot. They are fished as individual buoyed pots. (Alaska Department of Fish and Game, 1998—Commercial Shellfish Fishing Regulation, 1998–1999).

The Bering Sea fishery for scallops primarily occurs in waters 73 to 110 meters (40 to 60 fathoms) in depth over the Continental Shelf (Alaska Department of Fish and Game, 1998—Annual Management Report for the Shellfish Fisheries of the Westward Region). Most vessels are specialized for pulling dredges across the sea floor. The primary target is the weathervane scallop (Alaska Department of Fish and Game, 1998—Annual Management Report for the Shellfish Fisheries of the Westward Region). A very small fishery occurred for pink scallops near Adak in 1991 and 1992. These catch data are confidential (North Pacific Fisheries Management Council, 1997—Stock Assessment and Fishery Evaluation Report for the Scallop Fisheries off Alaska).

A variety of other species are harvested to a limited extent under commercial shellfish regulations established by the state. Two vessels registered to fish for shrimp using pots in the Aleutian Islands Area in 1997, but no harvests were reported (Alaska Department of Fish and Game, 1998—Annual Management Report for the Shellfish Fisheries of the Westward Region).

Sea urchins, primarily the green urchin *Strongylocentrotus droebachiensis*, are harvested by divers and rakes from shallow waters around Unalaska Bay.

Other fisheries in the study area have included snails (*Neptunea* sp.), razor clams (*Siliqua* sp.), and the crab *Paralomis multispina*. Of these, only snails are harvested at present. Pots are the fishing gear permitted for harvesting snails (Alaska Department of Fish and Game, 1998—Annual Management Report for the Shellfish Fisheries of the Westward Region).

Finfish. Pacific herring are harvested by purse seine and gill net from coastal waters in portions of the study area. This fishery is by seine, with a few boats participating. In the western part of the project area, herring fisheries occur around the Alaska Peninsula. They occur in April and early May.

Five species of salmon are harvested in the Bering Sea by gill net or purse seine. These fisheries are conducted in inshore coastal areas. These fisheries occur from May through August.

Groundfish include Pacific cod, walleye pollock, rockfish, flatfish, sablefish, and Atka mackerel. Walleye pollock are the most abundant species of groundfish targeted in the commercial fisheries of the North Pacific Ocean. Fisheries for pollock occur throughout the Gulf of Alaska, the Aleutian Islands, and the eastern Bering Sea. The pollock trawl fishery in the Bering Sea (1.2 to 1.4 million metric tons [1.3 to 1.5 million tons] annual catch) is one of the largest finfish fisheries in the world.

Pollock in the study area occur along the outer Continental Shelf and Slope during winter. They migrate into shallower waters and aggregate for spawning in late winter and spring months. Vessels fishing for pollock mostly use bottom trawls that fish on or near the bottom. A limited quantity of pollock is landed from longline gear. In the Bering Sea/Aleutian Islands area, approximately 160 trawl vessels participate in the pollock fishery (Kinoshita et al., 1997—Economic Status of the Groundfish Fisheries off Alaska).

The pollock fishery in the Bering Sea/Aleutian Islands occurs in two seasons. An early season targets roe pollock north of the Aleutian Islands from Unimak Island to the Pribilof Islands. A later season targets non-roe pollock north and west of the Pribilof Islands. Fishing occurs during the months of mid January to early March for the early season. The later season runs from mid August through late September (Witherell, 1996—Groundfish of the Bering Sea and Aleutian Island Area).

Pacific cod, or gray cod (*Gadus macrocephalus*), are harvested in the Bering Sea/Aleutian Islands by longline, trawl, pot, and jig gear. The season in the Bering Sea/Aleutian Islands is March through April for trawling, January through early May for hook and line, and March through October for jigging and pots. Most trawling and pot fishing grounds are located north and west of Unimak Island. Longline fishing areas are further offshore along the Continental Slope north and west of the Pribilof Islands (DiCosimo, 1998—Groundfish of the Gulf of Alaska). In the Bering Sea/Aleutians, 150 trawl vessels, 90 longline vessels, and 100 pot vessels fish for Pacific cod (Kinoshita et al., 1997—Economic Status of the Groundfish Fisheries off Alaska).

The Pacific halibut is a large flatfish harvested on the Continental Shelf throughout the North Pacific Ocean, primarily in the Gulf of Alaska (International Pacific Halibut Commission, 1987—The Pacific Halibut Biology, Fishery and Management). The largest fisheries occur in Alaskan waters of the Gulf of Alaska, with a smaller fishery in the Bering Sea. Halibut are harvested by longline gear only, and the fishery is conducted as an Individual Transferable Quota fishery in Alaska. The season is from March 15 through November 15 in Alaska.

Other species of flatfish harvested in the Bering Sea include several species of flounder, sole, sand dabs, plaice, and turbot. A large biomass of these species exists, but most are exploited at a low level.

Sablefish are a deeper water species harvested primarily by longline. They are long lived, and occur along the outer Continental Shelf and Slope in waters deeper than 900 meters (3,000 feet). They are managed as a directed fishery in the Bering Sea/Aleutian Islands areas. They are harvested under an Individual Transferable Quota program in all Federal waters. The rest are harvested as trawl bycatch or by pot gear. The state fishery is very limited, due to the limited deep water near shore. A harvest quota for the fishery around the Aleutian Islands is established annually. The 1996 season ran from March 15 to July 26 when the quota of 122,470 kilograms (270,000 pounds) was attained (Jackson and Urban, 1998—Westward Region Report on 1997 State Managed Pacific Cod Fishery, No. 4K96-50).

Rockfish fisheries are generally managed by species groups that have similar values, abundance, or habitat use patterns. Some species are pelagic and live in the water column, while others are demersal and inhabit the benthic zone. Among the demersal assemblages, some are shallow water species, others inhabit deeper waters.

Several species of rockfish are harvested in state waters. They are grouped according to their habitat preferences. The most abundant species harvested in state waters is the black rockfish (*Sebastes melanops*), which is part of the assemblage of midwater schooling fishes. This fishery started in the early 1990s with small vessels fishing with jig gear. Effort has increased and expanded from a few areas around Kodiak to a larger area westward along the Alaska Peninsula (Jackson and Urban, 1998—Westward Region Report on 1997 State Managed Pacific Cod Fishery, No. 4K96-50). The season for pelagic shelf rockfish in state waters is open year round.

Pacific ocean perch and related demersal species inhabit the outer Continental Shelf and Slope. They are long-lived species that may live up to 90 years (Witherell, 1996—Groundfish of the Bering Sea and Aleutian Islands Area). The fishery is conducted by trawling vessels.

There is a complex of other species managed as an assemblage that includes at least 30 species of *Sebastes* (DiCosimo, 1998—Groundfish of the Gulf of Alaska). Little is known about the biology of this group. A fairly small percentage of the available harvestable biomass is taken each year. In the Bering Sea/Aleutian Islands, this group includes *Sebastolobus* and *Sebastes* rockfish not included with the Pacific ocean perch complex.

The Atka mackerel fisheries occur in both the Gulf of Alaska and the Bering Sea/Aleutian Islands management areas. The fishery is conducted primarily by larger factory trawlers (Witherell, 1996—Groundfish of the Bering Sea and Aleutian Islands Area). Due to low stock abundance in the Gulf of Alaska, Atka mackerel was a bycatch only fishery in 1997 (DiCosimo, 1998—Groundfish of the Gulf of Alaska).

The other species category in the Bering Sea/Aleutian Islands management area includes species that have minimal economic value such as skates, sculpins, smelts, sharks, and octopus. These fishes are taken as bycatch in other fisheries. Most are discarded, although some skate are marketed and some species are processed into fishmeal (Witherell, 1996—Groundfish of the Bering Sea and Aleutian Island Area).

3.4.1.6.4 Terrestrial Habitats

The description of affected environments for terrestrial biota differ slightly from the marine species. Divisions for the terrestrial habitats are made into regions as closely aligned with the oceanic masses they contact. Whittier and Seward are grouped together as similar habitats. Kodiak Island and the Alaska Peninsula front the Gulf of Alaska, and the Aleutian Chain divides the Bering Sea from the Gulf of Alaska.

Prince William Sound/Seward

Vegetation. The onshore sites at Whittier and Seward are both highly modified by human activities and contain little vegetation.

Anadromous Fishes. Anadromous fish species known to migrate in streams near Whittier and Seward include six species of Pacific salmon: king (*Oncorhynchus tschawytscha*), silver (*O. kisutch*), chum (*O. keta*), red (*O. nerka*), pink (*O. gorbuscha*), and steelhead (*O. mykiss*) (previously rainbow trout). Whittier Creek, a pink salmon migration waterway, discharges into Passage Canal next to the boat harbor. Additionally, the Alaska Department of Fish and Game has been releasing silver salmon smolts into Whittier Creek since 1978.

The area surrounding Seward contains a vast number of waterways important for anadromous fish, including Salmon Creek, Resurrection River, and numerous unnamed creeks and streams. Over a dozen of these streams and creeks discharge into Resurrection Bay within 3.2

kilometers (2 miles) of Seward. These streams provide salmon spawning, rearing, and migration habitat for all six species.

Terrestrial Wildlife. The areas surrounding Whittier and Seward are among the richest in Alaska for abundance and variety of wildlife. Terrestrial mammals found in the Seward area include black bear, brown/grizzly bear (*Ursus arctos horribilis*), moose, Dall sheep (*Ovis dalli*), mountain goat (*Oreamnos americanus*), Sitka black-tailed deer (*Odocoileus hemionus*), wolf, coyote, lynx, red fox, marten, wolverine, mink, weasel (*Mustela erminea* and *M. rixosa*), marmot (*Marmota caligata*), porcupine, beaver, land otter (*Lutra canadensis*), muskrat, snowshoe hare (*Lepus americanus*), red squirrel, ground squirrel (*Spermophilus parryii*), mice and voles (*Microtus spp.*), pika (*Ochotona collaris*), and lemmings (*Lemmus sibiricus*) (Alaska Department of Fish and Game, 1989—Wildlife Note Book Series; Jarrell and MacDonald, 1989—Checklist of the Mammals of Alaska; Exxon Valdez Oil Spill Council, 1994—Final EIS—Proposed IMS Infrastructure Improvements Project). However, few of these species live in the specific area of the proposed project, due to its urban setting.

Whittier is in a major migratory flyway for ducks traveling between Cook Inlet and Prince William Sound (City of Whittier, 1989—Whittier Coastal Management Plan). Twelve common species of ducks, one goose species, and two swan species are found in the Whittier/Portage Pass area (U.S. Fish and Wildlife Service, 1977—Portage Flats Environmental Analysis Report). The coves and bays of Passage Canal are an important area for migration, nesting, rearing, and wintering for sea ducks (Alaska Department of Transportation and Public Facilities, 1995—Whittier Access Project Revised Draft EIS; City of Whittier, 1989—Whittier Coastal Management Plan). Ptarmigan, grouse, bald eagles, swans, songbirds, and possibly peregrine falcons are also found in the area (U.S. Fish and Wildlife Service, 1977—Portage Flats Environmental Analysis Report).

Seward provides wintering habitat for birds and waterfowl including ducks, scoters, and mergansers. The Steller's eider winters in small numbers in Resurrection Bay. Bald eagles are the most abundant raptor species present in Seward. As many as 70 eagles winter in the vicinity, although only a few actually nest there (Exxon Valdez Oil Spill Trustee Council, 1994—Final EIS, Proposed IMS Infrastructure Improvement Project).

Kodiak Island

Vegetation. The onshore area of the proposed landing site at Monashka Bay is a wet low elevation area that may be classified as a wetland.

Anadromous Fishes. The three nearest creeks on Kodiak Island containing anadromous fish are several miles away from the landing site, and would not be affected by the project.

Terrestrial Wildlife. Six species of land mammals occur naturally on Kodiak Island. They include one large mammal, the brown/grizzly bear, three furbearers, and two small mammals. These species are common throughout Kodiak Island in suitable habitats. Several large terrestrial mammal species, such as cattle, elk, and deer have been introduced to Kodiak Island, but few if any would be encountered by project activities (U.S. Fish and Wildlife Service, 1985—Kodiak National Wildlife Refuge, Draft Comprehensive Conservation Plan).

The approximately 1,287 kilometers (800 miles) of coastline, plus a variety of interior areas, provide abundant habitat for a large variety of birds on Kodiak. Over 80 species of birds nest on Kodiak Island, and it is a wintering area for over 1.5 million pelagic seabirds and sea ducks (U.S. Fish and Wildlife Service, 1985—Kodiak National Wildlife Refuge, Draft Comprehensive Conservation Plan). Shorebird species nesting on Kodiak include plovers, yellowlegs, sandpipers, dowitchers, and phalaropes. (U.S. Fish and Wildlife Service, 1985—Kodiak National Wildlife Refuge, Draft Comprehensive Conservation Plan).

Thirteen raptor species occur on Kodiak Island. The bald eagle is the most abundant, with fewer numbers of hawks and owls (U.S. Fish and Wildlife Service, 1985—Kodiak National Wildlife Refuge, Draft Comprehensive Conservation Plan).

Forty-three songbirds have been identified on Kodiak Island. They include ravens, magpies, crows, and many smaller species (U.S. Fish and Wildlife Service, 1985—Kodiak National Wildlife Refuge, Draft Comprehensive Conservation Plan).

Aleutian Islands

Vegetation. The vegetation of the Aleutian Islands is classed as a terrestrial-maritime tundra ecosystem (U.S. Fish and Wildlife Service; 1994—EA for the Removal of Introduced Caribou from Adak Island, Alaska). The vegetation in the Aleutians is characterized as heath, dominated by *Empetrum nigrum*. The chain is essentially treeless except for a few introduced spruce trees.

Three vegetative zones were described for Umnak Island during an intensive forage survey conducted by the Alaska Agricultural Experiment Station and Extension Service (1956). The Seashore and Low Plateau Zone varies in width from a few feet of shore to several miles wide. Sedge marshes frequently occur behind the shoreline, with grass extending inland. The Low Hills and Upland Plateau Zone mainly consists

of grass prairie and pumice rock ridges. The final zone described is the Alpine Zone of Ridges and Upland Meadows. The proposed terrestrial cable route and landing sites are primarily in the Seashore and Low Plateau Zone, and the Low Hills and Upland Plateau Zone. Lowland tundra, which is generally a "wet meadow" with sedges, lichens, grass, and subshrubs, would be crossed in both of these zones (Batten and Murray, 1982—A Literature Survey of the Wetland Vegetation of Alaska).

Anadromous Fishes. Anadromous fish species known to spawn in streams of the Aleutians include red, pink, and silver salmon, and Dolly Varden char (Alaska Department of Fish and Game, 1985—Alaska Habitat Management Guide, Southwest Region; 1996—An Atlas to the Catalog of Waters Important for Spawning, Rearing, or Migration of Anadromous Fishes).

Red, pink, and silver salmon use the streams of Adak for reproduction. There are several red and pink salmon streams scattered around the island. Silver salmon are found in NavFac Creek (west of Zeto Point) and have been reported to occur in several additional streams. (Alaska Department of Fish and Game, 1985—Alaska Habitat Management Guide, Southwest Region)

On Umnak Island, small numbers of red salmon were located in Nikolski Bay and Sandy Beach. Most of the pink salmon streams were located in the southern half of the island. Silver salmon were found in streams of Nikolski Bay, Sandy Beach, and other streams. (Alaska Department of Fish and Game, 1985—Alaska Habitat Management Guide, Southwest Region)

A large commercial red salmon run occurs at Kashega Lakes on Unalaska Island. Numerous pink salmon streams are found on Unalaska. The major runs of the island are in Unalaska Bay, which is the only area that produces many pink salmon during odd-numbered years. A few chum and silver salmon were observed in a variety of locations on Unalaska Island. (Alaska Department of Fish and Game, 1985—Alaska Habitat Management Guide, Southwest Region)

Terrestrial Wildlife. Almost all terrestrial mammals of the Aleutian Chain, west of Unimak Island, have been introduced by man. Only the fox is thought to be indigenous, and then only to the Fox Islands (easternmost group of the Aleutians) (U.S. Bureau of Sport Fisheries and Wildlife, 1974—Draft Environmental Statement, Proposed Aleutian Islands Wilderness).

The USFWS conducted a survey in August 1993 of the caribou introduced to Adak in the late 1950s and found the population to be between 650 and 700.

Farmers introduced domestic cattle to seven of the Aleutian Islands, beginning in the 1890s. However, herds of feral cattle presently roam freely on only four islands, including Umnak and Unalaska (U.S. Fish and Wildlife Service, 1988—Alaska Maritime National Wildlife Refuge, Final Comprehensive Conservation Plan). Sheep were introduced to Umnak and Unalaska Islands. Ranches have been reported to carry over 12,000 sheep at various times; however numbers are much lower now (Soil Conservation Service, 1978—Soils and Range Sites of the Umnak-Unalaska Area; University of Alaska, 1956—Forage Plants, Soils, and General Grazing Conditions on Umnak, Kodiak and Other Areas in Southern Alaska).

Foxes are considered an introduced species in most of the Aleutian Islands. However, red foxes are native to the Fox Island Group of the Aleutians (easternmost group including Umnak and Unalaska) (U.S. Bureau of Sport Fisheries and Wildlife, 1973—Preliminary Draft Aleutian Islands National Wildlife Refuge Wilderness Study Report). Damage to native bird populations has prompted a plan for fox management to allow native bird species to return and/or recover. (U.S. Fish and Wildlife Service, 1988—Alaska Maritime National Wildlife Refuge, Final Comprehensive Conservation Plan)

Several introduced species of small mammals are found on islands in the chain. Fox farmers introduced several of these to islands where there were no rodents to increase the available food supply for the fox (U.S. Fish and Wildlife Service, 1988—Alaska Maritime National Wildlife Refuge, Final Comprehensive Conservation Plan; U.S. Bureau of Sport Fisheries and Wildlife, 1974—Draft Environmental Statement, Proposed Aleutian Islands Wilderness). The others were accidental introductions.

Many groups of birds are found on the Aleutian Islands, but in contrast with seabirds, only a few species breed on the islands. However, during the fall and spring migration, the Aleutians host an extraordinary diversity of birds from both America and Asia, due to their proximity to both continents. (U.S. Fish and Wildlife Service, 1988—Alaska Maritime National Wildlife Refuge, Final Comprehensive Conservation Plan)

The lowland lakes, streams, and adjacent marine waters of the Aleutians support up to 250,000 nesting and feeding waterfowl. The Aleutians also represent the major breeding grounds of the threatened Aleutian Canada goose. Steller's eiders and ducks are common year-round residents. Harlequin ducks are found throughout the year in the Aleutians, but are most common in winter and spring. They are not known to breed on the Aleutian Chain. (U.S. Fish and Wildlife Service, 1988—Alaska Maritime National Wildlife Refuge, Final Comprehensive Conservation Plan)

Wintering waterfowl populations in the Aleutians include several species of sea ducks (U.S. Fish and Wildlife Service, 1988—Alaska Maritime National Wildlife Refuge, Final Comprehensive Conservation Plan). Many goose species are generally distributed in wet lowland areas throughout the Alaska Peninsula and Aleutian Chain. Nearly the entire world population of emperor geese winter along Aleutian shorelines from December to April (U.S. Bureau of Sport Fisheries and Wildlife, 1974—Draft Environmental Statement, Proposed Aleutian Islands Wilderness; U.S. Fish and Wildlife Service, 1988—Alaska Maritime National Wildlife Refuge, Final Comprehensive Conservation Plan). Loons and grebes occur throughout the Aleutians. Sandhill cranes are migratory visitors. (U.S. Fish and Wildlife Service, 1988—Alaska Maritime National Wildlife Refuge, Final Comprehensive Conservation Plan)

Each spring, thousands of migrating shorebirds from Asia and the western hemisphere frequent the Aleutian Islands. Beach and mudflat habitats for migrating shorebirds are widely scattered, offering many small pieces of habitat, which host an unusually large number of species, and which are critical for a few. (U.S. Fish and Wildlife Service, 1988—Alaska Maritime National Wildlife Refuge, Final Comprehensive Conservation Plan)

Peregrine falcons are the most widely distributed raptor throughout the entire Aleutian Chain. Breeding peregrines are cliff-nesters that typically feed on medium-sized seabirds (U.S. Fish and Wildlife Service, 1988—Alaska Maritime National Wildlife Refuge, Final Comprehensive Conservation Plan). Bald eagles are the next most widespread raptor. Eagles nest on bushes or on the ground in the Aleutians from Buldir Island east, with high numbers nesting on Adak and Umnak (U.S. Bureau of Sport Fisheries and Wildlife, 1974—Draft Environmental Statement, Proposed Aleutian Islands Wilderness; U.S. Fish and Wildlife Service, 1988—Alaska Maritime National Wildlife Refuge; Final Comprehensive Conservation Plan, 1994—EA for the Removal of Introduced Caribou from Adak Island, Alaska). Other raptors nesting in the Aleutians include several species of eagles, falcons, hawks, and owls (U.S. Bureau of Sport Fisheries and Wildlife, 1974—Draft Environmental Statement, Proposed Aleutian Islands Wilderness; U.S. Fish and Wildlife Service, 1988—Alaska Maritime National Wildlife Refuge, Final Comprehensive Conservation Plan).

The most common terrestrial bird that nests throughout the Aleutian Chain is the Lapland longspur. Buntings, sparrows, finches, wrens, and ravens are also common (U.S. Bureau of Sport Fisheries and Wildlife, 1974—Draft Environmental Statement, Proposed Aleutian Islands Wilderness).

Shemya Island's Significance for Migrating Birds. Shemya Island and the other Near Islands in the Western Aleutians support a diversity of birds not seen on the other Aleutian Islands further to the east. The Western Aleutians appear especially important for migrating songbirds, which

require landfall during storms, and even in calm weather. At Shemya, protected bays on the north shore, along with dense tall grassy meadows, provide refuge for the migrants, especially during intense storms.

3.4.1.6.5 Marine Mammals

The Federal Marine Mammal Protection Act of 1972 protects all marine mammals in U.S. waters, and some marine mammals are listed under the U.S. Endangered Species Act of 1973. Table 3.4-2 lists the marine mammals that might be encountered near the Aleutian Islands and in the western Gulf of Alaska. Whales migrate into the Gulf of Alaska, Prince William Sound, and the Bering Sea to feed during the summer. Most of the whales, however, are commonly found offshore along the Continental Shelf in areas of high marine productivity. Most of the pinniped species and sea otters are found from Prince William Sound through the Aleutian Islands.

Table 3.4-2: Marine Mammals Potentially Occurring in the Project Area

Scientific Name	Species	Status
Balaena glacialis	Northern Right Whale	Endangered
Balaenoptera acutorostrata	Minke Whale	Not Listed
Balaenoptera borealis	Sei Whale	Endangered
Balaenoptera musculus	Blue Whale	Endangered
Balaenoptera physalus	Fin Whale	Endangered
Berardius bairdii	Baird's Beaked Whale	Not Listed
Callorhinus ursinus	Northern Fur Seal	Depleted
Delphinapterus leucas	Beluga Whale	Not Listed
Enhydra lutris	Sea Otter	Not Listed
Eschrichtius robustus	Gray Whale	Not Listed
Eumetopias jubatas	Steller Sea Lion	Endangered
Lagenorhynchus obliquidens	Pacific White-Sided Dolphin	Not Listed
Megaptera novaeangliae	Humpback Whale	Endangered
Mesoplodon stejnegeri	Stejneger's Beaked Whale	Not Listed
Odobenus rosmarus	Walrus	Not Listed
Orcinus orca	Killer Whale	Not Listed
Phoca vitulina richardii	Harbor Seal	Not Listed
Phocoena phocoena	Harbor Porpoise	Not Listed
Phocoenoides dalli	Dall's Porpoise	Not Listed
Physeter macrocephalus	Sperm Whale	Endangered
Ziphius cavirostrius	Cuvier's Beaked Whale	Not Listed

Affected Species. Any of the marine mammals listed in table 3.4-2 might be encountered along the route of the project. The most likely marine mammal species to be encountered are the Steller sea lions, beluga whales, northern fur seals, sea otters, and harbor seals. Steller sea lions are common throughout the waters surrounding the Aleutian Islands, and they are also found in the Gulf of Alaska.

The sensitivity of Steller sea lions to human presence on or near rookeries and haulouts is variable. Adult sea lions seem to be less disturbed by human presence at rookeries during the breeding season (June), and are generally more sensitive to human presence after the breeding season (Johnson, et al., 1989—Synthesis of Information on the Effects of Noise). Typically during a significant disturbance event, non-breeding or sub-adult animals will leave the rookery or haulout first, followed by adults and females with pups.

Steller sea lion haulouts in British Columbia are located adjacent to high traffic shipping lanes. Steller sea lions are often seen around and follow vessels actively engaged in fishing or fish processing (Johnson, et al., 1989—Synthesis of Information on the Effects of Noise). They also "raft" in the major shipping lanes near British Columbia. There is no trend in the estimated abundance of Steller sea lions at rookeries and major haulouts in British Columbia (National Marine Fisheries Service, 1992—Recovery Plan for the Steller Sea Lion).

Beluga whales are found in Cook Inlet during the summer and are distributed throughout Prince William Sound and the Gulf of Alaska during the winter. Northern fur seals migrate through and forage in the waters around the Aleutian Islands and in the Gulf of Alaska. Sea otters and harbor seals inhabit the nearshore waters of the Gulf of Alaska, the Alaska Peninsula, and the Aleutian Islands; they are likely to be encountered in the nearshore areas where the fiber optic cable line makes landfall.

The marine domains of the northern Gulf of Alaska, the Bering Sea, and Prince William Sound could be impacted. Domains are defined as large marine ecosystems: they are units of the marine environment based on distinct hydrographic boundaries, bottom topography, and trophic dependencies of interacting populations.

Prince William Sound

Presently, there are no active Steller sea lion rookeries or major haulouts within Prince William Sound (National Marine Fisheries Service, 1992—Recovery Plan for the Steller Sea Lion). Steller sea lions, however, are frequently seen. During the winter, beluga whales are found within Prince William Sound, although their winter migratory pattern is largely unknown (Hill, et al., 1997—Alaska Marine Mammal Stock Assessment). Northern fur seals are unlikely to be found. The sea otter population in

Prince William Sound was estimated to be approximately 14,352 animals in 1994 (U.S. Fish and Wildlife Service, 1998—Sea Otter Program). Fin, minke, and humpback whales are regular summer migrants (Wynne, 1992—Guide to Marine Mammals of Alaska). Killer whales and Dall's and harbor porpoises inhabit Prince William Sound year round.

Gulf of Alaska

Steller sea lion rookeries are located on the following islands in the region of proposed activity in the Gulf of Alaska: Outer, Sugarloaf, Marmot, Chirikof, Chowiet, Atkins, Chernabura, Pinnacle Rock, Clubbing Rocks, Ugamak, and Ogchul (National Marine Fisheries Service, 1992—Recovery Plan for the Steller Sea Lion). Beluga whales are found during the winter in the northern Gulf of Alaska; their winter distribution, however, is largely unknown (Hill, et al., 1997—Alaska Marine Mammal Stock Assessment). In the spring, fall, and winter, northern fur seals migrate through the Gulf of Alaska (National Marine Fisheries Service, 1993—Conservation Plan for the Northern Fur Seal). In the late 1980s and early 1990s, the number of sea otters in the Gulf of Alaska (northern Gulf of Alaska, Kodiak Island, Kenai Peninsula, south Alaska Peninsula) was estimated to be approximately 42,203 animals (U.S. Fish and Wildlife Service, 1998—Sea Otter Program). During the summer, fin, blue, sei, gray, minke, and humpback whales are found regularly in the Gulf (Wynne, 1992—Guide to Marine Mammals of Alaska). Pacific white-sided dolphins, northern right, Cuvier's beaked, Stejneger's beaked, and Baird's beaked whales are found in the Gulf of Alaska (Wynne, 1992—Guide to Marine Mammals of Alaska). Killer whales and Dall's and harbor porpoises inhabit the Gulf of Alaska year round (Wynne, 1992—Guide to Marine Mammals of Alaska).

Bering Sea

Steller sea lion rookeries are located on the following islands in the Bering Sea along the proposed fiber optic cable line route: Adugak, Seguam, Agligadak, Kasatochi, Tag, Semisopochnoi, Ayugadak, and Buldir. During the winter, beluga whales from the western Alaska coastal stocks are widely distributed in the Bering Sea; their winter distribution, however, is largely unknown (Hill, et al., 1997—Alaska Marine Mammal Stock Assessments). Northern fur seals forage primarily in the Bering Sea from June through November (National Marine Fisheries Service, 1993—Conservation Plan for the Northern Fur Seal). There is a northern fur seal rookery on Bogoslof Island (National Marine Fisheries Service, 1993—Conservation Plan for the Northern Fur Seal). Northern fur seals forage along the Continental Shelf and Slope to the north of Bogoslof Island (Robson, 1996—Personal communication). The number of sea otters in the Bering Sea–Aleutian Islands (including southern Bristol Bay) is estimated at approximately 32,194 animals (U.S. Fish and Wildlife Service, 1998—Sea Otter Program). Fin, blue, sei, gray, northern right,

minke, humpback, Cuvier's beaked, and Stejneger's beaked whales are all found in the Bering Sea and waters around the Aleutian Islands (Wynne, 1992—Guide to Marine Mammals of Alaska; Hill, et al., 1997—Alaska Marine Mammal Stock Assessment). Baird's beaked whale is a winter migrant and the Pacific white-sided dolphin is a summer migrant in the Bering Sea and waters around the Aleutian Islands (Wynne, 1992—Guide to Marine Mammals of Alaska). Killer whales, Dall's porpoise, and harbor porpoises inhabit the Bering Sea year round (Wynne, 1992—Guide to Marine Mammals of Alaska).

3.4.1.6.6 Marine Birds

A detailed description of the cable route and construction techniques is given elsewhere in this document, but a brief summary of the route provides a context for the discussion of marine birds. The fiber optic cable line will be laid offshore on the Continental Shelf, the Continental Slope, or the Abyssal Plain along most of its route and will be buried where possible. The cable will come ashore at a limited number of sites to connect to various other existing communication facilities. The cable will originate at either Whittier or Seward. Landfalls could be made at Kodiak, Umnak Island at Nikolski, and finally on Shemya Island. The island crossing at Nikolski will be overland for approximately 10 kilometers (6 miles) from the Gulf of Alaska to the Bering Sea. The landings at Whittier or Seward and on Kodiak Island would utilize existing charted cable corridors. The landings on Umnak Island and Shemya would be new, and cable corridors would need to be surveyed.

Over 15 million marine birds of over 35 species or species groups are present at colonies in Alaskan waters during the summer breeding period (U.S. Fish and Wildlife Service, 1998—Beringian Seabird Colony Catalog). A very large proportion of these birds is present in Prince William Sound, the Gulf of Alaska, and the Aleutian Chain. An additional 10 million non-breeding marine birds of over a dozen additional species migrate from the southern hemisphere to feed in the rich waters of the Gulf of Alaska and the Bering Sea. The greatest abundance of marine birds occurs during the May through July breeding season when they aggregate at nesting colonies along the coast. Another major peak in marine bird abundance is during the spring (May through June) migration period of short-tailed and sooty shearwaters. The marine birds traverse the Gulf of Alaska (including Prince William Sound) and the Aleutians (mainly through Unimak Pass) to reach their feeding grounds in the Bering Sea. The return migration to nesting areas in the southern hemisphere occurs in the fall (August through September).

As described above, the proposed route of the fiber optic cable line passes through Prince William Sound, the Gulf of Alaska, and the Bering Sea. The discussion of marine bird distribution and abundance along the currently proposed cable route is broken down into these three broad geographic regions. As shown in tables 3.4-3, 3.4-4, and 3.4-5, the numbers of birds associated with marine bird colonies in the Aleutians exceeds those in Prince William Sound by a factor of 100 and those in the Gulf of Alaska by a factor of 10. A very large proportion of the millions of southern hemisphere migrants heading to and from the Bering Sea aggregate in the Unimak Pass area of the Aleutian Islands during spring and fall. It is clear that the Aleutian Islands segment of the proposed cable route supports the largest number of marine birds.

Table 3.4-3: Summary of 10 Largest Marine Bird Colonies Adjacent to Proposed Fiber Optic Cable Line Route Through Prince William Sound, Alaska

Colony Name	Location	Estimated Total Number of Birds	Total Number of Species	Most Abundant Species	Total Number of Species Likely Breeding
Barwell Island	Entrance to Resurrection Bay	21,620	7	Common Murre	7
Beehive Island	Chiswell Islands Group	15,710	7	Tufted Puffin	7
Wooded Islands	E Montague Island	14,857	13	Tufted Puffin	13
Passage Canal	Near Whittier	8,228	3	Black-legged Kittiwake	2
Matushka Island	Chiswell Islands Group	5,620	14	Rhinoceros Auklet	14
Chiswell Island	Chiswell Islands Group	5,557	11	Black-legged Kittiwake	11
Blackstone Glacier	Blackstone Bay, near Whittier	4,874	3	Black-legged Kittiwake	2
North Icy Bay	Near Chenega Island	3,758	2	Black-legged Kittiwake	2
Northland Glacier	Blackstone Bay, near Whittier	3,512	2	Black-legged Kittiwake	2
Chiswell Bay	Chiswell Islands Group	2,758	8	Tufted Puffin	8

Source: U.S. Fish and Wildlife Service, 1998—Beringian Seabird Colony Catalog.

Table 3.4-4: Summary of 10 Largest Marine Bird Colonies Adjacent to Proposed Fiber Optic Cable Line Route Through the Gulf of Alaska

Colony Name	Location	Estimated Total Number of Birds	Total Number of Species	Most Abundant Species	Total Number of Species Likely Breeding
Suklik Island	Semidi Islands	611,286	16	Horned Puffin	16
Aghiyuk Island	Semidi Islands	517,558	14	Murres	14
Amagat Island	South of Unimak Island	451,140	11	Horned Puffin	11
Chowiet Island	Semidi Islands	384,210	14	Murres	14
Castle Rock	North of Shumagin Islands	271,242	16	Tufted Puffin	15
Karpa Island	Southwest of Stepovak Bay, Alaska Pen.	247,319	8	Common Murre	8
Kateekuk Island	Semidi Islands	225,032	15	Murres	15
Aliksemit Island	Semidi Islands	206,162	15	Murres	15
Aghik Island	Semidi Islands	184,574	14	Horned Puffin	14
High Island	Sandman Reefs, South of Deer Island	135,316	12	Leach's Storm-Petrel	12

Source: U.S. Fish and Wildlife Service, 1998—Beringian Seabird Colony Catalog.

Table 3.4-5: Summary of 10 Largest Marine Bird Colonies Adjacent to Proposed Fiber Optic Cable Line Route Along the Aleutian Islands and Through the Bering Sea

Colony Name	Location	Estimated Total Number of Birds	Total Number of Species	Most Abundant Species	Total Number of Species Likely Breeding
Chagulak Island	Islands of the Four Mountains	1,695,186	18	Northern Fulmar	18
Kiska Island (Sirius Pt.)	Rat Islands	1,496,126	5	Least Auklet	5
Gareloi Island (Southeast side)	West of Tanaga Island	641,078	12	Least Auklet	4
Segula Island	Rat Islands	524,339	8	Least Auklet	8
Egg Island	East of Unalaska Island	442,716	12	Fork-tailed Storm-Petrel	9
Koniuji Island	North of Atka Island	288,007	14	Fork-tailed Storm-Petrel	14
Emerald Island	West of Unalaska Island	162,593	8	Leach's Storm-Petrel	8
Aiktak Island	Unimak Pass	146,561	15	Tufted Puffin	12
Kaligagan Island	Unimak Pass	128,078	10	Tufted Puffin	10

Source: U.S. Fish and Wildlife Service, 1998—Beringian Seabird Colony Catalog.

Prince William Sound

According to the Beringian Seabird Colony Catalogue maintained by the USFWS, there are approximately 224 known marine bird colonies in the general area of the proposed fiber optic cable line route through Prince William Sound. Although all of these colonies are not immediately adjacent to the proposed route, seabirds are known to fly long distances to areas where prey are abundant, and birds from any one of the colonies could be present along the cable route. Table 3.4-3 summarizes important information regarding the 10 largest marine bird colonies in the area of the proposed cable route through Prince William Sound. The largest colony in the vicinity of Whittier is in Passage Canal where a colony of over 8,000 glaucous-winged gulls exists (over 4,000 nests). The largest colony along the cable route outside the Whittier area is on the Wooded Islands on the east side of Montague Island. This site supports over 9,500 tufted puffins, over 2,000 black-legged kittiwakes, and over 2,000 fork-tailed storm-petrels. The largest colony in the vicinity of Seward is on Barwell Island at the mouth of Resurrection Bay, where a colony of over 17,500 common murres and over 2,800 black-legged kittiwakes exists.

Gulf of Alaska

According to the Beringian Seabird Colony Catalogue maintained by the USFWS maps 22, 25-29, 31-34, and 50, there are approximately 240 known marine bird colonies in the general area of the proposed fiber optic cable line route through the Gulf of Alaska. Although all of these colonies are not immediately adjacent to the proposed route, seabirds are known to fly long distances to areas where prey are abundant, and birds from any one of the colonies could be present along the cable route. Table 3.4-4 summarizes important information regarding the 10 largest marine bird colonies in the area of the proposed cable route through the Gulf of Alaska. The largest colony in the vicinity of where the cable comes ashore at Kodiak is on Kulichikof Island, which has a colony of about 1,700 mainly black-legged kittiwakes. The largest marine bird colony along this entire Gulf of Alaska section of the cable route is on Suklik Island, in the Semidi Island group. This site supports over 611,000 marine birds, of which over 250,000 are tufted puffins.

Aleutian Islands

According to the Beringian Seabird Colony Catalogue maintained by the USFWS maps 13-24, there are approximately 272 known marine bird colonies in the general area of the proposed fiber optic cable line route along the Aleutian Islands. Although all of these colonies are not immediately adjacent to the proposed route, seabirds are known to fly long distances to areas where prey are abundant, and birds from any one

of the colonies could be present along the cable route. Table 3.4-5 summarizes important information regarding the 10 largest marine bird colonies in the area of the proposed cable along the Aleutian Islands.

The largest colony in the immediate vicinity of where the cable would come ashore on the south side of Umnak Island in Driftwood Bay is on East Cliff at Cape Udak, which has a colony of about 2,000 tufted puffins. The largest colony in the immediate vicinity of where the cable would leave Umnak Island in Nikolski Bay is in Nikolski Bay itself, which has a colony of about 40 Aleutian terns.

The largest colony along the cable route away from the Adak and Dutch Harbor areas is on Buldir Island. This island supports over 3.5 million marine birds, of which 1.7 million are Leach's storm-petrels, 1.3 million are fork-tailed storm-petrels, and over 500,000 are crested auklets and least auklets. The largest colony in the immediate vicinity of where the fiber optic cable line would come ashore at Shemya is on the Hammerhead Islets, where a colony of nearly 2,000 glaucous-winged gulls and tufted puffins exists.

3.4.1.6.7 Endangered, Threatened, and Special Concern Species

Steller Sea Lion (*Eumetopias jubatas*)

In 1997 the western stock of Steller sea lions was listed as an endangered species under the Endangered Species Act of 1973, as amended. All Steller sea lion rookeries in the western stock are located in the general project area except those on Walrus, Attu, and Agattu Islands. The fiber optic cable line route, however, falls within the critical aquatic habitat in the vicinity of Bogoslof Island (50 CFR 227.12). The designated critical aquatic habitats are designed to protect the important foraging areas of the Steller sea lions.

Beluga Whale (*Delphinapterus leucas*)

There are five stocks of beluga whales in Alaska. Of these, four are western Bering Sea stocks and one is the Cook Inlet stock. The Cook Inlet stock is distributed throughout upper Cook Inlet in the spring and summer and is thought to be distributed in lower Cook Inlet and the northern Gulf of Alaska during the fall and winter.

The Cook Inlet beluga whale stock is presently listed as a candidate species under the Endangered Species Act. On March 3, 1999, NMFS was petitioned under the Endangered Species Act to list the Cook Inlet beluga whale stock as endangered. NMFS will issue an Endangered Species Act determination by April 2000. On October 19, 1999, NMFS proposed to designate the Cook Inlet beluga whale stock as depleted under the Marine Mammal Protection Act. The four beluga whale stocks

in the Bering Sea are neither listed under the Endangered Species Act nor being reviewed to be designated as a depleted, threatened, or endangered species.

Northern Fur Seal (*Callorhinus ursinus*)

The Eastern Pacific stock of northern fur seals is listed as a depleted species under the Marine Mammal Protection Act. The habitat for this species includes rookeries and haulouts on the Pribilof Islands and Bogoslof Island. The population on Bogoslof Island only has recently (1980) comprised breeding individuals. Each summer, female fur seals arrive (peak arrival around mid-July) on the breeding grounds on the Pribilof Islands and only recently on Bogoslof Island to give birth, breed, and nurse their pups. Fur seals from this stock migrate through the Aleutian Islands in the spring (May through June) and fall (November through December) to winter in the North Pacific Ocean. However, some fur seals (primarily adult males) may stay in the Bering Sea throughout the winter (National Marine Fisheries Service, 1993—Conservation Plan for the Northern Fur Seal).

Endangered Whales

The endangered bowhead whale (*Balaena mysticetus*), blue whale (*Balaenoptera musculus*), Sei whale (*Balaenoptera borealis*), fin whale (*Balaenoptera physalus*), northern right whale (*Balaena glacialis*), humpback whale (*Megaptera novaeangliae*), and sperm whale (*Physeter macrocephalus*) are present in the general project area at some times of the year (generally in the summer). All of these species range widely in the North Pacific Ocean. They transit through the passes in the Aleutian Islands, and may forage in the highly productive offshore areas.

Short-tailed Albatross (*Phoebastria albutrus*)

The short-tailed albatross is currently listed as endangered by Alaska and Federally endangered only on the high seas and in Japan and Russia. This species has been proposed for listing for the near shore, 5 kilometers (3 miles), to correct an administrative oversight (Augustine, 2000—Personal communication with 611 CES/CEVP regarding natural resources on Eareckson AS). Feather hunters killed an estimated 5 million short-tailed albatrosses during the late 1800s and early 1900s, and volcanic eruptions in the 1930s destroyed potential nesting habitat. The short-tailed albatross is a large (2-meter [7-foot] wingspan) pelagic seabird that breeds mainly on Torishima (500 individuals) in the Izu Islands group in Japan. Other small colonies occur at Minami-kojima (75 individuals), Japan, and at Midway Atoll (1 to 3 individuals) near the Hawaiian Islands. Although this species does not breed in Alaska, its distribution at sea includes the Gulf of Alaska and Bering Sea. Sightings in Alaskan waters have become

more common in recent years as the population has increased from about 50 in the late 1940s to approximately 1,000 in 1999, and several sitings near Kodiak Island have been documented (U.S. Fish and Wildlife Service, 1998—Kodiak National Wildlife Refuge and Kodiak Island Archipelago—Birds). Population increases are largely due to habitat protection and restoration and protection from hunting (Cochrane, 1998—Short-tailed Albatross).

Current threats to this species include accidental mortality associated with the high seas long-line and drift-net fisheries (United Nations, 1998—Food and Agriculture Organization-Committee on Fisheries) and the potential for another volcanic eruption on Torishima to destroy nesting habitat (Cochrane, 1998—Short-tailed Albatross).

Aleutian Canada Goose (*Branta canadensis leucopareia*)

The Aleutian Canada goose is currently listed as a Species of Special Concern by the State of Alaska and is currently (since 1990) considered threatened by the U.S. Government (Alaska Department of Fish and Game, 1998—Species of Special Concern; U.S. Fish and Wildlife Service, 1998—Endangered and Threatened Wildlife) and is in the final steps of being delisted, which is expected by the end of July (Boone, 2000—Personal communication with the USFWS regarding the Aleutian Canada goose). If survey data after delisting indicate a reversal in recovery, the Aleutian Canada goose could be emergency listed at any time. Aleutian Canada geese declined in the early part of the twentieth century as a result of the introduction of arctic foxes for fur farming to most of their nesting islands in the Aleutian Islands and the Commander and Kuril Islands in the North Pacific. It was listed as endangered by the U.S. Government in 1967.

The Aleutian Canada goose is one of several small subspecies of Canada goose found in Alaska. It is distinguished by small size, an obvious ring of white feathers around the neck, and a short bill and abrupt forehead. Since the initiation of the recovery program in the mid-1970s, the population has rebounded from about 800 geese nesting on only 3 islands where foxes were not introduced, to over 20,000 geese on the original 3 islands and on several additional islands where foxes were exterminated. In addition, sport hunting for all Canada geese was curtailed in areas in California and Oregon where this subspecies was known to overwinter and to stage during migration. Aleutian Canada geese apparently make a 3,220-kilometer (2,000-mile) migration across the Gulf of Alaska during spring and fall migration, and they may spend considerable time roosting on the ocean. Large numbers feed on Shemya Island during mid April to mid June at the conclusion of spring migration and during mid August to mid October at the beginning of fall migration (Augustine, 2000—Personal communication with 611 CES/CEVP

regarding natural resources at Eareckson AS). Aleutian Canada geese currently nest on the Semidi Islands in the Gulf of Alaska and on several other islands in the Aleutian Chain, including Buldir Island, Agattu Island, Alaid/Nizki Islands, Chagulak Island, and the Rat Islands (U.S. Fish and Wildlife Service, 1998—Status of Aleutian Canada Geese).

Spectacled Eider (*Somateria fischeri*)

The spectacled eider is currently listed as a Species of Special Concern by the State of Alaska and as threatened by the U.S. Government (Alaska Department of Fish and Game, 1998—Species of Special Concern; U.S. Fish and Wildlife Service, 1998—Endangered and Threatened Wildlife). The breeding population in Alaska has declined markedly since the 1960s. Where an estimated 47,700 to 70,000 pairs of spectacled eiders had nested in the Yukon-Kuskokwim Delta in the early 1970s, the nesting population had declined to about 1,700 to 3,000 pairs by 1990-1992 (U.S. Fish and Wildlife Service, 1993—Final Rule to List Spectacled Eider as Threatened). Similar declines have been noted on the north slope of Alaska. The cause(s) of the decline of this species are unknown but may include reduced food supplies, pollution, overharvest, increased predation, lead poisoning, and other causes (U.S. Fish and Wildlife Service, 1993—Final Rule to List Spectacled Eider as Threatened). They were listed in the United States as a threatened species in 1993.

Spectacled eiders are large diving ducks that nest in wetland complexes near ponds in Arctic Alaska and Russia and in the Yukon–Kuskokwim Delta in Alaska. They feed on marine and freshwater molluscs, crustaceans, and plant material. They build their nests on shorelines, islands, and meadows in wet coastal arctic and subarctic tundra, usually within 15 kilometers (9.3 miles) of the coast (Dau and Kistchinski, 1977—Seasonal Movements and Distribution of the Spectacled Eider). Most of the world population overwinters in the northern Bering Sea south of St. Lawrence Island. The birds molt and stage at a number of locations, including areas in the Bering, Beaufort, and Chukchi Seas. Staging also occurs in waters off eastern St. Lawrence Island and just off the island's southern shore. In the waters around Kodiak Island, individual spectacled eiders have been reported in spring and winter, but they are considered rare or accidental in this area (U.S. Fish and Wildlife Service, 1998—Kodiak National Wildlife Refuge and Kodiak Island Archipelago—Birds).

Steller's Eider (*Polysticta stelleri*)

The Steller's eider is currently listed as a Species of Special Concern by the State of Alaska and the Northern American breeding population as threatened by the U.S. Government (Alaska Department of Fish and Game, 1998—Species of Special Concern; U.S. Fish and Wildlife Service,

1998—Endangered and Threatened Wildlife). The cause(s) of the decline of this species are unknown, but the current world population (150,000 to 200,000 birds) is thought to have declined by up to 50 percent during the 20-year period between the 1960s and the 1980s. They were listed in the United States as a threatened species in 1997. The breeding population in Alaska may be fewer than 1,000 birds (Alaska Department of Fish and Game, 1998—Species of Special Concern). Little is known about this species, but studies are in-progress to determine the causes of the decline.

Steller's eiders are diving ducks that feed on marine invertebrates during winter and on freshwater invertebrates during the breeding season in spring and summer. Their breeding range currently includes the Arctic Coastal Plain of northwest Alaska and northern coastal areas of Russia. Most of the world population overwinters throughout the Alaska Peninsula and in the eastern Aleutian Islands. In the waters around Kodiak Island, Steller's eiders are commonly seen in spring and winter, are uncommon in fall, and are rare in summer (U.S. Fish and Wildlife Service, 1998—Kodiak National Wildlife Refuge and Kodiak Island Archipelago—Birds).

3.4.2 NORTH DAKOTA INSTALLATIONS

The following sections describe biological resources for the NMD alternatives in North Dakota and their surrounding areas when applicable. Cavalier AFS, Grand Forks AFB, the Missile Site Radar and Remote Sprint Launch Sites (facilities of the SRMSC), and areas between some of these facilities, for fiber optic cable lines, are alternative locations for the NMD program.

Northeastern and north central North Dakota lie within the Northern Great Plains. The area's natural vegetation consisted of northern mixed prairie containing tall grass, mid-grass, and short grass species. Extensive cultivation has resulted in only remnants of natural prairie remaining today. Prairie potholes in the region provide important habitat for migrating birds. (Minot AFB, 1995—Integrated Natural Resources Management Plan)

3.4.2.1 Cavalier AFS—Biological Resources

Cavalier AFS is located in west central Pembina County, North Dakota. The ROI for biological resources includes Cavalier AFS property (approximately 4 hectares [10 acres]) that could be affected by the construction of an XBR, as well as surrounding areas that could potentially be affected by the deployment or operation of this component. A site visit to the project area was conducted in June 1998.

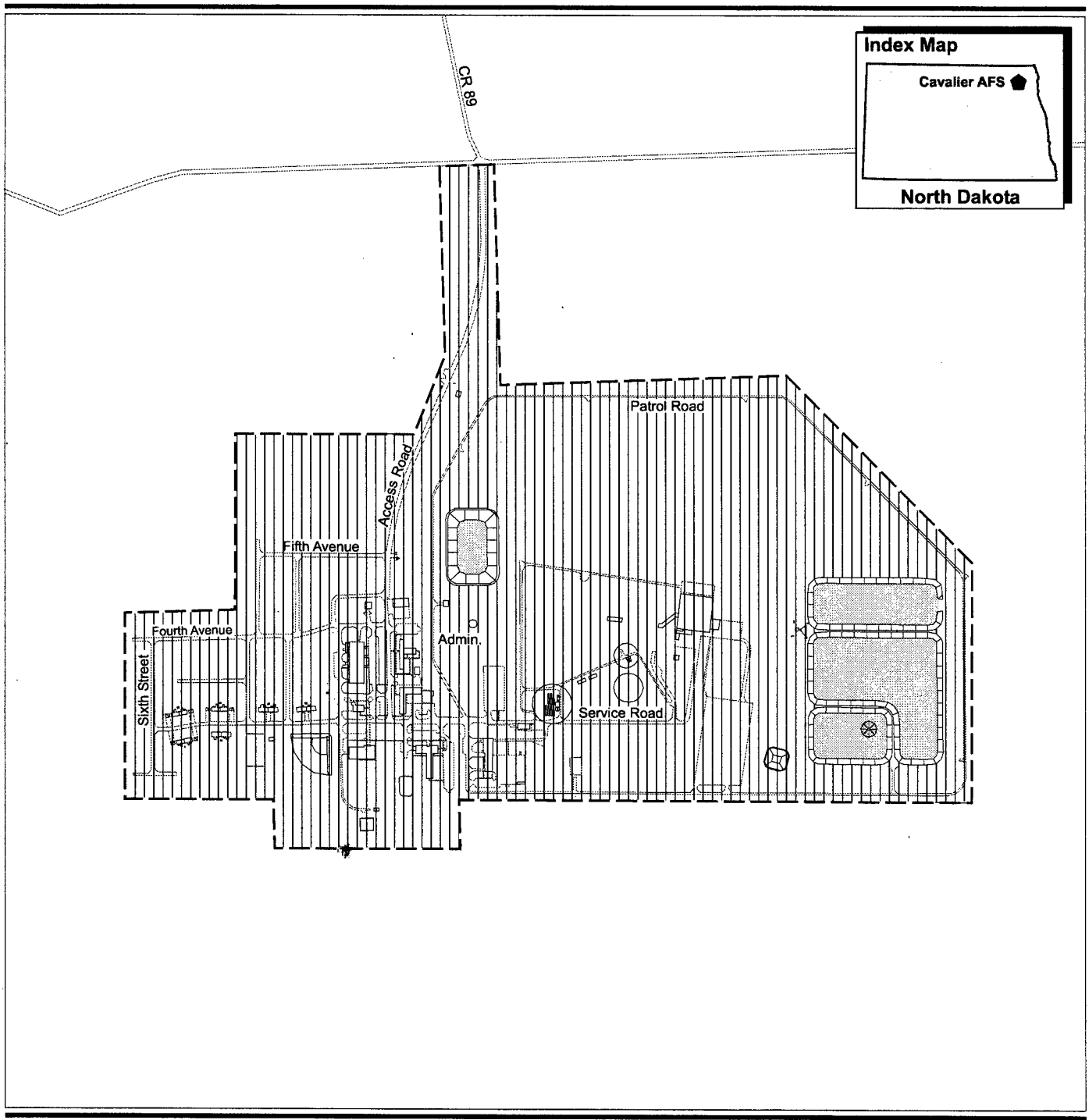
Vegetation

Cavalier AFS lies within the rolling western region of the Red River Valley in a vegetational transition area. A recent biological survey (Cavalier AS, 1996—Biological Survey) describes the vegetation of the Gunlogson Nature Preserve, approximately 16 kilometers (10 miles) from the station, as a composite of eastern deciduous woodlands, boreal forests, and mid-continental grasslands. Wooded areas of the Nature Preserve are characterized by mixed hardwood dominated by bur oak (*Quercus macrocarpa*), basswood (*Tilia americana*), and elm (*Ulmus americana*). The understory is primarily hazel (*Corylus cornuta* and *C. americana*) with juneberry (*Amelanchier alnifolia*) and chokecherry (*Prunus virginiana*). Grasslands near the station have been described as high prairie with dominant grasses such as needle and thread (*Stipa comata*), porcupine grass (*S. spartea*), little bluestem (*Andropogon scoparius*), Junegrass (*Koeleria pyramida*), and prairie sandreed (*Calamovilfa longifolia*). (Cavalier AS, 1996—Biological Survey; National Park Service, 1998—Grasses of the Mixed Prairie)

The site is landscaped with non-native trees and shrubs and is regularly mowed, particularly in the areas immediately surrounding the buildings (figure 3.4-11). There is evidence that the area was cultivated before the construction of Cavalier AFS and reseeded with non-native grasses. The dominant species are smooth brome (*Bromus inermis*) and Kentucky bluegrass *(Poa pratense*) (appendix F, table F-12). The remainder of the vegetation within the ROI consists of a variety of scattered weedy species, approximately half of which are non-native. (Cavalier AS, 1996—Biological Survey)

Wildlife

The lack of habitat for wildlife nesting and foraging at Cavalier AFS results in a relatively low diversity in species observed. The great blue heron (*Ardea herodias*), horned lark (*Eremophila alpestris*), and eastern mourning dove (*Zenaida macroura*) are examples of bird species observed in recent surveys at the site. Moose, deer mice (*Peromyscus maniculatus*), and Richardson ground squirrel (*Spermophilus richardsonii*) are some of the mammals that have been observed. No reptiles were observed during the recent 2-year biological survey performed for Cavalier AFS. One amphibian, a northern leopard frog (*Rana pipens*) was seen in the drainage ditch near the northern boundary fence. Appendix F, table F-13, lists the species sighted during the recent survey of the site (Cavalier AS, 1996—Biological Survey)



EXPLANATION

— — Installation Boundary

Human Influenced Upland Grassland/Maintained

Standing Water

CR = County Road

Scale 1:11,000

0 459 917 Feet

0 140 280 Meters

NORTH

br_cas_001

Vegetation, Cavalier Air Force Station

North Dakota

Figure 3.4-11

Threatened and Endangered Species

No species listed as threatened or endangered either by the state or the USFWS have been identified at Cavalier AFS; however, species such as the bald eagle (recommended for delisting), whooping crane, and recently delisted peregrine falcon may fly over the site during migration (Cavalier AS, 1996—Biological Survey).

Sensitive Habitats

There are no wetlands or other sensitive habitat on Cavalier AFS (Cavalier AS, 1996—Biological Survey).

3.4.2.2 Grand Forks AFB—Biological Resources

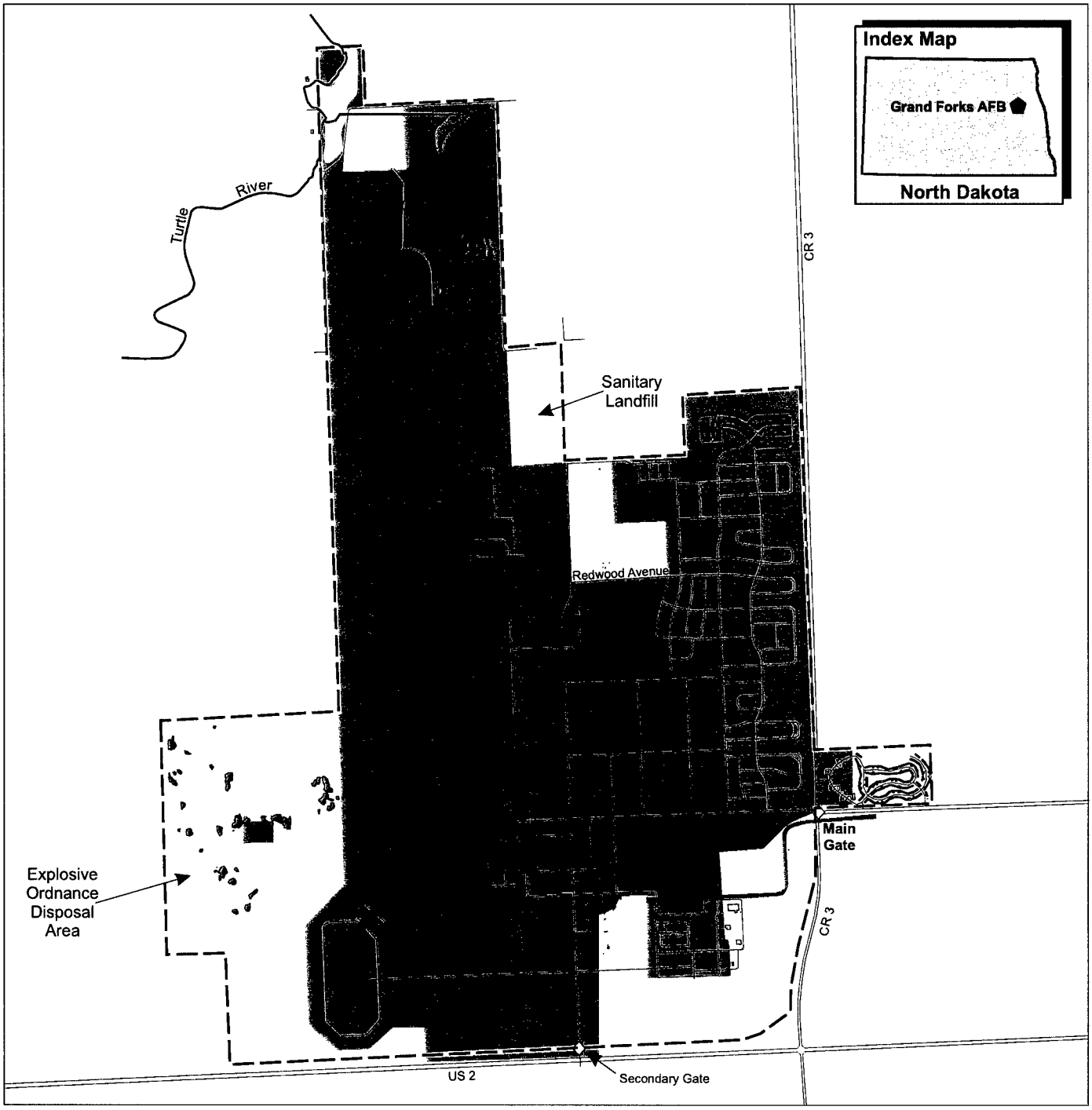
Grand Forks AFB is located in Grand Forks County, North Dakota. The ROI for biological resources includes the base and adjacent properties that could be affected by the construction and deployment or operation of a GBI or BMC2 at Grand Forks AFB. The ROI also includes the area encompassed by the installation of the utility corridor. A site visit to the project area was conducted in June 1998.

Vegetation

The land surrounding Grand Forks AFB is predominantly agricultural, with small grain crops and sunflowers. An area west of the base is maintained as a wildlife research area. A natural area of lowland prairie and marshes that is part of the Kelly's Slough National Wildlife Refuge is located to the east and northeast of the base. (Grand Forks AFB, 1994—Biological Survey)

Grand Forks AFB is located within the bluestem prairie region, an area dominated by tallgrass and mixed grass prairie communities. Bluestem prairies are dominated by big bluestem (*Andropogon gerardii*), wand panic grass (*Panicum virgatum*), and yellow Indian grass (*Sorghastrum nutans*). Fire suppression has encouraged the invasion of shrubs and trees into the remaining prairie remnants. There are no known prairie remnants on Grand Forks AFB (figure 3.4-12). Some prairie index species, however, are found in unimproved and semi-improved areas on base. (U.S. Department of the Air Force, 1997—Integrated Natural Resources Management Plan)

Two introduced grass species, smooth bromegrass and Kentucky bluegrass, are predominant throughout the base. Hay and alfalfa are actively cultivated on base. Grass within semi-improved areas is maintained at a height of 18 to 36 centimeters (7 to 14 inches). (U.S. Department of the Air Force, 1997—Integrated Natural Resources Management Plan)



EXPLANATION

- Roads
- Water Area
- Installation Boundary
- Gate

CR = County Road

- Seeded Grassland
- Wet Meadow (seeded)
- Alfalfa Field
- Wetlands
- Naturalized Grassland
- Oak Woodland

Scale 1:40,000

0 1,667 3,333 Feet

NORTH

0 508 1,016 Meters

br_gfafb_001_color

Vegetation and Wetlands, Grand Forks Air Force Base

- North Dakota

Figure 3.4-12

Ten natural vegetative communities have been identified in Grand Forks County, but only one, the Lowland Woodland community, has been identified as occurring on Grand Forks AFB. Dominant trees include elm (*Ulmus americana*), cottonwood (*Populus deltoides*), and green ash (*Fraxinus pennsylvanica*). Chokecherry and woodrose (*Rosa woodsii*) are common understory plants. Bur oak, green ash, and basswood are common trees in upland areas on base. Meadow anemone (*Anemone canadensis*), downy yellow violet (*Viola pubescens*), and burdock (*Arctium minus*) are common forbs in the upland areas. Appendix F, table F-14, lists vegetation observed on Grand Forks AFB. (U.S. Department of the Air Force, 1997—Integrated Natural Resources Management Plan)

Wildlife

Terrestrial and aquatic habitats are very limited on base due to extensive development. White-tailed deer (*Odocoeilus virginianus*), eastern cottontail (*Sylvilagus floridanus*), white-tailed jackrabbits (*Lepus townsendi*), and Richardson's ground squirrel are common mammals on the base. Cliff swallows and sea gulls (*Larus* spp.) are the most frequent birds involved in low altitude bird strikes on and near the Grand Forks AFB airfield. Canada geese (*Branta canadensis*) and ducks are attracted to small prairie potholes and open water wetlands such as Kellys Slough in the vicinity of the base. Appendix F, table F-15, lists wildlife common to Grand Forks AFB. (U.S. Department of the Air Force, 1997—Integrated Natural Resources Management Plan; U.S. Department of the Air Force, 1999—Final EIS, Minuteman III Missile System Dismantlement)

Threatened and Endangered Species

An inventory of protected and rare plants, completed in 1994, did not identify any rare plants on Grand Forks AFB. Threatened, endangered, and special interest species that have the potential to be located on base are listed in table 3.4-6. Protected birds may migrate through the area. (Grand Forks AFB, 1994—Biological Survey; U.S. Department of the Air Force, 1999—Final EIS, Minuteman III Missile System Dismantlement)

Sensitive Habitats. Kelly's Slough Wildlife Management Area is located approximately 3 kilometers (2 miles) east of the base. This 656-hectare (1,620-acre) wetland area, managed by the USFWS, is a stopover for migratory waterfowl. Wetlands occur in drainageways, low-lying areas, and potholes. Approximately 10 hectares (24 acres) of wetlands were recently identified within the boundary of Grand Forks AFB (Grand Forks AFB, 1999—Draft Wetland Identification and Delineation). An additional 73 hectares (180 acres) are located east of the main base and are associated with four sewage lagoons. Several small prairie potholes on Grand Forks AFB support nonforested wetlands. (U.S. Department of the Air Force, 1997—Integrated Natural Resources Management Plan)

Table 3.4-6: Sensitive Species at Grand Forks Air Force Base

Scientific Name	Common Name	Status		Habitat and Distribution
		Federal	State	
Wildlife				
Charadrius melodus	Piping plover	T	S2	Nests on sand bars of Missouri and Yellowstone Rivers, along shorelines of saline wetlands, no nests known at or near any of the missile facilities
Charadrius montanus	Mountain plover	C	SX	Short grass prairie, considered extirpated in North Dakota
Falco peregrinus [1] *anatum*	American peregrine falcon	--	S1	Migrates spring and fall along major river courses
Falco peregrinus [1] *tundrius*	Arctic peregrine falcon	--	--	Migrates spring and fall along major river courses
Grus americana	Whooping crane	E	SX	Migrates through west and central counties during spring and fall; roosts on wetlands and stockdams
Haliaeetus leucocephalus	Bald eagle	T	S1	Migrates spring and fall along major river courses; concentrated along Missouri River
Numenius borealis	Eskimo curlew	E	--	Variety of grassland habitat; not likely to occur in project area
Sterna antillarum	Least tern	E	S1	Along Missouri River; barren or sparsely vegetated sandbars
Vulpes velox hebes	Swift fox	C	--	Prairie grasslands
Plants				
Platanthera praeclara	Western prairie fringed orchid	T	SH	Moist tall grass prairie swales

Source: U.S. Department of the Air Force, 1997—Integrated Natural Resources Management Plan; U.S. Department of the Air Force, 1999—Final EIS, Minuteman III Missile System Dismantlement.
[1] Recently delisted, will be monitored for the next decade

E Endangered
T Threatened
C Candidate
R Rare
-- Not listed
S1 Critically imperiled in state (5 or fewer occurrences)
S2 Imperiled in state (6 to 20 occurrences)
S3 Rare in state
SA Accidental in state
SH Of historical occurrence in state
SU Possibly in peril in the state
SX Apparently extirpated from the state

3.4.2.3 Missile Site Radar—Biological Resources

The Missile Site Radar is located in Cavalier County, North Dakota. The ROI for biological resources includes the areas on and surrounding the Missile Site Radar that could be affected by construction and deployment or operation of a GBI element or an XBR. A site visit to the project area was conducted in June 1998.

Vegetation

Northeastern North Dakota was historically vegetated by tall grass prairie. Little of the natural prairie remains today due to extensive cultivation in the region. Vegetation on the Missile Site Radar (figure 3.4-13) (appendix F, table F-16) consists of four general upland habitat types: natural unmowed grassland, human-influenced grassland, maintained lawn, and upland grassland and thicket. All four of these habitat types are generally dominated by smooth bromegrass, Kentucky bluegrass, and yellow sweet clover (*Melilotus officinalis*). Most of the central portion of the site is covered with human-influenced upland grasslands that are mowed periodically. The western half and the southeastern corner of the site are vegetated by prairie grasses that provide habitat for a variety of wildlife species. (U.S. Army Strategic Defense Command, 1992—Natural Resources Management Plan; Summer 1992 Biological Survey)

Wildlife

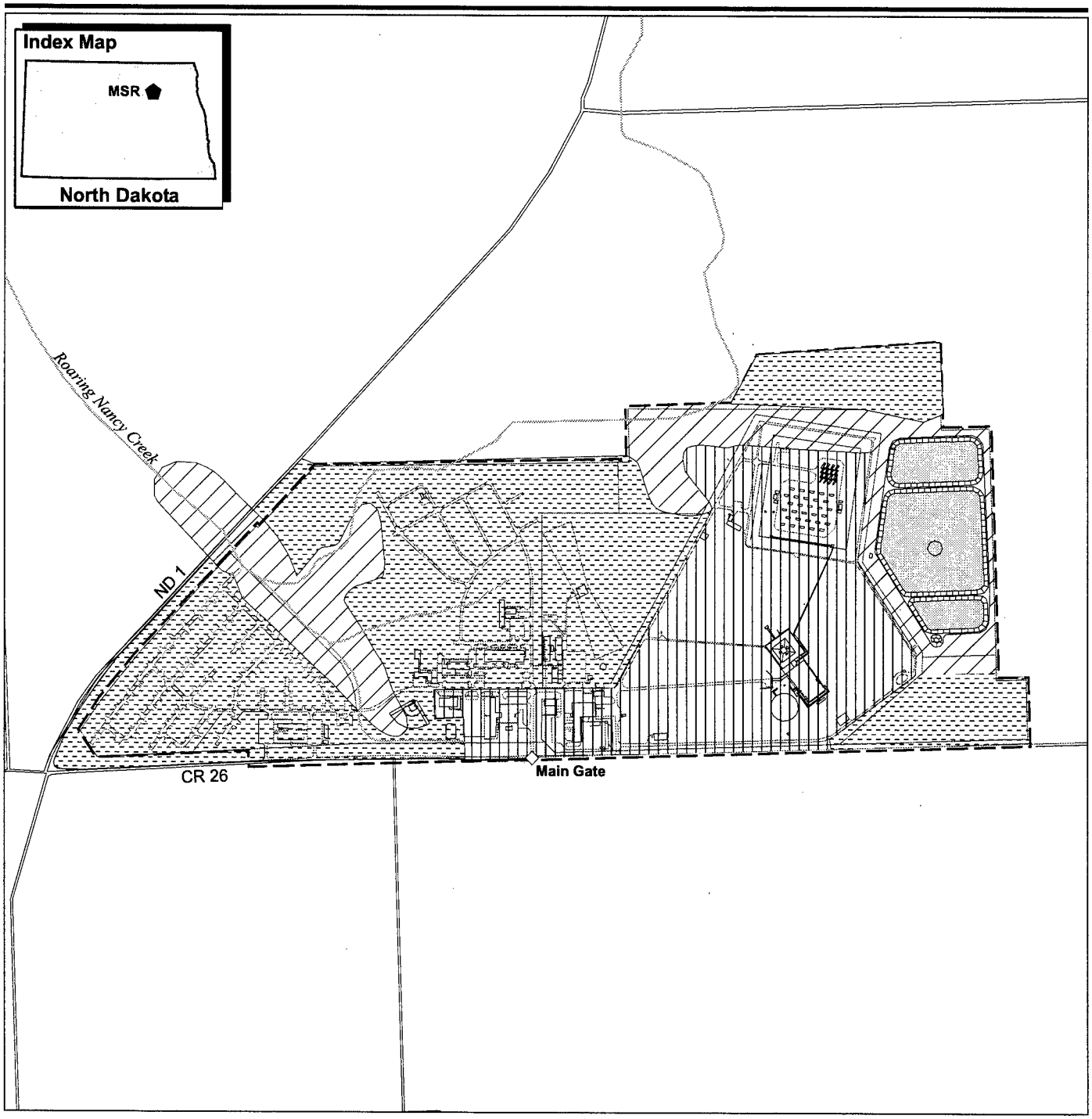
The most important habitats for wildlife on Missile Site Radar are the wetlands associated with Roaring Nancy Creek, the storm water swales, and waste stabilization ponds. These wetland and upland habitats provide nesting cover for a variety of birds and refuge and security to regional deer and small mammals such as Richardson ground squirrels and northern pocket gophers (*Thomomys talpoides*). Security fencing on the site imposes a barrier to use of wildlife habitat by larger mammals, although deer have been observed near the waste stabilization ponds. Appendix F, table F-17, lists wildlife observed at the site. (U.S. Army Strategic Defense Command, 1993—Winter 1992 Biological Survey)

Threatened and Endangered Species

No Federal or state threatened or endangered species have been observed at Missile Site Radar. However, the bald eagle, recently delisted peregrine falcon, and whooping crane could fly over the site during migration.

Sensitive Habitats

The natural wetland on Missile Site Radar is a wetland system associated with Roaring Nancy Creek, located in the western portion of the site. Vegetation in this wetland is dominated by broad-leaved cattails (*Typha*



EXPLANATION

- Installation Boundary
- Gate
- CR = County Road
- ND = North Dakota Highway
- Natural Upland Grassland
- Human Influenced Upland Grassland
- Wetland/Upland Grassland and Thicket
- Standing Water
- Rivers

Scale 1:15,000

0 625 1,250 Feet

NORTH 0 191 381 Meters

br_msr_001

Vegetation and Wetlands, Missile Site Radar

North Dakota

Figure 3.4-13

latifolia), soft rush (*Juncus effusus*), and pussy willow (*Salix discolor*). The waste stabilization lagoons provide some of the functions of created wetland systems, such as wildlife habitat and flood storage. (U.S. Army Strategic Defense Command, 1992—Natural Resources Management Plan; Summer 1992 Biological Survey)

3.4.2.4 Remote Sprint Launch Site 1—Biological Resources

Remote Sprint Launch Site 1 is located in the northwest corner of Ramsey County, North Dakota. The ROI for biological resources encompasses approximately 17 hectares (41 acres) of disturbed land entirely within the current launch site that could be affected by the construction of an XBR at Remote Sprint Launch Site 1, and the surrounding area that could potentially be affected by operation of the XBR. A site visit to the project area was conducted in June 1998.

Vegetation

Remote Sprint Launch Site 1 is a small, flat site surrounded by tilled agricultural fields. The site is periodically mowed and has been seeded (figure 3.4-14) with non-native or human-influenced grasses. There is a small parcel (0.7 hectare [1.7 acres]) of natural upland grassland. Appendix F, table F-18, lists vegetation that has been observed on the site. (U.S. Army Strategic Defense Command, 1992—Natural Resources Management Plan; Summer 1992 Biological Survey)

Wildlife

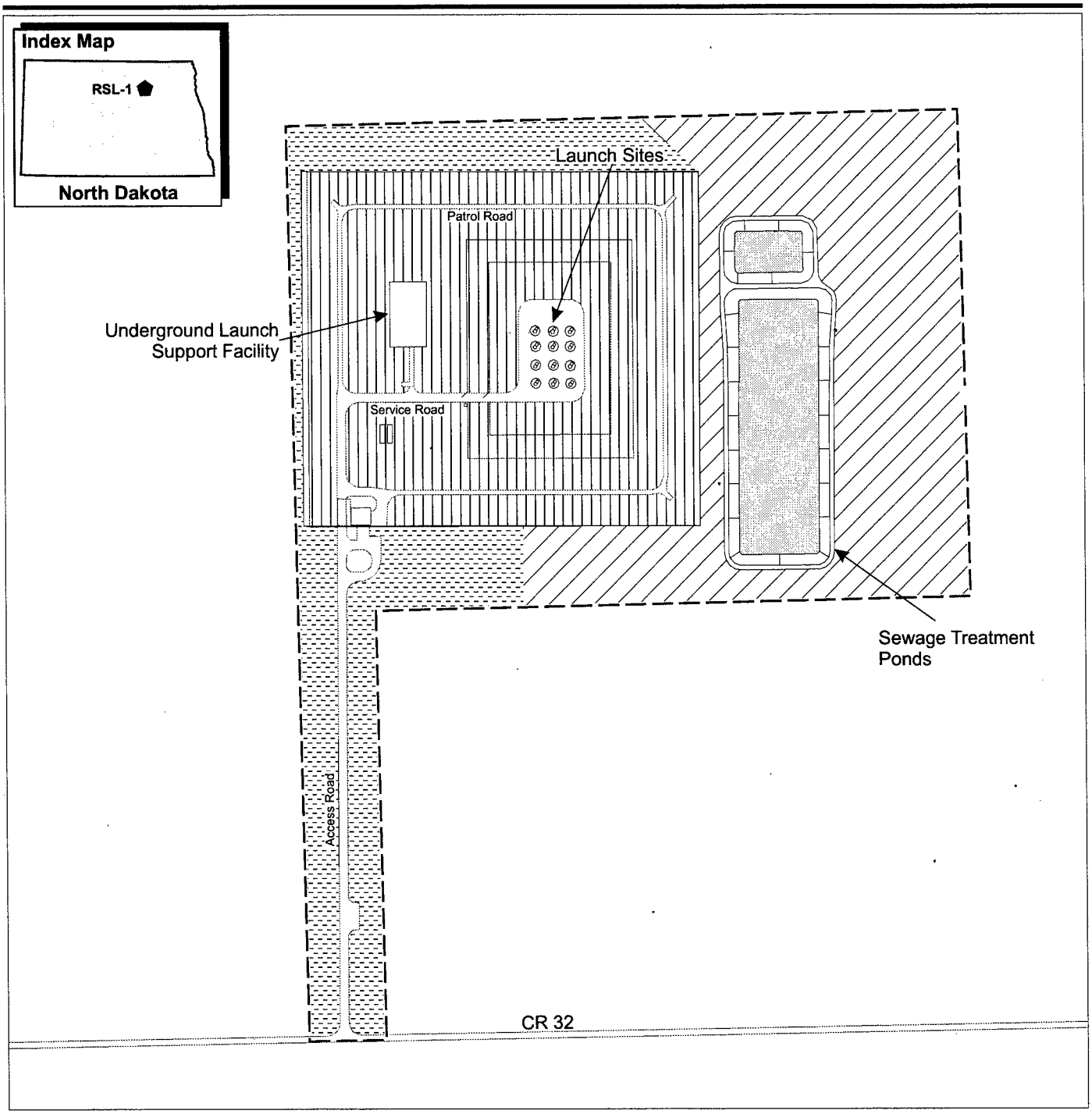
Wildlife on the site is limited due to the size of the site and the fencing surrounding it. Appendix F, table F-19, lists wildlife, such as the white-tailed jackrabbit (*Lepus townsendii*), thirteen-lined ground squirrel, and northern pocket gopher, that have been observed on the site. (U.S. Army Strategic Defense Command, 1992—Natural Resources Management Plan; Summer 1992 Biological Survey)

Threatened and Endangered Species

No Federal or state threatened or endangered species have been observed at Remote Sprint Launch Site 1. However, the bald eagle, recently delisted peregrine falcon, and whooping crane could fly over the site during migration.

Sensitive Habitats

Two small sewage lagoons (figure 3.4-14) provide relatively good habitat for a variety of reptiles, amphibians, and small mammals. The vegetation is dominated by soft rush, reed canary grass (*Phalarus arundinacea*), and broad-leaved cattail. (U.S. Army Strategic Defense Command, 1992—



EXPLANATION

- Installation Boundary
- Natural Upland Grassland
- Human Influenced Upland Grassland
- Wetland/Upland Grassland and Thicket
- Standing Water

CR = County Road

Scale 1:400

NORTH

0 167 333 Feet

0 51 101 Meters

Vegetation and Wetlands, Remote Sprint Launch Site 1

North Dakota

Figure 3.4-14

Natural Resources Management Plan; Summer 1992 Biological Survey) Although the lagoons contain vegetation normally associated with jurisdictional wetlands, it has been determined that they are not subject to Section 404 regulations as long as they continue to function as wastewater containment facilities (U.S. Army Corps of Engineers, 1992—Final Section 404 Clean Water Act Jurisdictional Determination)

3.4.2.5 Remote Sprint Launch Site 2—Biological Resources

Remote Sprint Launch Site 2 is located in north central Cavalier County, North Dakota. The ROI for biological resources encompasses approximately 15 hectares (36 acres) of disturbed land entirely within the current launch site that could be affected by the construction of an XBR, and the area that could potentially be affected by deployment or operation of the XBR. A site visit to the project area was conducted in June 1998.

Vegetation

Remote Sprint Launch Site 2 is a small, flat site surrounded by tilled agricultural fields. The site is periodically mowed and has been seeded (figure 3.4-15) with non-native or human-influenced grasses. There is a small parcel (0.7 hectare [1.7 acres]) of natural upland grassland. Appendix F, table F-20, lists vegetation that has been observed on the site. (U.S. Army Strategic Defense Command, 1992—Natural Resources Management Plan; Summer 1992 Biological Survey)

Wildlife

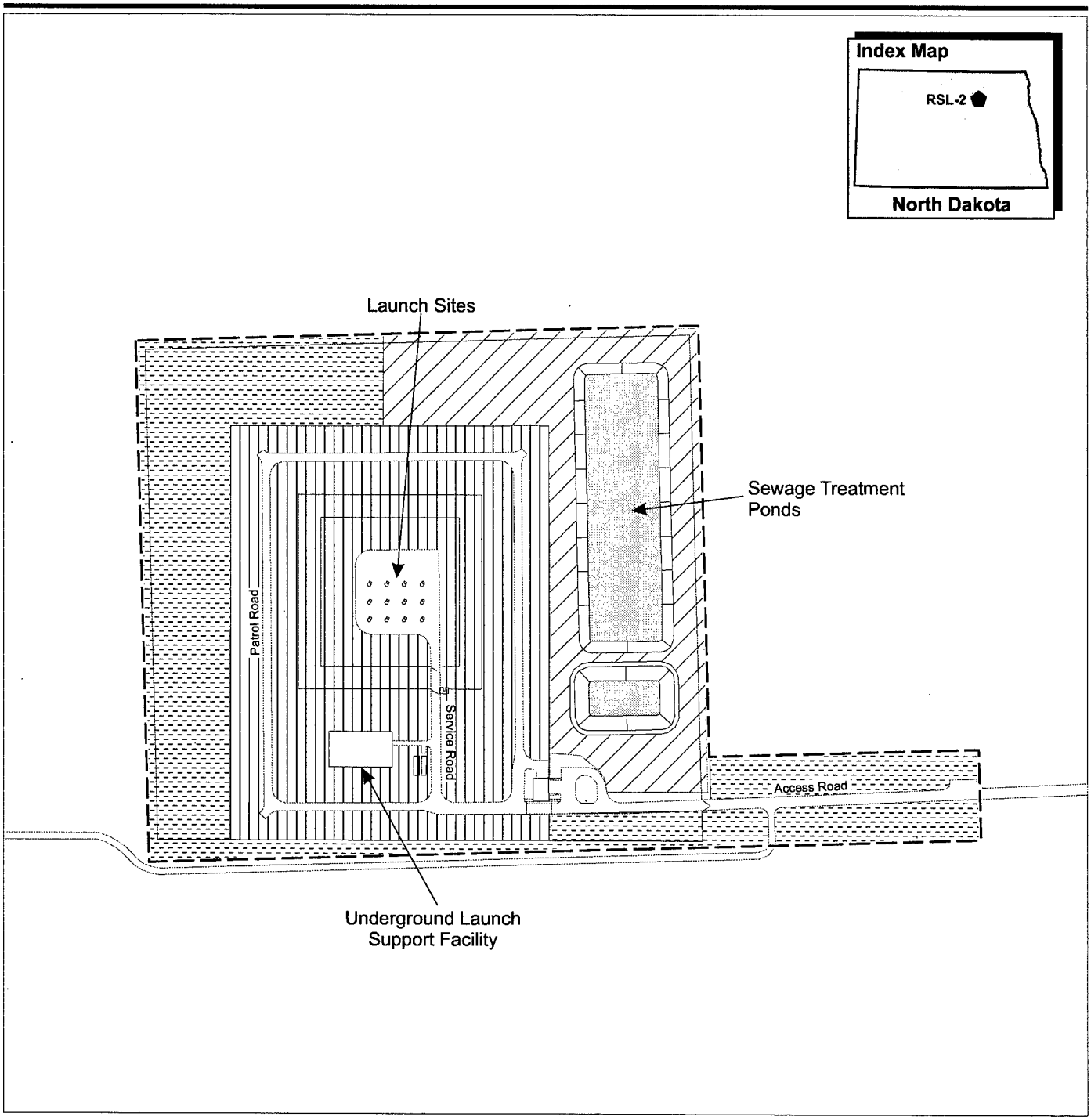
Wildlife on the site is limited due to the size of the site and the fencing surrounding it. Appendix F, table F-21, lists wildlife, such as the white-tailed jackrabbit, northern pocket gopher, and red fox that have been observed on the site. (U.S. Army Strategic Defense Command, 1992—Natural Resources Management Plan; Summer 1992 Biological Survey)

Threatened and Endangered Species

No Federal or state threatened or endangered species have been observed at Remote Sprint Launch Site 2. However, the bald eagle, recently delisted peregrine falcon, and whooping crane could fly over the site during migration.

Sensitive Habitats

Two small sewage lagoons (figure 3.4-15) provide good habitat for waterfowl. The vegetation is dominated by dense scrub-shrub habitat. (U.S. Army Strategic Defense Command, 1992—Natural Resources Management Plan; Summer 1992 Biological Survey) Although the lagoons contain vegetation normally associated with jurisdictional



EXPLANATION

- Installation Boundary
- Natural Upland Grassland
- Human Influenced Upland Grassland
- Wetland/Upland Grassland and Thicket
- Standing Water

Scale 1:4,000

0 167 333 Feet

0 51 101 Meters

NORTH

Vegetation and Wetlands, Remote Sprint Launch Site 2

North Dakota

Figure 3.4-15

br_rsl2_001

wetlands, it has been determined that they are not subject to Section 404 regulations as long as they continue to function as wastewater containment facilities (U.S. Army Corps of Engineers, 1992—Final Section 404 Clean Water Act Jurisdictional Determination)

3.4.2.6 Remote Sprint Launch Site 4—Biological Resources

Remote Sprint Launch Site 4 is located in northwestern Walsh County, North Dakota. The ROI for biological resources encompasses approximately 20 hectares (50 acres) of disturbed land entirely within the current launch site that could be affected by the construction of an XBR, and the area that could potentially be affected by deployment or operation of the XBR. A site visit to the project area was conducted in June 1998.

Vegetation

Remote Sprint Launch Site 4 is a small, flat site surrounded by tilled agricultural fields. The site is periodically mowed and has been seeded (figure 3.4-16) with non-native or human-influenced grasses. There is a small parcel (5.8 hectares [14.3 acres]) of natural upland grassland. This vegetation is typical of disturbed and undisturbed grasslands and provides habitat for small rodents and ground nesting birds.

Appendix F, table F-22, lists vegetation that has been observed on the site. (U.S. Army Strategic Defense Command, 1992—Natural Resources Management Plan; Summer 1992 Biological Survey)

Wildlife

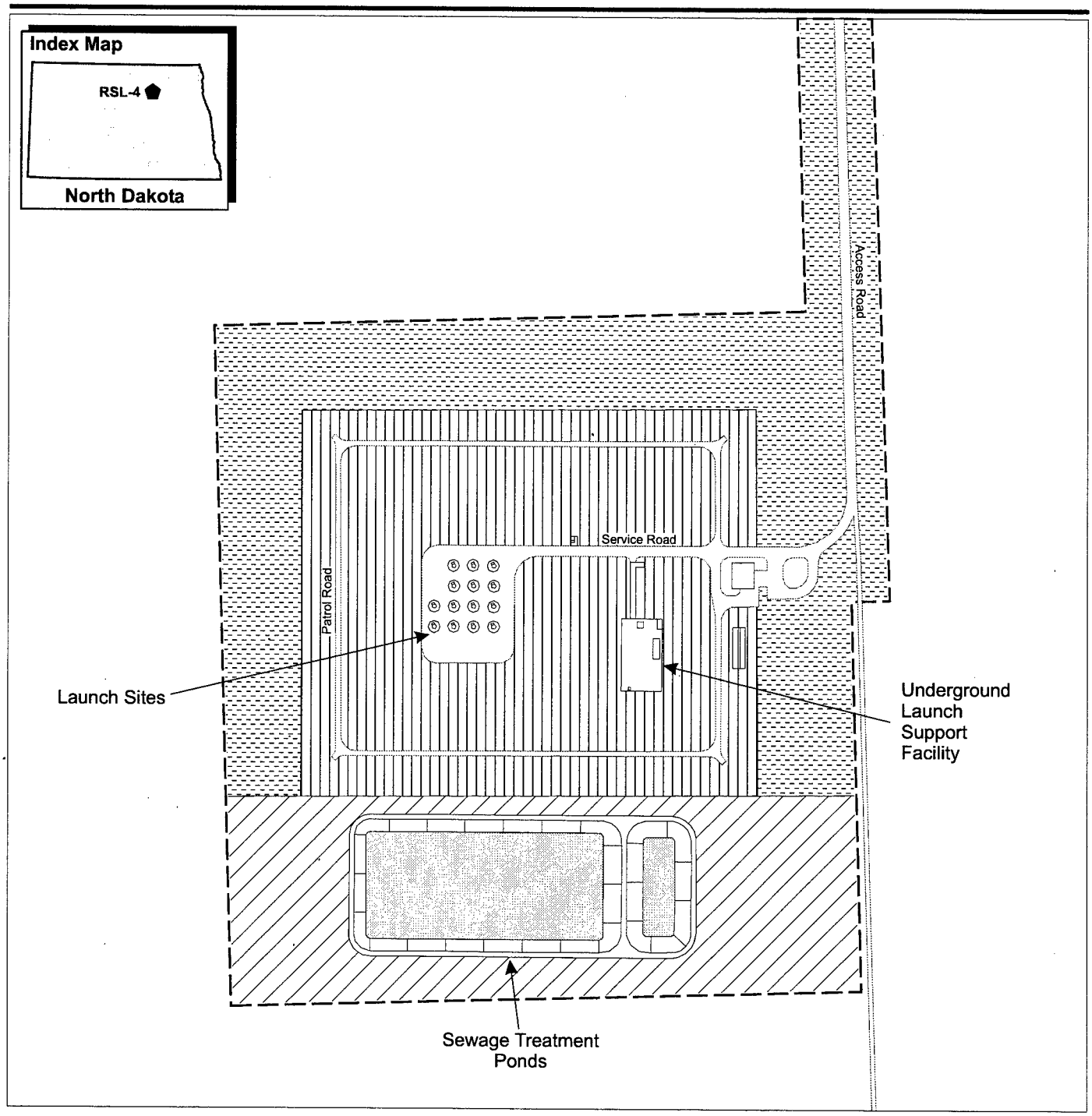
Wildlife on the site is limited due to the size of the site and the fencing surrounding it. Appendix F, table F-23, lists wildlife, such as the white-tailed jackrabbit, northern pocket gopher, and red fox, that have been observed on the site. (U.S. Army Strategic Defense Command, 1992—Natural Resources Management Plan; Summer 1992 Biological Survey)

Threatened and Endangered Species

No Federal or state threatened or endangered species have been observed at Remote Sprint Launch Site 4. However, the bald eagle, recently delisted peregrine falcon, and whooping crane could fly over the site during migration.

Sensitive Habitats

Two small sewage lagoons are located at Remote Sprint Launch Site 4 (figure 3.4-16), the smaller of which provides good waterfowl habitat. The larger lagoon is a palustrine emergent wetland dominated by broad-leaved cattail. The smaller lagoon supports both emergent and scrub-



EXPLANATION

- Installation Boundary
- Natural Upland Grassland
- Human Influenced Upland Grassland
- Wetland/Upland Grassland and Thicket
- Standing Water

Scale 1:3,500

0 146 292 Feet

0 45 89 Meters

NORTH

br_rsl4_001

Vegetation and Wetlands, Remote Sprint Launch Site 4

North Dakota

Figure 3.4-16

shrub vegetation. (U.S. Army Strategic Defense Command, 1992—Natural Resources Management Plan; Summer 1992 Biological Survey) Although the lagoons contain vegetation normally associated with jurisdictional wetlands, it has been determined that they are not subject to Section 404 regulations as long as they continue to function as wastewater containment facilities. (U.S. Army Corps of Engineers, 1992—Final Section 404 Clean Water Act Jurisdictional Determination)

3.4.2.7 North Dakota—Fiber Optic Cable Line—Biological Resources

This section describes biological resources for the area along the fiber optic cable line route. It is expected that the fiber optic cable line would be laid in the area around the proposed NMD element locations described above. The cable alignment would be along existing roadways and utility corridors. The width of the ROI would encompass approximately 8 meters (25 feet) on each side of the roadway along the indicated route.

Vegetation

Construction and motor vehicle use frequently disturb the sides of the roadway. Vegetation within the ROI is indicative of disturbed areas and consists primarily of grasses and weedy species. However, there are some small areas of vegetation along the roadways that provide highly productive wildlife habitat (U.S. Department of the Interior, 1999—comments received on the Draft EIS). The remainder of the area in the fiber optic cable line ROI is used for agricultural purposes.

Wildlife

Wildlife is sparse within the ROI along the roadway corridor, as there is little overall habitat for nesting and foraging. However, there are pockets of habitat that make up a small fraction of the area along the roadways. Researchers have found these areas are highly productive nesting sites for more than 40 kinds of birds and animals that nest on the ground or in low vegetation. This is particularly the case in northeastern North Dakota (U.S. Department of the Interior, 1999—comments received on the Draft EIS). The types of wildlife would be similar to that described above for the North Dakota installations.

Threatened and Endangered Species

Potential threatened and endangered species in fiber optic cable line alignment area would be similar to those described above for the North Dakota installations. Additional species not listed above that could be found in the area include the endangered gray wolf (*Canis lupus*), the endangered black-footed ferret (*Mustela nigripes*), and the endangered pallid sturgeon (*Scaphirhynchus albus*). The gray wolf is an occasional visitor in North Dakota, with most habitat found in forested areas in the north central part of the state in the Turtle Mountains. The black-footed

ferret is typically found in the southwestern part of North Dakota. The decline in the ferret has been linked to eradication of the prairie dog due to farming and grazing. The pallid sturgeon is not known to exist within the ROI for the fiber optic cable line alignment (U.S. Department of the Air Force, 1999—Final EIS, Minuteman III Missile System Dismantlement).

Sensitive Habitats

Although it is anticipated that the fiber optic cable line would be installed along existing roadways and utility corridors, there is the potential to affect sensitive habitat. The sensitive habitat would mainly consist of wetlands and prairie potholes that can be found along some of the roadways in North Dakota. This habitat provides nesting for migrating waterfowl and shorebirds.

3.5 CULTURAL RESOURCES

Cultural resources include prehistoric and historic sites, structures, districts, artifacts, or any other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or any other reason. For ease of discussion, cultural resources have been divided into archaeological resources (prehistoric and historic), historic buildings and structures, native populations/ traditional resources (e.g., Native American sacred or ceremonial sites), and paleontological resources.

Prehistoric and historic archaeological resources are the physical remnants of human activity. They include archaeological sites, features, ruins, artifacts, and other evidence of prehistoric or historic human behavior.

Historic buildings and structures (i.e., architectural features) consist of above ground, standing properties postdating the advent of written records (e.g., homesteads, ranchsteads, World War II buildings, Cold War structures).

Traditional resources may be prehistoric sites and artifacts, historic areas of occupation and events, historic and contemporary sacred areas, materials used to produce implements and sacred objects, hunting and gathering areas, and other botanical, biological, and geological resources of importance to contemporary culture groups. Of primary concern are Native American sacred spaces, because a fundamental feature of Native American cultures is the belief in the sacred character of physical spaces (e.g., mountain peaks, springs, and burial sites). In addition, traditional rituals often prescribe the use of a particular native plant, animal, or mineral; therefore, activities that may affect sacred sites, their accessibility, or the availability of materials used in traditional practices may be of concern.

Paleontological resources include the fossil evidence of past plant and animal life. This includes both fossil traces left in stone, and also remains such as coalized or petrified wood or bone preserved in sediment, or insects and plants preserved in sediment or amber.

Numerous laws and regulations require that possible effects to cultural resources be considered during the planning and execution of Federal undertakings. These laws and regulations stipulate a process of compliance, define the responsibilities of the Federal agency proposing the action, and prescribe the relationship among other involved agencies (e.g., State Historic Preservation Officer [SHPO], the Advisory Council on Historic Preservation [ACHP]). In addition to the NEPA, the primary laws that pertain to the treatment of cultural resources during environmental analysis are the National Historic Preservation Act (NHPA) (especially

Sections 106 and 110), the Archaeological Resources Protection Act, the Antiquities Act of 1906, the American Indian Religious Freedom Act, and the Native American Graves Protection and Repatriation Act (NAGPRA).

Only those cultural resources determined to be potentially significant under the above-cited legislation are subject to protection from adverse impacts resulting from an undertaking. To be considered significant, a cultural resource must meet one or more of the criteria established by the National Park Service that would make that resource eligible for inclusion in the National Register of Historic Places (NRHP). The term "eligible for inclusion in the NRHP" includes all properties that meet the NRHP listing criteria, which are specified in the Department of the Interior regulations Title 36 CFR 60.4 and NRHP Bulletin 15. Therefore, sites not yet evaluated may be considered potentially eligible for inclusion in the NRHP and, as such, are afforded the same regulatory consideration as nominated properties. Whether prehistoric, historic, or traditional, significant cultural resources are referred to as "historic properties."

Note: On June 17, 1999, the revised regulations implementing Section 106 of the NHPA (36 CFR 800) were officially put into effect. The new regulation significantly modifies the review process, introducing new streamlining while incorporating statutory changes mandated by the 1992 amendments to the NHPA. Substantial information relating to the changes in 36 CFR 800 can be found at the ACHP internet web site.

To relieve the burden on agencies to revise documents already in an "advanced" state of review at the time of the regulation change, the ACHP suggests completion of those "in progress" documents under the old (pre-June 1999) regulations. Because of the complexity of this EIS and the length of time the document has been under preparation and review, guidance under the old regulation has been maintained.

Region of Influence

For the purposes of this analysis, the term ROI is synonymous with the "area of potential effect" as defined under cultural resources legislation. In general, the ROI for cultural resources at each location encompasses areas requiring ground disturbance (e.g., areas of new facility/utility construction) and all buildings or structures requiring modification, renovation, demolition, or abandonment. Specific cultural resources ROIs for each installation and alternative will be provided within each subsection.

3.5.1 ALASKA INSTALLATIONS

Following is a brief prehistory and history encompassing the Alaska NMD ROIs. The description is divided into two parts: Interior Alaska (which encompasses the areas associated with Clear AFS, Eielson AFB, Fort

Greely, and the Yukon Training Area) and the Aleutian Islands (which encompasses the area associated with Eareckson AS). Together, these discussions provide a general context for the types of cultural resources known to exist, or that have the potential to occur, within the two Alaska ROIs. Detailed information can be found in the numerous reports cited within this section and listed in the reference list. Installation-specific information is found within each subsection.

Interior Alaska

Because Interior Alaska was ice-free during the Wisconsin glaciation, prehistoric and historic archaeological sites have been recorded within the Interior that span the time period from the late Pleistocene to the present (U.S. Department of the Interior, 1997—Northern Intertie Project, Draft EIS). Some of these sites are among the oldest and most well-documented archaeological sites in North America (approximately 12,000 years before the present [B.P.]) and are characterized by microblades, bifaces, a burin technology, core bifaces, and bifacially-flaked projectile points (U.S. Army Corps of Engineers, 1986—Historic Preservation Plan for U.S. Lands in Alaska; U.S. Department of the Interior, 1997—Northern Intertie Project, Draft EIS).

There are four divisions for the prehistory of Interior Alaska (discussed below). Euroamerican historical accounts began in the latter part of the 19th century, resulting in a relatively short Interior Alaska Historic Period (A.D. 1875 to the present).

Nenana and Denali Complexes (12,000 to 7,000 B.P.). The earliest known inhabitants of Interior Alaska were likely adapted to exploitation of late glacial tundra or steppe-tundra environments. Trees were generally absent from the landscape, warm and dry conditions prevailed, and populations of herd animals (e.g., bison, caribou) are believed to have been plentiful. The remains of these inhabitants are represented by Nenana Complex archaeological sites, which are characterized by teardrop-shaped knife forms and triangular, bifacially-flaked projectile points. Noteworthy archaeological sites representing this complex include Components 1 of the Dry Creek, Moose Creek, and Walker Road sites (U.S. Department of the Interior, 1997—Northern Intertie Project, Draft EIS).

The Denali Complex spans the Pleistocene-Holocene boundary and appears to date to between 10,690 and approximately 7,000 B.P. Characteristic artifacts of this archaeological culture include wedge-shaped microblade cores, microblades, burins, leaf-shaped biface knives, and scrapers. Inhabitants of this period appear to have been more adapted to tundra environments. Noteworthy archaeological sites representing this complex include Dry Creek (Component II), Dragonfly Creek, and several sites in the Alaska Range drainage. Early Denali

materials are also documented from the Healy Lake and Chugwater sites (near Eielson AFB) (U.S. Department of the Interior, 1997—Northern Intertie Project, Draft EIS).

Northern Archaic Tradition (6,000 to 2,000 B.P.). About 6,000 years ago, the Northern Archaic tradition appeared in Interior Alaska. This culture is generally associated with a boreal forest adaptation to climate and vegetation changes and is believed to coincide with the expansion of white spruce. Hallmarks of this tradition include side-notched projectile points (which may relate to either hunting or wood-working); large, irregular knives; steep-angled end scrapers; cobble choppers; and crescent to oval-shaped bifaces (U.S. Army Corps of Engineers, 1986—Historic Preservation Plan for U.S. Lands in Alaska; U.S. Department of the Interior, 1997—Northern Intertie Project, Draft EIS). Key archaeological sites representing this complex include the Tok Terrace site, Healy Lake, the Chugwater site, and several other sites in the Fairbanks area.

Late Denali Complex (3,500 to 1,500 B.P.). The artifacts ascribed to the Late Denali Complex are similar in many respects to the early Denali Complex, even though the ages of the two differ by several thousand years. Microblades and notched points are most typically found; however, cores, burins, and endscrapers are also seen. Sites of the Late Denali Complex are found throughout the middle Tanana Valley, the Goldstream area, and areas just north and east of Fairbanks (U.S. Department of the Interior, 1997—Northern Intertie Project, Draft EIS).

Athapaskan Tradition (2,000 B.P. to the Present). Sites derived from the Athapaskan Tradition encompass roughly the last two millennia; however, they are comparatively rare in numbers. This rarity is believed to represent high mobility and seasonal human movements, cremation practices, and an apparent tendency towards settlements along major waterways. The prehistoric Athapaskan period is represented by several well-documented sites. Two of these include the Nenana River Gorge site (near Moody), the components of which were deposited between A.D. 1500 and 1685 and the Porcupine River site (in the Yukon), which may have the longest continuum of any site of this age (from 1,200 to 100 years B.P.). Artifacts associated with these sites include copper tools, wood and bone tools, crude pottery, fire-cracked rock, pecked and ground-stone tools, and unmodified flakes (U.S. Army Corps of Engineers, 1986—Historic Preservation Plan for U.S. Lands in Alaska; U.S. Department of the Interior, 1997—Northern Intertie Project, Draft EIS).

Historic Period (A.D. 1875 to Present). Indirect contact between the Alaska Natives and Euroamerican immigrants in Interior Alaska began in the 1830s and 1840s, when trading posts were established at Nulato and Fort Yukon; British traders established a post at Fort Yukon in 1847.

During the 1860s, non-native prospectors, traders, and explorers (primarily British and Russian) immigrated to Interior Alaska and began directly trading with the local native groups (U.S. Department of the Interior, 1997—Northern Intertie Project, Draft EIS).

In 1867, the Territory of Alaska was purchased from Russia, but even at that point, very little was known about the area and, in particular, Interior Alaska. Several expeditions were made between 1885 and the turn of the century to map the Copper, Tanana, Yukon, and Kyoukuk rivers (Fairbanks Convention and Visitors Bureau, 1998—Fairbanks Alaska Visitors Guide), but it was not until 1902, when gold was discovered in Fairbanks, that large numbers of non-native immigrants settled in Interior Alaska. With the influx of gold seekers, roadhouses and way stations were constructed along many of the existing Alaska Native trails. The roadhouses and way stations assisted the horse and dog teams that traversed the wilderness (Northern Land Use Research, Inc., 1996—Archaeological Survey) and served the local native groups, as well as subsistence hunters and trappers, prospectors, miners, market meat hunters, and mail delivery men. Numerous existing trails were improved into roads, including the Bonnifield Trail, which was a good winter road from Fairbanks to Gold King Creek; the Kobi-Bonnifield Trail, which ran from the Bonnifield mining district (in the Wood River area) to just south of present-day Clear AFS; and the Valdez-Fairbanks Trail (later called the Richardson Highway), which was an essential overland trail between the Pacific Ocean and Interior Alaska (Northern Land Use Research, Inc., 1996—Archaeological Survey, Eielson AFB).

Increased mining and trading in Alaska led the Army to improve communications systems in the region and construct the Washington–Alaska Military Cable Telegraph System. Completed between 1899 and 1906, the Washington–Alaska Military Cable Telegraph System connected areas such as Fort Liscum (in Valdez) and Fort Egbert (in Eagle), across the "fortymile" region east of Fort Greely and down the Tanana River to Fort Gibson, at the village of Tanana (Northern Land Use Research, Inc., 1996—Archaeological Survey, Eielson AFB; Office of History and Archaeology, 1998—Draft Integrated Cultural Resources Management Plan). Part of this system included the construction of small cabins spaced at intervals of about 64 kilometers (40 miles).

In 1904, the town of Fairbanks was incorporated and named after Charles W. Fairbanks, a senator from Indiana (later to become Vice President under Theodore Roosevelt) (Fairbanks Convention and Visitors Bureau 1998—Fairbanks Alaska Visitors Guide). That same year, the U.S. Army Signal Corps established the McCarthy Telegraph Station adjacent to the Fairbanks–Valdez Trail, and Delta Junction was established as a road construction camp and telegraph station. In 1914, the Alaska Railroad was authorized by Congress and constructed between Fairbanks and Seward (completed between 1915 and 1923)

(the line runs adjacent to Clear AFS). Many of the town names now in usage along the railroad route evolved from construction camps established to build the railroad; Nenana and Anchorage were the largest of the railroad towns (U.S. Department of the Interior, 1997—Northern Intertie Project, Draft EIS).

Between 1920 and 1927, the new Richardson Highway was constructed east of the old Valdez Trail to link Fairbanks with the seaport of Valdez, and the Steese Road was built to connect Fairbanks to Circle City on the Yukon River. The Alaska Highway connecting Alaska and the lower 48 United States was constructed during World War II. Taking only 8 months to construct, the road was built by the 97th Army Corps of Engineers (University of Alaska Museum 1996—Guide to the University of Alaska Museum).

In 1968, oil was discovered at Prudhoe Bay and, shortly thereafter, the construction of the Trans-Alaska Pipeline began. Extending from Prudhoe Bay to Valdez, the pipeline is one of the largest pipeline systems in the world. Passing through Fairbanks and Delta Junction, the pipeline transports 20 percent of the U.S. oil production.

Native Populations/Traditional Resources. The native peoples of Interior Alaska (i.e., Athapaskans) have survived as a recognizable group in Alaska for more than 10,000 years. At the time of Euroamerican contact, the areas of Interior Alaska encompassing the NMD ROI were traditionally used by the Tanana Athapaskans. These groups primarily utilized the Nenana, Tanana, Wood, and Chena River drainages, but ranged southward into the foothills of the Alaska Range. Native bands traditionally had permanent, seasonally-used camps (which sometimes shifted) that were used for hunting and salmon fishing and, later, for trapping (U.S. Department of the Interior, 1997—Northern Intertie Project, Draft EIS). Their economy was based on subsistence hunting, fishing, and trapping of such animals as moose, caribou, black and brown/grizzly bear, salmon, and muskrat and was supplemented by the gathering of edible plants, especially berries. Paper birch was used to make baskets, canoes, and assorted household utensils. Trade goods (beads and other Western items) entered Interior Alaska through aboriginal trade routes well before the arrival of Euroamerican explorers and fur traders (University of Alaska Museum 1996—Guide to the University of Alaska Museum).

Before 1870, the Tanana Athapaskans cremated their dead, marking pyre sites with forked sticks and with a crosspiece between them. After Euroamerican contact, prepared graves became a standard practice that continues to the present (Northern Land Use Research, Inc. 1996—Archaeological Survey).

Paleontological Resources. Interior Alaska is dominated by boreal forest environments, where white and black spruce, birch, aspen, and willow dominate the landscape. North facing slopes and valley bottoms generally have permafrost soil, sediment, and rock that remain frozen all year long. Because of this, many areas of Interior Alaska have the potential for paleontological remains (University of Alaska Museum 1996—Guide to the University of Alaska Museum). This is largely attributed to the fact that arctic and subarctic frozen soils (i.e., permafrost) preserve very old organic remains in excellent condition. Vertebrate remains are most often preserved in glacial age eolian and fluvial sediments; alluvium and colluvium have good potential for bone preservation; and invertebrate and plant fossils are likely to occur in association with the Tertiary-aged coal-bearing layers (U.S. Department of the Interior, 1997—Northern Intertie Project, Draft EIS).

In addition to a variety of plant and invertebrate life forms, 31 species of Ice Age mammal once roamed the grassland of Interior Alaska, including the woolly mammoth, the muskox, the American lion, the American horse, and the bison. Abundant evidence of the so-called "mega" fauna was exhumed during 1920s and 1930s placer mining in the Tanana Valley (Northern Land Use Research, 1996—Archaeological Survey). Paleontological remains that have been recorded within Interior Alaska include fossil plants and impressions; mammoth teeth, tusks, and bones; bison horns and bones; petrified wood; beaver and badger skulls; casts of the giant sloth; and freshwater clams (U.S. Department of the Interior, 1997—Northern Intertie Project, Draft EIS).

Aleutian Islands

The earliest evidence for settlement of the Aleutian Islands has been recorded in the eastern part of the chain on Anangula (within the Fox Islands), where a core and blade technology has been radiocarbon-dated to about 8,000 years B.P. The Anangula Industry (which spans approximately 10,000 to 4,500 years B.P.) appears to represent a variant of some of the oldest known archaeological remains in Alaska. By about 5,000 years ago, a distinctive Aleutian tradition (5,000 years B.P. to the present) is recognized in the Fox Islands at sites such as the Chaluk midden (on Umnak Island). The tradition is characterized by stemmed points and knives, stone lamps, diagnostic barbed harpoon and lance points, and polished slate ulus. Sites are represented by deep middens containing the remains of sea mammals, fish, shellfish, and sea urchins and traces of semi-subterranean houses (Drummond, 1983—Alaska and the Northwest Coast).

At Amchitka in the Rat Islands, the stone and bone artifacts are similar to those from Chaluka and include the remains of sea mammals, birds, fish, and invertebrates. A house dated to about 1500 A.D. was elliptical and

apparently entered through a hole in the roof. Associated tools included polished stone ulus (Drummond, 1983—Alaska and the Northwest Coast).

Farther west, collections from the Near Islands are stylistically the most variant of all those in the Aleutian Chain. Chipped stone artifacts include a very high proportion of elliptical to leaf-shaped bifaces similar to some found at Umnak (Drummond, 1983—Alaska and the Northwest Coast).

Although some changes occur in artifact style and dwelling form, the material culture of the prehistoric Aleuts remained fundamentally unchanged throughout prehistory—a phenomenon that likely suggests their isolation from other peoples of the northern Pacific (U.S. Fish and Wildlife Service, 1988—Alaska Maritime National Wildlife Refuge, Final Comprehensive Conservation Plan).

Beginning in the 18th century, Russian sailors and fur traders began to explore the Aleutians. The first recorded contact occurred in 1741, when a Russian ship anchored off what is believed to be Adak Island. Exploration and exploitation of the islands and their resources (particularly whale, sea otter, and seal) continued until 1867 when the United States purchased the entire Alaskan territory. The purchase set off a new wave of hunting and trapping in the islands that ultimately led to overhunting and a drastic decline in the number of otters and seals. By that time, violence between the native Aleuts and the Russians, disease, and an overall disruption of the Aleut society had caused the population of the Aleutians to decline by as much as 80 percent (Engineering Field Activity Northwest, 1996—HARP Plan for the Adak Naval Complex).

In the early 20th century, international treaties and Federal laws limited hunting and designated most of the archipelago as a national wildlife refuge. At about the same time, the United States was expanding into the Pacific, and U.S. military planners began to realize the strategic importance of Alaska and the Aleutian Islands. It was not until World War II, however, that the importance of the Aleutians became critical when, after the attack on Pearl Harbor, the western Aleutians were occupied by the Japanese. Soon after the occupation, the U.S. Army landed on Adak Island and rapidly built an air base. The Navy soon followed and established a seaplane base and a port. For the next several months, Adak was the forwardmost base of the U.S. military in the Aleutians and proved instrumental in U.S. efforts during the Aleutian Campaign. After the war, most of the various bases in the Aleutians were deactivated; however, both Adak and Shemya were retained (Engineering Field Activity Northwest, 1996—HARP Plan for the Adak Naval Complex).

Native Populations/Traditional Resources. Archaeological investigations indicate that the native peoples of the Aleutian Archipelago have survived as a recognizable group in Alaska for at least 8,000 years. At the time of Euroamerican contact, the area encompassing the NMD ROI was

traditionally used by the Aleut. The Aleut, or Unangan, as they call themselves, have relied almost exclusively on the sea. Historically, terrestrial animals have been virtually absent from the islands. Settlements have been clustered by the coast near sources of fresh water, large inter-tidal zones with sources of food, and areas offering some protection from the nearly constant storms. Settlement patterns also indicate that the Aleuts may have considered defense an important factor.

The Aleuts usually dwelled in large, communal, semi-subterranean structures of grass and earth over a driftwood or whale bone frame; smaller structures served as storage facilities and summer dwellings. The Aleuts depended on the seal for the majority of their food, and hunted whales, seals, otters, and especially sea lions, with harpoons and darts. The Aleuts used skin-covered kayaks to hunt on the open waters and supplemented their marine diets with birds, bird eggs, plants, and a variety of berries. Each village would generally have a recognized leader, but beyond the village (or small island) there was no particular organization. Leadership was frequently hereditary, and leaders were often whaling captains as well as the heads of the strongest family in the village.

Lifeways of the Aleut remain essentially unchanged today, with the communities in the Aleutian Archipelago almost entirely dependent on subsistence (U.S. Fish and Wildlife Service, 1988—Alaska Maritime National Wildlife Refuge, Final Comprehensive Conservation Plan).

Paleontological Resources. The Aleutian Islands are composed almost entirely of Tertiary and Quaternary volcanic and volcaniclastic rock. Water, wind, and ice erode the landscape, and there is considerable earthquake activity, as a result of tectonic plate movements along the Aleutian arc; a type of maritime tundra covers most of the area (University of Alaska Museum, 1996—Guide to the University of Alaska Museum). The older rocks of the Aleutians date back to the Paleozoic with the region being underlain by Cenozoic lava flows; volcanic ash, pumice, cinders, glacial till, outwash, and alluvium cover the bedrock. It is unlikely that permafrost occurs in the Aleutian Islands, but glacial erosional processes are active because of the cold, wet climate (U.S. Fish and Wildlife Service, 1988—Alaska Maritime National Wildlife Refuge, Final Comprehensive Conservation Plan).

There are no reports of paleontological sites within the Aleutian Islands; however, given the physiographic setting, fossils are possible.

3.5.1.1 Clear AFS—Cultural Resources

Prehistoric and Historic Archaeological Resources

For general archaeological information about Interior Alaska, see section 3.5.1.

Archaeological evidence indicates that the region around Clear AFS has been occupied for about 12,000 years. Although no specific sites have been found within the boundary of the installation, sites in nearby locations have been dated to that time frame. Sites characterized by projectile points, cores, and tools for preparing animal skins and food have been identified in areas around the installation.

Before 1991, no cultural resources surveys of Clear AFS had been undertaken. That year, the Oak Ridge National Laboratory initiated surveys to locate prehistoric and historic resources and to reconnoiter the station for potential future discovery of cultural resources. The 1991 survey identified no prehistoric archaeological sites and recorded two historic archaeological sites (a railroad camp and a portion of the Alaska Railroad bed), both of which have been determined to be potentially eligible for inclusion in the NRHP (Northern Land Use Research, Inc., 1995—Cultural Resources Management Plan).

In 1994, Northern Land Use Research, Inc. conducted additional survey (covering over 800 hectares [2,000 acres]) of the installation to build upon the previous survey and provide a basis for a Cultural Resources Management Plan. No prehistoric archaeological sites were identified (Northern Land Use Research, Inc., 1995—Cultural Resources Management Plan).

Results of the two surveys indicate that there are no areas within the boundary of Clear AFS with high potential for prehistoric archaeological resources. Based on geomorphic indicators and the amount of ground disturbance in some areas, the ancient Healy Terrace and the Nenana River margin have moderate potential for prehistoric use, and the central portion of the installation has low potential for preserved sites and requires no further survey (Northern Land Use Research, Inc., 1995—Cultural Resources Management Plan).

The currently defined NMD ROI (see figure 2.4.1-1) has not been surveyed for prehistoric or historic archaeological resources. However, neither of the historic sites is within the ROI, and the entire ROI is situated within the area determined by Northern Land Use Research to be of low archaeological potential (and requiring no further studies); the Alaska SHPO has concurred (Novak, 1998—Personal communication).

Detailed information about the 1991 and 1994 surveys can be found in the *Cultural Resources Survey and Management Plan of the Clear Air*

Force Station (1991) and *Cultural Resources Literature Search and Inventory Plan for Clear Air Force Station* (Northern Land Use Research, Inc. 1994).

Historic Buildings and Structures

The earliest non-indigenous use of the Clear AFS area was by the U.S. military, shortly after World War II (1949), when an airstrip was constructed. At that time, the installation was named Clear Air Force Air Auxiliary Field (U.S. Department of the Air Force, 1997—EA for Radar Upgrade, Clear AS). By 1950, the area of Clear AFS had become the Master Ground Control Intercept of the Air Force's Alaskan Interim Air Defense System. Between 1950 and 1960, Clear AFS became part of the White Alice Communications System and provided communications to the continental United States along the southeastern coast of Alaska. During the height of the Cold War, this installation provided 15-minute warning in the event of a Soviet-launched ICBM towards the United States, thereby allowing the United States time for interception of incoming missiles (Clear AFS, 1993—Comprehensive Planning Framework). In 1959, construction of the Ballistic Missile Early Warning System radar and support facilities (a faster early warning system) began, with operational capability being achieved in 1961 (Clear AFS, 1993—Comprehensive Planning Framework; U.S. Department of the Air Force, 1997—EA for Radar Upgrade, Clear AS). The detection radars, tracking radar, and associated buildings for the Ballistic Missile Early Warning System sites were the primary missile tracking and early warning systems of the Cold War era.

Currently, the installation's mission is to detect and provide early warning of a ballistic missile attack and to detect and monitor the behavior of satellites and space objects (Clear AFS, 1993—Comprehensive Planning Framework).

In 1995, the Argonne National Laboratory conducted an inventory and evaluation of Cold War-era properties at 21st Space Wing installations (Argonne National Laboratory, 1995—Historic Properties of the Cold War Era). Eight Ballistic Missile Early Warning System buildings/structures at Clear AFS (Buildings 101, 102, 104, 105, 106 and Structures 735, 736, and 737) were identified as potentially eligible for listing in the NRHP, and the Alaska SHPO has concurred (State of Alaska, Department of Natural Resources, 1997—Letter from the State Historic Preservation Officer). The Clear AFS Ballistic Missile Early Warning System is the only remaining mechanical radar warning system in the United States (Clear AS, 1998—Visitors Briefing). In 1996, the Ballistic Missile Early Warning System was considered for demolition; consultation with the Alaska SHPO has identified the need for a Memorandum of Agreement and Historic American Engineering Record documentation for this undertaking (Department of the Air Force, 1996—Memorandum from Peterson AFB).

In addition, the Clear AFS White Alice Communications System site has been included in a historic inventory of statewide White Alice Communications System sites; a determination of eligibility for the site has not been finalized.

Plans to modify or demolish existing facilities to support NMD activities (see section 2.4.1.1) will not involve any of the Ballistic Missile Early Warning System or White Alice Communications System buildings or structures; however, new facilities would be constructed near some of these potential properties.

Native Populations/Traditional Resources

Clear AFS is located within the traditional territory of the Nenana–Toklat band of the Lower Tanana Athapaskan Indians. The area was used by Athapaskan bands for hunting moose and small game animals as they moved across the land seasonally (Northern Land Use Research, Inc., 1995—Cultural Resources Management Plan).

No Alaska Native traditional cultural properties have been identified within the NMD ROI or the boundary of Clear AFS. Local Alaska Native groups with which Clear AFS typically consults include the Tanana Chief's Conference and the Toghotthele Corporation (Northern Land Use Research, Inc., 1995—Cultural Resources Management Plan).

Paleontological Resources

Most of Clear AFS is situated within a broad glaciofluvial outwash plain composed of sandy gravel (Clear AFS, 1993—Comprehensive Planning Framework); portions of the ROI may be underlain by permafrost.

Although no paleontological remains have been recorded within the NMD ROI or the boundary of the installation, evidence of several forms of extinct animals has been found in the vicinity. Evidence of mammoth (radiocarbon dated to about 13,500 years) has been found in the Teklanika River drainage (west of the station), and remains of elk (from approximately 11,120 years ago) and steppe bison (from approximately 10,690 years ago) have been found near Healy (U.S. Department of the Air Force, 1997—EA for Radar Upgrade, Clear AS).

3.5.1.2 Eareckson AS—Cultural Resources

Prehistoric and Historic Archaeological Resources

For general archaeological information about the Aleutian Archipelago, see section 3.5.1.

The prehistory of the Near Islands (which includes Shemya Island) has been only sporadically studied due to their relative inaccessibility.

Syntheses of Aleutian prehistory, which address this westernmost group of Aleutian Islands, indicate that they were settled much later than the central and eastern island groups (U.S. Department of the Air Force, undated—EA Shemya Borrow Pit and Rock Quarry Plan).

It is assumed that the Aleutian Islands were first settled in the Umnak Island area and that inhabitants then spread east and west until the entire chain became occupied. One dated archaeological assemblage in the Near Islands (on Krugloii Point on Aggatu Island) has been dated to 2,600 years ago. Based on the presence of some artifact classes there, as well as on Shemya and Attu, and their absence elsewhere, it has been hypothesized that the Near Islands inhabitants lived in relative geographic isolation from the rest of the archipelago. Of all the assemblages in the Aleutians, the Near Islands are the least typical stylistically. Near Islands assemblages appear distinctive from 2,600 years ago until about 400 years ago, when similarities to other assemblages farther east became more apparent (U.S. Department of the Air Force, undated—EA Shemya Borrow Pit and Rock Quarry Plan). Diagnostic artifact types include barbless fishhooks, flaked semi-lunar knives, and stylistic patterns (including circle and dot decoration of bone and serration of stone points). Art objects also exhibit unusual features such as ivory figurines with ovoid trunks and pegged-on appendages that bear a similarity to some northeast Asian cultures.

It is uncertain whether Shemya Island was inhabited when first sighted by the Russians in 1741. However, Russian records reveal that, when they arrived, practically every island was inhabited—Agattu alone had 31 villages. The first recorded contact between Europeans and the native people of the Near Islands was in 1745, when Russian hunters landed on Agattu and Attu in search of sea otters. It has been estimated that at that time the Near Islands had a population of approximately 1,000 Aleuts—Shemya island was apparently occupied by approximately 100 people.

By the end of the 1760s, the Aleut population of the Near Islands had declined to about 100 and Shemya Island was abandoned as a permanent settlement. Shemya remained essentially unpopulated until around 1922, when trapper's cabins were built on both Attu and Shemya Island for the trapping of the introduced arctic fox. In 1940, there were approximately 40 inhabitants of Attu, who used the cabins on Shemya for trapping—there were no permanent inhabitants of Shemya Island at that time.

Although archaeological investigations of the Near Islands began as early as the late 1800s (on Attu and Agattu), no professional surveys of Shemya Island were conducted until after World War II. In 1948, the locations of four prehistoric sites were plotted on the basis of an aerial reconnaissance. In the early 1960s, a student from the University of

Alaska located seven sites (including the four previously plotted). The information from this investigation represents the only record of several of these sites, which have since been destroyed. In 1985 and 1988, additional surveys were conducted to document claims made by the Aleut Corporation (under the Alaska Native Claims Settlement Act); however, only one site (ATU-003) was located during these surveys. Between 1990 and 1994, additional sites were located and samples taken for radiocarbon dates and paleobiological analyses.

A total of nine prehistoric archaeological sites have been recorded on Shemya Island. Three of the sites have been destroyed by previous construction, and the remaining six have been disturbed by construction and/or vandalism. In addition to the nine, two other locations have apparently yielded isolated artifacts, but have thus far failed to provide evidence of sites.

All of the prehistoric sites recorded on Shemya Island are located along the shoreline and represent middens occupied by prehistoric Aleuts. The sites consist primarily of sea urchin remains, organic-rich sediments, large quantities of bone and shell, and artifacts of stone and bone. Traces of semi-subterranean houses appear to be present at some sites, and at least one burial has been reported (site ATU-061). There have been no reported sites from the higher elevations of the island (Hoeffecker, 1998—Letter regarding archaeological survey).

The currently defined NMD ROI for Eareckson AS includes the 16-hectare (40-acre) XBR construction site and any other areas where ground disturbance could occur (e.g., utility corridors). In 1998, the proposed area for the NMD XBR was surveyed by Hoeffecker (1998); no prehistoric or historic sites were identified. The Alaska SHPO has reviewed the survey information and concurred that there are no historic properties within the NMD XBR ROI (State of Alaska, Department of Natural Resources 1998—Letter from Bittner, J., August 17).

Historic Buildings and Structures

World War II had an enormous impact on the population, economy, and culture of the Aleutian Islands. The western Aleutians possessed strategic military importance to the United States because of their relative proximity to northern Japan, and Shemya Island was especially suitable for long runways and the operation of large bombers.

In June 1942, carrier-based planes attacked U.S. Army and Navy forces at Dutch Harbor and Japanese troops landed on Attu and Kiska, but Shemya remained unoccupied. Occupation of these American islands was of limited strategic significance to the Japanese, but it represented enormous psychological and propaganda value. As a counter-offensive, the United States established new bases on Adak and other islands and began air

attacks of Kiska and Attu in May 1943. Kiska was isolated at this time and subsequently abandoned by the Japanese; however, the Japanese garrison on Attu was destroyed by the American strike in the second most costly battle of the World War II Pacific Theater. Towards the last days of this battle (May 11–30), U.S. Army units landed on Shemya Island to begin construction of an airfield and, by the end of 1943, the United States had established bases on both Attu and Shemya.

In addition to the runway, between 1943 and 1944 the Army erected Quonset huts, numerous permanent buildings such as a large hospital (now demolished), warehouses, a recreation hall, four massive birchwood hangars, and defensive fortification, such as concrete bunkers and gun emplacements. At the end of 1943, the Aleutians ceased to be a combat theater and the Japanese made no further attempt to contest U.S. control of the island chain; the final bombing raid from the Aleutians was launched from Shemya in August 1945.

Between 1945 and the early 1950s, Shemya Island had only limited military importance, and activities and personnel at the base were reduced. No new facilities were constructed on the island during that time, and its mission was primarily as a refueling stop for support and supply aircraft on the Great Circle Route between the Far East and North America. At that time the base was assigned to the Alaskan Air Command and operated by the 5021st Air Base Squadron. In 1954, following the Korean Armistice, the base at Shemya was deactivated and its facilities turned over to the Civil Aeronautics Authority. Subsequently, the facilities were leased to Northwest Orient Airlines, which used them for refueling commercial aircraft until 1961. The airlines constructed some additional facilities during that time, including 12 small dormitories, one of which remains (Building 527).

In 1958, Shemya Island was reactivated as an Air Force installation and assigned to the 5040th Air Base Squadron. Between 1958 and 1972, many additional Cold War military facilities were constructed, including a large dormitory, a mess hall, a chapel, maintenance shops, a radar, and three antennas. White Alice Communications System facilities were constructed on both Shemya and Adak in the 1960s; however, the Shemya facility was demolished in the late 1970s and replaced by a phased array radar (designated COBRA DANE), which became operational in 1977.

In 1993, Shemya Air Force Base was redesignated Eareckson Air Force Station. In 1994, as a result of downsizing, the Air Force Station was further redesignated an Air Station.

An inventory of historic buildings and structures was conducted by Argonne National Laboratory in 1996. Although numerous World War II and Cold War features are extant, the only facility from these periods at

Eareckson AS determined to be significant is the COBRA DANE radar. Plans to modify existing facilities to support NMD activities (section 2.4.4.1) do not include modification of the COBRA DANE radar; however, construction of the new XBR would be in the vicinity of this property.

Native Populations/Traditional Resources

Eareckson AS is located within the traditional territory of the Aleut. Nine archaeological sites have been recorded on Shemya Island; however, none have been determined to be Alaska Native traditional cultural properties.

The regional Alaska Native group with which Eareckson AS typically consults is the Aleut Corporation.

Paleontological Resources

The surface of Shemya Island is typical of hummocky glaciated terrain and tundra regions. A veneer of past or mid-Wisconsin (10,000 to 25,000 years ago) unconsolidated sediments cover the raised wave-cut platform of the island, and a thin layer of outwash sand and ground moraine till are observed in low areas. Active and stable sand dunes are along the entire south shore of the island with accumulation of up to 15 meters (50 feet) (U.S. Department of the Air Force, undated—EA Shemya Borrow Pit and Rock Quarry Plan). Knee-high tundra grass covers most of the island (Morrisette, 1988—Shemya).

There have been no paleontological sites reported on Shemya Island; however, given the physiographic setting, fossils are possible.

3.5.1.3 Eielson AFB—Cultural Resources

Prehistoric and Historic Archaeological Resources

For general archaeological information about Interior Alaska, see section 3.5.1.

Archaeological evidence indicates that the Eielson AFB area has been occupied for at least 9,000 years, and likely (based on sites dated in the Nenana and Upper Tanana Valleys) for 12,000 years. Despite this antiquity, the density of archaeological sites within this region is very low. This is possibly a function of limited subsistence resources in the area and/or a historically low density population (Northern Land Use Research, Inc. 1996—Archaeological Survey Eielson AFB).

Between May and August of 1996, a systematic cultural resources survey of three large areas (designated survey areas A through C) was conducted at Eielson AFB. The three areas were based on a predictive

model developed for the installation in 1994 (Northern Land Use Research, Inc., 1994—Predictive Model for Discovery of Cultural Resources). One hundred percent visual survey accompanied by soil probes and shovel tests covered the three areas (approximately 5,459 acres). Although archaeological sites have been recorded from adjacent lands on Fort Wainwright, no significant prehistoric or historic sites were discovered within any of the survey areas on Eielson AFB, and no further studies are recommended. If significant resources are present, it is believed that their discovery will be inadvertent through erosion and/or exposure of deeply buried sites through construction projects (Northern Land Use Research Inc., 1996—Archaeological Survey Eielson AFB, Management Summary). One paleontological site was investigated and is described below.

A number of cultural features associated with recent military activities, trapping, and hunting were identified during the survey. Ten features and 54 isolated objects were identified within Survey area A (e.g., a hunting stand and can scatter); 16 features and 96 isolated objects were identified within Survey area B (e.g., a collapsed cabin, can dumps, and a wooden sign); and 28 features and 77 isolated objects were identified within Survey area C (e.g., bunkers, foxholes, lean-tos, and collapsed cabins). All of the features or isolates noted during the survey were determined to be of little or no significance, and most (e.g., the cabins) retained no integrity. Detailed information about the survey and the predictive model can be found in the reports prepared by Northern Land Use Research, Inc. (1994—Predictive Model for the Discovery of Cultural Resources; 1996—Archaeological Survey Eielson AFB; Management Summary).

The NMD ROI for Eielson AFB is currently unspecified. Ground disturbance associated with construction of facilities or utilities could occur anywhere within the boundary of the installation.

Historic Buildings and Structures

The area now known as Eielson AFB lies adjacent to two transportation and communication routes significant to the development of Alaska—the Washington–Alaska Military Cable Telegraph System and the historic trail connecting Valdez and Fairbanks (see section 3.5.1). Thus, Euroamerican use of the area in both historic and recent times is likely. Features associated with this usage would include cabins, fur-bearer traps, wood-cutting lots, dog yards/pens, garden plots, etc. (Northern Land Use Research, Inc., 1996—Archaeological Survey Eielson AFB).

In June 1943, the Western Defense Command authorized construction of an airfield at Mile 16 on the Richardson Highway. Named "26 Mile Field," the new airfield was a satellite to Ladd Field (now Fort Wainwright) to receive excess Soviet Lend-Lease aircraft. Consisting of a

2,019-meter (6,625-foot) runway and a birchwood hangar, the field was underutilized between 1943 and 1944 and was placed in caretaker status in June 1945 (U.S. Army Corps of Engineers, 1995—Historic Building Survey).

In 1946, military planners decided that a strategic bomber base was needed in Interior Alaska, and "26 Mile Field" was reactivated. The runway was extended to 4,426 meters (14,520 feet), and buildings were constructed to house the planes on a rotational basis. In 1947, the 59th Reconnaissance Squadron was placed at the installation for a variety of missions, including weather reconnaissance. By 1948, the installation had been renamed Eielson AFB in honor of famed Arctic aviation pioneer Carl Ben Eielson and, throughout the 1950s, supported rotational Strategic Air Command forward-based bombers and tankers. There was also a major base expansion during this period with the construction of several new permanent facilities, including the central heat plant, ammunition storage igloos, taxiways, hydrant fueling systems, roads, and a hangar (Building 1140).

In 1961, Eielson AFB assumed all Interior Alaska Air Force duties with the transfer of Ladd AFB to the Army. During the 1970s, 0-2A forward air control aircraft were assigned to the installation to support Army missions. These aircraft departed in 1981 to allow for the arrival of the first A10s, and during that time additional construction was initiated. F-16s were assigned to the base in 1991, and the Pacific Air Force premier flying training exercises (COPE THUNDER) relocated to Eielson from Clark Air Base in the Philippines in 1992.

Currently, the 354th Fighter Wing flies F-16C and D Falcons and A-10 and OA-10 Thunderbolt I's and operates COPE THUNDER and three ranges. The 168th Air Refueling Wing utilizes KC-135Rs.

No historic buildings/structures have been identified on Eielson AFB; however, several have been identified as possibly historic during the ongoing Historic Building Inventory being worked with the SHPO. The Alaska SHPO has indicated that Buildings 500 (FAI-608) and 1185 (FAI-609) may be eligible for listing in the NRHP. Building 500 was the home of the Atomic Energy Detection System from 1954 to 1977, and Building 1185 is a nose hangar constructed in 1946 for small- and medium-sized aircraft. Building 500 will be demolished in 1999, and Building 1185 was demolished in 1998 under a Memorandum of Agreement among the Council, the SHPO, and the base. The Alaska SHPO has also indicated interest in a cluster of eight buildings within the Eielson AFB cantonment that may represent a Cold War historic district (Buildings 1221, 1230, 3425, 4112, 4113, 4365, 3409, and 3411) (State of Alaska, Department of Natural Resources, 1998—Letter from Bittner, J., January 30). A final determination on the eligibility of these buildings has not yet been made.

Building 1120 (Nose Dock); Building 1140 (SAC hangar); Building 1306 (Intelligence Operations); and the WB-29 aircraft (Serial Number 44-62214), known as Lady in the Lake, are also under consideration.

Plans to modify existing facilities at Eielson AFB to support NMD activities are described in section 2.4.1.3. The Alaska SHPO has expressed interest in Building 3425 (a warehouse) as an element of a potential Cold War historic district; however, a formal determination on the eligibility of this building has not yet been made.

Native Populations/Traditional Resources

No Alaska Native traditional cultural properties have been formally identified within the Eielson AFB NMD ROI. Alaska Native villages situated at the mouths of the Chena and Salcha rivers probably included this area in their subsistence areas; however, no archaeological sites or traditional cultural properties have been recorded (Northern Land Use Research, Inc., 1996—Archaeological Survey Eielson AFB; 1996—Archaeological Survey Eielson AFB, Management Summary).

The Alaska Native group with which Eielson AFB typically consults is the Tanana Chief's Conference (Northern Land Use Research, Inc., 1996—Archaeological Survey Eielson AFB; 1996 Archaeological Survey Eielson AFB, Management Summary).

Paleontological Resources

Several paleontological sites have been discovered within the boundary of Eielson AFB. Most of the finds have been located in pits during the quarrying of gravel and include bones and teeth of moose, bison, and Woolly Mammoth. The remains of several unidentified species have also been located.

In addition, one known site was investigated during the 1996 archaeological survey conducted by Northern Land Use Research, Inc. (Northern Land Use Research, Inc., 1996—Archaeological Survey Eielson AFB; 1996—Archaeological Survey Eielson AFB, Management Summary). Located in the vicinity of Quarry Hill (within an Alyeska Pipeline Service roadcut), this site has an assigned a number from the State Office of History and Archaeology (XBD-164) and contains the remains of a mammoth. Stratigraphic samples taken during the 1996 survey indicate that the base of the site dates to greater than 51,000 radiocarbon years ago (Northern Land Use Research, 1996—Archaeological Survey Eielson AFB).

Although site XBD-164 was the only paleontological site noted during the 1996 cultural resources survey of Eielson AFB, fossil remains of Ice-Age mammals such as horse, bison, or mammoth may be located in a variety of locales on the base (e.g., along the lower slopes and valley bottoms).

These areas hold potential for paleontological finds, which tend to be distributed randomly in organic rich and ice-rich sedimentary deposits (Northern Land Use Research 1996—Archaeological Survey Eielson AFB; 1996—Archaeological Survey Eielson AFB, Management Summary).

3.5.1.4 Fort Greely—Cultural Resources

Resources Prehistoric and Historic Archaeological Resources

For general archaeological information about Interior Alaska, see section 3.5.1.

Archaeological evidence indicates that the Fort Greely area has been occupied for between 10,000 and 12,000 years. Sites associated with the prehistoric era contain materials typical of those recorded from other sites within Interior Alaska (e.g., projectile points, cores, and tools for preparing animal skins and food).

Nine archaeological investigations have been conducted at Fort Greely. Six of the surveys were small clearance surveys within the cantonment; three were extensive investigations scattered throughout the training ranges. From these investigations, 84 prehistoric archaeological sites have been identified, all of which are located in one of three types of physiographic settings: on a high ridge, hill, or knoll; on a bluff or terrace overlooking a major river or site drainage; or on a lake margin. Sites are found in every vegetative community and predominantly west of the Delta River. Most of the sites are surface flake scatters, isolated artifacts, or are found in a disturbed context and contain insufficient information to determine site function, affiliation, or age. The remainder are largely associated with the Northern Archaic Tradition, although materials from earlier time periods have also been identified.

Fifteen of the identified archaeological sites have been found to be eligible for inclusion in the NRHP, including three individual sites and an archaeological district containing twelve sites (the Donnelly Ridge Archaeological District, located approximately 32 kilometers [20 miles] southeast of the NMD ROI) (U.S. Department of the Interior and U.S. Department of Defense, 1994—Fort Greely Proposed Resource Management Plan, Final EIS). Thirty-four sites have been determined to be not eligible for inclusion in the NRHP; the remaining sites on the installation require additional evaluation (U.S. Army Corps of Engineers, 1986—Historic Preservation Plan for U.S. Army Lands in Alaska).

In 1997, a survey of the BRAC cantonment area (including the runway area) was conducted by the Bureau of Land Management and the Corps of Engineers, Alaska District (Reynolds, 1998—Archaeological Site Report, Fort Greely Cantonment Area). Due to a lack of subsurface artifacts, the area was cleared of cultural resources concerns.

Detailed information about the prehistoric and historic sites at Fort Greely can be found in the *Historic Preservation Plan for U.S. Army Lands in Alaska* (U.S. Army Corps of Engineers, 1986), as well as the numerous survey reports cited within.

The currently defined NMD ROI for Fort Greely includes the 243-hectare (600-acre) GBI construction site and any other areas where ground disturbance could occur (e.g., utility corridors, roads, or runway modifications). This area is a large, essentially flat parcel, heavily disturbed in portions from past and present training missions. It is situated just south of the cantonment and approximately 1.6 kilometers (1 mile) from the nearest surface water. A review of the Alaska SHPO's archaeological database (conducted through the Fort Richardson data set) indicates that there are no recorded sites within the ROI; and that because of the degree of disturbance to the area and the physiographic setting within which the GBI ROI occurs, the potential for archaeological materials is considered low. However, to confirm this assumption, consultation with the SHPO determined that additional survey would be required. As such, an archaeological survey of the Fort Greely ROI was undertaken in August 1999. Results indicate that despite an extensive and intensive level of survey coverage and the use of subsurface archaeological testing methods considered appropriate and reasonable, evidence of prehistoric or non-military historic land use by Athapaskans or Euro-Americans was not found (Northern Land Use Research, Inc., 1999—Draft Cultural Resource Survey: Fort Greely and Yukon Training Area). Recent use sites (i.e., less than 50 years in age) are associated with contemporary hunters, trappers, and the military. None of these display sufficient significance or integrity to be considered eligible for listing in the NRHP. SHPO concurrence is pending.

Historic Buildings and Structures

Fort Greely originated as Station 17, Alaskan Wing, Air Transport Command in 1942. During World War II, the installation served as a rest and refueling stop for American pilots on their way to Ladd Army Airfield (now Fort Wainwright) to transport air freight and Lend-Lease planes to Russia (U.S. Army Alaska, 1997—Draft Integrated Natural Resource Management Plan).

In 1945, the installation was put on inactive status, but by 1948 had been reactivated for "Exercise Yukon," one of the first post-war cold weather maneuvers. in 1949, the installation became the site of the Arctic Training Center, because of its combination of extreme winter conditions and varied terrain (rivers, lakes, swamps, open plains) (U.S. Army Alaska, 1997—Draft Integrated Natural Resource Management Plan).

The Army Chemical Corps Arctic Test Team was established in 1950, and the post was renamed the Army Arctic Center in 1952. Construction began on permanent buildings to support cold weather testing and training (in the area now known as the Main Post) in 1953, and the installation had been renamed Fort Greely by 1955. Facilities constructed during that period included new housing, warehouses, and the military's first nuclear power plant (Office of History and Archaeology, 1998—Draft Integrated Cultural Resources Management Plan, Fort Wainwright).

In 1957, the Soviet Union successfully tested its first intercontinental ballistic missile. Antiaircraft defenses could not defend against such a weapon, and identifying and tracking missiles became a major component of the Air Force's mission. In 1959, a Missile Identification, Detection, and Alarm System was constructed at Donnelly Flats on Fort Greely. However, after 2 years of operation, the system was replaced by the Ballistic Missile Early Warning System station south of Fairbanks (Clear AFS), and the Missile Identification, Detection, and Alarm System was dismantled (Office of History and Archaeology, 1998—Draft Integrated Cultural Resources Management Plan, Fort Wainwright).

In 1963, elements of the Arctic Training Center were redesignated as the Northern Warfare Training Center with the mission of training units in the conduct of warfare in northern areas of operation. This center also became involved in emergency rescues and investigations across Alaska (e.g., climbing and aircraft accidents) (Charles M. Mobley & Associates, 1998—Historic Overview and Architectural Inventory of Fort Greely).

When the U.S. Army, Alaska, was restructured in 1974, Fort Greely became part of the 172nd Infantry Brigade, which was in turn replaced by the reactivated 6th Infantry Division (Light) in 1986. The 6th Infantry Division, which was deactivated in Korea following distinguished service in two world wars, was recalled as a specialized Arctic/mountain light contingency force under U.S. Army Pacific, with headquarters at Fort Richardson, where it remained until transferred to Fort Wainwright in 1990. In 1994, the 1st Infantry Brigade, 6th Infantry Division (Light), Headquarters, U.S. Army, Alaska became the active Army component at Fort Richardson.

As a result of archaeological investigations, three historic sites and a historic trail have been identified at Fort Greely—all are west of the Delta River. Sullivan Roadhouse on the Delta Creek (at the western edge of the Oklahoma Impact Area) is listed on the NRHP and a cabin, which dates from a molybdenum mining operation begun in 1914, is eligible. Gordon's Roadhouse, which is situated between Delta River and Delta Creek, is in ruins—it and the Sullivan Roadhouse were on the Washburn-Donnely winter sled trail, an alternate part of the Valdez–Fairbanks route established in the 1910s (U.S. Department of the Interior and U.S.

Department of Defense, 1994—Fort Greely Proposed Resource Management Plan, Final EIS).

In addition, a Historical Overview and Architectural Inventory of Fort Greely was completed in 1998 (Charles M. Mobley & Associates, 1998—Historic Overview and Architectural Inventory of Fort Greely). The study considered numerous buildings at Fort Greely associated with the World War II and Cold War historic contexts. Review of the study by the Alaska SHPO and subsequent consultation between the Army and the SHPO indicates that there are 26 buildings and structures eligible for listing in the National Register. Forming a National Register District, the buildings are: Buildings 501, 503, 504, 601, 602, 603, 605, 606, 608, 609, 610, 612, 614, 615, 650, 652, 653, 655, 656, 658, 659, 660, 661, 662, 663, and 675. A Memorandum of Agreement between the Army and the Alaska SHPO regarding these buildings has been drafted. The Memorandum of Agreement stipulates that all of the buildings within the district "may be altered, demolished, leased with no restrictions, or transferred out of federal ownership with no restrictions" following completion of Historic American Buildings Survey (HABS) Level 1 recordation. In accordance with the Memorandum of Agreement, completion of draft recordation documents (i.e., photographs, narrative, drawings) is scheduled for December 31, 2000.

The currently defined Fort Greely NMD ROI includes the area of the runway modification and a large open parcel south of the cantonment, which is heavily disturbed from past and present training missions and a number of buildings that require modification. Twenty of the buildings requiring modification have been determined eligible for listing in the National Register. These are: Buildings 503, 504, 601, 605, 608, 609, 610, 612, 615, 650, 652, 653, 655, 656, 659, 660, 661, 662, 663, and 675.

Native Populations/Traditional Resources

Fort Greely encompasses lands historically and prehistorically occupied by the Tanana Indians. Salcha Natives used the Delta River and Delta Creek for subsistence hunting in historic times; however, this generally ceased by the 1920s. By 1945, the natives had virtually abandoned Salcha, and by 1962, there were no native settlements in the Tanana Valley between Healy Lake and Nenana (U.S. Army Alaska, 1997—Draft Integrated Natural Resource Management Plan).

No Alaska Native traditional cultural properties have been formally identified within the NMD ROI. In addition, there are no Alaska Native reservations or villages in the immediate vicinity of Fort Greely. Tanana is the closest Alaska Native village, approximately 130 kilometers (80 miles) east of Fort Greely.

The Alaska Native group with which Fort Greely typically consults is the Tanana Chief's Conference (Johnson, 1998—Personal communication, August).

Paleontological Resources

The NMD ROI at Fort Greely is situated within an alluvial fan, characterized by glacial till; portions of the ROI are also underlain by permafrost. Although the bones of Ice Age mammals have been found elsewhere on the installation (bison bones associated with site XMH-297), no paleontological remains have been encountered within the NMD ROI.

3.5.1.5 Yukon Training Area (Fort Wainwright)—Cultural Resources

Prehistoric and Historic Archaeological Resources

For general archaeological information about Interior Alaska, see section 3.5.1.

Since 1973, there have been eight archaeological investigations conducted for Fort Wainwright and a total of 67 prehistoric and historic sites recorded; most of the prehistoric artifacts consist of lithic debris and bone fragments—most of the historic sites consist of buildings or groups of buildings (U.S. Army Corps of Engineers, 1986—Historic Preservation Plan for U.S. Army Lands in Alaska). Of the 8 surveys, 1 extensive survey was focused on the Yukon Training Area where 10 prehistoric archaeological sites were identified (Holmes, 1979—Report of Archaeological Reconnaissance; U.S. Army Corps of Engineers, 1997—EA BRAC 95 Realignment of Personnel and Military Functions to Fort Wainwright). Seven of the sites consist of isolates or a small number of artifacts in a disturbed context and require no further assessment. Three sites merit additional work, including Site FAI 157, which is near the NMD ROI. In addition, a large-scale survey was also conducted by the University of Alaska–Fairbanks in 1980; this survey resulted in the preparation of maps indicating low, medium, and high potential areas for both prehistoric and historic sites (U.S. Army Corps of Engineers, 1986—Historic Preservation Plan for U.S. Army Lands in Alaska).

Holmes' survey of the Yukon Training Area encompassed the NMD ROI. Records indicate that no sites were located within the ROI; however, consultation with the SHPO determined that additional survey would be required to ensure that no archaeological sites are impacted by NMD activities. As such, an archaeological survey of the Yukon Training Area ROI was undertaken concurrent with the survey performed at Fort Greely in August 1999. Results indicate that despite an extensive and intensive level of survey coverage and the use of subsurface archaeological testing methods considered appropriate and reasonable, evidence of prehistoric or non-military historic land use by Athapaskans or Euro-Americans was not found (Northern Land Use Research, Inc., 1999—Draft Cultural

Resource Survey: Fort Greely and Yukon Training Area). Recent use sites (i.e., less than 50 years in age) are associated with contemporary hunters, trappers, and the military. None of these display sufficient significance or integrity to be considered eligible for listing in the NRHP. SHPO concurrence is pending.

In addition, one site is located approximately 262 meters (860 feet) west of the westernmost boundary of the ROI. At the time of recordation, the site (site FAI 157) contained one coarse grained beige chert flake and the medial segment of an obsidian microblade. Additional studies to determine the extent of the site have not been undertaken; however, Holmes recommended that follow-on studies be conducted if future activities in the area posed a potential threat to the site (Holmes, 1979—Report of Archaeological Reconnaissance; U.S. Army Corps of Engineers, 1986—Historic Preservation Plan for U.S. Army Land in Alaska).

Historic Buildings and Structures

The currently defined NMD ROI is a large parcel within Yukon Training Area 2 and approximately 0.8 kilometer (0.5 mile) east of the Small Arms Impact Area (see section 2.4.1.3). With the exception of a few recent use log features (Northern Land Use Research, Inc., 1999—Draft Cultural Resource Survey: Fort Greely and Yukon Training Area), the entirety of the ROI is heavily wooded and devoid of standing buildings and structures. Plans to modify existing facilities to support this location would likely involve buildings or structures located on Eielson AFB (see section 3.5.1.3).

Native Populations/Traditional Resources

No Alaska Native traditional cultural properties have been formally identified within the Fort Wainwright NMD ROI. Alaska Native villages situated at the mouths of the Chena and Salcha rivers probably included the Yukon Training Area in their subsistence areas; however, only 10 archaeological sites have been recorded within this area, none of which have been determined to be traditional cultural properties (U.S. Department of the Interior and U.S. Department of Defense, 1994—Fort Greely Proposed Resource Management Plan, Final EIS; U.S. Army Corps of Engineers, 1997—EA BRAC 95 Realignment of Personnel and Military Functions to Fort Wainwright).

The Alaska Native group with which Fort Wainwright typically consults is the Tanana Chief's Conference (Office of History and Archaeology, 1998—Draft Integrated Cultural Resource Management Plan; Johnson, 1998—Personal communication, August).

Paleontological Resources

Although there is reason to believe that paleontological resources may exist within the Yukon Training Area (most likely buried in creek bottoms), none have been found (U.S. Department of the Interior and U.S. Department of Defense, 1994—Fort Greely Proposed Resource Management Plan, Final EIS). Paleontological resources have been recorded within the adjacent lands of Eielson AFB (see section 3.5.1.3).

3.5.1.6 Alaska—Fiber Optic Cable Line—Cultural Resources

Prehistoric and Historic Archaeological Resources

For general archaeological information about the Aleutian Archipelago, see section 3.5.1.

Whittier/Seward ROI

The fiber optic cable line would begin from a terminal building in either Whittier or Seward. The cable would be routed along existing commercial fiber optic corridor; however, the exact route has not, as yet, been determined, and the presence or absence of archaeological sites is not currently known.

Kodiak ROI

The fiber optic cable line would make landfall on Kodiak Island, north of the town of Monashka Bay. A 457-meter (1,500-foot) length of cable would tie to the existing utility corridor; however, the exact route has not, as yet, been determined, and the presence or absence of archaeological sites is not currently known.

Umnak ROI (Cable Line and Terminal Structure)

The fiber optic cable line would cross Umnak Island from south to north. The route of the cable would be along an existing dirt track. In addition, a small terminal structure would be constructed on Umnak. The exact route of the cable and the location of the terminal structure has not, as yet, been determined, and the presence or absence of archaeological sites is not currently known.

Shemya ROI

The fiber optic cable line will make landfall near the southeast end of Shemya Island. There is one archaeological site within this area (SH-5). The site was that of a midden; however, it has been completely destroyed by extensive construction and operational use on the island.

Historic Buildings and Structures

The fiber optic cable line will be constructed within an underground/underwater utility corridor; construction is not expected to affect any existing buildings or structures.

Native Populations/Traditional Resources

Information related to the native populations and traditional resources within the region traversed by the fiber optic cable line route would be as described in section 3.5.1 and 3.5.1.2.

Paleontological Resources

Information related to the paleontology in the region traversed by the fiber optic cable line route would be as described in section 3.5.1.

3.5.2 NORTH DAKOTA INSTALLATIONS

A brief culture history is included here to provide a context for the types of cultural resources known to exist or that have the potential to occur within any ROI for cultural resources in North Dakota.

Paleoindian (9,500 to 5,500 B.C.)

People lived in northwestern North Dakota before the end of the last Ice Age. People of the Paleoindian period are associated with long fluted points that were mounted on the ends of spears. Paleoindian finds are rare in eastern North Dakota. They are less rare in parts of the state where intact early Holocene land surfaces lie closer to the surface, such as the Unglaciated Missouri Plateau. (Grand Forks AFB, 1997—Cultural Resources Management Plan)

Plains Archaic (5,500 to 400 B.C.)

The Early Archaic is not well understood in North America, largely due to a paucity of sites. The Archaic in North Dakota seems to be characterized by regionalization of projectile point styles, and less apparent interaction between populations in different archaeological areas. (Grand Forks AFB, 1997—Cultural Resources Management Plan)

Woodland Period (400 B.C. to A.D. 1600)

The advent of the Woodland Period in North Dakota is marked by the appearance of ceramics and mound burials. The advent of pottery in North America is generally correlated with increased processing of plant foods, and often accompanies the use of domesticated plants. (Grand Forks AFB, 1997—Cultural Resources Management Plan)

Plains Village Period (A.D. 1000 to 1780)

Plains Village people were semi-sedentary, and constructed permanent dwellings in villages. The Plains village tradition was a combination hunter-gatherer-gardener subsistence practice. Bison hunting, maize horticulture, and wild plant collection all complemented each other during the appropriate production times of the year. The production of a surplus of maize is considered to have allowed for the establishment of more permanent communities by these groups in earthlodge villages. (Grand Forks AFB, 1997—Cultural Resources Management Plan)

Equestrian (A.D. 1600 to 1860)

The Equestrian Period marks the introduction of the horse and the gun to the Northern Plains in the protohistoric and early historic times. (Grand Forks AFB, 1997—Cultural Resources Management Plan)

The first trading post in North Dakota was established on the Knife River between the Native American Mandan and Hidatsa villages by Rene Jusseaume in 1794. Other trading posts were established near Pembina and on the Turtle River. (Grand Forks AFB, 1997—Cultural Resources Management Plan)

North Dakota became a part of the United States after the Louisiana Purchase in 1803, and was visited by Lewis and Clark the same year. North Dakota was a part of a succession of different territories until 1861 when the Dakota territory was established, encompassing what is now North and South Dakota, Montana, and Wyoming. (Grand Forks AFB, 1997—Cultural Resources Management Plan)

In 1812, an agricultural colony of Scots and Irish at the confluence of the Red and Assiniboine Rivers was founded. Insufficient provisions the first winter forced the colonists south to Pembina, where vast herds of buffalo could ensure their survival. Although many people returned north in the spring, Pembina became an important alternative settlement for both whites and Metis, the children of white fathers and Indian mothers. (Grand Forks AFB, 1997—Cultural Resources Management Plan)

The Metis at Pembina had long built sturdy wooden carts, with wheels wrapped in buffalo rawhide. Transportation in these Red River carts was much less expensive than moving goods by water through Hudson's Bay. Each spring long trains of these carts left Pembina for the journey to St. Paul, carrying valuable furs and other goods that meant wealth for St. Paul businessmen. This form of transportation grew in importance and lasted until the late 1860s and 1870s, when it was superseded by river steamboats and the railroad. (Grand Forks AFB, 1997—Cultural Resources Management Plan)

A network of forts was established across the territory during the 1850s, 60s, and 70s. These forts were designed to protect trading posts from attacks by Native American groups, and succeeded in drawing more white settlers to the region. However, tensions between these two groups erupted into a series of wars in 1862, ending when Sitting Bull surrendered in 1881. (Grand Forks AFB, 1997—Cultural Resources Management Plan)

Agricultural Expansion and the Cold War (A.D. 1860 to 1989)

The prairies and climate of North Dakota were ideal for the production of cereal crops, including oats, barley, rye, and wheat. The land was immensely productive and has remained so to the present. The wide prairies and sparse population encouraged military planners to regard the region as ideal for a new purpose (U.S. Army Space and Strategic Defense Command, 1995—Draft, SRMSC Historic Preservation Plan).

In 1954, as Cold War tension between the United States and the Soviet Union escalated, the DOD announced plans to build-up, or newly construct, six military installations within the uppermost northern tier of the middle United States. All of the installations were designed to support an alert fighter-interceptor squadron and a complement of support personnel and facilities. (Grand Forks AFB, 1997—Cultural Resources Management Plan)

In 1962 North Dakota was chosen as a deployment area for nuclear weapons systems, and by 1965 Minuteman intercontinental ballistic missiles had been installed. In 1975 the SRMSC was completed to safeguard the existing Minuteman missiles.

Native Populations/Traditional Resources

The five Native American groups that may have an association with traditional resources which may be located within the North Dakota ROI include: the three affiliated tribes of the Mandan, Hidatsa, and Arikara, The Spirit Lake Tribe, The Trenton Indian Service Area, The Turtle Mountain Band of Chippewa Indians, and the Standing Rock Sioux Tribe (North Dakota Indian Affairs Commission, 1998—Statewide Indian Program Directory).

Paleontological Resources

The surface geology of northeastern North Dakota consists primarily of relatively recent sediments associated with Wisconsin Glaciation (80,000 to 205,000 years B.P.) (Eardley, 1962—Structural Geology of North America; Thornsbury, 1965—Regional Geomorphology of the United States). These sediments include silts and gravels of late Tertiary age, which are generally not associated with the older deposits located in western North Dakota that commonly yield paleontological resources

(Eardley, 1962—Structural Geology of North America; Thornsbury, 1965—Regional Geomorphology of the United States).

3.5.2.1 Cavalier AFS—Cultural Resources

This section describes the cultural resources for the affected base property at Cavalier AFS. The ROI for cultural resources includes the Perimeter Acquisition Radar building and the complex of associated Cold War-era buildings as well as the 4 hectares (10 acres) at the site that could be affected by XBR construction activities.

Prehistoric and Historic Archaeological Resources

General background of archaeological resources in northeast North Dakota is provided in section 3.5.2. A cultural resources survey of Cavalier AFS was prepared for the U.S. Air Force Space Command in 1991. Neither the literature search conducted before the survey nor the actual field reconnaissance located any archaeological sites within the ROI or within the boundaries of Cavalier AFS (HQ SPACECOM, 1991—Draft Cultural Resource Survey of the Cavalier AFS). Therefore, no potentially eligible, eligible, or listed archaeological resources are located within the ROI for Cavalier AFS. The North Dakota SHPO has concurred with these findings (Peterson AFB, 1992—Draft EA of the Transition of Cavalier AFS to the Army).

Historic Buildings and Structures

The SRMSC was designed to protect the Minuteman ICBM fields against a Sino-Soviet ballistic missile attack (U.S. Army Space and Strategic Defense Command, 1992—Historic Context for Properties Located on the SRMSC). Completed in 1975, the various components of the SRMSC are located at five of the proposed NMD deployment locations in North Dakota. These components include Cavalier AFS, the Missile Site Radar, and Remote Sprint Launch Sites 1, 2, and 4.

Operation of the SRMSC was terminated after the ratification of the Strategic Arms Limitation Treaty of 1976 (U.S. Army Space and Strategic Defense Command, 1995—Draft SRMSC Historic Preservation Plan). Much of the SRMSC is considered eligible for listing in the NRHP because it was instrumental in obtaining Soviet agreement to the Anti Ballistic Missile Treaty and as a part of the United States' heritage as a unique and highly technical Cold War facility (Greenwood, 1999—Comments received by EDAW, Inc., regarding the NMD Deployment Coordinating Draft DEIS). The U.S. Army Space and Missile Defense Command has completed a Historic American Engineering Record (HAER) of all SRMSC facilities that are NRHP-eligible. HAER documentation includes a photographic, architectural, and historical recordation preserved in an archival form and typically serves as a mitigation for unavoidable impacts to historic buildings and structures. The National

Park Service has approved the SRMSC HAER documentation (Greenwood, 1999—Comments received by EDAW, Inc., regarding the NMD Deployment Coordinating Draft DEIS).

The facilities that compose the Cavalier AFS were constructed as a single component of the SRMSC. The function of the Cavalier AFS was to detect and track incoming ballistic missiles and transfer the acquisition information to the Missile Site Radar when the incoming missile was within a range and altitude suitable for an intercept attempt (U.S. Army Space and Strategic Defense Command, 1992—Historical Context for Properties Located on the SRMSC). While the SRMSC became inactive in 1975, the Perimeter Acquisition Radar has remained operational. The Perimeter Acquisition Radar and some of its associated support structures and infrastructure are eligible as part of the SRMSC.

Native Populations/Traditional Resources

See section 3.5.2 for a discussion of the traditional resources within the Cavalier AFS ROI.

Paleontological Resources

See section 3.5.2 for a discussion of the paleontological resources within the Cavalier AFS ROI.

3.5.2.2 Grand Forks AFB—Cultural Resources

This section describes the cultural resources for the affected base property at Grand Forks. The ROI for cultural resources includes the areas encompassed by the two proposed GBI sites within Grand Forks AFB, the area encompassed by the construction of the BMC2, and the corridor encompassed by the installation of the utility corridor.

Prehistoric and Historic Archaeological Resources

General background of archaeological resources in northeast North Dakota is provided in section 3.5.2. Two archaeological surveys have been conducted on Grand Forks AFB. The first of these surveys was conducted in 1989 and encompassed a 147-hectare (364-acre) portion of the base for the proposed Peace Keeper Rail Garrison Program. The second included a literature search and intensive survey of 299 hectares (740) acres. The latter survey was conducted for the purpose of identifying any archaeological resources located on the entire base. This survey established high, medium, and low probability zones for archaeological resources. Neither of these surveys located any archaeological sites that were considered potentially eligible for listing on the NRHP (Grand Forks AFB, 1997—Cultural Resources Management Plan). Therefore, no potentially eligible, eligible, or listed archaeological resources are located within the ROI for Grand Forks AFB.

Historic Buildings and Structures

Discussions with the North Dakota SHPO continues on all Cold War facilities in light of emerging Air Force guidance and increased DOD personnel and SHPO cognizance. However, the Air Force has prepared an Inventory of Cold War Properties for Grand Forks AFB (U.S. Air Force, 1996—Grand Forks AFB, Inventory of Cold War Properties). These inventoried Cold War-era resources are historically associated with both Air Defense Command/Tactical Air Command and Strategic Air Command missions. Twenty-seven buildings and structures located at Grand Forks AFB were inventoried. Most of the inventoried Cold War-era buildings and structures at Grand Forks AFB have been substantially altered and were determined to be ineligible for listing on the NRHP. Only building 714, a missile system surveillance and inspection facility, is considered potentially eligible for listing on the NRHP under criteria consideration G as a structure less than 50 years in age of exceptional significance. However, SHPO concurrence on the Cold War evaluation at Grand Forks AFB is pending.

Native Populations/Traditional Resources

See section 3.5.2 for a discussion of the traditional resources within the Grand Forks AFB ROI.

Paleontological Resources

See section 3.5.2 for a discussion of the paleontological resources within the Grand Forks AFB ROI.

3.5.2.3 Missile Site Radar—Cultural Resources

This section describes the cultural resources for the affected base property at Missile Site Radar. The ROI for cultural resources includes the area encompassed by the proposed GBI site within the Missile Site Radar complex; the area encompassed by the construction of the BMC2; the site that could be affected by the XBR construction activities; as well as the actual Missile Site Radar and the complex of associated Cold War-era structures.

Prehistoric and Historic Archaeological Resources

General background of archaeological resource in northeast North Dakota is provided in section 3.5.2. No archaeological survey has been undertaken at the Missile Site Radar. The Missile Site Radar is not within an area viewed as a high-density zone for archaeological resources, such as areas adjacent to streambanks, river terraces, or vertical changes in topography. Because the area within the facility security fence and right-of-way areas have been extensively disturbed and modified over the years, the likelihood of intact archaeological resources in the immediate

area is negligible (U.S. Department of the Air Force, 1999—Final EIS Minuteman III Missile System Dismantlement).

Historic Resources and Structures

The facilities which compose the Missile Site Radar were constructed as a single component of the SRMSC. See section 3.5.2.1 for a discussion of the SRMSC. The function of the Missile Site Radar was to locate and track incoming ballistic missiles, providing intercept trajectories, and launching and guiding Sprint and Spartan intercept missiles (U.S. Army Space and Strategic Defense Command, 1992—Historic Context for Properties Located on the SRMSC). The tactical areas of the Missile Site Radar have been determined to be eligible for listing in the NRHP (Greenwood, 1999—Comments received by EDAW, Inc., regarding the NMD Deployment Coordinating Draft DEIS).

Native Populations/Traditional Resources

See section 3.5.2 for a discussion of the traditional resources within the Missile Site Radar ROI.

Paleontological Resources

See section 3.5.2 for a discussion of the paleontological resources within the Missile Site Radar ROI.

3.5.2.4 Remote Sprint Launch Site 1—Cultural Resources

This section describes cultural resources for the base property and the surrounding areas of Remote Sprint Launch Site 1. The ROI for cultural resources encompasses approximately 17 hectares (41 acres) of disturbed land entirely within the current launch site that could be affected by the construction and deployment of XBR at Remote Sprint Launch Site 1.

Prehistoric and Historic Archaeological Resources

General background of archaeological resource in northeast North Dakota is provided in section 3.5.2. No archaeological survey has been undertaken at the Remote Sprint Launch Site 1. This site is not within an area viewed as a high-density zone for archaeological resources, such as areas adjacent to streambanks, river terraces, or vertical changes in topography. Because the area within the facility security fence and right-of-way areas have been extensively disturbed and modified over the years, the likelihood of intact archaeological resources in the immediate area is negligible (U.S. Department of the Air Force, 1999—Final EIS Minuteman III Missile System Dismantlement).

Historic Buildings and Structures

See section 3.5.2.1 for an overview of the SRMSC, including Remote Sprint Launch Site 1. Four Remote Sprint Launch Sites were originally constructed as part of the SRMSC. All of these sites and associated support structures and infrastructure have been determined to be eligible for listing in the NRHP (Greenwood, 1999—Comments received by EDAW, Inc., regarding the NMD Deployment Coordinating Draft DEIS). However, in accordance with a programmatic agreement with the North Dakota SHPO, only Remote Sprint Launch Site 3, the only Remote Sprint Launch site not located within the ROI, will be managed as a historic property (Greenwood, 1999—Comments received by EDAW, Inc., regarding the NMD Deployment Coordinating Draft DEIS).

Native Populations/Traditional Resources

See section 3.5.2 for a discussion of the traditional resources within the Remote Sprint Launch Site 1 ROI.

Paleontological Resources

See section 3.5.2 for a discussion of the paleontological resources within the Remote Sprint Launch Site 1 ROI.

3.5.2.5 Remote Sprint Launch Site 2—Cultural Resources

The ROI for cultural resources encompasses approximately 15 hectares (36 acres) of disturbed land entirely within the current launch site that could be affected by the construction and deployment of XBR at Remote Sprint Launch Site 2. The affected environment for cultural resources at this location is similar to that described for Remote Sprint Launch Site 1.

3.5.2.6 Remote Sprint Launch Site 4—Cultural Resources

This section describes cultural resources for the base property and the surrounding areas of Remote Sprint Launch Site 4. The ROI for cultural resources encompasses approximately 20 hectares (50 acres) of disturbed land entirely within the current launch site that could be affected by the construction and deployment of XBR at Remote Sprint Launch Site 4. The affected environment for this location is similar to that described for Remote Sprint Launch Site 1.

3.5.2.7 North Dakota—Fiber Optic Cable Line—Cultural Resources

The fiber optic cable line in North Dakota would follow existing road and utility alignments. The cultural complexity of the area would be the same as described above for the North Dakota region. Most of the cable route should be in areas that have been previously disturbed; however, the exact route of the cable and has not, as yet, been determined, and the presence or absence of archaeological sites is not currently known. Areas considered high-density zones for archaeological resources include streambanks, river terraces, or vertical changes in topography (U.S. Department of the Air Force, 1999—Final EIS Minuteman III Missile System Dismantlement).

3.6 GEOLOGY AND SOILS

Geology and soils include those aspects of the natural environment related to the earth, which may affect or be affected by the proposed NMD program. These features include physiography, geologic units and their structure, the presence/availability of mineral resources and related natural resources, soil condition and capabilities, and the potential for natural hazards. A natural hazard or geologic hazard is a phenomenon that presents a risk or potential danger to life and property, either naturally or by man-made means.

3.6.1 ALASKA INSTALLATIONS

3.6.1.1 Clear AFS—Geology and Soils

The ROI is the approximately 243-hectare (600-acre) GBI deployment area, associated support facilities, and adjacent area on Clear AFS. The GBI field and support structures may require the use of the Clear AFS infrastructure and existing facilities. Some of the NMD facilities could be located in the base construction camp. There are two proposed GBI alternatives at Clear AFS, one in the southern portion of the installation and the other in the northeast corner.

Physiography

Clear AFS is located in the Yukon Region of Interior Alaska on the southern margin of the Tanana–Kuskokwin Lowlands physiographic province, adjacent to the Northern Foothills province of the Alaska Range (U.S. Department of the Interior, 1997—Northern Inertie Project Draft EIS). The Lowlands can be characterized as a broad, relatively flat, sediment-filled depression formed by glacial meltwater outwash. Several rivers and streams originating in the Alaska Range and Northern Foothills flow northerly across the Lowlands to the Tanana River. These include the Nenana River, Totatlanika River, Tatlanika Creek, Wood River and their numerous tributaries (U.S. Department of the Interior, 1997—Northern Inertie Project Draft EIS). The Nenana River floodplain flanks the western edge of Clear AFS. A branch of the Nenana River (Lost Slough) forks near the west central border of Clear AFS and trends northeasterly across the northwest corner of the installation. Clear AFS is covered with many interlaced channels, terraces, and banks. Local topographic relief of these features generally ranges between 0.5 to 2.0 meters (2 to 7 feet) (Clear AS, 1996—Biodiversity Survey). Surface elevations are greatest at the southern Clear AFS boundary at approximately 198 meters (650 feet); however, the regional surface gradient is relatively mild at about 5 meters per kilometer (25 feet per mile) to the north (U.S. Geological Survey, 1950—Fairbanks, 15 Minute Quadrangle).

Geology

Much of the Fairbanks region is located within a large geologic province known as the Yukon–Tanana terrane. This a region of deformed and faulted metamorphic and igneous rocks of Precambrian to Mesozoic age (800 to 66 million years B.P.), overlain by younger sedimentary formations of Tertiary and Quaternary age (65 million years to present). The Yukon–Tanana terrane underlies much of Interior Alaska and encompasses three major physiographic provinces (Yukon–Tanana Upland, Tanana–Kuskokwin Lowland, and the Northern Foothills). For many years, the older metamorphic and igneous rocks in Interior Alaska were known collectively as the Birch Creek Schist. The Yukon–Tanana terrane is now recognized as a complex assemblage of many rock types with a very complicated geologic history. The area is cut by northeast-trending, high angle faults (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS).

The geology of Clear AFS has been influenced by the mountain building and glacial history of the Alaska Range to the south. The Alaska Range was uplifted during the late Pliocene (about 5 million years B.P.) and partially glaciated during the Late Pleistocene Epoch. Traces of six to eight glacial expansions have been noted before the last Glacial, which is dated to the late Wisconsin (25,000 to 9,500 years B.P.). Glacial advances ceased abruptly at the present escarpment of the Northern Foothills of the Alaskan Range (Northern Land Use Research, Inc., 1995—Cultural Resources Management Plan). The uplift of the Northern foothills, advance and retreat of the glaciers, and subsequent erosion by major drainages originating in the Alaska Range and foothills provided the source for major sedimentary deposition in the Tanana River Valley.

The sediments underlying the Clear AFS are derived from several sources: alluvial fans developed upon the Nenana gravel pediment (a gently sloping bedrock with low-relief covered with gravel and sand) at the mountain front; Pleistocene glacial outwash (cobbles, sand, and silt debris); Holocene alluvial sediments (mostly silt and sand) from the Nenana River; wind transported silt (loess) reworked from channel bars onto terraces; and Modern colluvium from water reworked loess (Northern Land Use Research, Inc., 1995—Cultural Resources Management Plan). The sedimentary wedge is heterogeneous but primarily composed of sandy gravel. The sandy gravel is poorly stratified with well to poorly graded course sand. The exact thickness is unknown but is estimated to exceed several hundred feet (Clear AS, 1998—Draft Solid Waste Management Plan).

Soils

Generally, soils at Clear AFS are predominately well drained sands and gravels overlain by a thin layer of silt. Silty soils generally occur in areas

dominated by deciduous forests. These soils vary from 0.9 meter (3 feet) to 1.8 meters (6 feet) deep and then a sandy gravel horizon varying from the 1.8-meter (6-foot) level to below 9 meters (30 feet). Areas dominated by spruce are generally covered by a peat layer 0.3 meter (1 foot) thick over a silt horizon that varies from 0.9 to 1.5 meters (3 to 5 feet) in depth. Under this horizon are horizons of sand, silt, and gravel combinations (Clear AS, 1996—Biodiversity Survey).

Silty soils of the station are generally well drained, although the drainage may be impeded in some areas by intermittent pockets of permafrost. Areas covered by the peat are more susceptible to permafrost, and drainage is poor. Permafrost may extend below 8 meters (25 feet) in these areas. The occurrence of permafrost at Clear AFS is discontinuous and comparable to Fairbanks and other areas in the Tanana Valley (Clear AS, 1996—Biodiversity Survey). Churn drill holes drilled in 1947 to depths of 12 to 15 meters (40 to 50 feet) show the presence of some permafrost; however, the permafrost is sporadic, and locations free of permafrost can be outlined by drilling (Clear AS, 1998—Draft Solid Waste Management Plan). Soils of the station have low erodibility. Erosion is minimized by vegetation and low annual precipitation (Clear AS, 1996—Biodiversity Survey).

Mineral Resources

Several former and potentially active gravel pits do exist on, or in close proximity to, Clear AFS. The quality, extent, and economic potential of the aggregate resources are unknown.

Geologic Hazards

Interior Alaska is periodically shaken by severe shocks. Several faults in the vicinity of Clear AFS are considered active, including the east-west trending Hines Creek and McKinley faults, which occur in the foothills to the south. Both are strands of the Denali Fault, one of the largest crustal breaks in Alaska (Bureau of Land Management, 1997—Northern Inertie Project Draft EIS). The Clear AFS lies in seismic zone 3 (Bureau of Land Management, 1997—Northern Inertie Project Draft EIS). Since 1904, there have been 12 earthquakes of magnitude 6.0 or higher within a 161-kilometer (100-mile) radius of Clear AFS (U.S. Geological Survey, 1993—Fact Sheet from the Largest Earthquakes in the United States) including a 1947 event, reported to be an 8+ on the Mercalli Scale, which was centered at Clear AFS (Bureau of Land Management, 1997—Northern Inertie Project Draft EIS). Recurrence of earthquakes of similar intensity is probable (Bureau of Land Management, 1997—Northern Inertie Project Draft EIS).

Clear AFS facilities might be subject to liquefaction conditions during a major earthquake. Wet sandy soils associated with alluvium of the

Nenana floodplain and its tributaries may be transformed to a liquefied state under extreme ground motion.

Permafrost, perennially frozen ground, is common throughout the region. The distribution of permafrost is sporadic and varies in occurrence, depth, and thickness depending on slope orientation, vegetation, landform, drainage, and soil type (Bureau of Land Management, 1997—Northern Inertie Project Draft EIS). Permafrost can also be a hazard when underlying proposed new facilities. New building structures can cause differential thawing of subsoils, resulting in loss of soil strength. Permafrost in fine-grained soils, such as loess, can be more troublesome, with subsidence and thermokarsts appearing more frequently than in other soil types. Thermokarsts appear when the permafrost thaws, shrinks, and the ground subsides, usually in uneven patterns. (Bureau of Land Management, 1997—Northern Inertie Project Draft EIS)

Site soils might also be susceptible to frost heave, or the upward movement of facility foundations due to freezing of the surrounding soil. The condition is particularly severe in fine-grained, high moisture content soils.

3.6.1.2 Eareckson AS—Geology and Soils

Planned NMD construction at Eareckson AS would consist of an approximately 12-hectare (30-acre) XBR in the northeast portion of the island. New construction of a power plant, fuel storage areas, and connecting infrastructure for electrical lines, and sewer lines, will affect both the north and south sides of the island. Since the island is relatively small, and new construction traverses much of the island, the ROI will be considered to be the entire island of Shemya.

Physiography

Shemya Island is near the eastern end of the Aleutian archipelago (arc or chain), that forms an arcuate string of islands that stretches from the southwest corner of mainland Alaska to within 161 kilometers (100 miles) of the Kamchatka Peninsula of Russia, a distance of over 2,414 kilometers (1,500 miles). Shemya is part of the Near Islands group, the westernmost group of islands in the Aleutian Chain consisting of Attu, Agattu, Shemya, Alaid, and Nizki. (U.S. Air Force, 1995—Draft Management Action Plan, Eareckson AS)

Shemya Island is a flat topped seamount approximately 2.4 kilometers (1.5 miles) in width and 5.7 kilometers (3.5 miles) in length on a west-east axis. The island's relief ranges from 6 to 8 meters (20 to 25) feet above sea level on the Pacific side to a maximum height of 73 meters (240 feet) on the northern Bering Sea side. Slopes exceeding 10 percent are found where the bluffs rise above the Bering Sea coast on the northern coast. The island is rimmed with small sandy/gravely beaches

and rugged bedrock crags. A small raised wave-cut platform nearly encircles Shemya island and suggests previous ocean level changes. (U.S. Department of the Air Force, 1997—Final Installation-Wide Environmental Baseline Survey, Eareckson AS) The surface is typical of hummocky glaciated terrain and tundra regions. Surface and subsurface drainage flows in a south-southwest direction. The construction of the existing 3,048-meter (10,000-foot) runway has greatly modified the natural surface drainage of the island. (U.S. Air Force, 1995—Natural Resources Plan, Eareckson AS)

Geology

Regionally, Shemya Island is part of the Aleutian volcanic arc of the North Pacific Ocean. The bedrock geology of the island consists of intrusive and extrusive igneous complexes, sedimentary and weakly metamorphosed deposits primarily Tertiary and Quaternary in age (30 million years to present). Bedrock on the western half of the island consists of a basement complex of fine-banded argillites, limey argillites, siltstone, graywackes, and conglomerates. On the north side of the island (Alcan Cove) silicified and pyritized lavas outcrop. Submarine pyroclasts and volcanic intrusives cover the eastern half of the island. These rocks overlie the sedimentary basement complex of the western half of the island. Intrusives composed of feldspar and horneblende porphyry outcrop along the northeast and southeast shores and locally inland. (U.S. Air Force, 1995—Draft Management Action Plan, Eareckson AS)

Unconsolidated surface materials on Shemya Island are generally of three types: sand, gravel, and peat deposited by marine, alluvial, and eolian processes. A thin layer of remnant glacial outwash sand and ground moraine covers most of the island. Sands, gravels, and discontinuous lenses of till are found in low areas directly overlying the southwest sloping bedrock. A thin veneer of unconsolidated sand mantles much of the wave cut terrace along the west and south facing slopes. Deposits of peat occur over much of the island, and it is the predominant surface material found over the east-northeast portion of the island. The western one-third of the island and part of the south side of the island are covered by active and stable sand dunes. The sand dunes on the southern side of the island are known to have accumulations up to 15 meters (50 feet). (U.S. Air Force, 1995—Draft Management Action Plan, Eareckson AS)

Soils

A matted accumulation of tundra peat is the predominant surficial soil on the island. The highly saturated material is typical of tundra regions. This layer varies in thickness, but is usually 1 to 2 meters (2 to 5 feet) deep overlaying loamy sands and gravel in the substrata. Depth to bedrock varies from zero to over 8 meters (25 feet). Sand soils over bedrock tend to dominate the south shore beach areas. Most of the

surficial materials on Shemya Island can retain and transmit water. Shemya Island has no permafrost.

Mineral Resources

Known mineral resources on Shemya are restricted to sand and gravel for construction purposes (Morrisette, 1988—Shemya). The U.S. Air Force has proposed to develop a borrow pit and quarry plan for controlled removal of available aggregate resources to support future construction and maintenance at Eareckson AS. Sand and gravel resource material on the island is limited. (U.S. Department of the Air Force, undated—EA, Shemya Borrow Pit and Rock Quarry Plan)

Geologic Hazards

Tectonic plate and volcanic activities along the Aleutian arc are frequent and often violent. The convergence of the Pacific and North American crustal plates creates one of the world's most active seismic zones. Over 100 earthquakes of magnitude 7 or larger have occurred along this boundary since the turn of the century. Shemya Island falls within seismic zone 4, which reflects the highest hazard potential for earthquakes and severe ground shaking. (U.S. Department of the Air Force, 1997—Final Installation-Wide Environmental Baseline Survey) Recent regional seismic zonation maps compiled by the U.S. Geological Survey (USGS) for the Building Seismic Safety Council and Federal Emergency Management Agency indicate the maximum considered earthquake ground motion at Shemya could exceed 1g. (U.S. Geological Survey, 1997—National Earthquake Hazards Reduction Program)

Eareckson AS is susceptible to tsunamis (tidal waves) resulting from earthquake ground displacements and earthquake triggered submarine landslides. In 1965, an 8.7 magnitude earthquake in the Rat Islands, Alaska, generated an 11-meter (36-foot) tsunami at Shemya. (U.S. Geological Survey, 1993—Fact Sheet from Largest Earthquakes in the United States) A tsunami line has been established at the 30-meter (100-foot) line for new construction (U.S. Department of the Air Force, 1997—Final Installation-Wide Environmental Baseline Survey, Eareckson AS).

3.6.1.3 Eielson AFB—Geology and Soils

The ROI is anticipated to be the cantonment area of Eielson AFB. Eielson AFB would be used to provide power and support logistics for the Yukon Training Area.

Physiography

Eielson AFB lies predominantly in the eastern portion of the Tanana–Kuskokwim Lowland physiographic province, with the eastern edge of the base encompassing the Yukon–Tanana Uplands. The Tanana–Kuskokwim

Lowland is characterized by flat lowlands and gently rolling hills, with elevations ranging from 107 to 290 meters (350 to 950 feet) above mean sea level. The Tanana River and tributaries marks the northeastern edge of the lowlands and western base boundary. Surface drainage at Eielson AFB is generally north–northwest, parallel to the Tanana River. Five streams flow through the base and discharge into the Tanana River via Piledriver Slough. (Pacific Air Forces, 1998—Draft General Plan, Eielson AFB) About 89 percent of the base is situated on flat alluvial floodplain with elevations ranging from 158 to 168 meters (520 to 550 feet). The remaining 11 percent of the base occurs in steeply rising hills to the east. The highest elevation is achieved in the southeast corner of the base at Quarry Hill, with an elevation of 343 meters (1,125 feet). (Eielson AFB, 1998—Integrated Natural Resources Management Action Plan)

Geology

Eielson AFB is located within a large geologic province known as the Yukon–Tanana terrane. This a region of deformed and faulted metamorphic and igneous rocks of Precambrian to Mesozoic age (800 to 66 million years B.P.), overlain by younger sedimentary formations of Tertiary and Quaternary age (65 million years to present). The Yukon–Tanana terrane underlines much of Interior Alaska and encompasses three major physiographic provinces (Yukon–Tanana Upland, Tanana–Kuskokwin Lowland, and the Northern Foothills). For many years, the older metamorphic and igneous rocks in Interior Alaska were known collectively as the Birch Creek Schist. The Yukon–Tanana terrane is now recognized as a complex assemblage of many rock types with a very complicated geologic history. The area is cut by northeast-trending, high angle faults. (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS)

During the Quaternary period, alluvial fans were deposited along the southern margin of the Tanana River Valley due to rapid uplift of the Alaska Range and northern foothills and the occurrence of at least four major glacial advances. Aggradation of the river plain built up a thick, layered sequence of unconsolidated silts, sands, and gravels in the lowlands. Unconsolidated deposits are approximately 61 to 91 meters (200 to 300 feet) beneath Eielson AFB but have been estimated to be as great as 229 meters (750 feet) just south of Fairbanks. (Eielson AFB, 1998—Integrated Natural Resources Management Action Plan) The glacial sediments have also been the source for wind blown silts that have been transported northward and been deposited as loess mantles on the crystalline upland areas and at lower elevations in organic muck deposits (Eielson AFB, 1998—Integrated Natural Resources Management Action Plan). Most of the base has been constructed on artificial fill material. (U.S. Air Force, 1995—Final Environmental Restoration Program, Eielson AFB)

Soils

Soils in the Tanana Valley consist of unconsolidated silt sands and gravels, organic silts, sandy silts, and clays. Floodplain soils nearest the active channel are sandy with a thin silt loam layer on the surface. On higher terraces, the soils are predominantly silt belonging to the Salchaket series. (Pacific Air Forces, 1998—Draft General Plan, Eielson AFB) On older river terraces, silt loam soils of the Goldstream series dominate and often have a significant organic component. These soils tend to be cold and wet and are generally underlain by permafrost. Clays, sandy silts, and sandy gravelly loams may be found in upland areas of the Tanana River Valley. (Pacific Air Forces, 1998—Draft General Plan, Eielson AFB)

Mineral Resources

Mining activities in and around Eielson are primarily for sand and gravel extraction. Sand and gravel have been used for the construction of the Richardson Highway, Eielson AFB, and the Trans-Alaska Pipeline.

Bedrock outcrops in the hills to the northeast of the base have been related to precious metal deposits near Eielson AFB and elsewhere in the Fairbanks region (Pacific Air Forces, 1998—Draft General Plan, Eielson AFB). These units consist of Precambrian and Paleozoic-age schists, micaceous quartzites, subordinate phyllite and marble, which have been locally intruded by a series of Cretaceous to lower Tertiary plutons of granodiorite and quartz monzonite.

Geologic Hazards

Eielson AFB is within the Fairbanks seismic zone, a northeast-trending band of seismic activity. An average of five or six earthquakes a year are actually felt in this zone. In June 1967, a series of three earthquakes of about magnitude 6 had epicenters to the west of Eielson AFB. Two other moderate earthquakes (magnitude 4.0 to 4.6) occurred in this zone in 1977. (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS) In 1937, a magnitude 7.3 earthquake occurred with an epicenter at Salcha Bluff, about 21 kilometers (13 miles) southeast of Eielson AFB (U.S. Department of the Air Force, 1998—Draft 1997 Sitewide Monitoring Program Report).

Other potential geotechnical hazards resulting from severe ground shaking, and frozen ground, are described in section 3.6.1.1.

3.6.1.4 Fort Greely—Geology and Soils

The ROI is anticipated to encompass a 243-hectare (600-acre) missile field with support structures and the land adjacent to this site. The ROI could also include the BMC2 element. The GBI field and support structures may require the use of the Fort Greely infrastructure and

existing facilities within the main cantonment area. The airfield may also require upgrading for NMD. Additional facilities could be constructed within the base area.

Physiography

Fort Greely encompasses portions of both the Northern Foothills of the Alaska Range and the Tanana–Kuskokwim Lowlands physiographic provinces. The Northern Foothills Physiographic province area can be characterized by flat-topped, east-trending ridges 610 to 1,219 meters (2,000 to 4,000 feet) in elevation, 5 to 11 kilometers (3 to 7 miles) wide, and 8 to 32 kilometers (5 to 20 miles) long. These foothills are separated by rolling lowlands 213 to 457 meters (700 to 1,500 feet) in elevation and 3 to 16 kilometers (2 to 10 miles) wide. The proposed site is situated in a transition area on the northern flanks of the Foothill province. Landforms in the area include coalescing alluvial fans, moraines, and river floodplains. Streams flowing through the foothills generally originate in the Alaska Range and flow north in rugged V-shaped canyons and across the broad terraced valleys of the Tanana–Kuskokwim Lowland. (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS) The site and the Fort Greely cantonment area are situated between two significant drainages originating in the foothills—the Delta River to the west and Jarvis Creek to the east. The terrain at the site is mildly undulating with elevations ranging from approximately 411 to 442 meters (1,350 to 1,450 feet). The site vicinity has a northeast surface gradient of about 18 meters (60 feet) per mile.

Geology

The Fort Greely area is underlain by altered sedimentary and volcanic rocks of Paleozoic age that were later intruded by granitic plutons. These rocks were subsequently overlain by Tertiary-age sediments of continental origin. The oldest of the Tertiary sediments contains coal. As the Alaska Range rose to the south, the exposed Tertiary sediments were eroded, then covered by massive gravel deposits known as the Nenana gravel. Glaciers flowed northward from the Alaska Range during the Quaternary Period, depositing moraine and outwash material in the site area. Deposits of loess were laid down between glacial periods. (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS) To the north of the cantonment area, between the Delta River and the Clearwater Lake, depth to bedrock has been estimated to exceed 762 meters (2,500 feet). (U.S. Army Corps of Engineers, 1996—Postwide Site Investigation, Fort Greely)

The proposed GBI site, like the cantonment area, is located on a low alluvial terrace that has a gently undulating surface. The terrace is composed of glacial outwash deposits that are underlain by till, which in turn is underlain by stratified gravel. The glaciofluvial (glacial meltwater

streams) sediments consist primarily of fine to coarse gravel with sand, and lenses of sand and silt are also found. Moraine features to the east and south of the cantonment are characterized by kame and kettle topography and are composed of coarse, unstratified, unsorted till ranging from silty gravel with sand to sandy silt with gravel. (U.S. Army Corps of Engineers 1996—Postwide Site Investigation, Fort Greely)

Wind blown loess of glacial origin forms a mantle over much of the Fort Greely area, ranging from several centimeters thick to greater than 1.5 meters (5 feet) thick. Discontinuous permafrost occurs throughout the region. The permafrost ranges [from the surface] to as much as 66 meters (217 feet) below ground surface. (U.S. Army Corps of Engineers 1996—Postwide Site Investigation, Fort Greely)

Soils

No detailed soil surveys have been completed for the site area. Shallow, well-drained silt loams with sandy to gravelly underlying material occupy most of the rolling uplands on the surface of the glacial moraines and alluvium east of the Delta River (U.S. Department of the Interior and U.S. Department of Defense, 1994—Fort Greely Proposed Resource Management Plan, Final EIS). The exact thickness and areal extent of these soils at the site are unknown.

Soils have generally been derived from glacial action, influenced by the presence of streams and intermittent permafrost. Glacial loess (windblown silt and dust) and outwash account for the presence of silty loams. Deep gravel deposits with shallow silt or sand cover are associated with alluvial plains in the area.

Mineral Resources

Select geologic units at Fort Greely could have potential locatable mineral resources. The geology of the area could be favorable for sulfide mineralization, copper-molybdenum porphyry, lode gold and placer deposits (includes gold, silver, lead, zinc, copper, tungsten, molybdenum, and tin). Lode mineral deposits are most likely to be found in the Paleozoic and Mesozoic-age rocks exposed in the southwest and northwest part of the West Training Area. In the southwest, the granite intrusive contains the Ptarmigan Creek molybdenum prospect, which was discovered in 1914. Molybdenum is associated with quartz veins in the granite, at the contact between granite and black slate. Ore samples from the prospect reportedly contained up to 2.7 percent molybdenum. Traces of gold were also reported. About 32 claims were located along Ptarmigan Creek before the withdrawals. (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS)

Localized placer deposits may also occur in streams draining the granites and Tertiary-age gravel benches. Some small placer mines, concentrated in the Tertiary gravels, are located in the Jarvis-Ober Creek area. No production records are available. (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS)

The U.S. Department of the Interior and DOD considered Fort Greely to have low to moderate potential for leasable minerals. The Nenana coal basin trends across the southern half of the Fort Greely West Training Area. The Middle Tanana basin contains coal to the west of Fort Greely, but no coal has been documented on the installation. A few hundred tons of coal were produced from one small mine in the Jarvis Creek field in 1958. This mine also provided all coal required at Fort Wainwright and Eielson AFB for at least one year, and was active from 1966 to 1972. (U.S. Army Alaska, 1997—Draft Integrated Natural Resource Management Plan) The potential of finding economic deposits of Tertiary coal on Fort Greely is unknown due to poor outcrops, a lack of subsurface information, extensive erosion of Tertiary sediments, and structural deformation of the bedrock. (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS)

Coal and organics within the Tertiary sediments could generate and trap gas under suitable geologic conditions. The Nenana Basin, with its known coal deposits, has moderate potential for producing gas. Geologic conditions are not favorable for oil. (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS)

Throughout the northern and central portion of Fort Greely there are extensive sand and gravel deposits associated with glacial moraines, glacial outwash, stream beds, and river floodplains. Readily accessible sand and gravel occur along the drainages and floodplains of Jarvis Creek, Granite Creek, and the Delta River. (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS) Eight mineral material sites, all of which are now closed or inactive, have been located at Fort Greely. Other gravel pits are located near Fort Greely along the Richardson Highway and the Trans-Alaska Pipeline System. (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS)

Geologic Hazards

Fort Greely lies within a seismic zone extending from Fairbanks southward through the Kenai Peninsula. Earthquake epicenters are scattered throughout Fort Greely and surrounding areas. From past studies there appears to be no concentration of seismic events in the area, and serious damage has not been reported. Fort Greely does lie in seismic Zone 3, where major earthquake damage has a 10 percent

probability of occurring at least once in 50 years. (U.S. Department of the Interior, 1997—Northern Intertie Project Draft EIS)

Severe ground shaking is described in section 3.6.1.1. In 1999 geotechnical studies were conducted at the proposed GBI site on Fort Greely. Permafrost was not encountered within the test borings, nor did ground penetrating radar indicate any ice lenses or other permafrost features.

3.6.1.5 Yukon Training Area (Fort Wainwright)—Geology and Soils

The ROI is anticipated to be an approximately 243-hectare (600-acre) missile field with support structures located on the western edge of the range and the area adjacent to the site. The GBI site could include a BMC2. The GBI field may require the use of Eielson AFB infrastructure and existing facilities.

Physiography

The Yukon Training Area encompasses portions of two physiographic provinces: the Tanana–Kuskokwim Lowlands, and the Yukon–Tanana Uplands. The lowlands region is characterized by flat lowlands and gently rolling hills, with elevations ranging from 107 to 290 meters (350 feet to 950 feet) above mean sea level. Bottom land, forest, and wetlands are typical. The uplands are characterized by rolling hills with elevations typically between 152 to 1,006 meters (500 and 3,300 feet) above mean sea level. The Chena River flows from east to west through the main cantonment area and drains into the Tanana River west of Fairbanks, Alaska (Alaskan Air Command, 1990—Installation Restoration Program, Site 3). The proposed site is located on a subdued east–west trending ridgeline on the west flanks of the uplands area. Maximum elevation is approximately 290 meters (950 feet). Surface slopes range from a mild 3 percent down the ridgeline to 10 to 20 percent on the north and south side slopes, respectively.

Geology

The Yukon Training Area is located within a large geologic province known as the Yukon–Tanana terrane. This a region of deformed and faulted metamorphic and igneous rocks of Precambrian to Mesozoic age (800 to 66 million years B.P.), overlain by younger sedimentary formations of Tertiary and Quaternary age. The Yukon–Tanana terrane underlines much of Interior Alaska and encompasses three major physiographic provinces (Yukon–Tanana Upland, Tanana–Kuskokwin Lowland, and the Northern Foothills). For many years, the older metamorphic and igneous rocks in Interior Alaska were known collectively as the Birch Creek Schist. The Yukon–Tanana terrane is now recognized as a complex assemblage of many rock types with a very complicated geologic history. The area is cut by northeast-trending, high angle faults. No glaciers exist within the

uplands. (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS)

Yukon Training Area cantonment area is underlain by several hundred feet of Quaternary fluvioglacial sediments deposited by the Tanana and Chena rivers. Bedrock is generally near the surface in the upland site area. However, it is largely obscured by extensive deposits of wind-blown sand and loess, locally as great as 46 meters (150 feet) thick. (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS)

Soils

Windblown silts and fine-grained sands form a mantle on much of the rolling upland area that varies in average thickness between 0.3 to 5 meters (1 to 15 feet). These soils are generally described as Alfic Cryochrepts in association with Histic Pergelic Cryaquepts. (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS) Approximately 35 percent of these soil types occur as well-drained silt loams on slopes other than north facing. Approximately 20 percent occurs as poorly drained silt loams on foot slopes and in valley bottoms, with corresponding peat layer and shallow permafrost conditions. Moderately drained silt loams occupy foot slopes over 15 percent of the area, and well drained shallow silt loam over bedrock occupies slopes over 10 percent of the area. The remainder of the area is occupied by poorly drained shallow silt loam underlain by permafrost in north facing slopes. (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS)

The Yukon Training Area is underlain by discontinuous permafrost of generally low ice content in non-organic soils. The ice is typically restricted to pore spaces and to thin ice seams in silts and clays. The depth to permafrost, when present, ranges from 0.6 to 12 meters (2 to 40 feet) below ground surface. Regionally, the thickness of the permafrost intervals varies from about 1.5 to 84 meters (5 to 275) feet. The seasonal frost layer (or active layer) varies between 0.6 to 4 meters (2 to 12 feet) thick (Alaskan Air Command, 1990—Installation Restoration Program, Site 3).

Permafrost is generally thickest in valley bottoms and on lower slopes and can extend to the summit of north-facing slopes. Sediments beneath the floodplain of the Tanana and Chena Rivers are perennially frozen as deep as 81 meters (265 feet). (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS) Permafrost is generally absent on hilltops and moderate to steep south facing slopes. River channels, lakes, wetlands, and other low-lying areas covered by water are also permafrost free. (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS)

Geotechnical studies of the proposed GBI site indicated the presence of permafrost on north-facing slopes.

Mineral Resources

The Yukon Training Area has been closed to mineral location since the 1950s. There are no valid mining claims nor leases (for leasable minerals) on withdrawn lands. Little active mineral exploration or development occurred before the withdrawal of the lands because the area is largely obscured by floodplain deposits, loess, and heavy vegetation, and there has been no compelling evidence of major mineralization trends (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS). That said, Interior Alaska is one of the state's most important regions for mineral production. The Fairbanks Mining District, which encompasses the Yukon Training Area, Eielson AFB, and a portion of Fort Greeley West Training Area, is the largest historic gold producer in the state. The Fairbanks District has experienced a resurgence in activity with the development of the Fort Knox gold mine in 1997. In addition to gold, other potentially economic mineralization has been identified in the Fairbanks Mining District, including silver, bismuth, antimony, tungsten, tin, and lead. (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS)

The area does encompass abundant surficial deposits of sand and gravel for construction, as well as silt and peat for agricultural use. Although sand and gravel have been extracted by the military and other agencies for construction purposes, they have not been extracted commercially. Near North Pole, Alaska, basalt has been quarried commercially for several years, providing high quality decorative stone and riprap for local projects. (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS)

Geologic Hazards

Moderate seismic activity occurs throughout the region. The earthquakes, however, have not been linked to movement along known faults, but rather, block rotation between Tintina and Denali faults resulting from the collision of the Pacific and North American plates. (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS)

The western part of the Yukon Training Area is within the Fairbanks seismic zone, a northeast-trending band of activity. An average of five or six earthquakes a year are actually felt in this zone. In June 1967, a series of three earthquakes of about magnitude 6 had epicenters to the west of the withdrawal land. Two other moderate earthquakes (magnitude 4.0 to 4.6) occurred in this zone in 1977. (U.S. Department

of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS)

Geotechnical hazards resulting from severe ground shaking, and frozen ground, are discussed in section 3.6.1.1.

3.6.1.6 Fiber Optic Cable Line—Geology and Soils

To provide a communication link between system elements that could be located in Alaska, fiber optic cable lines would be required out to Eareckson AS (Shemya Island). To meet NMD reliability requirements, two redundant lines may be needed. One preliminary route along the Aleutian Islands from Whittier or Seward to Eareckson AS has been identified. The second route could be north of the Aleutian Islands or connect to existing fiber optic cable in the central Pacific or along the northwestern United States. The exact alignment of this second cable has not been identified. Provided below is a description of the known route. The route would run from Whittier or Seward on the Kenai Peninsula to Eareckson AS in the western Aleutian Islands, a distance of approximately 3,592 kilometers (2,232 miles). Virtually all of the route would be offshore, with shore landings at Kodiak Island (north of the town of Monashka Bay), Island of Umnak, and terminating at Shemya Island. Since the exact location of the cable route would be predicated on a sea floor survey, this section only describes general conditions along the preliminary corridor alignment. The fiber optic cable line route would traverse a wide variety of offshore geologic conditions. For purposes of discussion, the geologic environment is characterized by conditions revealed in the islands that skirt the southern coasts of both the Kenai and Alaska Peninsula, and the Aleutian Island chain. Unless otherwise noted, this entire section references the Comprehensive Conservation Plan and EIS for the Alaska Maritime National Wildlife Refuge.

Physiography

The cable route predominantly traverses broad expanses of submarine terrain on the continental shelf (less than 200 meters (nominal 600 feet), transition and deep ocean areas (regarded as greater than 2,000 meters (6,560 feet). The continental shelf break generally lies 3 to 30 kilometers (2 to 20 miles) offshore in parts of the Aleutians, but 70 to 480 kilometers (45 to 300 miles) from land in parts of the Bering Sea. Cable depths can be very deep. From Whittier or Seward through Prince William Sound, cable depths would achieve estimated depths of 3,550 meters (11,640 feet) at Knight Island Passage. Entering the Gulf of Alaska to the Kodiak Loop, depths to seafloor are more shallow, generally ranging between 115 to 300 meters (380 to 966 feet). South of Kodiak and for the remainder of the cable reach, depths generally range from just over 900 to almost 4,000 meters (3,000 to 13,000 feet).

Land segments of the cable route would be relatively short and would generally occupy previously disturbed cable and utility corridors. Seward and Whittier are situated near the base of deeply incised glacial fjords in the Kenai Mountains. Surface relief is mildly sloping toward the bay. Adjacent mountain elevations can achieve 1,303 meters (4,274 feet) at Seward and 1,100 meters (3,609 feet) at Whittier.

The fiber optic cable line would land at Kodiak Island at Monashka Bay. The cable would traverse southerly across 457 meters (1,500 feet) of beach land before intersecting an existing utility corridor. The terrain along the cable alignment generally would not exceed 76 meters (250 feet) in ground elevation.

The longest land segment would occur at Nikolski, Umnak Island. The fiber optic cable line would come ashore at Driftwood Bay, passing westerly across low-lying terrain to Nikolski Bay, a distance of 10 kilometers (6 miles).

The land terminus of the fiber optic cable line would be at Shemya Island. The fiber optic cable line would make landfall near the southeast end of the island, near Fox Beach. Once on-island, the cable would follow existing utility corridors. The exact on-island route has not been determined at this juncture. The island is nearly encircled by a wave cut platform or terrace. Elevations on the southern side of the island are generally 6.0 to 8.0 meters (20 to 25 feet) above mean sea level.

Geology

The composition and thickness of sea floor sediments along the proposed alignment are unknown, as is the geology structure, and possible geologic hazards. The underlying geology can be surmised from the general geology of the islands.

The western Kenai Peninsula is underlain by Cretaceous graywacke, slate, conglomerates, and volcanic rock containing mafic and ultramafic bodies. Continental sedimentary rock and basaltic andesite outcrop on many island shores. Much of region is blanketed by surficial deposits of superglacial till, glacial outwash, alluvium, colluvium, and littoral deposits consisting of sand and lesser gravel.

Geologically, the Kodiak–Afognak Island areas are thought to be an appendage of the Kenai Peninsula; they share the same rocks and structures and are only 64 kilometers (40 miles) apart. The islands in the western part of the region are "accreted" continental parts. That is, they are successive wedges of marine sediments that accumulated in and near the trench at a convergent plate margin and were subsequently scraped off onto the continental margin and deformed as the oceanic plate was subducted.

Long faults, some thrust and others steep with predominantly vertical movement, extend the length of the western region and travel northeast from Kodiak Island to the Kenai Peninsula.

The islands and offshore area of the Alaska Peninsula are composed of deformed strata of continental origin that has been detached from the Alaska Peninsula by faulting and volcanism. The islands are situated on the Shumagin–Kodiak Shelf and are part of the slate and graywacke belt of southern Alaska. This belt of sedimentary rock is highly deformed and displays local and complex folding and faulting. The boundary between rock of the Alaska Peninsula and rock of the slate and graywacke belt probably represents a major fault. Portions of the area are covered by Tertiary and/or Quaternary volcanic rocks that prevent identification of the underlying terranes.

The sedimentary belt is composed of a thick sequence of Tertiary graywacke sandstone, black argillite, marl, shale, clay, and conglomerate. This sequence is intruded by mid-Tertiary quartz-diorite. The Shumagin Islands and islands nearby are underlain chiefly by sedimentary and volcanic rocks that are intruded by felsic and intermediate plutons.

Bedrock deposits are overlain by unconsolidated glacial deposits of varying thickness, as well as alluvium, colluvium, and inactive and active sand dunes. At Simeonof Island, deposits of beach and wind-blown sand can exceed 10 meters (30 feet) in thickness.

The Aleutian Islands are composed almost entirely of Tertiary and Quaternary volcanic and volcaniclastic rocks. Rock types are predominantly basalt and andesite lava flows. The major active volcanoes are strato volcanoes. The Aleutian Islands are actually the crests of an arc of submarine volcanoes. An arcuate line of 57 volcanoes, 27 of these active, rises 610 to 2,743 meters (2,000 to 9,000 feet) above sea level along the north side of the islands. Older volcanoes of the Aleutians include both shield volcanoes and strato volcanoes. There are also a large number of calderas or craters of volcanoes that have collapsed.

The bedrock is overlain by a wide variety of unconsolidated deposits including volcanic ash, pumice, cinders, glacial till, outwash, and alluvium deposited by glacial ice, running water, lake water, mass wasting, and wind.

Soils

Detailed soil information is not available for the cable land crossings. In general, steeper rock areas will consist of gravelly loam to silty volcanic ash layers. Hilly terrains will generally yield a thicker mantle of silty

volcanic ash, and low valley bottoms and moraine hills will contain deep fibrous or partially decomposed peat soils with lenses of volcanic ash.

Mineral Resources

There is evidence of mineralization throughout the Gulf of Alaska. Most relevant to the land crossings, there are stone and gravel pits near the town of Kodiak on Kodiak Island. On the northwest portion of Kodiak Island there is also gold, silver, and lead prospect as well as a past-producing placer gold deposit on the beach. Gold has been reported near Womens Bay, but not in economically feasible amounts. None of the other land crossings should encounter potentially recoverable mineral resources.

Petroleum prospects are favorable along the Gulf of Alaska Outer Continental Shelf Planning Area; however, for the most part, oil and gas resources of offshore Alaska occur in accumulations too small to warrant commercial exploitation in the foreseeable future. Only about 15 percent of the geologic oil endowment of offshore Alaska occurs in accumulations sufficiently large to be economic. Most of the undiscovered economically recoverable oil resources occur beneath the Beaufort Shelf and Chukchi Shelf in the Arctic area. The rest of the undiscovered, economically recoverable oil resources of the Alaska Federal offshore occur in Cook Inlet. (U.S. Department of Interior, Mineral Management Service, 1995—Assessment Data for Oil and Gas Potential of Alaska Federal Offshore)

Geologic Hazards

The Gulf of Alaska and Aleutian Island chain is one of the most seismically active areas in the world, responsible for 10 of the 13 largest earthquake events ever recorded in the United States. Most significant among these quakes was the magnitude 9.2 Prince William Sound Earthquake, or Great Alaska Earthquake, which was centered north of Middleton Island in the northern Gulf of Alaska in 1964. Most of the great earthquakes in this region generate tsunamis that impact coastal towns on the Gulf of Alaska as well as distant locations in the Pacific Basin. Notable events include the Andreanof Islands Earthquake of 1957. This magnitude 8.8 earthquake destroyed two bridges on Adak Island, destroyed part of a dock on Umnak Island, and Mount Vsevidof erupted after being dormant for 200 years. (U.S. Geological Survey, 1993—Fact Sheet from the Largest Earthquakes in the United States) The 1965 Rat Island Earthquake, magnitude 8.7, generated a tsunami reported to be about 10.7 meters (35.1 feet) high at Shemya Island.

Active volcanoes are prevalent along the Aleutian arc. Over 40 volcanoes have been active in historic time, responsible for approximately 256 eruptions. The volcanoes can generate earthquakes, submarine

volcanism, and volcanic ash, which could potentially disrupt cable continuity or operation if undiscovered.

3.6.2 NORTH DAKOTA INSTALLATIONS

3.6.2.1 Cavalier AFS—Geology and Soils

The ROI is anticipated to be the area adjacent to the existing Perimeter Acquisition Radar facility. Some power plant and road improvements would be required within the existing boundaries of Cavalier AFS to support the XBR.

Physiography

Cavalier AFS lies in the Central Lowlands province and is situated in the Red River Valley district. Cavalier AFS is located east of the Pembina Escarpment (ridge running approximately north to south through central North Dakota). The valley area is a result of a glacial lake created during the last glacial melting, approximately 12,000 years ago. Features of the ROI include nearshore deposits, beaches, and delta plains from the ancestral glacial lake (Lake Agassiz). Cavalier AFS and the ROI are situated in a relatively flat, large lake plain area. Elevations in the Cavalier AFS area range from 244 to 366 meters (800 to 1,200 feet) above mean sea level. The regional gradient is to the northeast, away from the Pembina Escarpment (North Dakota Geological Survey, 1975—Geology of Cavalier and Pembina Counties).

Geology

In eastern North Dakota, Paleozoic and Mesozoic sedimentary rocks ranging in thickness from about 61 to 640 meters (200 to 2,100 feet) overlie Precambrian crystalline rocks. Paleozoic rocks are all of Ordovician age; they include shale, sandstone, and limestone of the Winnipeg Group and limestone of the Red River and Stony Mountain formations. Mesozoic rocks are composed of sandstones, limestones, siltstones, and shales of the Dakota Group and shales and marlstone of the Colorado and Montana Groups. The Mesozoic sequence contains 13 formations, which range in age from Jurassic to Cretaceous. Three of these formations, the Carlile, Niobrara, and Pierre formations, are exposed at the surface along the Pembina escarpment. All three formations are primarily composed of shale of differing structure and hardness, some of which weathers heavily on exposure due to its bentonitic composition. (North Dakota Geology Survey, 1975—Geology of Cavalier and Pembina Counties) The thickness of these formations ranges from 91 meters (300 feet) to greater than 396 meters (1,300 feet).

Surficial deposits at Cavalier AFS consist of four categories based on origin; glacial, lacustrine, fluvial, and eolian. Lithologically, the glacial and fluvial deposits are primarily sand and gravel, reflecting the

heterogeneous mix of sediment in the original glacial outwash. Lacustrine, or lake deposits from ancestral Lake Agassiz, may range from coarse to fine grained sediments based on the energy environment in which they were deposited in the lake. Eolian deposits are primarily fine, well sorted sand. (North Dakota Geological Survey, 1975—Geology of Cavalier and Pembina Counties) Unconsolidated deposits for the Cavalier AFS range in thickness from 4 to 19 meters (13 to 63 feet).

Soils

The soils of the Cavalier AFS area consist of six major associations. The six soil associations range from poorly to well drained and include clays, silts, fine to coarse sands, and gravels (table 3.6-1).

Table 3.6-1: Soils at Cavalier AFS

Soils	Drainage	Texture	Erosion	Salinity
Binford Loam	Moderate to well	Moderate	Minimal	None
Vang Loam	Moderate to well	Fine to coarse	High	None
Brantford Loam	Poor	Very fine to fine	Minimal	None
Rollete Loam	Moderate to poor	Very fine to fine	Minimal	None
Rauville Loam	Poor	Very fine	Minimal	None
Clayey Breaks	Poor	Fine to moderate	Minimal	None

Source: U.S. Army Space and Strategic Defense Command, 1994—Engineering Report, SRMSC.

Mineral Resources

Sand and gravel suitable for concrete aggregate are found around Cavalier AFS and the ROI. The sand and gravel deposits are largely limited to beach deposits of Lake Agassiz. The major gravel pits are found in an old spit west of Cavalier AFS and on top of the Pembina Delta, south of Walhalla. Sand, especially in the delta area, is relatively clean. (North Dakota Geological Survey, 1975—Geology of Cavalier and Pembina Counties)

The Carlisle shale has been commercially used in the past for the manufacture of bricks; however, the high sulfur content makes it questionably suitable except for lower grade applications. (North Dakota Geological Survey, 1975—Geology of Cavalier and Pembina Counties)

The Pierre Formation is rich in Fuller's earth, which has been used as a clarifying agent for oils, as in bleaching clay, drilling mud, and filler. The lack of abundance and quality of the Fuller's earth does not make commercial extraction feasible except for possible lower quality applications. (North Dakota Geological Survey, 1975—Geology of Cavalier and Pembina Counties)

The Niobrara formation and Red River formation have been investigated as possible sources of Portland Cement. Neither source appears economically feasible at this time. (North Dakota Geological Survey, 1975—Geology of Cavalier and Pembina Counties)

Geologic Hazards

There are no known geologic hazards within the Cavalier AFS and ROI (North Dakota Geological Survey, 1973—Mineral and Water Resources of North Dakota).

3.6.2.2 Grand Forks AFB—Geology and Soils

The ROI is anticipated to be Grand Forks AFB and adjacent land. The GBI field and support structures may require the use of the Grand Forks infrastructure and existing facilities.

Physiography

Grand Forks is situated in the Red River Valley District of the Central Lowlands Physiographic Region. The Central Lowlands region is a result of the last glacial melting, approximately 12,000 years ago. Physiographic features in the ROI include lake plains, beaches, inter-beach areas, and delta plains in the Red River Valley district. Narrow ridges of sand and gravel follow a northwest-southeast trend in Grand Forks County. Grand Forks AFB is situated in a relatively flat, large lake plain area. Elevation in the region ranges from 243 to 353 meters (800 to 1,160 feet) above mean sea level. Relief in the deployment area varies from 1 to 8 meters (3 to 25 feet) per mile (U.S. Department of the Air Force, 1997—Integrated Natural Resource Management Plan, Grand Forks AFB).

Geology

The geologic history and setting is similar to the sequence described in section 3.6.2.1. The Fall River and Lakota formations of the Dakota Group are the predominant bedrock formations underlying Grand Forks AFB. These formations are composed of sandstone, siltstone, and shale and lie at depths generally ranging from 61 to 701 meters (200 to 2,300 feet) below ground surface. These units are overlain by a thick unconsolidated sequence of glacial, fluvial, lacustrine, and eolian deposits. (U.S. Department of the Air Force, 1997—Integrated Natural Resource Management Plan, Grand Forks AFB)

Soils

The soils of the Grand Forks AFB consist of six major soil associations. The soil associations range from poorly to well drained, from fine to coarse textured, and from no saline content to high saline content in their characteristics (table 3.6-2).

Table 3.6-2: Soils at Grand Forks AFB

Soils	Drainage	Texture	Erosion	Salinity
Antler–Gilby-Svea Loam	Poor to well	Medium	Minimal	None
Bearden–Antler	Poor	Fine to moderate	Minimal	Yes
Glyndon–Gardena	Poor to well	Medium	Minimal	None
LaDelle-Cashel	Poor to moderate	Fine to medium	Minimal	None
Ojata	Poor	Fine to moderate	Minimal	Yes
Wyndmere–Tiffany–Arvenson	Poor	Moderate to coarse	Minimal	None

Source: U.S. Department of the Air Force, 1997—Integrated Natural Resources Management Plan, Grand Forks AFB.

Mineral Resources

There are no mineral resources of economic value on Grand Forks (North Dakota Geological Survey, 1973—Mineral and Water Resources of North Dakota). The main sand and gravel suppliers are located near the Grand Forks area. Most of the suppliers have local resources or could obtain additional supplies by rail from sources outside of North Dakota.

Geologic Hazards

There are no known geologic hazards in the Grand Forks AFB area and ROI (North Dakota Geological Survey, 1973—Mineral and Water Resources of North Dakota).

3.6.2.3 Missile Site Radar—Geology and Soils

The ROI is anticipated to be all the area proposed for new construction within the existing Missile Site Radar boundary and the land adjacent to the site. This would include a GBI missile field in the east-central portion of the Missile Site Radar, and a BMC2, helicopter pad, and housing in the western half of the existing cantonment area.

Physiography

The Missile Site Radar and the ROI lie in the Central Lowlands physiographic area in the Drift Prairie province. The Drift Prairie is bordered on the east by the Pembina Escarpment (a ridge running approximately north to south through eastern North Dakota) and on the west by the Missouri Escarpment (a ridge running approximately north to south through western North Dakota). Features of the ROI include undulating delta plains, moraines, drumlins, and occasional meltwater channels. The Missile Site Radar and ROI are situated in a relatively flat, large lake delta plain area. Elevations in the plain district range between 491 to 506 meters (1,610 to 1,660 feet) above mean sea level and average approximately 497 meters (1,630 feet) above mean sea level.

Relief is approximately 15 meters (50 feet) for the entire region (U.S. Army Space and Strategic Defense Command, 1994). Average elevation at the site is approximately 494 meters (1,620 feet).

Geology

The geologic setting is similar to that described in section 3.6.2.1. Surficial geology of the Missile Site Radar and ROI consists of clays, silts, sands, sand lenses, glacial till, and occasional cobblestones. Unconsolidated deposits are to a depth of approximately 5 meters (15 feet) in the Missile Site Radar area and ROI. Unconsolidated deposits are underlain by light to dark gray blocky shales. The shales range in depth from 91 meters (300 feet) to a maximum of 700 meters (2,300 feet) (North Dakota Geological Survey, 1975—Geology of Cavalier and Pembina Counties).

Soils

The soils of the Missile Site Radar and ROI consist of 19 major soil associations. The soil associations range from poorly to well drained and from fine to coarse textured in their characteristics (table 3.6-3).

Table 3.6-3: Soils at Missile Site Radar

Soils	Drainage	Texture	Erosion	Salinity
Valler–Hamerly Loam	Poor	Fine to medium	Minimal	Yes
Parnell Silty Clay Loam	Poor	Fine	Moderate	No
Svea–Barnes Loam	Moderately well	Fine	Minimal	No
Cresbard–Svea Loam	Well	Fine to medium	Moderate	No
Barnes Loam	Moderately well	Fine	Minimal	No
Hamerly–Tonka Loam	Moderate to well	Fine to moderate	Moderate	No
Svea–Base Loam	Poor to well	Medium	Minimal	No
Barnes–Buse Loam	Poor to well	Fine to medium	Minimal	No
Hamerly–Svea Loam	Poor to well	Fine to medium	Minimal	No
Vang Loam	Very well	Fine to coarse	High	No
Lamoure Complex	Poor	Fine	Minimal	No
Wyard–Hamerly Loam	Poor	Fine to medium	Minimal	No
Vallers–Parnell Complex	Poor	Fine to medium	Moderate	Yes
Binford Loam	Well	Medium	Minimal	No
Hamerly–Cresbard Loam	Moderate	Very fine to fine	Minimal	No
Brantford Loam	Poor	Fine to medium	Minimal	No
Rollete Loam	Poor to moderate	Fine	Minimal	No
Rauville Loam	Poor	Fine	Minimal	No
Clayey Breaks	Poor	Fine to moderate	Minimal	No

Source: U.S. Army Space and Strategic Defense Command, 1994—Engineering Report, SRMSC.

Mineral Resources

Sand and gravel suitable for concrete aggregate are found in the vicinity of the Missile Site Radar. The highest grade deposits are largely limited to beach deposits of Lake Agassiz. The major gravel pits are found in beach gravels on top of the Pembina Delta, south of Walhalla. Sand, especially in the delta area, is relatively clean (North Dakota Geological Survey, 1975—Geology of Cavalier and Pembina Counties). Sources of sand and gravel derived from river deposited outwash may be extractable locally. A gravel pit exists 8 kilometers (5 miles) to the southwest of the Missile Site Radar.

Geologic Hazards

There are no known geologic hazards in the Missile Site Radar area of the ROI (North Dakota Geological Survey, 1973—Mineral and Water Resources of North Dakota).

3.6.2.4 Remote Sprint Launch Site 1—Geology and Soils

This section describes the physiography, geology, mineral resources, soils, and geologic hazards for the Remote Sprint Launch Site 1 property and ROI. The geologic ROI is defined as the physical geography, natural features, and land forms in the area of Remote Sprint Launch Site 1 and the adjacent properties that could be affected by construction or operations of an XBR. The physiography, geology, and mineral resources for this site are similar to that described for the Missile Site Radar. The soils of the Remote Sprint Launch Site 1 and ROI consist of four major soil associations. The soil associations range from poorly to well drained and from fine to medium textured in their characteristics (table 3.6-4). There are no known geologic hazards in the Remote Sprint Launch Site 1 ROI (North Dakota Geological Survey, 1973—Mineral and Water Resources of North Dakota).

Table 3.6-4: Soils at Remote Sprint Launch Site 1

Soils	Drainage	Texture	Erosion	Frost Heave	Salinity
Valler–Hamerly Loam	Poor	Fine to medium	Minimal	Yes	Yes
Svea–Buse Loam	Poor to well	Medium	Minimal	None	No
Barnes–Buse Loam	Poor to well	Fine to medium	Minimal	None	No
Hamerly–Svea Loam	Poor to well	Medium to fine	Minimal	None	No

Source: U.S. Army Space and Strategic Defense Command, 1994—Engineering Report, SRMSC.

3.6.2.5 Remote Sprint Launch Site 2—Geology and Soils

This section describes the physiography, geology, mineral resources, soils, and geologic hazards for the Remote Sprint Launch Site 2 property and ROI. The geologic ROI is defined as the physical geography, natural features, and land forms in the area of the Remote Sprint Launch Site 2 and the adjacent properties that could be affected by construction or operations of an XBR. The physiography, geology, and mineral resources for this site are similar to that described for the Missile Site Radar. The soils of the Remote Sprint Launch Site 2 and ROI consist of four major soil associations. The soil associations range from poorly to well drained and from fine to medium textured in their characteristics (table 3.6-5). There are no known geologic hazards in the Remote Sprint Launch Site 2 ROI (North Dakota Geological Survey, 1973—Mineral and Water Resources of North Dakota).

Table 3.6-5: Soils at Remote Sprint Launch Site 2

Soils	Drainage	Texture	Erosion	Frost Heave	Salinity	Regions
Svea–Barnes Loam	Moderately well	Fine	Minimal	None	No	Central, southcentral
Cresbard–Svea Loam	Well	Fine to medium	Moderate	None	No	Southeast
Hamerly–Tonka Loam	Moderate to well	Fine to moderate	Moderate	None	No	North, southwest, southeast
Svea–Buse Loam	Poor to well	Medium	Minimal	None	No	Southwest, northeast

Source: U.S. Army Space and Strategic Defense Command, 1994—Engineering Report, SRMSC.

3.6.2.6 Remote Sprint Launch Site 4—Geology and Soils

This section describes the physiography, geology, mineral resources, soils, and geologic hazards for the Remote Sprint Launch Site 4 property and ROI. The geologic ROI is defined as the physical geography, natural features, and land forms in the area of the Remote Sprint Launch Site 4 and the adjacent properties that could be affected by construction or operations of an XBR. The physiography, geology, and mineral resources for this site are similar to that described for the Missile Site Radar. The soils of the Remote Sprint Launch Site 4 and ROI consist of five major soil associations. The soil associations range from poorly to well drained and from fine to medium textured in their characteristics (table 3.6-6). There are no known geologic hazards in the Remote Sprint Launch Site 4 ROI (North Dakota Geological Survey, 1973—Mineral and Water Resources of North Dakota).

Table 3.6-6: Soils at Remote Sprint Launch Site 4

Soils	Drainage	Texture	Erosion	Frost Heave	Salinity	Regions
Valler–Hamerly Loam	Poor	Fine to medium	Minimal	Yes	Yes	Plains
Parnell Silty Clay Loam	Poor	Fine	Moderate	None	No	Northwest
Svea–Barnes Loam	Moderately well	Fine to moderate	Minimal	None	No	Southeast, central, northwest
Cresbard–Svea Loam	Well	Fine to medium	Moderate	None	No	East, south, southwest
Barnes Loam	Moderately well	Fine to moderate	Minimal	None	No	North, northeast

Source: U.S. Army Space and Strategic Defense Command, 1994—Engineering Report, SRMSC.

3.6.2.7 North Dakota—Fiber Optic Cable Line—Geology and Soils

Fiber optic cable line would be required to link all system elements in the North Dakota region. Cable would be buried 2 to 3 meters (6 to 10 feet) below ground surface along existing rights of way. At this juncture, the exact routing has not been defined. This section is therefore described in general terms.

Physiography

The fiber optic cable line would traverse portions of the Red River Valley (Cavalier AFS) and Glaciated Plains sections (all remaining site areas) of the Central Lowland physiographic province. Landforms in this region include lake plains, beaches, inter-beach areas, and delta plains. The terrain is relatively flat over large areas of the Red River Valley section, shifting to undulating and rolling terrain on the glacial plain. Drainage is poorly developed, creating many lakes and sloughs on the glacial plain. Elevations in the area range between 366 meters (1,200 feet) to 518 meters (1,700 feet) above mean sea level and average approximately 497 meters (1,630 feet) above mean sea level. The most significant physiographic feature to be negotiated by the cable routing will be the Pembina Escarpment, a significant (but relatively subtle) topographic feature that marks the boundary between the two physiographic sections.

Geology

The rolling terrain is underlain by Quaternary glacial deposits of variable thickness, ranging from a few feet to several hundred feet in buried valleys. Shale of the Cretaceous Pierre Formation, Niobrara or Carlile formations directly underlies the Quaternary sediments over the cable route. Depending on the route, these formations may be encountered

during excavation. All three formations are primarily composed of shale of differing structure and hardness, some of which weathers heavily on exposure due to its bentonitic composition (North Dakota Geological Survey, 1975–Geology of Cavalier and Pembina Counties).

The glacial surficial materials will exhibit a wide range of compositions, from clay and sand deposits to gravelly and cobbly glacial tills.

Soils

The soils of the fiber optic cable line area would be varied based upon the regions that it would pass through from site to site. The soil associations in the Central Lowlands physiographic area range from poorly to well drained, from fine to coarse texture, and from no saline content to high saline content in their characteristics. The soils would be similar to those previously described for the other North Dakota sites.

Mineral Resources

Construction quality sand and gravel are found primarily in deposits similar to those in the fiber optic cable line area. The USGS does not consider the sands and gravel in the area to be of a high enough quality for a potential economic source (North Dakota Geological Survey, 1973—Mineral and Water Resources of North Dakota).

Geologic Hazards

There are no known geologic hazards in the fiber optic cable line ROI (North Dakota Geological Survey, 1973—Mineral and Water Resources of North Dakota).

3.7 HAZARDOUS MATERIALS AND HAZARDOUS WASTE MANAGEMENT

The relevant aspects of hazardous materials/waste management include the applicable regulatory procedures for hazardous materials usage and hazardous waste generation, and management programs for existing hazardous waste-contaminated sites within areas potentially affected by the NMD program.

The hazardous materials and hazardous waste management section will provide an overview of hazardous materials management, including storage tanks, hazardous waste management, pollution prevention initiatives, Installation Restoration Program (IRP) sites, asbestos, polychlorinated biphenyls (PCBs), lead-based paint, radon, and pesticides. Hazardous materials and hazardous waste management activities are governed by specific environmental regulations. For the purposes of the following analysis, the terms hazardous materials or hazardous waste will mean those substances defined by both Federal and state regulations. In general, this includes substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to public health or welfare or the environment when released into the environment. Hazardous waste is further defined in 40 CFR 261.3 as any solid waste that possesses any of the hazard characteristics of toxicity, ignitibility, corrosivity, or reactivity.

Solid waste is defined as any discarded material (in effect, abandoned, recycled, inherently waste-like, or no longer suitable for its intended purpose) that is not specifically excluded in 40 CFR 261.4. This definition can include materials that are both solid and liquid (but contained). Transportation of hazardous materials is regulated by the U.S. Department of Transportation regulations within 49 CFR.

3.7.1 ALASKA INSTALLATIONS

3.7.1.1 Clear AFS—Hazardous Materials and Hazardous Waste Management

The ROI for hazardous materials and hazardous waste management at Clear AFS includes the Clear AFS infrastructure and existing facilities, with some NMD facilities located in the base construction camp.

Hazardous Materials Management

Hazardous materials are regularly used and stored throughout Clear AFS. The most commonly utilized hazardous materials include paints, paint thinners and removers, adhesives, solvents, sodium dichromate, hydrostatic fluids, batteries, pesticides, petroleum, oil, and lubricants. Hazardous materials are controlled and managed through a pharmacy

program (see Pollution Prevention section). Hazard Communication (HAZCOM) training is provided to all personnel whose jobs involve handling or managing hazardous materials. Material Safety Data Sheets for hazardous materials are maintained on file in the workplace where they are used or stored and in a central repository maintained on the Hazardous Material Information System.

There are 29 aboveground storage tanks, ranging in size from 189 to 113,562 liters (50 to 30,000 gallons), at Clear AFS. They serve as storage tanks for petroleum for building heat and vehicle fueling. (13 CWS/CC, 1999—Comments received by EDAW, Inc., regarding the NMD Deployment Preliminary Draft EIS) All underground storage tanks have been removed from Clear AFS (EDAW, Inc., 1998—Trip Report of visit to Alaska, July 20–31).

Clear AFS has developed a Spill Prevention and Response Plan which combines both a Spill Prevention Control and Countermeasures Plan that describes the procedure, methods, and equipment used to prevent spills, and an Oil and Hazardous Substances Pollution Contingency Plan that details procedures for releases, accidents, and spills involving these substances. The base also complies with the Emergency Planning and Community Right-to-Know Act (EPCRA) reporting requirements by submitting annual emergency response and extremely hazardous substances updates to local emergency management officials.

Hazardous Waste Management

Clear AFS is a large quantity generator of hazardous waste and is allowed to accumulate waste for up to 90 days. (13 CWS/CC, 1999—Comments received by EDAW, Inc., regarding the NMD Deployment Preliminary Draft EIS) Hazardous waste streams generated by operations at Clear AFS include waste paint, waste paint with methyl ethyl ketone, waste paint with lead and mercury, solvents, methyl ethyl ketone, batteries, waste oil with lead, waste oil with sulfide, waste oil with cadmium, waste oil with chromium, and spill residuals. In 1997, Clear AFS generated 4,977 kilograms (10,973 pounds) of hazardous waste (Department of the Air Force, 1998—Hazardous Waste Report for 1997).

Clear AFS operates one central accumulation point for storage of hazardous waste located in the composite area at Building 250 (U.S. Department of the Air Force, 1997—EA for Radar Upgrade, Clear AS). Waste from the six satellite accumulation points is forwarded to the central accumulation point. These satellite accumulation points are located at the Technical Site (Buildings 101 and 102), the Power Plant (Building 111), the Motor Pool (Building 196), the Civil Engineer Shop (Building 62), and the Auto Hobby Shop (Building 51). (Clear AS, 1998—Hazardous Waste Management Plan)

Clear AFS has developed a Hazardous Waste Management Plan that includes designation of responsible personnel, hazardous waste identification and management practices, training requirements, hazardous waste storage, accumulation point managers, and turn-in procedures.

Pollution Prevention

Clear AFS has developed a Pollution Prevention Management Plan, which aids in the elimination or reduction of hazardous substances, pollutants, and contaminants.

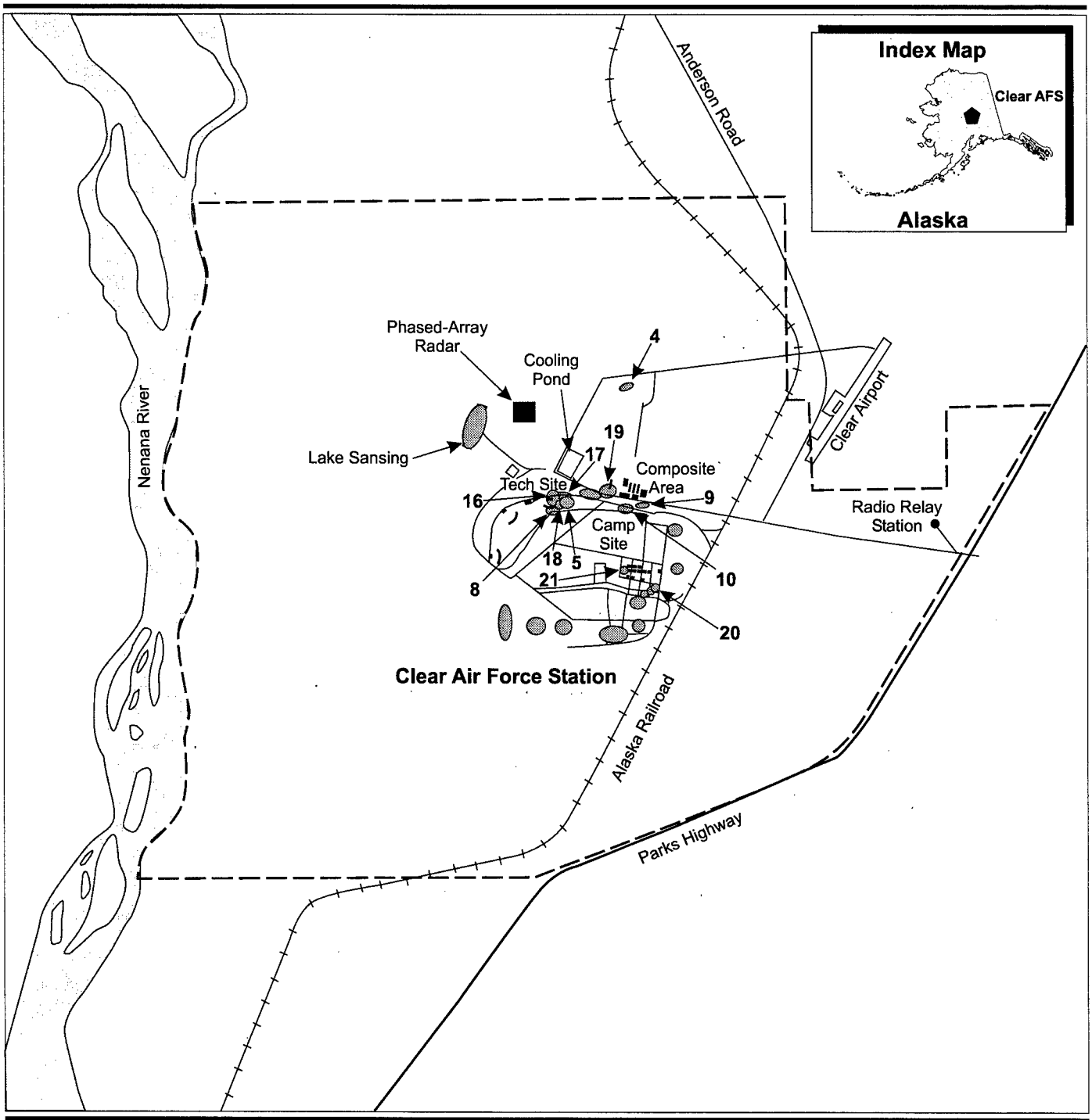
Clear AFS also administers a hazardous materials pharmacy program known as HAZMART to manage hazardous materials. This system tracks hazardous materials from the point at which they are brought onto the facility until they are brought back to the pharmacy either as an empty container or as excess material. This pollution prevention initiative is designed to control and reduce the amount of hazardous materials at the installation.

Recycling capabilities in Alaska are very limited. However, at Clear AFS used oil, asphalt, rags, and assorted paper are mixed with coal and burned in the power plant as a supplemental fuel source. Since 1992, an average of 22,525 liters (5,950 gallons) of waste oil, 665 kilograms (1,470 pounds) of asphalt, 2,655 kilograms (5,850 pounds) of rags, and 2,790 kilograms (6,150 pounds) of paper per year have been burned in the power plant. (U.S. Department of the Air Force, 1997—EA for Radar Upgrade Clear AS)

Installation Restoration Program

IRP investigations at Clear AFS since 1991 have identified 23 sites of potential contamination. Of these sites, 22 are considered closed sites, pending state written approval. Eleven of the identified sites are located on or near the proposed NMD sites (figure 3.7-1). Table 3.7-1 lists the types of contamination identified at these sites. Clear AFS is not on the National Priorities List site and does not have a Federal Facility Agreement.

During initial site investigations for construction at the phased array radar facility location in August 1996, several abandoned drums, old batteries, and other debris were found. The area has been identified as an area of concern, and further evaluation is in progress. (U.S. Department of the Air Force, 1997—EA Radar Upgrade Clear AS)



EXPLANATION

- Roads
- Land Area
- Water Area
- IRP Sites
- Installation Boundary
- Railroads

Scale
0 2,500 5,000 Feet
0 762 1,524 Meters

NORTH

Installation Restoration Program (IRP) Sites, Clear Air Force Station

Alaska

Figure 3.7-1

Hw_clas_001_new

Table 3.7-1: IRP Sites at Clear AFS Near Potential NMD Sites

Site No.	Site Description/Location	Activities/Findings
4	Abandoned landfill	Wooden and metal debris
5	Coal stockpile for power plant	Soil and groundwater contamination
8	Underground storage tank location	Fuel spill
9	Previous underground storage tank location	Gasoline contamination
10	Radioactive material storage	Radioactive electronic tube burial
16	Power plant	PCB transformers
17	Power plant oil/water overflow	Surface soil contamination
18	Power plant thaw shed infiltration pond	Surface soil contamination
19	Vehicle maintenance drainage crib (Building 196)	Diesel and gasoline contamination
20	Building 85 (demolished)	Construction camp diesel generator leaks
21	Auto Service Grease Pad (Building 1)	Oil, fuel, and solvent spills

Source: U.S. Air Force, 1995 Environmental Restoration Program; Perry, 1999—Personal Communication; Perry, 1999—Facsimile communication.

Asbestos

Clear AFS has developed an Asbestos Management Plan and an Asbestos Operations Plan. The Asbestos Management Plan includes designated personnel responsible for asbestos management such as the Asbestos Program Officer and the Asbestos Operations Officer; descriptions of asbestos management activities including data collection and identification; and discussions of recordkeeping procedures such as the asbestos database management. The Asbestos Operations Plan is designed to implement the procedures discussed in the Asbestos Management Plan, and to establish procedures for asbestos abatement. The operations plan includes budgeting concerns, planning procedures, notification requirements, health and safety equipment requirements, and an overview of a small-scale removal.

An asbestos survey was conducted on all facilities on Clear AFS in 1986. All facilities contain asbestos except the main dormitory, which was remodeled (EDAW, Inc., 1998—Trip Report of visit to Alaska, July 20–31). Prior to any building modifications, all asbestos in the affected area is removed in accordance with Federal Regulations. Asbestos-containing material wastes are disposed of in the Clear AFS landfill, which is permitted to accept asbestos.

Asbestos management activities at Clear AFS are handled by the installation's Operation and Maintenance contractor. The contractor's civil engineering manager and environmental coordinator are designated as the Asbestos Program Officer and Asbestos Operations Officer, respectively. Up to 0.3 square meter (3 square feet) of asbestos-containing material can be handled by the installations' contractor. Asbestos repair or removal of more than 0.3 square meter (3 square feet) of asbestos-containing material will be handled by other contractors specializing in asbestos abatement.

Polychlorinated Biphenyls

The PCB program at Clear AFS is managed by a contractor under the direction of the Environmental Coordinator's office, with support from Civil Engineering, Technical Site, and logistics personnel. A sitewide PCB inventory was conducted in 1990, and all known PCB and PCB-contaminated equipment has either been removed or purged and refilled with non-PCB fluid. Radio frequency interference filters, small capacitors, and fluorescent light ballasts are the remaining potentially PCB-contaminated equipment on the installation. Removal of the suspected PCB-contaminated radio frequency interference filters is planned. As ballasts and small capacitors are replaced, they are stored in Building 252 for later disposal in accordance with applicable regulations. (U.S. Department of the Air Force, 1997—EA Radar Upgrade Clear AS)

Lead-based Paint

Most of the buildings on Clear AFS contain lead-based paint except for dormitories 203 and 204, which have been remodeled. Dormitory 202 is scheduled for renovation and will be free from lead-based paint in the near future (EDAW, Inc., 1998—Trip Report of visit to Alaska, July 20–31). Prior to any building modification, all lead-based paint in the affected area is removed in accordance with Federal regulations. Clear AFS has a comprehensive lead-based paint management plan (Novak, 1999—Comments received by EDAW, Inc. regarding the NMD Deployment Preliminary Draft EIS).

Radon

With guidance from the Bioenvironmental Engineer at Eielson AFB, Clear AFS has developed and administrated a radon assessment and mitigation program. Radon inspection surveys were performed for Clear AFS in 1995. Radon levels were found to be well below the current U.S. EPA guidelines of 4 picocuries per liter (Clear AS, 1995—Site Radon Inspection Report).

Pesticides

The use of pesticides at Clear AFS is only on an as-needed, seasonal basis. Applications are kept to a minimum, and are restricted to developed areas of the installation. When utilized, pesticides are pre-approved by the Federal Pesticides Working Group and applied by state-certified personnel. Aerial spraying is not conducted, nor are pesticides applied to any waters of the state (U.S. Department of the Air Force, 1998—Grounds Management and Urban Forest Management Plan).

3.7.1.2 Eareckson AS—Hazardous Materials and Hazardous Waste Management

The ROI for hazardous materials and hazardous waste management includes Eareckson AS for general operations. The XBR and support may require the use of base infrastructure and existing facilities.

Hazardous Materials Management

Eareckson AS routinely receives and stores small quantities of hazardous materials, including a variety of flammable and combustible liquids such as aviation fuels. Additional hazardous materials utilized by the base include acids, corrosives, compressed gases, hydraulic fluids, solvents, paints, paint thinners, and lubricants. Supplies, including petroleum products, arrive either by barge during the summer months or by aircraft year round. JP-8 and gasoline arrive by barge and are stored in bulk storage tanks since they are used in large quantities. Most other petroleum products and chemicals are used in much smaller quantities and typically arrive in 208-liter (55-gallon) drums or smaller containers (U.S. Department of the Air Force, 1997—Final Installation-Wide Baseline Survey). Hazardous materials are controlled and managed through a hazardous materials program.

Storage tanks and associated piping systems at Eareckson AS are used to store and distribute various petroleum products or wastes, and other miscellaneous products. There are 47 aboveground storage tanks and 17 underground storage tanks currently utilized at Eareckson AS. (Hostman, 1999—Comments received by EDAW, Inc., regarding NMD Deployment Preliminary Draft EIS). All aboveground storage tanks at Eareckson AS are currently being evaluated to determine whether they are needed to support operations under the existing Base Operation Support Contract. Unneeded tanks and their associated pipelines that are found to be in excess will be cleaned, closed, and removed.

Eareckson AS administers a Storm Water Pollution Prevention Plan (SWPPP) Management Program that was amended in July 1995 after the base restructuring. The plan includes site specific good housekeeping practices, facility surveys, satellite accumulation area inspections, vehicle

inspections conducted daily by the operator, employee training, preventive maintenance, and spill prevention and response. Eareckson AS also maintains an Oil and Hazardous Substance Discharge Prevention and Contingency Plan that addresses spill prevention and preparedness. The base also complies with EPCRA reporting requirements by submitting annual emergency response and extremely hazardous substances updates to the local emergency management officials.

Hazardous Waste Management

Eareckson AS has implemented a Hazardous Waste Management Plan that sets forth the policies and procedures to be followed when handling hazardous wastes. Hazardous wastes generated at Eareckson AS include solvents, petroleum, oil and lubricants, fuel wastes, batteries, asbestos, PCBs, and wastes generated from site remediation (Piquniq Management Corporation, 1997—Hazardous Waste Management Plan). Eareckson AS is defined as a small quantity generator by the U.S. EPA and generates less than 100 kilograms (220 pounds) of hazardous waste per month.

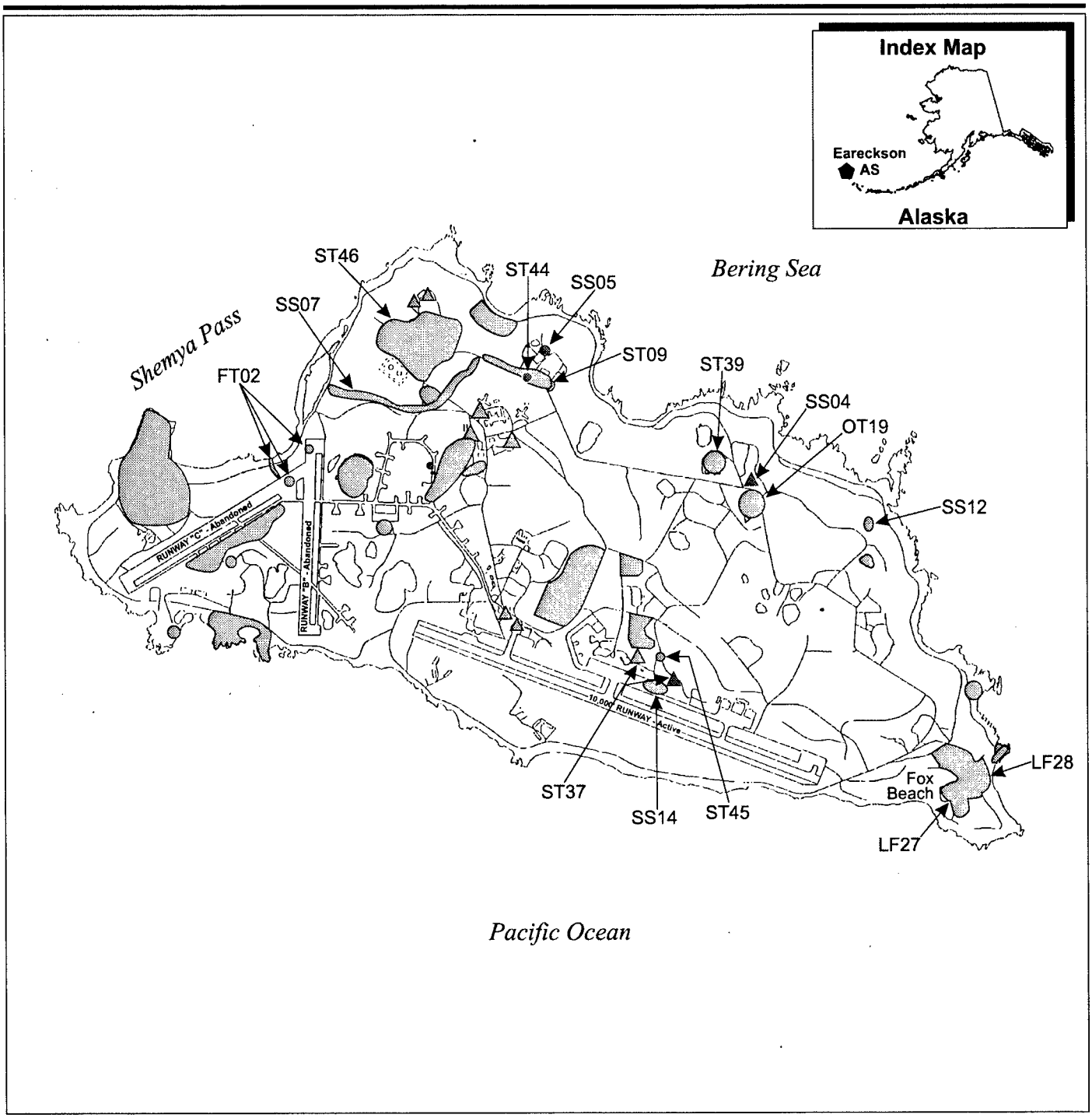
Hazardous wastes and waste petroleum products are accumulated at approximately 17 locations throughout the installation (U.S Department of the Air Force, 1997—Final Installation-Wide Baseline Survey). Eareckson AS is not permitted to dispose of hazardous wastes. All hazardous wastes with no energy recovery potential are sent to the Defense Reutilization and Marketing Office at Elmendorf AFB (Piquniq Management Corporation, 1997—Hazardous Waste Management Plan).

Pollution Prevention

The majority of waste streams at Eareckson AS are recycled or utilized for energy recovery. Used fuel, oil, oil filters, absorbent pads, and other petroleum contaminated waste solids are burned for energy recovery. Antifreeze is collected and recycled for reuse on the facility. Batteries are maintained for recycling through the Defense Reutilization and Marketing Office, and products such as transformer silicon oil are returned to the manufacturer for recycling. (Piquniq Management Corporation, 1997—Hazardous Waste Management Plan).

Installation Restoration Program

The Air Force began the IRP process at Eareckson AS in 1984. Fifty IRP sites at Eareckson AS have been identified. Major Preliminary Assessment activities were conducted at the installation during 1984, 1988, 1992, 1993, and 1994. Additional information was gathered from site inspections, remedial investigations, and feasibility studies conducted at the 50 sites. Figure 3.7–2 shows the 50 sites. Restoration activities were conducted at many of the Eareckson AS sites prior to the Preliminary Assessment conducted from 1992 to 1994. (U.S



EXPLANATION

- Roads
- Land Area
- Water Area
- IRP Sites
- No Further Action Decision Sites

Scale

0 1,738 3,475 Feet

0 530 1,059 Meters

NORTH

Installation Restoration Program (IRP) Sites, Eareckson Air Station

Alaska

Figure 3.7-2

Department of the Air Force, 1997—Final Installation-Wide Baseline Survey)

There are ordnance concerns for Eareckson AS at three locations administered by the IRP. The OT29 Ammunition Disposal at 50 Caliber Beach was the dumping ground for mass quantities of munitions after the end of World War II. The OT19 Hospital Lake and OT49 Upper Lake have also been identified as having known or suspected quantities of munitions. The OT19 Hospital Lake is also a potential, but unconfirmed, medical/biohazardous waste site. (U.S. Department of the Air Force, 1997—Final Installation-Wide Baseline Survey)

Table 3.7-2 lists the most significant IRP sites near the potential XBR site and potential support facilities. Figure 3.7-2 also shows these sites.

Table 3.7-2: IRP Sites at Eareckson AS Near Potential NMD Sites

Site No.	Site Description/Location	Activities/Findings
SS04	Old Hospital Site	Identified World Was II-era metals and PCBs
SS05	Old COBRA DANE	Identified transformer oil, waste oil, and diesel fuel
SS07	West End Oil/Water Separator	Identified waste oil and POLs
SS12	Old White Alice Site	Identified POL and PCBs
ST09	Power Plant Spills	Identified POL, waste oil, and PCBs
ST46	Abandoned Tank Farm	No previous investigation; suspected diesel fuel
OT19	Hospital Lake	Identified ordnance, ammunition, metals, nitrates, and nitrites; suspected medical/biohazardous waste
FT02	Aircraft Mock-up/Abandoned Drums/Fire Training Area	Identified waste oil, diesel, JP-4, and 208-liter (55-gallon) drums
LF27	Base Sanitary Landfill	Identified miscellaneous debris and rubbish
LF28	Scrap Metal Landfill	Identified metal debris
SS23	Past Drum Storage Area	Identified POLs, petroleum wastes, and solvents
ST39	USTs 110-1 through 110-4	Suspected diesel fuel
ST44	UST 3051-1	Suspected waste oil

Source: U.S. Department of the Air Force, 1997—Final Installation-Wide Baseline Survey
Notes: PCB = polychlorinated biphenyls; POL = petroleum, oil, lubricant; UST = underground storage tank

Asbestos

A comprehensive asbestos survey for Eareckson AS was completed in 1992. Based on the results of the basewide asbestos survey, asbestos-containing material is assumed or confirmed to be present in 48 facilities. In compliance with standard Air Force regulations, any friable asbestos-containing material must be removed if it is likely to release airborne fibers and can not be reliably maintained, repaired, or isolated. All asbestos-containing material identified as non-friable does not present a health hazard at this time as long as the material is not disturbed. The base asbestos manager is contacted at all times before any demolition or renovation occurs in order to take proper action and prevent material from becoming airborne. No immediate health hazard exists in those facilities in which the asbestos has been determined to be non-friable. However, the condition of asbestos in several buildings is unknown and needs to be investigated further (U.S. Department of the Air Force, 1997—Final Installation-Wide Baseline Survey).

Polychlorinated Biphenyls

All electrical equipment containing PCBs at Eareckson AS has been replaced, and PCB-containing transformers have been fully cleansed of the PCB-containing fluids. Eareckson AS is considered PCB free (EDAW, Inc., 1998—Trip Report of visit to Shemya, Alaska, April 24–May 1).

Lead-based Paint

No facilities at Eareckson AS have been tested for lead-based paint. It should be assumed that most facilities constructed before the implementation of the DOD ban on the use of lead-based paint in 1978 are likely to contain one or more coats of such paint, and are a probable concern. Sixty-nine existing facilities at the site were constructed before 1978. (U.S. Department of the Air Force, 1997—Final Installation-Wide Baseline Survey).

Radon

Radon testing was conducted at Eareckson AS in May 1988. Of the 12 samples taken, 10 were below the U.S. EPA guidelines of 4 picocuries per liter, and 2 were below detection levels (U.S. Department of the Air Force, 1997—Final Installation-Wide Baseline Survey). Hence, radon is not a concern at Eareckson AS.

Pesticides

The use of pesticides in and around Eareckson AS has not been limited to specific sites. The low levels of pesticides detected in sampling media throughout the installation are consistent with the controlled application

of pesticide for insect control (U.S. Department of the Air Force, 1997—Final Installation-Wide Baseline Survey).

3.7.1.3 Eielson AFB—Hazardous Materials and Hazardous Waste Management

The ROI for hazardous materials and waste management includes Eielson AFB for general operations and those areas where potential NMD construction activities would occur within the base boundary.

Hazardous Materials Management

Eielson AFB receives, stores, and utilizes large quantities of hazardous materials, including a variety of flammable and combustible liquids such as jet fuel. Hazardous materials used include antifreeze, lead-acid batteries, nickel-cadmium batteries, plating solution, epoxy primer, cleaning solvents, and photo processing chemicals. Petroleum products used and stored on the base include aviation gasoline, motor gasoline, diesel, JP-4, and JP-8 (Eielson AFB, 1997—Hazardous Material and Waste Management Plan). Hazardous materials are issued and managed through Eielson AFB Hazardous Material Pharmacy (see Pollution Prevention section).

Eielson AFB has the capacity to store approximately 114 million liters (30 million gallons) of fuel/petroleum. Typically, the majority of the stored fuel is JP-8. JP-8 is received through a pipeline from the Mapco Refinery in North Pole, Alaska. The other stored petroleum products are brought to Eielson AFB by truck, rail, or aircraft. Approximately 126 aboveground and 50 underground storage tanks are located at Eielson AFB (Pacific Air Forces, 1998—Draft General Plan Eielson AFB). All tanks have been inspected for compliance with secondary containment and overfill protection requirements. All required tanks have been or are designated to be upgraded (U.S. Air Force, 1997—Oil and Hazardous Substance Discharge Prevention and Contingency Plan, Eielson AFB, Alaska).

An Oil and Hazardous Substance Discharge Prevention and Contingency Plan was completed for Eielson AFB in November 1997. The plan includes a response action plan, prevention plan, supplemental information, and a contingency plan for oil and hazardous substance discharge prevention. The plan provides instruction for spill prevention and proper direction for containment, notification, safety, and cleanup if a spill does occur. The base also complies with EPCRA reporting requirements by submitting annual emergency response and extremely hazardous substances updates to the local emergency management officials.

Hazardous Waste Management

Eielson AFB maintains a current hazardous material and hazardous waste management plan. The plan details the procedures necessary for maintaining compliance with Air Force, Federal, and state regulations when handling hazardous waste. Hazardous wastes are initially collected at approximately 45 satellite accumulation points, and then transferred to one 90-day accumulation point (Siftare, 1999—Comments received by EDAW, Inc., regarding the NMD Deployment Coordinating Draft EIS). All wastes from the accumulation points are sent to the Hazardous Waste Facility for recycling or disposal off-base. The staff at that facility ensures all hazardous waste is processed off-base within 90 days.

Common hazardous wastes generated at Eielson AFB are absorbent with oils, absorbent with fuels, absorbent with antifreeze, used antifreeze, battery rinsate, carbon remover, fuel filters, paint remover, oil/water separator sludge, paint booth air filters, phenol, photo chemicals, paint, potassium hydroxide, sodium hydroxide, and sulfuric acid. Eielson AFB is a large quantity generator under the Resource Conservation and Recovery Act (RCRA). In 1997, Eielson AFB generated 61,990 kilograms (136,665 pounds) of hazardous waste (Eielson AFB, 1997—Hazardous Waste Disposal Report).

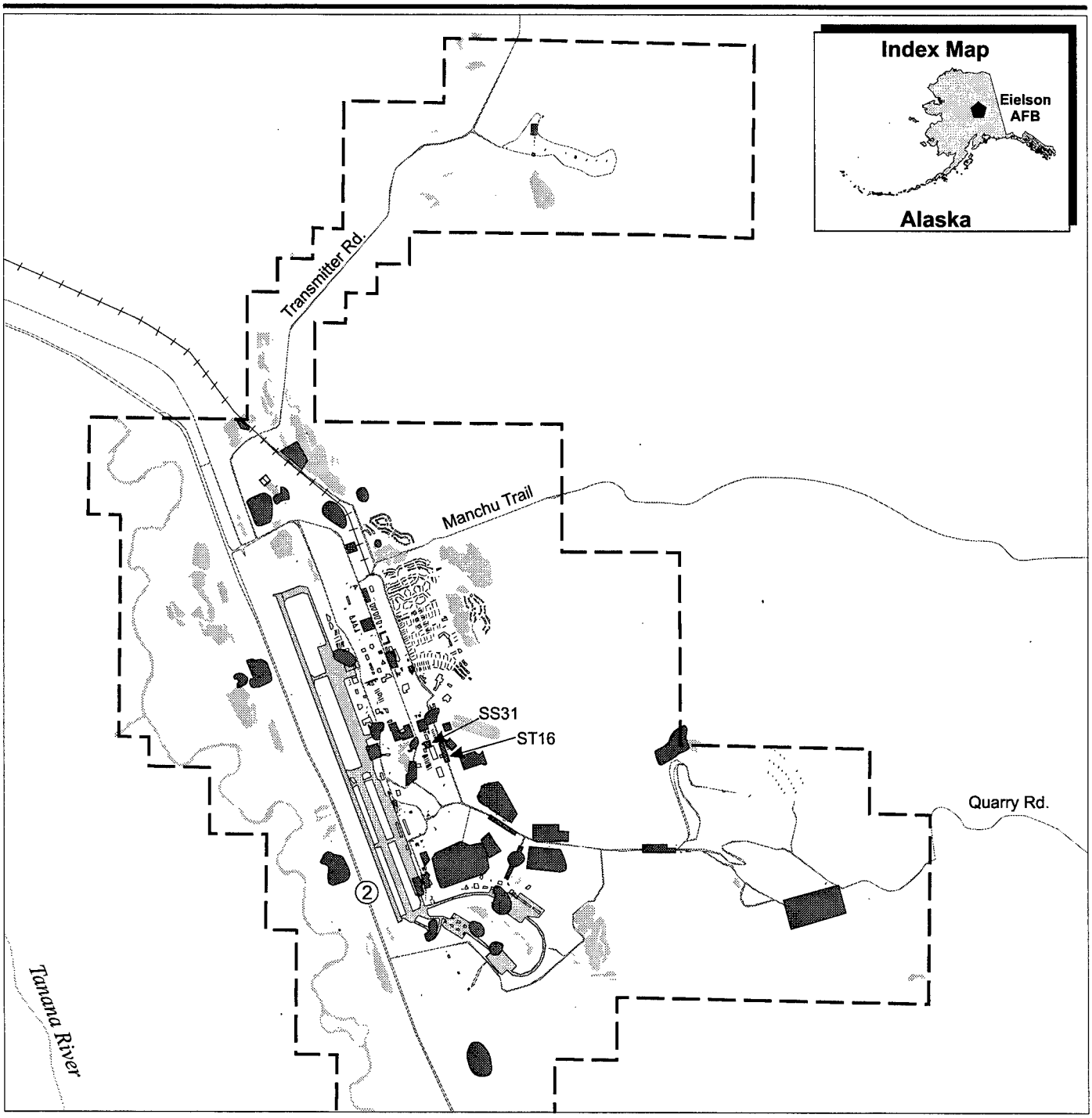
Pollution Prevention

Eielson AFB has implemented several waste reduction practices to limit the amount of hazardous waste produced on-base. These practices include product substitution, recycling, waste oil burning, and a Hazardous Material Pharmacy. The pharmacy is a pollution prevention initiative used throughout the Air Force, designed to reduce the amount of hazardous materials stored at various facilities. Eielson AFB also has an active recycling program for non-hazardous waste that includes paper, cardboard, plastics, glass, and aluminum. (Pacific Air Forces, 1998—Draft General Plan Eielson AFB)

Installation Restoration Program

In November 1989, Eielson AFB was listed on the National Priorities List of Federal Superfund sites by the U.S. EPA. The IRP implementation for Eielson AFB began in 1982. The initial records search identified 43 potential disposal or spill areas at Eielson AFB and recommended that confirmation studies be conducted on the basis of high migration potential (see figure 3.7-3).

On May 21, 1991, the U.S Air Force, the U.S. EPA, and the Alaska Department of Environmental Conservation signed the Federal Facility Agreement for Eielson AFB. The Federal Facility Agreement listed 64 potential source areas. The agreement established a procedure and



Installation Restoration Program (IRP) Sites, Eielson Air Force Base

Alaska

Figure 3.7-3

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schedule for developing, implementing, and monitoring appropriate response actions at the base in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the National Contingency Plan, Superfund guidance and policy, RCRA guidance and policy, and applicable Alaska State law. Under terms of the Federal Facility Agreement, the environmental impacts associated with the past and present on-base activities would be investigated, and remedial action taken to protect public health and welfare, and the environment. Only two sites are located near potential NMD required

facilities at Eielson AFB: SS31, a former PCB storage facility, and ST16, location of a fuel line spill. Both of these sites are currently in a no further action status. (U.S. Department of the Air Force, 1998—Draft 1997 Sitewide Monitoring Program Report)

Asbestos

An Asbestos Management and Operations Plan has been completed, in accordance with Air Force policy. The plan is reviewed annually and revised as necessary. The plan was developed in accordance with Air Force regulations to reduce exposure to occupants and workers on-base and to ensure compliance with all Federal, state, and local laws concerning asbestos management (Eielson AFB, 1997—Asbestos Management and Operations Plan).

An asbestos survey was conducted on facilities at Eielson AFB, with most buildings being found to contain asbestos. Asbestos-containing material is generated during remediation or demolition activities. Facilities that are to be renovated or demolished are surveyed for asbestos-containing material prior to construction activities, and remediated when necessary.

Polychlorinated Biphenyls

All electrical equipment at Eielson AFB containing PCBs has been replaced, and PCB-containing transformers have been fully cleansed of the PCB-containing fluid. (Department of the Air Force, 1997—Memorandum for PCB-Free Status)

Lead-based Paint

A draft Eielson AFB Lead-based Paint in Facilities Management Plan has been completed, in accordance with Air Force policy. The plan is reviewed annually and revised as necessary. The plan objective will help eliminate or reduce risks for lead-based paint exposure on Eielson AFB.

Several lead-based paint surveys have been performed at Eielson AFB. Although there has not been an extensive base-wide survey performed, it is expected that all pre-1980 buildings contain lead-based paint. Eielson AFB samples paint before any building remodeling or demolition and

removes any identified lead-based paint in accordance with applicable regulations.

Radon

A year-long Radon Assessment and Mitigation Program Assessment Survey has been conducted for Eielson AFB. The survey was performed from October 1990 through December 1991 in all base housing units, transient living facilities, clinic, and child care center. None of the 1,247 radon samples exceeded the 4 picocuries per liter limit, with 2.4 picocuries per liter being the highest level measured (Eielson AFB, 1992—Memorandum, Results of Radon Assessment and Mitigation Program) Radon is not a concern at Eielson AFB.

Pesticides

There are no non-point source pollution problems associated with pesticides and fertilizers on Eielson managed lands. The management of pesticides at Eielson AFB is the responsibility of the Pest Management Section of the Civil Engineer Squadron. All pesticides are approved by the Federal Working Group before application. All fertilizers are applied under the direction of personnel of the Maintenance Engineering Section of the Civil Engineer Squadron. Pesticides and fertilizer are not applied into any watercourses, and aerial spraying in not used as a method of application. (Pacific Air Forces, 1998—Draft General Plan Eielson AFB)

3.7.1.4 Fort Greely—Hazardous Materials and Hazardous Waste Management

The ROI for hazardous materials and hazardous waste management includes the Fort Greely infrastructure and existing facilities within the main base cantonment. Additional facilities could be constructed within the base cantonment area.

Hazardous Materials Management

Fort Greely has several facilities that use or store hazardous materials. A Hazardous Waste and Hazardous Materials Standard Operating Procedure Manual was created for Fort Greely in September of 1995, which complies with all applicable state and Federal regulations. The Plan established standard operating procedures for the correct management, storage, and generation of hazardous materials and hazardous waste. Hazardous material inventories are reviewed and updated twice a year if necessary (Department of the Army, 1995—Standard Operating Procedure Hazardous Material and Hazardous Waste Management).

Hazardous materials stored within the cantonment area include fuels and pesticides. Hazardous materials are also used in a variety of processes performed at the installation, including vehicle, boat, and aviation repair;

power and heat generation; wastewater treatment; photo processing; and building maintenance (U.S. Department of the Army, 1997—Preliminary Draft EA for the Disposal and Reuse of Surplus Property at Fort Greely, Alaska).

Fort Greely has 53 aboveground storage tanks with capacities ranging from 946 to 2,384,809 liters (250 to 630,000 gallons), 4 of which are in the cantonment area. The tanks and their supports are periodically inspected using visual inspection, hydrostatic inspection, or a system of nondestructive shell thickness testing. There are 23 underground storage tanks at Fort Greely, 9 in the cantonment area, with capacities ranging from 1,136 to 189,270 liters (300 to 50,000 gallons). (U.S. Army Alaska, 1998—Oil Discharge Prevention and Contingency Plan) Underground storage tanks located within the cantonment area that meet state regulations will be removed unless identified to support specific reuse activities. Underground storage tanks that do not meet current regulations will be deactivated and removed before disposal by deed. The aboveground storage tanks within the cantonment area will be emptied, purged of fumes, and secured at the area's closure.

Fort Greely administers an Oil Discharge Prevention and Contingency Plan, which leads personnel through the step-by-step procedures necessary to safely detect, contain, and clean up all oil spill discharges on post. Also, an SWPPP for Fort Greely was completed in May 1996. The plan includes site-specific good housekeeping practices, facility surveys, satellite accumulation area inspections, employee training, record keeping and internal reporting, comprehensive site compliance evaluation, and sediment and erosion control. The base also complies with EPCRA reporting requirements by submitting annual emergency response and extremely hazardous substances updates to the local emergency management officials.

Hazardous Waste Management

Fort Greely is registered by the U.S. EPA as a large quantity generator. Hazardous wastes generated at the installation are associated with equipment maintenance. Other wastes generated by the facility include silver nitrates, boiler treatment compound, medical waste, paint, pesticides, aerosol canisters, batteries, used acetone and paint thinner, and sewage sludge. The wastes are accumulated in 208-liter (55-gallon) drums at satellite accumulation points before disposal. Currently, a temporary unnumbered building near T100 serves as the centralized hazardous waste collection site (Spiers, 1999—Electronic communication). Hazardous wastes management is performed in accordance with the installation's Hazardous Waste and Hazardous Materials Standard Operating Procedures Manual (U.S. Department of the Army, 1997—Preliminary Draft EA for the Disposal and Reuse of Surplus Property at Fort Greely). In 1998, Fort Greely generated 59,787

kilograms (131,808 pounds) of hazardous waste (U.S. Army, 1998—The 1998 Hazardous Waste Report, Fort Greely).

Pollution Prevention

Fort Greely has developed and implemented a Pollution Prevention Plan. This plan aids in the elimination or reduction of hazardous substances, pollutants, and contaminants. Recycling activities at Fort Greely include fuels, batteries, and brass shell casings.

Installation Restoration Program

No sites on Fort Greely have been listed on the CERCLA National Priorities List. In addition, there are no Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) sites and no leaking underground storage tank sites on the installation. (U.S. Army Corps of Engineers, 1997—Environmental Baseline Survey Report, Fort Greely Alaska)

Three buildings within the cantonment area are on the State Priorities List. These include Building 612, where waste drains to the sanitary sewer; Building 601, where transformers, solvents, and herbicides have been stored in the Resource and Utilities yard north of the building; and Building 605, which includes a maintenance shop, paint bay, and battery storage facility. (U.S. Army Corps of Engineers, 1997—Environmental Baseline Survey Report, Fort Greely Alaska) All three of these buildings are potential support facilities for NMD.

There are 24 solid waste management units within the installation area. There are two non-solid waste management units, the site south of Building 626, where waste solvents have been dumped, and the nuclear waste pipeline and dilution well. There are 12 potentially contaminated areas within the cantonment area. In addition, there are seven sources of potential contamination on properties adjoining the cantonment area. (U.S. Army Corps of Engineers, 1997—Environmental Baseline Survey Report, Fort Greely Alaska)

Environmental cleanup at Fort Greely has been addressed under both the IRP and the BRAC Environmental Cleanup Program. Numerous sites have been investigated and remediated under these programs. Investigations are now complete at all known sites. Cleanup of the nuclear waste line from the past activities of the SM-1A nuclear reactor is nearing completion, and other cleanup actions at Building 110 and the old firefighter training pits are underway. Building 101, on retained property, and several other sites, on surplus property, are scheduled for cleanup, pending funding. (Spiers, 1999—Electronic Communication, Nov 22)

Asbestos

A limited asbestos survey of family housing unit basements was conducted at Fort Greely in 1998. Most of the buildings surveyed were found to contain asbestos in pipe fittings and pipe insulation (U.S. Army, 1998—Fort Greely Family Housing Asbestos Survey). The main post Fire Station, Building 504, was also tested in 1988 and found to contain asbestos in the pipe insulation. Buildings within the installation have been evaluated for the potential presence of asbestos-containing materials based on the results of this surveys and date of construction. Buildings constructed before 1985, which have not been surveyed, have been identified as at risk for the presence of asbestos-containing material. Most of the family housing and Fire Station 504 are proposed NMD support facilities.

Polychlorinated Biphenyls

A PCB survey was conducted at Fort Greely in 1993, during which all transformers were sampled. The 1993 survey identified 16 transformers that contained PCB concentrations between 50 and 499 ppm. All PCB-containing transformers were removed from the installation in 1994 (U.S. Army Corps of Engineers, 1997—Environmental Baseline Survey Report, Fort Greely Alaska).

Lead-based Paint

A lead-based paint survey was performed for the family housing, medical center, and transient quarters at Fort Greely in 1997. All buildings surveyed were found to contain lead-based paint. (U.S. Army Corps of Engineers, 1997—Lead-Based Paint Survey, Fort Greely) Buildings not surveyed but constructed before 1978 are believed to be at risk for the presence of lead-based paint.

Radon

Radon surveys were conducted in various buildings within the cantonment area from 1990 through 1993. Buildings within the cantonment area have been evaluated for the presence of radon based on the results of those surveys. Some buildings were found to have radon concentrations equal to or greater than the current U.S. EPA guidelines of 4 picocuries per liter. Family housing units with radon levels greater than or equal to 4 picocuries per liter have been mitigated. All buildings not surveyed were designated as potentially containing radon, and buildings found to contain radon concentrations below 4 picocuries per liter were not given a radon designation. (U.S. Department of the Army, 1997—Preliminary Draft EA for Disposal and Reuse of Surplus Property at Fort Greely)

Pesticides

Fort Greely has completed and implemented an Integrated Pest Management Plan. The goal of this plan is to minimize the adverse environmental impact of pesticide use while achieving an acceptable level of control and cost-effectiveness. The use of pesticides has fallen significantly in recent years; however, the Army's goal is to reduce pesticide use by 50 percent by the year 2000. All chemicals used on Fort Greely are U.S. EPA approved and are applied by personnel who are DOD management certified. (U.S. Army Alaska, 1997—Draft Integrated Natural Resources Management Plan)

Vegetation control is required at Fort Greely on the airfield, road shoulders of main roads, outside storage areas, and other places where weeds grow in concrete and asphalt cracks.

Mosquitoes, biting gnats, and flies are important pests during warm months. The Alaska Preventative Medicine Branch, and the Pest Controller are responsible for mosquito surveillance and determination of the need for control. Control includes elimination of mosquito breeding areas and use of pesticides when needed. Ultra Low Volume insecticide treatment with Pyrenone is the recommended treatment. Flies are normally treated using sanitation practices. (U.S. Army Alaska, 1997—Draft Integrated Natural Resources Management Plan)

3.7.1.5 Yukon Training Area (Fort Wainwright)—Hazardous Materials and Hazardous Waste Management

The ROI for hazardous materials and hazardous waste management is the Yukon Training Area Winter Camp area. This site has no present existing structures for support of the NMD activities. Therefore, there are no issues with asbestos, PCBs, or lead-based paint associated with the proposed site. The Yukon Training Area may require the use of Fort Wainwright and Eielson AFB infrastructure and existing facilities. Support facilities could be constructed on both the Yukon Training Area and Eielson AFB.

Hazardous Materials Management

The Yukon Training Area uses little or no hazardous materials in its present status. The hazardous materials utilized consist of motor fuel, oil, lubricants, and similar materials associated with trucks and equipment used for training. Any hazardous materials that are used are supplied through the Fort Wainwright hazardous materials management program.

Hazardous Waste Management

Only small amounts of hazardous waste are generated at the Yukon Training Area, due to the few activities and lack of any maintenance or

other facilities that typically generate hazardous waste. Any hazardous waste that is generated would be handled and disposed of according to the Fort Wainwright Hazardous Waste Management Plan. In 1997, Fort Wainwright generated a total of 177,396 kilograms (391,093 pounds) of hazardous waste (Johnson, D., 1998—Electronic communication, December 14).

Installation Restoration Program

No investigations have been performed for the Yukon Training Area; however, because of the limited amount of military activities at the proposed NMD sites, no contamination is expected (Alaska July Trip Report). There is a low potential for unexploded ordnance in the area, due to the long history of military training. Most of the ordnance consists of small arms ammunition and 40-millimeter practice grenades.

Radon

According to the Generalized Geologic Radon Potential of the United States Map by the USGS, the majority of Interior Alaska is classified as an area of moderate and/or variable radon concentration levels. Extreme northern areas and southern areas of the state are classified as low geological radon potential areas. Radon concentrations in the vicinity of the Yukon Training Area could range from 2 to 4 picocuries per liter. (U.S. Geological Survey, 1995—Radon Potential of the United States)

The site within the Yukon Training Area being considered for NMD activities is relatively close to Eielson AFB. Therefore, the radon levels at the proposed NMD site are expected to be similar to those experienced on Eielson AFB. As mentioned in section 3.7.1.3, radon levels at Eielson AFB are well below the U.S. EPA guideline of 4 picocuries per liter. Radon is not expected to be a concern in the Yukon Training Area.

Pesticides

No pesticides are used in the proposed NMD areas.

3.7.2 NORTH DAKOTA INSTALLATIONS

3.7.2.1 Cavalier AFS—Hazardous Materials and Hazardous Waste Management

The relevant aspects of hazardous materials/waste management include the applicable regulatory procedures for hazardous materials usage and hazardous waste generation, and management programs for existing hazardous waste-contaminated sites within areas potentially affected by the NMD program. The ROI for hazardous materials and hazardous waste management includes Cavalier AFS for general operations and those

areas where potential NMD construction activities would occur within the base boundary.

Hazardous Materials Management

Cavalier AFS receives, stores, and utilizes small quantities of hazardous materials. The most commonly utilized hazardous materials include diesel fuel, gasoline, lubricating oil, thinners, kerosene, solvents, and sulfuric acid. Cavalier AFS is currently in the process of starting its own hazardous material HAZMART management system. In the meantime, hazardous materials are issued and managed through Grand Forks AFB Hazardous Materials HAZMART (see section 3.7.2.2). Hazardous materials used and storage on Cavalier AFS are concentrated in the Perimeter Acquisition Radar building, the Power Plant, and the Industrial Buildings area. Expended hazardous materials are transported to the Defense Reutilization and Marketing Office at Minot AFB for disposal or re-use. All areas that contain hazardous materials have appropriate Material Safety Data Sheets.

Petroleum, oils, and lubricants at Cavalier AFS are stored in both aboveground storage tanks and underground storage tanks. A total of four underground storage tanks are located at Cavalier AFS. Two of the underground storage tanks have permanent leak detection. All four underground storage tanks are equipped with a spill and overfill protection system and a cathodic protection system. (Department of the Air Force, 1995—Underground Storage Tank Status Report)

A total of 19 aboveground storage tanks are located at Cavalier AFS. The aboveground storage tanks are inspected regularly by maintenance personnel for possible breach in containment (Cavalier AS, 1996—Environmental Protection Plan Part 6).

The base Spill Prevention and Response Plan provides guidance for the storage and handling of hazardous substances at Cavalier AFS. The plan also provides contingency plans identifying key personnel, responsibilities, and facility-specific procedures to follow in the event of a hazardous substance spill. The base also complies with EPCRA reporting requirements by submitting annual emergency response and extremely hazardous substances updates to local emergency management officials.

Hazardous Waste Management

A Hazardous Waste Management Plan for Cavalier AFS was completed in July 1998. The Hazardous Waste Management Plan requires that all hazardous waste must be stored, handled, and disposed of in accordance with applicable regulations. The plan requires an establishment of hazardous waste accumulation points, maintenance of written manifests of hazardous waste, and proper disposal of hazardous waste through

proper military and contractor personnel. Hazardous waste streams generated by facility operations at Cavalier AFS include Safety Kleen solvents, paint waste, mineral spirits, chlorine, sulfuric acid, mercury, and batteries. In 1997 Cavalier AFS generated 1,522 kilograms (3,357 pounds) of hazardous waste (Department of the Air Force, 1998—1997 Biennial Hazardous Waste Report).

Cavalier AFS is registered with the U.S. EPA as a conditionally exempt small quantity generator (Kotchman, 1999—Comments received by EDAW, Inc. regarding the NMD Deployment Coordinating Draft EIS, Jan 27). Hazardous waste is stored at a 180-day central accumulation point and four satellite accumulation points in several types of storage containers ranging from 3.8-liter (1-gallon) cans to 208-liter (55-gallon) drums. Cavalier AFS is not a transport, storage, or disposal facility, and no hazardous waste treatment of disposal is performed at Cavalier AFS. The Defense Reutilization and Marketing Office or their contractor will transport hazardous wastes from Cavalier AFS to a permitted hazardous waste facility at the Defense Reutilization and Marketing Office at Minot AFB (Cavalier AS, 1996—Environmental Protection Plan Part 5).

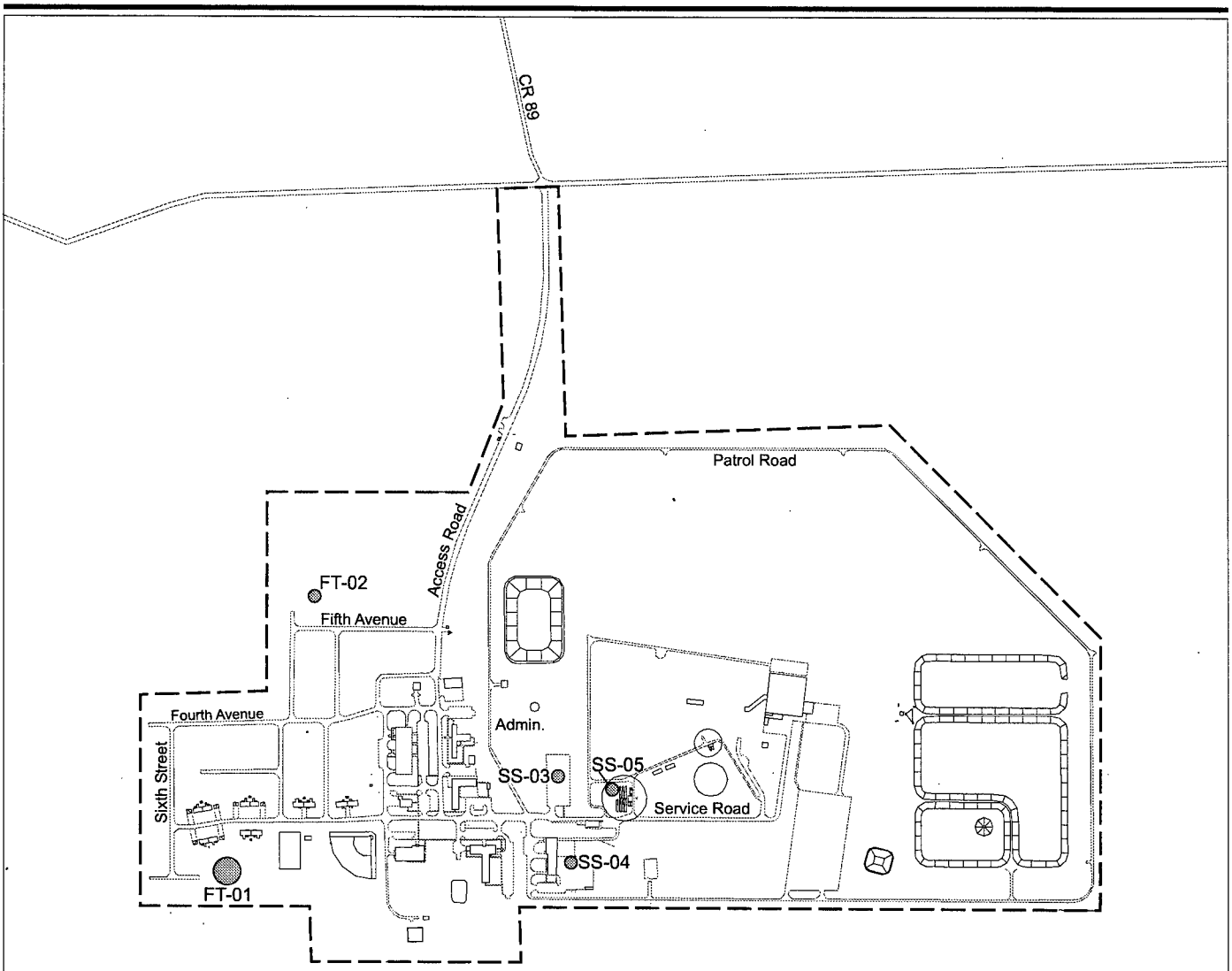
Pollution Prevention

A Pollution Prevention Plan was included as part of the Hazardous Waste Management Plan and was completed December 31, 1996 for Cavalier AFS. The plan includes reduction or elimination of hazardous substances, pollutants, or contaminants. Pollution that cannot be recycled will be treated in an environmentally safe manner (Cavalier AS, 1996—Environmental Protection Plan Part 5).

The refuse contractor for Cavalier AFS maintains recycling bins in the Perimeter Acquisition Radar building parking lot for glass, paper, cardboard, metal, and plastics. Under a local initiative, Cavalier AFS also segregates and recycles computer, bond, and newspapers. (U.S. Air Force Space Command—Comprehensive Planning Framework, Cavalier AS)

Installation Restoration Program

Five IRP sites have been identified at Cavalier AFS (figure 3.7-4). Four of these sites have been officially closed by the North Dakota Department of Health. Site FT-01, an old burn pit, may have contained diesel fuel, waste oils (potentially containing PCBs), and solvents. Current plans for the site are long-term monitoring. Cavalier AFS performs semi-annual groundwater sampling at site FT-01 as required by the North Dakota Department of Health. (U.S. Air Force Space Command, undated—Comprehensive Planning Framework, Cavalier AS)



EXPLANATION

- Installation Boundary
- Closed Site
- IRP Sites

CR = County Road
ND = North Dakota Road

Scale 1:11,000
0 459 917 Feet
0 140 280 Meters

NORTH

hw_cas_001

Installation Restoration Program (IRP) Sites, Cavalier Air Force Station

North Dakota

Figure 3.7-4

Asbestos

An Asbestos Management Operating Plan for Cavalier AFS was implemented in July 1998. Grand Forks AFB provides an Asbestos Management Team with trained and certified asbestos personnel to Cavalier AFS. The asbestos plan requires that contractors provide certified personnel if needed. The Asbestos Management Operating Plan includes copies of work orders, notification records, bulk and air sampling results, asbestos registry, training and certification records, and disposal documents.

At Cavalier AFS, asbestos-containing material is generated during remediation operations conducted for building renovations or demolition. Facilities that are to be renovated or demolished are surveyed for asbestos-containing material prior to construction activities, and remediated when necessary. The removal of asbestos-containing material from facilities generates a waste that can be landfilled at several local permitted municipal waste disposal facilities.

Facilities on Cavalier AFS were surveyed in June 1989 for asbestos-containing material. Most of the Perimeter Acquisition Radar building is believed to have asbestos matting between the sheet metal walls. Asbestos is also present in some utility ducts and in the insulation for pipes and heating ducts. Additionally, many of the floor tiles and mastic in facilities on Cavalier AFS contain asbestos, but are in good condition. (U.S. Air Force Space Command, undated—Comprehensive Planning Framework, Cavalier AS)

Polychlorinated Biphenyls

Cavalier AFS uses a variety of electronic and communications equipment that contain PCBs. Most of these items are located in the Perimeter Acquisition Radar facility. The station maintains a record of all PCB-containing equipment and has tested suspect equipment for PCB levels. (U.S. Air Force Space Command, undated—Comprehensive Planning Framework, Cavalier AS) An ongoing project to replace the PCB materials in electrical transformers and major equipment has been completed (Fors, 1999—Electronic communication).

Lead-based Paint

A lead-based paint survey began at Cavalier AFS in 1996 and was completed in 1998 (Kotchman, 1999—Comments received by EDAW, Inc. regarding the NMD Deployment Preliminary Draft EIS, April 30). The 1996 testing was concentrated in public and community areas accessible to children, for whom exposure to lead poses the greatest threat. Lead-based paint was noted in the Fitness Center, Bachelors Enlisted Quarters, and some playground equipment (U.S. Air Force Space Command,

undated—Comprehensive Planning Framework, Cavalier AS). The 1998 survey work involved evaluating the non-public areas of Cavalier AFS. Because Cavalier AFS was built before 1980, there is the potential that all buildings may contain lead-based paint. Cavalier AFS samples paint before any building remodeling and demolition and removes any identified lead-based paint in accordance with applicable regulations.

Radon

Cavalier AFS does not currently have a Radon Assessment and Mitigation Program. Radon sampling performed in March 1996 indicated that levels were below 4 picocuries and no further sampling was required. (U.S. Air Force Space Command, undated—Comprehensive Planning Framework, Cavalier AS)

Pesticides

Pest management support for Cavalier AFS is provided by Grand Forks AFB personnel under the 1994 Support Agreement. Herbicides are applied by state certified contractor personnel to control broadleaf weeds, grassy weeds, and several varieties of noxious weeds. (U.S. Air Force Space Command, undated—Comprehensive Planning Framework, Cavalier AS)

3.7.2.2 Grand Forks AFB—Hazardous Materials and Hazardous Waste Management

The relevant aspects of hazardous materials/waste management include the applicable regulatory procedures for hazardous materials usage and hazardous waste generation, and management programs for existing hazardous waste-contaminated sites within areas potentially affected by the NMD program. The ROI for hazardous materials and hazardous waste management includes Grand Forks AFB for general operations and those areas where potential NMD construction activities could occur.

Hazardous Materials Management

Grand Forks AFB receives, stores, and utilizes large quantities of hazardous materials. The most commonly utilized hazardous materials include aviation and motor fuels, various grades of petroleum products, lubricants, hydraulic fluids, solvents, paints, thinners, and compressed gases. Most hazardous materials are delivered to the base hazardous materials HAZMART (see Pollution Prevention section). Hazardous materials are distributed from this system, using base personnel as transporters. All base hazardous materials are tracked through this system.

A total of 74 regulated and non-regulated underground storage tanks and 55 aboveground storage tanks are present at Grand Forks AFB (U.S.

Department of the Air Force, 1997—Grand Forks AFB General Plan). Underground and aboveground storage tanks are checked on a routine basis. Compliance activities are being conducted in accordance with the North Dakota Underground Storage Tank Program (U.S. Department of the Air Force, 1997—Integrated Natural Resources Management Plan, Grand Forks AFB).

All personnel who work with hazardous materials have initial and updated training in Hazard Communication, which enables them to identify the hazards of the material. Material Safety Data Sheets are provided with materials or can be obtained from the Pharmacy or the Bioenvironmental Engineering Services office. Spill response is conducted by the Base Fire Protection Flight, and inspection of facilities is conducted by the Fire Protection Flight, Safety, and Bioenvironmental Engineering Services.

Grand Forks AFB maintains an Oil and Hazardous Substance Spill Prevention and Response Plan, which is in the process of being updated. The plan provides guidance and assigns responsibilities to prevent and respond to oil and hazardous substance discharges on-base and in the missile field (U.S. Department of the Air Force, 1999—Final EIS, Minuteman III Missile System Dismantlement). The base also complies with EPCRA reporting requirements by submitting annual emergency response and extremely hazardous substances updates to the local emergency management officials.

Hazardous Waste Management

Hazardous waste streams generated by facility operations at Grand Forks AFB include bead blast media, solvents, paint and paint-related material, shelf life expired materials, contaminated soil, and spill residue. The largest waste volumes generated in 1997 were off-spec paint (2,837 kilograms [6,255 pounds]), Safety Kleen solvent (1,836 kilograms [4,047 pounds]), paint related material (tape, paper, protective suits) (1,788 kilograms [3,941 pounds]), and sodium chromate solution (1,548 kilograms [3,412 pounds]). The total waste generated from the facility in 1997 was 18,834.7 kilograms (41,523.4 pounds) (Department of the Air Force, 1998—1997 Hazardous Waste Report, Grand Forks AFB). The missile fields generate batteries, battery acid, paint and solvent wastes, and sodium chromate solution and rags (U.S. Department of the Air Force, 1999—Final EIS, Minuteman III Missile System Dismantlement). All wastes are handled in accordance with applicable regulations.

Grand Forks AFB is a large quantity generator under RCRA. Grand Forks AFB operates a North Dakota Department of Health permitted treatment, storage, and disposal facility. Hazardous waste is stored at the 23 satellite accumulation points until 208 liters (55 gallons) of hazardous waste, or 0.9 liter (1 quart) of acutely hazardous waste is generated. After this amount of waste is generated at the satellite accumulation

point, it is transferred to one of the 90-day accumulation points. At this location waste is prepared for shipment before transfer to the main treatment, storage, and disposal facility. This facility has a capacity of 9,993 liters (2,640 gallons) or forty-eight 208-liter (55-gallon drums); approximately 14,574 liters (3,850 gallons) is processed through this facility annually. From this facility, the waste is disposed of by a state approved contractor to an off-base U.S. EPA permitted facility. (U.S. Department of the Air Force, 1997—Grand Forks AFB General Plan)

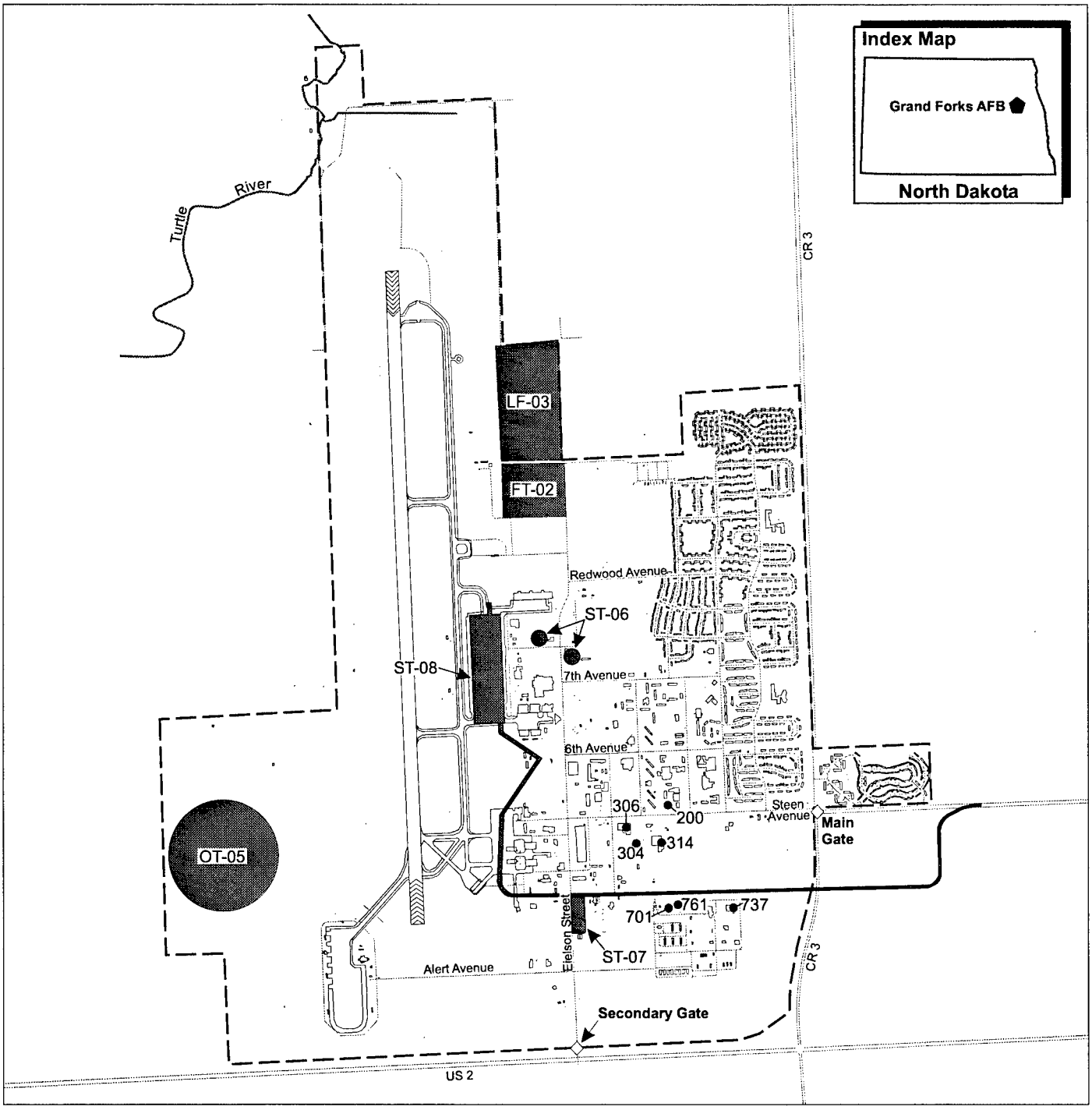
Emergency response equipment is maintained in accessible areas throughout Grand Forks AFB. Spill response kits and fire extinguishers are available at all 90-day hazardous materials storage areas and at the Defense Reutilization and Marketing Office. The Grand Forks AFB Fire Department maintains fire response, discharge control, and containment equipment. (U.S. Department of the Air Force, 1997—Integrated Natural Resources Management Plan)

Pollution Prevention

Grand Forks AFB has a Pollution Prevention Plan. The Pollution Prevention Plan includes the reduction or elimination of hazardous substances, pollutants, and contaminants. Pollution that cannot be recycled will be treated in an environmentally safe manner. Grand Forks AFB also administers a pharmacy program that controls and reduces the use of hazardous materials through a HAZMART system. The pharmacy is a pollution prevention initiative used throughout the Air Force, designed to reduce the amount of hazardous materials stored at various facilities. Hazardous materials are dispensed and tracked from the base HAZMART, which gathers the information necessary to optimize the use of hazardous materials and reduce waste, and provides the information needed for EPCRA reporting. Grand Forks AFB also has an active recycling program that includes paper, cardboard, aluminum, scrap metal, plastics, and glass. (U.S. Department of the Air Force, 1999—Final EIS, Minuteman III Missile System Dismantlement)

Installation Restoration Program

Grand Forks AFB administers an IRP under CERCLA guidance. There are currently seven IRP sites at Grand Forks AFB. They are the Fire Training Area/Old Sanitary Landfill Area (FT-02); New Sanitary Landfill Area (LF-03); Building 306 (ST-04); Explosive Ordnance Detonation Area (OT-05); Refueling Ramps and Pads (ST-08); Base Tanks Area (ST-06); and Petroleum, Oil, and Lubricant Off-loading Area (ST-07) (figure 3.7-5). Grand Forks AFB is not on the National Priorities List. (Grand Forks AFB, 1995—Management Action Plan)



EXPLANATION

- Installation Boundary
- Solid Waste Management Unit
- IRP Sites
- Gate

CR = County Road
US = U.S. Highway

Scale 1:40,000

0 1,667 3,333 Feet

NORTH

0 508 1,016 Meters

Installation Restoration Program (IRP) and Solid Waste Management Unit Sites, Grand Forks Air Force Base

North Dakota

Figure 3.7-5

In 1993, the North Dakota Department of Health added 48 new suspected areas of concern to the Base IRP. All areas, including the seven existing IRP sites, were grouped together and reclassified as 20 solid waste management units. All solid waste management units are subject to RCRA Corrective Action and are regulated by the base's RCRA Part B Permit. The existing IRP sites are also regulated by CERCLA and/or the North Dakota Underground Storage Tank Program. (U.S. Department of the Air Force, 1997—Grand Forks AFB General Plan)

The IRP sites near potential NMD deployment areas are the former explosive and ordnance detonation area OT-5 (which was closed under RCRA/CERCLA regulations and is at a low risk level) and the base underground storage tank ST-06, which was closed under The North Dakota Underground Storage Tanks Program. Another site is Site ST-07, which is a benzene groundwater plume under the Petroleum, Oil, and Lubricant Off Loading Area. The plume, which is just west of the Munitions Storage Area, is apparently moving in a westerly direction. Remedial action is in progress under RCRA/CERCLA regulations. Solid Waste Management Unit sites near potential NMD deployment areas include those associated with oil/water separators (Buildings 304, 314, and 701) and underground waste storage tanks (Buildings 200, 306, 737, and 761) that contained waste oil, hydraulic oil, solvents, contaminated fuel, and diesel fuel. Grand Forks AFB is recommending no further action required at Buildings 200, 306, 314, and 737. (Grand Forks AFB, 1995—Management Action Plan)

Asbestos. The base maintains trained and certified asbestos abatement personnel, and requires that contractors provide certified personnel if needed. Up to 0.28 square meter (3 square feet) of asbestos-containing material may be disturbed by non-certified contractors. (U.S. Department of the Air Force, 1999—Final EIS, Minuteman III Missile System Dismantlement)

At Grand Forks AFB, asbestos-containing material is generated during remediation operations for building renovations or demolition. The removal of asbestos-containing material from facilities generates a waste that is landfilled at the Grand Forks Municipal Landfill. Facilities on Grand Forks AFB were surveyed in 1993-94 for asbestos-containing material. Facilities that are to be renovated or demolished are surveyed for asbestos-containing material prior to construction activities, and remediated when necessary. The Environmental Engineers Flight, Civil Engineer Operations, and Bioenvironmental Engineering Services manage most aspects of asbestos remediation. The base maintains an Asbestos Management and Operation Plan that includes asbestos work orders, notification records, bulk and air sampling results, asbestos registry, training and certification records, and disposal documents. (U.S. Department of the Air Force, 1999—Final EIS, Minuteman III Missile System Dismantlement).

Polychlorinated Biphenyls

Personnel from the Environmental Engineers Flight, Missile Maintenance, and the Exterior Electric offices manage PCBs. Documents and files are maintained at Grand Forks AFB, including PCB documentation for the past 3 years. All known PCB-containing transformers, hydraulic systems, heat transfer components, and other PCB items have been removed from Grand Forks AFB. (U.S. Department of the Air Force, 1999—Final EIS, Minuteman III Missile System Dismantlement)

Lead-based Paint

Grand Forks personnel manage lead-based paint identification and abatement in accordance with all Air Force guidance, and have designated the Environmental Engineers Flight, Base Housing Office, and Medical Group as being responsible for lead-based paint management.

A visual inspection of pre-1980 buildings (those which are most likely to contain lead-based paint) has been conducted at Grand Forks AFB. The inspection included all housing and community buildings, but not industrial facilities of shops. Because most of Grand Forks AFB was built before 1980, there is the potential that most buildings may contain lead-based paint. Buildings that are to be demolished or remodeled are checked for lead-based paint. If lead-based paint is found, the paint is removed in accordance with Federal Regulations. (U.S. Department of the Air Force, 1999—Final EIS, Minuteman III Missile System Dismantlement)

Radon

A radon survey of base housing was completed in 1989 and was aimed at pinpointing potential sources of radon emissions. This study classified Grand Forks AFB housing as being a moderate risk facility requiring further sampling. Mitigation efforts occurred in 1991. Radon surveys and further mitigation efforts are continuing as part of an active program. Radon assessment surveys for evaluating radon emissions at administrative areas on-base are programmed and will be conducted when funding becomes available. (U.S. Department of the Air Force, 1997—Grand Forks AFB General Plan)

Pesticides

The management of pesticides at Grand Forks AFB is accomplished by the Pest Management staff, who maintain the grounds and buildings on the base, and by the golf course staff, who maintain the golf course. The base pesticide facility is a state-of-the-art facility, and Pest Management personnel are certified as pesticide applicators. The base also contracts for some pesticide applications. The Air Force has set a goal for the reduction of pesticides by the year 2000, which is being aggressively pursued by the Pest Management Shop (U.S. Department of

the Air Force, 1999—Final EIS, Minuteman III Missile System Dismantlement).

3.7.2.3 Missile Site Radar—Hazardous Materials and Hazardous Waste Management

The relevant aspects of hazardous materials/waste management include the applicable regulatory procedures for hazardous materials usage and hazardous waste generation, and management programs for existing hazardous waste-contaminated sites within areas potentially affected by the NMD program. The ROI for hazardous materials and hazardous waste management includes Missile Site Radar for general operations and those areas where potential NMD construction activities could occur.

Hazardous Materials Management

The Missile Site Radar is an inactive site that receives routine maintenance by a small caretaker staff. Hazardous materials used as part of the maintenance activities include paint solvents, thinners, and starter fluids. Only very small quantities of these materials are stored onsite.

Between June and September 1991, the E.P.I.C. Company, under contract to the U.S. Army Corps of Engineers, completed underground storage tank closures at the Missile Site Radar. All but one petroleum underground storage tank underwent closure according to North Dakota requirements in place at the time of removal. One 264,980-liter (70,000-gallon) concrete underground storage tank located adjacent to the Missile Site Radar Power Plant was closed in place. (U.S. Army Corps of Engineers, 1991—Underground Storage Tank Closure Report, SRMSC)

Hazardous Waste Management

The Missile Site Radar is in caretaker status, and little or no hazardous waste is being generated. Any hazardous waste generated as part of maintenance activities is disposed of offsite in accordance with applicable regulations.

Pollution Prevention

Because the site is currently inactive, there are no pollution prevention initiatives.

Installation Restoration Program

According to the U.S. Army Center for Health Promotion and Preventive Medicine report (1995) for the SRMSC, the areas described in the following paragraphs are, or will potentially be, IRP sites.

At the Missile Site Radar facility, a preliminary investigation revealed that a pipe tunnel contains trace amounts of diesel fuel. The fuel has not leaked or migrated to the soil or groundwater outside the tunnel. Only very low concentrations of total petroleum hydrocarbons (less than state action level) were detected sporadically in the borehole soil samples, and the analytical results of the groundwater samples did not indicate contamination.

Wastewater pond sediment samples from the center stabilization pond contained concentrations of total petroleum hydrocarbons that are above state action levels. If the ponds are drained and backfilled, the remaining sediments in each of the ponds would need to be sampled and analyzed for petroleum before backfilling.

The former Missile Site Radar Control Building Fire Water Storage Pond has contaminated soil and groundwater in the immediate vicinity. The concentrations of petroleum hydrocarbons exceed the state action levels. The groundwater samples contained two volatile organic compounds, trichlorofluoromethane and trichloroethane, that are constituents of solvents and coolants.

Seven of the eight electric vaults and signals at the Missile Site Radar missile field contain substantial concentrations of total petroleum hydrocarbons, as well as an oily layer.

In 1995, an inspection of water in nine of the Spartan missile silos was conducted. Results of the investigation showed elevated concentrations of chromium and also detected beryllium, cadmium, iron, mercury, manganese, nickel, lead, antimony, and zinc (U.S. Army Space and Missile Defense Command, 1999—Expanded Preliminary Assessment).

Asbestos

An Asbestos Survey Report and Asbestos Management Plan for the Missile Site Radar was implemented on September 18, 1995. The Missile Site Radar facility is part of the complex and was included in this plan. The Asbestos Management Operation Plan includes work orders, notification records, bulk and air sampling results, asbestos registry, training and certification records, and disposal documents.

At the Missile Site Radar, asbestos-containing material is generated during remediation operations for building renovations or demolition. The removal of asbestos-containing material from facilities generates a waste that can be landfilled at several local permitted municipal waste disposal facilities. Facilities on the Missile Site Radar were surveyed in September 1991, October 1991, and September 1995 for asbestos-containing material. A total of 58 buildings were inspected, with 428 samples

obtained. The majority of positive materials identified for asbestos were floor tiles. Additional items that contained asbestos include linoleum, transite panels, ceiling panels, wall panels, roofing material, caulk, conduit putty, and gaskets. Facilities that are to be renovated or demolished are surveyed for asbestos-containing material prior to construction activities, and remediated when necessary. (U.S. Army Space and Strategic Command, 1995—Asbestos Survey Report and Management Plan)

Polychlorinated Biphenyls

In 1990 a PCB survey was conducted at the Missile Site Radar facility and associated Remote Site Launch Sites and resulted in the identification of 74 transformers. Of the 74 transformers identified and tested, only 7 indicated the presence of PCBs. All known transformers and other items containing PCBs were removed from the Missile Site Radar facility. In 1992, an inspection of the Missile Site Radar Facility identified PCB containing equipment that could have gone unnoticed during the 1991 inspection. Therefore, in September 1993, suspect PCB containing materials was investigated. Results indicated that out of 37 potential PCB containing items it was unlikely that any of the items contained regulated levels of PCBs. (U.S. Army Space and Strategic Defense Command, 1994—Engineering Report, SRMSC)

Lead-based Paint

The Missile Site Radar facility was constructed before 1980. Therefore, there is the potential that most buildings and silos may contain lead-based paint. Buildings that are to be demolished or remodeled are checked for lead-based paint. If lead-based paint is found, the paint is removed in accordance with Federal regulations.

Radon

According to Radon Potential of the Upper Midwest map by the U.S. Geological Survey (1993), all of North Dakota is classified as an area of high radon concentration level. A radon survey completed for the Missile Site Radar found Building 348, now demolished, and Building 360 to have radon levels above 4 picocuries per liter. All other facilities surveyed were below 4 picocuries per liter (Greenwood, 1999—Comments received by EDAW, Inc., regarding the NMD Deployment Coordinating Draft DEIS).

Pesticides

The Missile Site Radar facility does not use any insecticides or pesticides. Herbicides have been used periodically to control weed growth in pavements and for spot control of noxious weeds such as leafy spurge.

Herbicides that have been used in the past include 2-4D Amine, Banvel, and Promoton. (Greenwood, 2000—Electronic communication)

3.7.2.4 Remote Sprint Launch Site 1—Hazardous Materials and Hazardous Waste Management

The relevant aspects of hazardous materials/waste management include the applicable regulatory procedures for hazardous materials usage and hazardous waste generation, and management programs for existing hazardous waste-contaminated sites within areas potentially affected by the NMD program. The ROI for hazardous materials and hazardous waste management includes Remote Sprint Launch Site 1 for general operations and those areas where potential NMD construction activities could occur.

Hazardous Materials Management

Remote Sprint Launch Site 1 is an inactive site that receives routine maintenance by a small caretaker staff that operates from the Missile Site Radar. Hazardous materials used as part of the maintenance activities include paint solvents, thinners, and starter fluids.

All underground storage tanks have been removed from the Remote Sprint Launch Sites (U.S. Army Corps of Engineers, 1991—Underground Storage Tank Closure Report, SRMSC).

Hazardous Waste Management

Remote Sprint Launch Site 1 is in caretaker status, and little or no hazardous waste is being generated. Any hazardous waste generated as part of maintenance activities is disposed of offsite in accordance with applicable regulations.

Pollution Prevention

Because the site is currently inactive, there are no pollution prevention initiatives.

Installation Restoration Program

There are no known hazardous waste contaminated sites at Remote Sprint Launch Site 1. Water removed from the Remote Launch Operations Building in 1991 did not indicate the presence of any contaminates. No further investigation is planned for these facilities. Water may exist in some of the Sprint Silos. Current plans are for a representative number of silos to be investigated. If water is present, it would be sampled and analyzed. If any contamination is discovered, consultation with the appropriate agencies would occur to determine

future investigation and potential remediation (U.S. Army Space and Missile Defense Command, 1999—Expanded Preliminary Assessment).

Asbestos

An Asbestos Survey Report and Asbestos Management Plan for the SRMSC was implemented on September 18, 1995. The Remote Sprint Launch Site 1 facility is part of the complex and was included in this plan. The Asbestos Management Operation Plan includes work orders, notification records, bulk and air sampling results, asbestos registry, training and certification records, and disposal documents.

The removal of asbestos-containing material from facilities generates a waste that can be landfilled at several local permitted municipal waste disposal facilities. Facilities at the Remote Sprint Launch Site were surveyed in September 1995 for asbestos-containing material. The majority of positive materials identified for asbestos were black mastic and gaskets. Additional items that contained asbestos include ceiling panels, conduit putty, and window caulking. Facilities that are to be renovated or demolished are surveyed for asbestos-containing material prior to construction activities, and remediated when necessary. (U.S. Army Space and Strategic Defense Command, 1995—Asbestos Survey Report and Management Plan)

Polychlorinated Biphenyls

In 1991, a PCB survey was conducted at the Missile Site Radar and Remote Site Launch Sites and resulted in the identification of 74 transformers. Of the 74 transformers identified and tested, only 7 indicated the presence of PCBs. All known transformers and other items containing PCBs were removed from the Missile Site Radar and Remote Sprint Launch Sites. In 1992, an inspection of the SRMSC identified PCB containing equipment that could have gone unnoticed during the 1991 inspection. Therefore, in September of 1993 suspect PCB-containing materials were investigated. Results did not identify any potential PCB items within the Remote Sprint Launch Sites (U.S. Army Space and Strategic Defense Command, 1994—Engineering Report, SRMSC).

Lead-based Paint

Remote Sprint Launch Site 1 was constructed before 1980. Therefore, there is the potential that most buildings and missile silos may contain lead-based paint. Buildings that are to be demolished or remodeled are checked for lead-based paint. If lead-based paint is found, the paint is removed in accordance with Federal Regulations.

Radon

According to Radon Potential of the Upper Midwest map by the USGS (1993), all of North Dakota is classified as an area of high radon concentration level. Remote Sprint Launch Site 1 could possibly be located in areas that have concentrations over the U.S. EPA threshold of 4 picocuries. The U.S. EPA recommends that any buildings built in areas higher than 4 picocuries should be tested, and the appropriate precautions taken if deemed necessary. Construction of new facilities may require the addition of radon mitigation measures.

Pesticides

No insecticides or rodenticides are used at Remote Sprint Launch Site 1. (Greenwood, 2000—Electronic communication)

3.7.2.5 Remote Sprint Launch Site 2—Hazardous Materials and Hazardous Waste Management

The relevant aspects of hazardous materials/waste management include the applicable regulatory procedures for hazardous materials usage and hazardous waste generation, and management programs for existing hazardous waste-contaminated sites within areas potentially affected by the NMD program. The ROI for hazardous materials and hazardous waste management includes Remote Sprint Launch Site 2 for general operations and those areas where potential NMD construction activities could occur. The Remote Sprint Launch Sites (1, 2, and 4) were built of similar design and construction material. The relevant aspects of hazardous materials and hazardous waste management for Remote Sprint Launch Site 2 is similar to that described for Remote Sprint Launch Site 1, except that some additional soil contamination investigations may be required for the evaporation ponds.

3.7.2.6 Remote Sprint Launch Site 4—Hazardous Materials and Hazardous Waste Management

The relevant aspects of hazardous materials/waste management include the applicable regulatory procedures for hazardous materials usage and hazardous waste generation, and management programs for existing hazardous waste-contaminated sites within areas potentially affected by the NMD program. The ROI for hazardous materials and hazardous waste management includes Remote Sprint Launch Site 4 for general operations and those areas where potential NMD construction activities could occur. The Remote Sprint Launch Sites (1, 2, and 4) were built of similar design and construction material. The relevant aspects of hazardous materials and hazardous waste management for Remote Sprint Launch Site 4 is similar to that described for Remote Sprint Launch Site 1.

3.8 HEALTH AND SAFETY/ELECTROMAGNETIC RADIATION

The discussion of human health and safety includes both workers (e.g., military and other government personnel, and contractor personnel) and the general public. Safety issues include injuries that may result from one-time accidents. Health issues result from activities where people may be impacted over a long-period of time rather than immediately. The affected environment for health and safety will include those areas that have the potential to be affected by the increased risk of proposed program activities based on the NMD element being deployed at a given location. This discussion will include existing hazards such as airfield safety zones, hazardous military operations (i.e., aircraft operations, military ground training), fire, unexploded ordnance, and explosive safety zones. In addition, existing safety procedures will be described. Issues related to the use of hazardous materials and generation of hazardous waste will be addressed under the hazardous materials and hazardous waste section of this EIS.

Issues related to existing non-ionizing radiation will be addressed for those locations where XBRs could be deployed. These sites include Eareckson AS, Alaska, Cavalier AFS, Missile Site Radar, and Remote Sprint Launch Sites 1, 2, and 4, North Dakota. A general description of EMR is provided below. Specific information about the existing EMR and equipment that may be affected at these locations is described under each site. Appendix E provides more detail on EMR.

Electromagnetic Radiation Environment

EMR is generated during the operation of such items as microwave ovens, cellular phones, radios, televisions, and radars. By definition, EMR is waves of energy with both electric and magnetic components at right angles to one another. The vibration or acceleration of an electric charge produces these components.

EMR is usually classified as one of two types: ionizing radiation or non-ionizing radiation. Non-ionizing radiation is produced by a wide variety of equipment such as cellular phones, ham radios, and radars. X-rays, cosmic rays, and gamma rays produce ionizing radiation.

Exposure to each of these types of radiation causes different effects in both humans and equipment. Human exposure to high levels of non-ionizing radiation primarily causes heat generation in body tissue. Human exposure to high levels of ionizing radiation causes cell tissue damage. For equipment, high levels of EMR can also cause the inadvertent detonation of ordnance or can simply cause static in radios or televisions. EMR normally causes problems to equipment either by electromagnetic

induction or degradation. Electromagnetic induction occurs when a conductor is moved through a magnetic field or whenever the magnetic field near a conductor is changing. Degradation occurs if undesired pulses from the system emitting the radiation either reduce the sensitivity of the receiving equipment or in some way impair the process involved in detecting the desired signal (Newhouse, 1984—Radar EMC Analysis Handbook).

Standards have been approved by the DOD, American National Standards Institute (ANSI), and the Institute of Electrical and Electronic Engineers (IEEE) to help identify these interference and radiation hazards. These standards also offer some mitigation techniques, such as maintaining safe distance separations and lowering the power levels of transmitters that generate high levels of EMR.

Defining the Electromagnetic Environment

Operation of a radar will certainly change the electromagnetic environment. The electromagnetic environment is made up of both civilian and government communications-electronics equipment. Civilian use of the electromagnetic spectrum is governed by the Federal Communications Commission (FCC). Government use of the spectrum is controlled by the National Telecommunications and Information Administration. Radiation hazards consist of human exposure, electroexplosive devices, and fuel exposure to EMR.

Communications–Electronics Frequency Related Interference

Communications–Electronics In-Band Radio Frequency Interference. In-band frequency interference addressed in this EIS is for the X-Band (8,000 to 12,000 megahertz). The X-Band is the band in which the proposed XBR will operate. In-band radio frequency interference occurs when two pieces of communications-electronics equipment are operating within the same frequency band. Therefore, equipment whose frequencies fall within the same bands will most likely be affected. Some examples of in-band communications-electronics equipment include airborne weather radars, fire control radars, and bomb/navigation radars. Several methods such as software controls can be used to reduce radio frequency interference caused by radars.

Communications–Electronics Adjacent Band Interference. Adjacent band radio frequency interference is similar to in-band radio frequency interference. The adjacent bands include all frequencies that are within approximately 5 percent of the operating frequency of the EMR source. The same standard methods to avoid interference that are used for in-band interference can be applied to adjacent band interference.

Communications–Electronics Harmonic Band Radio Frequency Interference. Harmonic band interference refers to interference produced in harmonically related receivers or interference caused by sub-harmonically related transmitters. Harmonic frequencies include those frequencies that are integer multiples of the operating frequencies. Sub-harmonic frequencies are those frequencies that are simple fractions of the operating frequencies. The likelihood and severity of radio frequency interference in the harmonically related bands is based upon the effective radiated power of the interfering source. Radio frequency interference in the harmonically related bands can be reduced by using software controls.

Communications–Electronics Non-frequency Related Interference

High Power Effects. The EMR fields associated with very high power emitters have produced interference in electronic devices that has not been predictable by the classical analysis processes; i.e., processes that predict spurious and intermodulation responses. This interference has been classified as high power effects (Franks, 1973—High Power Effects Susceptibility Criteria). High power effects typically occur in receivers that are located in proximity to high power transmitters and may be the result of either antenna-coupled signals or equipment case penetration. The accepted levels for high power effects are 40 dBm per square meter for military equipment and 30 dBm per square meter for civilian equipment (Franks, 1973—High Power Effects Susceptibility Criteria). At power density levels below these thresholds, it can be reasonably assumed that high power effects are not likely to occur. At power density levels above these thresholds, it cannot be stated with certainty that high power effects will occur, only that it is possible. High power effect is inherently a non-linear effect and is, therefore, difficult to predict.

Radio Frequency Interference to Avionics. Another form of non-frequency related interference affects aircraft and avionics. Aircraft may fly through the main beam of a radar, and therefore would be exposed to high EMR levels. These levels of EMR could impact the communications and navigation equipment on the aircraft. The fly-by-wire control systems may also be impacted by these high levels of EMR.

Both the DOD and the FAA have developed standards to protect aircraft and avionics from experiencing radio frequency interference. Military Standard 464, "Electromagnetic Environmental Effects Requirements for Systems" (Department of Defense, 1997—Electromagnetic Environmental Effects) identifies the operational environment that military aircraft are likely to experience and thus should be protected to those levels. At X-Band, the thresholds identified are 3,500 volts per meter (peak power) and 1,270 volts per meter (average power). An FAA standard, Notice 8110.71 "Guidance for the Certification of Aircraft Operating in High Intensity Radiated Fields" (Federal Aviation Administration, 1998—Notice 8110.71) also identifies the operational environment that aircraft are

likely to experience. The FAA thresholds for operating in high intensity radiated field environments are 3,000 volts per meter (peak power) and 300 volts per meter (average power).

Radiation Hazards

Operation of radars may generate levels of EMR that are above the standards set to prevent harm to humans. Radars may also generate EMR that is great enough to cause the inadvertent detonation of ordnance or the inadvertent ignition of fuels.

Human Exposure. The EMR that is generated by radars, microwave ovens, cellular phones, etc. is non-ionizing radiation that is absorbed into the human body in the form of heat. This causes the temperature of the body to rise. At low intensities, the heat that is induced by EMR can be accommodated by the thermoregulatory capabilities of the individuals exposed. Thus, any effects produced would generally be reversible. At high intensities, the body's ability to regulate temperature through blood flow and sweat may be exceeded, which could lead to cell tissue damage (Hanscom AFB, 1991—EA HAVE STARE Radar).

All current standards are based upon a 1982 report published by ANSI. The results of that report state that laboratory animals may be affected by specific absorption rates above 4 watts per kilogram, if maintained for protracted periods of time. Therefore, ANSI adopted a 10-fold safety margin specifying a maximum absorption rate of 0.4 watt per kilogram averaged over the whole body and 8 watts per kilogram in any one gram of tissue (IEEE, Inc., 1982—American National Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields).

In 1991, the IEEE published a revision to the 1982 ANSI report. This revision has since been adopted by the DOD as the standard for protecting personnel from radiation hazards (Department of Defense, 1996—Protection of DoD Personnel from Exposure to Radiofrequency Radiation and Military Exempt Lasers). The revision defined personnel exposure limits as a function of frequency in controlled and uncontrolled environments. Controlled environments represent areas that may be occupied by personnel who accept potential exposure as a contingent of employment or duties, by individuals who knowingly enter areas where such levels are to be expected, and by personnel passing through such areas. Uncontrolled environments generally represent living quarters, workplaces, or public access areas where personnel would not expect to encounter higher levels of radio frequency energy. In the X-Band frequency range, the more stringent personnel exposure limits are in uncontrolled environments. (See table 3.8-1.) These personnel exposure limits range from 5.33 to 8 milliwatts per square centimeter for an average time of 11.25 minutes to 7.5 minutes respectively (IEEE, Inc.,

1999—American National Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields).

Table 3.8-1: IEEE Personnel Exposure Limits for Uncontrolled Environments

Frequency Range (in megahertz)	Power Density (in milliwatts per square centimeter)	Average Time (minutes)
0.003 to 0.1	100	6
0.1 to 1.34	100	6
1.34 to 3.0	$180/f^2$	$f^2/0.3$
3 to 30	$180/f^2$	30
30 to 100	0.2	30
100 to 300	0.2	30
300 to 3,000	f/1,500	30
3,000 to 15,000	f/1,500	90,000/f
15,000 to 300,000	10	616,000/f

Source: IEEE, Inc., 1999—American National Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields.
Note: f = frequency in megahertz

People with pacemakers may also be affected by the EMR generated by radars. According to the Air Force Occupational Safety and Health Standard 161-9, significant disruption of normal pacemaker function requires radio frequency radiation signals having a primary frequency between 100 and 5,000 megahertz, pulsewidths greater than 10 microseconds, and electric field strengths greater than 200 volts per meter (Department of the Air Force, 1987—Exposure to Radio Frequency Radiation). The disruption of pacemakers via radio frequency radiation has also been studied extensively at the Georgia Technical Research Institute, and similar results have been found. The disruption of pacemakers has not been studied in the X-Band frequency range because the potential for interference in the X-Band was so low that it did not mandate further testing.

Public concerns have also arisen regarding exposure to potential radiation hazards from electric and magnetic fields caused by power lines. However, a 1997 report from the National Academy of Sciences that examined over 500 studies performed over 17 years found that there is no conclusive evidence that electromagnetic fields play a role in the development of cancer, reproductive and developmental abnormalities, or learning and behavioral problems (National Academy of Sciences, 1997—Possible Health Effects of Exposure to Residential Electric and Magnetic Fields). Researchers have studied the potential effects on human cells and tissue from electric and magnetic fields, and have found that only at

levels between 1,000 and 100,000 times stronger than typical fields found in residential areas have cells shown any reaction to electric and magnetic fields exposure. Therefore, the effects from power line generated electric and magnetic fields were given no further consideration in this study.

Electroexplosive Devices. An electroexplosive device is defined as a single unit, device, or subassembly in which electrical energy is used to initiate an enclosed explosive, propellant, or pyrotechnic material. Some applications of electroexplosive devices are detonators, squibs, blasting caps, and igniters. An electroexplosive device typically consists of a primary charge, a booster charge, and a heat sensitive bead. The heat sensitive bead is similar to a match head, and it is ignited when a current runs across two wires that are connected to the bead, thus constituting a bridge. The bead ignites and sets off the primary charge, which initiates the main charge. The current that ignites the bead can be induced by energy from EMR. Thus, high levels of EMR can inadvertently initiate the device. Energy from EMR may also cause the electroexplosive device to become inactive or dud whenever the induced current is insufficient to initiate the device.

The military standards applied to electroexplosive devices take into consideration three different phases in which electroexplosive devices can be initiated: (1) handling/loading, (2) presence, and (3) shipping. The handling/loading phase occurs whenever the electroexplosive device is in an exposed condition, i.e. not installed or packaged. This is the worst case scenario. The presence phase occurs when the electroexplosive device has been installed in a weapon, such as when a round of ammunition has been loaded in a gun or a missile has been loaded aboard a plane. The shipping phase occurs whenever the electroexplosive device is stored in a shipping container or package. The military standards associated with radiation hazards to electroexplosive devices are listed in table 3.8-2.

Table 3.8-2: Electroexplosive Standards

Military Standard	Date	Threshold at X-Band in volts per meter	Phase
Air Force Manual 91-201	May 1996	200	Handling/Loading
Military Standard 464	March 1997	1,270	Presence/Shipping

Source: Department of Defense, 1996—DODI 6055.11—Protection of DOD Personnel from Exposure to Radio Frequency Radiation.

Fuels. High levels of EMR may cause the accidental ignition of fuel vapors by radio frequency induced arcs during fuel handling operations. The probability of accidental ignition has been reduced in recent years

through various mitigation techniques such as pressurized fueling systems on aircraft and the use of less volatile fuels. However, the risk is still present during the handling of more volatile fuels such as motor vehicle and aviation gasolines. Air Force Technical Order 31 Z-10-4 requires a threshold of 5,000 milliwatts per square centimeter to prevent the inadvertent ignition of fuels (Department of the Air Force, 1989—Electromagnetic Radiation Hazards).

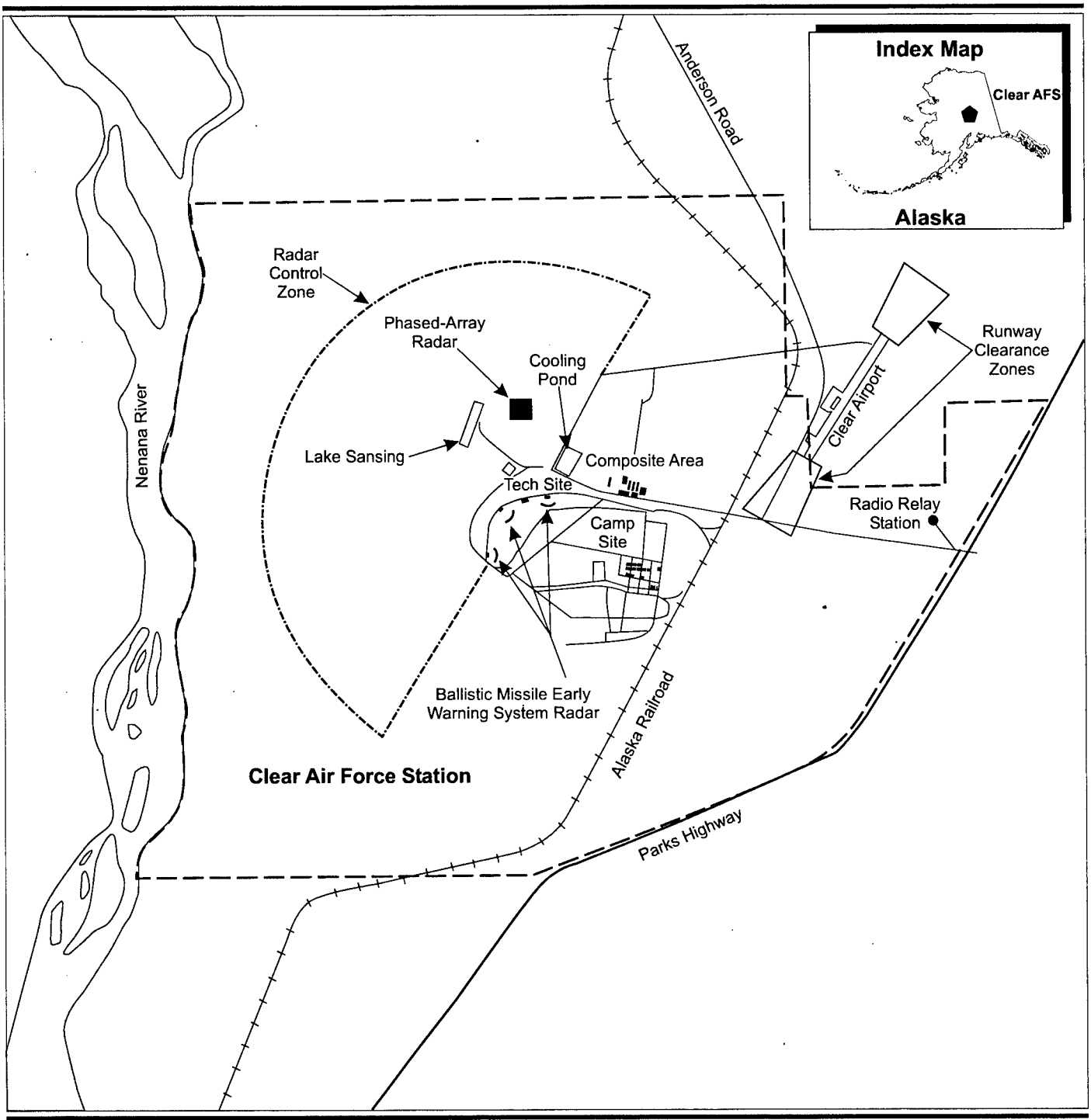
3.8.1 ALASKA INSTALLATIONS

3.8.1.1 Clear AFS—Health and Safety

This section describes the health and safety concerns for the affected base property at Clear AFS and the surrounding area. The ROI for health and safety includes the base and adjacent properties that could be affected by the deployment of a GBI or BMC2 at Clear AFS. The area potentially affected off-base would be the properties immediately adjacent to the base and the transportation network for hazardous materials. For a general description of the health and safety resource area, see section 3.8.

The Air Force has developed standards that dictate the amount of fire equipment that must be present based on the types of total square footage of base structures and housing. The Clear AFS fire department meets these standards, maintaining one structural pumper, a smaller fire fighting vehicle, and an emergency command vehicle. One centrally located facility houses the equipment. The positioning of this facility also meets the Air Force time and distance requirements for facility response. The base contractor has a Health and Safety Plan and there is a full-time emergency medical technician on the base.

Base health and safety issues at Clear AFS include EMR associated with operation of the Ballistic Missile Early Warning System radar and runway approach clearance zones at the end of the Clear Airport public airstrip. To ensure operational safety around the Ballistic Missile Early Warning System radar, a 1,524-meter (5,000-foot) control zone is maintained for structures emanating in a northwesterly direction from the radar (figure 3.8-1) (Clear AFS, 1993—Comprehensive Planning Framework). Radiation exposure measurement taken in surveys identified areas in which the power density levels exceeded the permissible exposure level of 4 milliwatts per square centimeter. These areas are within the base Technical Site where the radar facilities are located. All areas in which radiation levels above the permissible exposure level were measured have been posted with warning signs, and access is strictly controlled during radar operation. The base also maintains a Radiation Protection Program, which is implemented by the Radiation Protection Officer. This program is intended to identify, monitor, and control areas and sources of potentially hazardous radiation, and to provide training for personnel



EXPLANATION

- Roads
- Water Area
- Installation Boundary
- Railroads
- Ballistic Missile System Radar Control Zone

Scale
0 2,500 5,000 Feet
0 762 1,524 Meters

NORTH

Existing Health and Safety Issues, Clear Air Force Station

Alaska

Figure 3.8-1

working at the site with respect to such hazards (U.S. Department of the Air Force, 1997—EA for Radar Upgrade at Clear Air Station, Alaska).

Currently, a new solid state phased-array radar is being installed at Clear AFS to replace the existing Ballistic Missile Early Warning System radar. The new radar is expected to be operational in the fall of 2000. Ground-level measurements taken at a distance of 305 meters (1,000 feet) from a similar radar as the proposed phased-array averaged 0.005 milliwatt per square centimeter, well below the permissible exposure levels of 4 milliwatts per square centimeter. In addition, the phased-array radar is not expected to be a threat to fuel-handling operations or to ground-based electroexplosive devices (U.S. Department of the Air Force, 1997—EA for Radar Upgrade at Clear Air Station, Alaska).

Clear Airport is a small public airstrip northeast of the base. The runway approach clearance zones on the southern end of the runway are on Clear AFS boundary (Clear AFS, 1993—Comprehensive Planning Framework). The airstrip is primarily used by small private planes and has no scheduled commercial service.

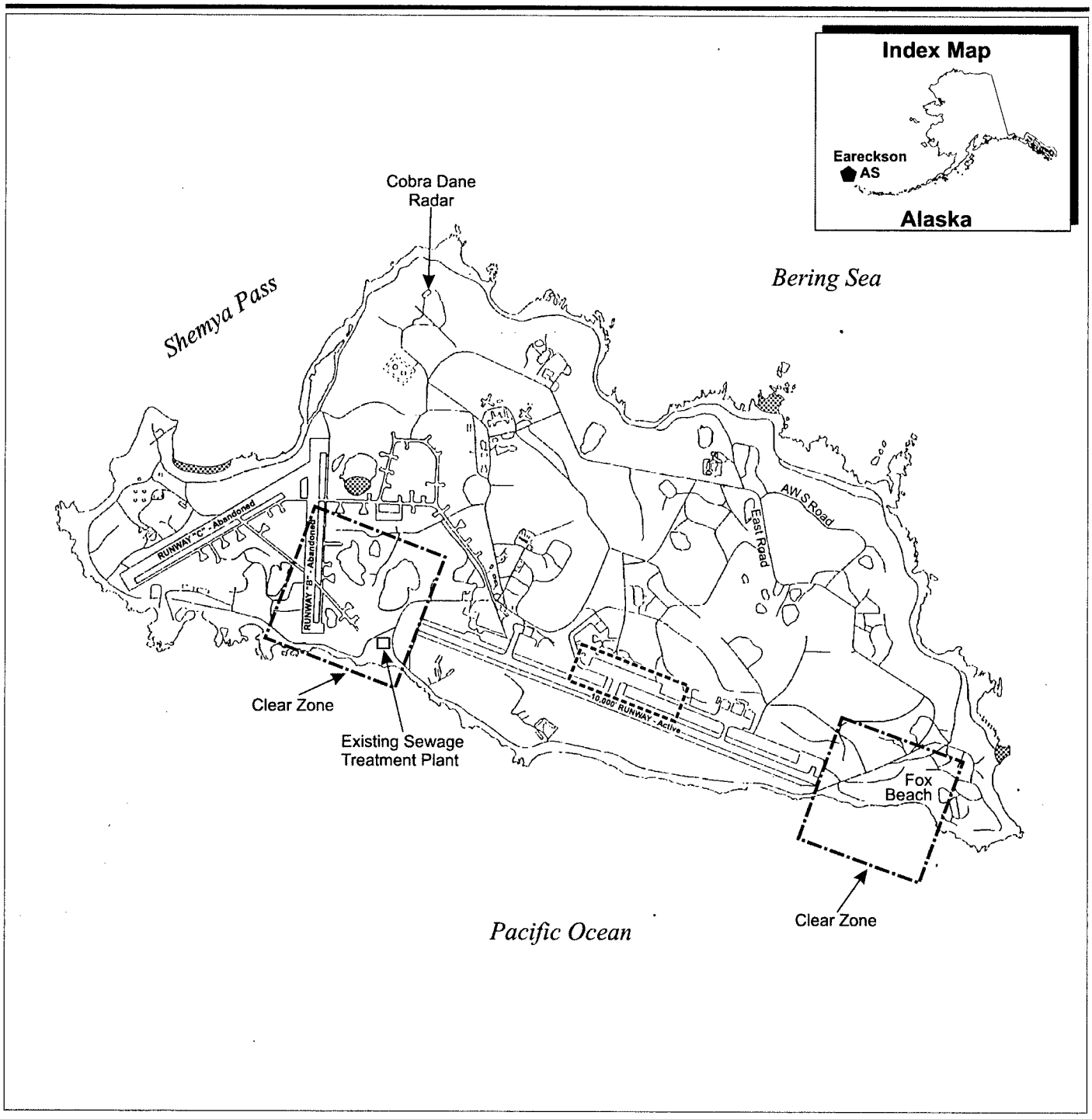
3.8.1.2 Eareckson AS—Health and Safety

This section describes the health and safety concerns for the affected base property at Eareckson AS and the surrounding area. The ROI for health and safety includes the base and adjacent public that could be affected by the deployment of an XBR. The ROI for EMR human health effects is the base and adjacent property. This ROI is based on the area where potential effects to human health are expected to occur (out to 150 meters [492 feet]). The ROI for certain electronic equipment and aircraft (see below) includes an area up to 350 kilometers (217 miles). For a general description of the health and safety resource area, see section 3.8.

On-base Safety

The Air Force has developed standards that dictate the amount of fire equipment that must be present based on the types of aircraft and total square footage of base structures and housing. The Eareckson AS fire department meets these standards, maintaining four crash fire trucks, three structural pumpers, and one spill response truck. One centrally located facility houses the equipment. The positioning of this facility also meets the Air Force time and distance requirements for facility response.

The threats to human safety from aircraft accidents at Eareckson AS have been addressed by the establishment of safety zones around the airfield. In order to minimize the risk at each end of the runway, a Clear Zone and Approach Zones have been designated. These zones have been established to limit development around the airfield on the island (figure 3.8-2).



EXPLANATION

- Roads
- Land Area
- Water Area
- Unexploded Ordnance
- Explosive Safety Quantity Distance (ESQD)
- Runway Clear Zone Boundary

Scale
0 1,738 3,475 Feet
0 530 1,059 Meters

NORTH

Existing Health and Safety Issues, Eareckson Air Station

Alaska

Figure 3.8-2

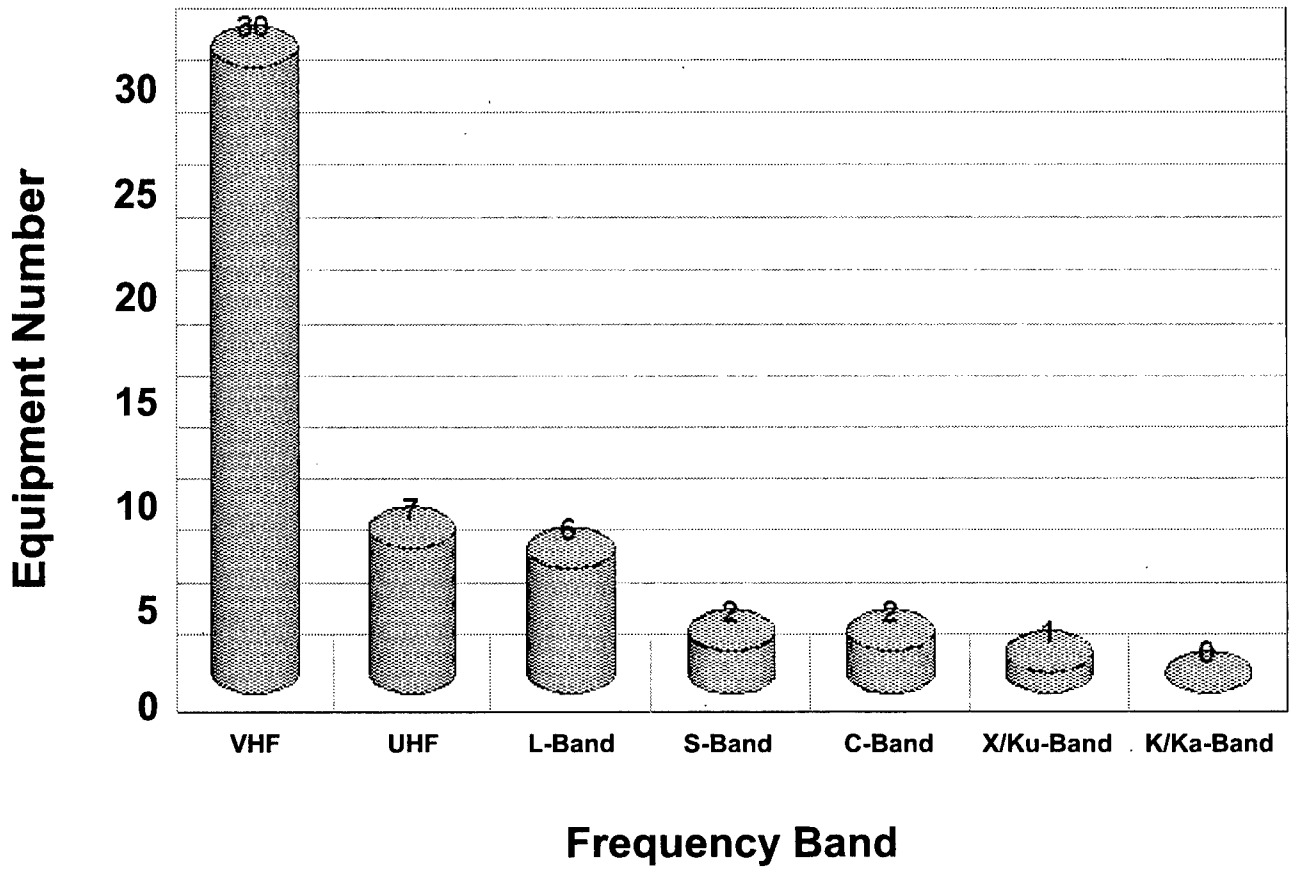
Other base safety issues include ESQDs associated with aircraft loading and unloading areas, unexploded ordnance areas, World War II bunkers, and the weather. Although no ordnance is stored on the base, the Air Force still maintains ESQDs along the aircraft flight line for aircraft using the airfield. There are presently four designated areas on the island that have known unexploded ordnance. These areas are clearly marked with "Danger Unexploded Ordnance" signs. Each person working on the island is informed of these areas. As a result of past construction on the island, there are many areas, which may have underground structures, which could pose a health hazard if not identified prior to construction activities. Periods of hazardous weather conditions (usually high winds) occur at Eareckson AS, and individuals are warned to take precautions during these conditions. The base safety office may limit outside access during these conditions. The base contractor has a Health and Safety Plan, and there is a full-time emergency medical technician on the island.

Electromagnetic Radiation Environment

For purposes of this study, the electromagnetic environment around the Eareckson AS site includes all ground-based systems within a 30-kilometer (19-mile) radius for out-of-band systems and within a 350-kilometer (217-mile) radius for in-band, adjacent band, and harmonically-related bands. The out-of-band communications-electronics environment around the Eareckson AS site was found to include 48 systems ranging in frequencies from 221 kilohertz to 10,525 megahertz. The distribution of these systems over the electromagnetic spectrum, VHF–K-Band, is shown in figure 3.8-3. These systems were categorized into potential receiving of frequency-related interference or non-frequency related interference.

Communications–Electronics Frequency Related Interference. The existing ground-based communications-electronics environment around the Eareckson AS site includes no in-band systems. The airborne electromagnetic environment includes three types of in-band systems: fire control, bomb/navigation, and weather radars. Weather radars are utilized on both civilian and military aircraft. Section 3.3.1.1 provides an overview of the airspace and airports in the Eareckson AS ROI.

Communications–Electronics Non-frequency Related Interference. The out-of-band electromagnetic environment (within 30 kilometers [19 miles]) at the Eareckson AS site includes 48 ground-based systems. The majority of the systems (37 of 48 systems) are used for UHF and VHF land-mobile radios. Also included are one airport surveillance radar, one early warning radar, one air traffic control radar beacon, one VHF omni-directional range/tactical air navigation aid, one Identify Friend or Foe (IFF) system, and six fixed/mobile-broadcasting satellites. Although no airborne systems are registered with the National Telecommunications and Information



Equipment Distribution at Eareckson Air Station

Figure 3.8-3

Administration (NTIA) or FCC for this area, it is anticipated that various avionics equipment (tactical air navigation, IFF systems, glideslopes, beacons, etc.) will be present as aircraft travel in and out of the area.

Additionally, the COBRA DANE Early Warning Radar is on Eareckson AS and can adversely affect electroexplosive devices aboard aircraft. A separation distance of 6 kilometers (4 miles) is recommended for electroexplosive devices aboard aircraft, in the presence phase, and 1.20 kilometers (0.75 mile) for electroexplosive devices on the ground, in the handling/loading phase.

Radiation Hazards. Based upon the presence of high-power emitters within a 30-kilometer (19-mile) radius of Eareckson AS, the existing electromagnetic environment could present substantial levels of radiation hazards to personnel and electroexplosive devices. No hazard to fuels is expected.

The COBRA DANE Radar, AN/FPS-108, presents the highest probability for radiation hazards. COBRA DANE is an early-warning phased-array radar that provides tactical warning and attack assessment of sea-launched and intercontinental ballistic missiles launched against the continental United States.

The COBRA DANE operates in the L-Band frequency range (1,000 to 2,000 megahertz). The beam from the COBRA DANE is continually scanning, and therefore will interact with the surrounding environment. However, due to the location and orientation of the COBRA DANE antenna on top of a cliff facing the open ocean, the interaction with the environment is limited to sidelobe and backlobe interactions.

According to IEEE C95.1, personnel exposure limits for uncontrolled environments in the 1,000 to 2,000 megahertz frequency range are between 0.78 and 0.92 milliwatt per square centimeter for an average time of 30 minutes. The COBRA DANE Radar can exceed the IEEE standard for distances out to approximately 100 meters (328 feet). The area around the face of the COBRA DANE is an enclosed area within government-controlled land that is fenced to assure no unauthorized access occurs within the hazardous area.

3.8.1.3 Eielson AFB—Health and Safety

This section describes the health and safety concerns for the affected base property at Eielson AFB and the surrounding area. The ROI for health and safety includes the base and adjacent properties that could be affected by the deployment of a GBI or BMC2 at Eielson AFB. The area potentially affected off-base would be the properties immediately adjacent to the base and the transportation network for hazardous

materials. For a general description of the health and safety resource area, see section 3.8.

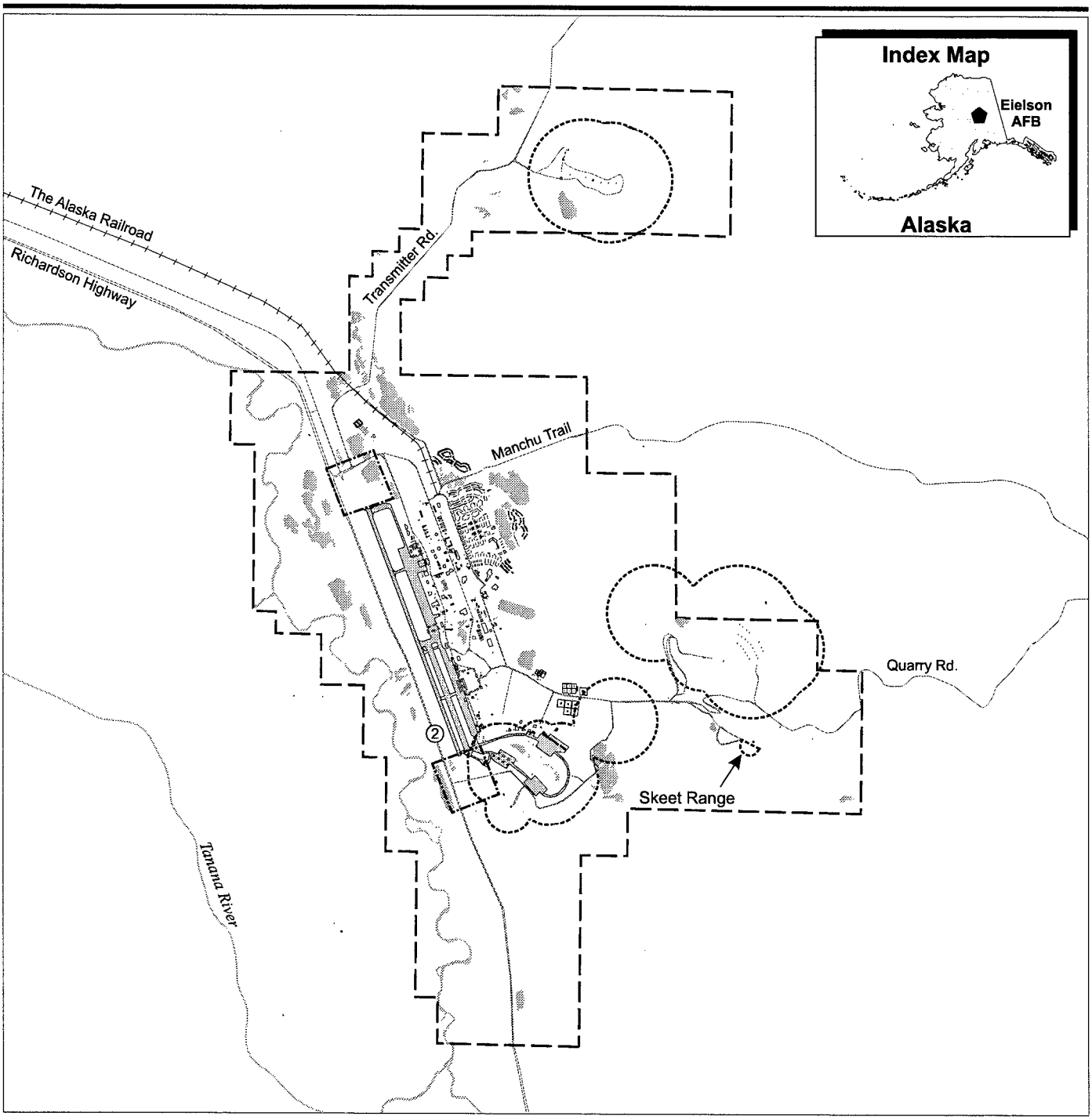
The Eielson AFB Safety Office reviews base safety issues. Other offices, such as the Bioenvironmental Engineering Office, also ensure safe operations by providing services such as sampling of indoor air, water, and unknown material or waste. To assist in emergency response, Eielson AFB maintains mutual aid agreements with the Bureau of Land Management to fight range fires and 10 local fire departments within the surrounding area. The Bureau of Land Management has the primary responsibility of fighting fires in the forested area of Eielson AFB with assistance from the base fire department. The base maintains firebreaks around hazardous areas such as ammunition storage areas and fuel storage areas (Pacific Air Forces, 1998—Draft General Plan, Eielson AFB).

The Air Force has developed standards that dictate the amount of fire/crash equipment and staffing that must be present based on the number and types of aircraft stationed on-base, and the types and total square footage of base structures and housing. The Eielson AFB fire department meets these standards, maintaining five crash trucks, three structural trucks, two water trucks, two ramp vehicles, two command vehicles, and one hazardous material truck. The base currently has 74 personnel to administer and manage the program for both the flightline and the base facilities. Two fire stations, one along the flightline and the second in the base housing area, provide the base fire protection needs. The positioning of these facilities meets the Air Force time and distance requirements for facility response.

The threats to human safety from aircraft accidents at Eielson AFB are summarized in the Air Installation Compatible Use Zone (AICUZ) Report. The AICUZ guidelines are based on the type of aircraft at the base and the nature of operations conducted. In order to minimize the risk to the public at each end of the runway, a Clear Zone and two Accident Potential Zones have been designated. The Clear Zone, the area where aircraft mishaps are most likely to occur, is contained within the base boundaries (figure 3.8-4).

Other on-base safety restrictions include ESQDs associated with the Railroad Unloading Dock, munitions storage at Engineer Hill and Quarry Hill, A-10 aircraft weather shelters, weapon unloading and loading areas, small arms munitions impact areas, and the chaff flare facility located near the northern end of the runway. There are no EMR safety zones on Eielson AFB (Pacific Air Forces, 1998—Draft General Plan, Eielson AFB).

To service the base aircraft, large amounts of jet fuel are stored on-base along with hydrazine, which is associated with the F-16 emergency power unit. The base has both standard and emergency operation procedures for the handling of both of these fuels.



EXPLANATION

- Eielson AFB Boundary
- Explosive Safety Quantity Distance (ESQD)
- Runway Clear Zone Boundary
- Roads
- Railroads
- Water Area
- Building

Scale
0 .8 1.6 Miles
0 1.25 2.5 Kilometers
NORTH

hs_eafb_001

Existing Health and Safety Issues, Eielson Air Force Base

Alaska

Figure 3.8-4

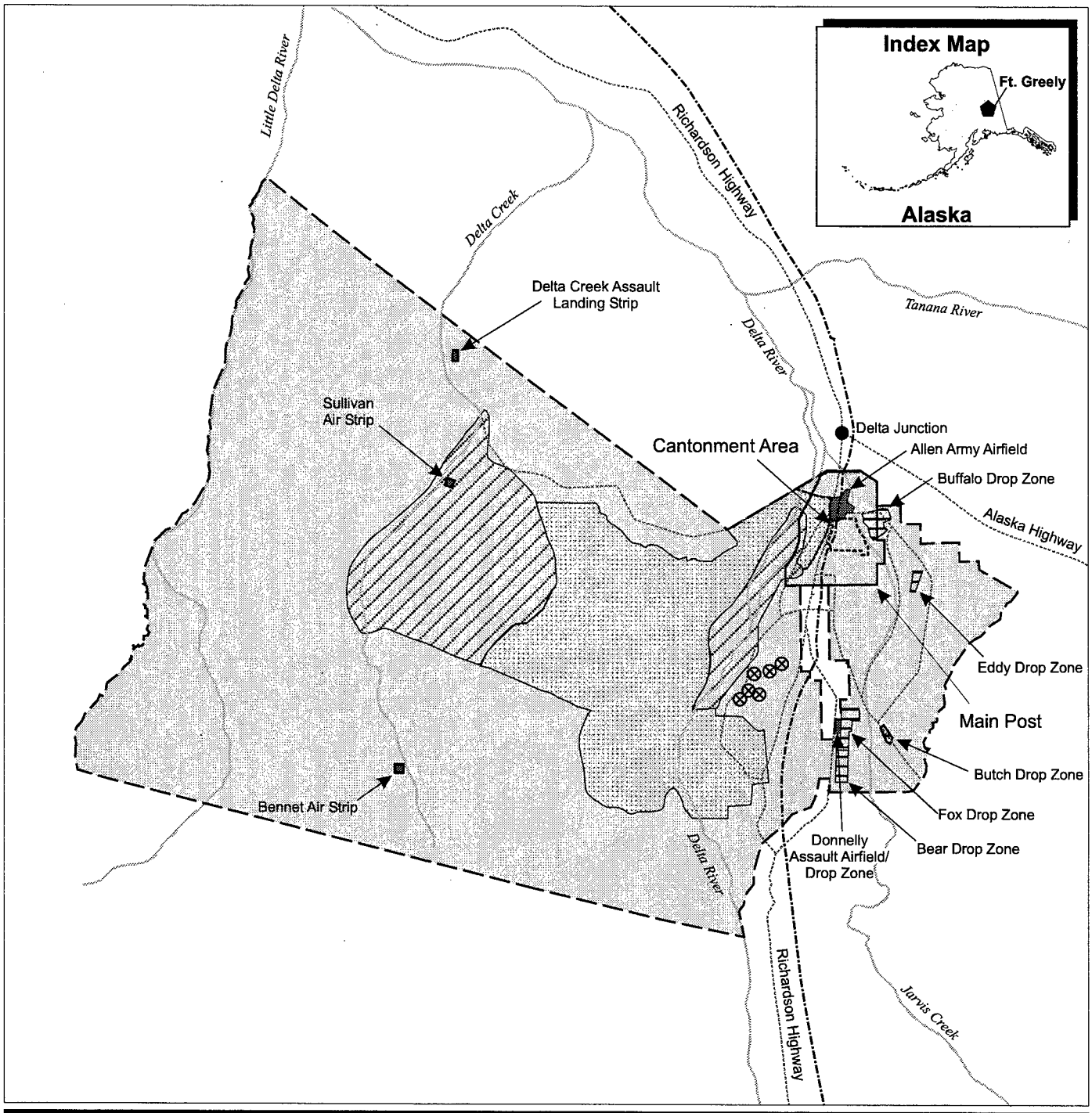
3.8.1.4 Fort Greely—Health and Safety

This section describes the health and safety concerns for the affected base property at Fort Greely and the surrounding area. The ROI for health and safety includes the base and adjacent properties that could be affected by the deployment of a GBI or BMC2 at Fort Greely. The area potentially affected off-base would be the properties immediately adjacent to the base and the transportation network for hazardous materials. For a general description of the health and safety resource area, see section 3.8.

The Fort Greely cantonment is being realigned; therefore, some of the operations in this area have ceased. The base still maintains maintenance personnel and fire fighting support for the cantonment area. The Fort Greely fire department maintains four crash/pumper trucks, three brush trucks, one small pumper truck, and a command vehicle. The base currently has 11 personnel to administer and manage the fire department. To assist in emergency response, Fort Greely maintains mutual aid agreements with most of the small communities within a 161-kilometer (100-mile) radius of the base. The Bureau of Land Management has the primary responsibility of fighting fires in the forested area of Fort Greely with assistance from the post fire department.

Fort Greely has an airfield; however, this field is only minimally used for training. The Clear Zones for the airfield are contained within the base boundaries (Department of the Army, 1983—The Master Plan of Fort Greely).

Health and safety issues at Fort Greely are associated with both Army and Air Force activities and range fires. The Army trains at Fort Greely throughout the year with exercises including the deployment of troops, weapons firing, and infantry tactical maneuvers. The Fort Greely Training Area is also used as a test site for weapons and equipment, including experimental designs, under conditions of extreme cold. Weapons are fired from the east side of the Delta River towards weapon impact areas (figure 3.8-5). Weapons include rockets, mortars, small arms, and artillery. Access to the weapon impact areas on Fort Greely is restricted because of the potential of unexploded ordnance (U.S. Army Alaska, 1997—Draft Integrated Natural Resources Management Plan). Because of the long history of military training on Fort Greely there is still a low potential for unexploded ordnance in areas outside of the weapon impact areas. Most of this ordnance consists of small arms ammunition and 40-millimeter practice grenades. The Fort Greely East Training Area is used primarily as a nonfiring maneuver area. The Cold Regions Test Center utilizes this same area for experimental airdrops, airborne training, and testing of clothing, vehicles, and equipment (U.S. Army Alaska, 1997—Draft Integrated Natural Resources Management Plan).



EXPLANATION

- Roads and Major Trails
- Rivers
- Installation Boundary
- Trans-Alaska Pipeline
- Cantonment Area
- Main Post Boundary
- Fort Greely
- Air Strip
- Drop Zone
- Hazard Area
- Impact Area
- Firing Point
- City

Scale 1:500,000

0 4 7.9 Miles

0 6.4 12.7 Kilometers

NORTH

hs_fge_001

Existing Health and Safety Issues, Fort Greely

Alaska

Figure 3.8-5

The Air Force uses the airspace above Fort Greely and the weapons impact areas for training activities. The type of aircraft operations include close air support, aerial gunnery, rockets, bombing, training flights, and test flights. These activities are conducted within the restricted airspace or along military training routes above Fort Greely. The Air Force has safety procedures in place for the aircraft activities above Fort Greely.

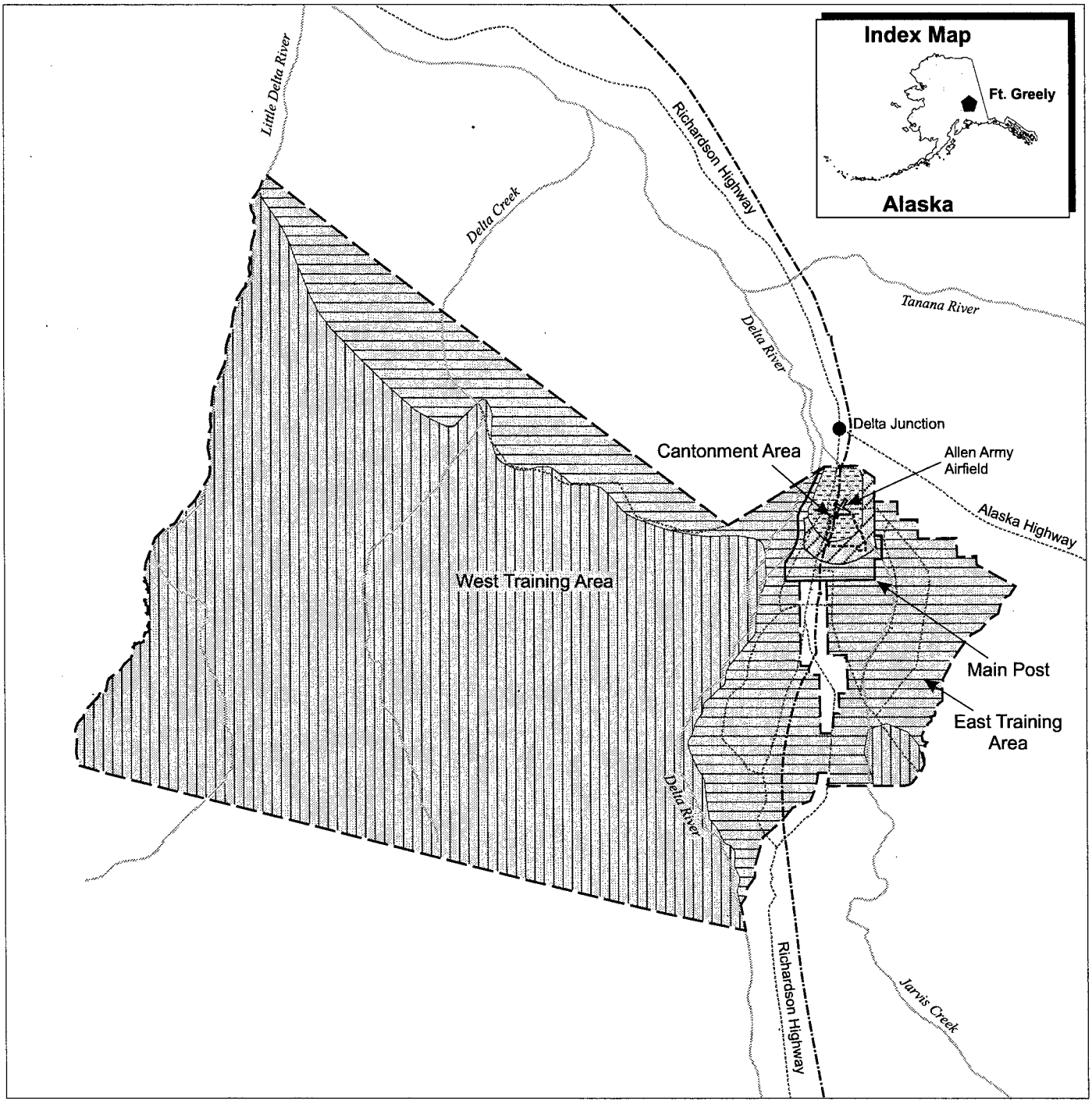
Under a Memorandum of Understanding, the Bureau of Land Management Alaska Fire Service is responsible for fire detection and suppression on withdrawn lands. The Alaska Fire Service has a reciprocal Fire Protection Agreement with the State of Alaska, Department of Natural Resources, Division of Forestry. The Alaska Wildland Fire Management Plan establishes four fire protection options (Bureau of Land Management, 1998—Draft Alaska Wildland Fire Management Plan). Land managers may select among these options, based on the evaluation of their individual legal mandates, policies, regulations, resource management, objectives and local conditions. The fire protection status options are:

- Critical Protection—Lands receive maximum detection coverage and are of highest priorities for attack response (figure 3.8-6).
- Full Protection—Areas receive maximum detection coverage and immediate and aggressive initial attack response.
- Modified Protection—A level of protection is provided between Full and Limited.
- Limited Protection—Areas where the values at risk do not warrant the expense or suppression and are areas where natural fire is important to ecosystem sustainability.
- Restricted—Includes Weapon Impact Areas and other places where no "on the ground" fire fighting can be accomplished due to the danger of unexploded ordnance.

Nineteen fires of 40 hectares (100 acres) or more occurred on Fort Greely from 1954–1997. Two were in the East Training Area and occurred in 1954 and 1987. The remaining 17 fires were in the Fort Greely West Training Area. Ten of the above fires were caused by incendiary devices, and five by lightning. Information on the remaining four is not available. The U.S. Army Alaska requires a 15-meter (50-foot) firebreak around all facilities.

3.8.1.5 Yukon Training Area (Fort Wainwright)—Health and Safety

This section describes the health and safety concerns for the affected base property at the Yukon Training Area and the surrounding area. The ROI for health and safety includes the base and adjacent properties that could be affected by the deployment of a GBI or BMC2 at the Yukon Training Area. The area potentially affected off-base would be the



EXPLANATION

- Roads and Major Trails
- Rivers
- Installation Boundary
- Trans-Alaska Pipeline
- Cantonment Area
- Main Post Boundary
- Fort Greely
- Critical Protection
- Full Protection
- Modified Action
- Limited Action
- City

Scale 1:500,000

0 4 7.9 Miles

0 6.4 12.7 Kilometers

NORTH

hs_fge_002

Fire Protection Status, Fort Greely

Alaska

Figure 3.8-6

properties immediately adjacent to the base and the transportation network for hazardous materials. For a general description of the health and safety resource area, see section 3.8.

Health and safety issues at the Yukon Training Area are associated with both Army and Air Force activities and range fires. The Army trains at the Yukon Training Area throughout the year with exercises including the deployment of troops, weapons firing, and infantry tactical maneuvers. Weapons are fired from firing points into the Stuart Creek Impact Area (figure 3.8-7). Weapons include rockets, mortars, small arms, and artillery. Access to the weapon impact areas on the Yukon Training Area is restricted because of the potential of unexploded ordnance. Because of the long history of military training on the Yukon Training Area, there is still a low potential for unexploded ordnance in areas outside of the weapon impact areas. Most of the ordnance consists of small arms ammunition and 40-millimeter practice grenades. In addition to the Stuart Creek Impact Area, there are two small arms range in the maneuver area.

The Air Force uses the airspace above the Yukon Training Area and the Stuart Creek Impact Area for training activities. The type of aircraft operations include close air support, aerial gunnery, rockets, bombing, training flights, and test flights. These activities are conducted within the restricted airspace or along military training routes above the Yukon Training Area. The Air Force has safety procedures in place for the aircraft activities above the Yukon Training Area.

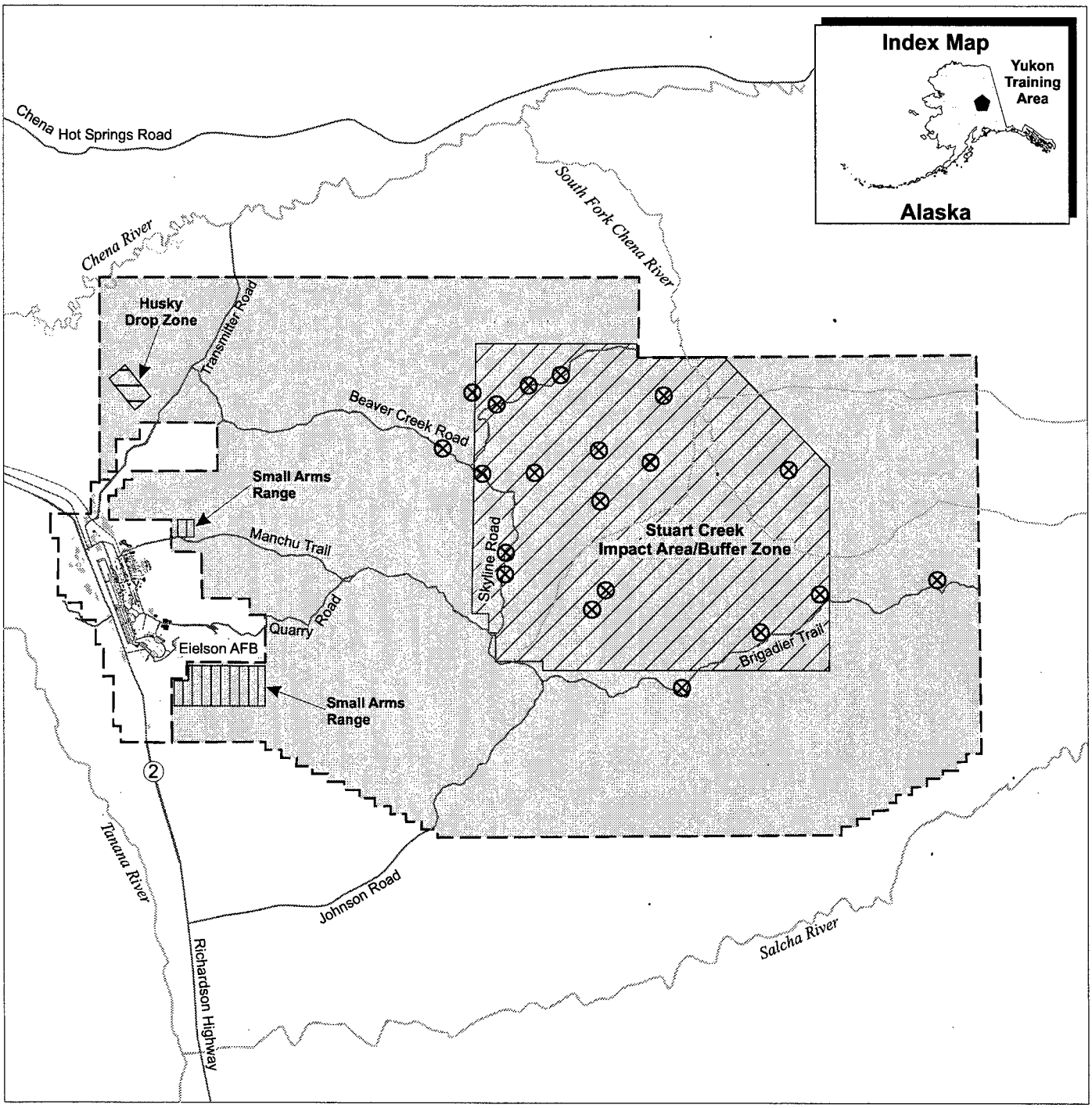
Range fire fighting practices for the Yukon Training Area are similar to those described for Fort Greely (section 3.8.1.4). Figure 3.8-8 provides the fire protection status options for the Yukon Training Area.

Eleven fires of 40 hectares (100 acres) or more occurred on the Yukon Training Area from 1954-1997. Nine of these fires were caused by incendiary devices within the Stuart Creek Impact Area and Buffer Zone. Two fires occurred within the northern portion of the maneuver area. The cause of one fire is unknown and the other was caused by lightning. Firebreaks are maintained around critical facilities at the Yukon Training Area.

3.8.2 NORTH DAKOTA INSTALLATIONS

3.8.2.1 Cavalier AFS—Health and Safety

This section describes the health and safety concerns for the affected base property at Cavalier AFS and the surrounding area. The ROI for health and safety includes the base and adjacent public that could be affected by the deployment of an XBR. The ROI for EMR human health effects is the base and adjacent property. This ROI is based on the area where potential effects to human health are expected to occur (out to



EXPLANATION

- Roads
- Rivers
- Water Area
- Installation Boundary
- Yukon Training Area
- Drop Zone
- Small Arms Range
- Impact Area/Buffer Zone
- Firing Point

Scale 1:300,000

0 2.4 4.7 Miles

0 3.8 7.6 Kilometers

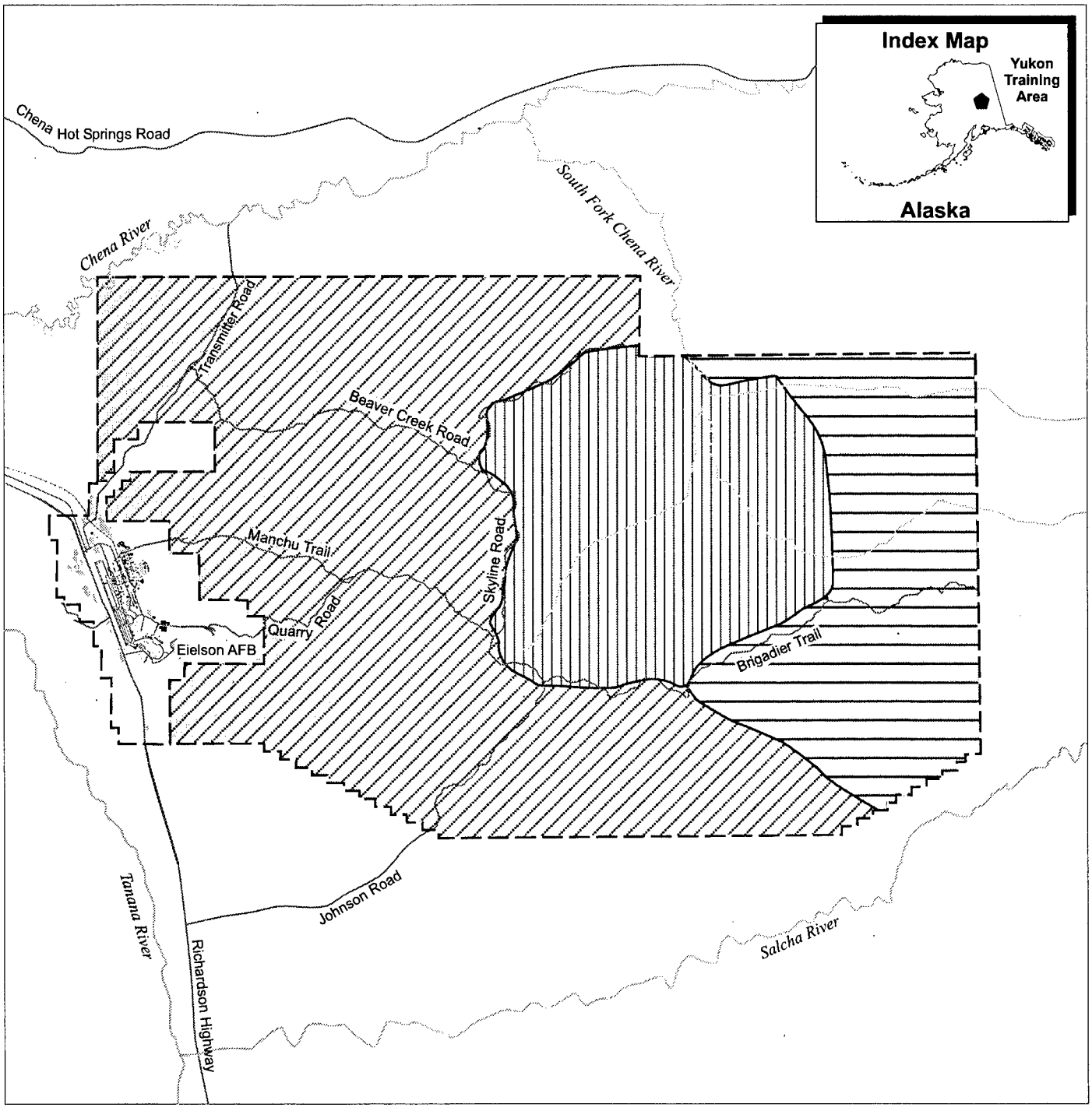
NORTH

Existing Health and Safety Issues, Yukon Training Area

Alaska

Figure 3.8-7

hs_yukon_002



EXPLANATION

- Roads
- Rivers
- Water Area
- Installation Boundary
- Yukon Training Area
- Full Protection
- Modified Action
- Limited Action

Scale 1:300,000

0 2.4 4.7 Miles

0 3.8 7.6 Kilometers

NORTH

Fire Protection Status, Yukon Training Area

Alaska

Figure 3.8-8

150 meters [492 feet]). The ROI for certain electronic equipment and aircraft (see below) includes a radius up to 350 kilometers (217 miles). For a general description of the health and safety resource area, see section 3.8.

On-base Safety

The Air Force has developed standards that dictate the amount of fire equipment and staffing that must be present based on the types and total square footage of base structures and housing. The Cavalier AFS fire department meets these standards, maintaining two pumper trucks. The base currently has 18 personnel to administer and manage the program for base facilities. One centrally located facility houses the equipment.

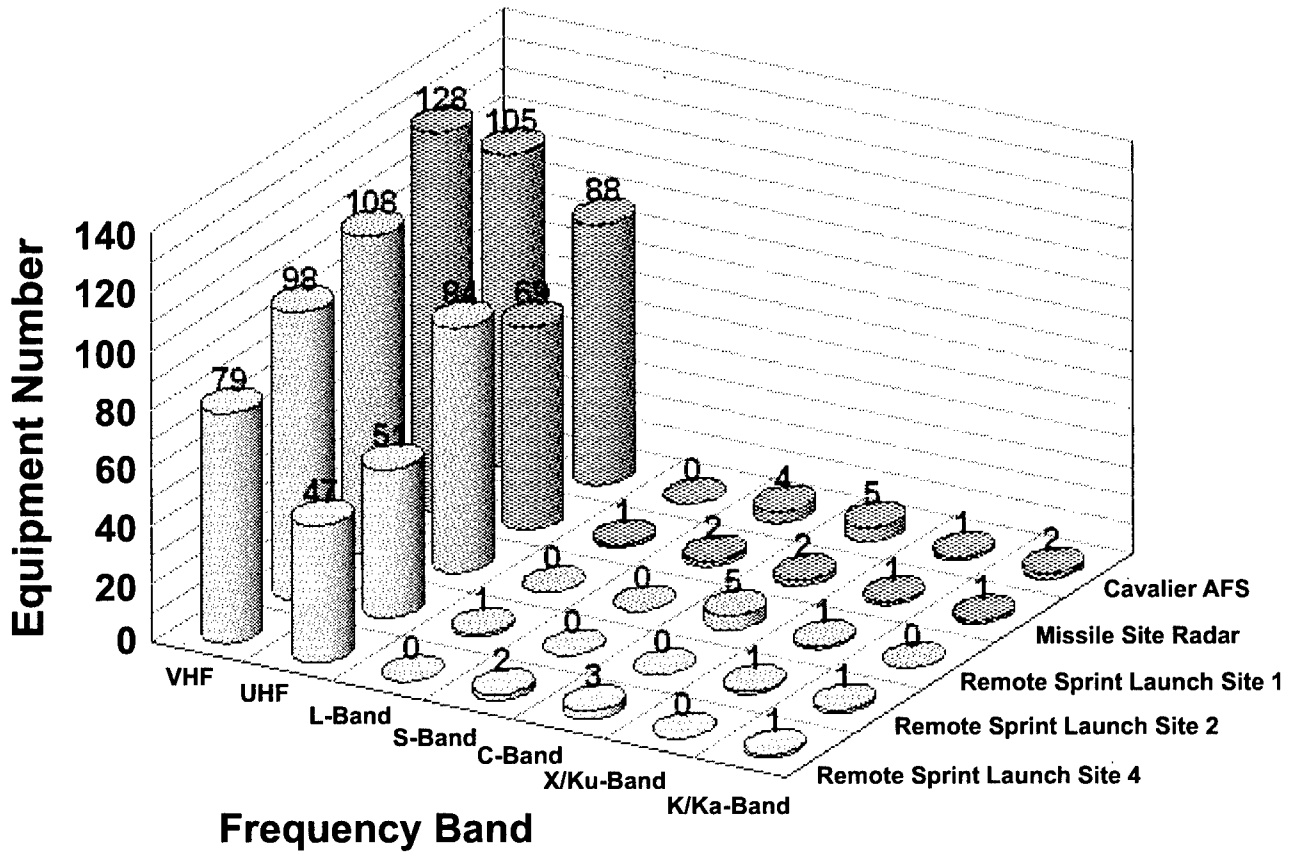
The positioning of this facility also meets the Air Force time and distance requirements for facility response. The Cavalier AFS Fire Protection Contractor established mutual aid agreements with six neighboring communities to ensure emergency response is available for the site and local towns.

Electromagnetic Radiation Environment

For purposes of this study, the electromagnetic environment around the Cavalier AFS site includes all ground-based systems within a 30-kilometer (19-mile) radius for out-of-band systems and within a 350-kilometer (217-mile) radius for in-band, adjacent band, and harmonically-related bands. The out-of-band communications-electronics environment around the Cavalier AFS site was found to include 205 systems ranging in frequencies from 48 to 24,150 megahertz. The distribution of these systems over the electromagnetic spectrum, VHF–K-Band, is shown in figure 3.8-9. These systems were categorized into potential sensitive receptors of frequency-related interference or non-frequency related interference.

Communications—Electronics Frequency Related Interference. The existing ground-based communications-electronics environment around the Cavalier AFS site includes two in-band systems: a precision approach radar in Minot, North Dakota, and a weather radar in Park Rapids, Minnesota. The airborne electromagnetic environment includes three types of in-band systems: fire control, bomb/navigation, and weather radars. Weather radars are utilized on both civilian and military aircraft. Section 3.3.2.1 provides an overview of the airspace and airports in the Cavalier AFS ROI.

Communications—Electronics Non-frequency Related Interference. The out-of-band electromagnetic environment (within 30 kilometers [19 miles]) at the Cavalier AFS site includes 205 ground-based systems. The majority of the systems (193 systems) are land-mobile UHF and VHF



EXPLANATION

Note: Number of equipment found within 50 kilometers (31 miles) of site.

Equipment Distribution in Northeast North Dakota

Figure 3.8-9

radios. Also included are one speed gun, one satellite communications terminal, and ten fixed/mobile broadcasting satellites. Although no airborne systems are registered with the NTIA or FCC for this area, it is anticipated that various avionics equipment (tactical air navigation, IFF systems, glideslopes, beacons, etc.) will be present as aircraft travel in and out of the area.

Also, the Perimeter Acquisition Radar can adversely affect electroexplosive devices aboard aircraft. In 1974, tests were conducted where electroexplosive devices aboard a B-52H were flown through EMR fields from the Perimeter Acquisition Radar. Based on those tests, a 13-kilometer (8-mile) required separation distance was recommended for aircraft carrying electroexplosive devices (Hovan and Wirt, 1974—Response of Airborne Electroexplosive Devices to Safeguard Electromagnetic Radiation).

Radiation Hazards. The Perimeter Acquisition Radar, AN/FPQ-16, presents the highest probability for radiation hazards within the 30-kilometer (19-mile) ROI. The Perimeter Acquisition Radar is a phased-array radar that provides tactical warning and attack assessment of sea-launched and intercontinental ballistic missiles launched against the continental United States.

The Perimeter Acquisition Radar operates in the UHF band (420 to 450 megahertz). The beam from the Perimeter Acquisition Radar is continually scanning, and therefore interacts with the surrounding environment.

According to IEEE C95.1, personnel exposure limits for uncontrolled environments in the 420 to 450 megahertz frequency range are between 0.28 and 0.30 milliwatt per square centimeter for an average time of 30 minutes. The Perimeter Acquisition Radar can exceed the IEEE standard for distances out to approximately 120 meters (394 feet). The area around the Perimeter Acquisition Radar at this distance is an enclosed area within government-controlled land that is fenced to assure no unauthorized access occurs. No hazards to fuels in the area occur.

3.8.2.2 Grand Forks AFB—Health and Safety

This section describes the health and safety concerns for the affected base property at Grand Forks AFB and the surrounding area. The ROI for health and safety includes the base and adjacent properties that could be affected by the deployment of a GBI or BMC2 at Grand Forks AFB. The area potentially affected off-base would be the properties immediately adjacent to the base, and the transportation network for hazardous materials. For a general description of the health and safety resource area, see section 3.8.

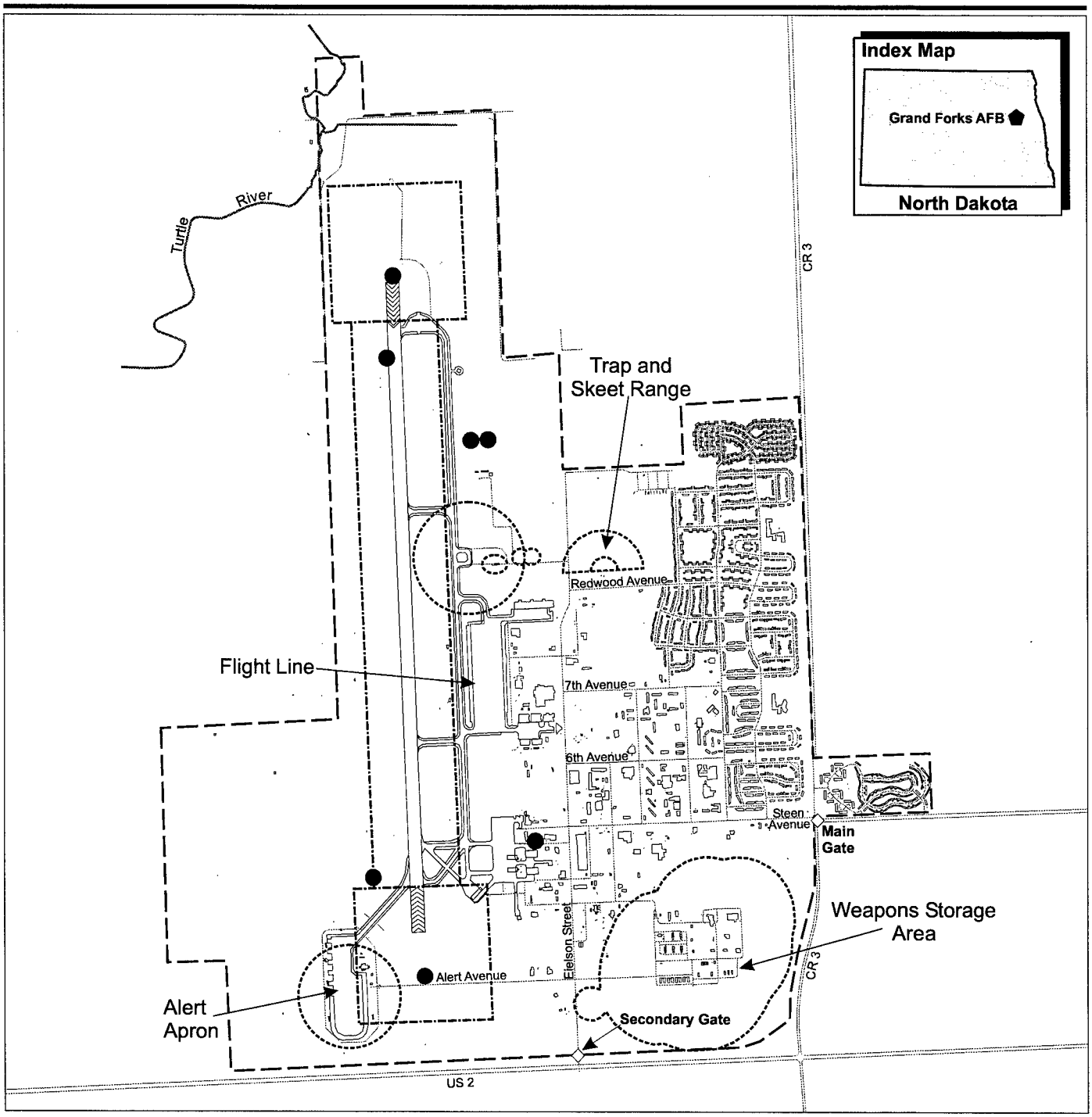
The Grand Forks Safety Office reviews base safety issues. Other offices, such as the Bioenvironmental Engineering Office, also ensure safe operations by providing services such as sampling of indoor air, water, and unknown material or waste. To assist in emergency response, Grand Forks AFB maintains mutual aid agreements with local fire departments in this area.

The Air Force has developed standards that dictate the amount of fire/crash equipment and staffing that must be present based on the number and types of aircraft stationed on-base, and the types and total square footage of base structures and housing. The Grand Forks AFB fire department meets these standards, maintaining nine trucks with both water and foam delivery capacities. The base currently has 62 personnel to administer and manage the program for both the flightline and the base facilities. One centrally located facility houses the equipment for both the flightline and the base structure fire protection needs. The positioning of this facility also meets the Air Force time and distance requirements for facility response.

The threats to human safety from aircraft accidents at Grand Forks AFB are summarized in the AICUZ Report. The AICUZ guidelines are based on the type of aircraft at the base and the nature of operations conducted. In order to minimize the risk to the public at each end of the runway, a Clear Zone and two Accident Potential Zones have been designated. The Clear Zone, the area where aircraft mishaps are most likely to occur, is contained within the base boundaries (figure 3.8-10). Other on-base safety restrictions include ESQDs associated with the Weapons Storage Area, alert apron, and flightline area and small arms range.

The base has six fixed-unit EMR sources that are monitored on a quarterly basis. The base radiation officer is responsible for the overall management of the EMR program. The program involves identifying, categorizing, and surveying all radio frequency emitters on the base to ensure personnel are adequately protected against unnecessary exposure to EMR (U.S. Department of the Air Force, 1997—Grand Forks AFB General Plan). Most of the EMR sources are associated with airfield navigational and weather radar systems.

Grand Forks AFB has a long history of transporting and handling missiles. The Air Force has instituted a rigorous training program for individuals who handled the various components of the Minuteman III missiles. The Air Force also has formal safety programs addressing missile logistics, which provide detailed safety requirements and mandatory reporting system for identifying and preventing safety-related problems. Missile facilities are regularly inspected to ensure compliance with safety criteria. Safety provisions are incorporated into all aspects of missile maintenance and transportation. Missile transport only occurs when weather



EXPLANATION

- Installation Boundary
- Explosive Safety Quantity Distance (ESQD)
- Runway Clear Zone Boundary
- Electromagnetic Radiation Source Points
- Gate

CR = County Road
ND = U.S. Highway

Scale 1:40,000

0 1,667 3,333 Feet

NORTH 0 508 1,016 Meters

Existing Health and Safety Issues, Grand Forks Air Force Base

North Dakota

Figure 3.8-10

hs_gfafb_001

conditions are good, and then only with a high level of security. A normal maintenance schedule involves removing between four and eight missiles a month for servicing at Grand Forks AFB. Prior to any missile movement, a maintenance vehicle traveled the route to check for road conditions. The Air Force has a long record of safe handling and maintenance of missiles. Approximately 804,700 kilometers (500,000 miles) have been driven by transporter-erectors carrying Minuteman missiles (I, II, and III) between the deployment bases and the launch facilities. In roughly 30 years, only six rollover accidents have occurred, with none involving propellant ignition. The Air Force Logistic Command studied the potential for transporting and disposing of missile motors from Malmstrom AFB, and found that no serious accident consequences involving transportation of the guidance system, reentry system, and the propulsion system rocket engine have occurred (Department of the Air Force, 1997—Grand Forks AFB General Plan).

3.8.2.3 Missile Site Radar—Health and Safety

This section describes the health and safety concerns for the affected base property at the Missile Site Radar and the surrounding area. The ROI for health and safety includes the base and adjacent public that could be affected by the deployment of a GBI, BMC2, or XBR. The ROI for the GBI and BMC2 is the base and the adjacent base property. The ROI for EMR human health effects is also the base and adjacent property. This ROI is based on the area where potential effects to human health are expected to occur (out to 150 meters [492 feet]). The ROI for certain electronic equipment and aircraft (see below) includes an area up to 350 kilometers (217 miles). For a general description of the health and safety resource area, see section 3.8.

On-base Safety

During a 3-month period in 1975, the Missile Site Radar was an active installation consisting of an operational radar and missile field of 30 launchers for Spartan long-range nuclear warhead missiles and 16 launchers for Sprint short-range nuclear missiles. During operations, no missile accidents occurred. All operational systems have been removed from the site. Associated with the deployment of this system, restrictive safety easements were obtained with surrounding property owners to limit future development. These easements are currently active. The Missile Site Radar is currently inactive, and access to the site is restricted to authorized personnel for occasional facility maintenance. The base maintenance contractor maintains a health and safety plan, which addresses worker safety in accordance with the Occupational Safety and Health Administration (OSHA) (Wheeler Contracting, Inc., 1996—Safety and Health Plan for the SRMSC). Because no activities occur at the site, there are no public health and safety issues to adjacent properties. To assist in emergency response at the site, mutual aid agreements are

maintained with the fire departments in the towns of Langdon and Nekoma. The mutual aid agreements allow access by the fire departments to the site for responding to fires or accident/injury assistance (U.S. Army Space and Strategic Defense Command, 1994—Memorandum of Agreement between Langdon, North Dakota Fire District and U.S. Army Space and Strategic Defense Command; Memorandum of Agreement between Nekoma North Dakota Fire District and U.S. Army Space and Strategic Defense Command).

Electromagnetic Radiation Environment

For purposes of this study, the electromagnetic environment around the Missile Site Radar includes all ground-based systems within a 30-kilometer (19-mile) radius for out-of-band systems and within a 350-kilometer (217-mile) radius for in-band, adjacent band, and harmonically related bands. The out-of-band communications-electronics environment around the Missile Site Radar was found to include 204 systems ranging in frequencies from 43 to 24,150 megahertz. The distribution of these systems over the electromagnetic spectrum, VHF–K-Band, is shown in section 3.8.2.1, figure 3.8-9. These systems were categorized into potential sensitive receptors of frequency-related interference or non-frequency related interference.

Communications–Electronics Frequency Related Interference. The existing ground-based communications-electronics environment around the Missile Site Radar includes two in-band systems: a precision approach radar in Minot, North Dakota, and a weather radar in Park Rapids, Minnesota. The airborne electromagnetic environment includes three types of in-band systems: fire control, bomb/navigation, and weather radars. Weather radars are utilized on both civilian and military aircraft. Section 3.3.2.1 provides an overview of the airspace and airports in the Missile Site Radar ROI.

Communications–Electronics Non-frequency Related Interference. The out-of-band electromagnetic environment (within 30 kilometers [19 miles]) at the Missile Site Radar included 204 ground-based systems. The majority of the systems (191 systems) are land-mobile UHF and VHF radios. Also included are one FM radio station, one air navigation beacon, five pager/cellular phone towers, five satellite communications systems, and one speed gun. Although no airborne systems are registered with the NTIA or FCC for this area, it is anticipated that various avionics equipment (tactical air navigation, IFF systems, glideslopes, beacons, etc.) will be present as aircraft travel in and out of the area.

Radiation Hazards. Based upon the absence of high-power emitters within a 30-kilometer (19-mile) radius of the Missile Site Radar, the existing electromagnetic environment does not present substantial levels of radiation hazards to personnel, electroexplosive devices, or fuels.

3.8.2.4 Remote Sprint Launch Site 1—Health and Safety

This section describes the health and safety concerns for the affected base property at Remote Sprint Launch Site 1 and the surrounding area. The ROI for health and safety includes the base and adjacent public that could be affected by the deployment of an XBR. The ROI for EMR human health effects is the base and adjacent property. This ROI is based on the area where potential effects to human health are expected to occur (out to 150 meters [492 feet]). The ROI for certain electronic equipment and aircraft (see below) includes an area up to 350 kilometers (217 miles). For a general description of the health and safety resource area, see section 3.8.

On-base Safety

During a 3-month period in 1975, Remote Sprint Launch Site 1 was active and consisted of 12 launch stations. During operation, no missile accidents occurred. Remote Sprint Launch Site 1 is currently inactive, access to the site is restricted to authorized personnel for occasional facility maintenance. The base maintenance contractor maintains a health and safety plan, which addresses worker safety in accordance with OSHA (Wheeler Contracting, Inc., 1996—Safety and Health Plan for the SRMSC). Because no activities occur at the site, there are no public health and safety issues to adjacent properties.

Electromagnetic Radiation Environment

For purposes of this study, the electromagnetic environment around Remote Sprint Launch Site 1 includes all ground-based systems within a 30-kilometer (19-mile) radius for out-of-band systems and within a 350-kilometer (217-mile) radius for in-band, adjacent band, and harmonically-related bands. The out-of-band communications-electronics environment around Remote Sprint Launch Site 1 was found to include 198 systems ranging in frequencies from 43 to 12,290 megahertz. The distribution of these systems over the electromagnetic spectrum, VHF–K-Band, is shown in section 3.8.2.1, figure 3.8-9. These systems were categorized into potential victims of frequency-related interference or non-frequency related interference.

Communications–Electronics Frequency Related Interference. The existing ground-based communications-electronics environment around Remote Sprint Launch Site 1 includes two in-band systems: a precision approach radar in Minot, North Dakota, and a weather radar in Park Rapids, Minnesota. The airborne electromagnetic environment includes three types of in-band systems: fire control, bomb/navigation, and weather radars. Weather radars are utilized on both civilian and military aircraft. Section 3.3.2.1 provides an overview of the airspace and airports in the Remote Sprint Launch Site 1 ROI.

Communications–Electronics Non-frequency Related Interference. The out-of-band electromagnetic environment (within 30 kilometers [19 miles]) at Remote Sprint Launch Site 1 included 198 ground-based systems. The majority of the systems (184 systems) are land-mobile UHF and VHF radios. Also included are five satellite communications systems, one fixed broadcasting satellite, and eight pager/cellular phone towers. Although no airborne systems are registered with the NTIA or FCC for this area, it is anticipated that various avionics equipment (tactical air navigation, IFF systems, glideslopes, beacons, etc.) will be present as aircraft travel in and out of the area.

Radiation Hazards. Based upon the absence of high-power emitters within a 30-kilometer (19-mile) radius of Remote Sprint Launch Site 1, the existing electromagnetic environment does not present substantial levels of radiation hazards to personnel, electroexplosive devices, or fuels.

3.8.2.5 Remote Sprint Launch Site 2—Health and Safety

This section describes the health and safety concerns for the affected base property at Remote Sprint Launch Site 2 and the surrounding area. The ROI for health and safety includes the base and adjacent public that could be affected by the deployment of an XBR. The ROI for EMR human health effects is the base and adjacent property. This ROI is based on the area where potential effects to human health are expected to occur (out to 150 meters [492 feet]). The ROI for certain electronic equipment and aircraft (see below) includes an area up to 350 kilometers (217 miles). For a general description of the health and safety resource area, see section 3.8.

On-base Safety

On-base safety for Remote Sprint Launch Site 2 is similar to that described for Remote Sprint Launch Site 1.

Electromagnetic Radiation Environment

For purposes of this study, the electromagnetic environment around Remote Sprint Launch Site 2 includes all ground-based systems within a 30-kilometer (19-mile) radius for out-of-band systems and within a 350-kilometer (217-mile) radius for in-band, adjacent band, and harmonically-related bands. The communications-electronics environment around Remote Sprint Launch Site 2 was found to include 152 systems ranging in frequencies from 31 to 24,150 megahertz. The distribution of these systems over the electromagnetic spectrum, VHF–K-Band, is shown in section 3.8.2.1, figure 3.8-9. These systems were categorized into potential victims of frequency-related interference or non-frequency related interference.

Communications–Electronics Frequency Related Interference. The existing ground-based communications-electronics environment around Remote Sprint Launch Site 2 includes two in-band systems: a precision approach radar in Minot, North Dakota, and a weather radar in Park Rapids, Minnesota. The airborne electromagnetic environment includes three types of in-band systems: fire control, bomb/navigation, and weather radars. Weather radars are utilized on both civilian and military aircraft. Section 3.3.2.1 provides an overview of the airspace and airports in the Remote Sprint Launch Site 2 ROI.

Communications–Electronics Non-frequency Related Interference. The out-of-band electromagnetic environment (within 30 kilometers [19 miles]) at Remote Sprint Launch Site 2 includes 152 ground-based systems. The majority of the systems (142 systems) are land-mobile UHF and VHF radios. Also included are one air navigational aid, one speed gun, six pager/cellular phone towers, one satellite communications system, and one fixed broadcasting satellite. Although no airborne systems are registered with the NTIA or FCC for this area, it is anticipated that various avionics equipment (tactical air navigation, IFF systems, glideslopes, beacons, etc.) will be present as aircraft travel in and out of the area.

Radiation Hazards. Based upon the absence of high-power emitters within a 30-kilometer (19-mile) radius of Remote Sprint Launch Site 2, the existing electromagnetic environment does not present substantial levels of radiation hazards to personnel, electroexplosive devices, or fuels.

3.8.2.6 Remote Sprint Launch Site 4—Health and Safety

This section describes the health and safety concerns for the affected base property at Remote Sprint Launch Site 4 and the surrounding area. The ROI for health and safety includes the base and adjacent public that could be affected by the deployment of an XBR. The ROI for EMR human health effects is the base and adjacent property. This ROI is based on the area where potential effects to human health are expected to occur (out to 150 meters [492 feet]). The ROI for certain electronic equipment and aircraft (see below) includes an area up to 350 kilometers (217 miles). For a general description of the health and safety resource area, see section 3.8.

On-base Safety

On-base safety for Remote Sprint Launch Site 4 is similar to that described for Remote Sprint Launch Site 1.

Electromagnetic Radiation Environment

For purposes of this study, the electromagnetic environment around Remote Sprint Launch Site 4 includes all ground-based systems within a 30-kilometer (19-mile) radius for out-of-band systems and within a 350-kilometer (217-mile) radius for in-band, adjacent band, and harmonically-related bands. The communications-electronics environment around Remote Sprint Launch Site 4 was found to include 132 systems ranging in frequencies from 43 to 24,150 megahertz. The distribution of these systems over the electromagnetic spectrum, VHF–K-Band, is shown in section 3.8.2.1, figure 3.8-9. These systems were categorized into potential victims of frequency-related interference or non-frequency related interference.

Communications-Electronics Frequency Related Interference. The existing ground-based communications-electronics environment around Remote Sprint Launch Site 4 includes two in-band systems: a precision approach radar in Minot, North Dakota, and a weather radar in Park Rapids, Minnesota. The airborne electromagnetic environment includes three types of in-band systems: fire control, bomb/navigation, and weather radars. Weather radars are utilized on both civilian and military aircraft. Section 3.3.2.1 provides an overview of the airspace and airports in the Remote Sprint Launch Site 4 ROI.

Communications–Electronics Non-frequency Related Interference. The out-of-band electromagnetic environment (within 30 kilometers [19 miles]) at Remote Sprint Launch Site 4 includes 132 ground-based systems. The majority of the systems (112 systems) are land-mobile UHF and VHF radios. Also included are one speed gun, twelve satellite communications systems, and seven pager/cellular phone towers. Although no airborne systems are registered with the NTIA or FCC for this area, it is anticipated that various avionics equipment (tactical air navigation, IFF systems, glideslopes, beacons, etc.) will be present as aircraft travel in and out of the area.

Radiation Hazards. Based upon the absence of high-power emitters within a 30-kilometer (19-mile) radius of Remote Sprint Launch Site 4, the existing electromagnetic environment does not present substantial levels of radiation hazards to personnel, electroexplosive devices, or fuels.

3.9 LAND USE AND AESTHETICS

Land use can be defined as the human use of land resources for various purposes including economic production, natural resources protection, or institutional uses. Land uses are frequently regulated by management plans, policies, ordinances, and regulations that determine the types of uses that are allowable or protect specially designated or environmentally sensitive uses. Potential issues typically stem from encroachment of one land use or activity on another, or an incompatibility between adjacent land uses that leads to encroachment.

Visual resources include the natural and man-made features that give a particular environment its aesthetic quality. The analysis considers visual resource sensitivity, which is the degree of public interest in a visual resource and concern over adverse changes in the quality of the resource.

3.9.1 ALASKA INSTALLATIONS

This brief introduction is provided to describe the land uses in the potentially affected areas in the Alaska region. Almost all of the land within the ROIs is relatively undisturbed and is very sparsely populated. With the exception of the Yukon Training Area and Eielson AFB in the Fairbanks North Star Borough, there are virtually no forms of comprehensive zoning. The controls that do exist are fairly lenient. All of the potential sites are located on Federal land and are not subject to local land use controls, but do try to be consistent with the regulations that do exist to avoid conflict.

3.9.1.1 Clear AFS—Land Use

This section describes the land uses and aesthetics for the affected base property at Clear AFS. The ROI for land use includes those areas potentially affected by deployment of the GBI or BMC2 at Clear AFS. This area includes the base and areas immediately adjacent to the base. The ROI for aesthetics includes the base and adjacent areas within the viewshed.

Regional Land Use

Clear AFS is located in Interior Alaska in the northeast corner of the Denali Borough. The regional land use ROI includes the installation property and surrounding adjacent land uses.

The Denali Borough is the zoning and development authority in the region. However, almost the entire zone is virtually zoned as unrestricted use, which allows almost any type of development unless individual communities vote to have further zoning or land use regulations (Denali

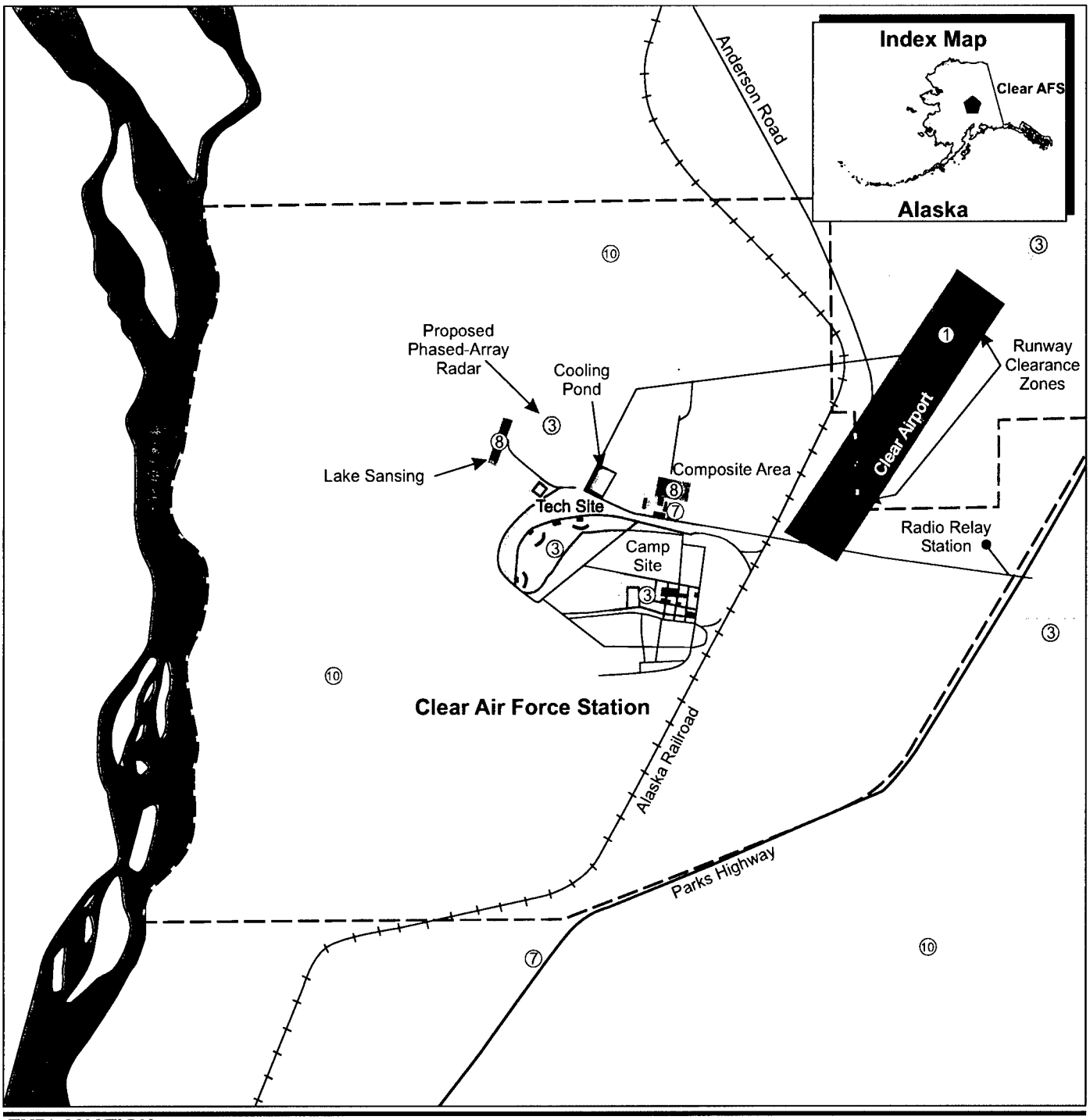
Borough, 1997—Denali Borough Comprehensive Land Use Plan). Since Clear AFS is a Federal property, it does not fall under the jurisdiction of the local planning authorities. The area around Clear AFS is sparsely populated and consists of undisturbed forestland. The nearest inhabited structure is just to the south of the base, and the community of Anderson is 8 kilometers (5 miles) to the north (U.S. Department of the Interior, 1998—Northern Intertie Project, Final EIS). The city of Anderson operates a small airport on the adjacent property to the west. None of the land uses in the area are incompatible with adjoining land uses of Clear AFS.

Clear AFS Land Use

Clear AFS consists of 4,670 hectares (11,542 acres) with approximately 142 hectares (350 acres) of the installation being developed and the remainder being mostly forested land that is relatively undisturbed. Of the total acreage at Clear AFS, 4,666 hectares (11,530 acres) are withdrawn from the public domain from the Department of the Interior, Bureau of Land Management, and 4.7 hectares (11.5 acres) are by easement from the State of Alaska (Gori, 1999—Comments received by EDAW, Inc., regarding NMD Deployment Coordinating Draft DEIS)

The mission facilities of Clear AFS are divided into three main areas and are centrally located on the installation as shown in figure 3.9-1. The Composite Area contains the headquarters, housing, recreation, community service, and administrative facilities and is just inside the main gate to the north. The Technical Site (also known as the Operations Area) is located to west of the Composite Area and contains the Ballistic Missile Early Warning System radar and related equipment as well as the power plant. Just north of the Technical Site is the construction site of the Solid State Phased-Array Radar that is to replace the existing Ballistic Missile Early Warning System radar. The new Solid State Phased-Array Radar will affect less than 2 hectares (5 acres) (U.S. Department of the Air Force, 1997—EA for Radar Upgrade at Clear AS). The third area is the Camp Area, which is located to the south of the Composite Area. This area is composed of civil engineering maintenance shops, security police offices, a fire station, and transient lodging. The remainder of the installation is open space consisting of mostly undisturbed forest that is at times used by military personnel for recreation activities and hunting. (Clear AS, 1993—Comprehensive Planning Framework)

The base is used by the stationed personnel for various recreational activities. Hunting and fishing are the most common activities. There is also hiking, cross-country skiing, running, picnicking, snowshoeing, snowmobiling, and off-road vehicle use. Use is limited to military personnel, and there is no subsistence hunting or fishing occurring on-base.



EXPLANATION

- ① Airfield
- ② Aviation Support*
- ③ Industrial
- ④ Institutional (Medical/Educational)*
- ⑤ Administrative
- ⑥ Commercial*
- ⑦ Residential
- ⑧ Recreation
- ⑨ Agriculture*
- ⑩ Open Space
- Water Area
- Roads
- Installation Boundary
- Railroads
- Ballistic Missile System Radar Control Zone

*Standard land use designation not applicable to this figure

Scale
0 2,368 4,735 Feet
0 722 1,443 Meters

NORTH

Existing Land Use, Clear Air Force Station

Alaska

Figure 3.9-1

lu_clas_002

Aesthetics

The ROI for aesthetics at Clear AFS includes the general visual environment surrounding the station and areas visible from offsite locations.

The visual environment of Clear AFS is characterized by the relatively flat terrain that primarily consists of undisturbed forests, woodlands, and meadows. The topography is generally flat, with the elevation of Clear AFS ranging from about 165 meters (540 feet) in the northern portion to about 198 meters (650 feet) above sea level in the southern portion of base (U.S. Department of the Air Force, 1997—EA for Radar Upgrade at Clear AS). The most significant man-made features are the Ballistic Missile Early Warning System radar and the Tracking Radar. The three Ballistic Missile Early Warning System radars are approximately 50 meters (165 feet) tall. The Tracking Radar, which is dome-shaped, is approximately 43 meters (140 feet) in diameter. The Ballistic Missile Early Warning System radar is not visible from surrounding highways or recreation areas because of the flatness of the land and the heavy forest cover; thus, the site and surrounding area have a low visual sensitivity. (U.S. Department of the Air Force, 1997—Supplemental EA for Radar Upgrade, Clear AS)

3.9.1.2 Eareckson AS—Land Use

This section describes the land uses and aesthetics for the affected base property at Eareckson AS. The ROI for land use includes those areas potentially affected by deployment of the XBR at this site. This area includes the base and areas up to 30 kilometers (19 miles) from the site to include areas where certain sensitive electronics may be susceptible to temporary interference by use of the XBR. The ROI for aesthetics includes the base and adjacent areas within the viewshed.

Regional Land Use

Eareckson AS is located on Shemya Island near the end of the Aleutian Island chain. The regional land use ROI includes the area within a 30-kilometer (19-mile) radius from the Eareckson AS site in the Aleutians West Census Area.

The Aleutians West Census Area is unincorporated and has no official zoning ordinances. However, all development will require review for consistency with the standards of the Alaska Coastal Management Program. See the Coastal Zone Management section below for further details.

The area around Shemya is virtually all open ocean, with the uninhabited islands of Nizki about 3 kilometers (2 miles) to the west and Alaid 8 kilometers (5 miles) to the west on the other side of Nizki. All of the land uses in the area are compatible with the adjoining areas of Eareckson AS.

Eareckson AS Land Use

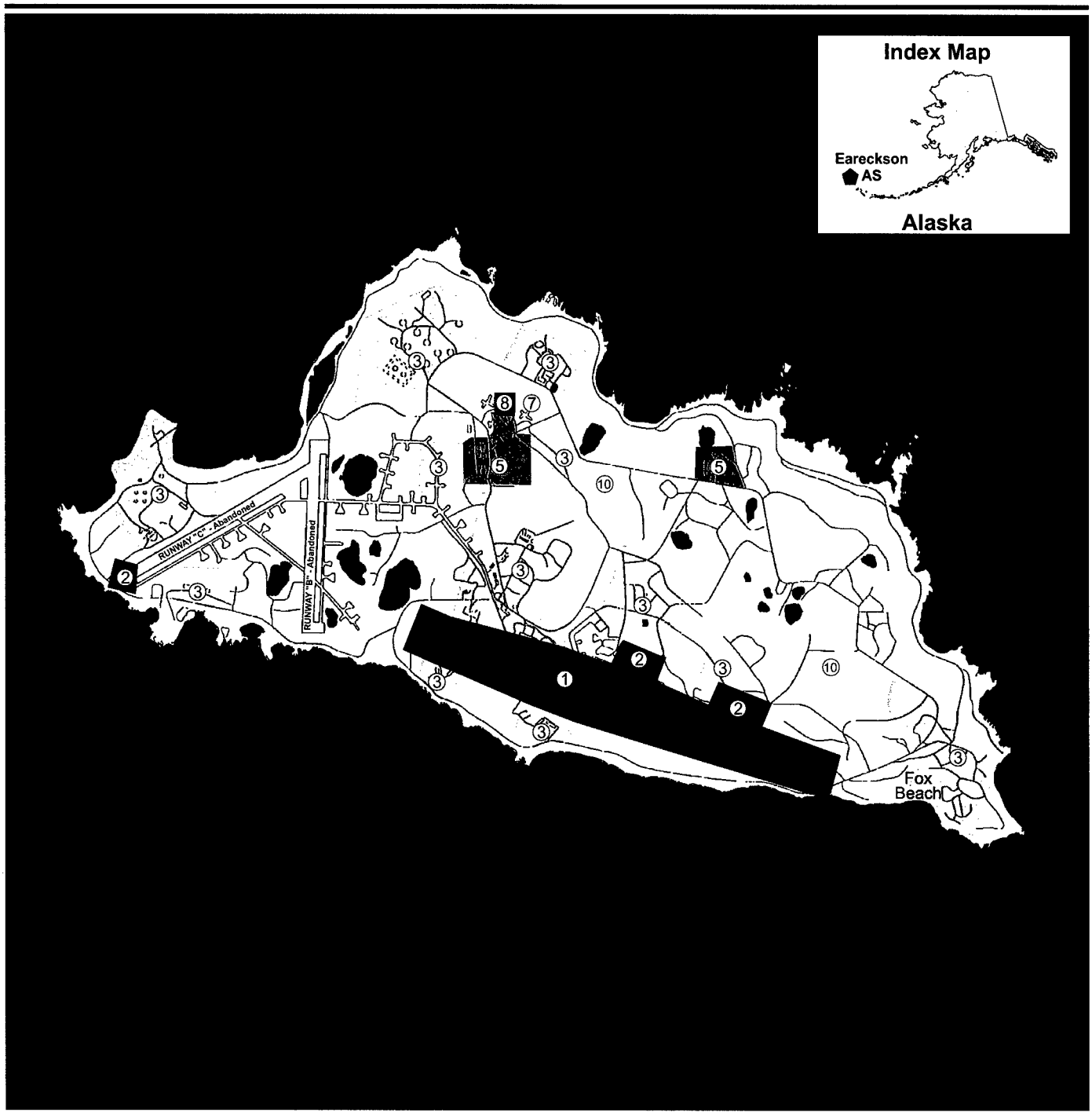
Eareckson AS consists of 1,425 hectares (3,520 acres), which is the entire island of Shemya. The island is located wholly within the Alaska Maritime National Wildlife Refuge (U.S. Department of the Air Force, 1997—Final Installation-Wide Environmental Baseline Survey, Eareckson AS). The Alaska Maritime National Wildlife Refuge is administered by the USFWS. The purposes of the Alaska Maritime National Wildlife Refuge include (1) conserving wildlife and wildlife habitat in their natural diversity, (2) fulfilling international treaty obligations of the United States with respect to fish and wildlife, (3) providing for a subsistence opportunity by local residents, (4) providing a national and international program of scientific research on marine resources, and (5) ensuring water quality and quantity within the refuge.

The southern portion of the air station is dominated by an airfield and airfield support, which consists of support buildings and one active runway. Administrative buildings are scattered throughout the northern portion of the station. Housing is in the north central section of the base, and community and service facilities are in close proximity to the housing and administrative facilities. Industrial sites are scattered throughout the air station, with the remainder of the land being open space. These land uses are shown in figure 3.9-2. Facilities associated with the airfield, the

COBRA DANE Radar, and some housing and administrative accommodations are all of the facilities that are currently in use. The remainder of the facilities is currently inactive.

Coastal Zone Management

All of the communities within the Aleutians West Coastal Resource Service Area (AWCRSA) are coastal, and essentially all developable land within the AWCRSA is located in the "zone of direct influence" of the coastal environment. All major development in the AWCRSA will require review for consistency with the standards of the Alaska Coastal Management Program and the policies of the AWCRSA coastal program. (Aleutians West Coastal Resource Service Area, 1991—Coastal Management Plan)



EXPLANATION

- 1 Airfield
- 2 Aviation Support
- 3 Industrial
- 4 Institutional (Medical/Educational)*
- 5 Administrative
- 6 Commercial*
- 7 Residential
- 8 Recreation
- 9 Agriculture*
- 10 Open Space
- 11 Military*
- Water Area

*Standard land use designation not applicable to this figure

NORTH

Scale
0 1,738 3,475 feet
0 530 1,059 meters

lu_eas_002

Existing Land Use, Eareckson Air Station

Alaska

Figure 3.9-2

COBRA DANE Radar, and some housing and administrative accommodations are all of the facilities that are currently in use. The remainder of the facilities is currently inactive.

Coastal Zone Management

All of the communities within the Aleutians West Coastal Resource Service Area (AWCRSA) are coastal, and essentially all developable land within the AWCRSA is located in the "zone of direct influence" of the coastal environment. All major development in the AWCRSA will require review for consistency with the standards of the Alaska Coastal Management Program and the policies of the AWCRSA coastal program. (Aleutians West Coastal Resource Service Area, 1991—Coastal Management Plan)

Federal lands are excluded from Alaska's coastal zone boundaries. Activities on these lands do, however, require preparation of a Coastal Zone Consistency Determination in accordance with the Coastal Zone Management Act of 1972. Any activities on Federal lands and waters that affect any land or water use or natural resource of the AWCRSA coastal zone must be consistent, to the maximum extent practicable, with the enforceable policies of the AWCRSA coastal management program. (Aleutians West Coastal Resource Service Area, 1991—Coastal Management Plan)

Aesthetics

The ROI for aesthetics at Eareckson AS includes the general visual environment surrounding the station and areas visible from offsite locations.

The visual environment is characterized by Shemya Island's presence in a broad span of open ocean. The topography of the island is gently rolling, with elevations at sea level on the southern or Pacific side and sloping upward to 73 meters (240 feet) on the north or Bering Sea side (U.S. Department of the Air Force, 1997—Final Installation-Wide Environmental Baseline Survey, Eareckson AS). The visual environment on-base is fairly developed and typical of a military installation with a mixture of airfields, housing, industrial, and administrative facilities. Since access to Eareckson AS is restricted, and due to the remoteness of the island, viewpoints are extremely limited. This limits views to occasional aircraft and boat traffic. Overall, the station has a very low visual sensitivity.

3.9.1.3 Eielson AFB—Land Use

This section describes the land uses and aesthetics for Eielson AFB and adjacent property. The ROI for land use includes those areas potentially affected by the use of facilities and infrastructure at Eielson AFB for the deployment of GBI or BMC2 on the Yukon Training Area just outside the

Eielson base boundary. The ROI for aesthetics includes the base and the surrounding areas in the viewshed.

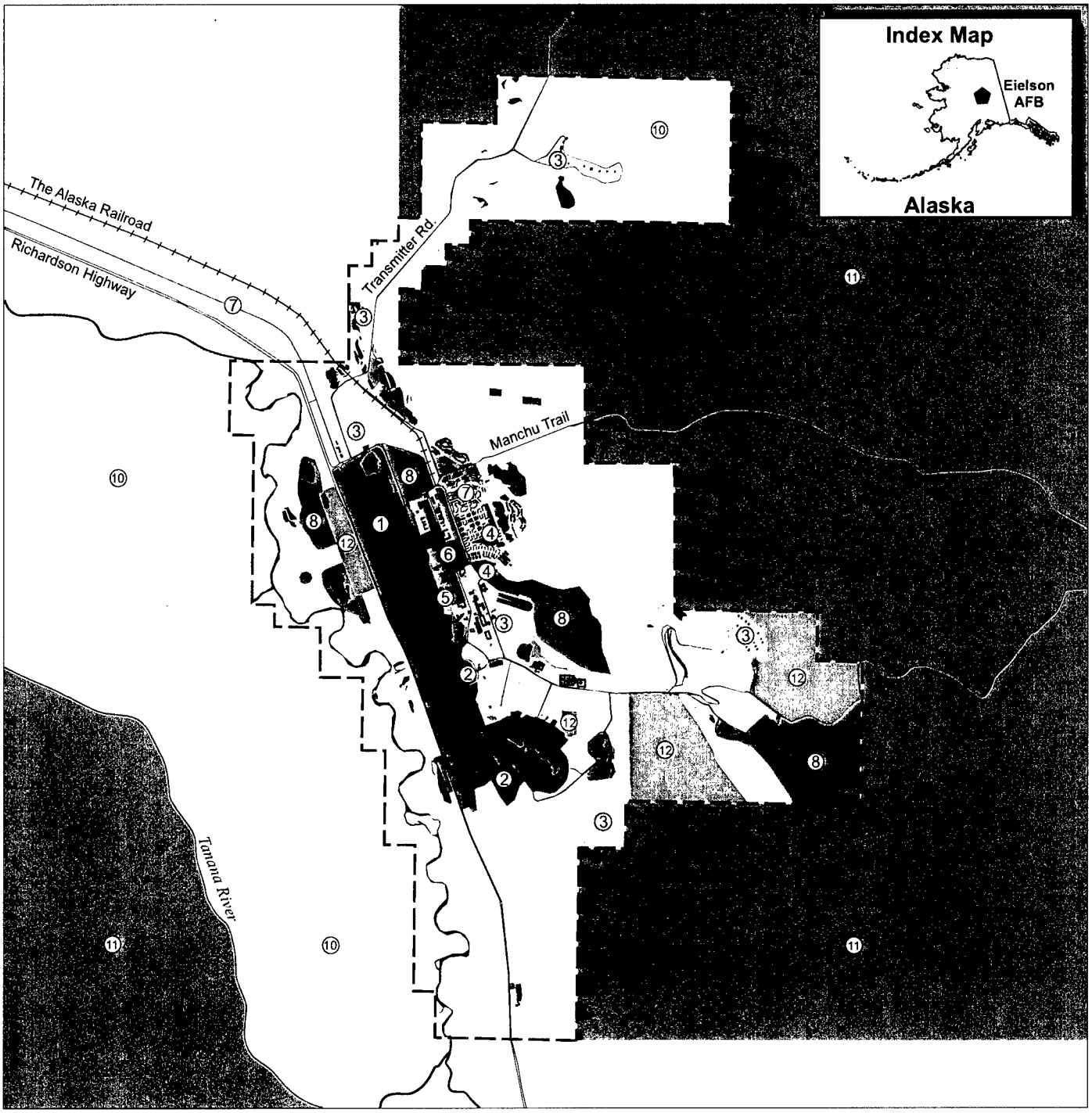
Regional Land Use

Eielson AFB is southeast of Fairbanks in the Fairbanks North Star Borough. The regional land use ROI for Eielson AFB includes the base and the adjacent surrounding land uses.

The Fairbanks North Star Borough provides the framework for the community to make land use and future development decisions. Planning within the base boundary is not under the borough's jurisdiction because it is Federal property; however, coordination between the base and borough often occurs. This coordination helps to prevent land use and noise conflicts between the base and surrounding communities. Eielson AFB is located in a relatively undeveloped, sparsely populated area. Two communities are located in close proximity to the base. The community of Moose Creek abuts the northwest boundary of Eielson AFB, consisting of residential and commercial land uses. The community of Salcha is located a few miles south of the base with residential areas with a density of less than one unit per acre (U.S. Department of the Air Force, 1992—AICUZ Study, Eielson AFB). A mixture of commercial, light industrial, and residential areas has been developed along the Richardson Highway, between the base and the North Pole. The remainder of the base is surrounded on the north, east, and west by undeveloped military reservation land. There have been no conflicts with the surrounding land uses, and the only incompatible land uses exist northwest of Eielson AFB in the community of Moose Creek and along the Richardson Highway that runs through the base parallel to the runways. Moose Creek currently has some residential and commercial uses within the Accident Potential Zone at the end of Runway 13. Also, parts of the Richardson Highway fall into the Clear Zones and the Accident Potential Zones of runways 13 and 31 (U.S. Department of the Air Force, 1992—AICUZ Study, Eielson AFB).

Eielson AFB Land Use

Eielson AFB main base encompasses approximately 8,021 hectares (19,820 acres) (Gori, 1999—Comments received by EDAW, Inc., regarding the NMD Deployment Coordinating Draft DEIS). It manages another 15,098 hectares (37,309 acres) at four other offsite locations. The land uses at Eielson AFB consist of the airfield, airfield operations, industrial, administration, community facilities, medical facilities, housing, recreational, and open space areas, as depicted in figure 3.9-3.



EXPLANATION

- 1 Airfield
- 2 Aviation Support
- 3 Industrial
- 4 Institutional (Medical/Educational)
- 5 Administrative
- 6 Commercial
- 7 Residential
- 8 Recreation
- 9 Agriculture*
- 10 Open Space
- 11 Military
- 12 Training Area
- Water Area
- Roads
- Railroads
- Installation Boundary
- Building

*Standard land use designation not applicable to this figure

Scale
0 .8 1.6 Miles
0 1.25 2.5 Kilometers
NORTH

Existing Land Use, Eielson Air Force Base

Alaska

Figure 3.9-3

Administration facilities are located in the central section of the main cantonment area between Central Avenue and Flightline Avenue. Housing land use areas are located in the northeast portion of the cantonment area. Community facilities are situated between the administrative areas and the housing. Medical facilities are just to the south of the Community Area. Outdoor recreation is scattered throughout the remainder of the base. The rest of the base is made up of open space, with portions of the open space being used for training activities. (Pacific Air Forces, 1998—Draft General Plan, Eielson AFB)

Eielson AFB is used by military personnel and the general public for various recreational activities. These activities include hunting, fishing, trapping, camping, picnicking, jogging, cycling, cross-country skiing, dog-mushing, snowmobiling, archery, and firing ranges. Some facilities and recreation areas on-base are governed by Air Force Instruction 34-101, *Service Programs and Use Eligibility*, and are limited to military personnel, retired military, DOD civilians, and their bona fide guests.

Aesthetics

The aesthetics ROI for Eielson AFB includes the general visual environment surrounding the base and areas visible from offsite locations.

The visual environment around Eielson AFB is characterized by the relatively flat wetlands-type terrain that is dominant in the area. The airfield and supporting facilities are the prominent man-made features on Eielson. Approximately 89 percent of the base is flat alluvial floodplain with elevations ranging from 158 meters (520 feet) to 168 meters (550 feet). The remaining 11 percent of the base consists of rolling hills with elevations up to 343 meters (1,125 feet) (Eielson Air Force Base, 1998—Integrated Natural Resources Management Plan). Parts of Eielson AFB are visible from the Richardson Highway, which bisects the base just southwest of the airfield, and from the community of Moose Creek. The remainder of the base provides very limited views due to the flatness of the land, restricted access, and dense vegetation. The character of the base is typical of most military installations, and because the terrain is relatively flat it does not provide for any prominent vistas; therefore, Eielson AFB has a relatively low visual sensitivity.

3.9.1.4 Fort Greely—Land Use

This section gives a description of the land uses and aesthetics for the affected base property at Fort Greely and the adjacent property. The ROI for land uses includes those areas potentially affected by deployment of the GBI or BMC2 at Fort Greely. The ROI for aesthetics includes the base and the surrounding areas in the viewshed.

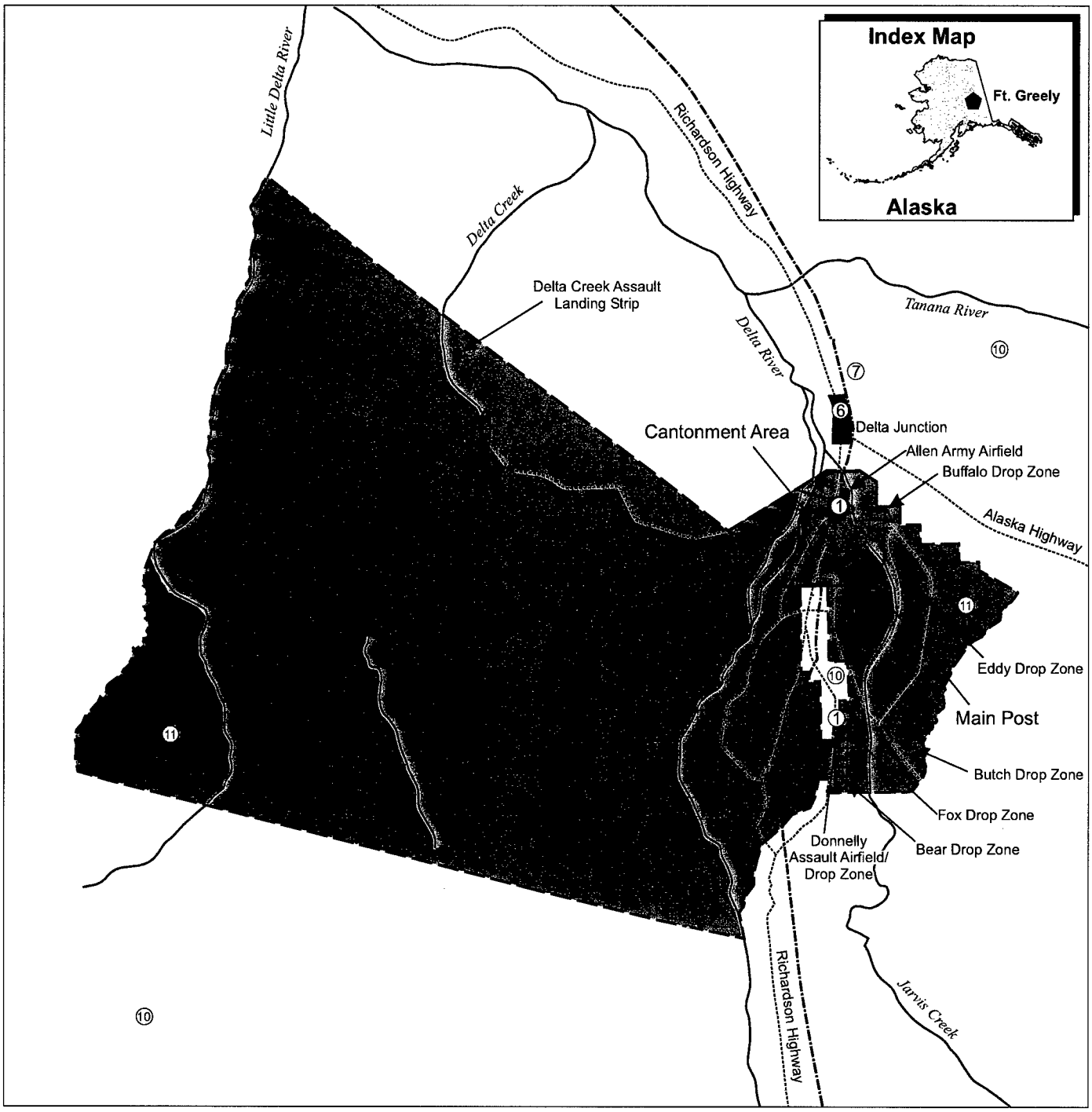
Regional Land Use

Fort Greely is located southeast of Fairbanks and just south of the community of Delta Junction in an unincorporated borough. The ROI for land use includes all of Fort Greely and the surrounding adjacent land uses.

Since the post is not located in a municipality or a borough, there are no local zoning or land use policies. There are also no state plans or guidelines for the area. Therefore, existing land uses do not conflict with any Federal, state, or local land use plans or policies. The land around Fort Greely is primarily agricultural, undeveloped open space, forests, tundra, or wetlands and is sparsely populated, with the closest inhabited structure being in Delta Junction. Most development occurs on the Richardson Highway north towards Fairbanks, and some small settlements are found along the highways at Big Delta, Richardson, Alrich, and Birch Lake. The Trans-Alaskan Oil Pipeline does bisect Fort Greely, with a pumping station located 4 kilometers (2.5 miles) southwest of the cantonment area. There is also a large private tract of land that separates the maneuver area and the drop zone area of Fort Greely. This 65-hectare (160-acre) tract was excluded from the area originally withdrawn. No land uses in the area are incompatible with the adjoining land uses of Fort Greely. (U.S. Army Alaska, 1997— Draft Integrated Natural Resources Management Plan)

Fort Greely Land Use

Fort Greely consists of about 267,519 hectares (661,051 acres), most of which was withdrawn land from the Bureau of Land Management by public land order or public law. The land uses of Fort Greely are shown in figure 3.9-4. Fort Greely consists of the Main Post, two large training areas (Fort Greely West Training Area and Fort Greely East Training Area), and three outlying sites in the area, Gerstle River Test Site (7,689 hectares, 19,000 acres), Black Rapids Training Site (1,125 hectares, 2,779 acres), and Whistler Creek Rock Climbing Area (214 hectares, 530 acres). (U.S. Army Alaska, 1997—Draft Integrated Natural Resources Management Plan)



EXPLANATION

- Roads and Major Trails
- Rivers
- Installation Boundary
- Trans-Alaska Pipeline
- Cantonment Area
- Main Post Boundary
- City

Scale 1:500,000

0 4 7.9 Miles

0 6.4 12.7 Kilometers

NORTH

- 1 Airfield
- 2 Aviation Support*
- 3 Industrial*
- 4 Institutional*
- 5 Administrative*
- 6 Commercial
- 7 Residential
- 8 Recreation*
- 9 Agriculture*
- 10 Open Space
- 11 Military
- Drop Zone
- Hazard Area
- Impact Area

*Standard land use designation not applicable to this figure

Existing Land Use, Fort Greely

Alaska

Figure 3.9-4

lu_fge_002

The potential NMD site would be located in what is known as the Main Post Area, just outside the cantonment area. The Main Post area consists of approximately 5,810 hectares (14,357 acres) and serves as the center for most of the day-to-day activities at Fort Greely. The cantonment area consists of family and troop housing, medical facilities, administrative buildings, community services, industrial areas, recreation areas, open space, and the Allen Army Airfield. (U.S. Army Alaska, 1997—Draft Integrated Natural Resources Management Plan) This portion of Fort Greely is operating on a skeleton crew, and very few facilities are being utilized. A total of 741 hectares (1,830 acres) within the cantonment area is subject to BRAC realignment action, which is scheduled to be completed in July 2001. A prison is currently being considered as a potential reuse of a portion of the cantonment area. (Gori, 1999—Comments received by EDAW, Inc., regarding the NMD Deployment Coordinating Draft DEIS)

The Fort Greely West Training Area consists of 231,479 hectares (571,995 acres), currently withdrawn from the public domain by Public Law 99-606. The withdrawal terminates in 2001. The Department of the Army has published a Legislative EIS to renew its use of the Fort Greely West Training Area (formerly known as the Fort Greely Maneuver Area). (Gori, 1999—Comments received by EDAW, Inc., regarding the NMD Deployment Coordinating Draft DEIS) This area is used as a test site for weapons and equipment (U.S. Army Alaska, 1997—Draft Integrated Natural Resources Management Plan) and is used to test experimental designs under extreme weather conditions. This testing of weapons and equipment includes all types of bombing and gunnery exercises in the impact areas. Large impact areas and buffer zones are required, since equipment and weapons with unknown or unreliable firing characteristics are being tested. Vehicle testing is also conducted on the maneuver area. This portion of Fort Greely contains very few man-made facilities. (U.S. Department of the Army, 1980—EIS concerning Proposed Land Withdrawal for the 172nd Infantry Brigade at Fort Greely)

The area to the south and east of the potential NMD site is known as the Fort Greely East Training Area. This area of Fort Greely consists of 20,943 hectares (51,750 acres) and is located east of the West Training Area (U.S. Army Alaska, 1997—Draft Integrated Natural Resources Management Plan). This land was withdrawn from the public domain by Public Law 99-606. The withdrawal terminates in 2001. The Department of the Army has published a Legislative EIS to renew its use of the Fort Greely East Training Area (formerly known as the Fort Greely Air Drop Zone). This area is primarily used as a non-firing maneuver area. (Gori, 1999—Comments received by EDAW, Inc., regarding the NMD Deployment Coordinating Draft DEIS) Other activities include experimental air drops, airborne training, and testing of clothing, vehicles, and equipment. The principal facilities within this area are 53-kilometer

(33-mile) and 18-kilometer (11-mile) vehicle test loops used to test vehicles in extreme weather conditions and varying snow depths. Other vehicles are tested during all seasons and on different types of terrain. Other than these test loops, there are very few man-made structures. When portions of the range are not in use for the testing of materials, infantry, artillery, and engineer units use the area for non-firing marches, troop maneuvers, artillery unit training, and small arms training (with blank ammunition). (U.S. Department of the Army, 1980—EIS concerning Proposed Land Withdrawal for the 172nd Infantry Brigade at Fort Greely)

Fort Greely with its abundance of open space is used by the military and the public for a wide range of recreation activities. Portions of the base may be closed at times for military missions, and impact areas are always closed for safety considerations. Otherwise, most of the remainder of the base can be used for recreation after obtaining permission from Fort Greely. The most common recreation activities on the base are hunting, fishing, and trapping. Other activities include off-road vehicle use, hiking, backpacking, camping, boating, bicycling, wildlife watching, and skiing. The use of Fort Greely for subsistence is minimal.

Aesthetics

The ROI for aesthetics at Fort Greely includes the general visual environment surrounding the base and areas visible from offsite locations.

The visual environment varies from rolling, plateau terrain in the West Training Area to relatively flat terrain at the Fort Greely East Training Area portion of the base. The East Training Area and northern sections of the West Training Area are nearly level and are covered with black spruce, deciduous trees and shrubs, and muskeg. The southern part of the West Training Area consists of rolling plateaus mixed with kettle lakes. This area also has dense vegetation mixed with bogs, tundra, gorges, and rock outcroppings (U.S. Department of the Interior and U.S. Department of Defense, 1994—Fort Greely Proposed Resource Management Plan, Final EIS). The elevations range from 366 meters (1,200 feet) in the East Training Area and Cantonment Area to approximately 1,829 meters (6,000 feet) above sea level in the southwestern portion of the West Training Area (U.S. Army Alaska, 1997—Draft Integrated Natural Resources Management Plan). The dominant visual features around Fort Greely include views of Mt. Hayes and the Alaska Range and the Trans-Alaska pipeline. Most views onto the base from the Richardson Highway are screened by timber. Due to the thickness of cover and sparse population of the region, Fort Greely has a relatively low visual sensitivity.

3.9.1.5 Yukon Training Area (Fort Wainwright)—Land Use

This section describes the land uses and aesthetics for the affected base property at the Yukon Training Area (Fort Wainwright) and adjacent property. The ROI for land use includes those areas potentially affected by deployment of the GBI or BMC2 at the Yukon Training Area. The ROI for aesthetics includes the training area and the surrounding areas in the viewshed.

Regional Land Use

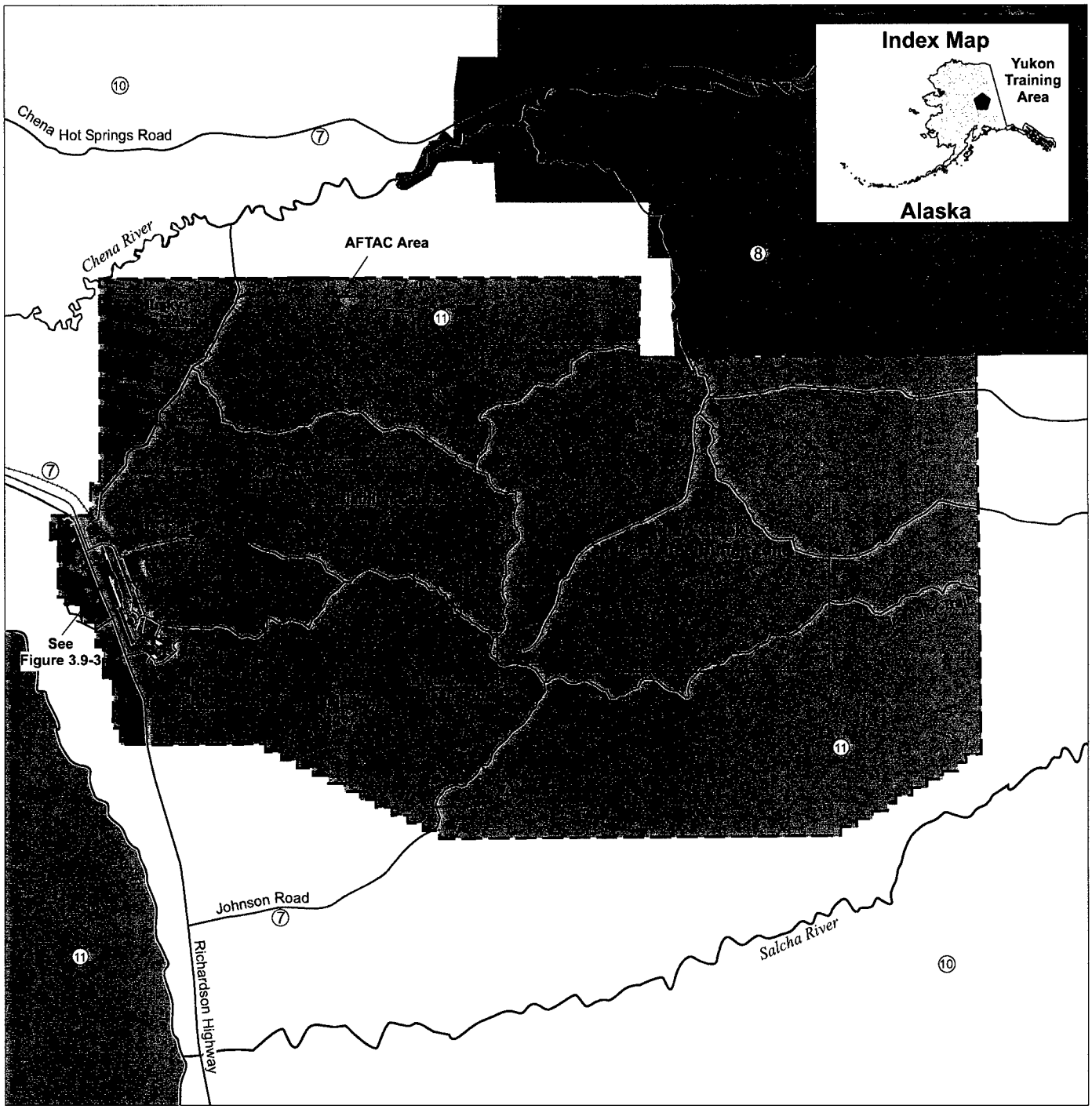
The Yukon Training Area is located in the Fairbanks North Star Borough southeast of Fairbanks and adjacent to Eielson AFB. Although the Yukon Training Area is part of Fort Wainwright, it is located about 24 kilometers (15 miles) southeast of the main post. The regional land use ROI includes the maneuver area and surrounding adjacent land uses.

The Fairbanks North Star Borough is the planning and zoning authority for the region around the Yukon Training Area. Since the Yukon Training Area is federally owned, it does not fall under the jurisdiction of the Fairbanks North Star Borough. The land around the training area is zoned as agriculture, forest land, open space/natural areas, reserve areas (hunting, trapping, fishing, mining, recreation, and agriculture), and remote settlement areas (Fairbanks North Star Borough, 1997—Comprehensive Plan). The land surrounding the Yukon Training Area, with the exception of Eielson AFB, is sparsely populated. The closest inhabited structure is in the community of Moose Creek just outside the northwest boundary of Eielson AFB. None of the land uses in the area are incompatible with the adjoining land uses of the Yukon Training Area.

Yukon Training Area (Fort Wainwright) Land Use

The site consists of 100,362 hectares (248,000 acres) and is utilized by all branches of the armed forces. It is jointly managed by the Bureau of Land Management and the U.S. Army. This training area is currently withdrawn by Public Law 99-606. The withdrawal terminates in 2001. The Department of the Army has published a Legislative EIS to renew its use of the Fort Wainwright Yukon Training Area (formerly known as the Fort Wainwright Yukon Maneuver Area). (Gori, 1999—Comments received by EDAW, Inc., regarding the NMD Deployment Coordinating Draft DEIS)

The Yukon Training Area is relatively undeveloped, undisturbed, and has very few man-made structures. It is roughly broken down into three main areas as shown in figure 3.9-5. One area is a 16-square-kilometer (6-square-mile) tract called the Stuart Creek Impact Area, which is located in the north central portion of the maneuver area. This area is used by the Air Force and Army for the firing of live and/or practice



EXPLANATION

- 1 Airfield*
- 2 Aviation Support*
- 3 Industrial*
- 4 Institutional*
- 5 Administrative*
- 6 Commercial*
- 7 Residential
- 8 Recreation
- 9 Agriculture*
- 10 Open Space
- 11 Military
- Impact Area/BufferZone
- Abandoned Nike Missile Site
- Drop Zone
- Small Arms Range
- AFTAC Area
- Roads
- Rivers
- Installation Boundary

*Standard land use designation not applicable to this figure

Scale 1:300,000

0 2.4 4.7 Miles

0 3.8 7.6 Kilometers

NORTH

Existing Land Use, Yukon Training Area

Alaska

Figure 3.9-5

lu_yukon_002

munitions (U.S. Department of the Interior, and U.S. Department of Defense, 1994—Fort Wainwright Yukon Maneuver Area, Proposed Resource Management Plan, Final EIS). The Air Force Technical Applications Center site is another area within the Yukon Training Area. It is located in the northwest corner of the maneuver area just east of Transmitter Road and north of Beaver Creek Road. The Air Force Technical Applications Center site consists of 8,802 hectares (21,750 acres) jointly utilized by the Army and the Air Force Technical Applications Center. Approximately 971 hectares (2,400 acres) within this large parcel are used exclusively by the Air Force (Department of the Army, 1989—Permit of usage of the Air Force Technical Applications Center site). The Air Force Technical Applications Center site is used for operation of a seismographic system that detects seismic disturbances and detonations of nuclear weapons worldwide. The remainder of the Yukon Training Area is designated as training areas for mortar, artillery, and maneuver exercises. Within these training areas are two Nike sites (Bravo and Charlie), which are abandoned nuclear defense facilities of the Nike Hercules missile system. (U.S. Army Corps of Engineers, 1994—Field Report/Site Assessment for Yukon Maneuver Area, Nike Sites B & C, Fort Wainwright, Alaska)

The Yukon Training Area with its abundance of open space is used by the military and the public for a wide range of recreation activities. Portions of the base may be closed at times for military missions and impacts areas, and the Air Force Technical Applications Center area is always closed for safety considerations and military operations. Otherwise, most of the remainder of the base can be used for recreation after obtaining permission from Fort Wainwright or Eielson AFB. The most common recreation activities on the base are hunting, fishing, and trapping. Other activities include off-road vehicle use, hiking, backpacking, camping, snowmobiling, wildlife watching, and skiing.

Aesthetics

The ROI for aesthetics at the Yukon Training Area includes the general visual environment surrounding the maneuver area and areas visible from offsite locations.

The visual environment around the Yukon Training Area is best described by the rolling terrain that primarily consists of undisturbed forests and woodlands. There are some scattered wetlands, relatively flat areas, and some parts that have been disturbed by training activities. The topography varies from rolling to hilly with elevations ranging from 168 meters (550 feet) to 995 meters (3,265 feet) above sea level (U.S. Department of the Army, 1979—Draft EIS concerning Proposed Land Withdrawal for the 172th Infantry Brigade at Fort Wainwright). Due to the terrain and remoteness of the Yukon Training Area, views of the Yukon Training Area are extremely limited. Some roads into the area are

not monitored, and the public could gain access into portions of the Yukon Training Area, but due to the thickness of cover and lack of prominent vistas, the Yukon Training Area has a low visual sensitivity.

3.9.2 NORTH DAKOTA INSTALLATIONS

A brief introduction is included to generally describe the land uses in the northeastern North Dakota region. Most of the land within all of the ROIs is almost extensively used for agricultural purposes with some scattered residential, commercial, and industrial areas usually located around small communities or towns. The area around all of the proposed sites is very sparsely populated. No form of comprehensive zoning or planning exists for most counties in the region. However, most of the counties in this region do have some land use controls that regulate development around highways for health and safety concerns and for the preservation of agricultural lands but leave planning and economic development to regional planning councils. All of the potential sites are located on Federal property and are not subject to local land use controls, but all try to be as consistent as possible with these land use controls.

3.9.2.1 Cavalier AFS—Land Use

This section describes the land uses and aesthetics for the affected base property at Cavalier AFS and surrounding area. The ROI for land use includes the base, adjacent land areas potentially affected by construction and deployment of the XBR, and areas up to 30 kilometers (19 miles) from the site to include areas where certain sensitive electronics may be susceptible to temporary interference with use of the XBR. The ROI will include those land uses that may contain sensitive electronics such as residential, commercial, industrial, and institutional (such as medical and educational). The ROI for aesthetics includes the base and adjacent off-base properties within the viewshed.

Regional Land Use

Cavalier AFS is located in the northeast corner of North Dakota on the western edge of Pembina County in the Beaulieu Township. The regional land use ROI includes the area within a 30-kilometer (19-mile) radius from the Cavalier AFS site in Pembina County.

Beaulieu Township has no zoning ordinances; therefore, development in the area is reviewed by Pembina County and the Red River Regional Planning Council to ensure compliance with the overall development guidelines. All of Pembina County's regulations deal with development around highways for health and safety concerns and for the preservation of agricultural lands. Red River Regional Planning Council is the planning and economic development authority for the four-county region of Grand Forks, Nelson, Pembina, and Walsh counties (Wangler, 1998—Personal

communication). However, since Cavalier AFS is a Federal property it does not fall within the zoning and planning regulations of the council. As shown in table 3.9-1, the area is sparsely populated. The small towns within the ROI generally contain residential, commercial, industrial, and institutional land uses that support the surrounding area. The remainder of the area outside of these towns consists of pasture land, cultivated cropland, wooded areas, and some small bodies of water scattered throughout the area. A small logging operation is adjacent to the north of Cavalier AFS, and a few farmsteads are in the area, with the closest inhabited structure being less than 0.8 kilometer (0.5 mile) away from the site. All of the land uses in the area are compatible with adjoining areas of Cavalier AFS.

Table 3.9-1: Urban/Populated Areas within 30 Kilometers (19 Miles) of the Cavalier AFS Site

Urban/Populated Area	Population	Occupied Housing Units	Distance[1] kilometers (miles)
Akra	*	*	15 (9)
Backoo	*	*	19 (12)
Cavalier	1,508	631	23 (14)
Concrete	20	6	3 (2)
Crystal	201	80	23 (14)
Easby	*	*	26 (16)
Edinburg	292	127	24 (15)
Gardar	*	*	15 (9)
Hallson	*	*	6 (4)
Hensel	*	*	18 (11)
Leroy	*	*	24 (15
Leyden	*	*	18 (11)
Milton	141	62	15 (9)
Mountain	130	44	5 (3)
Olga	*	*	13 (8)
Osnabrock	198	72	19 (12)
Svold	*	*	11 (7)
Union	*	*	19 (12)
Vang	*	*	26 (16)
Walhalla	1,131	454	21 (13)

Source: U.S. Department of Commerce, 1998—U.S. Census Bureau.
[1] Distance is in air miles
* Unincorporated communities, no population data available

Cavalier AFS Land Use

The general land use is described by the eight land use categories shown in figure 3.9-6. The station property totals 112 hectares (278 acres). The base is broken down into the airfield, industrial, administrative, commercial, residential, public recreation, and open space land use categories. (U.S. Air Force Space Command, undated—Comprehensive Planning Framework)

The eastern half of the site is dominated by mission-oriented industrial land uses consisting of the power plant, radar, and sewage and water treatment facilities. The western portion of the site is dominated by residential, administrative, industrial, and public facility/recreational uses with the remainder of the base being open land use (U.S. Air Force Space Command, undated—Comprehensive Planning Framework). There is also a small airfield at the southern end of the station that consists of a helicopter pad and clear lanes for landing and takeoff.

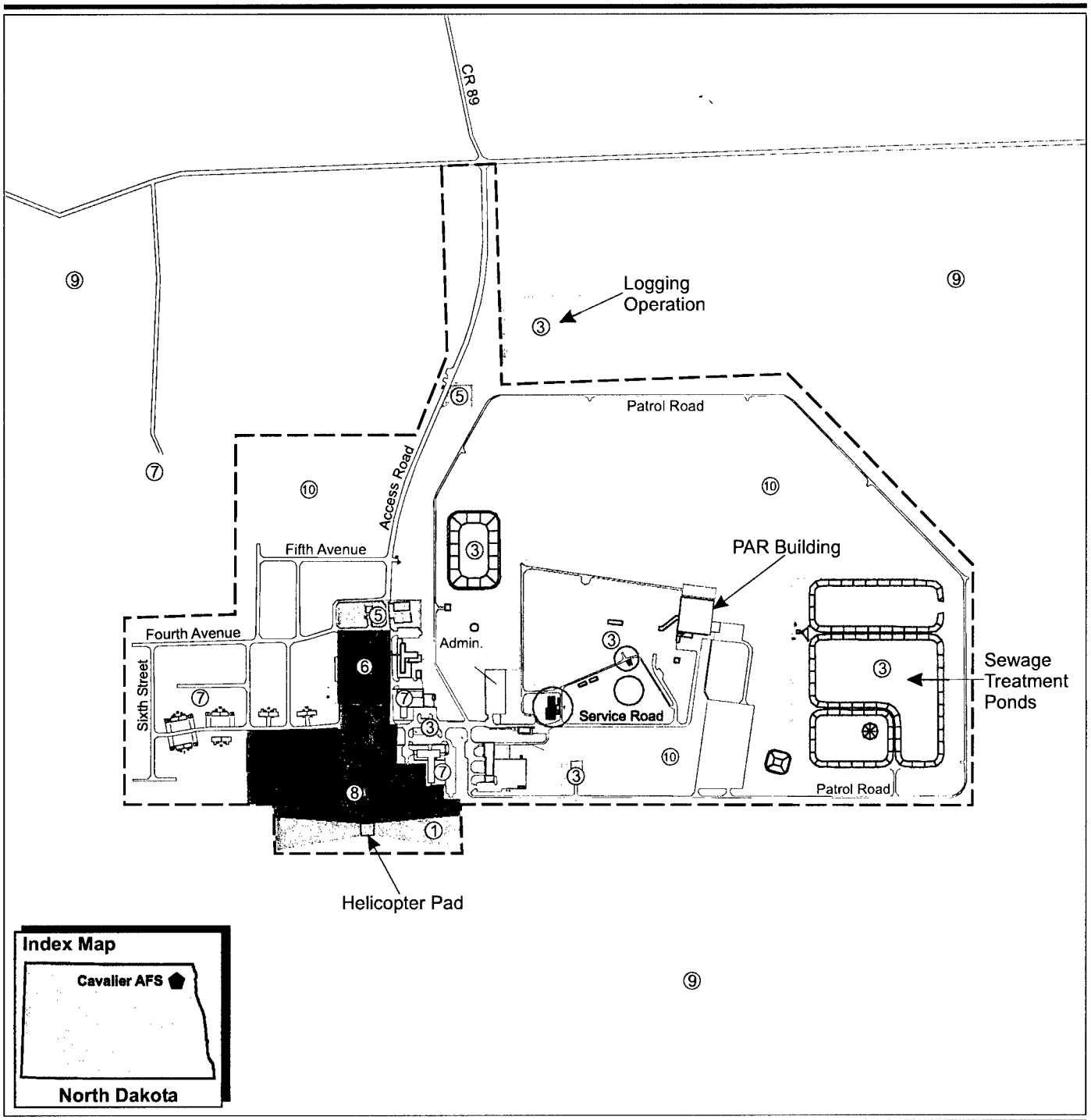
Aesthetics

The ROI for aesthetics at Cavalier AFS includes the general visual environment surrounding the station and the areas visible from offsite locations.

The visual environment is distinguished by the open plains surrounding the site, which are predominately used for agriculture and are the most significant feature of the natural environment. The topography of the site is generally flat at Cavalier AFS, with the site being at about 358 meters (1,175 feet) above sea level. The most significant man-made feature is the Perimeter Acquisition Radar building. This facility stands approximately 37 meters (121.5 feet) tall. (U.S. Army Strategic Defense Command, 1991—Preliminary Building Availability Conditions Survey–SRMSC) Public access to the site is prohibited; therefore, views are limited to passing traffic on ND 5 to the north, ND 32 to the east, and to adjacent land owners. The site has a relatively low visual sensitivity because the flatness of the land limits any prominent vistas.

3.9.2.2 Grand Forks AFB—Land Use

This section describes the land uses and aesthetics for the base property and the surrounding areas of Grand Forks AFB. The ROI for land use and aesthetics includes the base and adjacent properties that could be affected by construction activities and deployment of a GBI or BMC2 at Grand Forks AFB. The area potentially affected off-base would be the properties immediately adjacent to the base.



EXPLANATION

- ① Airfield
- ② Aviation Support*
- ③ Industrial
- ④ Institutional (Medical/Educational)*
- ⑤ Administrative
- ⑥ Commercial
- ⑦ Residential
- ⑧ Recreation
- ⑨ Agriculture
- ⑩ Open Space

Roads
Installation Boundary
CR = County Road
PAR = Perimeter Acquisition Radar

*Standard land use designation not applicable to this figure

Scale 1:11,000
0 459 917 Feet
0 140 280 Meters
NORTH

Existing Land Use, Cavalier Air Force Station

North Dakota

Figure 3.9-6

Regional Land Use

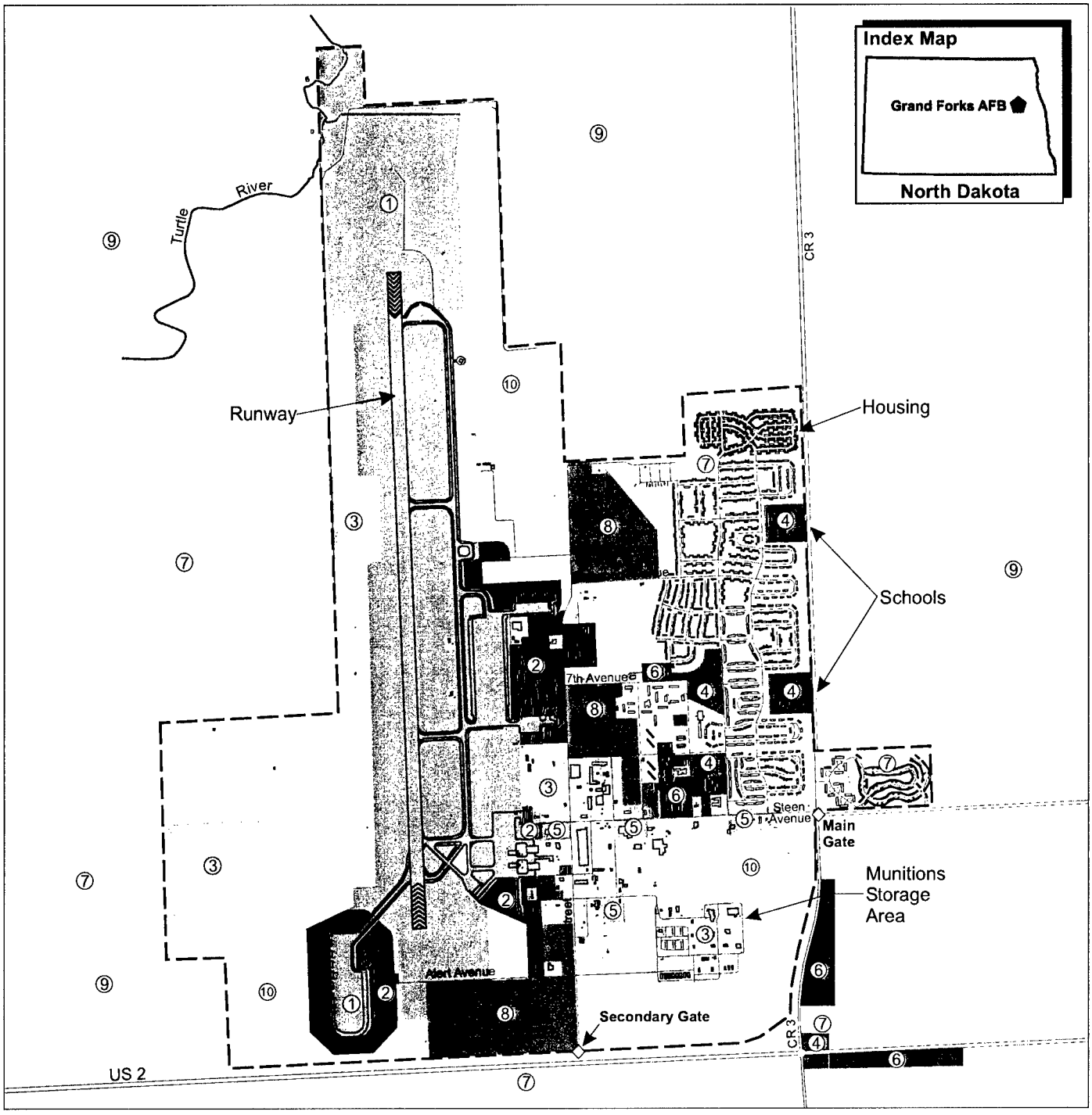
The regional land use that could be affected by NMD deployment includes those properties immediately adjacent to the base in Grand Forks County. The land in the region is approximately 96 percent agricultural, 2 percent developed, and 2 percent woodlands, water bodies, and wetlands.

Development within Grand Forks County is reviewed by the Grand Forks County Planning and Zoning Commission to ensure conformity with the county's zoning and subdivision regulations. Because Grand Forks AFB is Federal property, it does not fall within the zoning and planning regulations of the county. Grand Forks County adopted zoning within the Grand Forks AFB vicinity based on the Air Force mission. Two zones were created to prevent land uses that may encroach upon the base's mission. Zone I was established immediately around the base. Permitted uses are single family residences with a minimum lot size of 1 hectare (2.5 acres), agriculture, and "usual and ordinary farm buildings." Zone II extends outward from Zone I, permitting uses in Zone I plus additional uses such as duplexes, churches, motels, places of business, and mobile home courts (U.S. Department of the Air Force, 1995—AICUZ Study, Grand Forks AFB). The actual land use immediately adjacent to the base is agricultural, with the nearest inhabited structure being 0.8 kilometer (0.5 mile) from the base. A small commercial area and the town of Emerado are located southeast of the base. No land uses in the area are incompatible with adjoining areas of Grand Forks AFB (U.S. Department of the Air Force, 1997—Grand Forks AFB General Plan).

Grand Forks AFB Land Use

Grand Forks AFB encompasses an area of 1,954 hectares (4,830 acres) (U.S. Department of the Air Force, 1997—Integrated Natural Resource Management Plan). Land uses at Grand Forks AFB, as categorized in the Grand Forks Air Force Base General Plan include administrative, aircraft operations and maintenance, airfield, community, housing, industrial, medical, open space, recreation, and water (figure 3.9-7).

The airfield land use is the dominant category on the base, and is focused on the runway. The aircraft operations and maintenance land use is interdependent with the airfield land use and is just east of the runway. The industrial areas include the base civil engineering complex on Seventh Avenue, the supply and transportation complex on Eielson Street, and the Munitions Storage Area. The administrative land use areas are spread along Steen Avenue, with two smaller areas physically separated from it. Community facilities such as the Base Exchange and Commissary are on Holzapple Street, the schools in the family housing area, and several commercial areas and community support areas are



EXPLANATION

- ① Airfield
- ② Aviation Support
- ③ Industrial
- ④ Institutional (Medical/Educational)
- ⑤ Administrative
- ⑥ Commercial
- ⑦ Residential
- ⑧ Recreation
- ⑨ Agriculture
- ⑩ Open Space
- Roads
- Installation Boundary
- ◇ Gate

CR = County Road
ND = U.S. Highway

Scale 1:40,000

NORTH

0 1,667 3,333 Feet

0 508 1,016 Meters

Existing Land Use, Grand Forks Air Force Base

North Dakota

Figure 3.9-7

adjacent to the unaccompanied housing. The medical land use includes medical activity such as the dental clinic and hospital. Family housing land uses are found in attached and detached residential units located in the Main, Dakota, and Sunflake family housing areas and a mobile home park. Single personnel housing for enlisted members is in the central base area. Although pockets of outdoor recreation areas for children exist in the family housing area, the concentration of outdoor recreation land use is with the ball park complex and golf course area. Open space on the base is west of County Road 3 up to the main gate and north of the central core of the main base area (U.S. Department of the Air Force, 1997—Grand Forks AFB General Plan).

Aesthetics

The ROI for aesthetics at Grand Forks AFB includes the general visual environment surrounding the station and the areas visible from off-base areas.

The visual environment in the vicinity of Grand Forks AFB is characterized by the agricultural land that surrounds the base. The topography of the land is generally flat, with elevations ranging from 268 meters to 280 meters (880 feet to 920 feet) above sea level, averaging about 271 meters (890 feet) above sea level (U.S. Department of the Air Force, 1997—Integrated Natural Resource Management Plan). Grand Forks AFB is fairly developed and typical of a military installation with a mixture of airfield, industrial, administrative, and housing facilities. The most significant aspect of the natural environment is the flatness of the land and the abundance of agricultural land surrounding the base. The most significant man-made features are the airfield and the adjacent support facilities. These features are surrounded by open land, which consists of some woodlands, wetlands that include the lagoons for wastewater treatment, and some agricultural outleased land. Since public access to the base is prohibited, viewpoints are primarily limited to traffic on U.S. Highway 2 to the south of Grand Forks AFB, CR 3B to the east, and to adjacent land owners who use the land for agricultural purposes. The area has a low visual sensitivity because the flatness of the area does not allow for any prominent vistas.

3.9.2.3 Missile Site Radar—Land Use

This section describes the land uses and aesthetics for the affected base property at the SRMSC Missile Site Radar and the surrounding area. The ROI for land use includes the base and those adjacent areas potentially affected by the construction and deployment of the GBI or XBR at this site and areas up to 30 kilometers (19 miles) from the site to include areas where certain sensitive electronics may be susceptible to temporary interference with use of the XBR. The ROI will include those land uses that may contain sensitive electronics such as residential, commercial,

industrial, and institutional (such as medical and educational). The ROI for aesthetics includes the base and adjacent off-base properties within the viewshed.

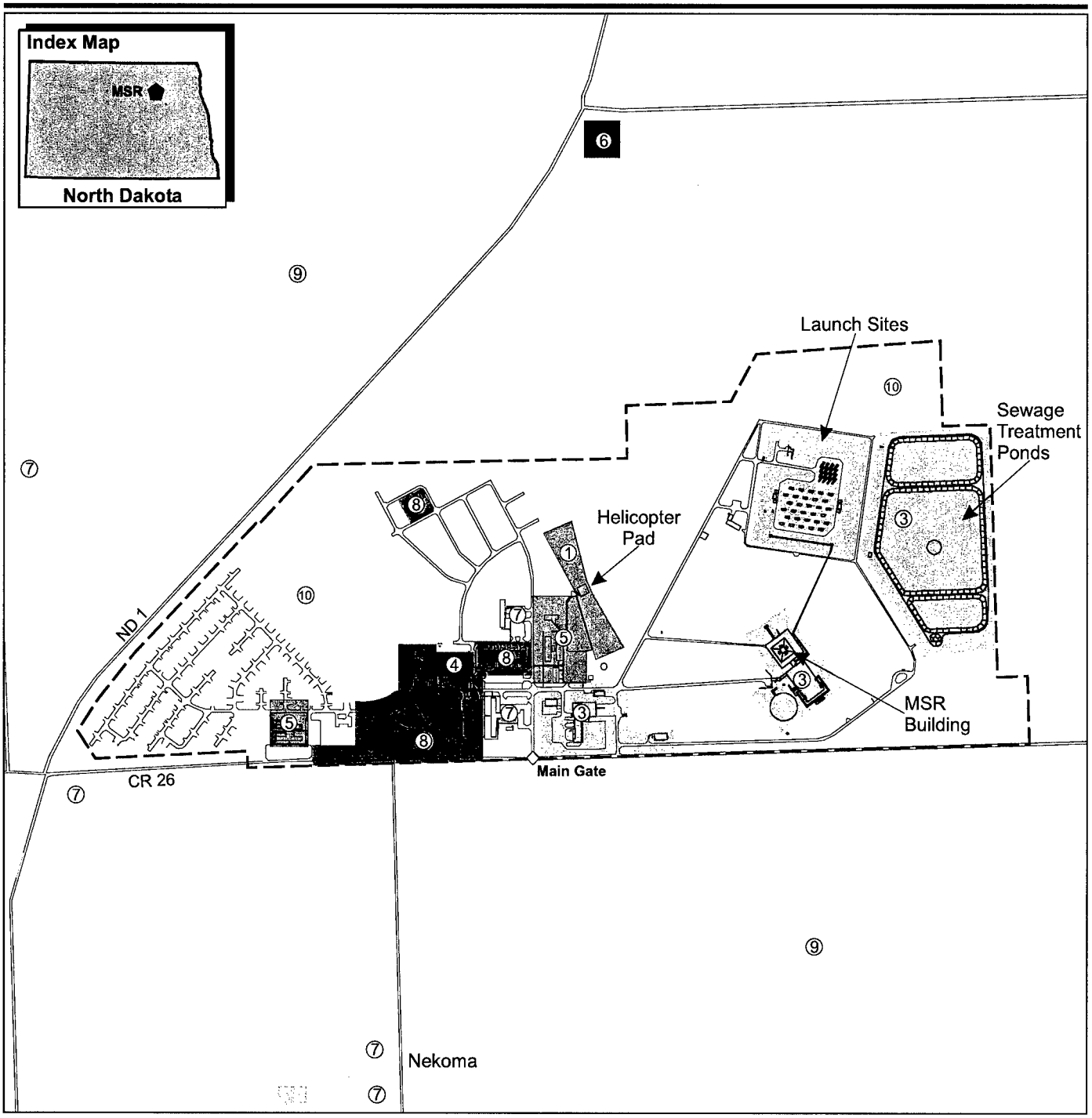
Regional Land Use

The Missile Site Radar is located in the Nekoma Township just north of the town of Nekoma in Cavalier County. The regional land use ROI includes the area within a 30-kilometer (19-mile) radius from the Missile Site Radar.

Nekoma Township has no zoning ordinances; therefore, development in the area is reviewed by Cavalier County and the North Central Planning Council to ensure compliance with overall development guidelines (Dufman, 1998—Personal communication). The Council is the planning and economic development authority for a six-county region that includes Cavalier, Ramsey, Benson, Eddy, Towner, and Rolette counties. However, Missile Site Radar is a Federal property and does not fall within the zoning and planning regulations of the Council or the county. As shown in table 3.9-2, the area is sparsely populated. The small towns within the ROI can be expected to contain residential, commercial, industrial, and institutional land uses that support the surrounding area. The remaining land outside these small towns is almost exclusively used for agricultural purposes with the majority being used for cropland, with small bodies of water and wooded areas scattered throughout. There are a few farmsteads and the town of Nekoma within close proximity to the site. The closest inhabited structure is approximately 0.8 kilometer (0.5 mile) away. All of the land uses in the area are compatible with adjoining areas of the Missile Site Radar.

Missile Site Radar Land Use

The general land use of the 175-hectare (432-acre) site is depicted in figure 3.9-8. The eastern half of the site is dominated by mission-oriented land uses consisting of launch silos, a power plant, a radar, and sewage and water treatment facilities. The western portion of the site is dominated by mostly open space. In the central section there are administrative, residential, and some industrial buildings remaining. There are also some indoor and outdoor recreation facilities located in the central portion of the base (U.S. Army Corps of Engineers, 1974—Analysis of Existing Facilities at SRMSC). Some existing permanent safety restrictive easements are in place that extend outside the Missile Site Radar boundary. These easements limit uses to only those of an agricultural nature. No permanent habitable structures are permitted in this easement. Currently, no structures are located within these easements. The entire site is currently inactive, but is being maintained in a caretaker status.



EXPLANATION

- ① Airfield
- ② Aviation Support*
- ③ Industrial
- ④ Institutional (Medical/Educational)
- ⑤ Administrative
- ⑥ Commercial*
- ⑦ Residential
- ⑧ Recreation
- ⑨ Agriculture
- ⑩ Open Space

Roads
Installation Boundary
◇ Gate
CR = County Road
ND = North Dakota Highway

*Standard land use designation not applicable to this figure

Scale 1:15,000

NORTH

0 625 1,250 Feet

0 191 381 Meters

Existing Land Use, Missile Site Radar

North Dakota

Figure 3.9-8

lu_msr_002

Table 3.9-2: Urban/Populated Areas within 30 Kilometers (19 Miles) of the Missile Site Radar

Urban/Populated Area	Population	Occupied Housing Units	Distance[1] kilometers (miles)
Adams	225	121	29 (18)
Alsen	118	60	26 (16)
Derrick	*	*	19 (12)
Easby	*	*	16 (10)
Edmore	329	135	21 (13)
Fairdale	80	34	15 (9)
Hampden	94	52	23 (14)
Langdon	2,241	960	19 (12)
Loma	19	12	13 (8)
Milton	141	62	24 (15)
Nekoma	61	30	2 (1)
Osnabrock	198	72	18 (11)
Weaver	*	*	27 (17)

Source: U.S. Department of Commerce, 1998—U.S. Census Bureau.
[1] Distance in air miles
* Unincorporated communities, no population data available

Aesthetics

The ROI for aesthetics at the Missile Site Radar includes the general visual environment surrounding the site and the areas visible from offsite locations.

The visual environment is characterized by the open plains surrounding the site that are used for agriculture. The agricultural land is the most significant feature of the natural environment. The topography of the land is relatively flat, with the Missile Site Radar being at about 497 meters (1,630 feet) above sea level (U.S. Army Corps of Engineers, 1974—Analysis of Existing Facilities at SRMSC). The most significant man-made feature is the Missile Site Radar building. This facility looks similar to a pyramid and stands approximately 23 meters (75 feet) tall. Public access to the site is prohibited; therefore, views are limited to traffic on Highway 1 to the west, CR 26 to the south, and CR 66 to the north, and to adjacent land owners and to the town of Nekoma to the south. The site and the surrounding area have a low visual sensitivity because the flatness of the land does not provide for any prominent vistas.

3.9.2.4 Remote Sprint Launch Site 1—Land Use

This section describes the land uses and aesthetics for the affected base property at the SRMSC Remote Sprint Launch Site 1 and surrounding area. The ROI for land use includes the base, adjacent areas potentially affected by construction and deployment of the XBR, and areas up to 30 kilometers (19 miles) from the site to include property where certain sensitive electronics may be susceptible to temporary interference with use of the XBR. The ROI will include those land uses that may contain sensitive electronics such as residential, commercial, industrial, and institutional (such as medical and educational). The ROI for aesthetics includes the base and adjacent off-base properties within the viewshed.

Regional Land Use

The regional land use includes the area within a 30-kilometer (19-mile) radius from Remote Sprint Launch Site 1. The site is located in Northfield Township east of the town of Hampden in Ramsey County and is 1.2 kilometers (0.75 mile) south of Cavalier County.

Northfield Township has no zoning ordinances; therefore, development in the area is reviewed by Ramsey County and the North Central Planning Council to ensure compliance with overall development guidelines. The Council is the planning and economic development authority for a six-county region that includes Cavalier, Ramsey, Benson, Eddy, Towner, and Rolette counties (Anderson, 1998—Personal communication, February 23). However, Remote Sprint Launch Site 1 is a Federal property and does not fall within the jurisdiction of the county or the North Central Planning Council. As shown in table 3.9-3, the area is sparsely populated, with the closest inhabited structure being about 2.4 kilometers (1.5 miles) northeast of the site. The small towns within the ROI generally contain residential, commercial, industrial, and institutional land uses that support the surrounding area. The remaining land outside these small towns is almost exclusively used for agricultural purposes, mostly cropland, with some wooded areas and small bodies of water distributed throughout. None of the land uses in the area are incompatible with adjoining land uses of Remote Sprint Launch Site 1.

Remote Sprint Launch Site 1 Land Use

The general land use of the 17-hectare (41-acre) site is military (U.S. Army Strategic Defense Command, 1991—Preliminary Building Availability Conditions Survey, SRMSC). The site consists of abandoned anti-missile launch silos that are located near the center of the site, launch support buildings located to the west of the launch silos, and sewage treatment ponds in the eastern portion of the site. A perimeter fence surrounds the facility. A security fence also surrounds the sewage

treatment ponds, as shown in figure 3.9-9. Remote Sprint Launch Site 1 is currently inactive, but is maintained in a caretaker status.

Table 3.9-3: Urban/Populated Areas within 30 Kilometers (19 Miles) of Remote Sprint Launch Site 1

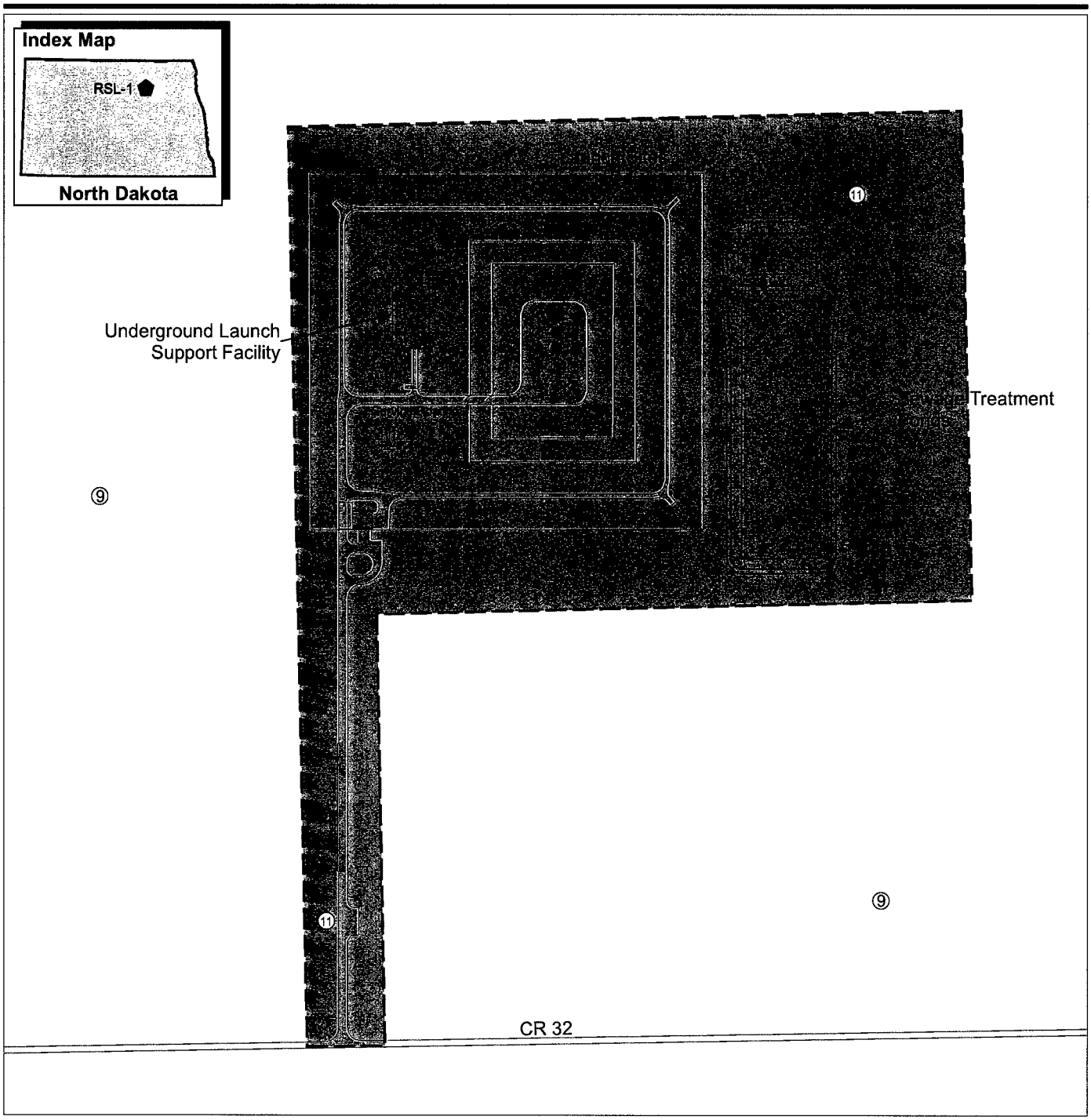
Urban/Populated Area	Population	Occupied Housing Units	Distance[1] kilometers (miles)
Alsen	118	60	15 (9)
Calio	30	16	29 (18)
Derrick	*	*	6 (4)
Edmore	329	135	16 (10)
Fairdale	80	34	27 (17)
Garske	*	*	29 (18)
Hampden	94	52	5 (3)
Langdon	2,241	960	30 (19)
Lawton	63	30	30 (19)
Loma	19	12	11 (7)
Munich	341	122	24 (15)
Nekoma	61	30	16 (10)
Saint Joe	*	*	26 (16)
Starkweather	180	68	24 (15)
Weaver	*	*	8 (5)

Source: U.S. Department of Commerce, 1998—U.S. Census Bureau.
[1] Distance in air miles
* · Unincorporated communities, No Population Data Available

Aesthetics

The ROI for aesthetics at Remote Sprint Launch Site 1 includes the general visual environment surrounding the site and the areas visible from offsite locations.

The visual environment is characterized by the open plains surrounding the site that are used for agriculture. The agricultural land is the most significant feature of the natural environment. The topography of the land is relatively flat, with Remote Sprint Launch Site 1 being at about 474 meters (1,555 feet) above sea level. (U.S. Army Corps of Engineers, 1974—Analysis of Existing Facilities at SRMSC) The most significant man-made features are the launch silos, launch support buildings, and the sewage treatment lagoons. Public access to the site is prohibited; therefore, views are limited to traffic on CR 32 to the south and to adjacent land owners. The site and the surrounding area have a



EXPLANATION

① Airfield*	⑥ Commercial*	⑪ Military	
② Aviation Support*	⑦ Residential*	Roads	
③ Industrial*	⑧ Recreation*	Installation Boundary	
④ Institutional (Medical/Educational)*	⑨ Agriculture	*Standard land use designation not applicable to this figure	
⑤ Administrative*	⑩ Open Space*		

Scale 1:4,000

NORTH

0 167 333 Feet

0 51 101 Meters

lu_rsl1_002

Existing Land Use, Remote Sprint Launch Site 1

North Dakota

Figure 3.9-9

low visual sensitivity because the flatness of the land does not provide for any prominent vistas.

3.9.2.5 Remote Sprint Launch Site 2—Land Use

This section describes the land uses and aesthetics for the affected base property at the SRMSC Remote Sprint Launch Site 2. The ROI for land use includes the base, adjacent areas potentially affected by construction and deployment of an XBR, and properties up to 30 kilometers (19 miles) from the site to include areas where certain sensitive electronics may be susceptible to temporary interference with use of the XBR. The ROI will include those land uses which may contain sensitive electronics such as residential, commercial, industrial, and institutional (such as medical and educational). The ROI for aesthetics includes the base and adjacent off-base properties within the viewshed.

Regional Land Use

The Remote Sprint Launch Site 2 is located in Langdon Township northeast of the town of Dresden. The regional land use ROI includes the area within a 30-kilometer (19-mile) radius from Remote Sprint Launch Site 2.

Langdon Township has zoning regulations for the town of Langdon and for areas outside the incorporated areas. These regulations deal with flood zones, building and tree setbacks, and agricultural uses. Non-conforming uses are reviewed by the Township Board (Borgan, 1999—Personal communication). Cavalier County falls under the jurisdiction of the North Central Planning Council. The Council is the planning and economic development authority for a six-county region that includes Cavalier, Ramsey, Benson, Eddy, Towner, and Rolette counties. However, since Remote Sprint Launch Site 2 is a Federal property, it does not fall within the zoning and planning regulations of the Council or the county. As shown in table 3.9-4, the area is sparsely populated, with the closest inhabited structure being 1.1 kilometers (0.7 mile) away. The remaining land outside the towns is almost exclusively used for agricultural purposes with the majority being used for cropland, with small bodies of water and wooded areas scattered throughout. All of the land uses in the area are compatible with adjoining areas of Remote Sprint Launch Site 2.

Remote Sprint Launch Site 2 Land Use

The general land use of the 15-hectare (36-acre) site is military, consisting of abandoned anti-missile launch silos located in the central portion of the site, launch support buildings in the southern portion, and sewage treatment ponds located on the eastern side of the site (U.S. Army Strategic Defense Command, 1991—Preliminary Building

Availability and Conditions Survey, SRMSC). A perimeter fence surrounds the facility. There is also a security fence around the sewage treatment ponds. See figure 3.9-10. The entire site is currently inactive, but is maintained under a caretaker status.

Table 3.9-4: Urban/Populated Areas within 30 Kilometers (19 Miles) of Remote Sprint Launch Site 2

Urban/Populated Area	Population	Occupied Housing Units	Distance[1] kilometers (miles)
Dresden	*	*	4 (3)
Easby	*	*	21 (13)
Hannah	59	25	23 (14)
Langdon	2,241	960	11 (7)
Loma	19	12	24 (15)
Maida	*	*	18 (11)
Mount Carmel	*	*	10 (6)
Olga	*	*	30 (19)
Osnabrock	198	72	29 (18)
Snowflake/Windygates	1,850[2]	620[2]	19 (12)
Vang	*	*	23 (14)
Wales	44	20	15 (9)

Source: U.S. Department of Commerce, 1998—U.S. Census Bureau; Statistics Canada, 1999—Welcome to Statistics Canada.

[1] Distance in air miles

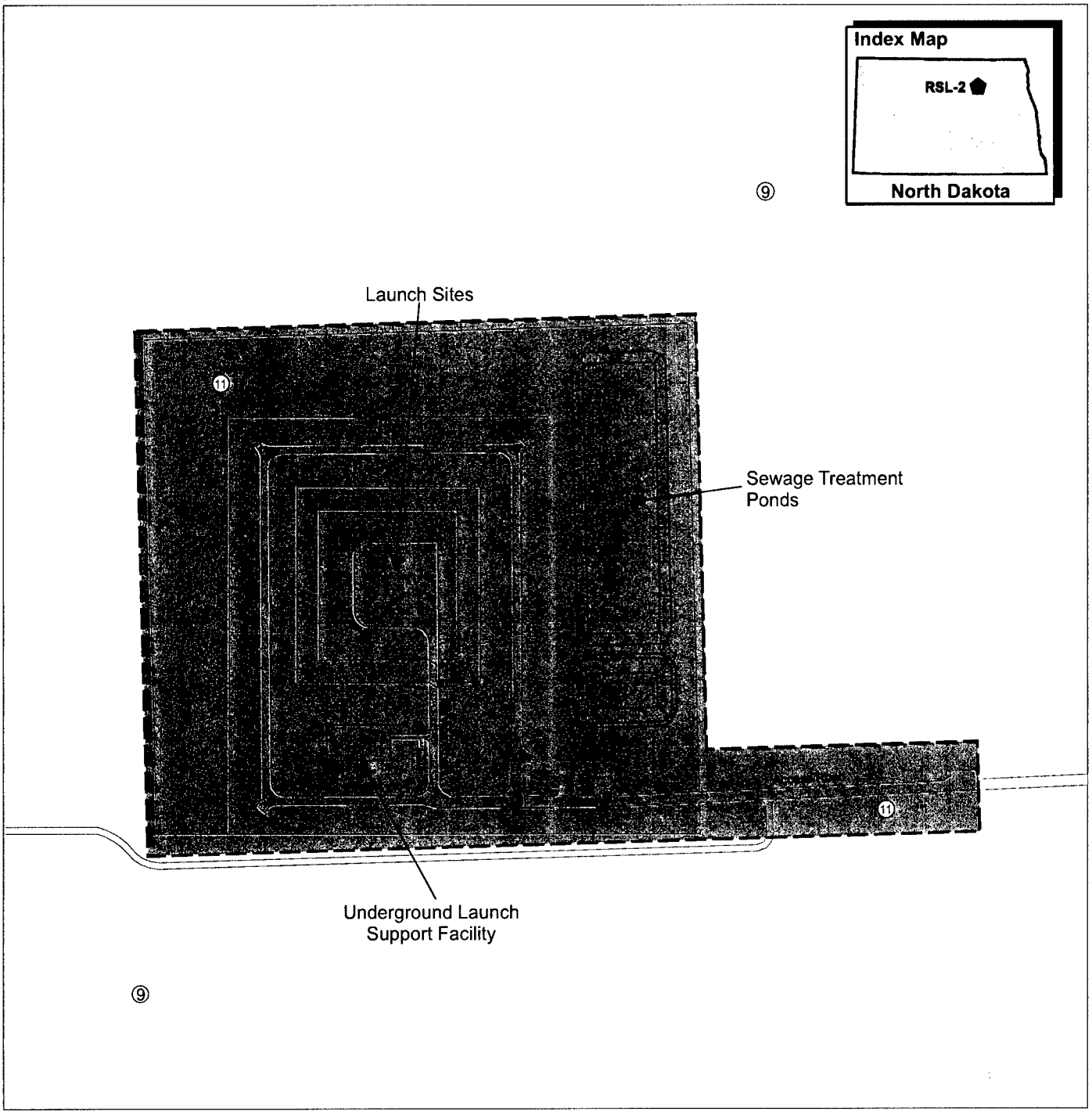
[2] Canadian towns that fall within the Pembina Municipality (County), which is the smallest breakdown of the Canadian Census

* Unincorporated communities, no population data available

Aesthetics

The ROI for aesthetics at Remote Sprint Launch Site 2 includes the general visual environment surrounding the site and the areas visible from offsite locations.

The visual environment is characterized by the open plains surrounding the site that are used for agriculture, and the agricultural land is the most significant feature of the natural environment. The topography of the land is relatively flat, with Remote Sprint Launch Site 2 being at about 489 meters (1,603 feet) above sea level. The most significant man-made features are the launch silos, launch support buildings, and the sewage treatment lagoons. Public access to the site is prohibited; therefore, views are limited to traffic on an unnamed county road that serves as the access road off of Highway 1 to the site and to adjacent land owners.



EXPLANATION

- ① Airfield*
- ② Aviation Support*
- ③ Industrial*
- ④ Institutional (Medical/Educational)*
- ⑤ Administrative*
- ⑥ Commercial*
- ⑦ Residential*
- ⑧ Recreation*
- ⑨ Agriculture
- ⑩ Open Space*
- ⑪ Military
- Roads
- Installation Boundary

*Standard land use designation not applicable to this figure

Scale 1:4,000

NORTH

0 167 333 Feet

0 51 101 Meters

Existing Land Use, Remote Sprint Launch Site 2

North Dakota

Figure 3.9-10

The site and the surrounding area have a low visual sensitivity because the flatness of the land does not provide for any prominent vistas.

3.9.2.6 Remote Sprint Launch Site 4—Land Use

This section describes the land uses and aesthetics for the affected base property at the SRMSC Remote Sprint Launch Site 4. The ROI for land use includes the base, adjacent off-base property potentially affected by construction and deployment of the XBR, and areas up to 30 kilometers (19 miles) from the site to include areas where certain sensitive electronics may be susceptible to temporary interference with use of the XBR. The ROI will include those land uses that may contain sensitive electronics such as residential, commercial, industrial, and institutional (such as medical and educational). The ROI for aesthetics includes the base and adjacent off-base properties within the viewshed.

Regional Land Use

Remote Sprint Launch Site 4 is located in Kinloss Township southwest of the town of Fairdale in Walsh County. The regional land use ROI includes the area within a 30-kilometer (19-mile) radius from Remote Sprint Launch Site 4.

Kinloss Township does not have any zoning ordinances; therefore, development in the area is reviewed by Walsh County and the Red River Regional Planning Council to ensure compliance with overall development guidelines. The Council is the planning and economic development authority for a four-county region that includes Grand Forks, Pembina, Walsh, and Nelson counties (Wangler, 1998—Personal communication). However, since Remote Sprint Launch Site 4 is a Federal property, it does not fall within the zoning and planning regulations of the Council or the county. As shown in table 3.9-5, the area is sparsely populated, with the closest inhabited structure being about 3.2 kilometers (2 miles) away in Fairdale. The small towns within the ROI generally contain residential, commercial, industrial, and institutional land uses that support the surrounding area. The remaining land outside these small towns is almost exclusively used for agricultural purposes, with the majority being used for cropland, with small bodies of water and wooded areas scattered throughout the area. All of the land uses in the area are compatible with adjoining areas of Remote Sprint Launch Site 4.

Remote Sprint Launch Site 4 Land Use

The general land use of the 20-hectare (50-acre) site is military, consisting of abandoned anti-missile launch silos located in the center of the site, launch support buildings located adjacent to the silos to the east, and a sewage treatment pond located at the southern portion of the site (U.S. Army Strategic Defense Command, 1991—Preliminary Building

Availability and Conditions Survey, SRMSC). The facility is surrounded by a perimeter fence. There is also a security fence around the sewage treatment ponds. See figure 3.9-11. The entire site is currently inactive, but is maintained in a caretaker status.

Table 3.9-5: Urban/Populated Areas within 30 Kilometers (19 Miles) of Remote Sprint Launch Site 4

Urban/Populated Area	Population	Occupied Housing Units	Distance[1] kilometers (miles)
Adams	225	121	15 (9)
Brocket	96	40	30 (19)
Derrick	*	*	23 (14)
Easby	*	*	26 (16)
Edinburg	292	127	30 (19)
Edmore	329	135	16 (10)
Fairdale	80	34	3 (2)
Lawton	63	30	21 (13)
Loma	19	12	27 (17)
Milton	141	62	23 (14)
Nekoma	61	30	15 (9)
Osnabrock	198	72	23 (14)
Union	*	*	24 (15)

Source: U.S. Department of Commerce, 1998—U.S. Census Bureau.

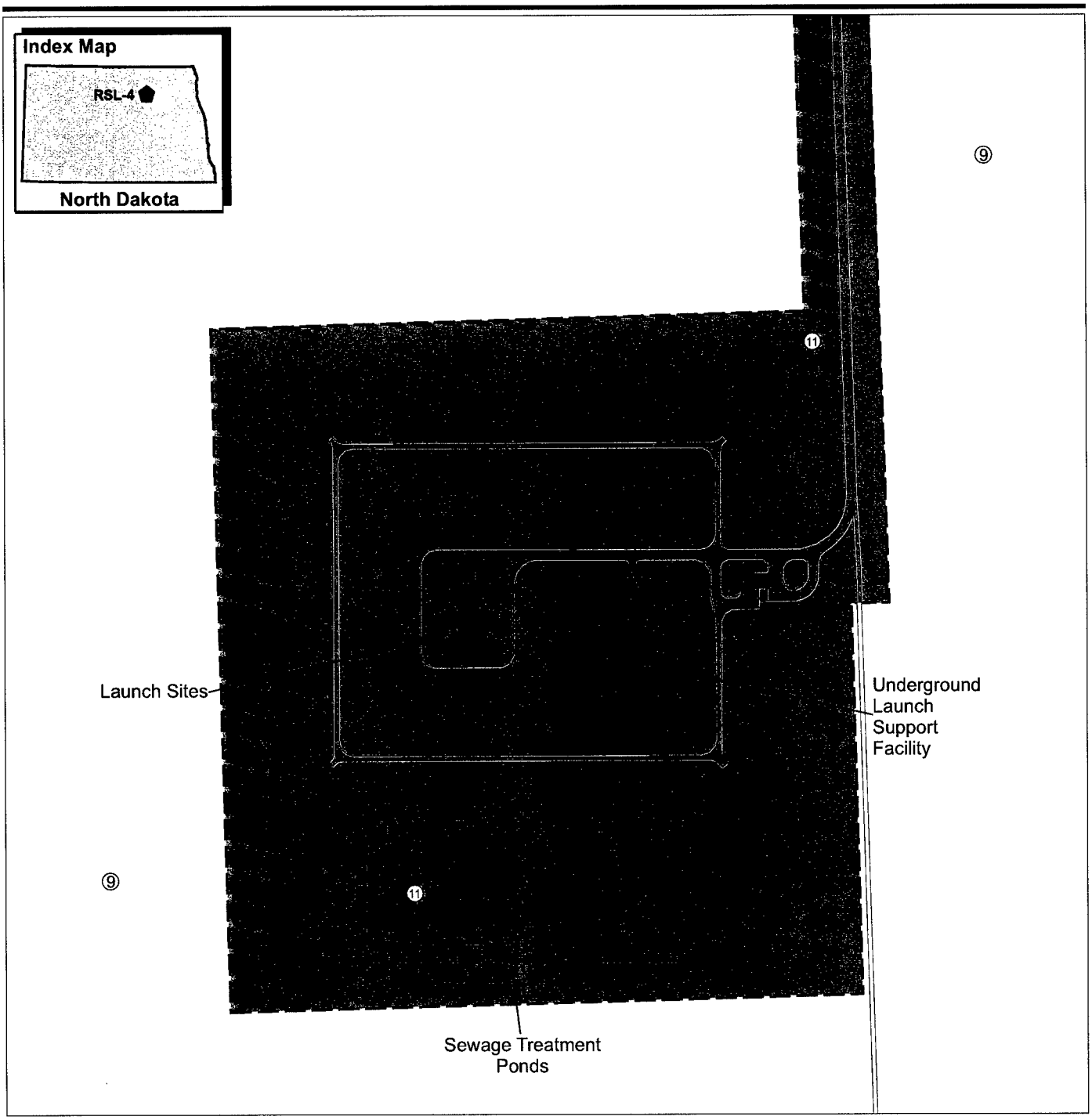
[1] Distance in air miles

* Unincorporated communities, no population data available

Aesthetics

The ROI for aesthetics at Remote Sprint Launch Site 4 includes the general visual environment surrounding the site and the areas visible from offsite locations.

The visual environment is characterized by the open plains surrounding the site that are used for agriculture. The agricultural land is the most significant feature of the natural environment. The topography of the land is relatively flat, with Remote Sprint Launch Site 4 being at about 489 meters (1,603 feet) above sea level. The most significant man-made features are the launch silos, launch support buildings, and the sewage treatment lagoons. Public access to the site is prohibited; therefore, views are limited to traffic on CR 22 to the east and CR 9 to the north and to adjacent land owners. The site and the surrounding area have a low visual sensitivity because the flatness of the land does not provide for any prominent vistas.



EXPLANATION

- ① Airfield*
- ② Aviation Support*
- ③ Industrial*
- ④ Institutional (Medical/Educational)*
- ⑤ Administrative*
- ⑥ Commercial*
- ⑦ Residential*
- ⑧ Recreation*
- ⑨ Agriculture
- ⑩ Open Space*
- ⑪ Military
- Roads
- Installation Boundary

*Standard land use designation not applicable to this figure

Scale 1:3,500

NORTH

0 146 292 Feet

0 45 89 Meters

Existing Land Use, Remote Sprint Launch Site 4

North Dakota

Figure 3.9-11

3.10 NOISE

Noise is usually described as unwanted sound. Characteristics of sound include amplitude, frequency, and duration. Sound can vary over an extremely large range of amplitudes. The decibel (dB) is the accepted standard unit for the measure of the amplitude of sound because it accounts for the large variations in amplitude and reflects the way people perceive changes in sound amplitude. Sound pressure levels (SPL) are easily measured, but the variability is subjective, and physical response to sound complicates the analysis of its impact on people. People judge the relative magnitude of sound sensation by subjective terms such as "loudness" or "noisiness." Table 3.10-1 presents the perceived change in loudness due to changes in SPL.

Table 3.10-1: Perceived Changes in Loudness due to Changes in Sound Pressure Level

Change in Sound Pressure Level (decibels)	Perceived Loudness
3	Just noticeable
5	Clearly noticeable
10	Doubling or halving

Source: Cowan, 1994—Handbook of Environmental Acoustics.

Sound also varies with frequency or pitch. When describing sound and its effect on a human population, A-weighted sound levels, measured in A-weighted decibels (dBA), are typically used to account for the response of the human ear. The term "A-weighted" refers to a filtering of the sound signal to emphasize frequencies in the middle of the audible spectrum and to de-emphasize low and high frequencies in a manner corresponding to the way the human ear perceives sound. The ANSI (1983) has established this filtering network. The A-weighted noise level has been found to correlate well with people's judgments of noisiness of different sounds and has been used for many years as a measure of community noise. Typical A-weighted SPLs for some common noise sources are given in table 3.10-2.

Noise is usually defined as sound that is undesirable because it interferes with speech communication and hearing, is intense enough to damage hearing, or is otherwise annoying. Noise levels often change with time; therefore, to compare levels over different time periods, several descriptors have been developed that take into account this time-varying nature. These descriptors are used to assess and correlate the various effects of noise on humans and animals, including land-use compatibility, sleep interference, annoyance, hearing loss, speech interference, and startle effects.

Table 3.10-2: Noise Levels of Common Sources

Source	Noise Level (in A-weighted decibels)	Comment
Air raid siren	120	At 15.2 meters (50 feet) (threshold of pain)
Rock concerts	110	
Airplane, 747	102.5	At 304.8 meters (1,000 feet)
Jackhammer	96	At 3.0 meters (10 feet)
Power lawn mower	96	At 0.9 meters (3 feet)
Football game	88	Crowd size: 65,000
Freight train at full speed	88 to 85	At 9 meters (30 feet)
Portable hair dryer	86 to 77	At 0.3 meters (1 foot)
Vacuum cleaner	85 to 78	At 1.5 meters (5 feet)
Long range airplane	80 to 70	Inside
Conversation	60	
Typical suburban background	50	
Bird calls	44	
Quiet urban nighttime	42	
Quiet suburban nighttime	36	
Library	34	
Bedroom at night	30	
Audiometric (hearing testing) booth	10	Threshold of hearing without hearing loss

Source: Cowan, 1994—Handbook of Environmental Acoustics.

The primary environmental noise descriptor used in environmental noise assessments is the A-weighted Day-Night Equivalent Sound Level (which is abbreviated DNL and symbolized as L_{dn}). The DNL was developed to evaluate the total daily community noise environment. The DNL is the average A-weighted acoustical energy during a 24-hour period, with 10 dBA added to all signals recorded within the hours of 10:00 p.m. and 7:00 a.m. This 10 dBA is a penalty that accounts for the extra sensitivity people have to noise during typical sleeping hours.

Almost all Federal agencies having non-occupational noise regulations use DNL as their principal noise descriptor for community assessments. These agencies include the FAA, the Federal Transit Administration, the U.S. EPA, the Department of Housing and Urban Development, the Department of Veterans Affairs, and the DOD. In addition, ANSI standards S12.9-1988, *American National Standard Quantities and Procedures for Description and Measurement of Environmental Sounds*, Part 1 (1988), and S12.40-1990, *American National Standard Sound Level Descriptors for Determination of Compatible Land Use* (1990), both

identify DNL as the descriptor of choice for long-term environmental assessment measurements.

The Federal Interagency Committee on Urban Noise developed land-use compatibility guidelines for noise in terms of DNL (U.S. Department of Commerce, 1980—Guidelines for Considering Noise in Land Use Planning and Control). Table 3.10-3 provides the U.S. Army's DNL ranges for compatibility with noise sensitive land uses.

Table 3.10-3: Land Use Compatibility for Noise

Noise Zone	Compatibility with Noise Sensitive Land Uses	Percent of Population Highly Annoyed	A-weighted Day-Night Sound Level (DNL)
I	Acceptable	Less than 15	Less than 65 dBA
II	Normally unacceptable	15 to 39	65 to 75 dBA
III	Unacceptable	More than 39	Greater than 75 dBA

Source: U.S. Department of the Army, 1990—Environmental Quality, Environmental Protection and Enhancement.

Other common environmental noise descriptors that are sometimes used to supplement the DNL in environmental noise assessments are the Continuous Equivalent Sound Level (L_{eq}), the Maximum Instantaneous SPL (L_{max}), and the Sound Exposure Level (SEL).

The L_{eq} is the continuous equivalent sound level, defined as the single SPL that, if constant over the stated measurement period, would contain the same sound energy as the actual monitored sound that is fluctuating in level over the measurement period. The L_{eq} must have a designated time period; for example, an L_{eq} for 30 minutes would be denoted as $L_{eq(30\ min)}$.

The L_{max} is simply the highest SPL measured during a noise event.

The total energy of a single discrete event, such as an aircraft flyover or train passby, is represented by the SEL. The SEL is based on A-weighted sound levels that compress the total energy for the event into a 1-second time duration. Since most discrete events occur for longer than 1 second, the SEL will be higher than values associated with any other rating method (including L_{max}) for a specific event. The SEL is the noise descriptor most commonly used to assess sleep disturbance.

The Federal Highway Administration has established criteria for characterizing motor vehicle noise on roads constructed with Federal funds. Because they represent established criteria for analyzing traffic noise levels, they will be used in analyzing baseline conditions. Based on these criteria (see table 3.10-4), an exterior $L_{eq(1\ hour)}$ of 67 dBA is the standard typically used to evaluate outdoor noise levels along roadways,

and, therefore, this value will be used to characterize noise levels along roadways adjacent to and in the areas surrounding proposed NMD activities.

Table 3.10-4: Federal Highway Administration Noise Abatement Criteria

Activity Category	$L_{eq(1\ hour)}$ (dBA)	Area Description
A	57 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose (Such areas could include amphitheaters, particular parts or portions of parks, open spaces, or historic districts which are dedicated or recognized by appropriate local officials for activities requiring special qualities or serenity and quiet)
B	67 (exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals
C	72 (exterior)	Developed lands, properties, or activities not included in categories A or B
D	---	Undeveloped lands (For requirements on undeveloped lands see paragraphs 11a and c of Federal Aid Highway Program Manual, Volume 7, Chapter 7, Section 3)
E	52 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums

Source: 23 CFR Part 772.

Note: dBA = decibel A-weighted, L_{eq} = equivalent sound level

Under OSHA regulations (29 CFR 1910.95), which are designed to ensure safe and healthy working conditions, workers exposed to 8-hour time-weighted average SPLs of 85 dBA and 90 dBA are required to be monitored and to be provided with hearing protection, respectively. While this standard is for workers, it is used as a reasonable guidance in assessing the potential impact to people in general.

The ROI for noise includes those areas potentially affected by proposed NMD activities that might experience DNLs greater than or equal to 65 dBA, those areas potentially affected by proposed NMD activities that potentially might experience short-term noise events (of less than 8 hours) with noise levels greater than or equal to 85 dBA, and those areas along roadways potentially affected by proposed NMD activities that potentially might experience a $L_{eq(1\ hour)}$ greater than or equal to 67 dBA.

3.10.1 ALASKA INSTALLATIONS

3.10.1.1 Clear AFS—Noise

The area surrounding Clear AFS is sparsely populated and, thus, would be expected to have a background noise level of DNL less than or equal to 55 dBA (see table 3.10-5). Furthermore, no major sources of noise are known to exist around the NMD site at Clear AFS (EDAW, Inc., 1998—Trip report of visit to Alaska, July 20–31), thus traffic is expected to be the main source of noise at Clear AFS and vicinity.

Table 3.10-5: Noise Levels Expected in Various Areas

Customary Qualitative Description of the Area	Typical Range of Background Noise Levels (Day-Night Level in dBA)	Average Background Noise Level (Day-Night Level in dBA)	Average Census Tract Population Density (Number of People Per Square Mile)
Quiet Suburban Residential	48—52	50	630
Normal Suburban Residential	53—57	21	2,000
Urban Residential	58—62	28	6,300
Noisy Urban Residential	63—67	65	20,000
Very Noisy Urban Residential	68—72	70	63,000

Source: U.S. EPA, 1974—Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety.

Note: dBA = decibel A-weighted, L_{eq} = equivalent sound level

The main highway in the vicinity of Clear AFS is the George Parks Highway. The summer average daily traffic count for the George Parks Highway in the vicinity of Clear AFS is 2,011 (Alaska Department of Transportation and Public Facilities, 1997—Annual Traffic Volume Report). Traffic noise levels of $L_{eq(1\ hour)}$ equals 72 dBA, $L_{eq(1\ hour)}$ equals 67 dBA, and $L_{eq(1\ hour)}$ equals 57 dBA are estimated to occur at approximately 14 meters (46 feet), 31 meters (101 feet), and 143 meters (469 feet) from the highway, respectively. For the purpose of analysis, the speed of the traffic was assumed to be 105 kilometers (65 miles) per hour.

No noise sensitive receptors are known to exist in the vicinity of the NMD site at Clear AFS (EDAW, Inc., 1998—Trip Report of visit to Alaska, July 20–31).

3.10.1.2 Eareckson AS—Noise

Eareckson AS is located on Shemya Island, which has no population other than personnel associated with the air station, and based on table 3.10-5, would be expected to have a background noise level of DNL less than or equal to 55 dBA.

Shemya Island is very quiet due to the prevailing winds, and aircraft noise is only heard when standing next to the airfield (EDAW, Inc., 1998—Trip Report of visit to Shemya, Alaska, April 24–May 1).

The closest civilian community is Atka, which is approximately 604 kilometers (375 miles) from Shemya Island.

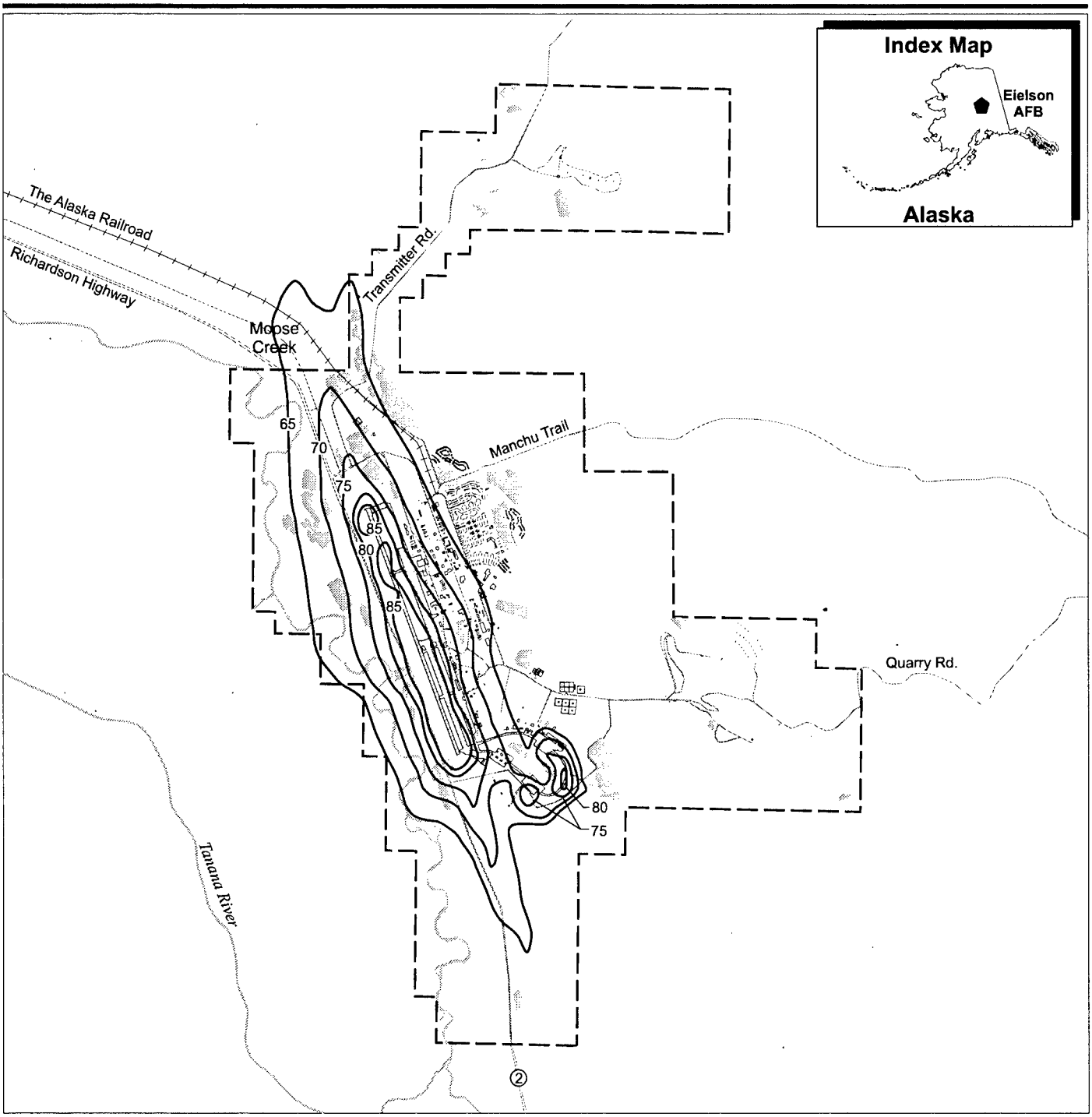
3.10.1.3 Eielson AFB—Noise

The area surrounding Eielson AFB is sparsely populated, and thus, based on table 3.10-5, would be expected to have a background noise level of DNL less than or equal to 55 dBA.

Aircraft noise at Eielson AFB occurs during aircraft engine warm-up, maintenance and testing, taxiing, takeoffs, approaches, and landings. Noise contours for aircraft operations were modeled for the *Eielson AFB Air Installation Compatible Use Zone (AICUZ) Study* (U.S. Department of the Air Force, 1992) and updated in 1996 (Eielson AFB, 1998—Integrated Natural Resources Management Plan).

As shown in figure 3.10-1, the contour with a DNL value of 65 dBA was estimated to occur outside the base boundaries on land off the northern end of Runway 31. The community of Moose Creek, which has low density housing, does fall within this contour. The highest DNLs occur on the runway and taxiways and were measured at 85 dBA. The loudest noise contours were estimated to have a DNL value of 85 dBA and to surround the majority of the airfield's primary surface. (Eielson AFB, 1998—Integrated Natural Resources Management Plan)

The main highway in the vicinity of Eielson AFB is the Richardson Highway. The Richardson Highway, a four-lane divided highway, provides access to the base through the Hursey Gate. This gate is the only operational gate at Eielson allowing access to and from the installation (Pacific Air Forces, 1998—Draft General Plan, Eielson AFB). The summer average daily traffic count for the Richardson Highway in the vicinity of the base is 10,461 (Alaska Department of Transportation and Public Facilities, 1997—Annual Traffic Volume Report). Assuming an even division of the traffic (i.e., 5,230 on each side of the divided highway), traffic noise levels of $L_{eq(1\ hour)}$ equals 72 dBA, $L_{eq(1\ hour)}$ equals 67 dBA, and $L_{eq(1\ hour)}$ equals 57 dBA are estimated to occur at approximately



EXPLANATION

- Roads
- Water Area
- Railroads
- Installation Boundary
- Noise Contour: Day Night Level (decibel A-weighted)

Scale

0 .8 1.6 Miles

0 1.25 2.5 Kilometers

NORTH

Noise Zones, Eielson Air Force Base

Alaska

Figure 3.10-1

15 meters (49 feet), 32 meters (105 feet), and 150 meters (492 feet) from the highway, respectively. For the purpose of analysis, the traffic speed was assumed to be 89 kilometers (55 miles) per hour.

Other than the community of Moose Creek, no noise sensitive receptors are known to exist in the vicinity of Eielson AFB.

3.10.1.4 Fort Greely—Noise

The area surrounding Fort Greely is sparsely populated, and thus, based on table 3.10-5, would be expected to have a background noise level of DNL less than or equal to 55 dBA. However, under certain conditions, a low level droning noise from a nearby Alaska pipeline pumping station can be heard (EDAW, Inc., 1998—Trip Report of visit to Alaska, July 20–31). This noise comes from the pumping stations' jet turbine engines and was estimated to be approximately 55 dBA.

The principal sources of noise at Fort Greely are vehicular traffic and military activities, including aircraft overflight and firing of large and small caliber weapons. Frequency and duration of noise from military activities varies as a factor of the irregular training schedules. (U.S. Department of the Army, 1997—EA, Construct Munitions Storage Facility, Cold Regions Test Center, Bolio Lake, Fort Greely, Alaska)

While intermittent, noise from military activity at Fort Greely can be fairly loud. Some representative examples include weapons testing, helicopters, and maintenance equipment. Noise from weapons testing typically ranges from 112 to 190 dBA. The noise levels on the ground from a helicopter at 460 meters (1,500 feet) and 76 meters (250 feet) of altitude are 79 dBA and 95 dBA, respectively. Maintenance equipment, such as the tracked vehicles used for trail maintenance, can generate noise levels up to 105 dBA. (U.S. Department of the Army, 1980—Final EIS Concerning Proposed Land Withdrawal for the 172nd Infantry Brigade (Alaska) at Fort Greely)

The main highways in the vicinity of Fort Greely are the Richardson Highway and the Alaska Highway. Estimated traffic noise levels for these two segments of highway are shown in table 3.10-6.

No noise sensitive receptors are known to exist in the vicinity of Fort Greely.

3.10.1.5 Yukon Training Area (Fort Wainwright)—Noise

The area surrounding the Yukon Training Area is sparsely populated, and thus, based on table 3.10-5, would be expected to have a background noise level of DNL less than or equal to 55 dBA.

Table 3.10-6: Estimated Traffic Noise Levels for the Fort Greely Area[1]

Segment of Highway	Average Annual Daily Traffic Count[2]	Distance at which $L_{eq(1\ hour)}$ = 72 dBA occurs in meters (feet)	Distance at which $L_{eq(1\ hour)}$ = 67 dBA occurs in meters (feet)	Distance at which $L_{eq(1\ hour)}$ = 57 dBA occurs in meters (feet)
Richardson Highway in the vicinity of Fort Greely	1,750	9 (29)	19 (62)	87 (284)
Alaska Highway at the Richardson Highway Junction	3,350	10 (33)	22 (72)	101 (334)

[1] Based on the methodology of the U.S. Federal Highway Administration (1978) and assuming a traffic speed of 89 kilometers (55 miles) per hour for the Richardson Highway, 72 kilometers (45 miles) per hour for the Alaska Highway.

[2] Alaska Department of Transportation and Public Facilities, 1997—Annual Traffic Volume Report.

Note: dBA = decibel A-weighted, L_{eq} = equivalent sound level

Sources of noise in the Yukon Training Area include subsonic overflights of aircraft (U.S. Department of the Air Force, 1995—Final EIS, Alaska Military Operations Areas). Noise from intermittent ground-based military activities, similar to those described in section 3.10.1.4 for Fort Greely, is also expected to occur. However, while the Yukon Training Area is expected to experience intermittent loud noises from both airborne and ground-based military activities, it is expected to have an average background noise of DNL less than 55 dBA (U.S. Department of the Air Force, 1995—Final EIS, Alaska Military Operations Areas).

The main highway in the vicinity of the Yukon Training Area is the Richardson Highway. Traffic noise from the Richardson Highway is discussed above in association with Eielson AFB in section 3.10.1.3.

No noise sensitive receptors are known to exist in the vicinity of the Yukon Training Area (EDAW, Inc., 1998—Trip Report of visit to Alaska, July 20–31).

3.10.2 NORTH DAKOTA INSTALLATIONS

3.10.2.1 Cavalier AFS—Noise

The area surrounding Cavalier AFS is sparsely populated and thus, based on table 3.10-5, would be expected to have a background noise level of DNL less than or equal to 55 dBA. Furthermore, no major sources of noise are known to exist on Cavalier AFS (EDAW, Inc., 1998—Trip Report of visit to North Dakota, June 16–18); thus, traffic is expected to be the main source of noise at Cavalier AFS and vicinity.

The main highways in the vicinity of Cavalier AFS are State Highways ND 5 and 32 and County Road 89. Estimated traffic noise levels for these three segments of highway are shown in table 3.10-7. The areas near Cavalier AFS with the highest traffic volumes are the cities of Cavalier, Walhalla, and Langdon. Table 3.10-8 shows the estimated traffic noise levels for the main road segments in these cities.

Table 3.10-7: Estimated Traffic Noise Levels for the Cavalier AFS Area[1]

Segment of Highway	Average Annual Daily Traffic Count [2]	Distance at which $L_{eq(1\ hour)}$ = 72 dBA occurs in meters (feet)	Distance at which $L_{eq(1\ hour)}$ = 67 dBA occurs in meters (feet)	Distance at which $L_{eq(1\ hour)}$ = 57 dBA occurs in meters (feet)
ND 5 in the vicinity of Cavalier AFS	1,000	5 (16)	11 (36)	50 (164)
ND 32 in the vicinity of Cavalier AFS	550	3 (10)	7 (23)	33 (108)
CR 89 at the ND 5 junction	300	2 (6)	4 (13)	17 (56)

[1] Based on the methodology of the U.S. Federal Highway Administration (1978) and assuming a traffic speed of 105 kilometer (65 miles) per hour for ND 5 and ND 32, a traffic speed of 89 kilometers (55 miles) per hour for CR 89.
[2] North Dakota Department of Transportation, 1996—Traffic Volume Map, Pembina County.
Note: dBA = decibel A-weighted, L_{eq} = equivalent sound level

Table 3.10-8: Estimated Traffic Noise Levels for Cities Near Cavalier AFS[1]

Segment of Highway	Average Annual Daily Traffic Count[2]	Distance at which $L_{eq(1\ hour)}$ = 72 dBA occurs in meters (feet)	Distance at which $L_{eq(1\ hour)}$ = 67 dBA occurs in meters (feet)	Distance at which $L_{eq(1\ hour)}$ = 57 dBA occurs in meters (feet)
ND 5 in the city of Cavalier	3,500	7 (23)	15 (49)	70 (230)
ND 32 in the city of Walhalla	1,400	4 (13)	8 (26)	38 (125)
ND 5 in the city of Langdon	1,325	4 (13)	8 (26)	37 (121)

[1] Based on the methodology of the U.S. Federal Highway Administration (1978) and assuming a traffic speed of 72 kilometers per hour (45 miles per hour).
[2] North Dakota Department of Transportation, 1996—Traffic Volume Map, Pembina County.
Note: dBA = decibel A-weighted, L_{eq} = equivalent sound level

The only noise sensitive receptor noted in the vicinity of the Cavalier AFS within 305 meters (1,000 feet) is a farmhouse approximately 90 meters (300 feet) from the western edge of the site.

3.10.2.2 Grand Forks AFB—Noise

The area surrounding Grand Forks AFB has a population density representative of a lightly populated rural area, and thus, based on table 3.10-5, would be expected to have a background noise level of DNL less than or equal to 55 dBA.

Aircraft noise at Grand Forks AFB occurs during aircraft engine warm-up, maintenance and testing, taxiing, takeoffs, approaches, and landings. Noise contours for aircraft operations were modeled for the *Air Installation Compatible Use Zone (AICUZ) Study* (U.S. Air Force, 1995) for Grand Forks AFB. As can be seen from figure 3.10-2, contours with DNL values of both 65 and 70 dBA were estimated to occur outside the base boundaries on land northwest of the base. The DNL equals 65 dBA contour was also estimated to extent very slightly off the southern end of the base. As the land use in these areas was designated as "Open/Agricultural/Low Density," the study did not conclude that there were any land use incompatibility due to the estimated aircraft noise. The loudest on-base noise contours were estimated to have a DNL value of 89 dBA and to occur at the southern end of the runway. (U.S. Air Force, 1995—AICUZ Study, Grand Forks AFB)

The main highways in the vicinity of Grand Forks AFB are U.S. Highway 2 and County Road 3B. Estimated traffic noise levels for segments of these highways are shown in table 3.10-9.

Table 3.10-9: Estimated Traffic Noise Levels for the Grand Forks AFB Area[1]

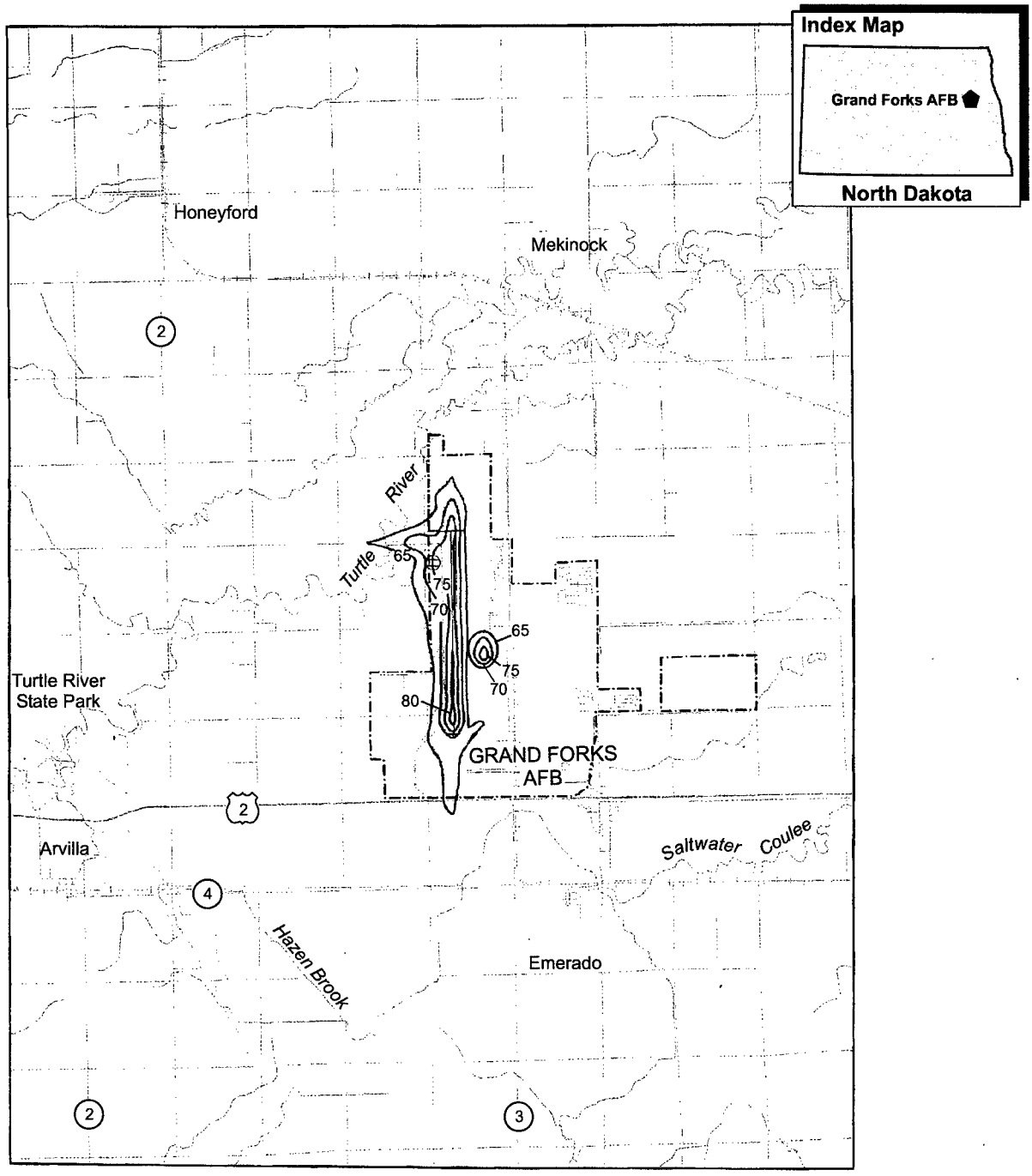
Segment of Highway	Average Annual Daily Traffic Count[2]	Distance at which $L_{eq(1\ hour)}$ = 72 dBA occurs in meters (feet)	Distance at which $L_{eq(1\ hour)}$ = 67 dBA occurs in meters (feet)	Distance at which $L_{eq(1\ hour)}$ = 57 dBA occurs in meters (feet)
CR 3B in the vicinity of Grand Forks AFB main gate	7,000	15 (49)	31 (102)	145 (478)
U.S. 2 in the vicinity of Grand Forks AFB main gate[3]	10,500	16 (52)	34 (112)	158 (518)
U.S. 2 in the vicinity of Grand Forks AFB secondary gate[3]	5,900	11 (35)	23 (76)	108 (353)

[1] Based on the methodology of the U.S. Federal Highway Administration (1978) and assuming a traffic speed of 105 kilometer (65 miles) per hour for U.S. 2, 89 kilometers (55 miles) per hour for CR 3B.

[2] North Dakota Department of Transportation, 1996—Traffic Volume Map, Grand Forks County.

[3] Traffic assumed divided evenly for divided highway, U.S. 2.

Note: dBA = decibel A-weighted, L_{eq} = equivalent sound level



EXPLANATION

—·—·— Installation Boundary

——— Noise Contour: Day-Night Equivalent Sound Level (A-weighted decibel)

Noise Zones, Grand Forks Air Force Base

North Dakota

Scale
0 .95 1.9 Miles
0 1.5 3 Kilometers
NORTH

Figure 3.10-2

ns_gfafb_aicuz

A house is located approximately 0.5 kilometer (0.3 mile) west of the base's southwest boundary (U.S. Geological Survey, 1963—Arvilla Quadrangle, North Dakota). Two churches and a portion of Emerado incorporated land is located within approximately 0.5 kilometer (0.3 mile) of the base's southeast corner (U.S. Geological Survey, 1979—Emerado Quadrangle, North Dakota). No other specific noise sensitive receptors have been noted within approximately 0.8 kilometer (0.5 mile) of the base. Beyond this, there is a small trailer park southeast of the base and the community of Emerado south of the base.

3.10.2.3 Missile Site Radar—Noise

The area surrounding the Missile Site Radar is sparsely populated, and, based on table 3.10-5, would be expected to have a background noise level of DNL less than or equal to 55 dBA.

The main highways in the vicinity of Missile Site Radar are State Highways ND 1 and 66 and County Road 26. Estimated traffic noise levels for these segments of highway are shown in table 3.10-10.

Table 3.10-10: Estimated Traffic Noise Levels for the Missile Site Radar Area [1]

Segment of Highway	Average Annual Daily Traffic Count[2]	Distance at which $L_{eq(1\ hour)}$ = 72 dBA occurs in meters (feet)	Distance at which $L_{eq(1\ hour)}$ = 67 dBA occurs in meters (feet)	Distance at which $L_{eq(1\ hour)}$ = 57 dBA occurs in meters (feet)
ND 1 in the vicinity of Missile Site Radar	600	4 (12)	8 (26)	35 (115)
ND 66 in the vicinity of Missile Site Radar	280	2 (7)	5 (16)	21 (69)
CR 26 in the vicinity of Missile Site Radar	180	1 (4)	3 (10)	13 (43)

[1] Based on the methodology of the U.S. Federal Highway Administration (1978) and assuming a traffic speed of 105 kilometers (65 miles) per hour for ND 1 and ND 66, 89 kilometers (55 miles) per hour for CR 26.

[2] North Dakota Department of Transportation, 1996—Traffic Volume Map, Cavalier County.

dBA = decibel A-weighted, L_{eq} = equivalent sound level

The Missile Site Radar is located approximately 0.8 kilometer (0.5 mile) north of Nekoma. The closest residential units to the site are two residences within approximately 305 meters (1,000 feet) of the western side of the site.

3.10.2.4 Remote Sprint Launch Site 1—Noise

The area surrounding Remote Sprint Launch Site 1 is sparsely populated, and, based on table 3.10-5, would be expected to have a background noise level of DNL less than or equal to 55 dBA.

The main highways in the vicinity of Remote Sprint Launch Site 1 are State Highway ND 1 and County Roads 3 and 32. Estimated traffic noise levels for these segments of highway are shown in table 3.10-11.

Table 3.10-11: Estimated Traffic Noise Levels for the Remote Sprint Launch Site 1 Area[1]

Segment of Highway	Average Annual Daily Traffic Count[2]	Distance at which $L_{eq(1\ hour)}$ = 72 dBA occurs in meters (feet)	Distance at which $L_{eq(1\ hour)}$ = 67 dBA occurs in meters (feet)	Distance at which $L_{eq(1\ hour)}$ = 57 dBA occurs in meters (feet)
ND 1 in the vicinity of Remote Sprint Launch Site 1	510	3 (10)	7 (23)	32 (105)
CR 3 in the vicinity of Remote Sprint Launch Site 1	280	2 (7)	4 (13)	17 (56)
CR 32 in the vicinity of Remote Sprint Launch Site 1	65	1 (3)	1 (3)	7 (23)

[1] Based on the methodology of the U.S. Federal Highway Administration (1978) and assuming a traffic speed of 105 kilometers (65 miles) per hour for ND 1, a traffic speed of 89 kilometers (55 miles) per hour for CRs 3 and 32.

[2] North Dakota Department of Transportation, 1996—Traffic Volume Map, Ramsey County.

Note: dBA = decibel A-weighted, L_{eq} = equivalent sound level

The closest noise sensitive receptor to the site is a residential unit approximately 1.6 to 2.4 kilometers (1 to 1.5 miles) northeast of the site.

3.10.2.5 Remote Sprint Launch Site 2—Noise

The area surrounding Remote Sprint Launch Site 2 is sparsely populated, and based on table 3.10-5, would be expected to have a background noise level of DNL less than or equal to 55 dBA.

The main highways in the vicinity of Remote Sprint Launch Site 2 are State Highway ND 1 and County Road 55. Estimated traffic noise levels for these segments of highway are shown in table 3.10-12.

The closest noise sensitive receptor to the site is a residential unit approximately 1 kilometer (0.7 mile) east of the site.

Table 3.10-12: Estimated Traffic Noise Levels for the Remote Sprint Launch Site 2 Area[1]

Segment of Highway	Average Annual Daily Traffic Count[2]	Distance at which $L_{eq(1\ hour)}$ = 72 dBA occurs in meters (feet)	Distance at which $L_{eq(1\ hour)}$ = 67 dBA occurs in meters (feet)	Distance at which $L_{eq(1\ hour)}$ = 57 dBA occurs in meters (feet)
ND 1 in the vicinity of Remote Sprint Launch Site 2	575	4 (13)	7 (23)	34 (112)
CR 55 in the vicinity of Remote Sprint Launch Site 2	150	1 (3)	3 (10)	11 (36)

[1]Based on the methodology of the U.S. Federal Highway Administration (1978) and assuming a traffic speed of 105 kilometers (65 miles) per hour for ND 1, a traffic speed of 89 kilometers (55 miles) per hour for CR 55.

[2] North Dakota Department of Transportation, 1996—Traffic Volume Map, Cavalier County.

Note: dBA = decibel A-weighted, L_{eq} = equivalent sound level

3.10.2.6 Remote Sprint Launch Site 4—Noise

The area surrounding Remote Sprint Launch Site 4 is sparsely populated, and, based on table 3.10-5, would be expected to have a background noise level of DNL less than or equal to 55 dBA.

The main highways in the vicinity of Remote Sprint Launch Site 4 are State Highways ND 1 and 17 and County Roads 9 and 22. Estimated traffic noise levels for these segments of highway are shown in table 3.10-13.

Fairdale, approximately 3 kilometers (2 miles) from the site, is the location with the closest noise sensitive receptors.

Table 3.10-13: Estimated Traffic Noise Levels for the Remote Sprint Launch Site 4 Area[1]

Segment of Highway	Average Annual Daily Traffic Count[2]	Distance at which $L_{eq(1\ hour)}$ = 72 dBA occurs in meters (feet)	Distance at which $L_{eq(1\ hour)}$ = 67 dBA occurs in meters (feet)	Distance at which $L_{eq(1\ hour)}$ = 57 dBA occurs in meters (feet)
ND 1 in the vicinity of Remote Sprint Launch Site 4	490	3 (10)	7 (23)	31 (102)
ND 17 in the vicinity of Remote Sprint Launch Site 4	450	3 (10)	6 (20)	30 (98)
CR 9 in the vicinity of Remote Sprint Launch Site 4	170	1 (3)	3 (10)	12 (39)
CR 22 in the vicinity of Remote Sprint Launch Site 4	200	1 (3)	3 (10)	13 (43)

[1] Based on the methodology of the U.S. Federal Highway Administration (1978) and assuming a traffic speed of 105 kilometers (65 miles) per hour for NDs 1 and 7, a traffic speed of 89 kilometers (55 miles) per hour for CRs 9 and 22.
[2] North Dakota Department of Transportation, 1996—Traffic Volume Maps, Walsh and Ramsey Counties.
Note: dBA = decibel A-weighted, L_{eq} = equivalent sound level

3.11 SOCIOECONOMICS

Socioeconomics describes a community by examining its social and economic characteristics. Several demographic variables are analyzed in order to characterize the community, including population size, the means and amount of employment, and income creation. In addition, socioeconomics analyzes the fiscal condition of local government and the allocation of the assets of the community, such as its schools, housing, public services, and healthcare facilities.

3.11.1 ALASKA INSTALLATIONS

3.11.1.1 Clear AFS—Socioeconomics

Clear AFS is in Denali Borough in Interior Alaska. It is within the city boundary of Anderson, an Alaskan 2nd Class City, 126 kilometers (78 miles) southwest of Fairbanks and 459 kilometers (285 miles) north of Anchorage. The Air Force Station was founded in 1961 as a ballistic early warning site a year before Anderson was incorporated.

Clear AFS is in a sparsely populated region that, until the late 1960s, had a rudimentary road network. Over 90 percent of the residents of Anderson are employed by Clear AFS or other Federal and state entities. For the purposes of this analysis the economic ROI is considered to coincide mainly with the Denali Borough boundary within which several small centers of population exist. These include Anderson, Cantwell, Ferry, Healy, Lignite, and McKinley Park. In addition, the ROI includes Nenana, which is outside the Denali Borough, but which is close enough to Clear AFS to merit inclusion.

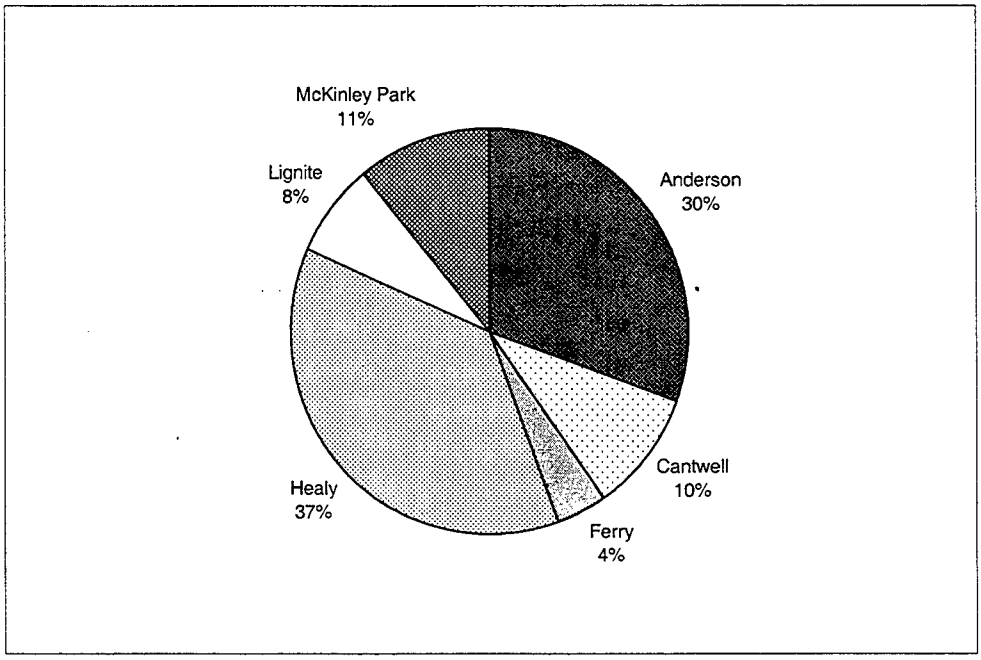
Population

Denali Borough was incorporated in 1990, when the U.S. Census of that year counted 1,764 residents. The certified 1997 population estimate for the borough shows an increase of 5.6 percent to 1,864 people. The population of Alaska grew by 10.7 percent during the same period.

An increasing proportion of the borough's citizens live within the six communities listed above; 88 percent in 1990, growing to 92 percent in 1997. Over two-thirds live in the cities of Anderson and Healy. Figure 3.11-1 illustrates the distribution of the 1997 population among the six communities that compose Denali Borough.

While Healy grew by 154 people between 1990 and 1997, Anderson lost 69 residents. Nenana grew from a population of 393 in 1990 to 435 in 1998.

Figure 3.11-1: Urban Distribution of the Population of Denali Borough



Source: Alaska Department of Community and Regional Affairs, 1998-Denali Borough, Community

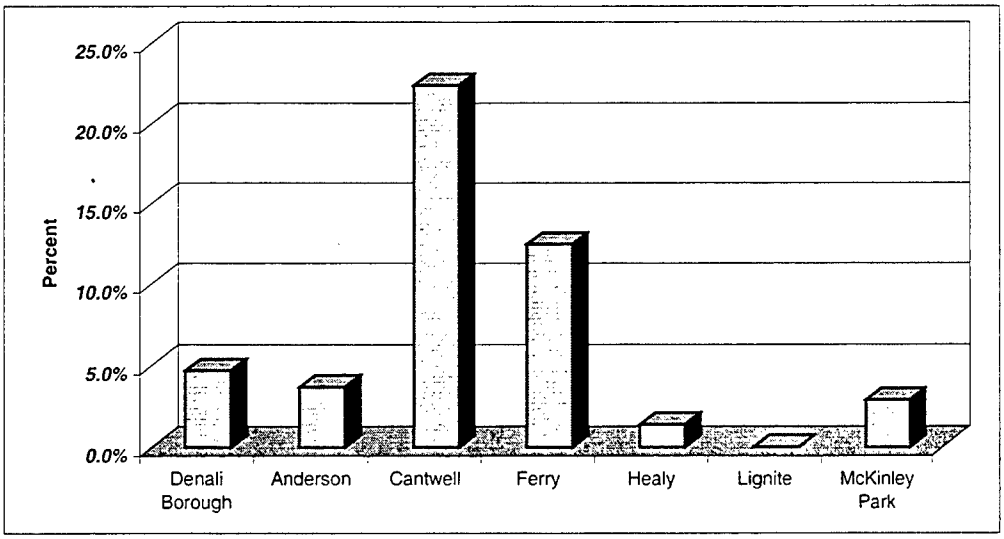
Alaska Natives comprised 4.7 percent of the population of Denali Borough in 1990. Figure 3.11-2 illustrates the varying densities of Alaska Natives among the communities of Denali Borough. The native population of Nenana represented over 47 percent of the town's population in 1990.

Employment

Denali Borough had 759 jobs in 1990, almost half of which were at, or dependent on, Clear AFS. The other main employers in the borough are the Usibelli Coal Mine, Golden Valley Electric Association and the local School District. Tourism-related industry also accounts for a significant proportion of local jobs. The community of McKinley Park, for instance, is at the entrance to Denali National Park, the home of Mount McKinley, the highest mountain in North America. The Park provided virtually all McKinley Park's 84 jobs in 1990.

Highway tourism, based on the George Parks Highway that links Anchorage to Fairbanks, is important to communities such as Cantwell, Healy, and Lignite.

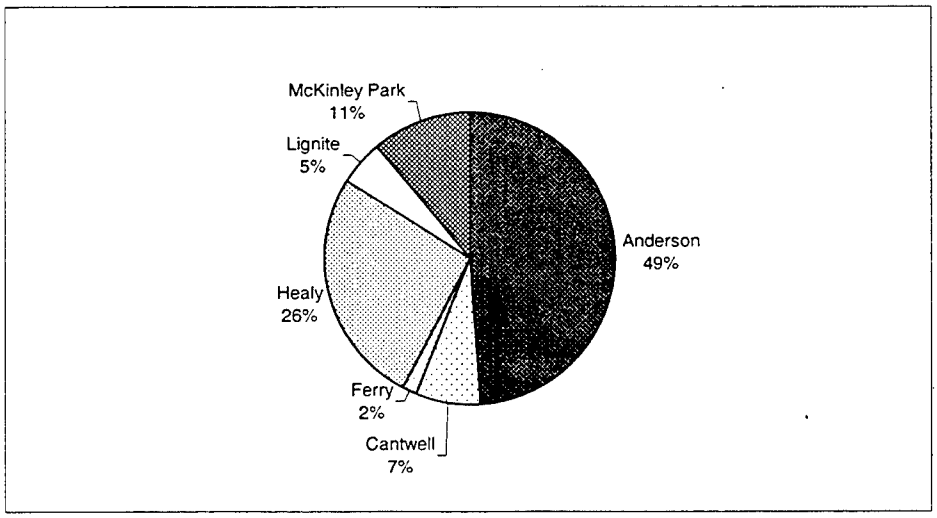
Figure 3.11-2: Alaska Natives as a Proportion of the Total Population in Denali Borough and its Communities, 1990



Source: Alaska Department of Community and Regional Affairs, 1998—Denali Borough, Community Information Summary.

The Usibelli Coal Mine is Alaska's largest coal mining operation and is located at Healy. It employs 145 people and supplies over 800,000 tons of coal a year to the local power company, the University of Alaska and the military. Coal is also exported to the Far East. Figure 3.11-3 illustrates the distribution of jobs in Denali Borough in 1990.

Figure 3.11-3: The 1990 Distribution of Jobs in Denali Borough



Source: Alaska Department of Community and Regional Affairs, 1998—Denali Borough, Community Information Summary.

In 1990, 127 people in Nenana's population were employed, with over one half occupying Federal, state, or local jobs. Other significant sources of employment included Yutana Barge Lines and various local tourist destinations. Unemployment in 1990 reached 17.5 percent.

The overall unemployment rate in Denali Borough was 10.1 percent in 1990, with 35.6 percent of the total population stating that they were economically inactive. These figures, however, masked extremes within the borough communities, where unemployment rates were as low as 3.9 percent in Healy and as high as 34.6 percent in Cantwell and 39.1 percent in Ferry. These extremes underline the statistical impact of very low regional population counts.

Retail Sales

Retailing in Denali Borough is carried out on a very limited basis, providing for basic needs. According to the 1992 Census of Retail Trade (U.S. Bureau of the Census, 1998), there were eight retailing establishments in the borough. In aggregate, they employed 20 people and had an annual turnover of about $3.2 million. They included a food store, two gas stations, three restaurant/bars and two miscellaneous stores. Fairbanks is the nearest variety retailing center to the ROI.

Nenana has a small amount of retailing that in 1990 employed 20 people, suggesting that it matches Denali Borough with respect to this activity.

Income

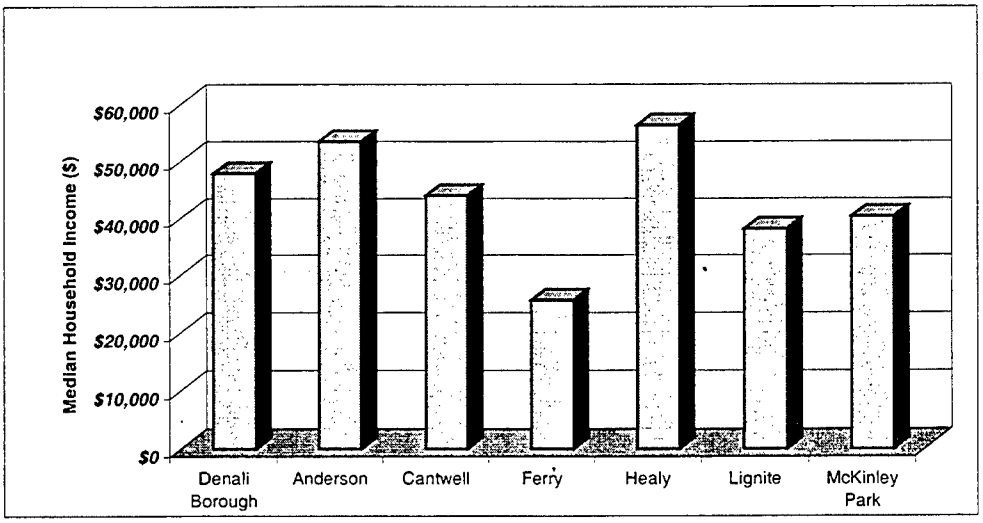
In 1990, Denali Borough had a median household income of $47,884; exactly half the households had an income higher than this figure, while half had household incomes lower. Ten percent of the residents of Denali Borough were living below the poverty level in 1990. Nenana had a median income of $27,292 and 10.4 percent of its population were below the poverty level in 1990. Figure 3.11-4 illustrates the range of median household income in Denali Borough.

Figure 3.11-5 shows the proportion of residents who have incomes below the poverty level in each community.

Housing, Education, and Health

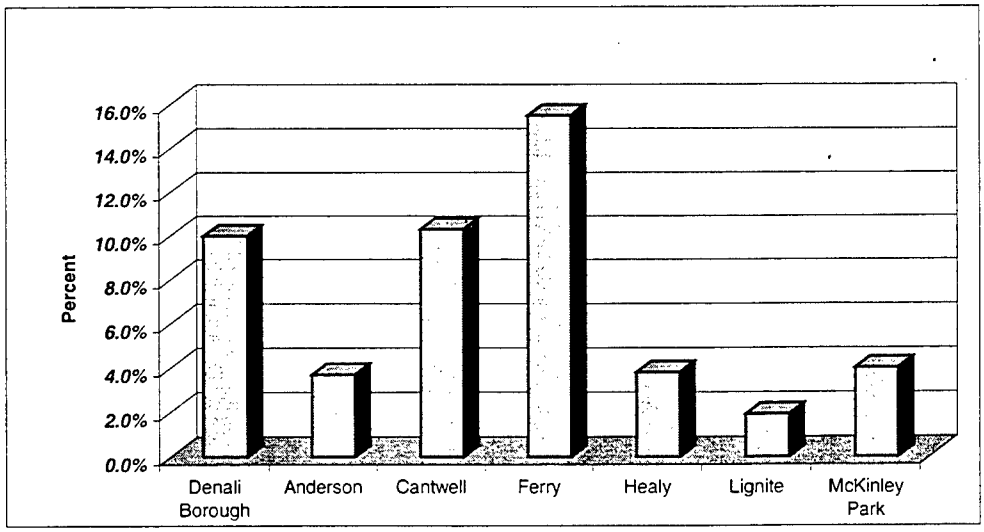
Denali Borough had 937 housing units, according to the 1990 Census. Of these, about 41 percent were vacant. While 75 percent of Denali Borough's housing stock was located in its six constituent communities, over half the vacant homes were found outside these communities. Figure 3.11-6 shows the distribution of housing stock throughout Denali Borough and its communities.

Figure 3.11-4: Median Household Income in Denali Borough and its Communities, 1990



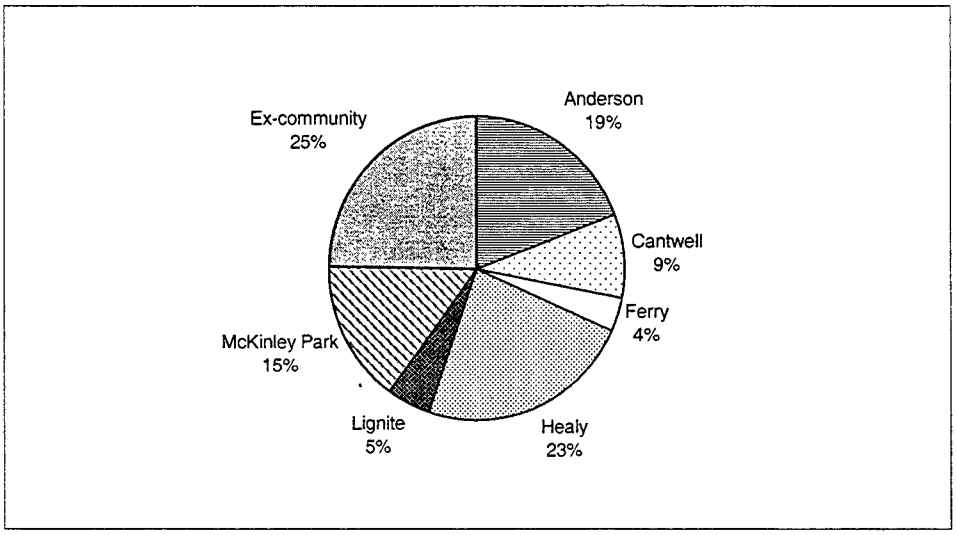
Source: Alaska Department of Community and Regional Affairs, 1998—Denali Borough, Community Information Summary.

Figure 3.11-5: The Proportion of Residents Earning Below Poverty Level Incomes in Denali Borough and its Communities, 1990



Source: Alaska Department of Community and Regional Affairs, 1998—Denali Borough, Community Information Summary.

Figure 3.11-6: The Distribution of the Housing Stock of Denali Borough, 1990



Source: Alaska Department of Community and Regional Affairs, 1998—Denali Borough, Community Information Summary.

Nenana had an additional 190 housing units in 1990. About 26 percent were vacant.

Figure 3.11-7 illustrates the extent to which vacant housing is more prevalent outside the established communities of Denali Borough.

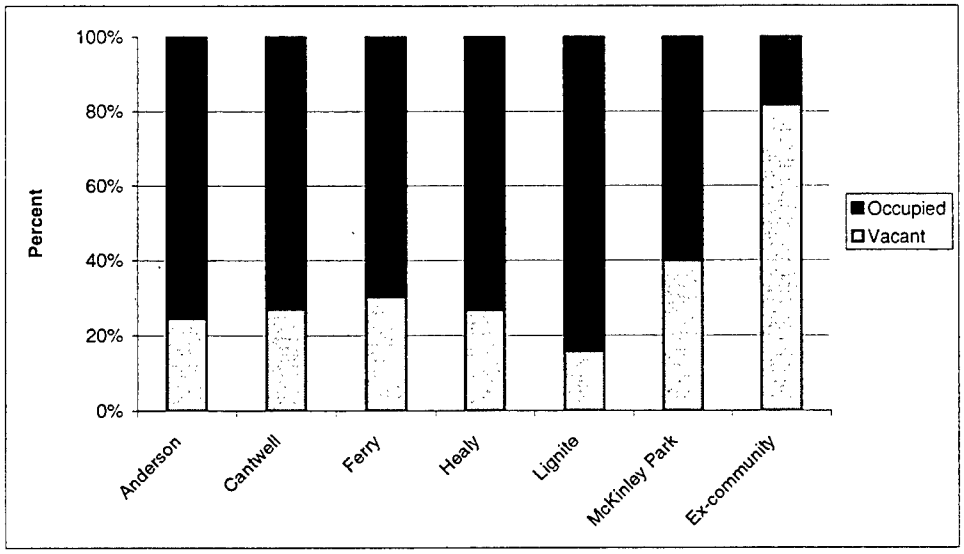
There are three schools in Denali Borough and two in Nenana. They have an aggregate roll of about 700 students. Denali Borough's schools are located in Anderson, Cantwell, and Healy.

Health care in Denali Borough and Nenana is provided at clinics or on an auxiliary basis by one or other of the emergency services. The nearest hospital to Denali Borough is in Fairbanks (see section 3.11.1.3). There are clinics at Nenana, Anderson, Cantwell, and Healy. Clear AFS has a clinic that serves the Anderson community.

Fiscal Conditions

In 1997, Denali Borough raised almost $2.8 million of operating revenues from various sources including taxes and external state funds. An important source of tax revenue was the 7 percent bed tax levied on temporary accommodation within the borough. About 55 percent of the operating revenue was applied to local education. The remaining 45 percent of revenues was split among government administration (10 percent), public safety (about 4 percent), public services (about 3 percent), and surplus funds (28 percent).

Figure 3.11-7: The Ratio of Vacant to Occupied Housing in the Communities of Denali Borough, 1990



Source: Alaska Department of Community and Regional Affairs, 1998—Denali Borough, Community Information Summary.

Nenana raised almost $3.1 million in operating revenues in 1997, over 70 percent of which was obtained from state and Federal sources. Nenana does not levy a bed tax. About 73 percent of revenues was spent on local education services.

3.11.1.2 Eareckson AS—Socioeconomics

Eareckson AS is an isolated self-contained military installation. It has no surrounding communities. There is, therefore, no socioeconomic environment at Eareckson AS affected by this action.

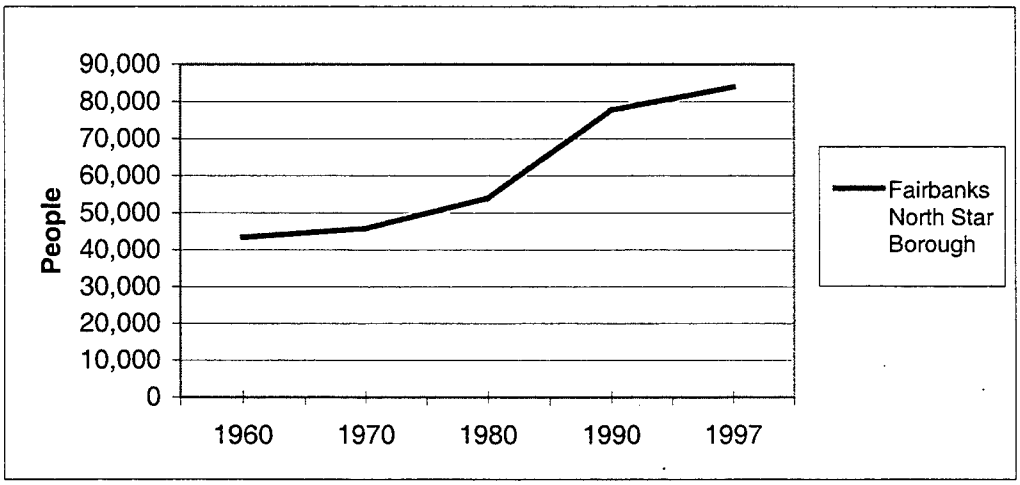
3.11.1.3 Eielson AFB—Socioeconomics

Eielson AFB is in Fairbanks North Star Borough, where it is an important component of the local economy. Though unincorporated, the community of Eielson AFB is one of the larger centers within a sparsely populated region. Fairbanks North Star Borough is in the heart of Interior Alaska and represents the second largest center of population in the state. For the purposes of this analysis, Fairbanks North Star Borough and its constituent communities form the ROI for Eielson AFB. The constituent communities of Fairbanks North Star Borough include College, Eielson AFB, Ester, Fairbanks, Fox, Moose Creek, North Pole, Pleasant Valley, Salcha, and Two Rivers.

Population

By Alaskan standards, Fairbanks has been a long-established center of population within the state. About 20 percent of Alaska's population lived in the borough in 1960. Figure 3.11-8 illustrates the growth in population of Fairbanks since 1960.

Figure 3.11-8: Population Change in Fairbanks North Star Borough 1960-1997



Source: Alaska Department of Community and Regional Affairs, 1998—Fairbanks North Star Borough, Community Information Summary.

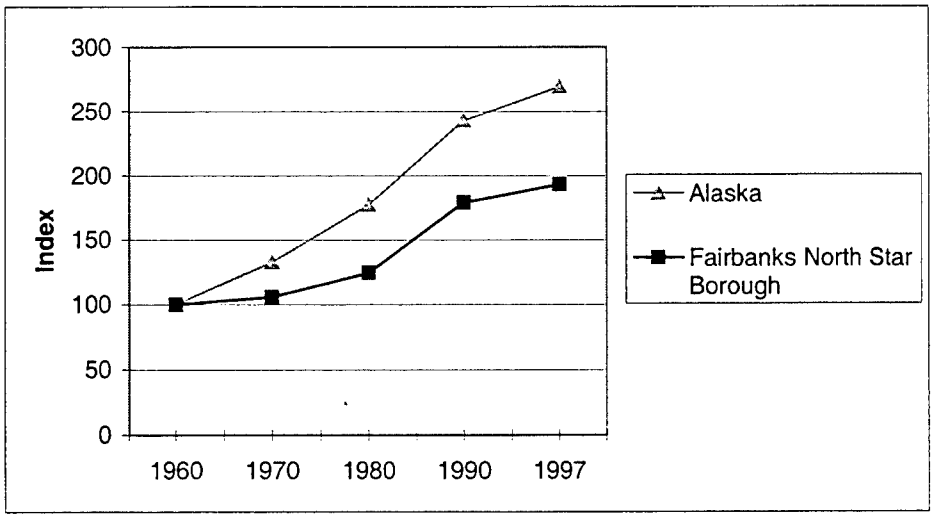
An index was created to illustrate the rate at which Alaska has grown in comparison to Fairbanks North Star Borough, since 1960. The index was set at 100 in 1960. By 1997 the rate of growth for Alaska had moved the index to over 250, compared to Fairbanks North Star Borough, which was a little below 200 (figure 3.11-9).

By 1997, about 13 percent of Alaska's population lived in Fairbanks North Star Borough.

The proportion of the borough's population living in the 10 communities listed above fell from 65.7 percent in 1990 to 63.6 percent in 1997. All of the 10 communities experienced an increase in population with the exception of Eielson AFB, which lost almost 6 percent of its population during that period. Figure 3.11-10 illustrates the distribution of population among the 10 communities.

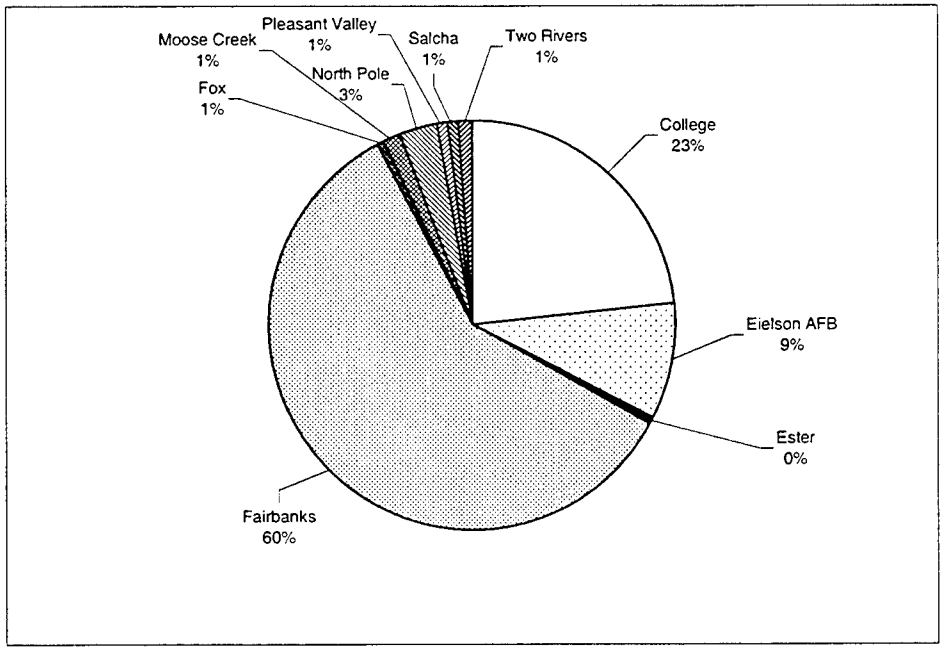
Fairbanks North Star Borough, with 6.9 percent of its population being Alaskan Natives, is considered primarily non-native. The largest concentration of Alaskan Natives is in Fairbanks, where 9.2 percent of its population have this ethnic origin.

Figure 3.11-9: Population Rate of Growth Index Comparing Alaska and Fairbanks North Star Borough 1960-1997



Source: Alaska Department of Community and Regional Affairs, 1998—Fairbanks North Star Borough, Community Information Summary.

Figure 3.11-10: Urban Distribution of the Population of Fairbanks North Star Borough



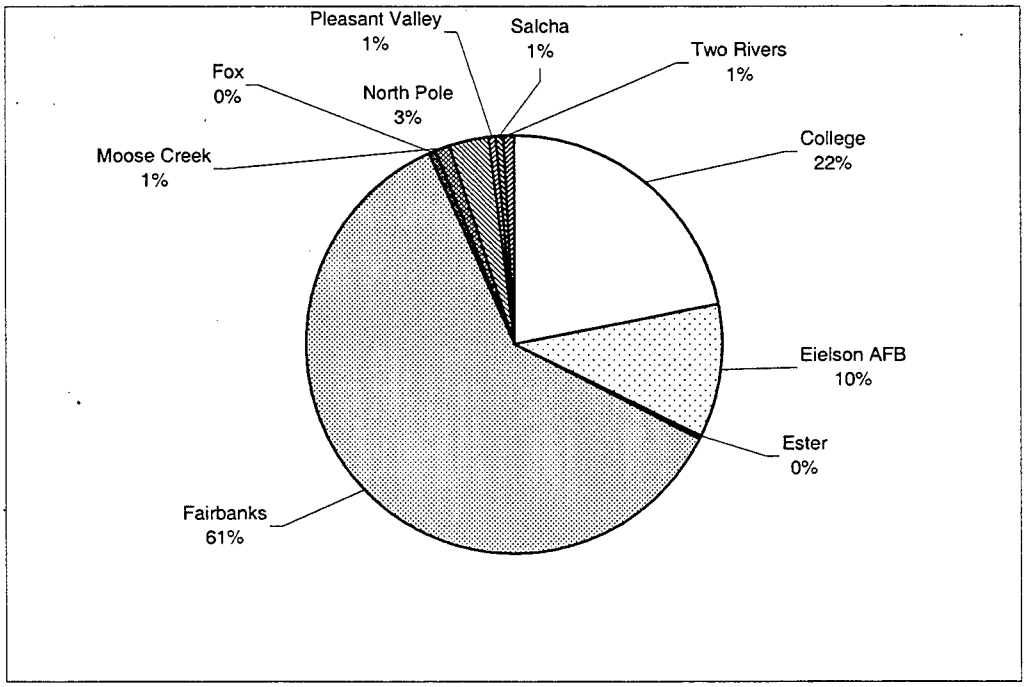
Source: Alaska Department of Community and Regional Affairs, 1998—Fairbanks North Star Borough, Community Information Summary.

Employment

Fairbanks is the largest employment center in Fairbanks North Star Borough, accounting for about 61 percent of the borough's 39,160 jobs in 1990. These jobs reflect the role of Fairbanks as the service center for Interior Alaska, with jobs being concentrated in the various arms of government, communication, transportation, manufacturing, financial, and medical services.

College, the borough's second community (though in reality a suburb of Fairbanks), mostly supplies the workforce for the nearby University of Alaska at Fairbanks. Eielson AFB is the third largest concentration of employment in the borough. About 50 percent of all the jobs in Fairbanks and its surrounding communities—including Eielson AFB—are in government services. Figure 3.11-11 shows the distribution of jobs throughout the borough.

Figure 3.11-11: Urban Distribution of Jobs in Fairbanks North Star Borough, 1990



Source: Alaska Department of Community and Regional Affairs, 1998—Fairbanks North Star Borough, Community Information Summary.

The overall unemployment rate in Fairbanks North Star Borough in 1990 was 10.2 percent. Almost 30 percent of the population claimed, at the time, to be economically inactive. Of the larger population centers, College had the lowest unemployment rate at 7.8 percent, while Eielson AFB had the highest at 13 percent.

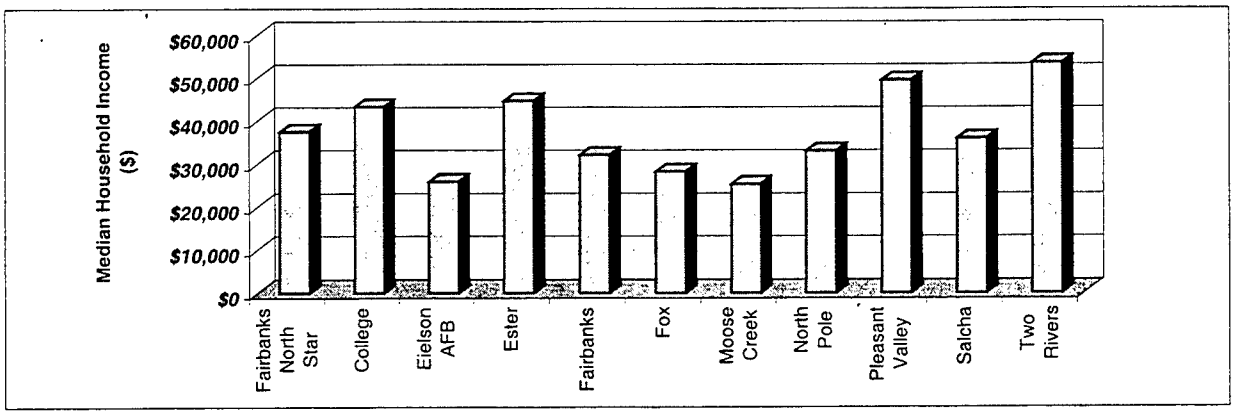
Retail Sales

Fairbanks North Star Borough is an important retail center in the state, accounting for about 14 percent of Alaska's annual retail sales and employing over 5,400 people. It is second only to Anchorage in this respect. Of the borough's 432 retail establishments in 1992 (U.S. Bureau of the Census, 1998—1992 Census of Retail Trade, Denali County Equivalent, Alaska), about 63 percent were located in Fairbanks. There were about $690 million of annual retail sales in Fairbanks North Star Borough in 1992.

Income

The median income of the borough was $37,468 in 1990. Figure 3.11-12 shows the variations in median household income among the various borough communities. Moose Creek had the lowest median household income in 1990, with Pleasant Valley having the lowest proportion of its population living beneath the poverty level (figure 3.11-13).

Figure 3.11-12: Median Household Income in Fairbanks North Star Borough and its Surrounding Communities, 1990

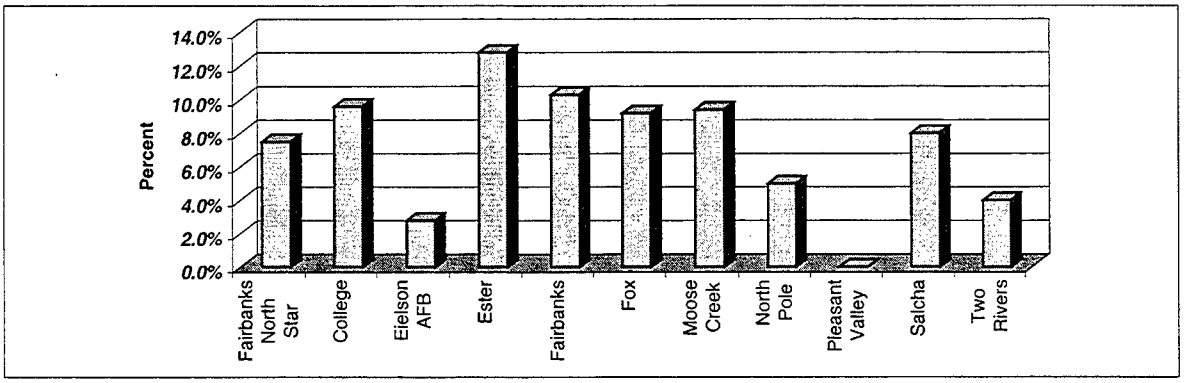


Source: Alaska Department of Community and Regional Affairs, 1998—Fairbanks North Star Borough, Community Information Summary.

Housing, Education, and Health

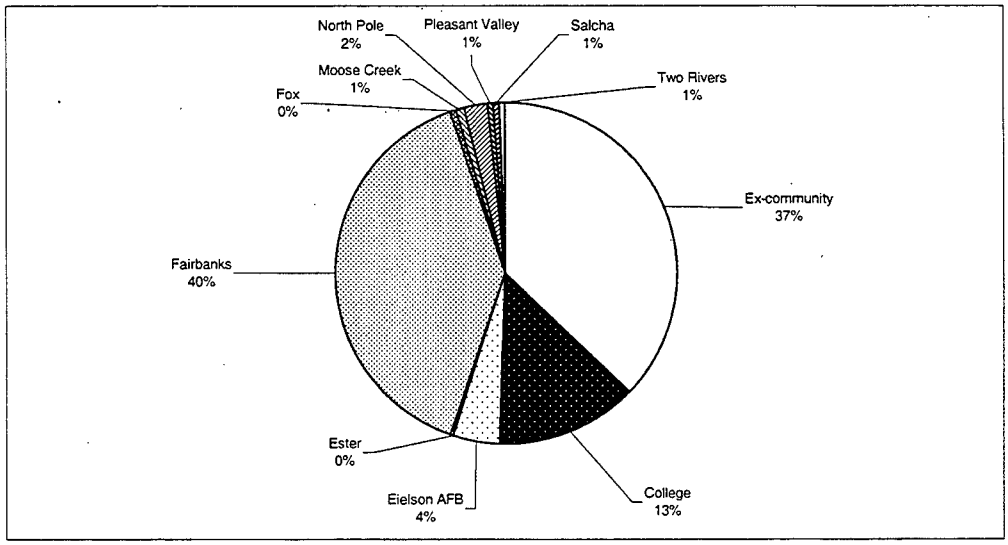
Fairbanks North Star Borough had 31,823 housing units, according to the 1990 census. About 16 percent, or 5,130, were vacant. Figure 3.11-14 illustrates the distribution of the borough's housing stock, with 37 percent being outside the 10 communities that compose the borough.

Figure 3.11-13: Proportion of Residents Living Beneath the Poverty Level, 1990



Source: Alaska Department of Community and Regional Affairs, 1998—Fairbanks North Star Borough, Community Information Summary.

Figure 3.11-14: The Distribution of the Housing Stock of Fairbanks North Star Borough, 1990



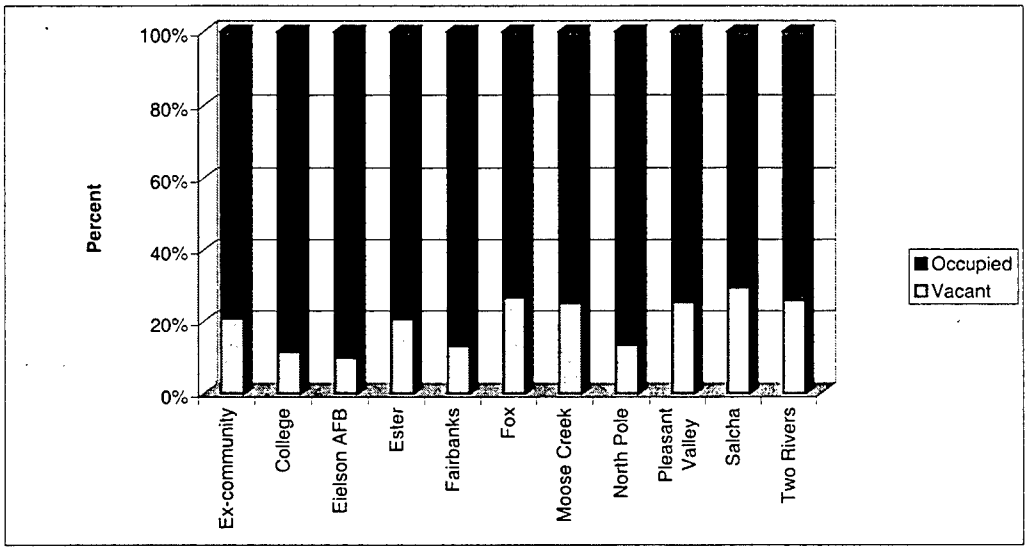
Source: Alaska Department of Community and Regional Affairs, 1998—Fairbanks North Star Borough, Community Information Summary.

The lowest housing vacancy rates in 1990 were in the largest communities of Fairbanks, College, and Eielson AFB (figure 3.11-15).

There are 32 schools of various sizes in Fairbanks North Star Borough. They had an aggregate student roll of 16,430 in 1997. About 65 percent of these students attended the 21 schools located in Fairbanks. Most of the remaining students in the borough attend school at either Eielson AFB or at the five schools located in North Pole. The schools in the Fairbanks North Star Borough currently have sufficient student capacity (C. Henry, 1999—comment provided at NMD Fairbanks Public Hearing).

Fairbanks, with its three hospitals, provides the majority of health care facilities in the borough. Currently, the Fairbanks Memorial Hospital is operating at approximately 54 percent of capacity. In addition, 11 new mental heath beds along with an expanded mental health unit were added in November 1999. This hospital serves as the major provider for Interior Alaska (R. Solie, 1999—written comment provided during NMD Draft EIS comment period). Its only other significant facility is located at Fort Wainwright, which operates Bassett Army Hospital. Eielson AFB operates a clinic to serve its immediate community.

Figure 3.11-15: The Ratio of Vacant to Occupied Housing in the Communities of Fairbanks North Star Borough, 1990



Source: Alaska Department of Community and Regional Affairs, 1998—Fairbanks North Star Borough, Community Information Summary.

Fiscal Conditions

In 1997, Fairbanks North Star Borough raised almost $185.1 million in operating revenues from various sources including an 8 percent bed tax. The largest borough expenditure was on education, which accounted for 60 percent of the total operating and capital budget.

The municipality of Fairbanks also collects and spends tax revenue. In 1996, this amounted to a little over $81 million collected and $60.65 million expended. Public services including electric, phone, and water utilities represented the largest expenditures, along with public safety. Fairbanks levies an 8 percent bed tax, a 5 percent alcohol tax, and an 8 percent tobacco tax.

3.11.1.4 Fort Greely—Socioeconomics

Fort Greely is in Interior Alaska, on the Richardson Highway. The nearest city to Fort Greely is Delta Junction, about 16 kilometers (10 miles) north of the base. The area is sparsely populated with an economy dependent on Fort Greely, state employment, some agriculture and Alyeska Pipeline Services.

For the purpose of this analysis, the ROI is assumed to include Fort Greely, Delta Junction, and Big Delta. Fort Greely was established in 1942 at the same time that the Alaska Highway was being constructed. The Fort started arctic training towards the end of the decade and in so doing became a major contributor to the local economy. In July 1995, the BRAC recommended realignment of Fort Greely with a scheduled completion by 2002.

At the time of the realignment announcement, there were about 750 jobs at Fort Greely, representing more than half the total employment for the area (Delta/Greely Community Coalition, 1998—Final Reuse Plan). At present, Fort Greely supports two tenants: the Cold Regions Test Center and the Northern Warfare Training Center.

A Reuse Plan, funded by Office of Economic Adjustment, Department of Defense, was produced in order to help the local community prepare for the realignment of Fort Greely. The Plan identifies two alternatives for the reuse of Fort Greely and builds on two previous planning studies. Alternative One (the preferred alternative) is characterized as a mixed use industrial complex anchored by military, institutional, and industrial uses. The latter uses are considered the most compatible with a continued military presence at Fort Greely. The institutional use would be a medium security correctional facility. The Reuse Plan estimates that the preferred alternative would generate between 490 and 600 jobs at Fort Greely.

The second alternative would represent a minimum threshold of post operations at Fort Greely, without a major institutional facility acting as an anchor. This alternative would generate 30 to 66 jobs.

Population

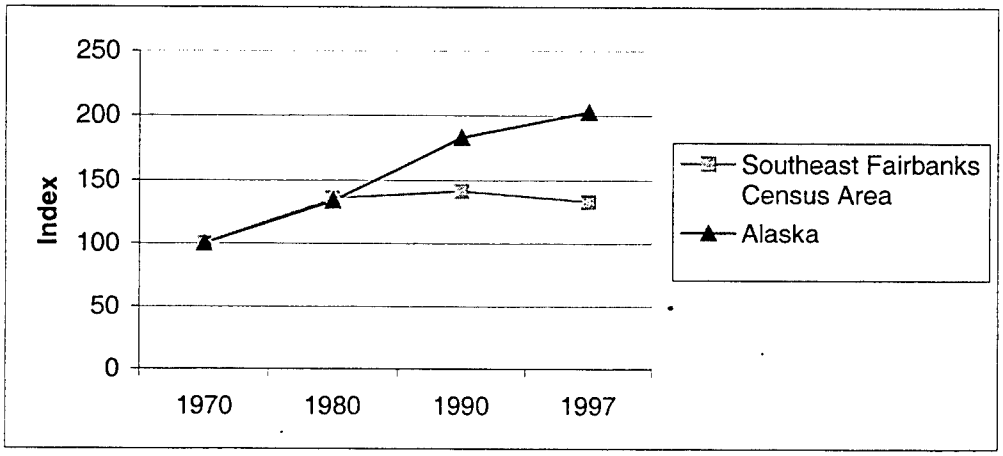
The ROI is part of a wider region known as the Southeast Fairbanks Census Area. In 1997, it was estimated that the Census Area had a population of 5,563. The population of the ROI at that time was 2,059, or 37 percent of the Census Area.

Figure 3.11-16 shows an index of growth that compares the Census Area with Alaska. Population growth in the Census Area was affected by the reduction in personnel at Fort Greely so that, unlike most of the rest of the state, its population fell to pre-1980 levels between 1990 and 1997.

The impact of the downsizing of Fort Greely on the region's population is further emphasized in figures 3.11-17 and 3.11-18. Fort Greely's share of the Census Area population clearly falls between 1990 and 1997.

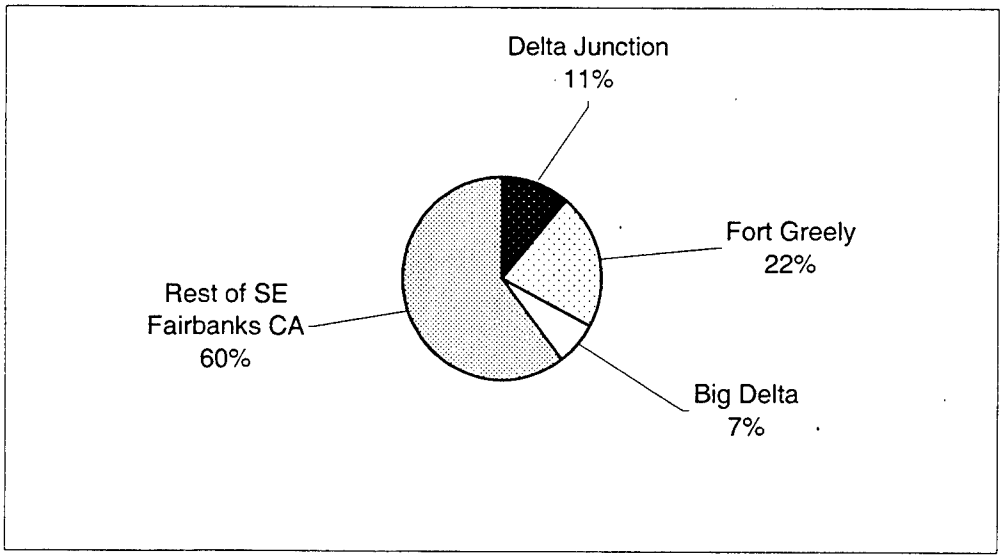
The Alaska Native population of the ROI in 1990 was relatively small, with Fort Greely having the lowest density of the three communities at 1 percent. Delta Junction and Big Delta had Alaska Native populations of 4.4 percent and 4 percent respectively.

Figure 3.11-16: Index of Population Growth, Alaska and Southeast Fairbanks Census Area, 1970-1997



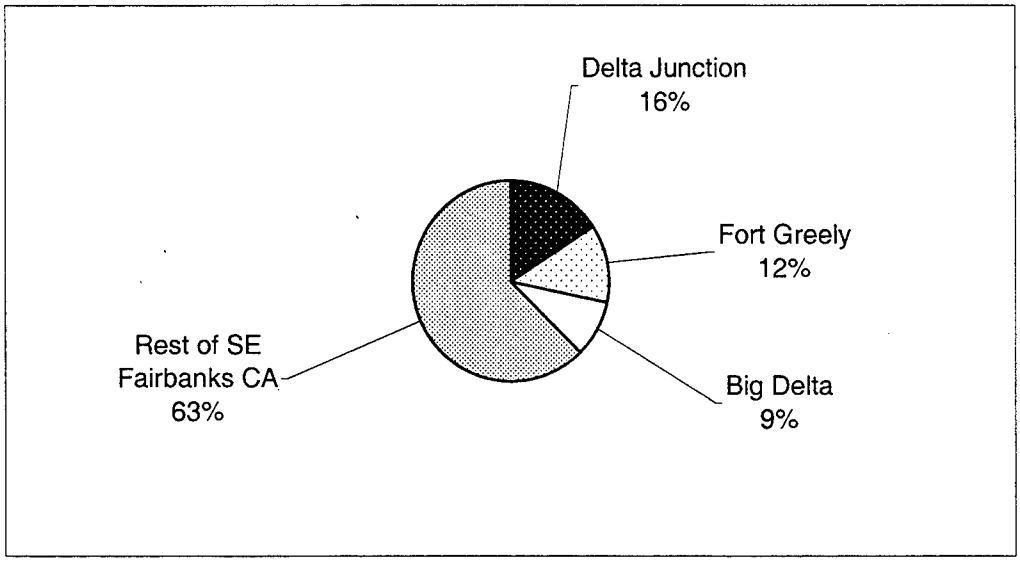
Source: Alaska Department of Labor, 1998—Alaska Population Overview

Figure 3.11-17: Distribution of the Population of Southeast Fairbanks Census Area, 1990



Sources: Alaska Department of Community and Regional Affairs, 1998—Fairbanks, Community Information Summary.; U.S. Bureau of the Census, 1995—Alaska Population.

Figure 3.11-18: Distribution of the Population of Southeast Fairbanks Census Area, 1997



Sources: Alaska Department of Community and Regional Affairs, 1998—Fairbanks, Community Information Summary; U.S. Bureau of the Census, 1995—Alaska Population.

Employment

Fort Greely is estimated to account for 50 percent of all the employment in its surrounding communities, emphasizing the lack of diversity in the economy of the ROI. The School District is the second largest government employer in the area, along with state and Federal highway maintenance services. The highway also provides some tourism-related employment during the summer months. Figure 3.11-19 shows the distribution of jobs among the three communities that compose the ROI.

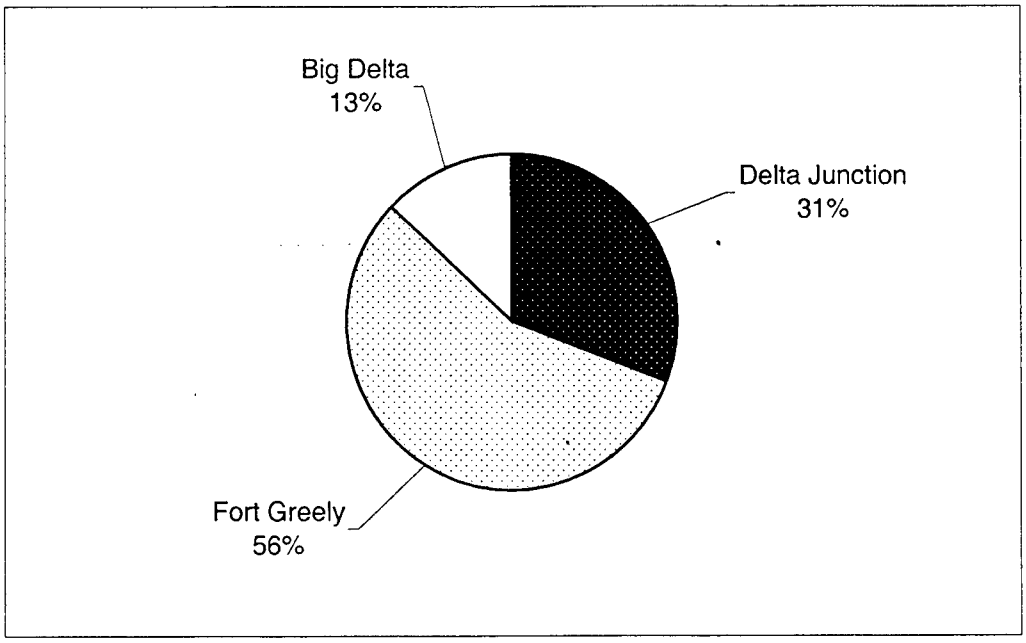
Unemployment in 1990 varied significantly among the three ROI communities. Figure 3.11-20 illustrates the difference.

In the case of Big Delta, its extremely low unemployment rate was paralleled by its comparatively high percentage of economically inactive residents; 54 percent of its 1990 population were characterized as such.

Retail Sales

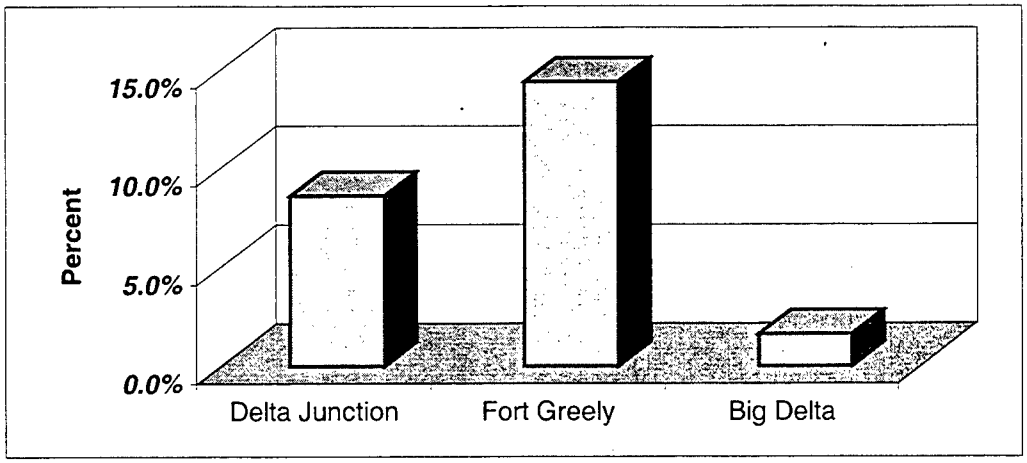
Retailing within the ROI is limited to small convenience stores, usually combined with a gas station, and tourism-related retailing, including bars and restaurants. The nearest variety retailing center to the ROI is Fairbanks.

Figure 3.11-19: Distribution of Jobs within the Urban Communities Surrounding Fort Greely, 1990



Source: Alaska Department of Community and Regional Affairs, 1998—Fort Greely, Delta Junction, and Big Delta, Community Information Summaries.

Figure 3.11-20: Unemployment Rates in the Communities Comprising the ROI, 1990



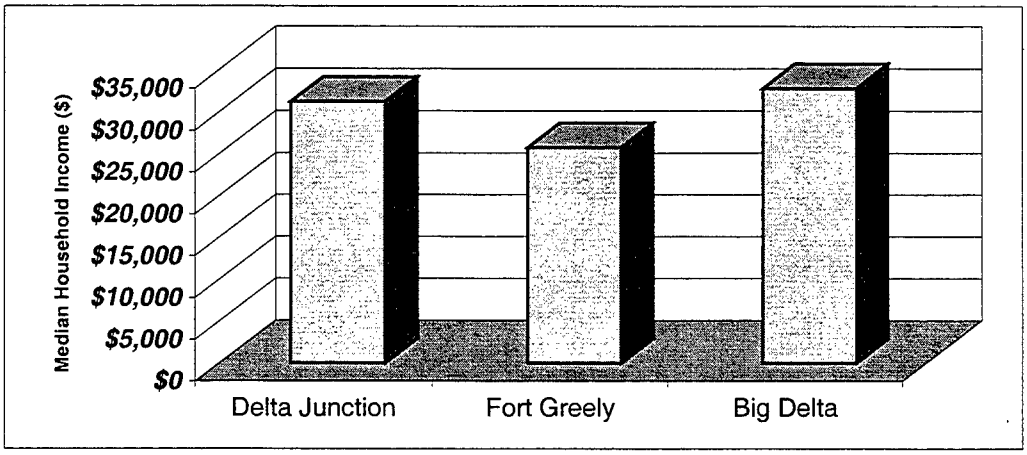
Alaska Department of Community and Regional Affairs, 1998—Fort Greely, Delta Junction, and Big Delta, Community Information Summaries.

Income

Big Delta had the highest median income among the three communities that are closest to Fort Greely. It also had the proportion of residents

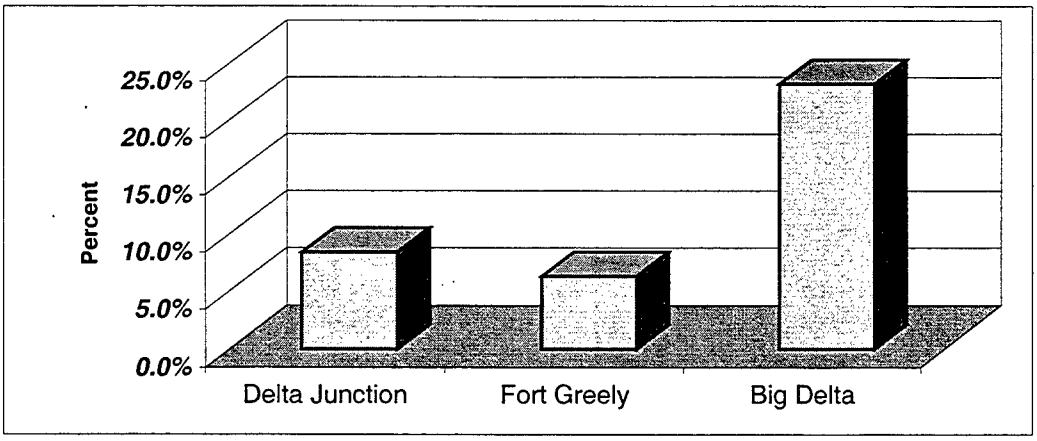
living below the poverty level. Figures 3.11-21 and 3.11-22 show median household income and the proportion of residents with household incomes below the poverty level.

Figure 3.11-21: Median Household Income in the Communities Surrounding Fort Greely, 1990



Source: Alaska Department of Community and Regional Affairs, 1998—Fort Greely, Delta Junction, and Big Delta, Community Information Summaries.

Figure 3.11-22: The Proportion of Residents Earning Below Poverty Level Incomes in the Communities Surrounding Fort Greely, 1990



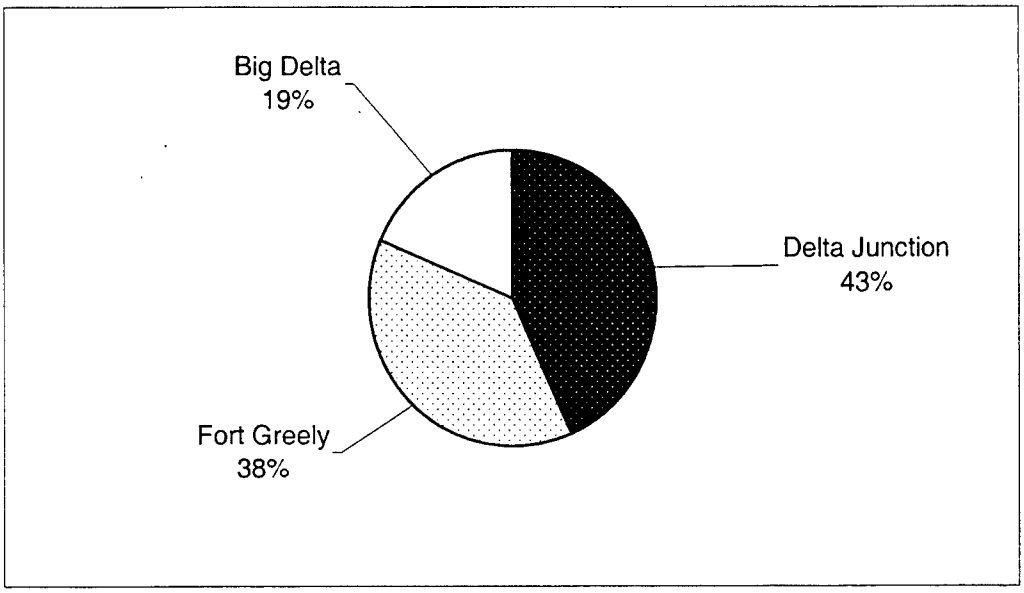
Source: Alaska Department of Community and Regional Affairs, 1998—Fort Greely, Delta Junction, and Big Delta, Community Information Summaries.

Housing, Education, and Health

There were 956 homes in the three communities surrounding Fort Greely in 1990. A little over 25 percent were vacant. This aggregate figure, however, masks a significant variation in housing stock and vacancy

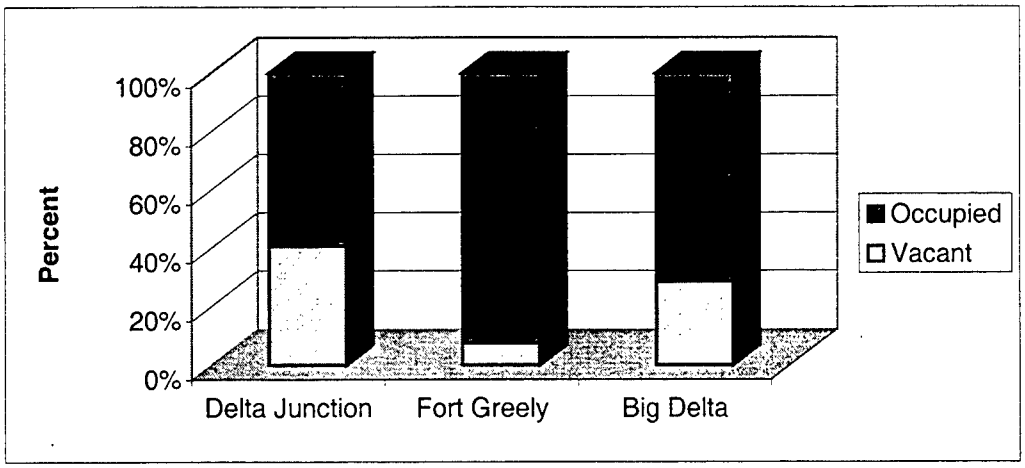
rates among the three communities. Figures 3.11-23 and 3.11-24 illustrate the variations.

Figure 3.11-23: The Distribution of Housing Among the Communities Surrounding Fort Greely



Source: Alaska Department of Community and Regional Affairs, 1998—Fort Greely, Delta Junction, and Big Delta, Community Information Summaries.

Figure 3.11-24: The Ratio of Vacant to Occupied Housing in the Communities Surrounding Fort Greely, 1990



Source: Alaska Department of Community and Regional Affairs, 1998—Fort Greely, Delta Junction, and Big Delta, Community/Information Summaries.

There are five schools in the ROI—four in Delta Junction, with a student roll of 491, and one at Fort Greely, with 307 pupils.

Delta Junction has a family medical center, and Fort Greely has a clinic. The nearest hospital is 153 kilometers (95 miles) away at Fairbanks.

Fiscal Condition

Delta Junction raised $150,000 of revenue in 1997 from local service charges and external, state sources. It spent almost $184,000 in the same year, the majority on public safety, roads, parks, and recreation. Delta Junction does not levy a bed tax on temporary accommodation.

3.11.1.5 Yukon Training Area (Fort Wainwright)—Socioeconomics

The socioeconomic affected environment for the Yukon Training Area is the same as that of Eielson AFB, as outlined in 3.11.1.3.

3.11.2 NORTH DAKOTA INSTALLATIONS

3.11.2.1 Cavalier AFS—Socioeconomics

Cavalier AFS is in Pembina County, in northeastern North Dakota, adjacent to the Canadian border. Cavalier AFS is in a rural region with scattered urban centers of population, where individuals will, typically, travel long distances to their workplace. This analysis, therefore, has defined an economic region—or ROI—that includes Cavalier, Pembina, Ramsey, and Walsh counties. This area also coincides broadly with the northernmost part of the United States Red River Basin economic region. It represents the primary drive-to-work area for Cavalier AFS, though it is acknowledged that, in this part of the United States, some employees regularly drive to their workplace from farther afield. Figure 3.11-25 illustrates the inter-relationship of the four counties. It uses 1990 census data to create a matrix of those employees resident and working within their county, those working outside their county, and those living outside the ROI who travel to it for work.

The table shows that in the cases of Cavalier, Pembina, and Walsh counties, about the same number of workers traveled to work between the counties (612) as traveled to them from counties outside the ROI (613). Ramsey County attracted 342 workers from other counties, compared to the 40 workers it attracted from within the ROI.

Population

Like much of North Dakota, the ROI is a sparsely inhabited rural area which, since the 1950s, has experienced a chronic decline in population. The total 1996 population of the four counties ROI was 39,265. This equaled 6.1 percent of the population of North Dakota for the same year.

The largest centers of population in the ROI are Devils Lake in Ramsey County and Grafton in Walsh County. These cities had populations in 1995 of 7,687 and 5,323 respectively.

Figure 3.11-25: Commuting Patterns in the ROI

		Destination of worker					
		Cavalier	Pembina	Ramsey	Walsh	Other counties	Total working outside county of residence
Origin of worker	Cavalier	2049	153	24	24	0	**201**
	Pembina	17	3560	0	266	59	**342**
	Ramsey	26	0	5239	39	327	**5631**
	Walsh	21	131	16	5563	187	**355**
	Other counties	42	260	342	311		**955**
Total living outside their county of employment		**106**	**544**	**382**	**640**	**573**	**16411**

Source: Goodman, 1996—The Economic Health of North Dakota

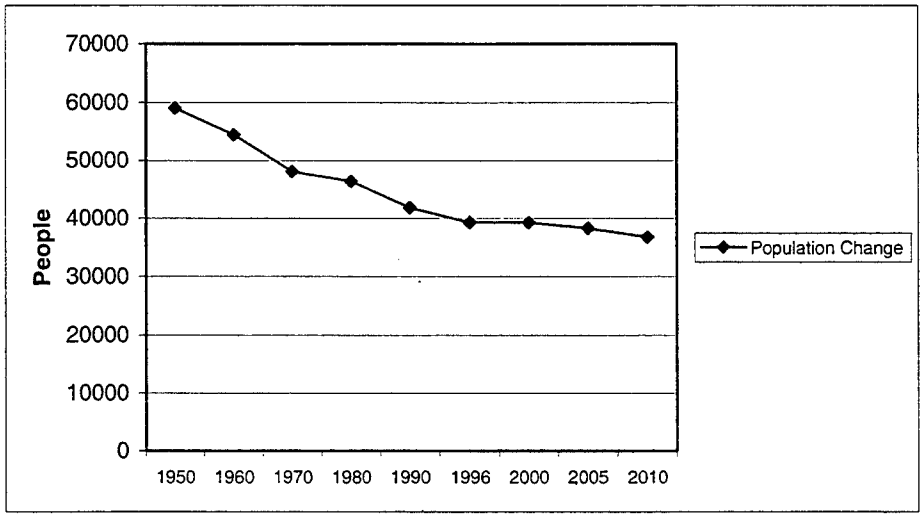
The total population of North Dakota fell by 2.8 percent between the 1980 and 1990 censuses. The population for the state in 1996, however, showed a reversal of this trend, with a small but perceptible increase of a little over 4,700 people. This increase was the result of growth in the more urbanized counties of North Dakota.

In contrast, the counties in the predominantly rural ROI experienced a varied, but continuous and disproportionately rapid rate of decline between 1980 and 1997. Figure 3.11-26 illustrates the long-term trend in population decline in the ROI. The change in population of Cavalier County was the most precipitous, falling almost 33 percent between 1980 and 1997. Pembina and Walsh counties fell by just over 17.1 percent and 11 percent respectively, while Ramsey County declined by a little over 5 percent. The differing rates of population decline are illustrated by creating an index of population change. Figure 3.11-27 considers the state and each of the counties in the ROI, and takes 1980 as the common starting point, with an index of 100. The index clearly shows the faster population decline of Cavalier County, and the decline of the ROI as a whole, when compared to the State of North Dakota.

The 1990 Census showed that North Dakota had a population density of 3.6 people per square kilometer (9.3 people per square mile). See figure 3.11-28. The least dense county within the ROI was Cavalier County, with 1.6 people per square kilometer (4.1 people per square mile). Ramsey and Walsh counties had population densities a little above the

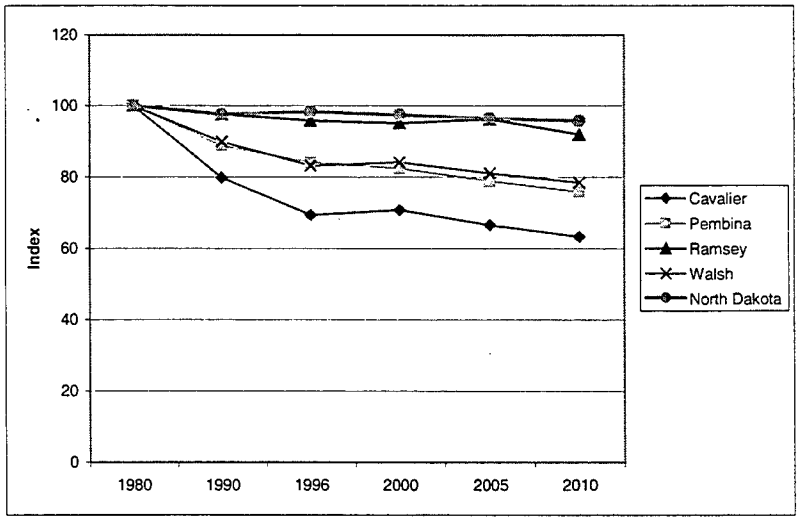
state average, and Pembina slightly below. In 1990, the United States had a population density of 27.2 people per square kilometer (70.3 people per square mile).

Figure 3.11-26: Population Change in the Four-County ROI



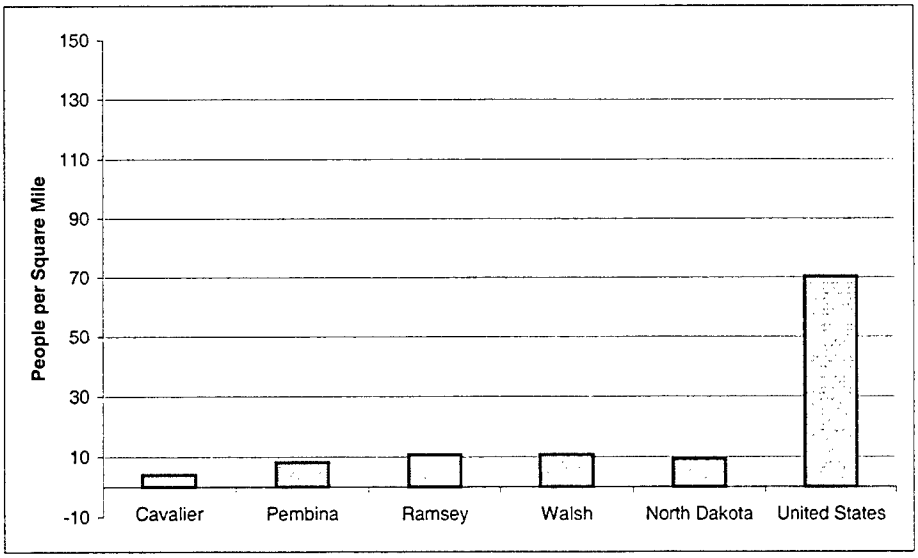
Sources: Coon and Leistritz, 1998—The State of North Dakota: Economic, Demographic, Public Service, and Fiscal Conditions; U.S. Bureau of the Census, 1998—North Dakota Population Estimates.

Figure 3.11-27: Population Index, Comparing the Four-County Region with North Dakota



Sources: Coon and Leistritz, 1998—The State of North Dakota: Economic, Demographic, Public Service, and Fiscal Conditions; U.S. Bureau of the Census, 1998—North Dakota Population Estimates.

Figure 3.11-28: 1990 Population Density



Source: U.S. Bureau of the Census, 1996—Land Area, Population, and Density for States and Counties.

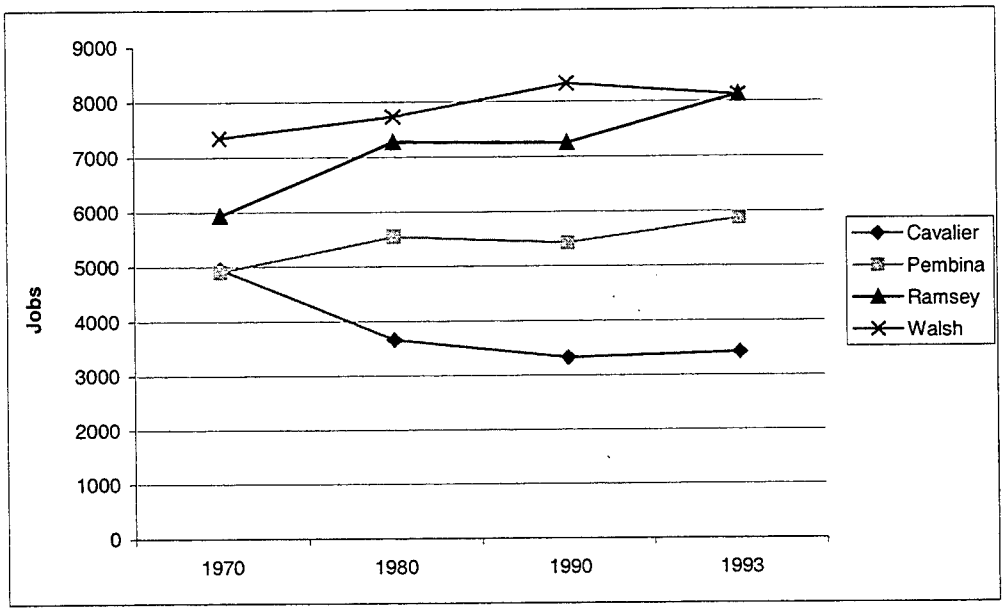
In 1994, the labor force resident in the ROI was 20,222. This represented 6 percent of North Dakota's labor force. Unemployment in the ROI was 5.6 percent or 1,143 persons, compared to 3.9 percent for North Dakota.

Employment

The number of jobs in the ROI rose from about 23,150 in 1970 to 25,534 in 1993, an increase of a little over 10 percent. Figure 3.11-29 shows, however, that this increase was neither consistent throughout the period nor experienced in equal measure in all of the counties that compose the ROI. Ramsey and Walsh counties accounted for the majority of jobs in the ROI, while Cavalier suffered the most significant level of decline. Figure 3.11-30, by indexing the job numbers, illustrates these differences further. Significantly, not one of the counties in the ROI was able to create jobs at the rate experienced in the state as a whole. In contrast, North Dakota's main urban centers of population were able to post year-on-year increases in jobs.

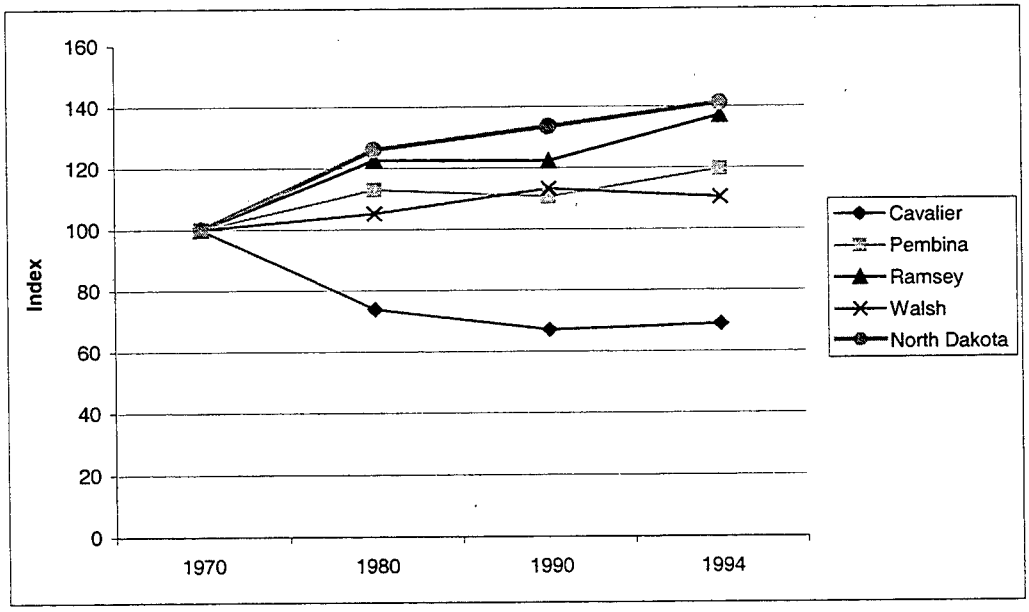
Apart from agriculture, the main sources of employment in the ROI were retailing and services. In recent years agriculture has been declining and retailing and services have been increasing.

Figure 3.11-29: Jobs in the ROI



Source: Goodman, 1996—The Economic Health of North Dakota

Figure 3.11-30: Index of Job Change in the ROI



Source: Goodman, 1996—The Economic Health of North Dakota

Despite its decline in recent decades, agriculture continues to maintain its role as a regional wealth-provider and economic engine. North Dakota is in the Northern Plains farm production region, as classified by the U.S. Department of Agriculture. The region is characterized by short growing seasons and the predominance of winter and spring wheat. In 1995, North Dakota ranked first among the top 10 wheat producing states, in terms of cash receipts for that commodity. Approximately 41,000 people were employed in agricultural production in North Dakota in 1993.

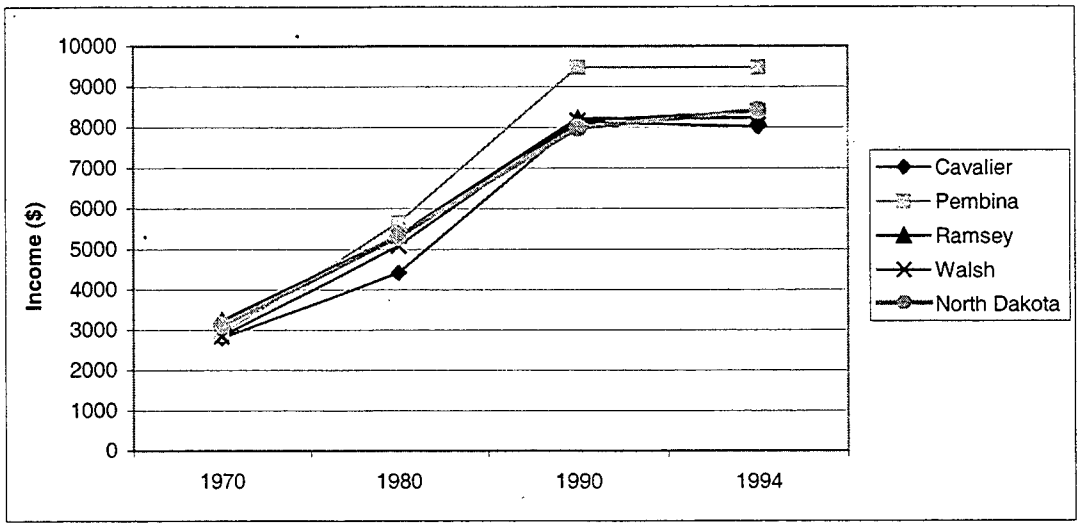
The counties of the ROI accounted for 16.7 percent of that state's farm earnings for 1990 (U.S. Bureau of the Census, 1995—County and City Data Book, 1994, North Dakota Counties). The dominance of agriculture within the ROI is further illustrated by the contribution of farm earnings to total earnings. In 1990, farm earnings were 12.4 percent of total earnings in North Dakota. The equivalent statistic for agriculture's contribution to earnings in Cavalier County was almost 52 percent, 34 percent for Pembina County, 20 percent for Ramsey County, and 28 percent for Walsh County.

The outlook for agriculture in the ROI is mixed. On the one hand, farms located in the Red River Valley have access to some of the most fertile land in the nation, allowing them to grow a diverse array of crops. Conversely, a greater need for mechanization, driven by diminishing Federal subsidies and increased competition, is accelerating the trend for larger farms with fewer owners. While productivity per farmed acre may be increasing in the ROI, the small, local communities that have always depended on the locally-spent farmer's dollar are suffering from a decline in retail sales. This in turn has led to migration from the countryside to the urban centers by younger people and those who have depended on a vibrant, locally-based farming community for their livelihood.

Income

Between 1970 and 1994, real per capita income in the ROI increased in line with that of North Dakota. Pembina County led the ROI in increased per capita income, as illustrated by figure 3.11-31. However, it is important to point out that North Dakota ranks 48th out of 50 states when comparing average weekly wage for covered employment (Department of Economic Development and Finance, 1998—North Dakota Details for Business and Industry). While wages form one component of per capita income, wage comparisons are a useful economic indicator. Only Pembina County, among those in the ROI, showed a higher than average wage rate for 1995 (North Dakota State Data Center, 1998—Average Wage per Job in North Dakota, 1991-1996).

Figure 3.11-31: Per Capita Income, 1970-1994



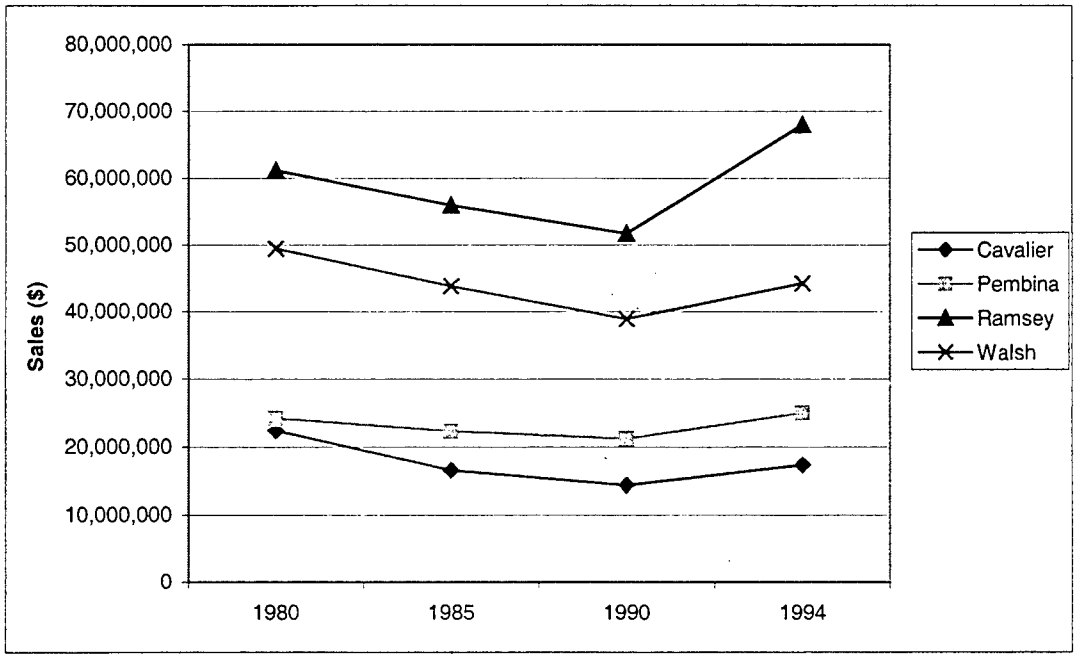
Source: Goodman, 1996—The Economic Health of North Dakota

Retail Sales

In a sparsely populated rural area like the ROI, retailing is a fundamental building block of the local community, providing jobs, wealth, and a vital service to those unable or unwilling to travel long distances to shop. The ROI has experienced a trend consistent with other parts of North Dakota; a decline in its retail centers, as people have migrated from the countryside to the cities. Devils Lake is the only surviving significant comparative retail center in the ROI, with the smaller communities of Langdon and Cavalier able to offer only limited shopping facilities. Figure 3.11-32 illustrates the change in real retail expenditure in the ROI since 1980. Figure 3.11-33 indexes retail sales in order to compare changes with the state trend. Retail sales levels in the ROI have recovered since the recession of the early 1990s, but to varying extents. Figure 3.11-33 shows that only Ramsey County, in which Devils Lake is situated, shows sales growth greater than the state average.

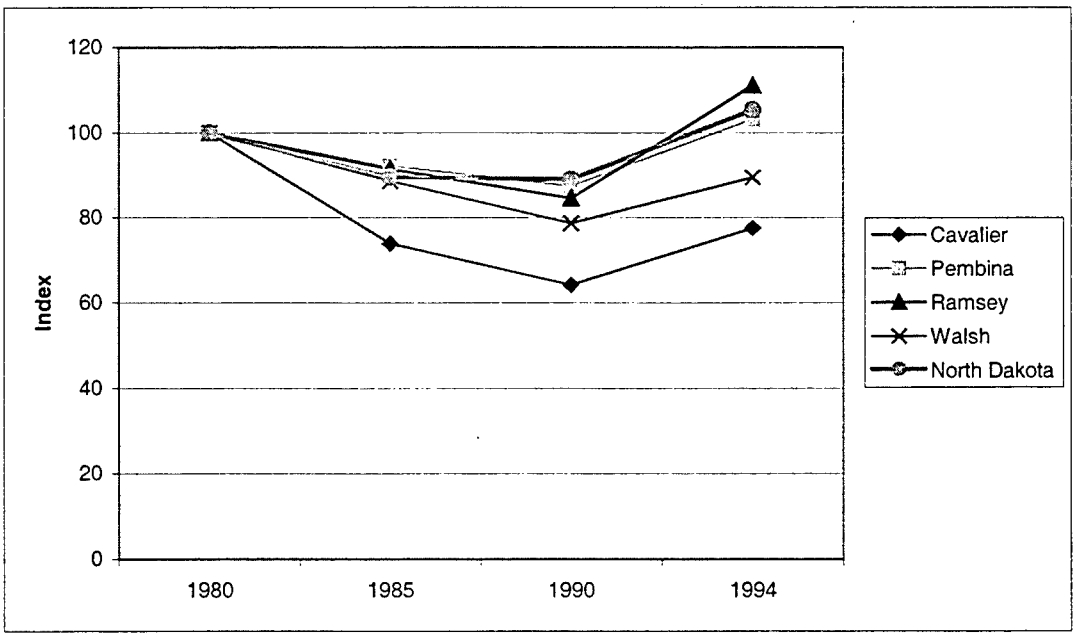
While the town of Devils Lake appears to exhibit healthy retail sales increases, a significant proportion of recent growth has been attributed to the indirect effects of the substantial flood remediation program being carried out around the lake itself. The importance of Devils Lake to retailing in Ramsey County and the ROI is further illustrated by figure 3.11-34. Per capita retail sales are higher in Ramsey County than in the state as a whole.

Figure 3.11-32: Retail Sales in the ROI, 1980-1994



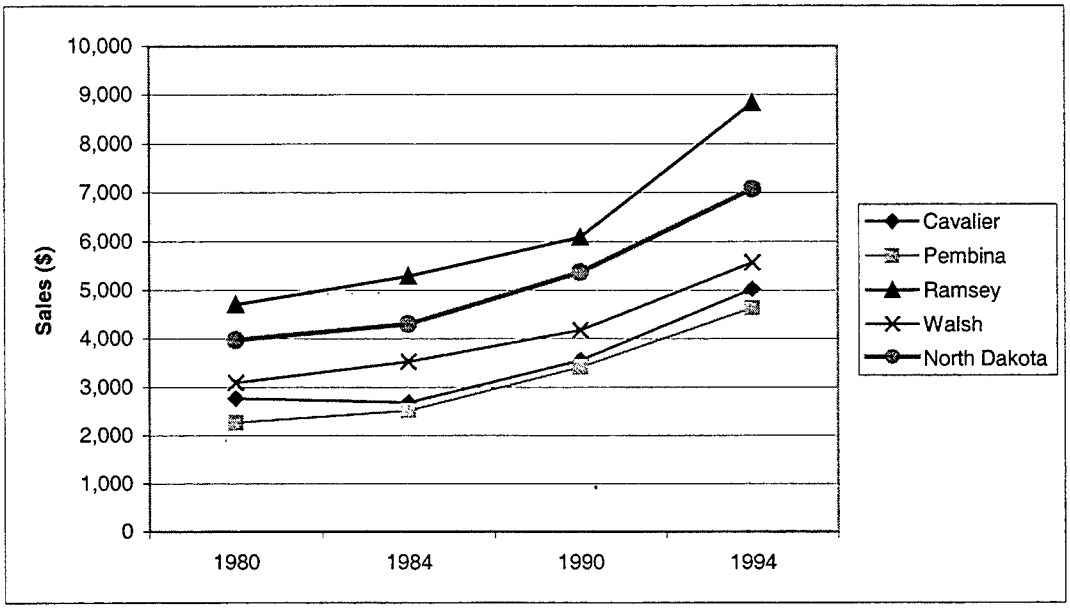
Source: Goodman, 1996—The Economic Health of North Dakota

Figure 3.11-33: Index of Change in Real Retail Sales in the ROI, 1980-1994



Source: Goodman, 1996-The Economic Health of North Dakota

Figure 3.11-34: Per Capita Retail Sales in the ROI, 1980-1994



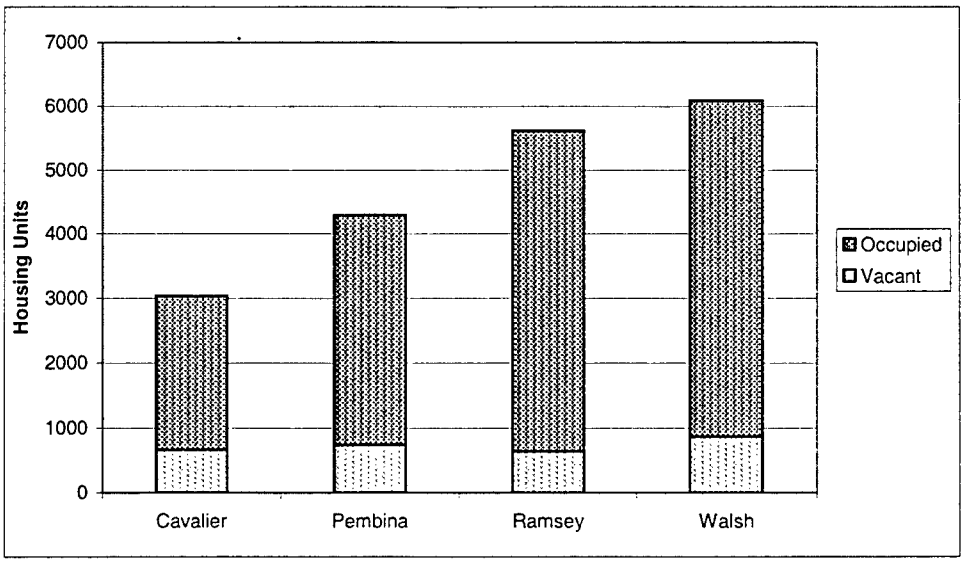
Source: Goodman, 1996—The Economic Health of North Dakota

Housing, Education, and Health

The ROI experienced a substantial investment in housing, education, and healthcare facilities in preparation for the Anti-Ballistic Missile program of the early 1970s. Temporary and permanent housing was installed in the communities surrounding Cavalier AFS during that period. While much of the temporary accommodation has been cleared, trailer courts, concrete pads, and capped services still exist in Langdon. At least one local manufacturer of assembled homes has increased its production capabilities since the anti-ballistic missile program and is able to meet the small local demand for housing construction with relative ease. In addition, the ROI's stock of vacant housing has increased over the last 2 decades as a result of the population migrating to major urban centers such as Grand Forks and Fargo. The four-county ROI had a stock of slightly over 19,000 housing units in 1990. Almost 3,000 were vacant. This represented a vacancy rate of about 15 percent, compared to the North Dakota rate of 12.8 percent. This is illustrated in figure 3.11-35.

The Langdon public school district covers about 1,683 square kilometers (650 square miles) and includes facilities designed for a relatively large number of pupils. The schools in Langdon, which serve grades K-12, have a current roll of 650 pupils and capacity for approximately 1,000. Revenue per pupil in 1997 was $4,666, compared to a state average of $4,833 per pupil.

Figure 3.11-35: Housing Vacancy Rates in the ROI in 1990



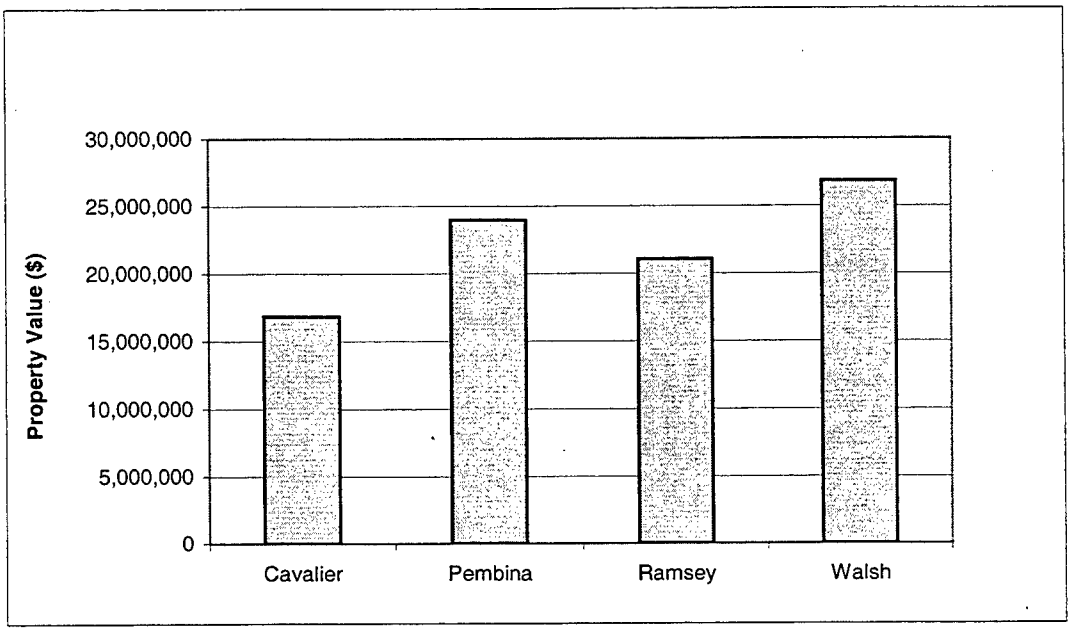
Source: Coon and Leistritz, 1998—The State of North Dakota: Economic, Demographic, Public Service, and Fiscal Conditions

The local health facilities within the ROI support a provider ratio of 1 to 1,500 people. Federal standards call for a ratio of 1 to 3,500. The Langdon hospital is funded by its own foundation and was characterized as well equipped for a rural facility. Langdon Hospital is about a 2-hour drive from more extensive medical facilities in Grand Forks.

Fiscal Conditions

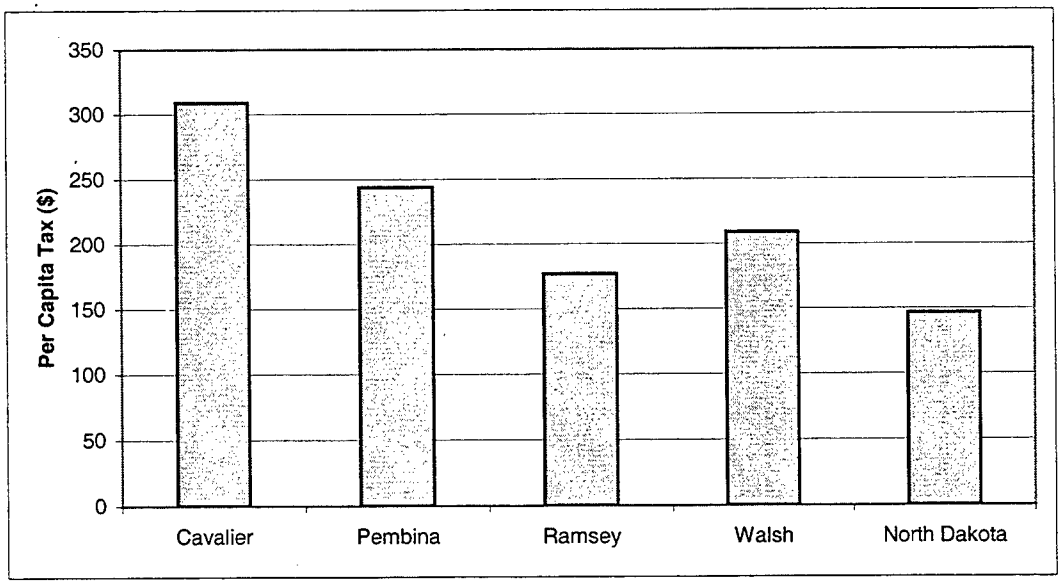
The North Dakota system of local government has been described as complicated because it comprises "townships within counties, cities within counties, and special districts overlaying townships, cities and counties" (Coon and Leistritz, 1998—The State of North Dakota: Economic, Demographic, Public Service and Fiscal Conditions). Figure 3.11-36 shows the taxable value of each of the four counties in the ROI. The 1996 taxable value of property in the ROI was $88,786,232, or 8 percent, of the state's total taxable value for that year. Local government expenditure per head varied throughout the ROI, with Cavalier County having the highest taxable value per capita (see figure 3.11-37), but the lowest per capita local government expenditure (see figure 3.11-38). These factors correlate strongly with Cavalier County being the smallest and fastest shrinking in terms of population and having the highest proportion of taxable value in agricultural land (see figure 3.11-39).

Figure 3.11-36: Total Taxable Property Value in the ROI 1996



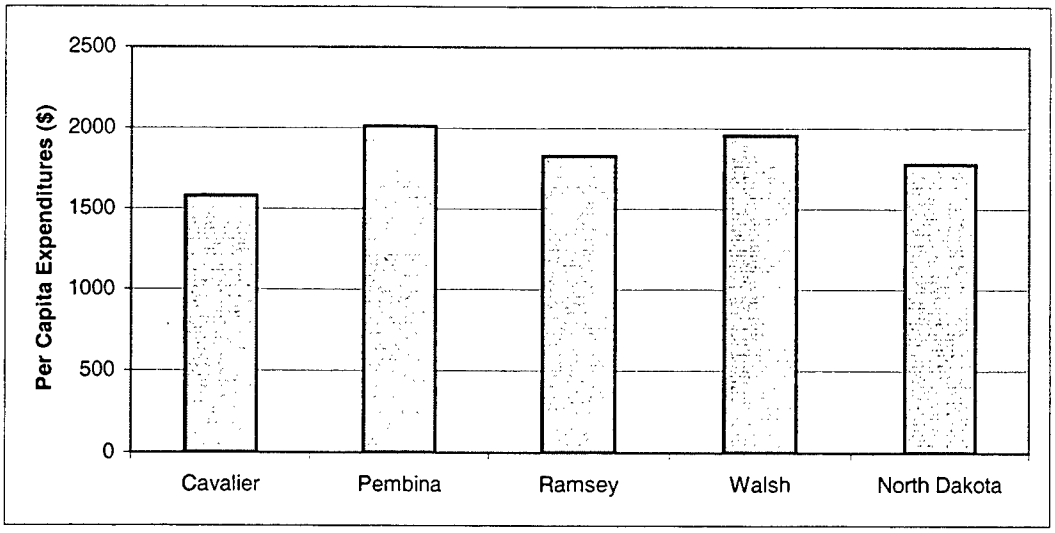
Source: Coon and Leistritz, 1998—The State of North Dakota: Economic, Demographic, Public Service, and Fiscal Conditions.

Figure 3.11-37: Per Capita Local Property Tax 1996



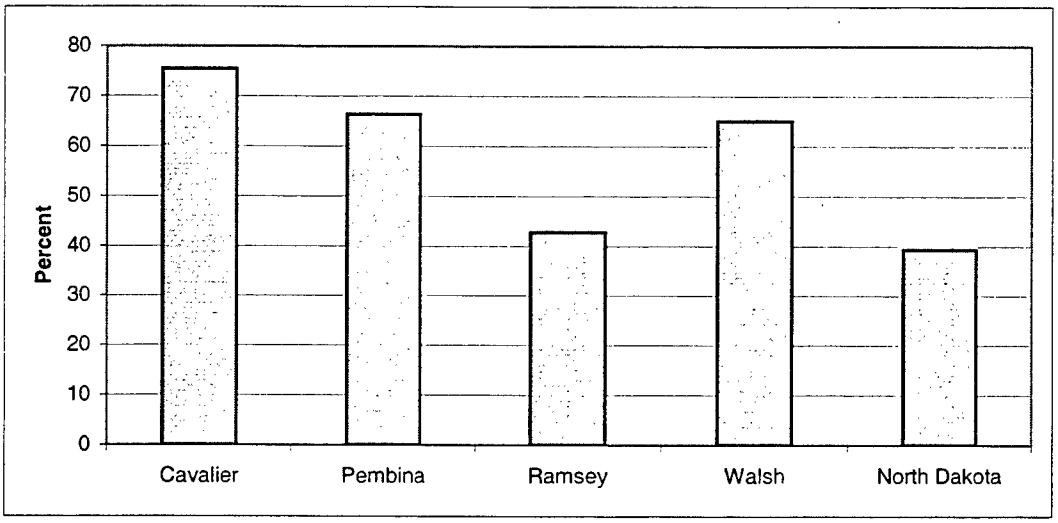
Source: Coon and Leistritz, 1998—The State of North Dakota: Economic, Demographic, Public Service, and Fiscal Conditions.

Figure 3.11-38: Per Capita Local Government Expenditure 1992



Source: Coon and Leistritz, 1998—The State of North Dakota: Economic, Demographic, Public Service, and Fiscal Conditions.

Figure 3.11-39: Agriculture Land as a Percent of Total Taxable Value 1996



Source: Coon and Leistritz, 1998—The State of North Dakota: Economic, Demographic, Public Service, and Fiscal Conditions.

3.11.2.2 Grand Forks AFB—Socioeconomics

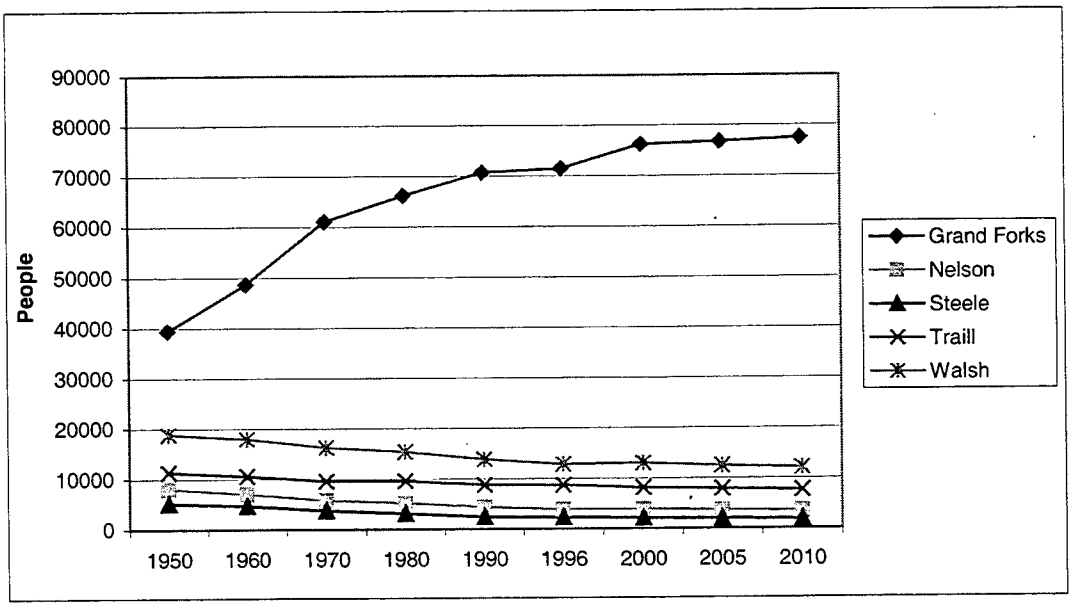
Grand Forks AFB is about 24 kilometers (15 miles) west of the city of Grand Forks, in Grand Forks County, situated in the Red River Basin in northeast North Dakota. While the region as a whole is rural in character, the city of Grand Forks is a relatively important urban population center that dominates the local economy. For the purposes of this analysis, a

wider economic region has been defined to include Grand Forks, Nelson, Steele, Traill, and Walsh counties in the state of North Dakota. This ROI is the main drive-to-work area for Grand Forks AFB, though it is recognized that some base employees will travel from further afield.

Population

The total estimated 1996 population of the five county ROI was 99,197. This was equivalent to 15.4 percent of the 1996 estimated population of North Dakota. The largest center of population in the ROI is Grand Forks, in Grand Forks County, which in 1996 had an estimated population of 50,675, or over half that of the ROI. The overwhelming influence of Grand Forks as the major urban population center within the ROI is illustrated in figure 3.11-40.

Figure 3.11-40: Population Change in the Five-County ROI



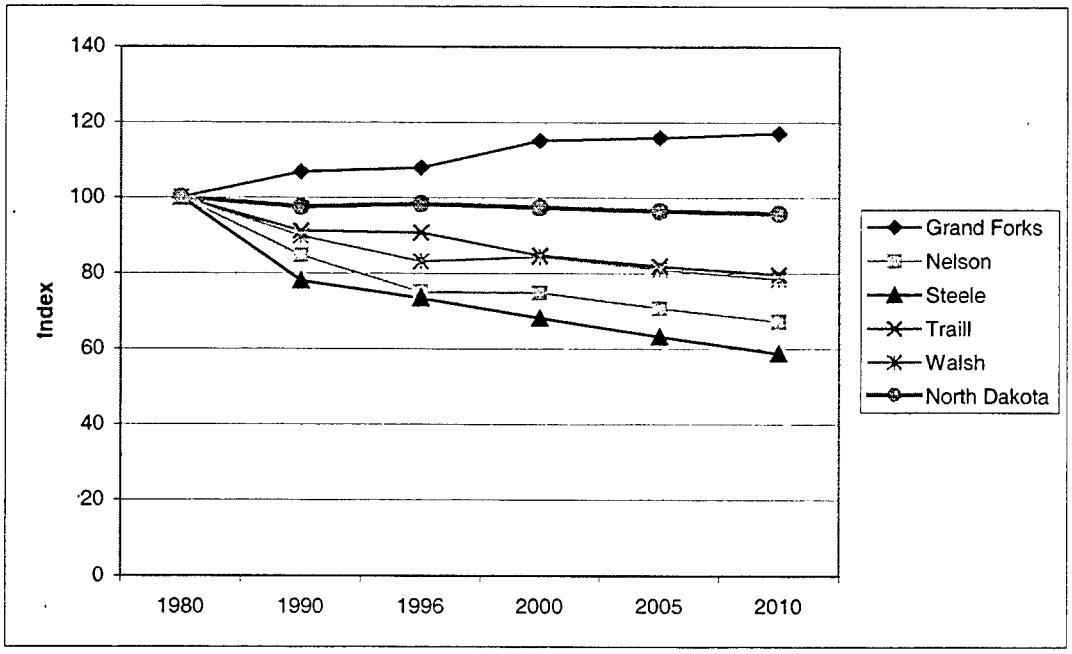
Sources: Goodman, 1996—The Economic Health of North Dakota; U.S. Bureau of the Census, 1998—North Dakota Population Estimates.

With the significant exception of Grand Forks County, the North Dakota counties in the predominantly rural ROI experienced a varied, but continuous and disproportionate rate of decline between 1980 and 1997. In contrast, Grand Forks County had the third largest growth in population in North Dakota between 1980 and 1990. Demographic forecasts for Grand Forks County to 2010 show an average annual increase in population of just over 400 persons. The historic changes in the populations of Nelson and Steele counties were the greatest, both falling about 27 percent between 1980 and 1997. Traill and Walsh

counties declined by just over 10 percent and 11 percent respectively. These rates of decline are forecast to level off over the next 15 years.

Figure 3.11-41 is a 1980-based index of the population of the counties within the ROI and the State of North Dakota. The disproportionately rapid rate of growth of Grand Forks County when compared to North Dakota is clearly illustrated. In contrast, the decline of the other remaining counties within the ROI is also evident. The ROI, therefore, is subject to two significant trends—a chronic decline in its rural population, and the corollary, a growth or stabilization of the population in its main urban center.

Figure 3.11-41: Index of Population Change, Comparing the Five-County Region with North Dakota

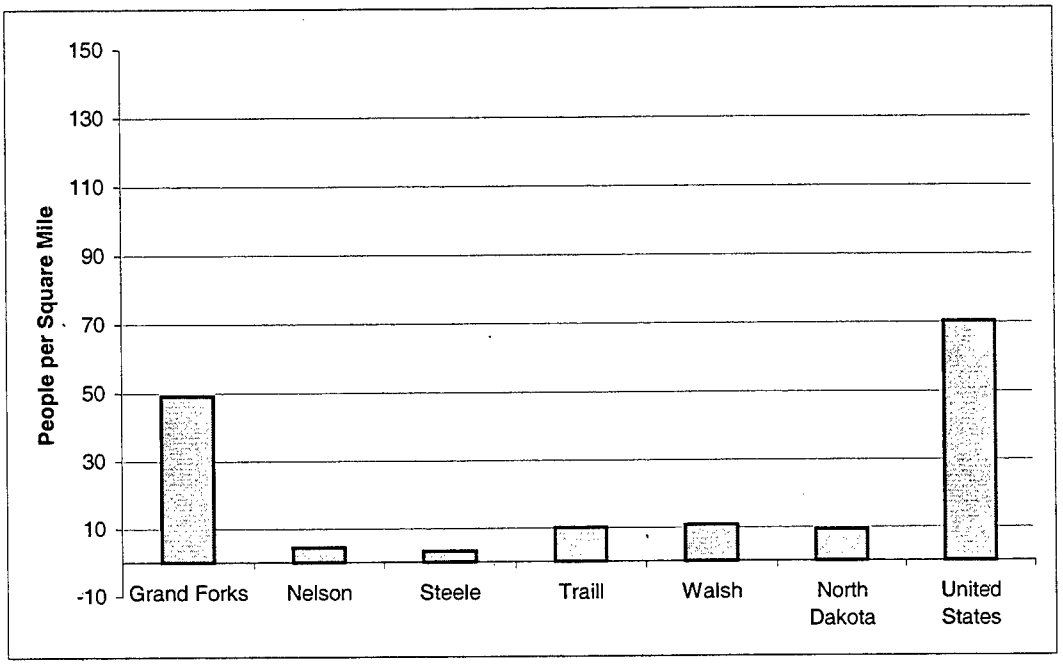


Source: Goodman, 1996—The Economic Health of North Dakota; U.S. Bureau of the Census, 1998—North Dakota Population Estimates.

The 1990 Census revealed that North Dakota had a population density of 3.6 people per square kilometer (9.3 people per square mile) as shown in figure 3.11-42. The least dense county within the ROI is Steele County, with 1.3 people per square kilometer (3.4 persons per square mile), while Traill and Walsh counties had population densities a little above the state average, and Nelson County slightly below. Grand Forks County had a population density of 19 people per square kilometer (49.2 people per square mile), substantially higher than the state average, but still significantly lower than the average population density of the United

States, which in 1990 was 27.1 people per square kilometer (70.3 people per square mile).

Figure 3.11-42: 1990 Population Density



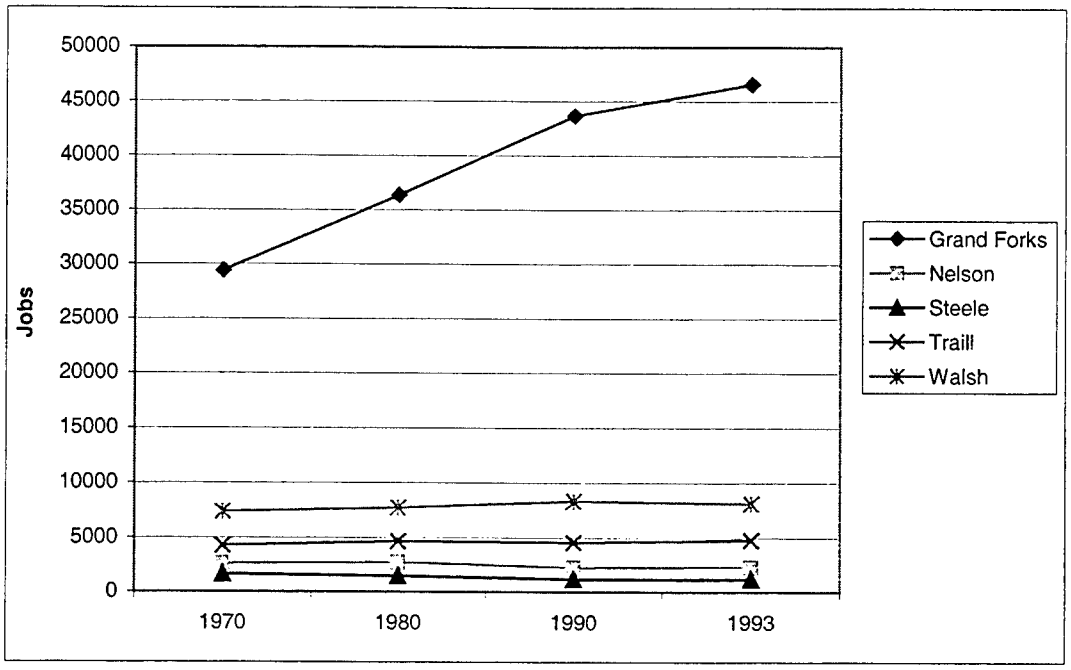
Source: U.S. Bureau of the Census, 1996—Land Area, Population, and Density for States and Counties.

Employment

The total employment for the ROI in 1993 was 62,952. Grand Forks County had the largest number of employees, with 46,567 representing about 74 percent of the ROI's jobs. Figure 3.11-43 illustrates the dominance of Grand Forks, since 1970, as a center of employment, as well as the extent of its growth. Figure 3.11-44, an index of employment, shows that the rate of growth of employment in Grand Forks County was slightly faster than the state's. Employment growth was relatively flat, or declined, in the remaining counties of the ROI.

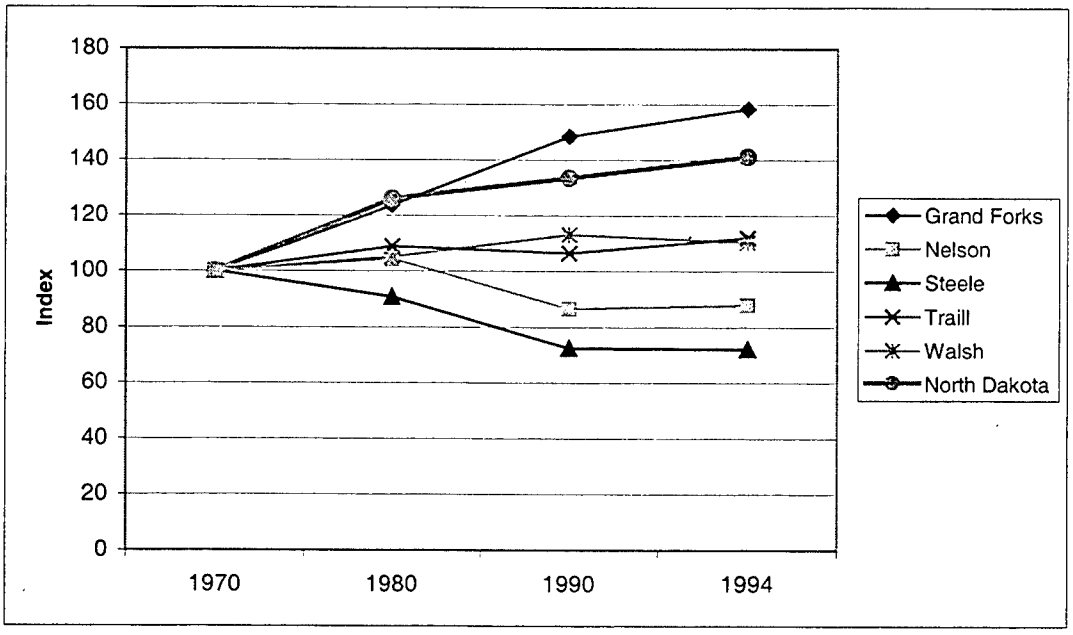
The three most important employment sources in the ROI have been Government, Services, and Retail & Wholesale. Grand Forks AFB has been the main Federal employer in the region. In 1972, military employment accounted for about 23 percent of all the nonfarm jobs in Grand Forks County. As the local economy and population of Grand Forks has expanded and defense cutbacks have reduced military jobs, this proportion of nonfarm employment has fallen to about 12 percent. Nevertheless, military jobs amounted to over 5,400 in Grand Forks County in 1993.

Figure 3.11-43: Jobs in the ROI



Source: Goodman, 1996—The Economic Health of North Dakota

Figure 3.11-44: Index of Job Change in the ROI



Source: Goodman, 1996—The Economic Health of North Dakota

The dominance of Services and Retail & Wholesale jobs typifies the role of Grand Forks as a regional center providing its surrounding communities with a wide range of shopping and professional and technical services.

Although the ROI includes four rural counties, agriculture in 1993 accounted for fewer than 10 percent of its jobs, further underlining the dominance of Grand Forks in the local economy. The trends affecting farming in North Dakota are likely to lead to a further decline in the importance of the agriculture sector in the ROI. Farms in North Dakota and the ROI have been falling in number but increasing in size and in their requirement for costly capital equipment, as world agricultural markets have become more competitive and the Federal government's subsidy of farming has been reduced.

The Impact of the Grand Forks Flood on Employment and Wages

A study by the North Dakota Job Service opens by stating that "The Red River flood of 1997 had a significant and widespread impact upon Grand Forks County, and in particular the city of Grand Forks, in terms of employment and wage levels" (Job Service North Dakota, 1998—Grand Forks County Impact of Spring Flood Second Quarter 1997). The study goes on to point out that actual employment and wages in the county fell short of forecasts by 10.7 percent and 8.1 percent, respectively.

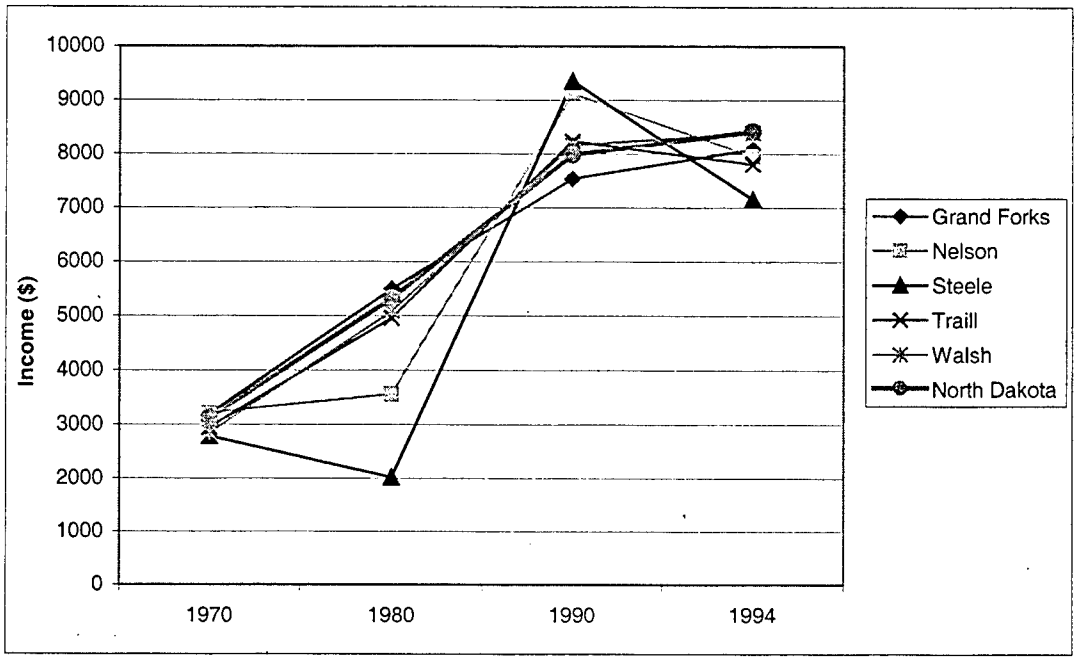
The flood's impact on each of the industrial sectors that composed the local economy varied substantially. The local construction industry experienced above-forecast wage rates and an influx of employees from other industries who were seeking higher wages. It is expected that these trends will continue for several years, as rebuilding projects end and new ones begin. Employment in the retail trade and service industries was between 14.7 percent and 15.9 percent lower than forecast. Lower paid jobs within these sectors have not been refilled, particularly in the eating and drinking sectors. The local wholesale sector suffered losses in wages and employment because its customers—the retailers—were hardest hit by the flood. Many manufacturing firms were located in flooded areas and as a result lost output, released employees, and lowered wages.

Income

Figure 3.11-45 shows the change in real per capita income in the ROI and in North Dakota. With the exception of Nelson and Steele counties, real per capita income in the ROI followed the state trend, increasing rapidly between 1970 and 1990 and then less rapidly between 1990 and 1994. Nelson and Steele counties are the smallest within the ROI and have experienced the most rapid population decline since the 1950s. It is likely, therefore, that the apparent volatility of real per capita income is

a reflection of this declining and aging population, rather than an increasing level of average wealth.

Figure 3.11-45: Per Capita Income, 1970-1994



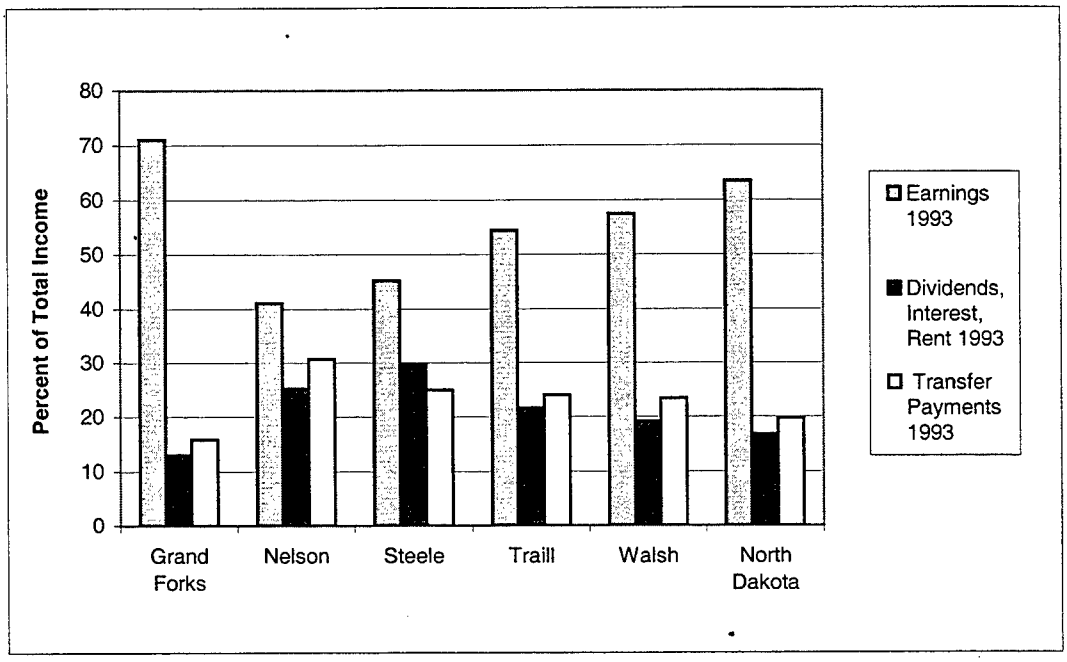
Source: Goodman, 1996—The Economic Health of North Dakota

Figure 3.11-46 shows the components of Total Personal Income (TPI) for each of the counties within the ROI in 1993. Grand Forks County has the largest proportion of its TPI in the form of wages, unlike Nelson Steele, and Traill. Nelson and Steele counties have the highest proportion of transfer payments as a component of their TPI, supporting the contention that wealth in these counties is concentrating among a smaller number of older people.

Retail Sales

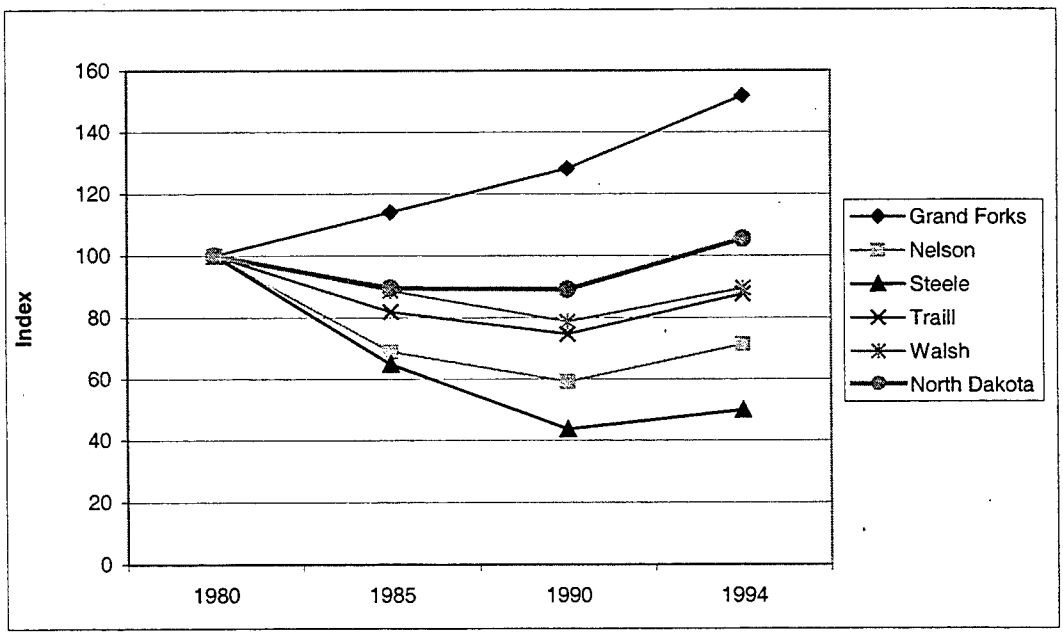
Figure 3.11-47 and figure 3.11-48 illustrate the dominance of Grand Forks as a retailing center within the ROI. While Walsh County reported real sales of a little over $44 million in 1994, Grand Forks County had sales of almost $370 million, or 13.5 percent of all of North Dakota's retail sales for that year. The index of real retail sales shows clearly the year-on-year growth generated by Grand Forks, compared to a much smaller growth rate for the state and a decline in the other counties within the ROI. Nelson and Steele experienced the most precipitous falls in real retail sales during the period, once again highlighting the sharp contrast between the expanding urban population centers of North Dakota and the chronic decline being experienced in rural areas and their communities.

Figure 3.11-46: The Components of Total Personal Income



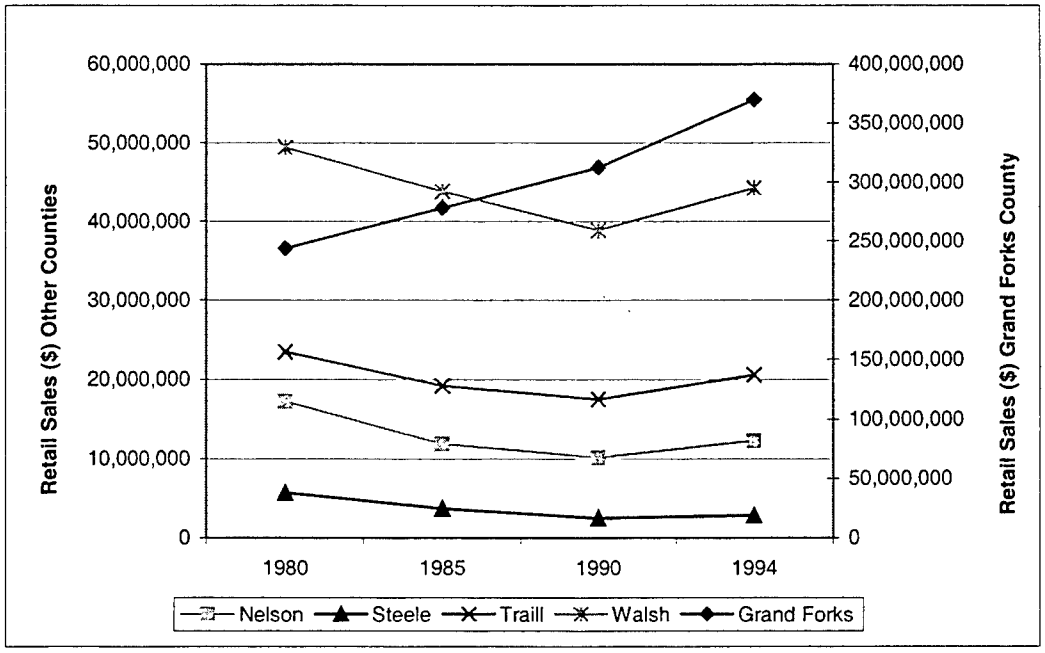
Source: Goodman, 1996—The Economic Health of North Dakota

Figure 3.11-47: Index of the Change in Retail Sales in the ROI, 1980-1994



Source: Goodman, 1996—The Economic Health of North Dakota

Figure 3.11-48: Retail Sales in the ROI, 1980-1994



Source: Goodman, 1996—The Economic Health of North Dakota

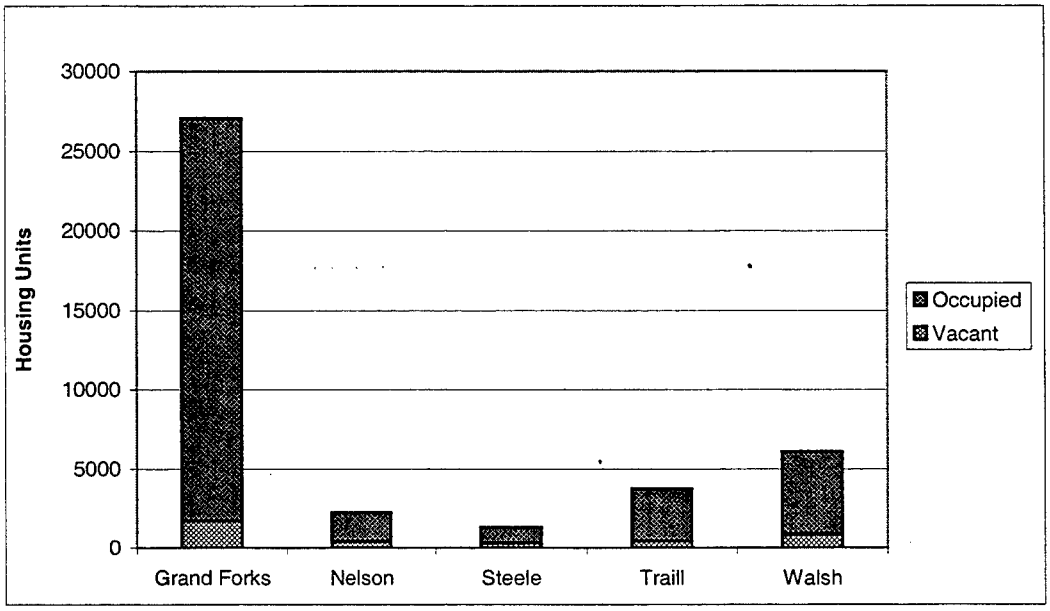
Housing, Education and Health

Housing construction in Grand Forks has been subject to several peaks and troughs since 1970. While single family homes constituted the main body of the housing stock before that date, apartments and condominiums have become increasingly prevalent in recent years. Much of this latter trend has been attributed to the accommodation demands of Grand Forks AFB between 1970 and 1980.

There were 40,520 housing units in the ROI in 1990. The overall percentage vacancy rate was 9.4 percent, or 3,793 units. Figure 3.11-49 illustrates the dominance of Grand Forks in the ROI's housing market.

The full impact of the Grand Forks flood on the population and housing of Grand Forks has yet to be determined. Many basement apartments have been removed from the housing stock because of flood damage, and many more are occupied by the transient population of construction workers. The immediate 4 percent drop in the post-flood school rolls (as a result of people moving away from the area) suggests that the supply of housing units in Grand Forks will exceed demand for several years to come. The true extent of permanent out-migration, however, will not be known until the transient construction workers leave the area at the close of their contracts.

Figure 3.11-49: Housing Vacancy Rates in the ROI in 1990



Source: Coon and Leistritz, 1998—The State of North Dakota: Economic, Demographic, Public Service, and Fiscal Conditions.

Housing in other parts of the ROI is subject to the trend common throughout rural North Dakota—the migration of people away from the countryside is leaving under-populated communities in which vacant property is readily available.

The Metro Forks Community Profile (Metropolitan Planning Organization, 1996) identified 13 elementary schools, 4 junior high schools, and 3 high schools with a combined enrollment of 9,670 pupils. In addition, Grand Forks AFB provided on-base tertiary education facilities for about 1,070 students per term at Lake Region Junior College, Park College, Embry Riddle Aeronautical University, and Central Michigan University.

The Red River flood closed 17 of Grand Forks' schools, with 7 requiring substantial refurbishment. It is expected that all will be reopened.

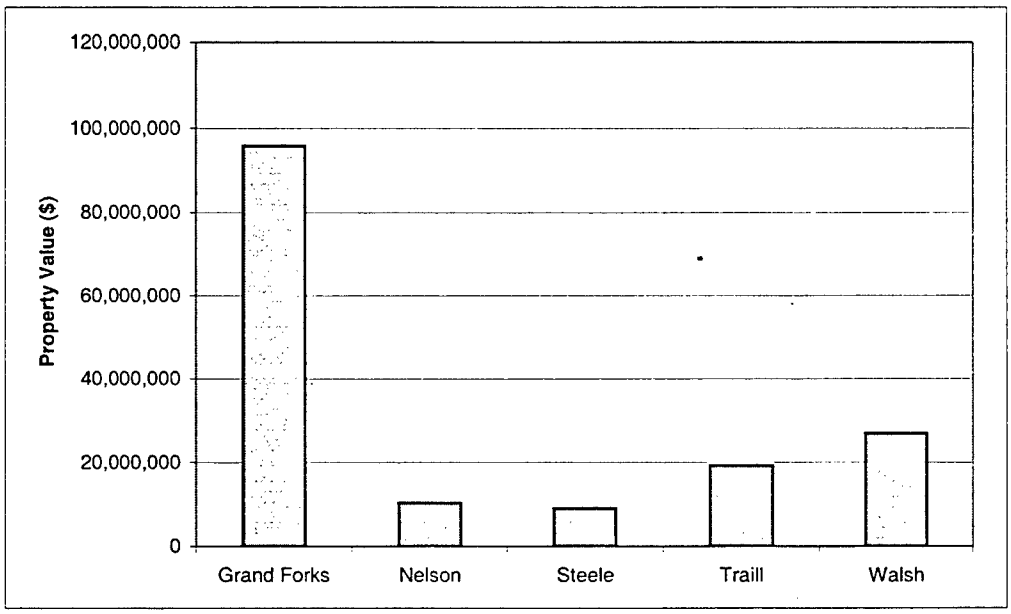
Schools in the remainder of the ROI have been experiencing falling rolls and are therefore operating at below capacity.

Health services in the ROI are centered in Grand Forks, which has five clinics and two hospitals. There were 305 hospital beds, 140 medical doctors, and 8 independent medical practices serving the wider Grand Forks region of 300,000 residents in December 1996 (Grand Forks Chamber of Commerce, 1996—Forks Facts). This region covered all of the ROI.

Fiscal Conditions

Figure 3.11-50 shows the taxable value of each of the five counties in the ROI. The 1996 taxable value of property in the ROI was $161,132,417, or 14.5 percent of the State of North Dakota's total taxable value of property for that year. Nelson and Steele counties had the highest per capita local property taxes as well as the highest expenditure per head as shown in figures 3.11-51 and 3.11-52. This phenomenon was a function of their decline in population and their high proportion of agricultural land illustrated in figure 3.11-53.

Figure 3.11-50: Total Taxable Property Value in the ROI 1996



Source: Coon and Leistritz, 1998—The State of North Dakota: Economic, Demographic, Public Service, and Fiscal Conditions.

3.11.2.3 Missile Site Radar—Socioeconomics

The socioeconomic affected environment for Missile Site Radar is the same as that described for Cavalier AFS in section 3.11.2.1.

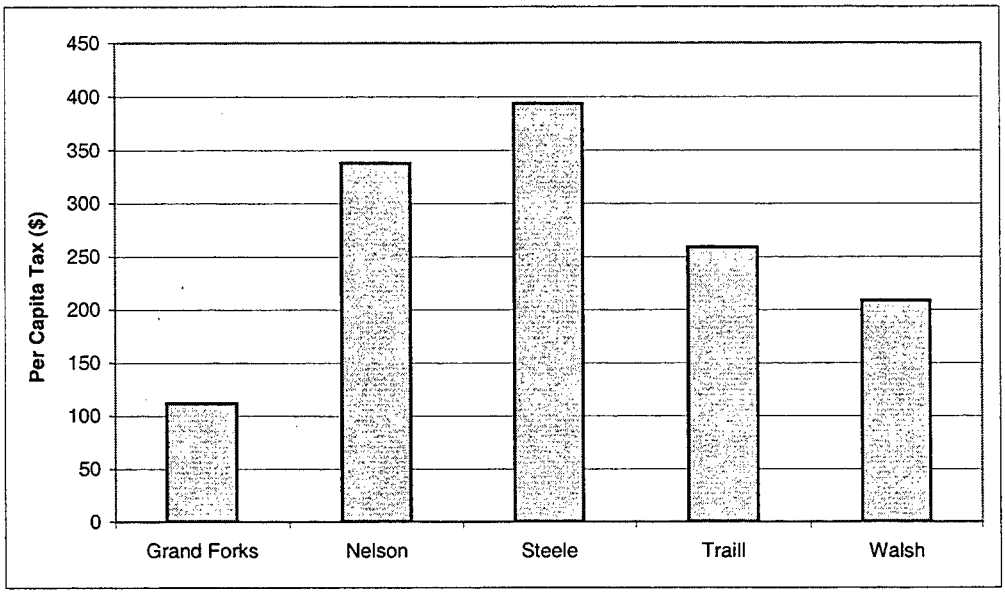
3.11.2.4 Remote Sprint Launch Site 1—Socioeconomics

The socioeconomic affected environment for Remote Sprint Launch Site 1 is the same as that described for Cavalier AFS in section 3.11.2.1.

3.11.2.5 Remote Sprint Launch Site 2—Socioeconomics

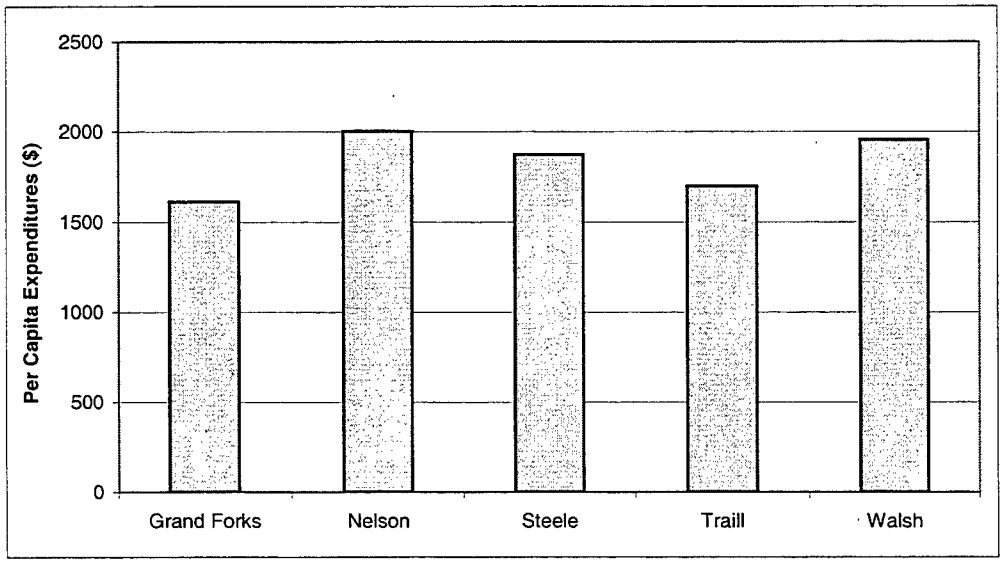
The socioeconomic affected environment for Remote Sprint Launch Site 2 is the same as that described for Cavalier AFS in section 3.11.2.1.

Figure 3.11-51: Per Capita Local Property Tax 1996



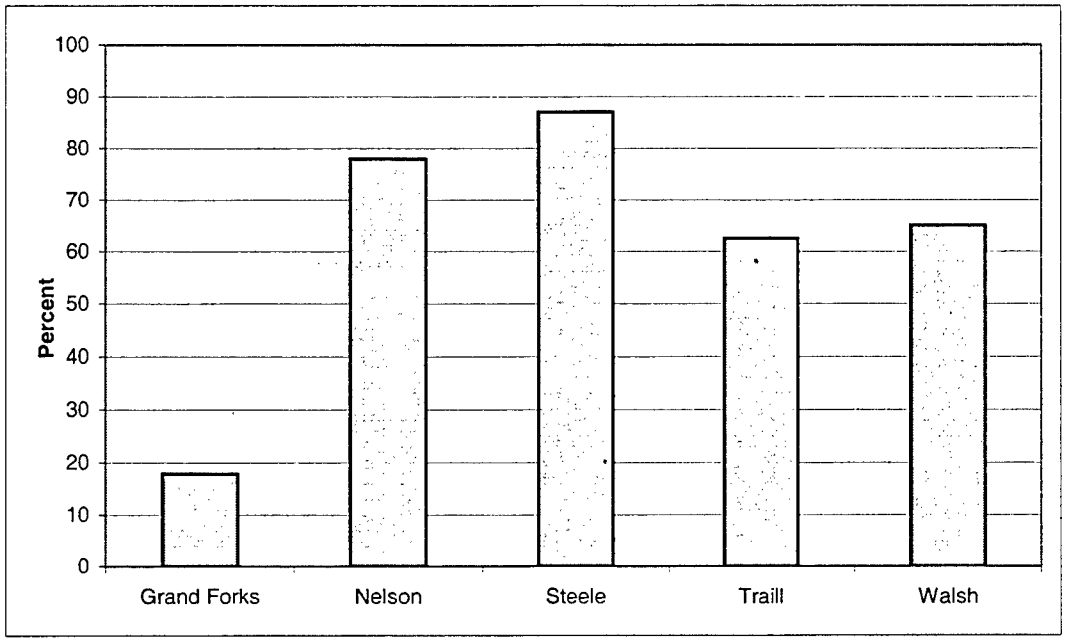
Source: Coon and Leistritz, 1998—The State of North Dakota: Economic, Demographic, Public Service, and Fiscal Conditions.

Figure 3.11-52: Per Capita Local Government Expenditure 1992



Source: Coon and Leistritz, 1998—The State of North Dakota: Economic, Demographic, Public Service, and Fiscal Conditions.

Figure 3.11-53: Agriculture Land as a Percent of Total Taxable Value 1996



Source: Coon and Leistritz, 1998—The State of North Dakota: Economic, Demographic, Public Service, and Fiscal Conditions.

3.11.2.6 Remote Sprint Launch Site 4—Socioeconomics

The socioeconomic affected environment for Remote Sprint Launch Site 4 is the same as that described for Cavalier AFS in section 3.11.2.1.

3.12 TRANSPORTATION

The evaluation of existing roadway and airport conditions is based on capacity, which reflects the ability of a given roadway or airport to accommodate vehicular demand and volume.

Traffic volumes are typically reported in Annual Average Daily Traffic (AADT) counts, which is the total volume of vehicles per day averaged for an entire year. These counts are provided upon request from the Department of Transportation. A comparison of a roadway's volume to its capacity is expressed in terms of levels of service (LOS). There are six levels of service, ranging from A to F, with LOS A representing the best operating conditions and LOS F the worst (table 3.12-1).

Table 3.12-1: Roadway Levels of Service

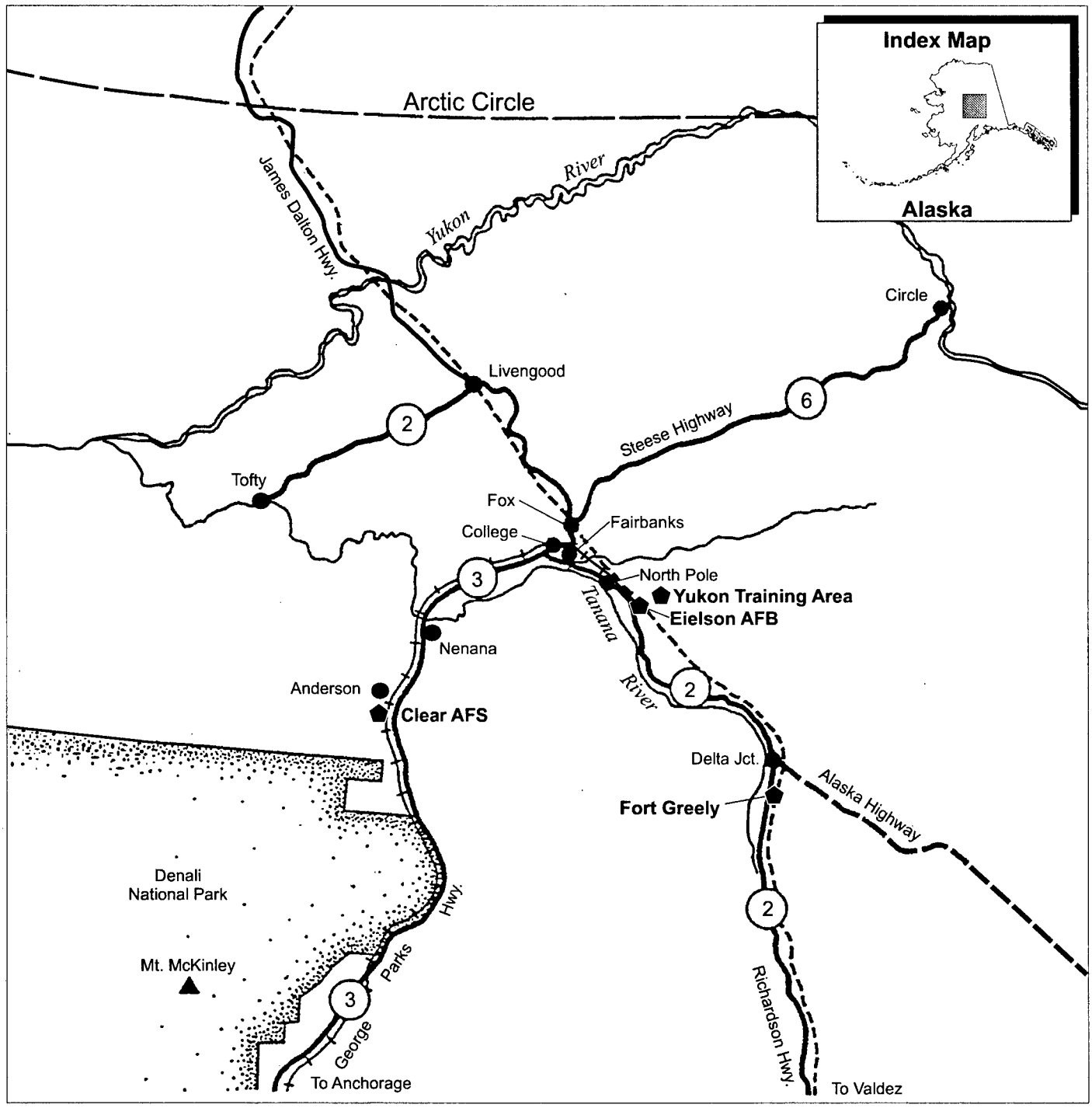
Level of Service	Description
A	Primarily free flow operations with users almost completely unhindered in their ability to maneuver within the traffic stream
B	Reasonably free flow operations with users' ability to maneuver within the traffic stream only slightly restricted
C	Stable flow with users' freedom to maneuver within the traffic stream noticeably restricted; noticeable increase in driver tension
D	High density, but stable flow; speed and freedom to maneuver are more noticeably limited; reduced level of driver comfort and convenience
E	Unstable flow; operating conditions at capacity, reduced speeds, maneuverability extremely limited, and extremely poor level of driver comfort and convenience
F	Breakdown in vehicular flow with traffic demand exceeding capacity; unstable stop-and-go traffic

Source: Compiled from National Research Council, 1994—Highway Capacity Manual.

3.12.1 ALASKA INSTALLATIONS

Roadway travel in Alaska is limited, with the only highways being in the southeastern quarter of the state. Due to the limited amount of roadways, the traffic volume in sparsely populated areas tends to be greater than experienced in the lower 48 states. The summer months experience the highest amount of traffic, due to tourism and good weather. When available, the summer average daily traffic counts were used to determine the level of service. Figure 3.12-1 shows the highways within central Alaska.

Given the vast area of Alaska and limited road network, aircraft provide an alternate means of transportation. This section addresses airports potentially used by the NMD program. Issues related to airspace use around potential NMD locations are discussed in section 3.3, Airspace.



EXPLANATION

- TransAlaska Pipeline
- Alaska Railroad
- City
- Military Installation

NORTH

Not to Scale

Central Alaska Highways

Alaska

Figure 3.12-1

A discussion of the transportation resource area and the methodology involved is found in section 3.12.

3.12.1.1 Clear AFS—Transportation

Ground Transportation

The ROI for the transportation analysis includes the George Parks Highway in the vicinity of Clear AFS and the on-base roads expected to be the roadway route used for construction and operation activities.

Clear AFS is located in Interior Alaska approximately 126 kilometers (78 miles) southwest of Fairbanks, near the community of Anderson. The main base road provides access from the George Parks Highway to the base main gate. The only off-base paved public road of any distinction in the area is Anderson Road, which provides access to the community of Anderson and to Clear Airport. The George Parks Highway is the primary road in the area, running north–south and connecting Anchorage and Fairbanks.

The area surrounding Clear AFS is relatively remote, with a moderate traffic volume. The summer average daily traffic for the George Parks Highway in the vicinity of Clear AFS is 2,011 (Alaska Department of Transportation and Public Facilities, 1997—Annual Traffic Volume Report). The highway operates at LOS B (see table 3.12-2). Vehicular traffic on Clear AFS is accommodated by a 14-kilometer (8.7-mile) network of primary and secondary roads, with 5.5 kilometers (3.4 miles) of paved roads and 8.5 kilometers (5.3 miles) of unpaved roads (Clear AFS, 1993—Comprehensive Planning Framework). There is no traffic volume information for Anderson Road or the main gate to Clear AFS.

Table 3.12-2: Peak-Hour Traffic Volumes and Levels of Service

Roadway	Location	Annual Average Daily Traffic[1]	Capacity[2] Peak Hour Volume	Traffic[2] Peak Hour Volume	Level of Service
Alaska Highway	Delta Junction	3,350	1,763	372	B
George Parks Highway	Anderson Road	2,011[3]	1,526	231	B
Richardson Highway	Eielson AFB	10,461[3]	2,200	214	A
Richardson Highway	Fort Greely	1,750	1,763	204	B

[1] Source: Alaska Department of Transportation and Public Facilities, 1997—Annual Traffic Volume Report.

[2] For four-lane roadways, volumes and capacity are one-way, per lane.

[3] Summer average daily traffic numbers

Notes: Calculations performed using the National Research Council, 1994—Highway Capacity Manual.

Air Transportation

The ROI for the air transportation analysis includes the airports in the vicinity of Clear AFS. There is no runway at Clear AFS. The nearest airfield is Clear Airport, which is operated by the State of Alaska and is located just outside the base boundary. The airfield provides an alternate means of transportation to and from Clear AFS and the community of Anderson. It serves a vital role as a means of medivac service and is used by private pilots in the area. According to the FAA master record, annual operations at this facility total 2,000. The majority of these involve private aircraft. At least 14 based aircraft are reported at the airport. In addition, it was reported that approximately 2,500 helicopter operations associated with forest fire fighting have occurred on five different occasions over the past 10 years. The Clear Airport runway is paved and is approximately 1,219 meters (4,000 feet) in length and 30 meters (100 feet) wide (Alaska Department of Transportation and Public Facilities, 1993—EA for Clear Airport Improvements).

3.12.1.2 Eielson AFB—Transportation

Ground Transportation

The ROI for the transportation analysis includes the Richardson Highway in the vicinity of the base and the on-base roads expected to be the roadway route used for construction and operation activities.

Eielson AFB is located approximately 37 kilometers (23 miles) southeast of Fairbanks near the community of Moose Creek. The Richardson Highway, a four-lane divided highway, provides access to the base through the Hursey Gate. This gate is the only operational gate at Eielson allowing access to and from the installation (Pacific Air Forces, 1998—Draft General Plan, Eielson AFB).

The Richardson Highway is the primary road in the area and spans southeast Alaska, connecting Fairbanks with Valdez. The installation has a network of roads and streets, which for the most part are laid-out on a north–south grid (Pacific Air Forces, 1998—Draft General Plan, Eielson AFB). Most roads are two-lanes and paved; however, some are gravel.

The area surrounding Eielson AFB is sparsely populated with a moderate traffic volume. The summer average daily traffic for the Richardson Highway in the vicinity of the base is 10,461 (Alaska Department of Transportation and Public Facilities, 1997—Annual Traffic Volume Report). The highway operates at LOS A (see table 3.12-2). There is no traffic volume information for the Hursey Gate, but it usually has no traffic problems (EDAW, Inc., 1998—Trip Report of visit to Alaska, July 20–31).

Air Transportation

The ROI for the air transportation analysis includes the Eielson AFB airport. Eielson AFB is home to the 354th Fighter Wing. The 354th equips and trains its 18th Fighter Squadron of F-16s, and the wing's 355th Fighter Squadron flies the A-10 and OA-10 aircraft. The runway is 4,420 meters (14,500 feet) in length and supports all aircraft in the Air Force inventory. Air traffic is all military-related, with no civilian aircraft using the facility. Approximately 59,000 aircraft operations occur per year at Eielson AFB.

3.12.1.3 Fort Greely—Transportation

Ground Transportation

The ROI for the transportation analysis includes the Richardson Highway in the vicinity of Fort Greely, the Alaska Highway at Delta Junction, and Fort Greely installations roads. These roadways are expected to be used for construction and operation activities.

Fort Greely is located approximately 172 kilometers (107 miles) southeast of Fairbanks and just south of the community of Delta Junction. The Richardson Highway provides access to the base. The primary roads in the area are the Richardson Highway, which runs north–south connecting Fairbanks and Valdez, and the Alaska Highway, which runs east–west connecting Delta Junction with the Canadian-American border. Fort Greely is located approximately 10 kilometers (6 miles) south of the junction of these two highways.

Fort Greely consists of the Main Post, two large training areas (Fort Greely Maneuver Area and Fort Greely Air Drop Zone), and three outlying areas (Gerstle River Test Site, Black Rapids Training Site, and Whistler Creek Rock Climbing Area). Roads serving the Main Post are generally paved and in good condition. Range roads are generally graded and in fair condition, with the exception of a few unmaintained roads. (U.S. Army Alaska, 1997—Draft Integrated Natural Resources Management Plan)

The area surrounding Fort Greely is sparsely populated with a moderate traffic flow. The Richardson Highway in the vicinity of Fort Greely experiences an AADT of 1,750. The Alaska Highway at the Richardson Highway junction has an AADT of 3,350 (Alaska Department of Transportation and Public Facilities, 1997—Annual Traffic Volume Report). Both of these roads are two-lane in this area and operate at LOS B (see table 3.12-2). There is no traffic information for Fort Greely installation roadways.

Currently, Fort Greely is undergoing realignment, which is scheduled for completion by July 2001. This realignment will decrease personnel at Fort Greely from approximately 750 in 1997 to 66 by 2001. Likewise, traffic volume in the area will also decrease.

Air Transportation

The ROI for the air transportation analysis includes the Fort Greely airport. Allen Army Airfield at Fort Greely provides general aviation support for the U.S. Army Garrison, Post Headquarters, Cold Regions Test Center, the Northern Warfare Training Center, and U.S. Army Alaska. The Aviation Detachment at Allen Army Airfield also provides support for visiting DOD units during training exercises. Allen Army Airfield has three runways. All of these runways are operational, although one is not plowed in the winter. The northeast/southwest runway is 2,286 meters (7,500 feet) in length, and the northwest/southeast runway is 1,859 meters (6,100 feet) in length. The airfield can support C5/C41 aircraft in the winter and C130 aircraft at all times of the year. Air traffic is mostly military-related, with approximately 6,000 operations per year.

3.12.1.4 Yukon Training Area (Fort Wainwright)—Transportation

Ground Transportation

The ROI for the transportation analysis includes the Richardson Highway in the vicinity of the Eielson AFB and roadways within the Yukon Training Area that are expected to be used for construction and operation activities.

The Yukon Training Area is located approximately 40 kilometers (25 miles) southeast of Fairbanks. Although the Yukon Training Area is part of Fort Wainwright, it is located about 24 kilometers (15 miles) southeast of the main post. Access into the area is gained from the Richardson Highway at two points: through the main gate of Eielson AFB and via Johnson Road, which intersects the highway about 16 kilometers (10 miles) south of the Eielson AFB Hursey Gate. The Yukon Training Area consists of a network of unpaved roads and trails. There is no traffic information for the Yukon Training Area roadways.

More information concerning the traffic volume of the Richardson Highway and roadways associated with Eielson AFB can be found in section 3.12.1.2.

Air Transportation

There are no airport facilities on the Yukon Training Area. The Army uses Fort Wainwright in Fairbanks for their aviation support needs.

3.12.2 NORTH DAKOTA

The existing roadways system in northeastern North Dakota includes Federal, state, and county roads. Because the topography of the area is basically flat, the road network is essentially orthogonal in north–south and east–west directions. Most of this area of North Dakota is rural, and traffic volume is relatively low. Roadway capacity is not an issue in this region of the state. Figure 3.12-2 shows the roadways within northeast North Dakota.

This section addresses the airports potentially used by the NMD program. Issues related to airspace use around potential NMD locations are discussed in section 3.3, Airspace.

A discussion of the transportation resource area and the methodology involved is found in section 3.12.

3.12.2.1 Cavalier AFS—Transportation

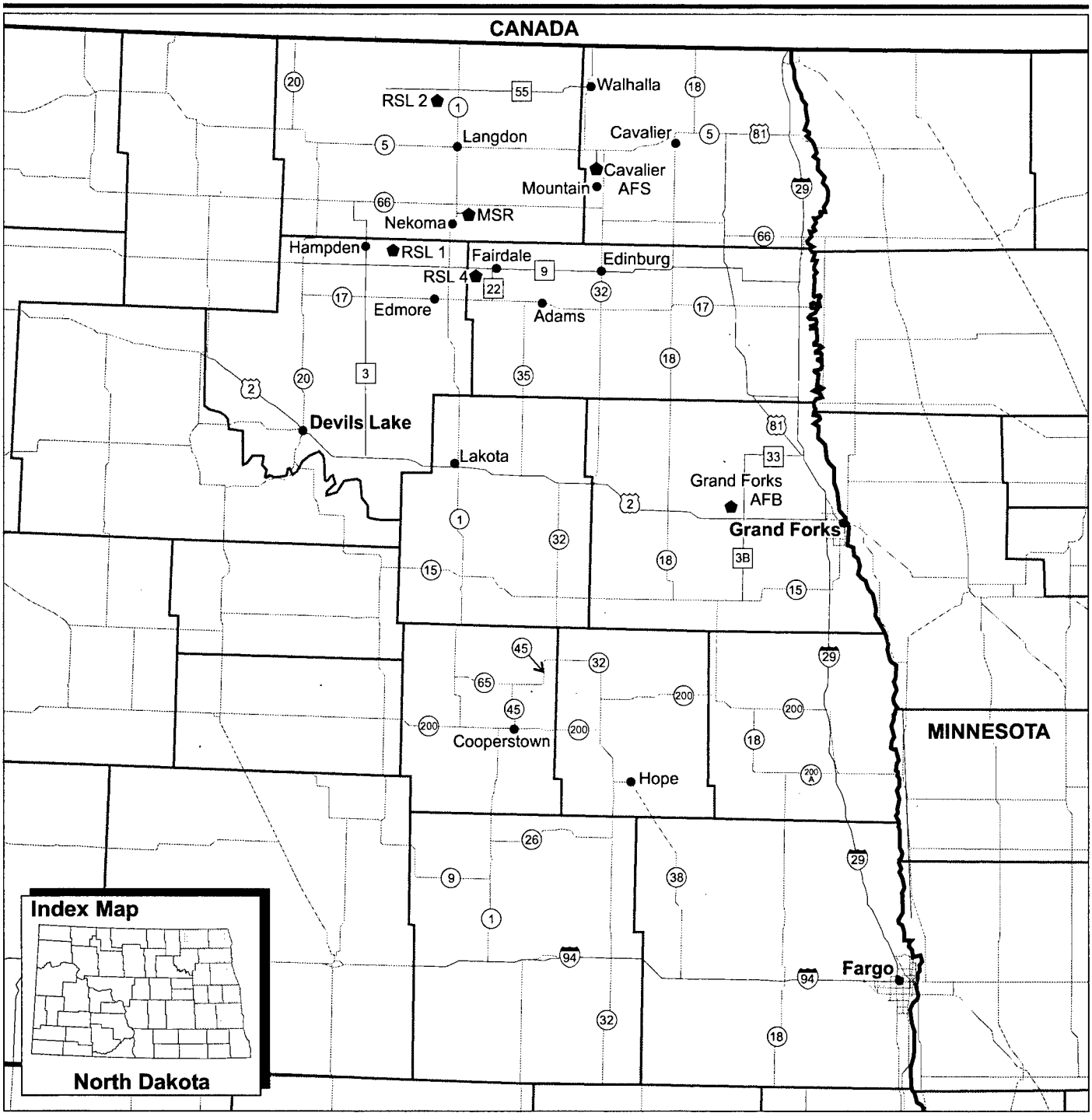
Ground Transportation

The ROI for the transportation analysis includes the installation roadways and roadways in the surrounding area of Cavalier AFS that are expected to be utilized for construction and operation activities.

Cavalier AFS is located on the western edge of Pembina County, North Dakota, approximately 23 kilometers (14 miles) southwest of the town of Cavalier. Cavalier AFS is served by ND 5, 4 kilometers (2.5 miles) north of the station. CR 89 provides access to the station through the traffic checkpoint/entry gate. (U.S. Air Force Space Command—Comprehensive Planning Framework, Cavalier AS) The primary road network of the area consists mainly of state highways and county roads, which are all two-lane roads.

ND 5 runs east–west connecting the towns of Cavalier and Langdon. ND 32 runs north–south connecting Walhalla and the Canadian border to the communities of Mountain and Edinburg (see figure 3.12-2).

The area surrounding Cavalier AFS is sparsely populated, and traffic volume is low. ND 5 in the vicinity of the station has an AADT of 1,000, and ND 32 has an AADT of 550 (North Dakota Department of Transportation, 1996—Traffic Volume Map, Pembina County). The traffic volume of CR 89 at the ND 5 junction is AADT 300 (North Dakota Department of Transportation, 1996—Traffic Volume Map, Pembina County). The areas with the highest traffic volume are the cities of Cavalier (ND 5), Walhalla (ND 32), and Langdon (ND 5), which experience an AADT of 3,500, 1,400, and 1,325, respectively (North Dakota Department of Transportation, 1996-Traffic Volume Map, Cavalier and Pembina County). As shown in table 3.12-3, all of these roadways



EXPLANATION

- Roads
- Interstate Roads
- U.S. Highways
- State Highways
- County Roads
- City
- Military Installation

Scale 1:1,500,000

0 12 24 Miles

NORTH

0 19 39 Meters

Major Roadways in Northeast North Dakota

North Dakota

Figure 3.12-2

Table 3.12-3: Peak-Hour Traffic Volumes and Levels of Service

Roadway	Location	Annual Average Daily Traffic[1]	Capacity[2] Peak Hour Volume	Traffic[2] Peak Hour Volume	Level of Service
CR 3	Remote Sprint Launch Site 1	280	2,660	31	A
CR 3B	Grand Forks AFB main gate	7,000	2,580	778	C
CR 9	Remote Sprint Launch Site 4	170	2,660	19	A
CR 22	Remote Sprint Launch Site 4	200	2,660	22	A
CR 26	Missile Site Radar	180	2,660	20	A
CR 32	Remote Sprint Launch Site 1	65	2,660	8	A
CR 55	Remote Sprint Launch Site 2	150	2,660	17	A
CR 89	ND 5 junction Cavalier AFS	300	2,660	33	A
ND 1	Missile Site Radar	600	2,660	67	A
ND 1	Remote Sprint Launch Site 1	510	2,660	57	A
ND 1	Remote Sprint Launch Site 2	575	2,660	64	A
ND 1	Remote Sprint Launch Site 4	490	2,660	54	A
ND 5	Cavalier	3,500	2,580	389	B
ND 5	Cavalier AFS	1,000	2,660	111	A
ND 5	Langdon	1,325	2,580	148	A
ND 17	Remote Sprint Launch Site 4	450	2,660	50	A
ND 32	Cavalier AFS	550	2,660	61	A
ND 32	Walhalla	1,400	2,580	156	A
ND 66	Missile Site Radar	280	2,660	31	A
U.S. 2[2]	CR 3B (main entrance)	10,500	2,200	315	A
U.S. 2[2]	Secondary gate	5,900	2,200	177	A

[1] Source: North Dakota Department of Transportation, 1996—Traffic Volume Map, Cavalier, Grand Forks, Pembina, Ramsey, and Walsh Counties.

[2] For 4-lane roadways, traffic volumes and capacity are one-way, per lane.

Notes: Calculations performed using the National Research Council, 1994—Highway Capacity Manual. Level terrain, 5 percent truck traffic, 50/50 directional split, and peak hour factor of 0.9 were used in all capacity calculations.

CR = County Road, ND = North Dakota

operate at LOS A, except ND 5 in the city limits of Cavalier, which operates at LOS B.

Air Transportation

General aviation support for Cavalier AFS is provided by Grand Forks AFB, discussed in section 3.12.2.2.

3.12.2.2 Grand Forks AFB—Transportation

Ground Transportation

The ROI for the transportation analysis includes the on-base roadways and roadways in the surrounding area of Grand Forks AFB that are expected to be utilized for construction and operation activities.

The area surrounding Grand Forks AFB is served by a network of U.S., state, and county roads. The main gate is located off of CR 3B (two-lane), approximately 1.6 kilometers (1 mile north) of U.S. 2, while the secondary gate is located off of U.S. 2 (four-lane), approximately 1.2 kilometers (0.75 mile) west of CR 3B (see figure 3.12-2). Traffic counts for these gates are no longer compiled by the base (U.S. Department of the Air Force, 1999—Final EIS, Minuteman III Missile System Dismantlement). U.S. 2 in the vicinity of the base has an AADT count of 10,500 vehicles, while CR 3B between U.S. 2 and the main gate has an AADT of 7,000 vehicles (North Dakota Department of Transportation, 1996—Traffic Volume Map, Grand Forks County). Both of these roadways operate at LOS A.

Air Transportation

The ROI for the air transportation analysis includes the Grand Forks AFB airport. Grand Forks AFB is host to the 319th Air Refueling Wing and the 321st Missile Group. The runway is approximately 3,764 meters (12,350 feet) in length and is capable of accommodating most aircraft in the Air Force inventory. Air traffic is all military-related, with no civilian aircraft using the facility. At Grand Forks AFB, approximately 35,000 aircraft operations occur per year.

3.12.2.3 Missile Site Radar—Transportation

Ground Transportation

The ROI for the transportation analysis includes the roadways adjacent and in the surrounding area of the Missile Site Radar that are expected to be utilized for construction and operation activities.

The Missile Site Radar is located in Cavalier County, North Dakota, approximately 21 kilometers (13 miles) south of the town of Langdon,

and just north of the town of Nekoma. The Missile Site Radar is accessed by CR 26 via ND 1. The network of roadways in the vicinity of the site consists of state highways and county roads. ND 1 is the primary road in the area, running north–south and connecting the town of Langdon to Lakota. ND 66 runs east–west, and is approximately 5 kilometers (3 miles) north of the site (see figure 3.12-2).

Currently, the Missile Site Radar is inactive and the only traffic to the site is from maintenance personnel. The area surrounding the Missile Site Radar is remote, and traffic volume is low. ND 1 in the vicinity of the site has an AADT of 600, and ND 66 has an AADT of 280 (North Dakota Department of Transportation, 1996—Traffic Volume Map, Cavalier County). CR 26 experiences an AADT of 180 (North Dakota Department of Transportation, 1996—Traffic Volume Map, Cavalier County). All of these roads are two-lane and operate at LOS A (see table 3.12-3).

Air Transportation

The Missile Site Radar is in caretaker status with minimal activities; there are no airport facilities at this location.

3.12.2.4 Remote Sprint Launch Site 1—Transportation

Ground Transportation

The ROI for the transportation analysis includes the roadways adjacent and in the surrounding area of Remote Sprint Launch 1 that are expected to be utilized for construction and operation activities.

Remote Sprint Launch Site 1 is located in northern Ramsey County, approximately 5 kilometers (3 miles) east of the town of Hampden. The site is served north–south by CR 3, connecting the towns of Hampden and Devils Lake, and east–west by CR 32. CR 32 provides access to Remote Sprint Launch 1. The primary roads in the area consist of ND 1, which connects Remote Sprint Launch 1 to Langdon and Lakota, CR 3, and CR 32 (see figure 3.12-2).

Currently, Remote Sprint Launch Site 1 is inactive, and the only traffic to the site is occasional maintenance visits. The traffic volumes on the area roadways are low with ND 1, CR 3, and CR 32 experiencing AADT values of 510, 280, and 65, respectively (North Dakota Department of Transportation, 1996—Traffic Volume Map, Ramsey County). All of these roadways are two-lane and operate at LOS A (table 3.12-3).

Air Transportation

Remote Sprint Launch Site 1 is in caretaker status with no activities; there are no airport facilities at this location.

3.12.2.5 Remote Sprint Launch Site 2—Transportation

Ground Transportation

The ROI for the transportation analysis includes the roadways adjacent and in the surrounding area of Remote Sprint Launch 2 that are expected to be utilized for construction and operation activities.

Remote Sprint Launch Site 2 is located in Cavalier County, North Dakota, approximately 13 kilometers (8 miles) north–northwest of the town of Langdon and 18 kilometers (11 miles) south of the Canadian border. Remote Sprint Launch Site 2 is served by ND 1, which runs north–south connecting Langdon and the Canadian border. CR 55 is located approximately 5 kilometers (3 miles) north of the site, and runs east–west connecting the site to the town of Walhalla. An unnamed county road provides access to the site via ND 1 (see figure 3.12-2).

Remote Sprint Launch Site 2 is currently inactive, and the only traffic to the site is for occasional maintenance visits. The site is located in a remote area, and traffic volume is low. ND 1 in the vicinity of the site has an AADT of 575, and CR 55 has an AADT of 150 (North Dakota Department of Transportation, 1996—Traffic Volume Map, Cavalier County). Both of these roadways are two-lane and operate at LOS A. Traffic volume data for the unnamed county road providing access to the site is not available.

Air Transportation

Remote Sprint Launch Site 2 is in caretaker status with no activities; there are no airport facilities at this location.

3.12.2.6 Remote Sprint Launch Site 4—Transportation

Ground Transportation

The ROI for the transportation analysis includes the roadways adjacent and in the surrounding area of Remote Sprint Launch 4 that are expected to be utilized for construction and operation activities.

Remote Sprint Launch Site 4 is located in the northwest corner of Walsh County, North Dakota, approximately 3 kilometers (2 miles) southwest of the town of Fairdale. The site is served north–south by CR 22 and east–west by CR 9. An unnamed county road provides access to Remote Sprint Launch Site 4. The primary roads in the area are ND 17 connecting the towns of Edmore and Adams, and ND 1 connecting the towns of Langdon and Lakota (see figure 3.12-2).

Remote Sprint Launch Site 4 is currently inactive, and the only traffic to the site is for occasional maintenance visits. The area surrounding the site is sparsely populated, and the traffic volume is low. CR 22 in the vicinity of the site has an AADT of 200, and CR 9 has an AADT of 170 (North Dakota Department of Transportation, 1996—Traffic Volume Map, Walsh County). ND 17 has an AADT value of 450 (North Dakota Department of Transportation, 1996—Traffic Volume Map, Walsh County), and ND 1 has an AADT of 490 (North Dakota Department of Transportation, 1996—Traffic Volume Map, Ramsey County). All of these roadways are two-lane and operate at LOS A (see table 3.12-3). There is no traffic count data available for the unnamed CR providing access to the site.

Air Transportation

Remote Sprint Launch Site 4 is in caretaker status with no activities; there are no airport facilities at this location.

3.13 UTILITIES

The major attributes of utility systems are processing, distribution, and storage capacities and related factors, such as average daily consumption and peak demand, required in making a determination of adequacy of such systems to provide services in the future.

The utility systems addressed in this analysis include the facilities and infrastructure used for:

- Potable water pumping, treatment, storage, and distribution
- Wastewater collection and treatment
- Solid waste collection and disposal
- Energy generation and distribution, including the provision of electricity and natural gas

3.13.1 ALASKA INSTALLATIONS

3.13.1.1 Clear AFS—Utilities

This section describes the utilities in the vicinity of Clear AFS. The ROI for utilities is made up of the service areas of each utility provider servicing the air station and local community.

Water Supply

On-base. Clear AFS obtains its water from wells with a total capacity of 55.15 million liters per day (14.57 million gallons per day), and average daily water consumption for industrial and domestic use was 35.5 million liters per day (9.37 million gallons per day) in fiscal year 1995 (U.S. Department of the Air Force, 1997—EA for Radar Upgrade, Clear AS). Chlorination is provided for the potable water. (Clear AFS, 1993—Comprehensive Planning Framework)

Five wells in the Technical Site supply water for the power plant turbine condenser cooling, demineralization, and plant cooling. These wells have a combined capacity of 18.7 million liters per day (4.95 million gallons per day). Average daily consumption in 1995 was 11 million liters per day (2.8 million gallons per day). Industrial water is cycled through a 62.1-million-liter (16.4-million-gallon) cooling pond. Excess water is discharged to Lake Sansing. Two of the industrial wells at the power plant can also be used to supply potable water for domestic purposes. (U.S. Department of the Air Force, 1997—EA for Radar Upgrade, Clear AS)

Seven wells in the Technical Site supply water to the radar facilities for cooling and to heat exchangers that cool radar equipment located in

Buildings 101 and 102. These wells have a combined capacity of 24.2 million liters per day (6.38 million gallons per day). The heat exchanger system contains a chromate solution that is circulated through a closed-loop system to cool critical radar electronic components. (U.S. Department of the Air Force, 1997—Supplemental EA for Radar Upgrade, Clear AS)

Water for domestic purposes is supplied from three wells with a total capacity of 12.3 million liters per day (3.24 million gallons per day). Water consumption for domestic purposes averaged 0.64 million liters per day (0.17 million gallons per day) in 1995. Water used for human consumption, food preparation, and fire protection is chlorinated. (U.S. Department of the Air Force, 1997—EA for Radar Upgrade, Clear AS)

Off-base. Cities potentially impacted by activities at Clear AFS include Anderson, Cantwell, Ferry, Healy, Lignite, McKinley Park, and Nenana. All these cities are located in Denali Borough. In all of these cities except for Nenana, the large majority of homes have individual wells, septic systems, and plumbing. (Alaska Department of Community and Regional Affairs, 1998—DCRA Community Database)

The Nenana water system is approximately 20 years old. It has two wells able to be used as potable water sources. The primary well is 61 meters (200 feet) deep and has a pumping capacity of 0.545 million liters per day (0.144 million gallons per day). The secondary well is 21 meters (70 feet) deep and is rarely used. The system has a storage capacity of approximately 1.6 million liters (0.42 million gallons), and average usage is approximately 0.136 million liters per day (0.036 million gallons per day). (Knight, 1998—Personal communication)

Approximately 75 percent of the city is served by the current system, and a study is underway to upgrade the design to incorporate approximately 90 percent of the community. Those not on the city water system have their own private wells. (Knight, 1998—Personal communication)

Wastewater

On-base. Based on potable water pumping records from January 1996 to February 1997, the average daily domestic wastewater flow for Clear AFS is 0.87 million liters per day (0.23 million gallons per day) (Hardy, 1998—Personal communication). Sanitary sewage from all Camp facilities with water service except Buildings 26 and 51 and the Composite Area is conveyed by gravity flow to an Imhoff tank, which functions much like a septic tank. Sanitary sewage from the Composite Area is conveyed to the Imhoff tank via a lift station. The Imhoff tank is cleaned by moving accumulated sludge into a drying bed and then transferring the dried sludge to the base landfill. The effluent from the

Imhoff tank drains into a leach field. (Clear AFS, 1993—Comprehensive Planning Framework)

The new leach field that currently accepts the effluent from the Imhoff tank was designed using performance data from the previous two leach fields. The new leach field has an area of approximately 2.4 thousand square meters (26 thousand square feet) and is estimated to be able to accept the current load of 0.87 million liters per day (0.23 million gallons per day) for from 10 to 20 years. (Meyer, 2000—Comments received by EDAW, Inc., regarding the NMD Deployment coordinating Final EIS)

Sanitary sewage from the Technical Area flows into septic tanks with leaching wells or pits. Each of three Scanner buildings, the two Tracker buildings, and the Power Plant has its own septic tank and leaching well or pit. (Clear AFS, 1993—Comprehensive Planning Framework)

Cooling water from the Clear AFS Power Plant is discharged to a ditch at a point 15 meters (50 feet) from where the ditch flow enters Lake Sansing. This discharge is covered by State of Alaska Wastewater Disposal Permit number 9531-DB004. The permit requires the discharge to be no more than 23 million liters per day (6.2 million gallons per day). (Alaska Department of Environmental Conservation, 1998—Wastewater Disposal Permit)

Off-base. Wastewater treatment for the city of Anderson consists of a sewage lagoon. The system has a capacity of approximately 2.2 million liters per year (0.6 million gallons) with an average use of 1.5 million liters per year (0.4 million gallons). Wastewater treatment for the city of Nenana consists of a piped gravity system that collects the sewage and a secondary rotating biological contactor treatment plant. Approximately 75 percent of the city homes are connected to the sewer system, and a study is underway to determine an efficient method of connecting up to 90 percent of the community. No allowance is made for industrial waste treatment. The current system has a treatment capacity of approximately 0.227 million liters (0.06 million gallons) per day and is generally operated at or near capacity. (Knight, 1998—Personal communication)

Solid Waste

On-base. The annual solid waste production on Clear AFS is approximately 5,168 cubic meters (6,760 cubic yards) or about 1,533 metric tons (1,690 tons). The break down of the waste stream is 20 percent municipal waste, 16 percent construction waste, and 64 percent fly ash. The waste is collected from containers throughout Clear AFS and taken to the Clear AFS landfill on a daily basis. The fly ash from the power plant is used as cover at the landfill. (Clear AS, 1998—Draft Solid Waste Management Plan)

The Clear AFS landfill began operations in 1975. The total capacity of the landfill is estimated to be 191 thousand cubic meters (250 thousand cubic yards). Therefore, given the current waste to cover ratio, the total non-cover (i.e., non-fly ash) waste capacity of the landfill is 63.1 thousand cubic meters (82.5 thousand cubic yards). Using current rates, the landfill is estimated to be full sometime between 2008 and 2013. (Clear AS, 1998—Draft Solid Waste Management Plan) Current plans are to close the Clear AFS landfill in 2002 or 2003 and utilize the Denali Borough landfill, which was recently opened.

Off-base. The Nenana landfill was closed in July 1998. Solid waste in Nenana and the area surrounding Clear AFS is collected by a private firm and delivered to the Denali Borough landfill.

Energy

Electricity—On-base. Electricity is generated onsite at the Clear AFS Power Plant by three General Electric, Class A, 7.5 megawatt generators. Each turbine generator is powered by steam from three coal-fired boilers. The combined electrical generating capacity of the three generators is 22.5 megawatts. Average demand is 9 megawatts, for an annual consumption of 78.8 million kilowatt-hours. An emergency General Motors, Class C, 1,400 horsepower, 1 megawatt diesel generator is also available. The Clear AFS electrical system is not connected to the public grid. (Clear AFS, 1993—Comprehensive Planning Framework; Graves, 1998—Personal communication)

Electricity—Off-base. The Golden Valley Electric Association is a non-profit, member-owned cooperative that provides electrical service to the Fairbanks North Star Borough, the Denali Borough, unincorporated areas between these two boroughs, and along the Richardson Highway to Fort Greely. Clear AFS, Eielson AFB, Fort Wainwright, Fort Greely, Fort Knox Gold Mine, the University of Alaska Fairbanks, and the communities of Fairbanks, North Pole, Nenana, Delta Junction, and Healy are all located in Golden Valley Electric Association's service area. Golden Valley Electric Association provides electricity to approximately 90,000 people via over 36,000 service locations (Golden Valley Electric Association, 1998—History; U.S. Department of the Interior, 1998—Northern Intertie Project, Final EIS)

The Golden Valley Electric Association has a generating capability of 224 megawatts of power, with an additional 70 megawatts available through the existing Fairbanks/Anchorage intertie (Golden Valley Electric Association, 1998—History). In 1996, they had a peak demand of 134.1 megawatts and total energy sales of 653 million kilowatt-hours (U.S. Department of the Interior, 1998—Northern Intertie Project, Final EIS). In 1997 their peak demand was 163 megawatts (Golden Valley Electric Association, 1998—History).

3.13.1.2 Eareckson AS—Utilities

This section describes the utilities in the vicinity of Eareckson AS. The ROI for utilities is made up of the utilities servicing the air station.

Water Supply

On-base. Eareckson AS's potable water system has 25 thousand meters (82 thousand feet) of water lines and a capacity to produce 1.5 million liters per day (0.39 million gallons per day). On average there is a total base usage of 0.22 million liters per day (0.059 million gallons per day). (Domahoski, 1998—Personal communication)

Wastewater

On-base. Eareckson AS's sanitary sewage system has 24 thousand meters (79 thousand feet) of sewer lines and the capacity to treat 0.95 million liters per day (0.25 million gallons per day) of wastewater. On average there is a total base demand for treatment of 0.26 million liters per day (0.07 million gallons per day). The treatment plant provides secondary treatment before ocean out fall. (Domahoski, 1998—Personal communication)

Solid Waste

On-base. The Air Force at Eareckson AS adopted a regulation in 1991 that established policies and procedures for segregation of solid, nonhazardous waste into two main categories and several subcategories. Junk metal and aluminum cans are categorized as recyclable and are retrograded off of the island. Large items such as automobiles, couches, and washing machines are also removed from the island. Heavy plastic, polyvinyl chloride, and all other municipal wastes are also disposed of in the Eareckson AS landfill. (U.S. Air Force, 1994—Landfill Operations Plan Eareckson AFS)

The Eareckson AS landfill is located on the southeast point of the island and has been in operation since 1944 (U.S. Air Force, 1994—Landfill Closure Plan, Eareckson AFS). The landfill is currently operated under State of Alaska Solid Waste Disposal Permit number 9425-BA009, which permits the disposal of municipal solid waste at the landfill (Alaska Department of Environmental Conservation, 1994—Eareckson AFS Landfill, Shemya, Alaska, Solid Waste Disposal Facility Permit). The Eareckson AS landfill permit expired December 1, 1999 but is under administrative extension until the State of Alaska can complete its review of the permit renewal package. The permit is expected to be renewed as currently written. (Hostman, 2000—Personal communication) It is expected that the landfill will reach capacity in approximately 15 years.

Energy

Electricity—On-base. Eareckson AS has six 3-megawatt diesel generators, only two of which are operating at any one time. Under most conditions, the two generators are run at 55 percent of their capacity, for a total of 3.3 megawatts. Eareckson's has an annual usage of 28 million kilowatt-hours. (Domahoski, 1998—Personal communication)

By running all six generators simultaneously, a total power output of 18 megawatts can be achieved, and thus a capacity for an annual production of more than 150 million kilowatt-hours of electricity. (Domahoski, 1998—Personal communication)

3.13.1.3 Eielson AFB—Utilities

This section describes the utilities in the vicinity of Eielson AFB. The ROI for utilities is made up of the service areas of each utility provider servicing the base and local community.

Water Supply

On-base. Currently, five wells directly serve the Eielson AFB water treatment and distribution system. Three of these wells are used to supply raw water directly to the base's water treatment plant. The other two wells are standby wells designated to deliver untreated water directly to the distribution system if necessary. In the event that the water treatment plant requires bypassing, its three wells can be used to individually supply water to the distribution system. Chlorinating of raw well water is possible for these three wells any time they are bypassing the plant. (Eielson AFB, 1998—Infrastructure Management Plan)

A new water treatment plant has been in operation since April 1998. The water treatment plant has a capacity to treat up to 11 million liters per day (3 million gallons per day). With the new treatment plant, Eielson AFB's system now has a storage capacity of 4 million liters (1 million gallons). Average water demand at Eielson AFB is approximately 4 million liters per day (1 million gallons per day). Peak demand, which occurs during summer, can exceed 8 million liters per day (2 million gallons per day).

Off-base. Cities potentially impacted by activities at Eielson AFB include Ester, Fairbanks, Fox, Harding Lake, Moose Creek, North Pole, Pleasant Valley, Salcha, and Two Rivers. All these cities are located in Fairbanks North Star Borough. In all of these cities except for Fairbanks and North Pole, the large majority of homes have individual wells, septic systems, and plumbing. (Alaska Department of Community and Regional Affairs, 1998—DCRA Community Database)

The water supply at Fairbanks is pumped from four wells. Two have a pumping capacity of 13 thousand liters per minute (3,400 gallons per minute) and the other two have a capacity of 9,800 liters per minute (2,600 gallons per minute). The system has a storage capacity of approximately 19 million liters (5 million gallons). On average, the city uses 11 to 13 million liters per day (3 to 3.3 million gallons per day). Less than 1 percent of the city is still on private wells. There are no plans to expand the water service beyond its current level. (Rogers, 1998—Facsimile communication)

The water supply at North Pole is provided through two ground wells (55 meters and 49 meters [180 feet and 160 feet] deep respectively). There are three water reservoirs with a storage capacity of approximately 3.8 million liters (1 million gallons) and a current recharge rate of up to approximately 2.3 million liters per day (0.6 million gallons per day). The plant is almost 13 years old, and is expandable. However, since current usage is limited to approximately 0.8 million liters per day (0.2 million gallons per day), no plans have been made to expand water service beyond the current amount. It is estimated that no more than 33 percent of the city is serviced by both the water and wastewater systems. (Johnson, R., 1998—Personal communication, Nov 23)

Wastewater

On-base. The wastewater received at the Eielson AFB sewage treatment plant includes sewage from the base collection system and septic tank wastes delivered by trucks. The treatment process includes pre-treatment, primary treatment, and secondary treatment. Final disposition is by percolation into an abandoned gravel pit where additional biostabilization occurs in summer months. (Eielson AFB, 1998—Infrastructure Management Plan)

The sewage treatment plant, which was originally constructed in 1952, has had extensive repairs and upgrades in the last 5 years. Consequently, it is in excellent condition. The plant treats an average of 4 million liters per day (1 million gallons per day) and currently has a maximum permitted allowance of 6.0 million liters per day (1.6 million gallons per day). (Eielson AFB, 1998—Infrastructure Management Plan)

Off-base. The wastewater treatment facility at Fairbanks is a borough-wide service system that includes the city of Fairbanks, Fort Wainwright, College Utilities, and the University of Alaska Fairbanks. It is a pure oxygen activated sludge system with secondary clarifiers, aerobic digestors, and bar screens. It was completed in 1977. (Rogers, 1998—Facsimile communication)

The Fairbanks wastewater treatment system serves approximately 55 to 65 thousand people and has the capability to treat up to approximately

30 million liters per day (8 million gallons per day). On average, the system operates at approximately two-thirds capacity and treats approximately 20 million liters per day (5.4 million gallons per day). Less than 1 percent of the population in Fairbanks is still on septic systems, and no plans have been made to expand the current system. (Rogers, 1998—Facsimile communication)

The wastewater treatment at North Pole consists of a city-owned aerated lagoon system. The system is less than 10 years old and has the capacity to treat approximately 1.9 million liters per day (0.5 million gallons per day). Current usage averages approximately 0.8 to 1 million liters per day (0.2 to 0.3 million gallons per day). (Lewis, 1998—Personal communication)

Solid Waste

On-base. In 1998 Eielson AFB will produce an estimated 4.0 thousand metric tons (4.4 thousand tons) of solid waste. Of that, an estimated 3.0 thousand metric tons (3.3 tons) will be transferred to the Fairbanks North Star Borough landfill, 0.76 thousand metric tons (0.83 tons) of combustible waste will be used as fuel at the Eielson AFB Refuse Derived Fuel facility, and the rest will be recycled or composted. (Eielson AFB, 1998—Recyclable Materials, Capture Rates)

Off-base. The Fairbanks North Star Borough Landfill has been in operation for approximately 30 years. The newest cell is currently under construction and is anticipated to be in operation within the next year. The landfill can accept asbestos-contaminated waste, household hazardous waste, and waste from conditionally exempt small quantity hazardous waste generators. No other hazardous or radioactive waste can be accepted at the landfill. (Jordan, 1998—Personal communication)

It is estimated that the landfill accepts approximately 73 thousand metric tons (80 thousand tons) of waste annually, the majority of which comes from the Fairbanks North Star Borough (which includes both North Pole and Fairbanks). However, they do occasionally accept waste from other boroughs. (Jordan, 1998—Personal communication)

Energy

Electricity and Steam—On-base. The Central Heat & Power Plant is the most critical facility on Eielson AFB, as it is the base's primary source for heating and electric power. Operating continuously, year round, it has an annual production of approximately 860 million kilograms (1.9 billion pounds) of steam and 89 million kilowatt-hours of electricity. With arctic temperatures dipping as low as -51°C (-60°F), reliable steam heat is critical to operations at Eielson AFB. (Eielson AFB, 1998—Infrastructure Management Plan)

Electrical power on Eielson AFB is generated by a series of steam turbine generators in the Central Heat & Power Plant. The base is electrically self-sufficient, except for Charlie Battery, Pedro Dome, Birch Lake, and Flag Hill. All of these areas receive their electricity from Golden Valley Electric Association. (Eielson AFB, 1998—Infrastructure Management Plan)

The Central Heat & Power Plant is equipped with five steam turbine generators capable of producing 25 megawatts of electricity. Eielson AFB also has a contract with Golden Valley Electric Association that allows the base to access 10 megawatts of power whenever needed. (Eielson AFB, 1998—Infrastructure Management Plan)

Power demand varies seasonally. Average summer demand is approximately 10 megawatts. Winter demands range from 11 megawatts to 14 megawatts, with peak demands of approximately 17 megawatts. In fiscal year 1997, Eielson AFB purchased 13.3 million kilowatt-hours of electricity from Golden Valley Electric Association and produced approximately 89 million kilowatt-hours themselves. (Eielson AFB, 1998—Infrastructure Management Plan)

The Central Heat & Power Plant has six spreader-stoker, traveling grate, coal-fired boilers. Each of the boilers has a maximum rating of 54 thousand kilograms (120 thousand pounds) of steam per hour. The normal operating range for the boilers is between 27 thousand and 32 thousand kilograms (60 thousand and 70 thousand pounds) of steam per hour. During the summer months, only two boilers are needed for electrical generation. During winter operations, four to five boilers are required to meet the heating load. (Eielson AFB, 1998—Infrastructure Management Plan)

Electricity—Off-base. The Golden Valley Electric Association is a non-profit, member-owned cooperative that provides electrical service to the Fairbanks North Star Borough, the Denali Borough, unincorporated areas between these two boroughs, and along the Richardson Highway to Fort Greely. The Golden Valley Electric Association is described in section 3.13.1.1.

3.13.1.4 Fort Greely—Utilities

Water

On-base. The water supply at Fort Greely is currently managed from Building 606, the power plant. Two groundwater wells are utilized to supply all of the existing building facilities and fire hydrants within the main cantonment. These two wells have a combined capacity of 4.2 million liters per day (1.1 million gallons per day). A 712-thousand-liter (188-thousand-gallon) storage tank is located in Building 606 and feeds

two 76-thousand-liter (20-thousand-gallon) pressure tanks that pump into a piped water system. The only water treatment performed is the addition of chlorine and fluorine. The existing base water system, when all buildings were in use, consumed roughly 1.19 million liters per day (0.315 million gallons per day). (Delta/Greely Community Coalition, 1998—Final Reuse Plan, Fort Greely, Alaska; U.S. Army Corps of Engineers, 1997—Environmental Baseline Survey Report for Fort Greely, Alaska)

Off-base. Households in the Delta Junction area maintain individual wells with depths ranging from 46 meters (150 feet) to 110 meters (350 feet). A community water purification plant is not feasible due to the dispersed nature of the area's populace and businesses. (Alaska Department of Community and Regional Affairs, 1998—DCRA Community Database)

Wastewater

On-base. The sewage system at Fort Greely conveys wastewater to an Imhoff tank inside Building 633. Sludge from the bottom of this tank is pumped to sludge drying beds. Once the sludge is dried, it is hauled to the landfill. Effluent from the Imhoff tank is conveyed to the sewage lagoon. The lagoon is aerated for further treatment. Effluent leaving the sewage lagoon is chlorinated and discharged to Jarvis Creek. (U.S. Army Corps of Engineers, 1997—Environmental Baseline Survey Report for Fort Greely, Alaska)

This system has a capacity of 1.7 million liters per day (0.46 million gallons per day). (Delta/Greely Community Coalition, 1998—Final Reuse Plan, Fort Greely, Alaska) Wastewater usage, when all buildings were in use, was less than 1.2 million liters per day (0.32 million gallons per day).

Wastewater from buildings in the Old Post and Mid Post area is discharged to either a septic tank or a leach field (U.S. Army Corps of Engineers, 1997—Environmental Baseline Survey Report for Fort Greely, Alaska).

Off-base. Businesses and residences are dispersed over a large area, so a community wastewater treatment system is not practical. Instead, each household maintains a septic system. (Alaska Department of Community and Regional Affairs, 1998—DCRA Community Database)

Solid Waste

On-base. The base landfill is a class 2 facility that is currently permitted to receive both sewage sludge and asbestos materials. The current facility is not lined, but does have groundwater monitoring tubes. Cells at this facility are about 18 meters (60 feet) by 61 meters (200 feet) by 6 meters (20 feet) deep and generally last 1.5 years under current

conditions. The current ADEC solid waste disposal permit comes up for renewal May 1, 1999. No determination has yet been made to close the existing landfill at Fort Greely because of BRAC. (Delta/Greely Community Coalition, 1998—Final Reuse Plan, Fort Greely, Alaska)

Off-base. The city-owned landfill in the Delta Junction area is leased to a private collection company, Delta Sanitation. The current landfill started as a pit with an area of 37 square meters (400 square feet) and a depth of 4.6 meters (15 feet) that was dug in 1984. Delta Sanitation collects up to approximately 76 cubic meters (100 cubic yards) of municipal waste per week from Delta Junction and the outlying areas. This waste is then burned in large "burn boxes" (large incinerators). The resulting ash is then dumped into the landfill pit. Large household waste is also disposed of at the landfill pit. The pit is currently one-third full and has capacity for another 12 to 15 years of use at the current rate. There is no provision for asbestos-contaminated materials or hazardous waste of any sort. There is limited capacity for clean construction waste. (Peters, 1998—Personal communication)

The Alaska Department of Environmental Control, in coordination with the city council and Delta Sanitation, is in the process of determining what changes will be required to the current solid waste disposal program. No specific changes have been determined, and no specific date of change has been established. However, since the waste disposal program now in effect is not standardized, it is likely that changes of some sort will be instituted. (Peters, 1998—Personal communication)

Energy

Electricity and Steam—On-base. Electrical power requirements at Fort Greely are currently met through a combination of power supplied from Fort Wainwright and on-post generators run by Fort Greely personnel. The electrical power from Fort Wainwright is "wheeled" over the commercial electrical grid that exists between the two bases and is eventually supplied to Fort Greely through an existing 2.9-megawatt substation. The U.S. Army Alaska pays Golden Valley Electrical Association (which is described in section 3.13.1.1) for the use of its grid. The average electrical power demand at Fort Greely was approximately 1.835 megawatts when all buildings were in use. However, peak demands of up to 3.3 megawatts sometimes occurred during the winter. When the demand at Fort Greely exceeded the capacity of the substation, the additional power requirements were met by the three on-post diesel-powered generators, which together can generate up to 0.95 megawatt. (U.S. Department of the Army, 1997—Preliminary Draft EA for the Disposal and Reuse of Surplus Property at Fort Greely, Alaska)

Electricity—Off-base. The Golden Valley Electric Association is a non-profit, member-owned cooperative that provides electrical service to the Fairbanks North Star Borough, the Denali Borough, unincorporated areas between these two boroughs, and along the Richardson Highway to Fort Greely. The Golden Valley Electric Association is described in section 3.1.3.1.1.

3.13.1.5 Yukon Training Area (Fort Wainwright)—Utilities

There are no utilities at the current proposed NMD site on the Yukon Training Area. Potential support facilities for this site could be located on Eielson AFB, as described in section 3.13.1.3.

3.13.2 NORTH DAKOTA INSTALLATIONS

3.13.2.1 Cavalier AFS—Utilities

This section describes the utilities in the vicinity of Cavalier AFS. The ROI for utilities is made up of the service areas of each utility provider servicing the air station and local community.

Water Supply

On-base. Cavalier AFS receives its water from the North Valley Water Association. Under this arrangement, the North Valley Water Association is under contract to supply Cavalier AFS with up to 1.09 million liters per day (0.29 million gallons per day) of water (Johnson, G., 1998—Personal communication, July 9). Current demand is using approximately 0.45 million liters per day (0.12 million gallons per day). Up to 0.4 million liters per day (0.1 million gallons per day) of this amount is used in the tower and heat sink evaporative cooling system. (U.S. Air Force Space Command, undated—Comprehensive Planning Framework, Cavalier AS)

Off-base. North Valley Water Association, Inc. gets their water from wells approximately 10 kilometers (6 miles) west of Cavalier AFS. In 1997, they sold approximately 624 million liters (165 million gallons) of water. They expect this to increase to 1.00 to 1.14 billion liters (265 to 300 million gallons) per year in the next few years. They have a total storage capacity of 5.7 million liters (1.5 million gallons) of water, which is stored in a number of reservoirs. They have two treatment plants, and the one that will be providing water to Cavalier AFS has a capacity of 9.5 million liters per day (2.5 million gallons per day). Their service area includes almost all of Pembina County and some of Cavalier County. They have approximately 1,300 customers, 8 of which are bulk wholesalers. These eight are cities and Cavalier AFS. (Johnson, G., 1998—Personal communication, July 9)

Wastewater

On-base. Cavalier AFS's sanitary sewer system is composed of waste water treatment lagoons. The wastewater treatment lagoons consist of two cells with a total capacity of approximately 83.3 million liters (22.0 million gallons) (U.S. Air Force Space Command, undated—Comprehensive Planning Framework, Cavalier AS). There is also a third cell that is not currently in use, and that would need repairs to be used (Greenwood, 1998—Electronic communication, June 8).

Site operations currently require full time use of the primary cell and periodic use of the secondary cell. The secondary cell is never used to capacity. Capacity significantly exceeds current requirements. (Greenwood, 1998—Electronic communication, June 8)

Off-base. The city of Cavalier's wastewater treatment plant consists of three 3.34-hectare (8.25-acre) lagoons. Based on the system's pumping capacity, it has a capacity of 2.7 million liters per day (0.72 million gallons per day). The current average usage is 0.662 million liters per day (0.175 million gallons per day). This system serves the city of Cavalier. (Sagert, 1998—Personal communication) Most of the area surrounding Cavalier AFS is rural, and most households are not connected to public sewage systems.

Solid Waste

On-base. Cavalier AFS's solid waste is disposed of through a contractor to the city of Grand Forks landfill. For fiscal year 1998, Cavalier AFS typically disposed of less than 5 cubic meters (6 cubic yards) of solid waste per month. (Fors, 1998—Personal communication, July 14)

The refuse contractor for Cavalier AFS maintains recycling bins in the Perimeter Acquisition Radar building parking lot for glass, paper, cardboard, metal, and plastics. Under a local initiative, Cavalier AFS also segregates and recycles computer, bond, and newspapers even though they are not revenue-generating recyclables. (U.S. Air Force Space Command, undated—Comprehensive Planning Framework, Cavalier AS)

Off-base. The city of Grand Forks landfill was scheduled to close in the fall of 1999. Due to the floods in the spring of 1998, there is an extension of operations through the fall of 2000. Even after that time, it is planned that the current landfill will be used as an inert landfill, and thus will be able to accept demolition and construction wastes. (Kingery, 1998—Personal communication)

Under normal conditions, the current landfill can receive 318 metric tons (350 tons) per day of municipal solid waste. Inert waste is not included in that amount. As much construction waste as there is room for can be

accepted, and it is reported on a quarterly basis. (Kingery, 1998—Personal communication)

A new municipal waste landfill for Grand Forks is planned. Four potential sites are currently being considered. The intent is to purchase a parcel of approximately 260 hectares (640 acres) in size and for construction to begin in the spring of 1999. The new landfill has been designed to be able to accept up to 454 metric tons (500 tons) per day of municipal solid waste and have a life span of 40 years. (Kingery, 1998—Personal communication)

Energy

Electricity—On-base

Commercial Power. Electricity is provided to Cavalier AFS by Minnkota Power Cooperative, Inc., and Nodak Electric Cooperative, Inc. (U.S. Air Force Space Command, undated—Comprehensive Planning Framework, Cavalier AS; Greenwood, 1998—Electronic communication). Peak power demand for Cavalier AFS is approximately 7 megawatts, and annual energy use is approximately 47 million kilowatt-hours (Greenwood, 1998—Electronic communication, June 8).

Backup Power. Cavalier AFS is capable of generating primary power for the entire installation using the generators in the underground power plant facility (Building 820), and these generators supply primary power to critical operations when commercial service is interrupted (U.S. Air Force Space Command, undated—Comprehensive Planning Framework, Cavalier AS).

The onsite power plant has a total capacity of 15 megawatts (Greenwood, 1998—Electronic communication, June 8).

Electricity—Off-base. Nodak Electric Cooperative is one of 12 member-owner cooperative and 12 municipal utilities that are served by the Minnkota Power Cooperative, Inc. (Minnkota Power Cooperative, Inc., 1998—Homepage). Nodak Electric Cooperative provides electricity to a portion of the northwestern part of North Dakota, and serves approximately 12,000 people (Rodgers, 1998—Personal communication). Nodak's peak demand is approximately 130 megawatts, and in 1997 it purchased approximately 561 million kilowatt-hours of electricity from Minnkota (Rodgers, 1998—Personal communication).

The Minnkota Power Cooperative is a regional generation and transmission company that obtains its electricity from the power plants of the Milton R. Young Station. (Minnkota Power Cooperative, Inc., 1998—Homepage)

Natural Gas

On-base. The natural gas system for Cavalier AFS was constructed as a cooperative effort among Cavalier AFS and five local communities. Under the SAFEGUARD program, and with the combined efforts of the local communities, Montana–Dakota Utilities Company (MDU) constructed approximately 110 kilometers (70 miles) of 15- and 20-centimeter (6- and 8-inch) lines to connect the installation, and the local communities, to the existing natural gas system near Devils Lake, North Dakota. (U.S. Air Force Space Command, undated—Comprehensive Planning Framework, Cavalier AS)

Natural gas is used for heating as well as to drive the power plant generators. Annual use is approximately 3 million cubic meters (107 million cubic feet). (Greenwood, 1998—Electronic communication, June 8)

Off-base. MDU distributes natural gas and propane and operates electric power generation, transmission, and distribution facilities in North Dakota, South Dakota, Montana, and Wyoming. MDU's pipeline supplier, Williston Basin Interstate Pipeline Company, owns three large storage fields. Combined, the three storage fields have a capacity of almost 5.7 billion cubic meters (200 billion cubic feet) of natural gas. As the average home in MDU's service area uses 3.1 thousand cubic meters (110 thousand cubic feet) of gas a year, this storage capacity equals the annual needs of 1.8 million homes. Since summer gas demand is only about one-fourth of the daily amount produced from wells and processing plants, MDU diverts the remainder into the storage fields for use during the winter. During the winter, on a peak usage day, roughly two-thirds of MDU's gas supply comes from the Williston Basin's storage fields. (Montana–Dakota Utilities Company, 1998—Utility Operations)

3.13.2.2 Grand Forks AFB—Utilities

This section describes the utilities in the vicinity of Grand Forks AFB. Section 3.13 contains an overview of the utilities resource.

Water Supply

On-base. Grand Forks AFB obtains water for domestic and industrial uses from the city of Grand Forks and Grand Forks–Traill Water Users, Inc., and during the 12-month period from May 1997 to May 1998 the base used 2.13 billion liters (562 million gallons) of water (Arp, 1998—Personal communication, July 8 and Aug 27), or an average of 5.83 million liters per day (1.54 million gallons per day). The city of Grand Forks is the primary supplier, typically providing approximately 75 percent of the water used, with approximately 25 percent provided by the base's secondary source, Grand Forks—Traill Users, Inc. (U.S.

Department of the Air Force, 1997—Grand Forks AFB General Plan). However, during the recent floods Grand Forks—Traill Water Users supplied all the base's water for 44 days, due to the city of Grand Forks' water system being disabled.

The base provides no treatment of the water but maintains the base distribution system. Four elevated tanks provide a water storage capacity of 7.2 million liters (1.9 million gallons). In addition, there is a 1.34-million-liter (355-thousand-gallon) reinforced concrete ground tank. (U.S. Department of the Air Force, 1997—Grand Forks AFB General Plan)

Off-base. The city of Grand Forks obtains its water from two rivers, the Red River and the Red Lake River. They have a treatment capacity of 62.5 million liters per day (16.5 million gallons per day). In 1997 they produced an average of 30.2 million liters per day (7.97 million gallons per day) of water with a 15 percent loss. The city of Grand Forks has a storage capacity of 51.1 million liters (13.5 million gallons) of water within their system. (Sletten, 1998—Personal communication)

Traill Water Users, Inc. obtains its water from 13 wells that have a normal pumping capacity of 8 thousand liters (2 thousand gallons) per minute and an emergency capacity of 10 thousand liters (2.7 thousand gallons) per minute. Their treatment capacity is 6.51 million liters per day (1.72 million gallons per day) of soft water or 15 million liters per day (4 million gallons per day) of hard water. They have 2 million liters (0.5 million gallons) of storage at the wells and 5.7 million liters (1.5 million gallons) of storage in their service area. Their service area has no specific boundaries, but tends to be limited by the other rural water companies that are located to their north, south, and west. (Loeslie, 1998—Personal communication)

Traill Water Users, Inc. sold 1.64 billion liters (433 million gallons) of water in fiscal year 1997. In a typical year they sell approximately 320 million liters (85 million gallons) of water to Grand Forks AFB. (Loeslie, 1998—Personal communication)

Wastewater

On-base. The Grand Forks AFB sewage treatment system is operated by the base and is located on base property less than 2 kilometers (1 mile) east of the main base. The treatment system consists of six lift stations, four treatment cells, and one tertiary cell. The lift stations are for discharge into the primary lagoon cell. (U.S. Department of the Air Force, 1997—Grand Forks AFB General Plan)

The water is discharged in accordance with a National Pollutant Discharge Elimination System (NPDES) permit (Permit No. ND0020621) from the state of North Dakota. The discharge from the lagoon flows

into a drainageway of Kelly's Slough. In 1997 Grand Forks AFB generated an average of 3.6 million liters per day (0.96 million gallons per day) of wastewater. The system's capacity is approximately 20 million liters per day (5 million gallons per day). (Arp, 1998—Personal communication, July 8 and August 27)

Off-base. The city of Grand Fork's wastewater treatment facility is a lagoon system. The system has a capacity of 39.7 million liters per day (10.5 million gallons per day). The average usage is 26 million liters per day (7 million gallons per day). A new activated sludge treatment facility is currently in planning. This system is expected to come online the early part of 2001 and have a capacity of 114 million liters per day (30 million gallons per day). (Goetz, 1998—Personal communication) Much of the area surrounding Grand Forks AFB is rural, and many households are not connected to public sewage systems. Of the 27,085 households counted within Grand Forks County in the 1990 census, 2,790 households (10.3 percent) were not connected to a public sewage system (U.S. Bureau of the Census, 1995—County & City Data Book 1994, Grand Forks AFB).

Solid Waste

On-base. Hardfill, construction debris, and inert waste generated by activities at Grand Forks AFB are disposed of at a special use landfill located on-base. The landfill is permitted by the North Dakota Department of Health as a "Special Use Disposal Site." All on-base municipal and industrial solid wastes are collected by a contractor and deposited in the Grand Forks County Landfill. (U.S. Department of the Air Force, 1997—Grand Forks AFB General Plan)

During the 12-month period from June 1997 to May 1998 approximately 3,056 metric tons (3,369 tons) of municipal solid waste were generated at Grand Forks AFB and subsequently removed to the Grand Forks County landfill (Braun, 1998—Personal communication).

The new on-base special use and inert solid waste landfill and land recycling farm is located near the OT-5 area (EDAW, Inc., 1998—Trip Report of Visit to North Dakota, June 16-18). The special-use on-base landfill (for construction debris only) occupies 2.6 hectares (6.5 acres) (Koop, 1998—Personal communication) and has a capacity of approximately 54 thousand cubic meters (70 thousand cubic yards) (Braun, 1998—Personal communication). The total area of the landfill/land treatment area is approximately 9.7 hectares (24 acres) (EDAW, Inc., 1998—Trip Report of visit to North Dakota, June 16–18).

Off-base. Section 3.13.2.1 contains a description of the city of Grand Forks landfill.

Energy

Electricity—On-base

Commercial Power. Electricity is provided to Grand Forks AFB by Nodak Electric Cooperative. In fiscal year 1997, Grand Forks AFB used 88.6 million kilowatt-hours of electricity. Grand Forks AFB's peak usage of electricity is in the winter due to large heating requirements because of the cold weather (Anderson, M. 1998—Personal communication).

Electrical power purchased from Nodak Electrical Cooperative arrives via two 69-kilovolt feeders. (U.S. Department of the Air Force, 1997—Grand Forks AFB General Plan)

Backup Power. To provide electrical power to critical facilities on-base in case of emergency, 25 backup generators are installed in or adjoining buildings housing airfield control and instrumentation, emergency organizations, and utility services. (U.S. Department of the Air Force, 1997—Grand Forks AFB General Plan)

Off-base. Nodak Electric Cooperative is one of 12 member-owner cooperative and 12 municipal utilities that are served by the Minnkota Power Cooperative, Inc. (Minnkota Power Cooperative, Inc., 1998—Homepage). Nodak Electric Cooperative and the Minnkota Power Cooperative are described in section 3.13.2.1.

Natural Gas

On-base. Grand Forks AFB purchases natural gas from Northern States Power Company, a local distributing company (Arp, 1998—Personal communication, July 8 and August 27). Annual gas usage at Grand Forks AFB was approximately 271.5 thousand decatherms at the main meter and 459.7 thousand decatherms at the central heating plant, for a total of 731.2 thousand decatherms (Arp, 1998—Personal communication, July 14). This is the amount of energy in approximately 1 billion cubic meters (38 billion cubic feet) of natural gas.

The on-base gas distribution system begins at the metering station near the main gate entrance (U.S. Department of the Air Force, 1997—Grand Forks AFB General Plan).

Off-base. Northern States Power Company, headquartered in Minneapolis, Minnesota, and its wholly owned subsidiary, Northern States Power Company–Wisconsin, operate generation, transmission, and distribution facilities providing electricity to about 1.4 million customers in Minnesota, Wisconsin, North Dakota, South Dakota, and Michigan. (Northern States Power Company, 1998—About NSP)

In North Dakota, Northern States Power Company provides natural gas to more than 30,000 customers in the communities of Buffalo, Casselton, Emerado, Fargo, Grand Forks, Horace, Mapleton, Oriska, Thompson, Tower City, and West Fargo (Northern States Power Company, 1999—Service Area in North Dakota). Northern States Power Company's 1997 annual sales for the Grand Forks area was 4.36 million decatherms (Arp, 1998—Personal communication, July 14), which is the amount of energy in approximately 117 million cubic meters (4.14 billion cubic feet) of natural gas.

3.13.2.3 Missile Site Radar—Utilities

This section describes the utilities in the vicinity of the Missile Site Radar. Section 3.13.2 contains an overview of the utilities resource.

Because the Missile Site Radar is in caretaker status, there is currently little to no utility usage at the site.

Water Supply

On-base. The original onsite water distribution system that served the site is still in place and substantially intact. This system is currently government owned, but privatization efforts are being made. The government owned, onsite pumphouse was refurbished and can pressurize the distribution system. The four pumps currently in the pumphouse are in good condition. Two of the pumps are electric motor driven and are rated at 810 liters (214 gallons) per minute. The other two pumps may be driven by either electric motor or internal combustion engine. They are rated at 3.7 thousand liters (1.0 thousand gallons) per minute with electric motor and 5.7 thousand liters (1.5 thousand gallons) per minute with engine drive. A 1.5-million-liter (400-thousand-gallon) reservoir is onsite that can be filled by the government-owned distribution system or a commercial water system connection. Missile Site Radar has recently switched the source of its water supply to Langdon Rural Water Users, a commercial water supplier. (Greenwood, 1998—Electronic communication, July 13)

Off-base. Langdon Rural Water Users is a rural water distributor that obtains all its water from the city of Langdon Water Department. Langdon Rural Water Users purchases only treated water. They provided 217 thousand liters (57.5 thousand gallons) of water to their customers in calendar year 1997. Langdon Rural Water Users services the rural areas around the city of Langdon, North Dakota. (Wenzel, 1998—Personal communication)

The Water Department of the city of Langdon obtains its raw water from Mount Carmel Dam and Mulberry Creek. They have a treatment capacity of 3.54 million liters (935 thousand gallons) per day and produced

approximately 477 million liters (126 million gallons) of treated water in 1997. They have a storage capacity of approximately 4 million liters (1 million gallons). Their service area is the city of Langdon. (Anderson, R. 1998—Personal communication)

Wastewater

On-base. The onsite sewage treatment system consists of a two-cell evaporative sewage lagoon, sewage collection piping to existing facilities, and a lift station. Currently there is no measurable sewage discharge to the lagoon. The only use of the system during caretaker operation has been to manage groundwater on the site to keep lower levels of the facilities from flooding. The force main from the lift station to the lagoon currently requires repair and the lagoon, although functional, would require repairs if the site were reactivated. The lagoon capacity is approximately 130 million liters (34 million gallons). Pumping capacity of the lift station is nominally 1,900 liters (500 gallons) per minute at 26 meters (85 feet) total head. There are two pumps. (Greenwood, 1998—Electronic communication, July 13)

Off-base. Approximately 21 kilometers (13 miles) of wastewater collection sewers serve the city of Langdon. Six sanitary lift stations pump wastewater through forcemains to approximately 20.8 hectares (51.3 acres) of facultative treatment lagoons. The city of Langdon is nearing completion of a phased pump and control replacement project for each of the lift stations. The lagoons are typically discharged semi-annually to a stream that flows northwesterly away from the city. (Cavalier County Job Authority, 1998—Building Our County's Future)

Solid Waste

On-base. Current average solid waste generated at the Missile Site Radar is estimated at 3 cubic meters (4 cubic yards) per month. This is caretaker operation usage. Capacity is mainly limited by requirements. There is no government owned landfill. All waste is disposed of offsite in a commercial landfill. (Greenwood, 1998—Electronic communication, July 13)

Off-base. Section 3.13.2.1 contains a description of the city of Grand Forks landfill.

Energy

Electricity—On-base. Electricity is provided to the Missile Site Radar by Cavalier Rural Electric Cooperative, which is headquartered in Langdon, North Dakota. Consumption for fiscal year 1997 was 272.4 thousand kilowatt-hours, which represents use during caretaker operations. The existing service from Cavalier Rural Electric Cooperative provides single and 3-phase power. The onsite distribution serves all existing facilities in

the non-tactical area and the radar building in the tactical area and is government owned. (Greenwood, 1998—Electronic communication, June 8)

Electricity—Off-base. Cavalier Rural Electric Cooperative provides electricity to Cavalier County and a portion of Ramsey County. It serves approximately 1,500 accounts, which includes approximately 1,200 families. Its latest peak and low demands were 8,242 kilowatt-hours in January and 3,468 kilowatt-hours in July. In 1997 Cavalier Rural Electric purchased approximately 37 million kilowatt-hours of electricity from Minnkota. (Otto, 1998—Personal communication)

Cavalier Rural Electric Cooperative, Inc. is one of 12 member-owner cooperative and 12 municipal utilities that are served by the Minnkota Power Cooperative, Inc. (Minnkota Power Cooperative, Inc., 1998—Homepage). Minnkota Power Cooperative is described in section 3.12.2.1.

Natural Gas—On-base. The original onsite, government owned natural gas distribution system is still in place. Leak tests are performed each year and indicate the system is tight. Cathodic protection on the system is due to be upgraded in 1998. Service is provided by Montana-Dakota Utilities. (Greenwood, 1998—Electronic communication, July 13)

Consumption of natural gas in fiscal year 1997 represents caretaker status, and was 794.3 decatherms (Greenwood, 1998—Electronic communication, July 13). This is the amount of energy in approximately 21.4 thousand cubic meters (756 thousand cubic feet) of natural gas.

Natural Gas—Off-base. Montana-Dakota Utilities is described in section 3.13.2.1.

3.13.2.4 Remote Sprint Launch Site 1—Utilities

This section describes the utilities in the vicinity of Remote Sprint Launch Site 1. Section 3.13.2 contains an overview of the utilities resource.

Water Supply

Potable water is not currently available at Remote Sprint Launch Site 1. When it was operational, it was necessary to haul in potable water. The underground water tanks are still in place, but the condition of the tanks and associated piping and pumping systems is assumed to be poor. (Greenwood, 1998—Electronic communication, July 13)

Wastewater

There is an existing 2-cell evaporative lagoon at each of the Remote Sprint Launch Sites, which are intact but not used. They could be made

functional if necessary. (Greenwood, 1998—Electronic communication, July 13)

The system was designed for 100 percent loss of waste through evaporation and seepage of up to 7.6 thousand liters (2.0 thousand gallons) per day (U.S. Army Corp of Engineers, 1974—Analysis of Existing Facilities at SRMSC).

Solid Waste

On-base. There is currently no solid waste generated or collected at Remote Sprint Launch Site 1. If needed, refuse collection could be obtained by commercial contract with local service agencies. (Greenwood, 1998—Electronic communication, July 13)

Off-base. Section 3.13.2.1 contains a description of the city of Grand Forks landfill.

Energy

Electricity—On-base. Electricity is not currently available at Remote Sprint Launch Site 1. Commercial power could be provided to Remote Sprint Launch Site 1 from nearby sources if required. (Greenwood, 1998—Electronic communication, July 13)

Electricity—Off-base. Electricity in the areas surrounding the Remote Sprint Launch Sites is provided by Minnkota Power Cooperative, Inc. through one of its 12 member-owner cooperatives (Minnkota Power Cooperative, Inc., 1998—Homepage). Minnkota Power Cooperative is described in section 3.13.2.1.

Natural Gas—On-base. Natural gas service is not currently available at Remote Sprint Launch Site 1 (Greenwood, 1998—Electronic communication, July 13).

3.13.2.5 Remote Sprint Launch Site 2—Utilities

The utilities that service Remote Sprint Launch Site 2 are the same as described for Remote Sprint Launch Site 1.

3.13.2.6 Remote Sprint Launch Site 4—Utilities

The utilities that service Remote Sprint Launch Site 4 are the same as described for Remote Sprint Launch Site 1.

3.14 WATER RESOURCES

This section describes the existing water resource conditions at each of the proposed sites. Water resources include surface water, groundwater, water quality, and flood hazard areas. Marine water resources are also discussed for the proposed fiber optic cable lines in Alaska. See section 3.7, Hazardous Materials and Hazardous Waste Management, for existing water contamination, and section 3.13, Utilities, for a discussion of water-related utilities.

The Federal Water Control Amendments of 1972, commonly known as the Clean Water Act (CWA), established a national strategy to restore and maintain the chemical, physical, and biological integrity of the nation's water. Under the CWA, the U.S. EPA is the principal permitting and enforcement agency. The CWA functions primarily by requiring permits for activities that result in the discharge of water pollutants from both point sources (i.e., discharge pipes, ditches, etc.) and non-point sources (i.e., agricultural lands, construction sites, and dredge and fill operations).

The 1987 amendments to the CWA required the U.S. EPA to establish an NPDES permit program for storm water discharges associated with industrial activities. Industrial operations that result in the discharge of storm water are permitted under an individual or multi-sector industrial permit. The U.S. EPA renewed the NPDES Storm Water Construction General Permit on February 17, 1998 and amended the Multi-Sector Industrial Permit on September 30, 1998. The amended Multi-Sector permit covers those industries previously covered under the expired Baseline General Permit. A Notice of Intent to Obtain Coverage under an NPDES Storm Water Construction General Permit must be filed with the U.S. EPA or appropriate state agency for construction activities that result in the disturbance of 2 hectares (5 acres) or more in area. The preparation of an SWPPP is also required.

Section 404 of the CWA established the Federal program that regulates activities in the nation's wetlands. Specifically, Section 404 of the CWA established a program to regulate the discharge of dredged and fill material into waters of the United States, including wetlands. Refer to section 3.4, Biological Resources, for a discussion of wetlands.

Executive Order 11988, Floodplain Management, was established in 1977 "to avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative." All Federal and Federally supported activities are required to comply with Executive Order 11988.

3.14.1 ALASKA INSTALLATIONS

Storm water management activities within the State of Alaska are governed by Title 18 Environmental Conservation, Chapter 60, Article 2 of the Alaska Administrative Code in accordance with 40 CFR 122.26. Other applicable codes include Title 18 Environmental Conservation, Chapter 70 Water Quality Standards; Title 11 Natural Resources, Part 6 Lands, Chapter 93 Water Management; and Title 46 Water, Air, Energy, and Environmental Conservation. For construction projects, a copy of the Notice of Intent and SWPPP prepared for the U.S. EPA must be provided to the Alaska Department of Environmental Conservation.

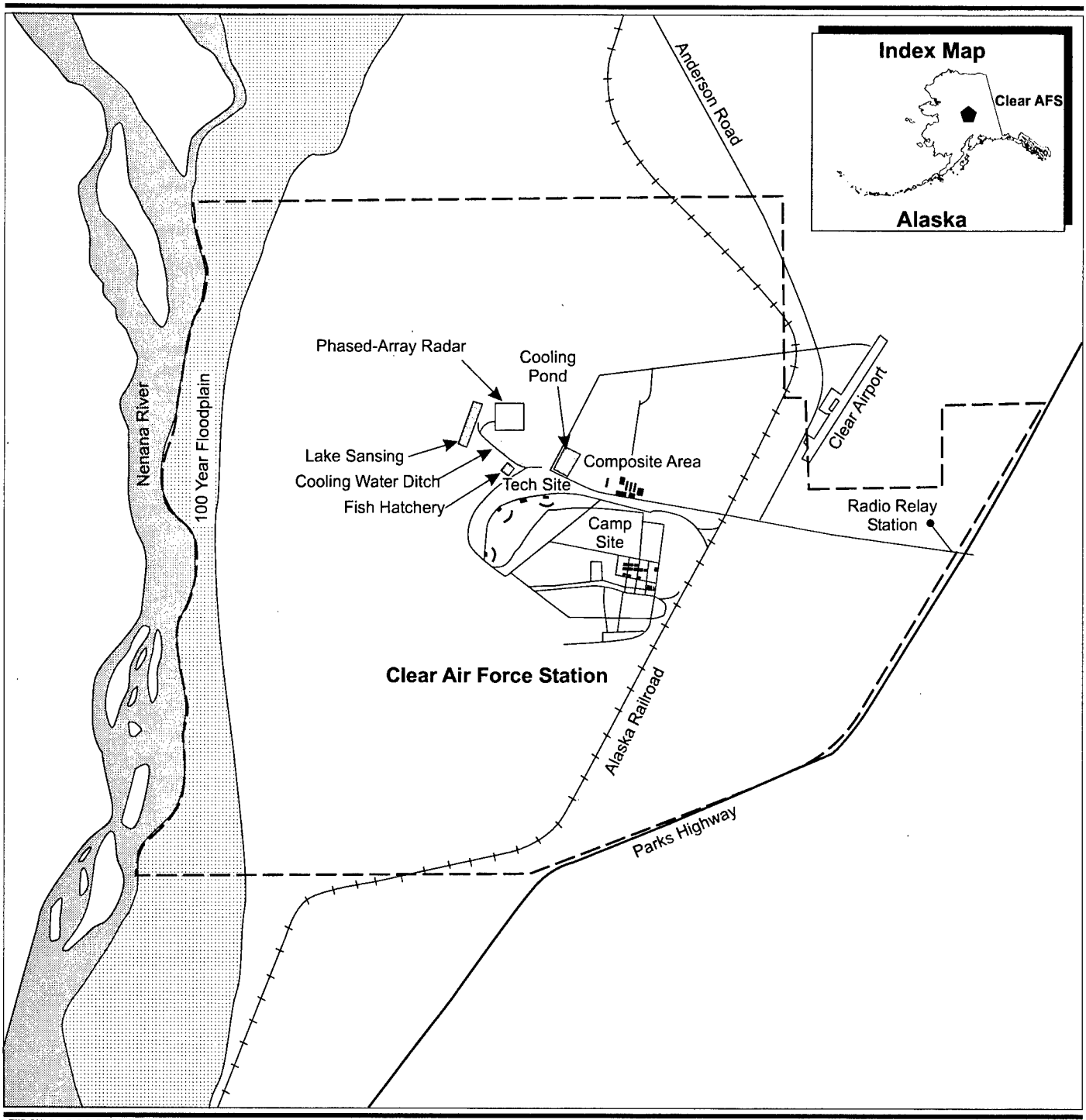
3.14.1.1 Clear AFS—Water Resources

The water resources ROI includes all surface water features, drainage areas, and underlying aquifers that could be affected by construction or operations. This area includes Clear AFS and an area within approximately 2 kilometers (1 mile) of the base boundary (figure 3.14-1).

Surface Water

Clear AFS is located in the Nenana River watershed, USGS Cataloging Unit 19040508 (U.S. EPA, 1998—Surf Your Watershed). Surface water flow on Clear AFS follows the topography in a northeasterly direction. Runoff follows several small creeks north of the station that flow into the Nenana River (U.S. Department of the Air Force, 1997—Supplemental EA for Radar Upgrade, Clear AS). Due to the low mean annual precipitation for the area of 33 centimeters (13 inches), very little overland flow occurs other than at spring breakup (Clear AS, 1998—Draft Solid Waste Management Plan). The 100-year floodplain of the Nenana River is restricted to the westernmost portion of the installation (U.S. Department of the Air Force, 1997—Supplemental EA for Radar Upgrade, Clear AS).

There are four primary bodies of water contained on or bordering Clear AFS. The largest of these bodies of water is the Nenana River, which runs along the entire west boundary of Clear AFS. The other water bodies, Lake Sansing, the power plant cooling ponds, and the radar cooling water reject ditch, are man-made. There are approximately 1.6 kilometers (1 mile) of relatively undisturbed wilderness between the Nenana River and any developed area on Clear AFS. Lake Sansing is a groundwater infiltration area (approximately 5 hectares [12 acres]) contained in an old gravel borrow pit, and is fed by the radar operations cooling pond overflow via the reject ditch and by rainfall. The cooling pond is an unlined reservoir (approximately 3 hectares [8 acres]) that receives water via underground pipe from the power plant. (U.S. Department of the Air Force, 1997—Supplemental EA for Radar Upgrade, Clear AS)



EXPLANATION

- Roads
- Land Area
- Water Area
- 100 Year Floodplain
- Installation Boundary
- Railroads

NORTH

Scale

0 2,500 5,000 Feet

0 762 1,524 Meters

Water Resources, Clear Air Force Station

Alaska

Figure 3.14-1

On the developed section of the installation, manmade features have in many cases altered normal overland flow paths. In all cases, the storm water is redirected into manmade features or into the surrounding forest to infiltrate into the groundwater or to evaporate. (U.S. Department of the Air Force, 1997—Supplemental EA for Radar Upgrade, Clear AS)

Clear AFS does not discharge storm water into any waters of the United States, and is currently not required to have an NPDES Multi-Sector Industrial Storm Water Permit. However, Clear AFS has prepared an SWPPP to establish a system and guidelines to reduce or eliminate potential storm water pollution. (Clear AS, 1998—Draft Storm Water Pollution Prevention Plan)

Groundwater

The groundwater within the ROI occurs in an unconfined aquifer composed of unconsolidated sand and gravel. Depth to water ranges from approximately 17 to 20 meters (55 to 65 feet) below the surface, and tends to flow north at a gradient of about 1 meter (3 feet) per mile. The groundwater receives its recharge from the infiltration from the Nenana River, surface water features, and precipitation. The groundwater discharges about 8 kilometers (5 miles) north of Clear AFS into Julius Creek and Clear Creek. (Clear AS, 1998—Draft Solid Waste Management Plan)

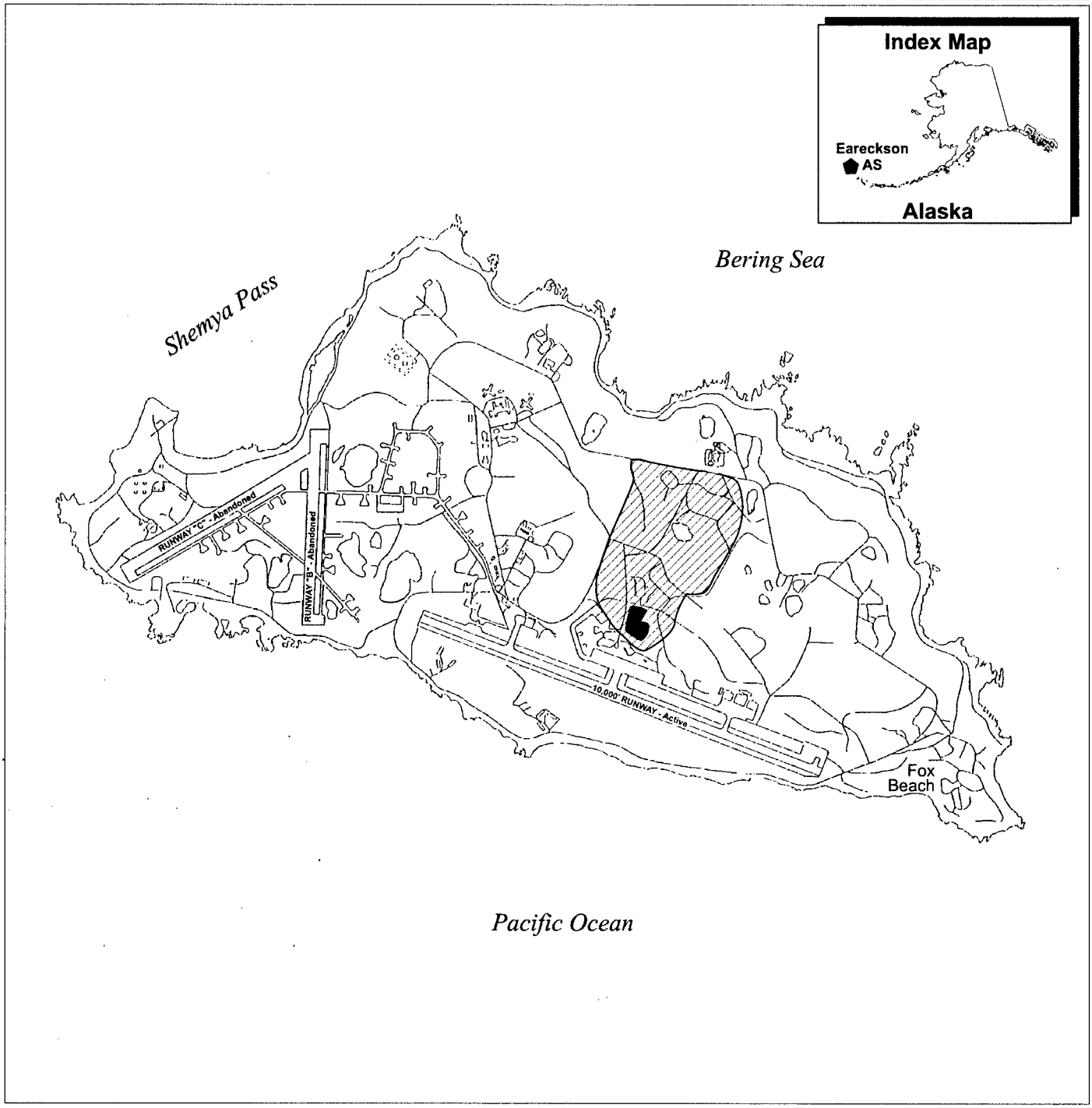
Water for domestic and industrial use at Clear AFS is obtained from 15 wells completed to depths of approximately 46 meters (150 feet) (U.S. Department of the Air Force, 1997—Supplemental EA for Radar Upgrade, Clear AS).

Water Quality

Water quality is subject to seasonal variations, but all within established U.S. EPA drinking water standards (water resources appendix). There are several water supply wells down gradient from the landfill that are checked for water quality on a regular basis. No contaminates were detected in monitoring wells installed around the site landfill during the previous monitoring of groundwater at the landfill. (Clear AS, 1998—Draft Solid Waste Management Plan)

3.14.1.2 Eareckson AS—Water Resources

The water resources ROI includes all surface water features, drainage areas, and underlying aquifers that could be affected by construction or operations. This area includes all of Shemya Island (figure 3.14-2).



EXPLANATION

- Roads
- Land Area
- Water Area
- Watershed Area
- Water Gallery

Scale

0 1,738 3,475 feet

0 530 1,059 meters

NORTH

Water Resources, Eareckson Air Station

Alaska

Figure 3.14-2

Surface Water

Eareckson AS is located in the Shemya Island watershed. Surface water flow on Eareckson AS follows the topography in a south–southwest direction, although the east and west halves of the island are distinct drainage systems. Drainage is generally poor in the interior of the island, resulting in standing water. There is no record of either rainfall induced or coastal flooding on Shemya Island. The small drainage area of the interior is not likely to result in flooding, and the coastline is sufficiently high such that 100-year storm waves would not top the beach crest. However, a tsunami line has been established at the 30-meter (100-foot) elevation mark (U.S. Department of the Air Force, 1997-Final Installation-Wide Environmental Baseline Survey; U.S. Air Force, 1995—Natural Resources Plan; U.S. Department of the Air Force, undated—EA Shemya Borrow Pit and Rock Quarry Plan).

Numerous lakes and ponds exist on the island, generally in the northern and western one thirds. Except for the western Lake Complex, most of the lakes and ponds have poorly defined drainage basins. Frost ponds, open pits, and standing water are a result of the poor drainage on the island. Many of the lakes and ponds are situated near surface water divides or high points, and a significant portion of the available precipitation is absorbed by surficial and near-surface deposits. The remaining water is discharged by streams or springs on the southern coastline. There is not a large runoff on the northern coast of the island due to the increasing northern elevation. (U.S. Department of the Air Force, undated—EA Shemya Borrow Pit and Rock Quarry Plan; U.S. Air Force, 1995—Eareckson AS, Draft Management Action Plan; U.S. Air Force, 1995—Natural Resources Plan)

A small watershed located in the eastern part of the island that covers an area of approximately 103 hectares (255 acres) is the recharge area for potable water at Eareckson AS (U.S. Air Force, 1994—Eareckson AFS Storm Water Pollution Prevention Plan). Within this area, surface water infiltrates into a shallow unconfined aquifer.

Storm water flows overland and through culverts, eventually reaching outfall locations at the ocean. Outfalls usually discharge storm water mixed with groundwater that seeps into the drainage channels. Eareckson AS has an NPDES Multi-Sector Industrial Storm Water Permit and SWPPP that document existing conditions and establish practices for prevention of storm water pollution. (U.S. Air Force, 1994—Eareckson AFS Storm Water Pollution Prevention Plan; Shoviak, 1999—Personal communication)

Groundwater

The varying lithology and structural influences found on the island create a relatively complex hydrogeological environment. Both confined and unconfined aquifers occur on the island, with some areas having multiple zones of saturation. Groundwater can be encountered either in the surface peat layer that occurs over much of the island, or in the unconsolidated sand and gravel that occurs primarily in the southern coastal area, or in the fractured bedrock in the central portion of the island. The general trend for the island is that groundwater depth increases with an increase in surface elevation. Depth to water varies from approximately 3 meters (10 feet) to more than 60 meters (200 feet) below ground surface. (U.S. Department of the Air Force, undated—EA Shemya Borrow Pit and Rock Quarry Plan; U.S. Air Force, 1995—Draft Management Action Plan)

Groundwater flow within the unconsolidated deposits closely follows the surface topography. Most water finds its way into the fractures in the bedrock where it is stored. General direction of water flow within the bedrock follows surface topography also, suggesting that gravity is more dominant than fracture flow. An east–west trending groundwater divide occurs somewhere within the northern one third of the island. To the south of this divide, groundwater flow is predominantly to the south/southwest. To the north of this divide, groundwater flow is predominantly to the north/northeast. All of the potential aquifers on the island are either quite thin, have low porosity, or have low permeability. (U.S. Department of the Air Force, undated—EA Shemya Borrow Pit and Rock Quarry Plan; U.S. Air Force, 1995—Draft Management Action Plan)

Potable water is collected through an infiltration gallery system installed in the 1950s. Four horizontal infiltration collectors are installed below the peat layer of the shallow unconfined aquifer. Groundwater from the peat layer enters the collectors and flows to a central holding tank. The water is pumped to the water treatment plant, where it is treated for domestic use, chlorinated, and then pumped into three water storage reservoirs for domestic and construction uses. Two wells provide up to 416 liters (110 gallons) per minute of water as a backup to the water gallery system. (U.S. Department of the Air Force, undated—EA Shemya Borrow Pit and Rock Quarry Plan)

Water Quality

Surface water and groundwater quality is generally good except in isolated areas of known contamination. Water pumped from the water gallery is treated in the water treatment plant before domestic use. Drinking water quality is subject to seasonal variations but is generally within established U.S. EPA drinking water standards (U.S. Department of the Air Force, undated—EA Shemya Borrow Pit and Rock Quarry Plan).

However, drinking water samples have exceeded the 1993 action levels for lead and copper (U.S. Department of the Air Force, 1997—Final Installation-Wide Environmental Baseline Survey).

3.14.1.3 Eielson AFB—Water Resources

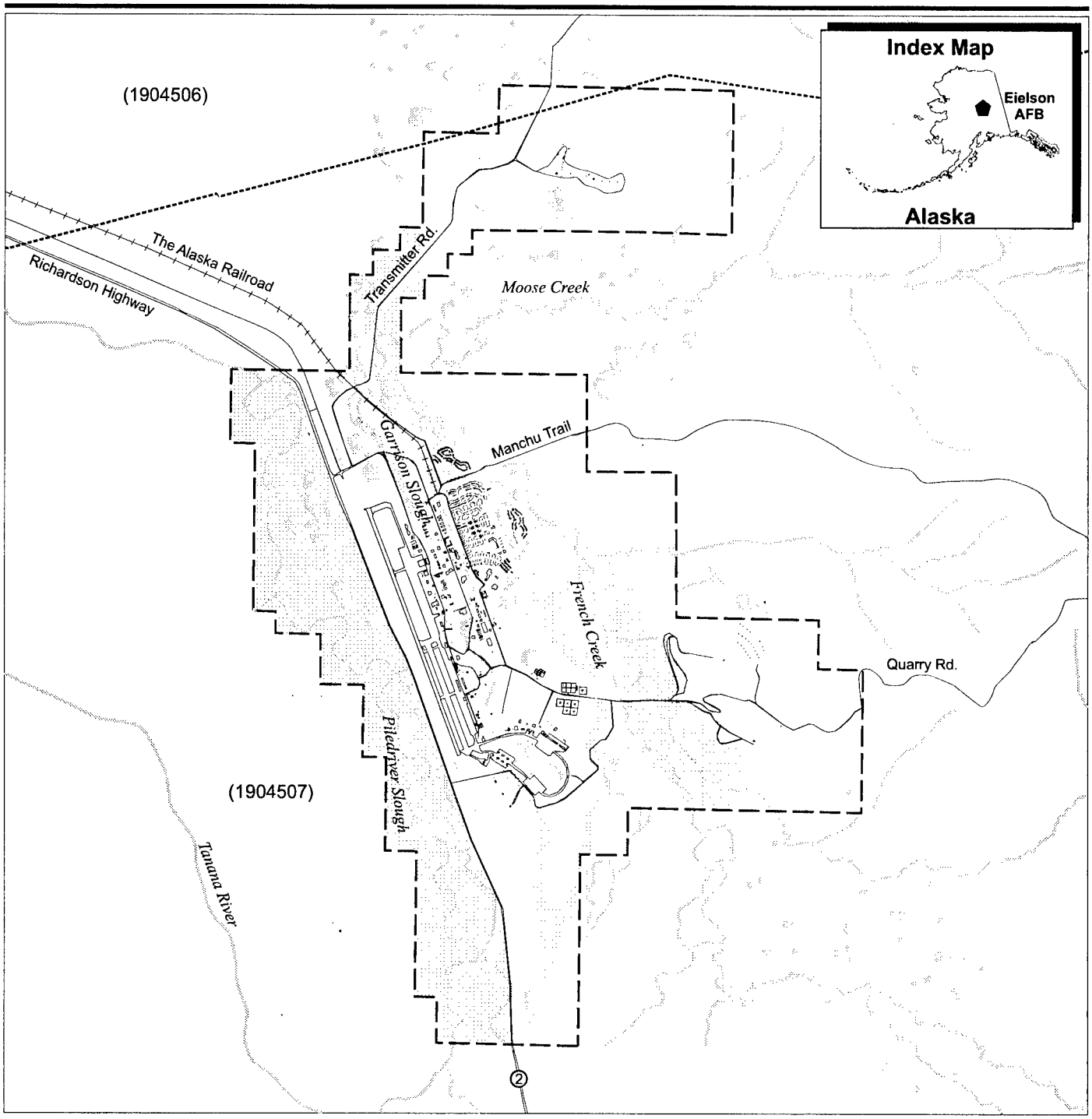
The water resources ROI includes all surface water features, drainage areas, and underlying aquifers that could be affected by construction or operations. The ROI includes all of Eielson AFB and a buffer area of approximately 3 kilometers (2 miles) that includes proposed action areas on the Yukon Training Area (figure 3.14-3).

Surface Water

The Eielson ROI is located primarily in the Tanana Flats watershed, USGS Cataloging Unit 19040507 and also extends into the Chena River watershed, USGS Cataloging Unit 19040506 (U.S. EPA, 1998—Surf Your Watershed). Surface water bodies near Eielson AFB include rivers, creeks, sloughs, lakes, and ponds. Surface drainage at Eielson AFB is generally north–northwest, parallel to the Tanana River. Several small sloughs or creeks pass through the ROI and discharge into the Tanana River. Moose Creek is the main receiving stream for small local drainages around the base. French Creek, along the eastern side of the base, discharges into Moose Creek. Garrison Slough also discharges into Moose Creek. Garrison Slough passes directly through the developed portion of the base and consists primarily of engineered drainage channels. Moose Creek discharges into Piledriver Slough just above the confluence with the Tanana River. With the exception of a short period during spring, the surface water elevation in Garrison Slough is lower than the groundwater elevations. This indicates the Garrison Slough is a gaining stream that receives its recharge from the groundwater during most of the year. (U.S. Air Force, 1995—Final Environmental Restoration Program, Eielson AFB, Operable Units 3, 4, and 5; U.S. Department of the Air Force, 1998—Draft 1997 Sitewide Monitoring Program Report)

Approximately 34 percent of Eielson AFB is within the 100-year floodplain (U.S. Air Force, 1997—EA Gravel Borrow Pit in the North Area of Eielson AFB). The Winter Camp site on the Yukon Training Area is not within a floodplain.

Eielson AFB operates under an NPDES Multi-Sector Industrial Storm Water Permit and SWPPP. The SWPPP identifies existing and potential sources of storm water pollution at Eielson AFB and defines Best Management Practices to reduce potential pollution and ensure compliance with permit requirements.



EXPLANATION

- Water Area
- 100 Year Floodplain
- Drainage
- Roads
- Watershed Boundary (EPA Watershed ID Number)
- Railroads
- Roads
- Installation Boundary
- Building

NORTH

Scale 1:101,000

0 .8 1.6 Miles

0 1.25 2.5 Kilometers

Water Resources, Eielson Air Force Base

Alaska

Figure 3.14-3

Groundwater

Groundwater on the developed part of the base occurs at depths of 2 to 3 meters (6 to 10 feet) below ground surface. This is an unconfined aquifer associated with the Tanana River floodplain. The aquifer is 61 to 91 meters (200 to 300 feet) thick and overlies the Birch Creek Schist. Flow directions are usually to the north–northwest and parallel the flow of the Tanana River. Local variations in flow directions occur on Eielson AFB near surface water bodies, Power Plant pumping supply wells, and near melting piles of stored snow that create a source of recharge water during breakup.

Groundwater elevations in the unconfined aquifer are subject to seasonal fluctuations, with the highest elevation occurring during and immediately following snowpack melting. The lowest elevations are expected during the fall. During winter, a slow rise in water levels is normal. The magnitude of fluctuations varies from year to year, but generally is in the range of 0.5 to 0.6 meter (1.5 to 2.0 feet). (U.S. Air Force, 1995—Final Environmental Restoration Program, Eielson AFB, Operable Units 3, 4, and 5; U.S. Department of the Air Force, 1998—Draft 1997 Sitewide Monitoring Program Report)

Groundwater in the upland portion of the base occurs at depths of approximately 15 to 91 meters (50 to 300 feet) in a fractured bedrock aquifer. Downgradient flowpaths are not well defined in this aquifer. Groundwater flow in the bedrock aquifer is controlled largely by the heterogeneities in the bedrock such as fractures or relatively permeable lenses and layers. (U.S. Air Force, 1995—Final Environmental Restoration Program, Eielson AFB, Operable Units 3, 4, and 5)

Groundwater is the only source of potable water used at Eielson AFB. Additional private and agricultural wells are located within a 5-kilometer (3-mile) radius of the base. These wells are located downgradient, north–northwest, and to the west of the base. The community of Moose Creek depends upon a public water system (groundwater) and on private wells. Groundwater is also utilized for emergency and fire fighting purposes on Eielson AFB. (U.S. Air Force, 1995—Final Environmental Restoration Program, Eielson AFB, Operable Units 3, 4, and 5)

Water Quality

Groundwater is the principal source for industrial, domestic, agricultural, and fire-fighting purposes (U.S. Air Force, 1995—Final Environmental Restoration Program, Eielson AFB, Operable Units 3, 4, and 5). Background groundwater quality analyses have shown that the average iron and manganese concentrations typically exceed the secondary maximum contaminant levels for drinking water. Arsenic has been identified as a constituent of concern at Eielson AFB, and one

background sample exceeded the primary drinking water standard of 50 micrograms per liter (U.S. Air Force, 1993—Environmental Restoration Program, Eielson AFB, Background Ground—Water Quality; U.S. Department of the Air Force, 1998—Draft 1997 Sitewide Monitoring Program Report).

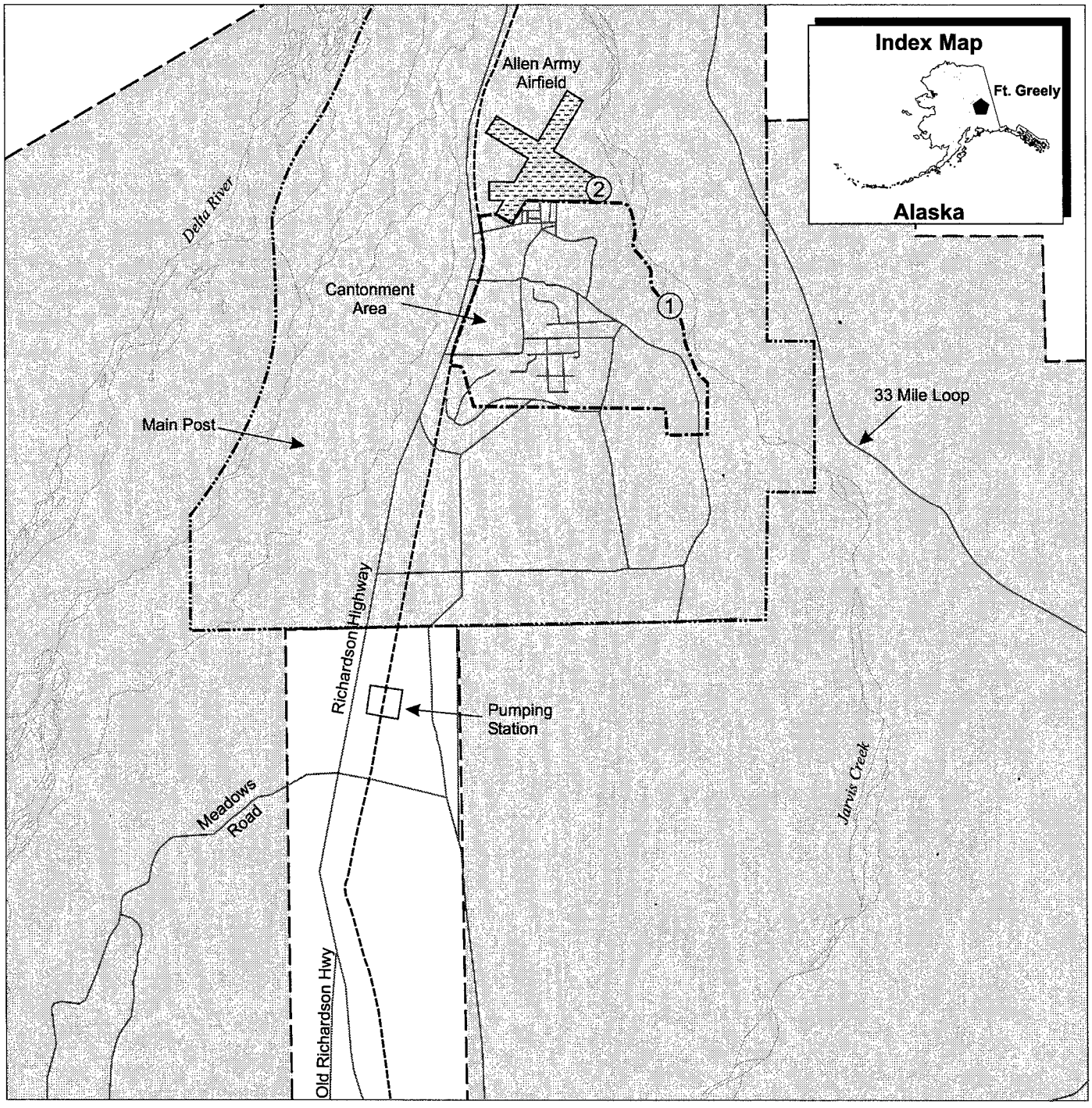
Surface water is not utilized for drinking water in the Eielson AFB area. (U.S. Air Force, 1995—Final Environmental Restoration Program, Eielson AFB, Operable Units 3, 4, and 5). Water sampling of Garrison Slough has identified volatile organic compounds at levels below the U.S. EPA drinking water maximum contaminant levels. Low levels of pesticides were detected in 1993; however, no pesticides were detected in 1994. (U.S. Department of the Air Force, 1998—Draft 1997 Sitewide Monitoring Program Report)

3.14.1.4 Fort Greely —Water Resources

The water resources ROI includes all surface water features, drainage areas, and underlying aquifers that could be affected by construction or operations. This includes the cantonment area and an adjacent area several miles south from the cantonment boundary (figure 3.14-4).

Surface Water

Fort Greely is in the Delta River watershed, USGS Cataloging Unit 19040504 (U.S. EPA, 1998—Surf Your Watershed). The Delta River to the west and Jarvis Creek immediately east are the two primary drainages for the Fort Greely ROI. Both are glacier-fed and silt-laden. The peak flow in these water systems is reached in late summer, when snow and ice melt is augmented by rainfall. Minimum flow occurs in winter when precipitation occurs as snow. (Alaskan Air Command, 1990—Installation Restoration Program, Site 3, Fort Wainwright Landfill) Other surface water bodies within the ROI are intermittent, unnamed creeks, and lakes. Jarvis Creek and Delta River are generally frozen solid during the winter, but discharges from springs at the mouth of the river have been measured at about 0.8 cubic meter (30 cubic feet) per second. Discharges measured on the Delta River 3 kilometers (1.8 miles) south of Big Delta range from nearly 283 cubic meters (10,000 cubic feet) per second in July to 0.7 cubic meter (24 cubic feet) per second in October. Similar discharge measurements for Jarvis Creek at the Richardson Highway range from 25 cubic meters (880 cubic feet) per second in July to no flow from November to March. (U.S. Army Corps of Engineers, 1996—Final Report, Postwide Site Investigation, Fort Greely)



EXPLANATION

- Fort Greely
- Roads
- Drainage
- Runways
- Installation Boundary
- Trans-Alaska Pipeline
- Main Post Boundary
- Cantonment Area Boundary
- (1) Outfall 1 - Stormwater
- (2) Outfall 2 - Stormwater

Scale 1:80,000

0 3,334 6,667 feet

NORTH

0 1,016 2,032 meters

wr_fge_001

Water Resources, Fort Greely

Alaska

Figure 3.14-4

Although floodplain boundaries have not been developed for the ROI, there is a low probability of flooding. High flows in the Delta River overflow to the west rather than toward the ROI. Jarvis Creek overflowed into an old channel during a 1967 flood. Since a barrier was placed at the overflow location, flooding along the old channel has not occurred. (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS)

Due to the relatively flat terrain and permeable soils within the ROI, much of the storm water runoff infiltrates before it reaches a water body. Fort Greely operates under an NPDES Multi-Sector Industrial Storm Water Permit and SWPPP (Johnson, D., 1999—Personal communication, March 24). The SWPPP identifies two outfalls from the main cantonment area. One discharges into Jarvis Creek, and the other discharges within 183 to 213 meters (600 to 700 feet) of Jarvis Creek (U.S. Army Corps of Engineers, 1996—Final Report, Storm Water Pollution Prevention Plan, Fort Greely).

Groundwater

One unnamed water-bearing unit has been described in the ROI. This unit consists of a lower stratified gravel layer extending at least 52 meters (170 feet) below ground surface. One boring completed at Fort Greely penetrated the alluvium to depths of 122 meters (400 feet) below ground surface. The lower stratified gravel aquifer has been reported to be overlain by low-permeability lenses and seams that may result in the formation of perched water zones. Although the water table is usually reported to lie below the permafrost, the presence of perched water has been documented within the fort boundaries. (U.S. Army Corps of Engineers, 1996—Final Report, Postwide Site Investigation, Fort Greely)

The groundwater flows in a northeasterly direction at a gradient ranging from approximately 1.5 to 6 meters (5 to 21 feet) per mile. Groundwater in the area is recharged continuously by the Delta River and by infiltration of meltwater from the Alaska Range in the late spring and early summer. The depth to groundwater ranges from 53 meters (175 feet) to at least 91 meters (300 feet) below ground surface, and fluctuates in response to seasonal recharge. As of 1983, there were five usable wells, located near the north end of the existing post, with an estimated combined capacity in excess of 15 million liters (4 million gallons) per day. (U.S. Army Corps of Engineers, 1996—Final Report, Postwide Site Investigation, Fort Greely)

Water Quality

Surface water quality samples meet the primary drinking water standards; however, the concentrations of aluminum, iron, and manganese were higher than the secondary standards. Measurements of

pH on Fort Greely were within the state standards. The average annual sediment yield for the Delta River is 420 metric tons per square kilometer (1,200 tons per square mile), most of which is transported during the summer. (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS)

Groundwater quality in the vicinity of Fort Greely is considered good for a potable water supply (U.S. Army Corps of Engineers, 1996—Final Report, Postwide Site Investigation, Fort Greely). In a recent study, all of the water quality parameters were within the state drinking water standards (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS).

3.14.1.5 Yukon Training Area (Fort Wainwright)—Water Resources

The water resources ROI is described under Eielson AFB, section 3.14.1.3, and includes all surface water features, drainage areas, and underlying aquifers that could be affected by construction or operations. The ROI includes all of Eielson AFB and a buffer area of several miles around the proposed GBI site.

Surface Water

See section 3.14.1.3. The Yukon Training Area operates under the Fort Wainwright NPDES Multi-Sector Storm Water Permit and SWPPP.

Groundwater

See section 3.14.1.3.

Water Quality

See section 3.14.1.3.

3.14.1.6 Alaska—Fiber Optic Cable Line—Water Resources

This section describes the water resources and water quality for the fiber optic cable line ROI. The potential fiber optic cable line would be installed to connect Eareckson AS to existing fiber optic cables at Seward or Whittier as shown in figure 2.4.5-1. The fiber optic cable line route would cross approximately 4,000 kilometers [2,500 miles)] of ocean floor. The route would start in either Whittier, in Prince William Sound, or Seward, adjacent to the Gulf of Alaska. It would then cross the Gulf of Alaska and the Bering Sea.

In addition to this route, a second redundant route may be required. The exact alignment of this route has not been identified but could be north of the Aleutian Islands or connect to existing fiber optic cable in the central Pacific. Provided below is a description of the known fiber optic

cable route starting in either Whittier or Seward. Once the second route is identified, additional environmental analysis would be conducted.

Prince William Sound

Prince William Sound is a semi-enclosed 100-by-160-kilometer (60-by-100-mile) body of seawater in Southcentral Alaska that is bounded on the north and west by the south-central coastline and on the east and south by islands that separate it from the Gulf of Alaska. The greatest depths in Prince William Sound are close to 3,650 meters (12,000 feet) deep. The deepest water is found in a series of basins west of Naked Island. Typically, however, water depths throughout the sound range from 200 to 400 meters (650 feet to 1,300 feet). Hinchinbrook Entrance is 140 meters (460 feet) deep, and Montague Strait is 265 meters (875 feet) deep. Shallow sills at these entrances restrict the movement of water between the gulf and the sound.

Surficial sediments in much of Prince William Sound are fine glacial clay and silt overlaying graywacke or shale (Sharma, 1979—The Alaskan Shelf). Depth of the fine sediment layer is greater in the deeper areas further from the glacial sources of much of the sediment input. Soft sediments are composed of 30 to 40 percent silt and 60 to 70 percent clay. Graywacke, shale, and scattered igneous extrusions are exposed throughout the sound.

Prince William Sound tidal currents flood and ebb through the entrances to the sound. Predicted velocities are not available for any of these channels. However, the sound contains a large volume of water and is highly affected by tidal variations. Since shallow sills limit the flow into the passes, flood and ebb velocities can be assumed to be over 5 kilometers per hour (3 miles per hour) at maximum flow. Net circulation of seawater in the sound is in from the east and out to the south; waters enter through Hinchinbrook Entrance, flow to the southwest around Knight Island, and then flow out through the sound's southwest passages.

Waves in Prince William Sound seldom reach heights over 2 meters (6 feet), and then only in the open areas of the eastern sound. Tidal range in the sound is typically 4 to 5 meters (12 to 15 feet).

The North Pacific Basin, including the Gulf of Alaska and Prince William Sound, is subject to tsunamis, or seismic ocean waves. Eighty percent of tsunamis reported between 1928 and 1963 occurred in this region. These are very long period waves generated by earthquakes. Underwater landslides set off by an earthquake may be the direct cause, as large volumes of water may be displaced very quickly by such events. The length between crests may be several hundred kilometers, and they travel at speeds up to 900 kilometers per hour (560 miles per hour). In the deep ocean the wave height may be under 1 meter (3.3 feet). The

wavelength shortens and the height increases as a tsunami approaches shallow water. When it hits a coastline, a tsunami pushes a tremendous volume of water up the shoreline, which then drains back down rapidly. The tremendous volume washing up the shoreline at high speed, rather than wave height, does the damage. (U.S. Department of the Interior, 1974—The Western Gulf of Alaska)

Water temperatures in the sound range from just above freezing during the winter and spring to as high as 15°C (60°F) during August. Salinity of surface water in the sound ranges from 30.5 parts per thousand in late winter to a high of about 32.5 parts per thousand in the central sound in summer. Temperature and salinity variations are the result freshwater inputs from streams mixing with the offshore oceanic water mass entering through Hinchinbrook Entrance (Sharma, 1979—The Alaskan Shelf).

Information on turbidity is not available for the deep waters of Prince William Sound. However, turbidity values are generally low for most of the year, with the exception of spring, when plankton blooms. Turbidity is higher near the mainland shore.

Gulf of Alaska

The Gulf of Alaska is bounded on the north by the shoreline of south-central Alaska and extends from southeast Alaska westerly to Unimak Pass near the tip of the Alaska Peninsula (Sharma, 1979—The Alaskan Shelf). It is bounded on the south by the eastward flowing sub-arctic current in the North Pacific Ocean. It is the terminus of one of the world's largest storm tracks, resulting in weather conditions in the gulf that tend toward the extreme, especially during the winter.

The Gulf of Alaska has several bathymetric regions (Sharma, 1979—The Alaskan Shelf). The continental shelf east of Kodiak Island is a relatively shallow, flat shelf environment. The greatest depths in this area are about 275 meters (900 feet) deep. The shelf extends up to 250 kilometers (150 miles) offshore. To the south and west of Kodiak Island the continental shelf is narrower. This area is characterized by shoals, islands, and undersea canyons that break up the smooth shelf environment. Ocean depths of 3,700 meters (12,000 feet) can be found within 50 kilometers (30 miles) of the coast. Approximately 140 kilometers (85 miles) south of the shoreline at Nikolski, ocean depths drop to over 7,200 meters (23,500 feet).

Sediments underlying the Gulf of Alaska are a mixture of glacial fines, silt, sand, gravel, boulders, and rock outcrops (Sharma, 1979—The Alaskan Shelf). Nearshore areas are often covered with fine sediments overlying relict glacial moraines. Soft sediment depths are greater in depressions and valleys, and shallower along ridgelines. Fine sediments

are common near the coast; currents flush the exposed ridges clear of the finer sediments. Further offshore, the seabed is dominated by relict glacial moraine.

As the eastward flowing Subarctic Current approaches the coastline of North America (the Alaska Current), it flows counterclockwise to the north and then runs westerly along the Alaska coastline (figure 3.14-5). The U.S. Department of the Interior (1974) reported a net velocity of 0.5 kilometer per hour (0.3 knot) across the central Gulf of Alaska.

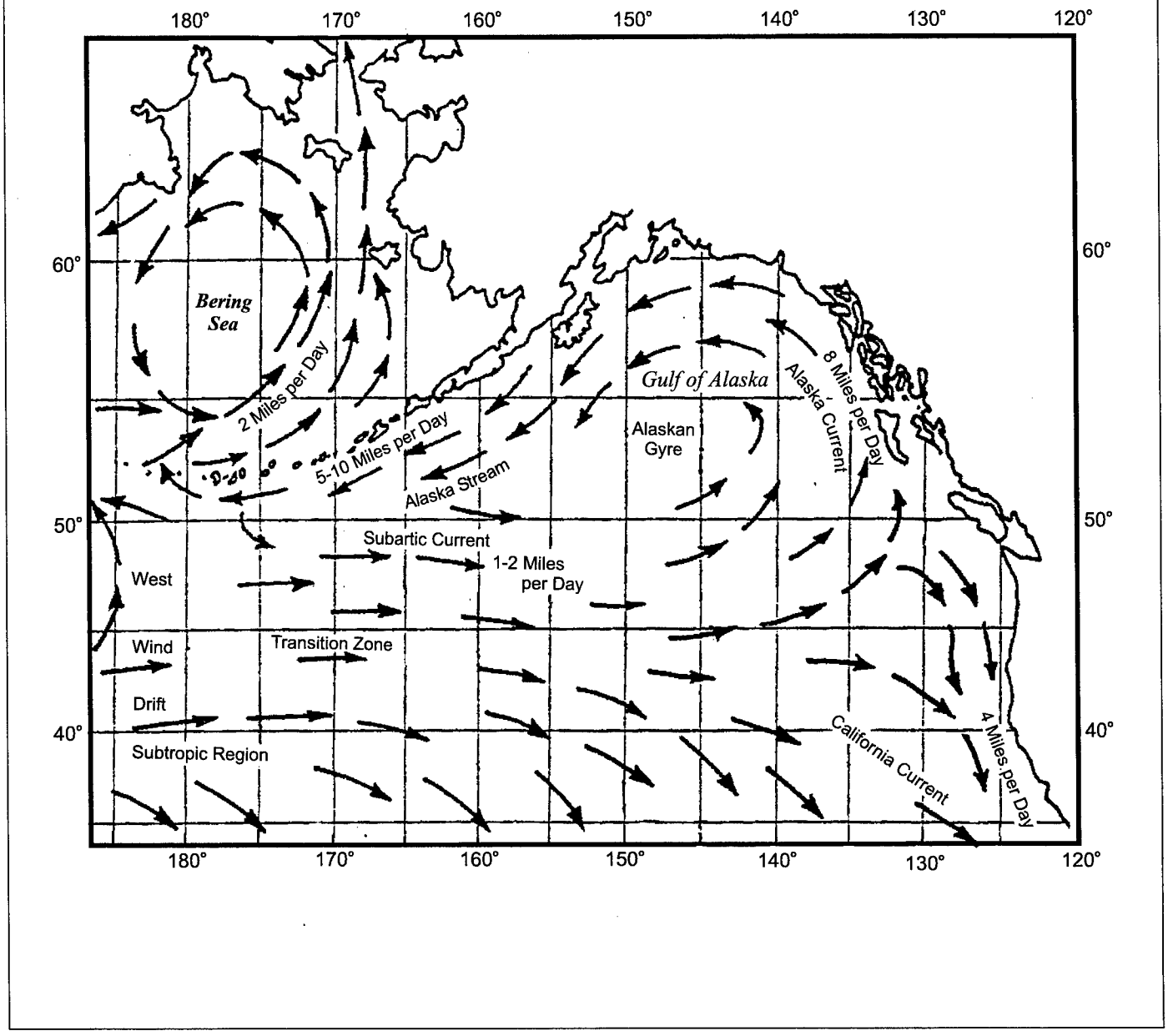
Tidal currents in the Gulf of Alaska run from zero at slack tide to as high as 16 kilometers per hour (9 knots) or even higher through the passes in the Aleutians Islands. Storm driven tides may even run over 20 kilometers per hour (11 knots).

The Alaska Current narrows and becomes the Alaska Stream as it moves west past Kodiak Island, the Alaska Peninsula, and along the Aleutian Range. Near 175 degrees west longitude, south of the Aleutian Chain, the Alaska Stream slows and splits. Part of the stream turns southerly and rejoins the eastbound Subarctic Current, and part, assisted by the Coriolis effect, flows north into the Bering Sea. Tidal activity is moderate in the Gulf of Alaska; the typical tidal range is about 2.75 meters (9 feet) at Kodiak.

During storms, seas in the Gulf of Alaska are heavy and chaotic. The chaotic wave action results from the short fetch in the gulf (the distance winds blow unobstructed over water). Maximum unsubstantiated wave height calculated for the Gulf of Alaska is 15 meters (50 feet) (U.S. Department of the Interior 1974—The Western Gulf of Alaska). Reliable estimates put maximum wave height closer to 9 meters (30 feet). Ocean swells in the open North Pacific have been measured at a height of 34 meters (110 feet) (Gross, 1987—Oceanography). The Gulf of Alaska is also subject to tsunamis.

Winter surface seawater temperatures in the Gulf of Alaska ranges from 0 to 1°C (32 to 34°F) near shore to offshore temperatures of 2.2 to 3.3°C (36 to 38°F). Offshore surface temperatures can reach 11 to 12°C (52 to 54 °F) during the summer. Water temperatures below 100 meters (330 feet) average 4 to 5°C (39 to 41°F) year-round.

Salinity at the surface over the continental shelf ranges from 32.0 to 32.2 parts per thousand in summer and 32.4 to 32.6 parts per thousand in winter. Bottom water over the continental shelf is close to 33.0 parts per thousand year-round. This is the same salinity as in the North Pacific, indicating uniformity of subsurface conditions in the Gulf of Alaska with the North Pacific. (U.S. Department of the Interior 1974—The Western Gulf of Alaska)



General Circulation, North Pacific Ocean

Alaska

Not to Scale

NORTH

Figure 3.14-5

Turbidity information is unavailable for the deep waters of the Gulf of Alaska. However, turbidity values are generally low during winter. During summer, turbidity increases near the surface from plankton blooms. Nearshore turbidity increases from fine-grained glacial sediment as stream flows increase during summer.

Bering Sea

The Bering Sea is bounded by the Commander and Aleutian Islands on the south, by Western Alaska on the east, by the Bering Straits on the north, and by Russia on the west and northwest.

The Bering Sea is generally shallow, especially over the continental shelf in the eastern and northern portions of the sea. It is ice-free for about 6 months of the year; maximum winter ice typically covers approximately half to three-quarters of the Bering Sea (McRoy and Goering, 1974—The Influence of Ice on the Primary Productivity of the Bering Sea). The floor of the southwestern Bering Sea is typically a smooth abyssal plain surrounded by steep walls of the continental slope. The abyssal plain covers approximately 43 percent of the sea floor; the continental shelf covers approximately 43 percent of the bed; and the continental slope, nearly 13 percent of the floor. Depths of 1,900 meters (6,300 feet) are found within 32 kilometers (20 miles) of the eastern Aleutian coast. Depths above the abyssal plain generally range from 2,500 meters (8,200 feet) to 3,500 meters (11,500 feet). Bower's Ridge rises from the bed of abyssal plain and runs north and then west from a point two thirds out along the Aleutian Chain. The ridge rises to the surface at Semisopochnoi Island and is about 600 kilometers (375 miles) long.

The deeper portions of the Bering Sea have a thick layer of fine sediment that was deposited by the Kuskokwim and Yukon Rivers when they flowed south during the last ice age (Sharma, 1979—The Alaskan Shelf). Rocky substrates are found in the Aleutian Chain and along Bower's Ridge. The continental shelf in the Bering Sea varies from fine sediments near the rivers in Bristol Bay to coarse sand further offshore. There is little rocky substrate on the continental shelf within the Bering Sea.

The general circulation pattern in the Bering Sea flows in a counterclockwise direction (figure 3.14-5). Part of the water mass passes north through the Bering Straits, and the balance of the water mass flows west and back south, thus continuing the counterclockwise Bering Sea Gyre. The average velocity of the northward flowing current along the eastern boundary of the Bering Sea is 0.13 kilometer per hour (0.07 knots).

Over half of the Bering Sea is shallow, and the fetch is short. Storms create chaotic and heavy seas. Tidal activity along the southern edge of the Bering Sea is the same as that in the adjoining western Gulf of Alaska.

In the central Bering Sea, winter surface water temperatures range from 0 to 3°C (32 to 37°F). Surface water temperature in the northern Bering Sea is typically at the freezing point, and sea ice covers the northern two-thirds of the sea. For most of the Bering Sea, summer temperatures rise to 7 to 8°C (44 to 46°F).

Salinity in the Bering Sea is 33 to 34 parts per thousand (Favorite, 1974; —Flow Into the Bering Sea through the Aleutian Island Passes; McAlister and Favorite, 1977—Oceanography). Salinity drops near rivers such as the Yukon River and the rivers that drain into Bristol Bay.

Turbidity information is unavailable for the waters of the Bering Sea. However, turbidity values are generally low during winter. During summer, turbidity increases from plankton blooms in near-surface waters. Turbidity is higher near the shorelines and lower in the offshore areas. Turbidity is expected to be low in the deeper waters below the photic zone.

3.14.2 NORTH DAKOTA INSTALLATIONS

Potentially applicable North Dakota Administrative Code includes: Standards of Water Quality for the State of North Dakota (Chapters 33-16-02); North Dakota Century Code Section 61-28-01; The Department of Health and Consolidated Laboratories, North Dakota Title 33, Articles 16 and 17; and North Dakota Water Pollution Control Act (Title 61).

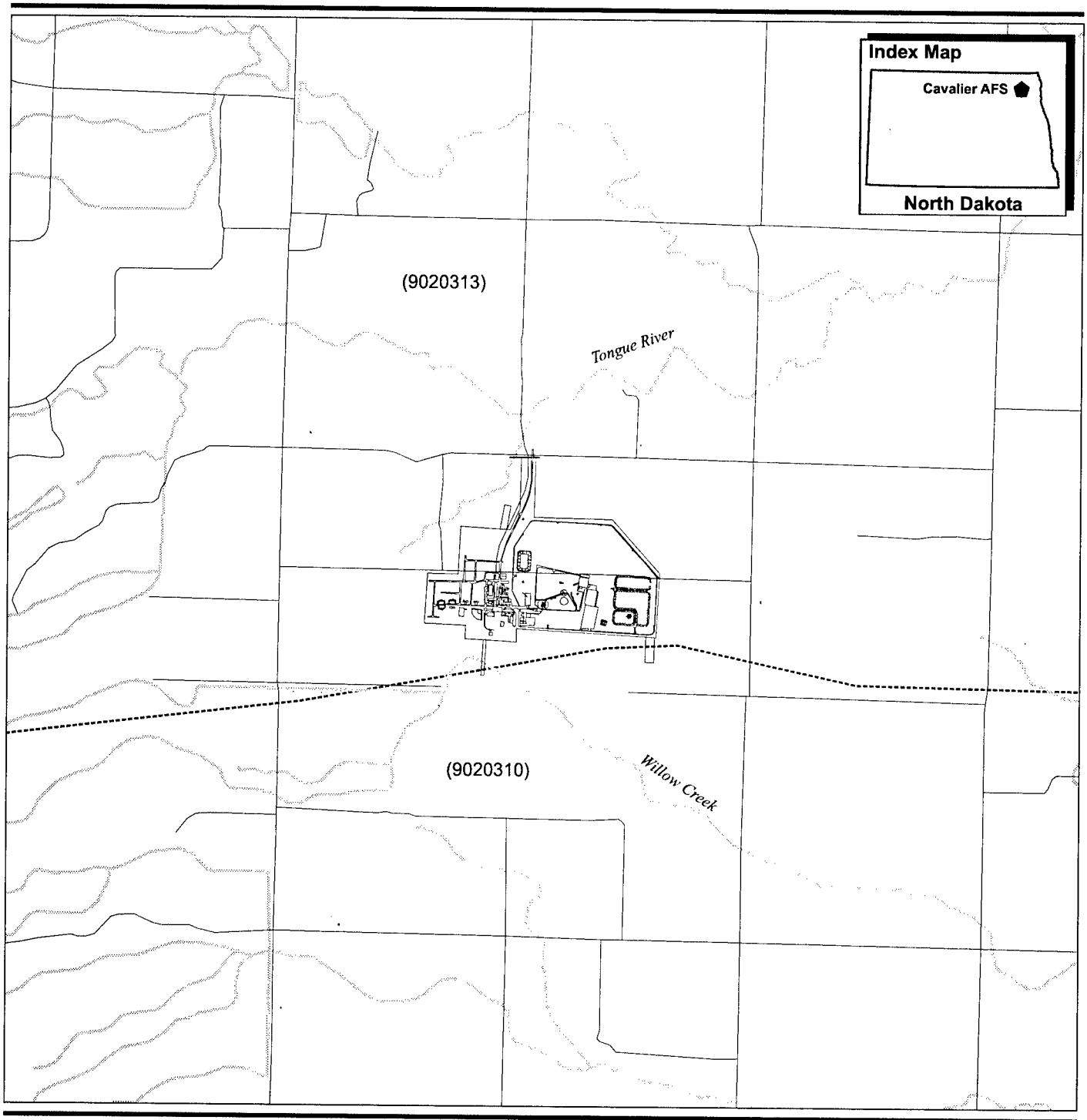
For construction projects, a Notice of Intent to Obtain Coverage under North Dakota Pollutant Discharge Elimination System General Permit for Storm Water Discharge Associated with Construction Activity must be filed with the North Dakota Department of Health, Division of Water Resources.

3.14.2.1 Cavalier AFS—Water Resources

The water resources ROI includes all surface water features, drainage areas, and underlying aquifers that could be affected by construction or operations. This area includes Cavalier AFS and an area within approximately 3 kilometers (2 miles) of the base boundary (figure 3.14-6).

Surface Water

The Cavalier AFS ROI includes the Pembina and Park watersheds, USGS Cataloging Units 09020313 and 09020310 (U.S. EPA, 1998—Surf Your Watershed). The Tongue River is located to the north of the Cavalier AFS and flows to the northeast and drains into the Pembina River. The Tongue River has an annual average discharge of 0.63 cubic meter (22.4 cubic feet) per second. The Pembina River drains into the Red River just south of Pembina. Runoff from the Cavalier AFS flows to the



EXPLANATION

- Drainage
- Roads
- ------- Watershed Boundary (EPA Watershed ID Number)

Scale 1:40,000

0 1,667 3,333 feet

NORTH 0 508 1,016 meters

Water Resources, Cavalier Air Force Station

North Dakota

Figure 3.14-6

south of the site into Willow Creek, a tributary of the Park River. The Park River travels southeast away from the Cavalier AFS and empties into the Red River. Cavalier AFS is not in a 100-year floodplain (Cavalier AFS, 1993—Natural Resources Management Plan).

Cavalier AFS operates under an NPDES General Permit for Storm Water Discharges Associated with Industrial Activities. The permit sets standards for pollutants in storm water discharges, and Cavalier AFS meets the requirements of its permits (U.S. Air Force Space Command, undated—Comprehensive Planning Framework).

Groundwater

Groundwater in the ROI is found in three major aquifers, the Pembina Delta Aquifer, Dakota Aquifer, and Icelandic Aquifer. The Pembina Delta Aquifer is approximately 3 kilometers (2 miles) north of Cavalier AFS and covers an area of 184 square kilometers (71 square miles). The Pembina Delta Aquifer is a glacial deposit consisting of clay, silt, sand, and gravel and is approximately 30 meters (100 feet) thick.

The Dakota Aquifer underlies Cavalier AFS. Groundwater in the Cavalier AFS area is found less than 3 meters (10 feet) below ground surface. Recharge for the Dakota Aquifer occurs through precipitation, infiltration, snowmelt, and prairie potholes (seasonal water bodies). The Dakota aquifer is an artesian aquifer and has a pump rate ranging from 4 liters (1 gallon) per minute to 378 liters (100 gallons) per minute.

Cavalier AFS receives its water from the North Valley Water Association, which taps the glacial drift Icelandic Aquifer 9.6 kilometers (6 miles) west of Cavalier AFS. North Valley is under contract to provide 1.09 million liters (0.29 million gallons) per day to Cavalier AFS. The Icelandic Aquifer, which serves the region around the city of Cavalier, has not shown any noticeable yield declines (Patch, 1998—Personal communication). The water usage for Cavalier AFS is approximately 0.45 million liters (0.12 million gallons) per day, of which 0.4 million liters (0.1 million gallons) per day is used for the existing radar cooling tower.

Water Quality

Groundwater and surface water vary in quality depending upon the geology, topography, and quantity of flow. Surface water quality is judged by rate of flow. Low flow rates usually result in higher dissolved mineral concentrations because of the longer exposure time to leachable minerals. Most streams in the area have a dissolved solids concentration of less than 500 milligrams per liter at high flow rate, which is marginally acceptable for irrigation uses. (North Dakota Geological Survey, 1973—Mineral and Water Resources of North Dakota)

Groundwater in the Pembina Delta Aquifer is considered very hard, with a high dissolved calcium and magnesium content. Iron in the groundwater often exceeds drinking water standards. The Pembina Delta Aquifer is utilized in the Cavalier AFS region for livestock, irrigation, and some domestic use. The groundwater from the Dakota and Icelandic aquifers is utilized for industrial, domestic, and rural resident purposes. The water is very hard with a calcium magnesium bicarbonate (North Dakota Geological Survey, 1973—Mineral and Water Resources of North Dakota).

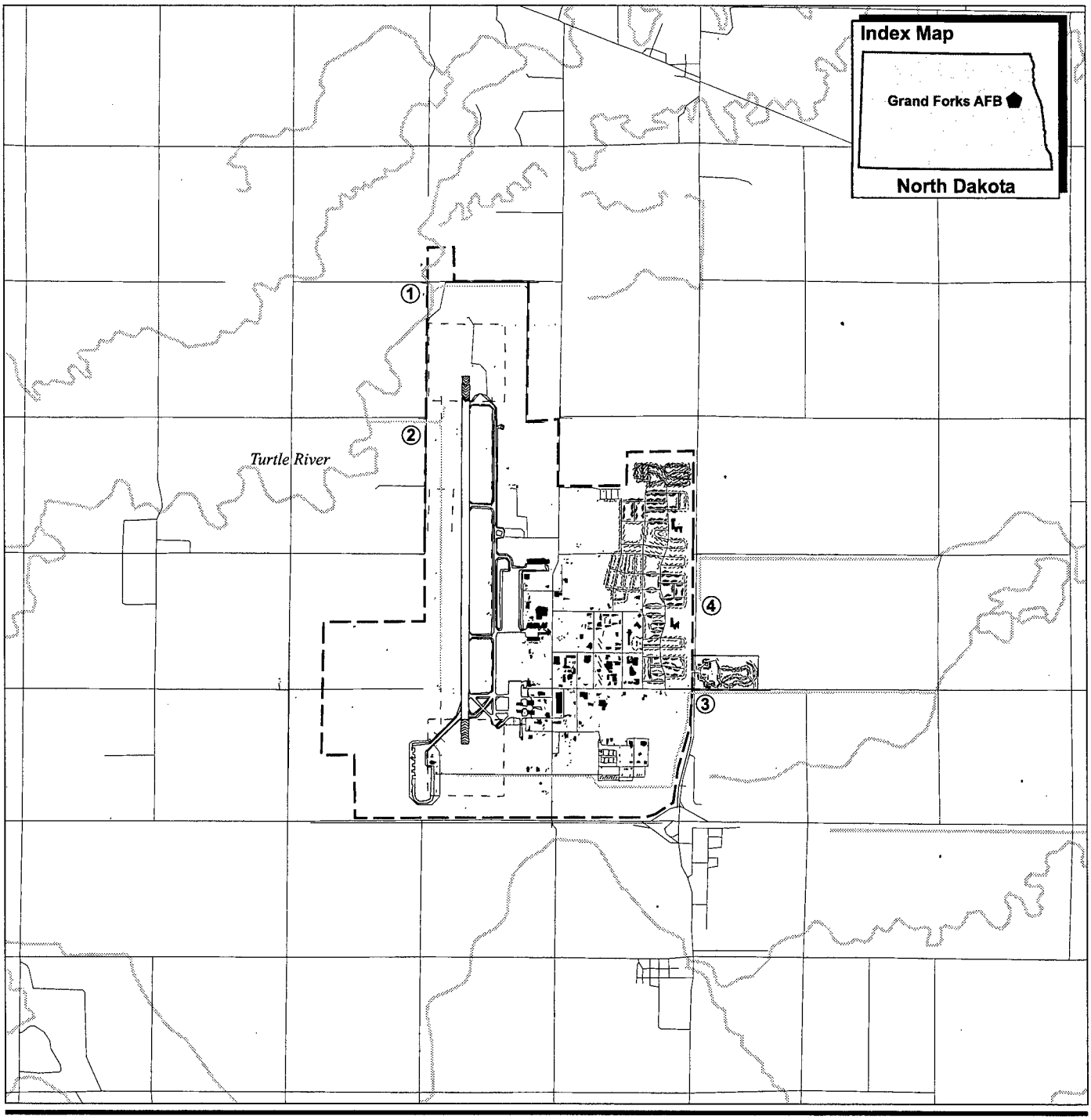
3.14.2.2 Grand Forks AFB—Water Resources

The water resources ROI includes all surface water features, drainage areas, and underlying aquifers that could be affected by construction or operations. This area includes Grand Forks AFB and an area within approximately 3 kilometers (2 miles) of the base boundary (figure 3.14-7).

Surface Water

The Grand Forks AFB ROI is in the Turtle River watershed, USGS Cataloging Unit 09020307 (U.S. EPA, 1998—Surf Your Watershed). The Turtle River and Kelly's Slough are the major bodies of moving surface water in the Grand Forks AFB area. Kelly's Slough, located approximately 3 kilometers (2 miles) east of Grand Forks AFB, flows in a north–northeast direction in a marshy floodplain with a poorly defined stream channel. Kelly's Slough empties into the Turtle River to the east of the Grand Forks AFB. The Turtle River intersects Grand Forks AFB at the northwest corner and flows in a generally northeast direction to the Red River. There are no lakes or ponds in the Grand Forks AFB area (U.S. Department of the Air Force, 1997—Integrated Natural Resources Management Plan). Water for domestic and industrial use from the city of Grand Forks (75 percent of Grand Forks AFB total) is obtained from the Red River and the Red Lake River (U.S. Department of the Air Force, 1999—Final EIS, Minuteman III Missile System Dismantlement).

Prairie potholes tend to be seasonal water bodies closely associated with wetlands (See biological resources). Numerous prairie potholes exist throughout northeastern North Dakota, including several small prairie potholes that exist on Grand Forks AFB. Prairie potholes consist of surface water that generally is not large enough or deep enough to maintain fish populations. Prairie potholes are typically filled following the spring snowmelt, although many potholes are situated within a surficial aquifer and retain water throughout the year. Prairie potholes are prime waterfowl production areas, and also provide habitat for waterfowl and other species during migratory seasons (U.S. Department of the Air Force, 1999—Final EIS, Minuteman III Missile System Dismantlement).



EXPLANATION

- Installation Boundary
- Drainage
- Roads

Stormwater Outfall

① Northwest Ditch
② West Ditch
③ South Ditch
④ North Ditch

Water Resources, Grand Forks Air Force Base

North Dakota

Figure 3.14-7

NORTH

Scale 1:70,000

0 .6 1.1 miles

0 .9 1.8 kilometers

wr_gfafb_001

Storm water runoff leaves the Grand Forks AFB from four identifiable drainage locations. Runoff flows to specific drainageways in the north (north ditch), northwest (northwest ditch), west (west ditch) and south (south ditch) at Grand Forks AFB. The northwest ditch collects runoff from the northern part of the base. The west ditch collects runoff from the west side of the base, to include the west runways. The south ditch collects runoff from the southern part of the base, to include the vehicle maintenance and fuel storage areas. The north ditch collects runoff from the northern part of the base, to include the hanger and aircraft maintenance areas. The northwest and west ditches drain into the Turtle River. The east and south ditches drain to Kelly's Slough. All drainage ultimately flows to the Red River. The base storm water runoff plan was approved by the North Dakota Department of Health and listed in the Grand Forks AFB storm water runoff permit. Under the base NPDES permit, storm water exiting west to Turtle Creek and east to Kelly's Slough are monitored twice annually. The base permit does not contain specific contaminant limits for discharges. Discharge points that service areas with higher risk of oil or fuel product spill flow through oil/water separators. (U.S. Department of the Air Force, 1997—Integrated Natural Resources Management Plan)

The 100-year floodplain on Grand Forks AFB is limited to an area of 76 meters (250 feet) on either side of Turtle Creek in the northwest corner of the base (about 19 hectares [46 acres]) (U.S. Department of the Air Force, 1997—Integrated Natural Resources Management Plan).

Groundwater

Water for domestic and industrial use from the Grand Forks–Traill Water Users, Inc. (25 percent of the Grand Forks AFB total) is obtained from 13 wells. Groundwater in the Grand Forks AFB ROI is found in the bedrock aquifers and the glacial drift aquifers. The Dakota Aquifer is the major bedrock aquifer. Limited quantities of water are also found in Pierre Shale. (U.S. Department of the Air Force, 1999—Final EIS, Minuteman III Missile System Dismantlement)

The Dakota Aquifer is in the Dakota Shale and Sandstone and is composed of quartzose, sandstone, and shale. Recharge of the Dakota Aquifer is to the west of the ROI (U.S. Department of the Air Force, 1999—Final EIS, Minuteman III Missile System Dismantlement). The primary use for water from the Dakota Aquifer is livestock watering. Many wells in this aquifer have experienced reduced flows due to regional decline caused by long-term groundwater withdrawals. These withdrawals have resulted in a 6-meter (20-foot) drop in the aquifer over the past several years. (U.S. Department of the Air Force, 1997—Integrated Natural Resources Management Plan)

The Pierre Aquifer consists of shale, marlstone, and claystone, and is found throughout much of the deployment area. Recharge occurs throughout much of the deployment area from precipitation, snowmelt, and prairie potholes. This aquifer is used by some farms and municipalities, but is not a major groundwater source in the region (U.S. Department of the Air Force, 1999—Final EIS, Minuteman III Missile System Dismantlement).

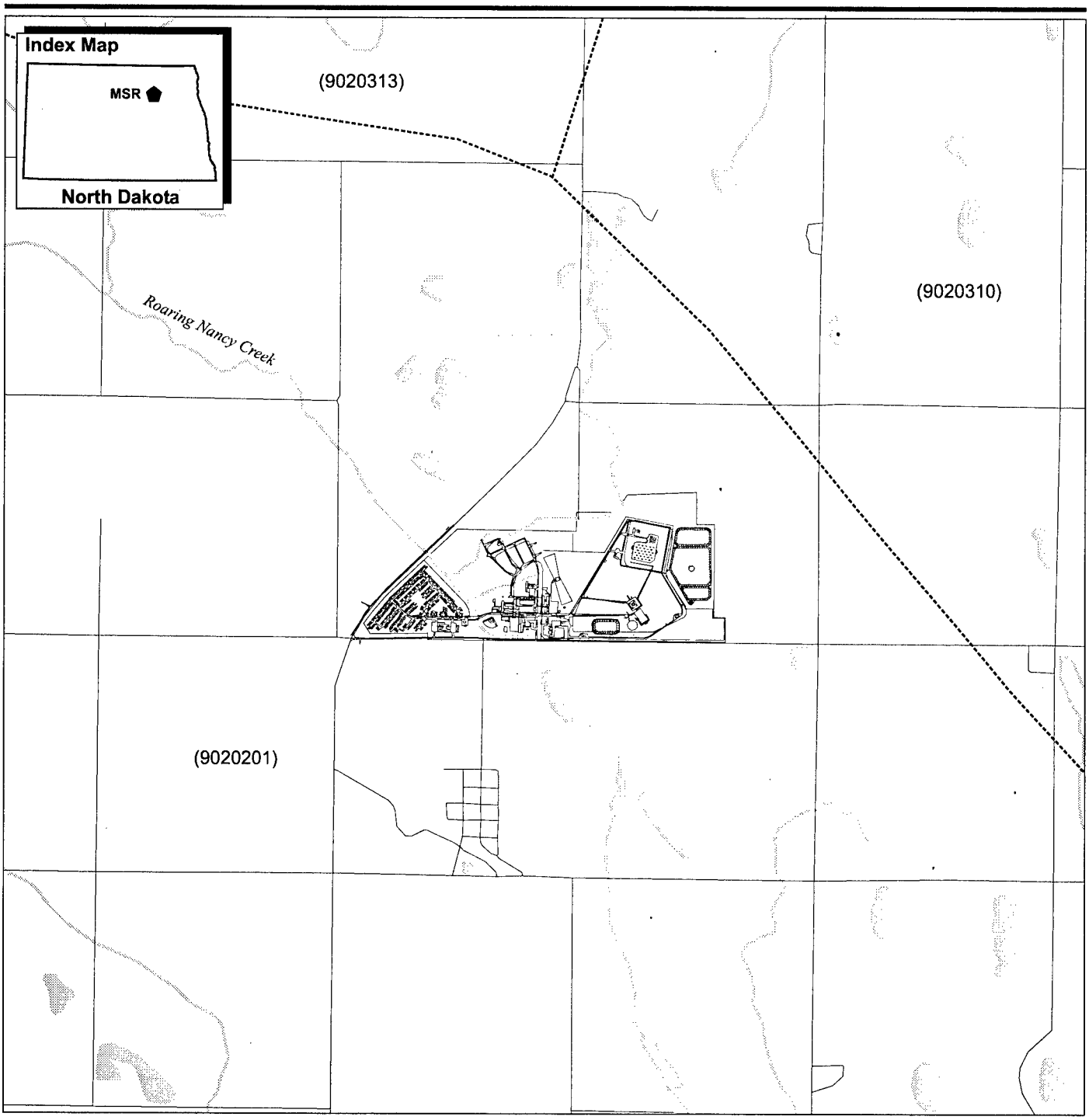
Water Quality

Groundwater and surface water vary in quality depending upon the geology, topography, water usage, and quantity of flow. Calcium magnesium bicarbonate is the prevalent dissolved constituent of concern in the ROI. High concentrations of sodium and magnesium are also found in the local area aquifers. Surface water quality is judged by rate of flow. Low flow rates usually result in higher dissolved mineral concentrations because of the longer exposure time to leachable minerals. Most streams in the area have a dissolved solids concentration of less than 500 milligrams per liter at high flow rates. These levels are considered acceptable for domestic use. Surface water salinity concentrations are typically too high during periods of low flow to be considered acceptable for possible potable domestic use (North Dakota Geological Survey, 1973—Mineral and Water Resources of North Dakota; U.S. Department of the Air Force, 1997—Integrated Natural Resources Management Plan). According to the National Water Quality Report, North Dakota reports that 78 percent of its surveyed river and streams have good water quality. The major sources of contaminated waters are agriculture, the removal of stream side vegetation, which increases siltation, and municipal sewage treatment plants. Natural conditions, such as low flows, also contribute to violations of standards. Good water quality is found in 95 percent of the lakes surveyed. The leading sources of pollution in lakes are agricultural activities, municipal sewage treatment, and urban runoff/storm sewers.

The Turtle River near Grand Forks AFB has a Class II stream designation from the North Dakota Department of Health, which means that it may be intermittent, but when flowing, it meets the chemical, physical, and bacteriologic requirements for municipal use. The designation also indicates that the river's water is of sufficient quality to use for irrigation, propagation of resident fish species, swimming, and other water-based recreation (U.S. Department of the Air Force, 1997—Integrated Natural Resources Management Plan).

3.14.2.3 Missile Site Radar—Water Resources

This section describes the water resources and water quality of the Missile Site Radar complex. The water resources ROI includes all waterways, potential drainage areas, still waters, and shallow and deep aquifers that could be affected by construction or operations (figure 3.14-8).



EXPLANATION

- Water Area (Intermittent)
- Drainage
- Roads
- ------- Watershed Boundary (EPA Watershed ID Number)

Scale 1:40,000

0 1,667 3,333 feet

0 508 1,016 meters

NORTH

Water Resources, Missile Site Radar

North Dakota

Figure 3.14-8

Surface Water

The Missile Site Radar complex ROI is in the Devils Lake, Pembina, and Park watersheds, USGS Cataloging Units 09020201, 09020313, and 09020310 (U.S. EPA, 1998—Surf Your Watershed). There are no significant rivers or bodies of surface water in the ROI. The ROI is affected by the soils' ability to hold water (soils are clay and silt, low permeability). The Missile Site Radar is not within a 100-year floodplain (Greenwood, 1998—Electronic communication, June 5.)

Due to the slow infiltration rate, heavy rains often result in surface water being retained in depressions. The only natural surface water body on the site is a small intermittent stream, Roaring Nancy Creek, that crosses the western side of the site. This creek has been classified as a wetland by the Corps of Engineers. Storm water at the site flows through two drainage swales into the creek, and is carried northwest to a pond approximately 8 kilometers (5 miles) away (U.S. Army Center for Health Promotion and Preventive Medicine, 1995—Final Report, Site Inspection, SRMSC). Additionally, water from the site's sewage lagoons are periodically lowered by discharging to Roaring Nancy Creek when the lagoons fill from heavy rains. This discharge is regulated under an NPDES permit issued by the state of North Dakota. The permit requires periodic monitoring of surface water runoff.

Groundwater

Groundwater in the Missile Site Radar area is found in the Pierre Aquifer, which consists of fractured light to dark gray shale. Groundwater in the aquifer ranges in depth from 5 to 8 meters (15 to 25 feet) with pump rates ranging from 20 to 1,130 liters (5 to 300 gallons) per minute. Recharge for the Pierre Aquifer occurs through precipitation, snowmelt, and infiltration from prairie potholes (seasonal water bodies). The Pierre Aquifer is not a major groundwater source in the region.

The Missile Site Radar did receive its potable water from the municipal Fordville Well Field, in the south-central part of Walsh County. However, in 1996 the Missile Site Radar was connected to the town of Langdon's water supply, a surface water source northeast of Langdon (U.S. Army Center for Health Promotion and Preventive Medicine, 1995—Final Report, Site Inspection, SRMSC). The Missile Site Radar is still connected to the Fordville Well Field and occasionally uses the water for non-potable uses. Pump rates for the Fordville Well Field are up to 1,136 liters (300 gallons) per minute. Cavalier AFS, east of the Missile Site Radar, withdrew approximately 185,022 cubic meters (150-acre feet) per year before changing water supplies. In addition, other users in the region are withdrawing another 740,089 cubic meters (600-acre feet) from the Fordville Aquifer. No noticeable yield decline trends or changes

in the aquifer have been noted from past use (Patch, 1998—Personal communication).

Water Quality

Groundwater and surface water vary in quality depending upon the geology, topography, water usage, and quantity of flow. Groundwater in the Missile Site Radar area has a high salinity content. Water in the Pierre Aquifer is considered toxic to plants because of the high sodium content. Sodium-bicarbonate-sulfate is the prevalent dissolved constituent of concern in the ROI. This groundwater is used for industrial and livestock purposes and often exceeds the drinking water standard for iron, chloride, and sulfate. Surface water low flow rates usually result in higher dissolved mineral concentrations because of the longer exposure time to leachable minerals. Most surface water in the area has a dissolved solids concentration of less than 500 milligrams per liter at high flow rate, which is marginally acceptable for irrigational uses (North Dakota Geological Survey, 1973—Mineral and Water Resources of North Dakota).

3.14.2.4 Remote Sprint Launch Site 1—Water Resources

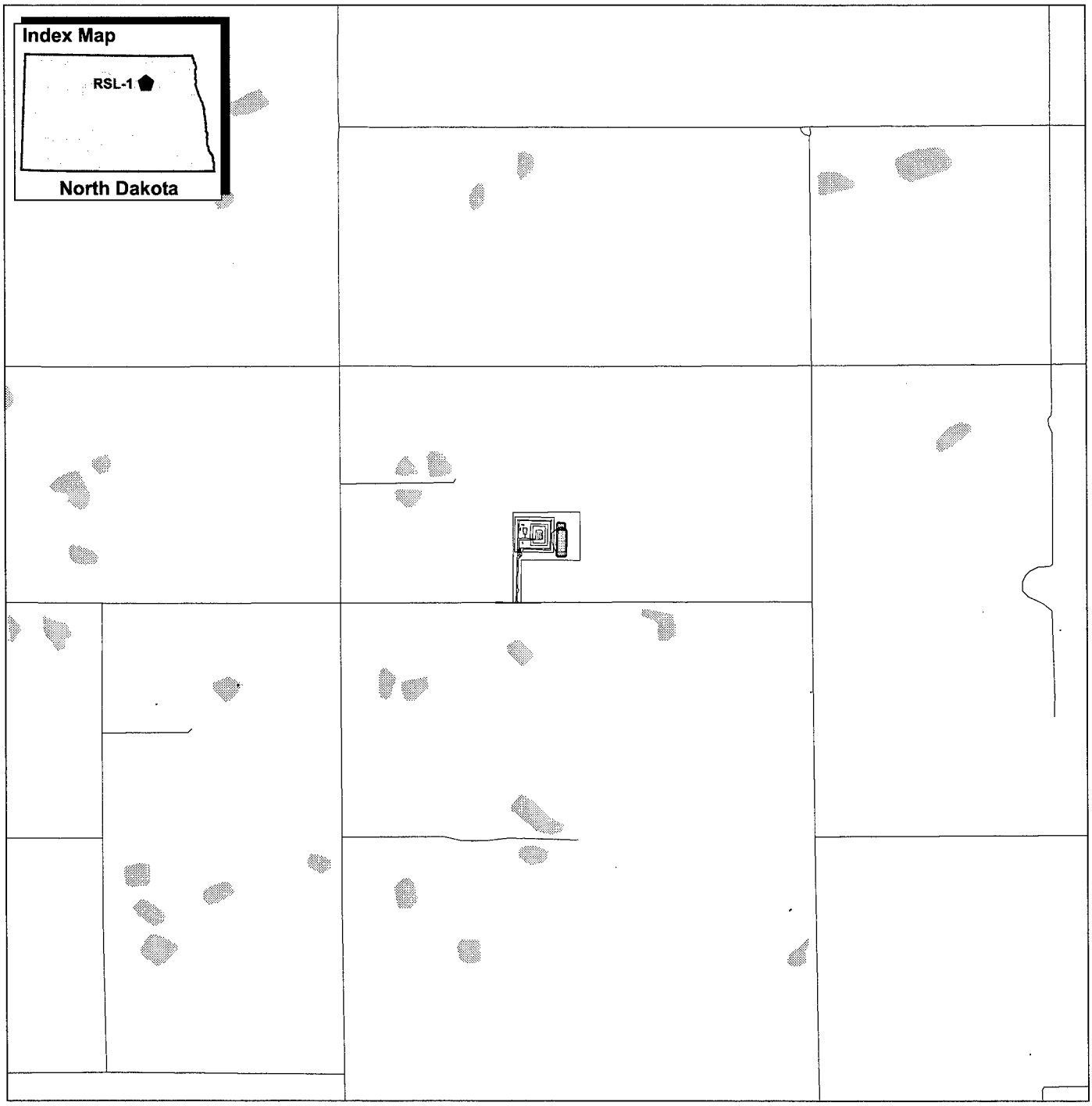
The water resources ROI includes all surface water features, drainage areas, and underlying aquifers that could be affected by construction or operations. This area includes an area within approximately 2 kilometers (1 mile) of Remote Sprint Launch Site 1 (figure 3.14-9).

Surface Water

The Remote Sprint Launch Site 1 ROI is in the Devils Lake watershed, USGS Cataloging Unit 09020201 (U.S. EPA, 1998—Surf Your Watershed). There are no major bodies of surface water in the Remote Sprint Launch Site 1 area. Storm water runoff from the Remote Sprint Launch Site 1 and area drains into local surface depressions. The runoff follows no specific drainage pattern. Remote Sprint Launch Site 1 is not situated in a floodplain region. The site is currently inactive and does not have a storm water permit.

Groundwater

The groundwater at this site is similar to that described for the Missile Site Radar. There are no groundwater wells at Remote Sprint Launch Site 1.



EXPLANATION

Water Area (Intermittent)

Roads

Water Resources, Remote Sprint Launch Site 1

North Dakota

Scale 1:40,000

0 1,667 3,333 feet

0 508 1,016 meters

NORTH

Figure 3.14-9

3.14.2.5 Remote Sprint Launch Site 2—Water Resources

The water resources ROI includes all surface water features, drainage areas, and underlying aquifers that could be affected by construction or operations. This area includes an area within approximately 2 kilometers (1 mile) of Remote Sprint Launch Site 2 (figure 3.14-10).

Surface Water

The Remote Sprint Launch Site 2 ROI is in the Pembina River watershed, USGS Cataloging Unit 09020313 (U.S. EPA, 1998—Surf Your Watershed). Storm water runoff drains in two directions from Remote Sprint Launch Site 2. The northwest portion of the site drains to local surface depressions. The southwest portion drains to the southeast of the Remote Sprint Launch Site 2 area. Surface water runs into the Little South Pembina River approximately 1 kilometer (0.5 mile) to the south of the Remote Sprint Launch Site 2 area. The site is currently inactive and does not have a storm water permit.

Groundwater

The groundwater at this site is similar to that described for the Missile Site Radar. There are no groundwater wells at Remote Sprint Launch Site 2.

Water Quality

The surface and groundwater quality at this site is similar to that described for the Missile Site Radar.

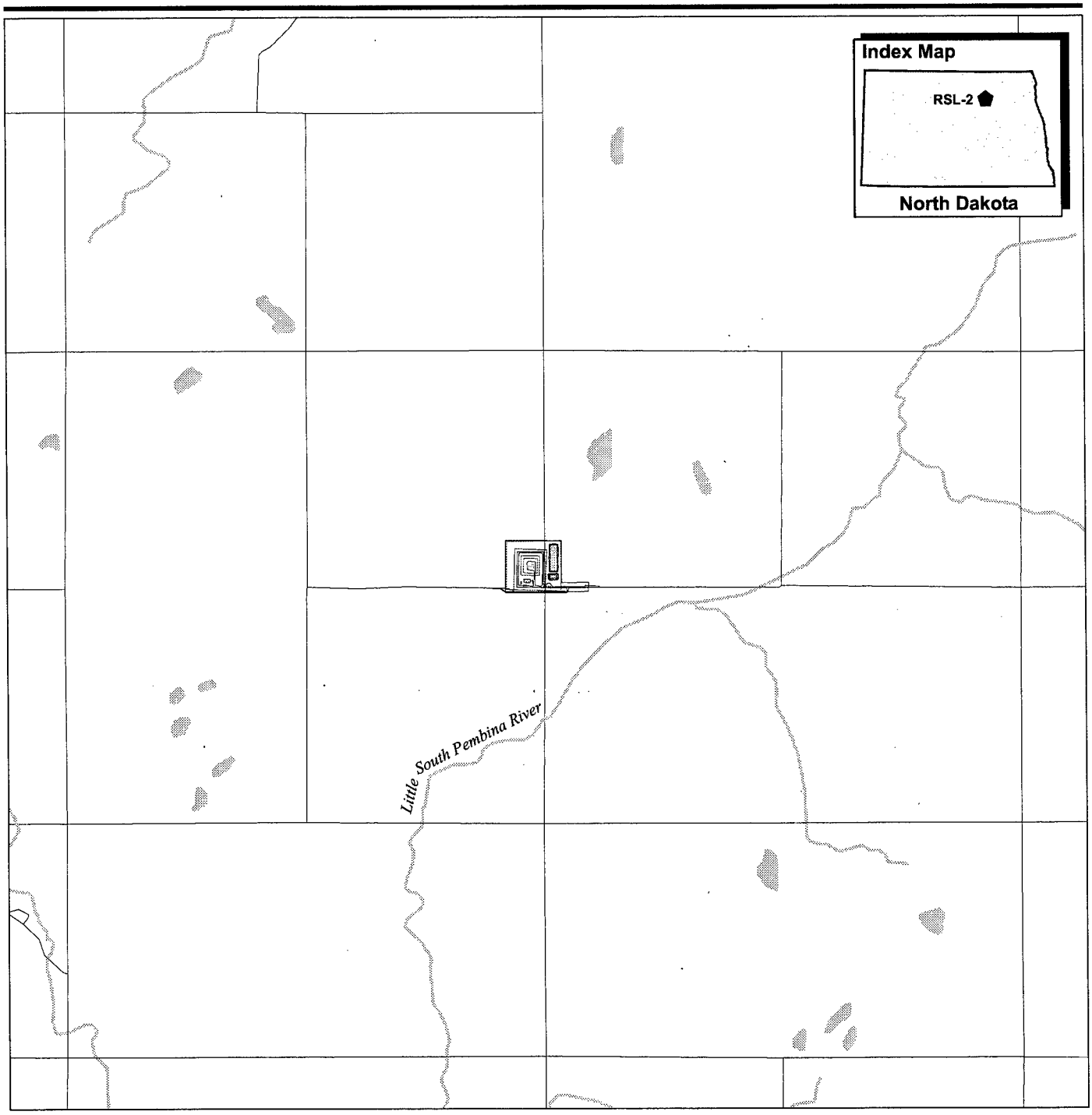
3.14.2.6 Remote Sprint Launch Site 4—Water Resources

The water resources ROI includes all surface water features, drainage areas, and underlying aquifers that could be affected by construction or operations. This area includes an area within approximately 2 kilometers (1 mile) of Remote Sprint Launch Site 4 (figure 3.14-11).

Surface Water

The Remote Sprint Launch Site 4 ROI is in the Devils Lake and forest watersheds, USGS Cataloging Units 09020201 and 09020308 (U.S. EPA, 1998—Surf Your Watershed).

Storm water runoff from Remote Sprint Launch Site 4 drains into intermittent tributaries of the Edmore Coulee. The Edmore Coulee flows into Sweetwater Lake. Remote Sprint Launch Site 4 is not situated in a floodplain region (North Dakota Parks and Recreation, 1987—North Dakota Rivers Study). The site is currently inactive and does not have a storm water permit.



EXPLANATION

- Water Area (Intermittent)
- Drainage
- Roads

Water Resources, Remote Sprint Launch Site 2

North Dakota

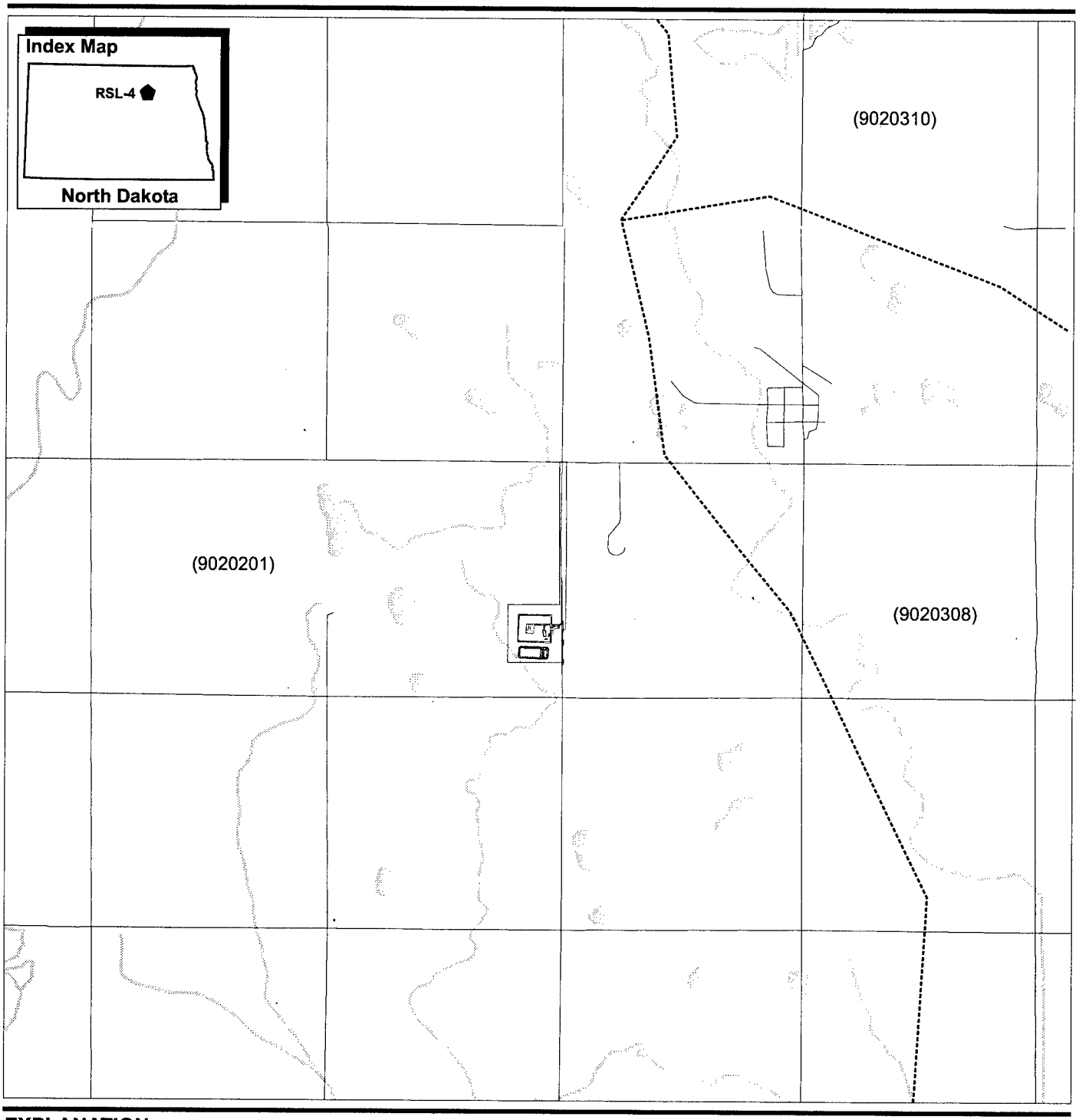
Scale 1:40,000

0 1,667 3,333 feet

0 508 1,016 meters

NORTH

Figure 3.14-10



EXPLANATION

- Water Area (Intermittent)
- Drainage
- Roads
- ------- Watershed Boundary (EPA Watershed ID Number)

Scale 1:40,000

0 1,667 3,333 feet

0 508 1,016 meters

NORTH

wr_rsl4_001

Water Resources, Remote Sprint Launch Site 4

North Dakota

Figure 3.14-11

Groundwater

The groundwater at this site is similar to that described for the Missile Site Radar. There are no groundwater wells at Remote Sprint Launch Site 4.

Water Quality

The surface and groundwater quality at this site is similar to that described for the Missile Site Radar.

3.14.2.7 North Dakota—Fiber Optic Cable Line—Water Resources

This section describes the water resources and water quality for the fiber optic cable line ROI. The ROI for water resources includes the waterways, potential drainage areas, still waters, and shallow and deep aquifers that could be affected by construction. The potential fiber optic cable line would be installed to connect the selected NMD sites in North Dakota.

Surface Water

It is anticipated that the fiber optic cable line would follow along existing utility and road corridors. Surface water along the route would be dependent on the specific route and terrain where the cable is installed. Surface water along the roadways and utility corridors could consist of both seasonal and year round streams, ponds, wetlands, and floodplains, although the cable would most likely be in proximity to the roadway and not within water areas. Stream flow rates and flooding for this region are highest during snowmelt and early summer conditions, coinciding with precipitation patterns.

Groundwater

The regional groundwater in the fiber optic cable line ROI is similar to that described above for the potential NMD North Dakota deployment sites.

Water Quality

Groundwater and surface water quality in the ROI would be similar to that described above for the potential NMD North Dakota deployment sites. In general, groundwater in North Dakota is hard and has chemical constituents that minimize potential use.

According to the National Water Quality Report, North Dakota reports that 78 percent of its surveyed river and streams have good water quality. The major sources of contaminated waters are agriculture, the removal of streamside vegetation, which increases siltation, and municipal sewage treatment plants. Natural conditions, such as low flows, also contribute to violations of standards. Good water quality is

found in 95 percent of the lakes surveyed. The leading sources of pollution in lakes are agricultural activities, municipal sewage treatment, and urban runoff/storm sewers.

Most of the rivers in North Dakota have average dissolved solids of less than 500 milligrams per liter during medium to high flows, with water suitable for domestic use. During low flow periods, the rivers are generally too saline for domestic use.

3.15 ENVIRONMENTAL JUSTICE

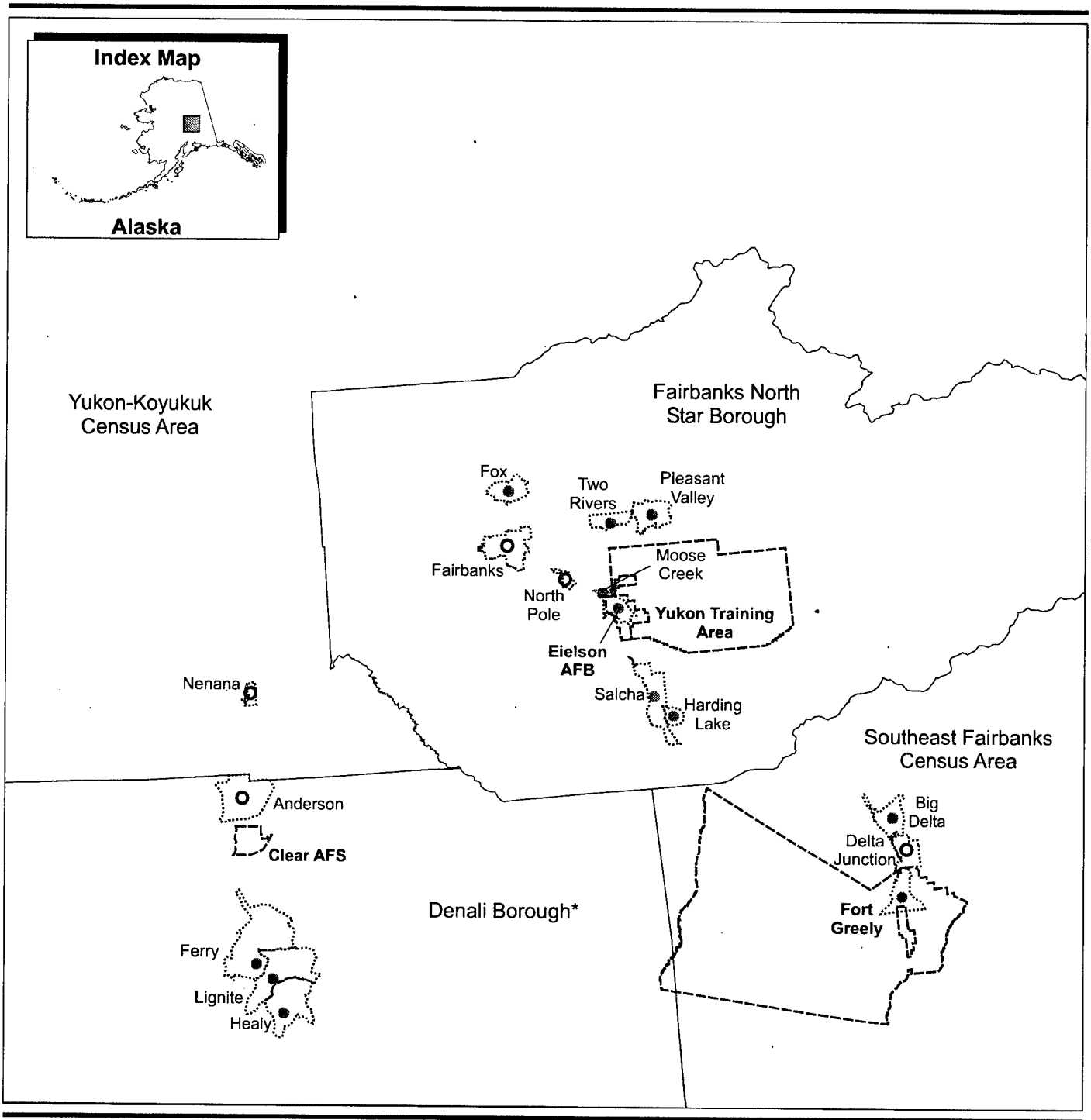
Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, was issued by the President on February 11, 1994. Objectives of the Executive Order as it pertains to this EIS include development of Federal agency implementation strategies, identification of minority and low-income populations where proposed Federal actions have disproportionately high and adverse human health and environmental effects, and participation of minority and low-income populations. Accompanying Executive Order 12898 was a Presidential Transmittal Memorandum, which referenced existing Federal statutes and regulations to be used in conjunction with Executive Order 12898. The memorandum addressed the use of the policies and procedures of NEPA. Specifically, the memorandum indicates that, "Each Federal agency shall analyze the environmental effects, including human health, economic and social effects, of Federal actions, including effects on minority communities and low-income communities, when such analysis is required by the NEPA 42 U.S.C. section 4321 et. seq." Although an environmental justice analysis is not mandated by NEPA, DOD has directed that NEPA will be used as the primary approach to implement the provision of the Executive Order.

Although Executive Order 12898 provides no guidelines as to how to determine concentrations of minority or low-income populations, the demographic analysis provides information on the approximate locations of minority and low-income populations potentially affected by the NMD program.

The 1990 Census of Population and Housing reports numbers of both minority and poverty residents. Minority populations included in the census are identified as Black; American Indian, Eskimo or Aleut; Asian or Pacific Islander; Hispanic; or other. Poverty status (used in this EIS to define low-income status) is reported as the number of families with income below poverty level ($12,764 for a family of four in 1989, as reported in the 1990 Census of Population and Housing).

3.15.1 ALASKA INSTALLATIONS

Most of the environmental effects from the Proposed Action would be expected to occur at one or more of the five installations that are being considered depending on the site(s) selected. Therefore, the ROI for environmental justice is the Census Area where each of the installations is located. Alaska's Census Areas are not broken down into tracts; however, there are cities and Census Designated Places (CDPs) breakdowns that help provide a better understanding of what is occurring in these census areas. The CDPs and cities that were in close proximity to the installations were investigated. The potential sites are located in four different census areas, as shown in figure 3.15-1.



Census Areas Within the Installation's Region of Influence

Alaska

Figure 3.15-1

The Census Areas, as well as the CDPs and cities that are in close proximity to the potential sites, are shown in table 3.15-1. This table shows total population, percent minority, percent low-income, and what installation is located in that Census Area.

Table 3.15-1: Minority and Low Income Populations for Potential Sites in Alaska

	Population 1990	Percent Minority	Percent Low Income	Installation ROI
United States	248,709,873	24.24	13.12	
Alaska	550,043	26.03	9.00	
Aleutians West Census Area	9,478	35.63	8.95	Eareckson AS
Fairbanks North Star Borough	77,720	19.63	7.58	Eielson AFB, Yukon Training Area (Fort Wainwright)
Eielson CDP	5,251	21.22	2.87	
Fairbanks City	30,843	29.79	10.39	
Fox CDP	259	5.02	9.27	
Harding Lake CDP	25	0.00	0.00	
Moose Creek CDP	626	20.29	9.42	
North Pole City	1,456	16.14	5.09	
Pleasant Valley CDP	277	0.00	0.00	
Salcha CDP	303	9.90	8.08	
Two Rivers CDP	483	13.25	0.00	
Southeast Fairbanks Census Area	5,913	22.07	14.19	Fort Greely
Big Delta CDP	400	6.75	23.21	
Delta Junction City	651	9.37	8.45	
Fort Greely CDP	1,147	31.04	6.36	
Yukon-Koyukuk Census Area	8,478	58.47	26.05	Clear AFS
Anderson City	644	15.68	3.71	
Ferry CDP	58	17.24	15.52	
Healy CDP	494	5.06	3.85	
Lignite CDP	102	0.00	1.96	
Nenana City	377	46.95	10.40	

Source: U.S. Department of Commerce, 1998—The Official Statistics.
CDP = Census Designated Place

3.15.1.1 Clear AFS—Environmental Justice

Most environmental impacts resulting from the No-action Alternative and Proposed Action at the Clear AFS site are anticipated to occur in the Denali Borough (formerly the Yukon–Koyukuk Census Area), which is the ROI for the environmental justice analysis. This borough during the 1990 Census was the Yukon–Koyukuk Census Area. Since then it has been divided, and Clear AFS now falls into the Denali Borough. This study will refer to data from the 1990 Census and will refer to the ROI as the Yukon–Koyukuk Census Area. Based upon the 1990 Census of Population and Housing, the Yukon–Koyukuk Census Area had a population of 8,478. Of that total, 2,208 persons, or 26.05 percent, were low-income, and 4,957 persons, or 58.47 percent, were minority. However, this borough covers a broad area. In close proximity to Clear AFS there are several small communities and cities that more accurately reflect the populations of the area around Clear AFS. These are shown in table 3.15-1.

3.15.1.2 Eareckson AS—Environmental Justice

Most environmental impacts resulting from the No-action Alternative and Proposed Action at the Eareckson AS site are anticipated to occur in the Aleutians West Census Area, which is the ROI for the environmental justice analysis. Based upon the 1990 Census of Population and Housing, the Aleutians West Census Area had a population of 9,478. Of that total, 848 persons, or 8.95 percent, were low-income; 3,377 persons, or 35.63 percent, were minority. This is shown in table 3.15-1.

3.15.1.3 Eielson AFB—Environmental Justice

Most environmental impacts resulting from the No-action Alternative and Proposed Action at Eielson AFB are anticipated to occur in the Fairbanks North Star Borough, which is the ROI for the environmental justice analysis. Based upon the 1990 Census of Population and Housing, the Fairbanks North Star Borough had a population of 77,720. Of that total, 5,891 persons, or 7.58 percent, were low-income, and 15,256 persons, or 19.63 percent, were minority. However, this borough covers a broad area. In close proximity to Eielson AFB there are several small communities and cities that more accurately reflect the populations of the area around the base. These are shown in table 3.15-1.

3.15.1.4 Fort Greely—Environmental Justice

Most environmental impacts resulting from the No-action Alternative and Proposed Action at the Fort Greely site are anticipated to occur in Southeast Fairbanks Census Area, which is the ROI for the environmental justice analysis. Based upon the 1990 Census of Population and Housing, Southeast Fairbanks Census Area had a population of 5,913.

Of that total, 839 persons, or 14.19 percent, were low-income, and 1,305 persons, or 22.07 percent, were minority. However, this borough covers a broad area. In close proximity to Fort Greely there are several small communities and cities that more accurately reflect the populations of the area around Fort Greely. These are shown in table 3.15-1.

3.15.1.5 Yukon Training Area (Fort Wainwright)—Environmental Justice

The environmental justice ROI for the Yukon Training Area is similar to that described for Eielson AFB.

3.15.2 NORTH DAKOTA INSTALLATIONS

Most of the environmental effects from the Proposed Action would be expected to occur at one or more of the six installations that are being considered depending on the site(s) selected. The ROI for environmental justice is the county where each of the installations is located.

The information for these counties is shown in table 3.15-2. It includes total population, percent minority, percent low-income, and what installation is located in that county.

Table 3.15-2: Minority and Low Income Populations for Potential Sites in North Dakota

	Population 1990	Percent Minority	Percent Low Income	Installation ROI
United States	248,709,873	24.24	13.12	
North Dakota	638,800	5.69	14.38	
Cavalier County	6,064	0.76	14.07	Missile Site Radar, Remote Sprint Launch-2, Remote Sprint Launch-1, Cavalier AFS, Remote Sprint Launch-4
Grand Forks County	70,683	6.39	12.32	Grand Forks AFB
Pembina County	9,238	2.99	9.22	Cavalier AFS
Ramsey County	12,681	4.84	13.23	Remote Sprint Launch-1, Remote Sprint Launch-4, Missile Site Radar
Walsh County	13,840	3.73	13.38	Remote Sprint Launch-4, Missile Site Radar

Source: U.S. Department of Commerce, 1998—The Official Statistics.

3.15.2.1 Cavalier AFS—Environmental Justice

Most environmental impacts resulting from the No-action Alternative and Proposed Action at the Cavalier AFS site are anticipated to occur in Pembina and Cavalier counties, which is the ROI for the environmental justice analysis. Based upon the 1990 Census of Population and Housing, Pembina County had a population of 9,238. Of that total, 860 persons, or 9.22 percent, were low-income, and 276 persons, or 2.99 percent, were minority. Cavalier County had a population of 6,064, of

which 853 persons, or 14.07 percent, were low-income, and 46 persons, or 0.76 percent, were minority.

3.15.2.2 Grand Forks AFB—Environmental Justice

Most environmental impacts from the No-action Alternative and Proposed Action would be expected to occur within Grand Forks County. Grand Forks County would be the ROI for the environmental justice analysis. Based upon the 1990 Census of Population and Housing, Grand Forks County had a population of 70,638. Of that total, 8,708 persons, or 12.32 percent, were low-income, and 4,517 persons, or 6.39 percent, were minority.

3.15.2.3 Missile Site Radar—Environmental Justice

Most environmental impacts resulting from the No-action Alternative and Proposed Action at the Missile Site Radar are anticipated to occur in Cavalier, Ramsey, and Walsh counties, which is the ROI for the environmental justice analysis. Based upon the 1990 Census of Population and Housing, Cavalier County had a population of 6,064. Of that total, 853 persons, or 14.07 percent, were low-income, and 46 persons, or 0.76 percent, were minority. Ramsey County had a population of 12,681, of which 1,678 persons, or 13.23 percent, were low-income, and 614 persons, or 4.84 percent, were minority. Walsh County had a population of 13,840, of which 1,852 persons, or 13.38 percent, were low-income, and 516 persons, or 3.73 percent, were minority.

3.15.2.4 Remote Sprint Launch Site 1—Environmental Justice

Most environmental impacts resulting from the No-action Alternative and Proposed Action at Remote Sprint Launch Site 1 are anticipated to occur in Cavalier and Ramsey counties, which is the ROI for the environmental justice analysis. Based upon the 1990 Census of Population and Housing, Cavalier County had a population of 6,064. Of that total, 853 persons, or 14.07 percent, were low-income, and 46 persons, or 0.76 percent, were minority. Ramsey County had a population of 12,681, of which 1,678 persons, or 13.23 percent, were low-income, and 614 persons, or 4.84 percent, were minority.

3.15.2.5 Remote Sprint Launch Site 2—Environmental Justice

Most environmental impacts resulting from the No-action Alternative and Proposed Action at the Remote Sprint Launch Site 2 are anticipated to occur in Cavalier County, which is the ROI for the environmental justice analysis. Based upon the 1990 Census of Population and Housing, Cavalier County had a population of 6,064. Of that total, 853 persons, or 14.07 percent, were low-income, and 46 persons, or 0.76 percent, were minority.

3.15.2.6 Remote Sprint Launch Site 4—Environmental Justice

Most environmental impacts resulting from the No-action Alternative and Proposed Action at the Remote Sprint Launch Site 4 are anticipated to occur in Cavalier, Ramsey, and Walsh counties, which is the ROI for the environmental justice analysis. Based upon the 1990 Census of Population and Housing, Cavalier County had a population of 6,064. Of that total, 853 persons, or 14.07 percent, were low-income, and 46 persons, or 0.76 percent, were minority. Ramsey County had a population of 12,681, of which 1,678 persons, or 13.23 percent, were low-income, and 614 persons, or 4.84 percent, were minority. Walsh County had a population of 13,840, of which 1,852 persons, or 13.38 percent, were low-income, and 516 persons, or 3.73 percent, were minority.

3.16 SUBSISTENCE

Many families living in rural areas of Alaska are partially or wholly dependent upon the harvesting of natural resources for food and other living necessities. In order to ensure the existence of these resources, the ANILCA was passed by Congress in 1980. It provides continued opportunity for customary and traditional uses of fish and wildlife resources for subsistence purposes. In accordance with ANILCA, the Federal Government manages these subsistence resources on Federal Public Lands (U.S. Department of the Air Force, 1995—Final EIS, Alaska Military Operations Area).

In anticipation of the passage of the ANILCA, the State of Alaska passed a subsistence law in 1978, which the Secretary of the Interior subsequently found to be consistent with the ANILCA. However, in 1989, the Supreme Court ruled that the rural preference in state statute was unconstitutional. Thus, all Alaskan residents may harvest subsistence resources on state lands as well as on some local and private lands. However, subsistence harvesting on Federal public lands under the Federal subsistence regulations is only permitted: (1) by residents of rural communities determined to have customary and traditional use of the resource, or (2) where no determination has been made, by all rural Alaska residents (residents of certain non-rural communities are specifically excluded) (U.S. Department of the Air Force, 1995—Final EIS, Alaska Military Operations Area).

In these rural communities, the harvesting of subsistence resources can be the primary means of support for a family unit. While food is the primary use of subsistence resources, there are many other uses for subsistence products such as clothing, food for work animals, fuel, home crafts, customary trade, ceremonial tools, as well as arts and crafts (Alaska Department of Fish and Game, 1999—Subsistence: Frequently Asked Questions). In addition to the material importance of subsistence hunting, it also plays a strong role in the social and cultural traditions of many native Alaskan communities (U.S. Department of the Air Force, 1995—Final EIS, Alaska Military Operations Area).

The importance of subsistence harvesting varies among individuals and communities depending on the local culture and customs. In order to evaluate the effects of the Proposed Action, the significant subsistence use areas must first be identified, after which the impacts on those resources can be identified.

Subsistence Areas

The native Athapaskans well into the 1900's historically used the areas that are currently within the central part of Alaska near Clear AFS, Eielson AFB, Yukon Training Area, and Fort Greely for subsistence. These areas

are within the historic ranges of the Salcha, Goodpasor–Wood River, and Chena Bands of the lower Tanana Athapaskans and the Healy River–Joseph band of the Tanacross Athapaskans. In addition, the Southern portions of Fort Greely were likely used intermittently by Ahtna Athapaskans of the Copper River Drainage (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS).

The Athapaskans of the interior regions depended upon the seasonal exploitation of mammals and fish for subsistence. Settlement patterns reflected subsistence constraints. Small temporary upland camps hunted caribou. During the summer months, the groups moved to fishing camps along the Tanana River and its major tributaries. While caribou was the most important food source, other large game such as moose and dall sheep were harvested as well. Smaller game included hares, marmots, ground squirrels, ptarmigan, ruffed grouse, sharp-tailed grouse, whitefish, and three varieties of salmon (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS).

With the settlement of Euroamericans there were dramatic changes in the hunting and social practices of the native bands. With the onset of trapping and mining practices, subsistence activities were changed dramatically. The discovery of gold further altered the native way of life by drawing populations from traditionally semi-nomadic camps to developing towns such as Fairbanks. Although many smaller native villages still relied on local subsistence resources, the exploitation of large hunting ranges was no longer necessary. Today, subsistence resources within the ROI are still utilized in Nenana, Healy Lake, Delta Junction, Big Delta, and Dot Lake (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS).

The Tanana River has continued to be a primary source for subsistence fishing throughout the year, with the highest concentration of harvesting occurring 32 kilometers (20 miles) downstream from Fairbanks. Commonly harvested fish include chinook, chum, and coho salmon; broad, humpback, and round whitefish; least cisco; sheefish; burbot; grayling; and northern pike.

3.16.1 CLEAR AFS

Clear AFS is located in part of the subsistence range used by the Nenana-Toklat band of the Lower Tanana Athapaskans in the nineteenth and twentieth centuries. During the 1930s and 1940s, development in the area led to a decline in the groups' reliance on subsistence resources. Most of these people were residing in Nenana by the 1940s. Use of the area for hunting and trapping still continues to the present (U.S. Department of the Interior, 1997—Northern Intertie Project Draft EIS).

Although subsistence hunting and fishing occurs in the vicinity of Clear AFS, only Air Force and civilian base personnel and people they sponsor can hunt on Clear AFS property, which could include some people that subsistence hunt and fish. However, this would include a very small percentage of the population at Clear AFS. Therefore, there is minimal subsistence activity occurring on the base.

3.16.2 EARECKSON AS

Under ANILCA, Eareckson AS is not considered to be a rural community because it is a restricted military installation. Therefore, it is exempt from subsistence considerations. However, this does not limit the surrounding areas of Shemya Island from subsistence use.

3.16.3 EIELSON AFB

Eielson AFB is part of the historic subsistence range of two lower Tanana bands: the Chena and the Salcha. The Chena band utilized the area within the Chena River drainage, while the Salcha utilized areas within the Salcha River drainage. Development in the region was devastating to these bands and by the 1960s virtually eliminated the historic subsistence ranges of these groups.

Eielson AFB is within the Fairbanks North Star Borough, which is not considered a rural area and, therefore, residents are not qualified as Federal subsistence users. However, Game Management Unit 20B has several seasons and bag limits for Federal subsistence hunters, all of which overlap entirely with current state bag limits and seasons. Subsistence users from outside the borough may utilize Eielson AFB for subsistence use. Such use is infrequent if it occurs. (U.S. Department of the Army, 1999—Alaska Army Lands Renewal Final Legislative EIS)

Approximately 2,200 fishing permits, 1,050 hunting permits, and 30 trapping permits are issued annually to mostly recreational users. These activities are allowed on-base in accordance with Federal and State of Alaska regulations, seasons, and bag limits (Eielson AFB, 1998—Integrated Natural Resources Management Plan). Almost all of these permit holders would fail to qualify as subsistence users, and almost all hunting, fishing, and trapping use is for recreational purposes (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS).

3.16.4 FORT GREELY

The land on Fort Greely was once the subsistence ranges of two lower Tanana bands in the nineteenth and twentieth centuries. The land between the Little Delta River and Jarvis Creek is within the historic range of the Salcha band. However, ethnographic research has indicated that by the 1920s the Salcha had ceased to use Delta River and Delta

Creek drainages for subsistence. By 1962 there were no native settlements along the entire Tanana drainage from Healy Lake to Nenana (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS).

The land east of Jarvis Creek is within the historic subsistence range of the Healy River–Joseph band. The remaining descendents of this band currently reside 48 kilometers (30 miles) east of Fort Greely near Healy Lake. While many members of this community are subsistence hunters, most residents do not travel as far as Fort Greely for subsistence harvesting (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS).

The community of Dot Lake is about 96 kilometers (60 miles) west–southwest of Delta Junction along Highway 1. Dot Lake consists primarily of non-native households but also includes the native village of Dot Lake. The historic subsistence area of the village terminates at least 32 kilometers (20 miles) east of Fort Greely. Some residents of Dot Lake may travel the extra distance to harvest subsistence resources on Fort Greely (U.S. Department of the Army, 1999—Alaska Army Lands Withdrawal Renewal Final Legislative EIS).

Approximately 72 kilometers (45 miles) east-southeast of Delta Junction on the Alaska Highway is the non-native community of Dry Creek. According to the Alaska Department of Community and Regional Affairs, at least 15 adult residents rely on the exploitation of natural resources. A number of Dry Creek residents can be characterized as subsistence hunters/trappers. (U.S. Department of the Army, 1999—Alaska Army Lands Renewal Final Legislative EIS)

Currently, the use of subsistence resources on Fort Greely is minimal. Species harvested in the area around Fort Greely include moose, caribou, brown/grizzly bear, Dall sheep, fish, waterfowl, and small game.

From 1996 through 1998, an average of 620 permits were issued for nonmilitary range use on Fort Greely, which includes hunting, fishing, and trapping. It is estimated that approximately one-half of these permit holders are civilians, mostly residents of Delta Junction and Big Delta. A number of Big Delta and Delta Junction residents can be characterized as subsistence users, but due to the employment opportunities in and around the Fort Greely area, there is little dependency on subsistence harvesting in these communities. However, as a result of the stocked lakes on Fort Greely, a considerable number of permit holders are recreational anglers from the Fairbanks area. Due to the lack of specific use information regarding permit holders (who may be berry pickers, hikers, birders, bicyclists, etc.) it is impossible to specifically determine recent subsistence use of the installation. (U.S. Department of the Army, 1999—Alaska Army Lands Renewal Final Legislative EIS)

Subsistence users from other portions of the state may also travel to Fort Greely in time of game shortages in their region. However, this event does not occur on a regular basis, and the use of Fort Greely for subsistence purposes would remain relatively low.

3.16.5 YUKON TRAINING AREA (FORT WAINWRIGHT)

The Yukon Training Area is part of the historic subsistence range of the Chena band and the Salcha band. The Chena band utilized northern portions of the Yukon Training Area within the Chena River drainage, while the Salcha band utilized southern portions of the Yukon Training Area within the Salcha River drainage. Development in this region was devastating to these bands and by the 1960s virtually eliminated the historic subsistence ranges.

The Yukon Training Area is within the Fairbanks North Star Borough, which is not considered a rural area and, therefore, residents are not qualified as Federal subsistence users. However, Game Management Unit 20B has several seasons and bag limits for Federal subsistence hunters, all of which overlap entirely with current state bag limits and seasons. Subsistence users from outside the borough may utilize the Yukon Training Area for subsistence use. Such use is infrequent if it occurs. (U.S. Department of the Army, 1999—Alaska Army Lands Renewal Final Legislative EIS)

Between 1991 and 1997, an average of 2,449 hunting, fishing, and trapping permits were issued annually to mostly recreational users for all of Fort Wainwright and Eielson AFB combined (of which the Yukon Training Area is less than 30 percent). Almost all of these permit holders would fail to qualify as subsistence users, and almost all hunting, fishing, and trapping is for recreational purposes. (U.S. Department of the Army, 1999—Alaska Army Lands Renewal Final Legislative EIS)

3.16.6 WESTERN ALEUTIANS—FIBER OPTIC CABLE ALIGNMENT

This section describes the communities that would be potentially affected by the laying of a fiber optic cable line and other Western Aleutian communities between Whittier and Eareckson Air Station, Shemya Island. This section is based on existing demographic, subsistence, and commercial fishing information.

Based on the general alignment of the fiber optic cable line, listed below are the communities that could be potentially affected by the project. This list includes most of the coastal communities from Whittier to Shemya Island. Next, a brief community description is provided that includes a brief demographic profile and describes which of the communities participate in commercial and subsistence fishing. Based on Commercial Fisheries Entry Commission data, the type and magnitude of

commercial fisheries in which residents of the communities participate is provided. Based on Alaska Department of Fish and Game Division of Subsistence data, the relative reliance on subsistence fishing is assessed.

This section is limited to local fishing effort; it does not include any discussion of non-resident fishers. The subsistence information in this report is from Alaska Department of Fish and Game Division of Subsistence Community Profile Data Base. Where there is more than 1 year of subsistence data available in the Community Profile Data Base, the "most representative year" for each community, rather than an average of subsistence data for all years, is used. This section only includes subsistence resource categories potentially affected by the project (e.g., salmon, non-salmon fish, marine mammals, and marine invertebrates). It does not include land mammals, birds and eggs, and vegetation. Non-salmon subsistence fish include such species as herring, smelt, cod, flounder, greenling, halibut, rock fish, sablefish, sculpin, sole, and skates. The Alaska Department of Fish and Game Community Profile Data Base did not include data for Cold Bay and Seward.

In addition to the fiber optic cable line addressed above, a second redundant line may be required to meet NMD reliability requirements. This line could be north of the Aleutian Islands or connect to existing fiber optic cable in the central Pacific. Once the exact alignment is identified, additional environmental analysis will be prepared.

3.16.6.1 Communities Potentially Affected by the Project

The 21 communities presented in table 3.16-1 are potentially impacted by the project because they are coastal communities whose residents participate in subsistence and commercial fishing in the vicinity of the fiber optic cable line route.

The following coastal communities in the general vicinity of the project are not included in this discussion for the reason listed next to the community.

- Karluk—located on the northwest side of Kodiak Island
- Larsen Bay—located on the northwest side of Kodiak Island
- Nelson Lagoon—located on the north side of the Alaska Peninsula
- Adak Station CDP—former U.S. Government facility
- Eareckson Air Station—U.S. Government facility
- Attu Coast Guard Station—U.S. Government facility
- Amchitka CDP—U.S. Government facility

Table 3.16-1: Coastal Communities from Whittier to Shemya Potentially Affected by the Project

	Community	Census Area
1.	Whittier	Valdez–Cordova
2.	Chenega Bay	Valdez–Cordova
3.	Seward	Kenai-Peninsula Borough/Seward Census Subarea
4.	Kodiak	Kodiak Island Borough
5.	Ouzinkie	Kodiak Island Borough
6.	Port Lions	Kodiak Island Borough
7.	Old Harbor	Kodiak Island Borough
8.	Akhiok	Kodiak Island Borough
9.	Chignik Bay	Lake and Peninsula Borough
10.	Chignik Lagoon	Lake and Peninsula Borough
11.	Chignik Lake	Lake and Peninsula Borough
12.	Perryville	Lake and Peninsula Borough
13.	Ivanof Bay	Lake and Peninsula Borough
14.	Sand Point	Aleutians East
15.	King Cove	Aleutians East
16.	Cold Bay	Aleutians East
17.	False Pass	Aleutians East
18.	Akutan	Aleutians East
19.	Unalaska	Aleutians West
20.	Nikolski	Aleutians West
21.	Atka	Aleutians West

To the extent that Karluk, Larsen Bay, and Nelson Lagoon fishers rely on areas in the vicinity of the project for commercial and subsistence fishing, they are also potentially affected by the project.

3.16.6.2 Community Descriptions

The region potentially affected by the project can be divided into the following subregions and corresponding communities:

- Prince William Sound (Whittier, Chenega Bay)
- Seward
- Kodiak (Kodiak, Ouzinkie, Port Lions, Old Harbor, Ahkiok)
- Alaska Peninsula (Chignik Bay, Chignik Lagoon, Chignik Lake, Perryville, Ivanof Bay)

- Aleutians (Sand Point, King Cove, Cold Bay, False Pass, Akutan, Unalaska, Nikolski, Atka)

Prince William Sound

Whittier, located in western Prince William Sound at the head of Passage Canal, is 121 kilometers (75 miles) southeast of Anchorage. The site was established as a port and railroad terminus by the U.S. Army for transport of petroleum and other supplies during World War II. Two large buildings, originally military housing, now are condominiums housing most of Whittier's 243 residents (table 3.16-2). The population is predominantly non-native. They participate in commercial and sport fishing as well as subsistence activities. The economy is supported by the shipping industry, local government, and tourism.

Chenega Bay is on Evans Island in southwestern Prince William Sound, 68 kilometers (42 miles) southeast of Whittier. The community was located originally on Chenega Island until the 1964 earthquake destroyed the village and many residents perished; the new location was settled in the mid-1980s. The population in 1990 was 94 people living in 34 households. Sixty-nine percent of residents were Alaska Native, mainly Aluutiq Eskimo. The local economy consists mainly of commercial fishing, oyster farming, and subsistence activities.

Seward

Because of its isolated location from most of the other communities, Seward does not easily fit into any of the other subregions. Seward is located on Resurrection Bay on the southeastern Kenai Peninsula. Seward is also linked to Anchorage by rail. The town, founded in 1902, developed around its ice-free harbor and railroad terminus. The 1990 population of 2,699 residents was 15 percent native. Seward's economy developed around being a transportation center and has diversified into tourism (including cruise ships and Kenai Fjords National Park boat tours), ship services, fish processing, coal export facility, a prison, the University of Alaska's Institute of Marine Sciences, and the new Alaska Sea Life Center. Residents participate in commercial fishing, sport fishing, and subsistence activities.

Kodiak

The Kodiak archipelago has been occupied by Sugpiaq Eskimos since 8,000 B.C. and was settled by Russian fur trappers in 1792. Russian colonization and the sea otter fur trade virtually decimated the Sugpiaq Eskimo population. The military established bases on Kodiak during World War II and has maintained a presence since then. All communities (six villages and the city of Kodiak) are incorporated within the Kodiak Island Borough. The economy of Kodiak and the smaller communities on Kodiak Island is based primarily on commercial fishing.

Table 3.16-2: Demographic Data for Selected Coastal Communities

Community	U.S. Census[1]		Alaska Department of Fish and Game Division of Subsistence Demographic Information[2]						Alaska Department of Community & Regional Affairs[3]
							Household Heads		
	1990 Population	Percent Native	Alaska Department of Fish and Game Study Year	Number of Households	Population	Percent Native	Percent Born Locally	Average Years Residency	Current Population
Akhiok	77	93.5	1992	24	80	88.8	81.6	25.2	84
Akutan	589	13.6	1990	31	102	85.4	69	28.5	414
Atka	98	92.8	1994	29	85	91.4	85.7	32.6	106
Chenega Bay	94	69.2	1993	28	101	73.9	55.3	7.2	95
Chignik Bay	188	45.2	1991	44	128	51.7	41.2	17.6	128
Chignik Lagoon	53	56.6	1989	15	41	65.9	65.4	28.4	80
Chignik Lake	133	91.8	1991	33	131	91.6	51.2	23.7	152
Cold Bay	148	5.4	nd	nd	nd	nd	nd	nd	146
False Pass	69	76.5	1988	22	59	84.1	64.5	22.4	79
Ivanof Bay	35	94.3	1989	7	32	96.9	57.1	14.5	28
King Cove	677	39.3	1992	158	560	69.5	55.1	22.5	897
Kodiak City	6,375	12.7	1993	1,994	6,058	9.4	8.4	14.8	6,869
Kodiak Road	3,220	11.5	1991	1,161	4,002	10.3	8.3	15.2	nd
Nikolski	35	82.8	1990	20	49	73.5	78.3	36.2	27
Old Harbor	284	88.7	1991	66	217	84.1	68.2	25.6	316
Ouzinkie	209	85.2	1993	71	234	84.6	69.8	19.9	259
Perryville	108	94.4	1989	31	116	94	78.6	36.9	101
Port Lions	222	67.6	1993	80	236	66.2	51.9	18	264
Sand Point	878	49.3	1992	204	606	67.6	52	23.6	808
Seward	2,699	15.2	nd	nd	nd	nd	nd	nd	2,914
Unalaska	3,089	8.4	1994	700	1,825	14.3	10.1	9.1	4,087
Whittier	243	12.4	1990	103	279	13.9	0.7	7.1	289
Total	19,523								

Sources:

[1] Alaska Department of Labor, 1991—Alaska Population Overview 1990 Census & Estimates.

[2] Alaska Department of Fish and Game, 1998—Community Profile Data Base.

[3] Alaska Department of Community and Regional Affairs, 1996—Alaska's Cities, Towns and Villages.

Note: There is significant variation in the population in some communities (e.g., Unalaska and Akutan) among the three sources of population data. This variation is likely due to the time of year for the enumeration was conducted; in some cases the enumeration may include cannery workers.

nd = no data

The city of Kodiak was Russian America's capital until it moved to Sitka around the time the United States purchased Alaska from Russia in 1867. Following Russian overharvesting of the sea otter, commercial fishing became the main economic activity in Kodiak, along with military activity during and after World War II. The 1964 earthquake devastated the city and fishing fleet. By 1968, Kodiak was the largest fishing port in the United States in terms of dollar value. Kodiak also has the largest U.S. Coast Guard Station. The community had a population of 6,365 in 1990 and was 13 percent native. A relatively large population of Asian/Pacific Island ancestry (20 percent) resides in Kodiak, due mainly to commercial fishing and processing. Commercial fishing and processing are the economic mainstay, and residents also participate in sport fishing and subsistence. Kodiak is the economic and transportation hub for the outlying villages of the Kodiak archipelago.

The communities of Akhiok, Old Harbor, Ouzinkie, and Port Lions are accessible from Kodiak only by air or water. The populations of these communities range from 84 (Akhiok) to 316 (Old Harbor) and are 85 percent or more native. The natives are mainly Sugpiaq Eskimos. Commercial fishing is the main source of cash income in these communities, and subsistence is another important activity economically as well as culturally.

Alaska Peninsula

The communities of Chignik, Chignik Lake, Chignik Lagoon, Perryville, and Ivanof Bay along the south side of the Alaska Peninsula are part of the Lake and Peninsula Borough. They are southwest of Kodiak and Anchorage, and access is by air or water. Ivanof Bay is the smallest community with a population of 28, and Chignik Lake is the largest with a population of 152. The communities are mostly native; Perryville, Ivanof Bay, and Chignik Lake are predominantly Aleut, whereas Chignik and Chignik Lagoon are Koniag. The populations of Chignik, Chignik Lake, and Chignik Lagoon increase substantially in the summer with the influx of seasonal fishers and cannery workers. Many Ivanof Bay, Perryville, and Chignik Lake residents leave their villages in the summer to fish elsewhere on the Peninsula. Commercial fishing is the economic mainstay of all five communities, and Chignik has two year-round fish processing plants. Subsistence is also an important element of the local economy and culture.

Aleutians

Sand Point, King Cove, Cold Bay, False Pass, and Akutan are within the Aleutians East Borough. Sand Point is in the Shumagin Islands, 917 kilometers (570 miles) from Anchorage. Its population is 808 and was 49 percent native (primarily Aleut) in 1990. The town was founded in 1898 as a cod fishing station, which brought many Scandinavian

fishermen. The community is still centered around commercial fishing, with subsistence also culturally and economically important.

Cold Bay is at the western end of the Alaska Peninsula. The community was originally established as a strategic air base during World War II. Because of its airport, Cold Bay is a regional hub for air transportation on the Alaska Peninsula. It also services the fishing industry. Cold Bay's mostly non-native population numbers 146. Residents work mainly in transportation, government, and retail trade. Residents also participate in subsistence and sport fishing and hunting.

King Cove is also at the western end of the peninsula, 1,006 kilometers (625 miles) from Anchorage. The town grew up around the cannery that was built there in 1911. Like Sand Point, the community was settled originally by Aleuts, Scandinavians, and other Europeans. Presently, the population numbers 897, and in 1990 was 40 percent non-native. The economy is based on commercial fishing, with the cannery and with 75 residents holding commercial fishing permits. Subsistence is culturally and economically important as well.

False Pass is on Unimak Island, 1,040 kilometers (646 miles) from Anchorage. The town was settled by Aleuts from the surrounding area when a cannery was built there in 1917. The population of 79 is mostly Aleut. Commercial fishing is the mainstay of the economy, and subsistence hunting and fishing are significant as well.

Unalaska, on Unalaska Island (1,287 kilometers [800 miles] from Anchorage), is the largest community in the Aleutians. Its population is 4,087, and in 1990 was 62 percent Caucasian, 8 percent native, 18 percent Asian/Pacific Islanders, and 8 percent "other ethnic." This mixture is the result of a large scale, year-round fishing industry. The town has fish processing plants, a harbor suitable for large factory trawlers and cargo ships, fleet services, and is strategically located between Asia and North America. The harbor ranks first in the United States for seafood volume and value.

Akutan is located 56 kilometers (35 miles) east of Unalaska on Akutan Island. The site was originally a fur storage and trading port, then a cod fishing and processing plant. These economic activities attracted Aleuts to the community, which also served as a whaling station in the early 1900s. The present population is about 414, and in 1990 was 14 percent native. This number includes workers from the fish processing plants nearby. The largest ethnic group in 1990 was Asian/Pacific Islanders (42 percent). Commercial fishing is the backbone of the local economy.

Nikolski and Atka are small Aleut villages far out in the Aleutian Islands chain; Atka is 1,770 kilometers (1,100 miles) from Anchorage, and

Nikolski is a bit closer. Both communities have been occupied for thousands of years. Nikolski's population is 27; Atka's population numbers 106; and both are predominantly Aleut (83 and 92 percent, respectively). Nikolski was involved in sea otter hunting under Russian rule in the early 1800s, and fox farming in the early 1900s. Presently residents maintain sheep and cattle herds, work outside the village in fish processing, and conduct subsistence fishing and hunting to support themselves. Atka residents also depend primarily on subsistence, with additional employment in commercial fishing.

3.16.6.3 Commercial Fishing in Communities

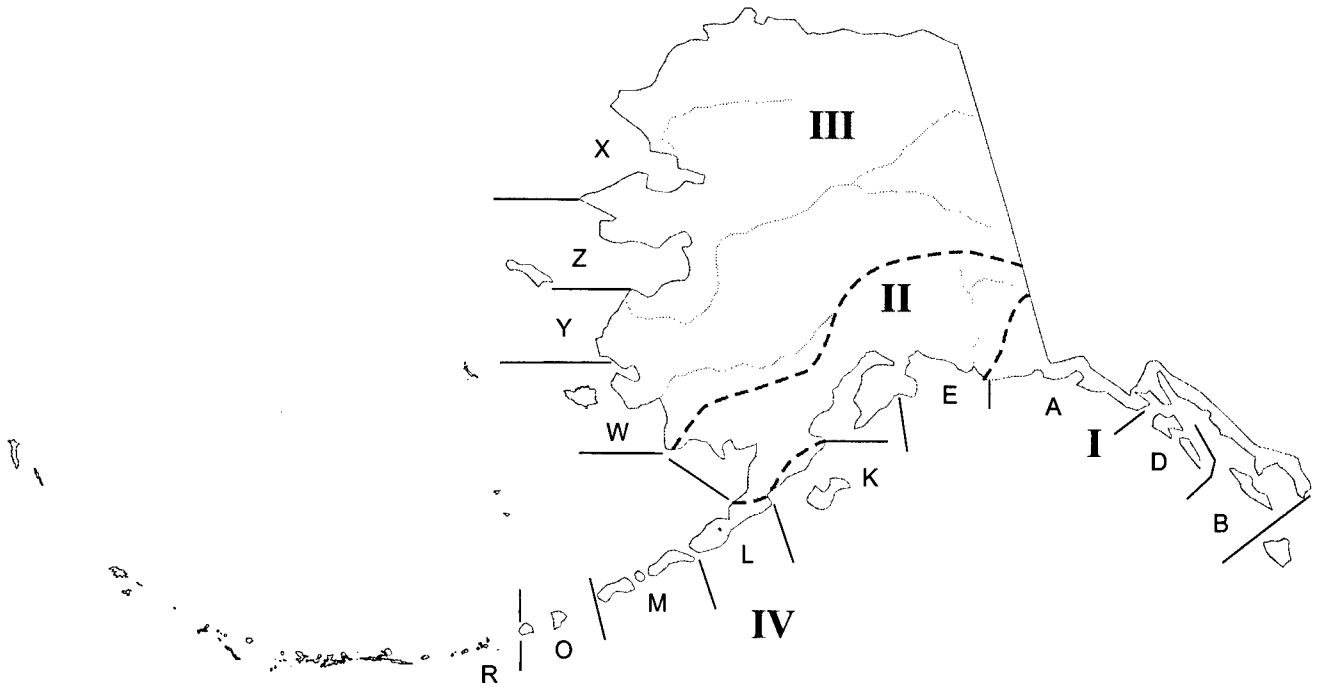
Residents of the study area communities participate in and rely on commercial fishing. It is the economic mainstay of these communities as well as an important component of residents' cultural identity. Important commercial species include salmon, crab (Dungeness, king, and Tanner), halibut, herring, saltwater finfish, and black cod. Alaska commercial fishing areas potentially affected by the project include the following (see figure 3.16-1):

- Prince William Sound (Area E)
- Kodiak (Area K)
- Chignik (Area L)
- Alaska Peninsula (Area M)
- Dutch Harbor (Area O)
- Adak and Western Aleutians (Area R)

Based on Commercial Fisheries Entry Commission commercial fishing data for 1996, table 3.16-3 provides information for each community on:

- The number of separate permit fisheries in which residents of each community participate
- The number of people who own permits
- The number of permits that are fished in each community
- The pounds harvested
- The estimated gross earnings
- The primary fisheries in which residents participate

As shown in table 3.16-3, in 1996, 957 individuals held 1,803 Alaska limited entry fishing permits and participated in 263 different fisheries. The 1996 harvest totaled over 148 million kilograms (326 million pounds), and the gross earnings were in excess of $133 million.



ALASKA COMMERCIAL FISHERIES REGIONS AND AREAS

REGION I: SOUTHEASTERN: Dixon Entrance to Cape Suckling

Areas: A. Juneau & Yakutat
B. Ketchikan
C. Petersburg
D. Sitka

REGION II: CENTRAL: State Third Judicial Division Northern Boundary to Cape Suckling to Cape Douglas to Cape Menshikof to Cape Newenham

Areas: E. Prince William Sound
H. Cook Inlet
T. Bristol Bay (salmon and herring catch; all fish and shellfish production)

REGION III: ARTIC-YUKON-KUSKOKWIM (AYK): North of State Third Judicial Division Northern Boundary which ends at the west Cape Newenham including Nunivak, St. Matthew, and St. Lawrence Islands

Areas: W. Kuskokwim
X. Kotzebue
Y. Yukon
Z. Norton Sound

REGION IV: WESTERN: Cape Douglas to Unimak Pass to Cape Newenham including Kodiak and Aleutian Islands

Areas: K. Kodiak
L. Chignik
M. Alaska Peninsula
O. Dutch Harbor
Q. Bering Sea
R. Adak & W. Aleutians
T. Bristol Bay (fish other than salmon and herring catch; and shellfish catch)

Commercial Fisheries Regions and Areas

Alaska

Scale
0 193 385 miles
0 310 620 kilometers
NORTH

Figure 3.16-1

Table 3.16-3: Commercial Fisheries Participation and Harvest for Selected Coastal Communities, 1996

Community	Number of Fisheries[1]	Number of People	Number of Permits Fished	Kilograms (Pounds)	Estimated Gross Earnings	Primary Fisheries
Akhiok[2]	1	2	2	***	***	Salmon
Akutan[2]	2	6	6	2,910 (6,415)	$12,628	Halibut
Atka[2]	4	10	10	61,250 (135,034)	$206,059	Halibut and salmon
Chenega Bay	1	4	4	83,948 (185,074)	$121,889	Salmon
Chignik Bay[2]	4	15	21	1,023,509 (2,256,450)	$1,534,901	Salmon, halibut, herring
Chignik Lagoon	7	19	32	2,000,721 (4,410,835)	$3,001,436	Salmon, halibut, Dungeness crab, herring, misc. saltwater finfish
Chignik Lake[2]	3	7	9	298,488 (658,054)	$554,641	Salmon and herring
Cold Bay	1	1	1	***	***	Salmon
False Pass	5	12	17	512,777 (1,130,480)	$627,568	Salmon and halibut
Ivanof Bay	2	3	3	***	***	Salmon and halibut
King Cove	22	69	143	6,639,122 (14,636,759)	$4,433,123	Salmon, halibut, king and Tanner crab, misc. saltwater finfish
Kodiak City	53	490	955	103,598,800 (228,396,233)	$91,614,927	Salmon, halibut, king and Tanner crab, misc. saltwater finfish, herring, black cod
Nikolski	0	0	0	0	0	
Old Harbor	13	27	55	2,210,914 (4,874,231)	$2,906,064	Salmon, herring, misc. saltwater finfish, and halibut
Ouzinkie	8	23	30	345,586 (761,886)	$396,567	Salmon, halibut, misc. saltwater finfish, herring
Perryville[2]	2	8	9	357,729 (788,657)	$658,454	Salmon and herring
Port Lions	14	17	31	801,045 (1,766,001)	$1,038,479	Salmon; Dungeness, king and Tanner crab; halibut; misc. saltwater finfish; herring
Sand Point	33	109	227	22,757,630 (50,171,985)	$11,522,729	Salmon, halibut, herring, king and Tanner crab, misc. saltwater finfish

Table 3.16-3: Commercial Fisheries Participation and Harvest for Selected Coastal Communities, 1996 (Continued)

Community	Number of Fisheries[1]	Number of People	Number of Permits Fished	Pounds	Estimated Gross Earnings	Primary Fisheries
Seward	35	60	111	3,406,759 (7,510,618)	$5,891,727	Salmon, black cod, halibut, herring, king and Tanner crab, misc. saltwater finfish
Unalaska[3]	44	65	121	3,778,726 (8,330,664)	$8,792,148	Halibut; king, Dungeness and Tanner crab; misc. saltwater finfish; salmon; black cod
Whittier	9	10	16	80,582 (177,652)	$163,376	Black cod, halibut, salmon, shrimp
Totals	263	957	1,803	147,960,500 (326,197,028)	$133,476,716	

Source: Alaska Commercial Fisheries Entry Commission, 1996—Commercial Fishing Statistics, Reports and Listings.

[1] Number of fisheries refers to the number of different permit fisheries in which residents of the community participate (e.g., species x gear x area)

[2] Pounds and earnings are greater, but some data are not reported because there are too few fishers to make data public.

[3] Includes Dutch Harbor

*** pounds and earnings are not public because there are too few fishers.

3.16.6.4 Subsistence Harvests and Activities in Communities

In addition to commercial fishing, residents of the potentially affected communities participate in subsistence fishing, gathering of marine invertebrates, and hunting marine mammals. Table 3.16-4 provides the following subsistence information for 19 of the 21 communities (no subsistence data were available for Cold Bay or Seward):

- Date of Alaska Department of Fish and Game Division of Subsistence harvest survey
- Relevant resource categories (e.g., all resources, fish [salmon and non-salmon], marine mammals and marine invertebrates)
- Percentage of households that used, tried to harvest, harvested, received, or gave away the subsistence resource during the study year
- Estimated harvest presented as estimated number, total pounds harvested, pounds per capita harvested, and the percentage of the total harvest.

Table 3.16-4: Selected Subsistence Harvests and Subsistence Activities for Selected Coastal Communities

Alaska Department of Fish and Game Study Year	Resource	Percentage of Households					Estimated Harvest				
		Using	Trying to Harvest	Harvesting	Receiving	Giving	Estimated Number	Total Pounds[1]	Mean Household Harvest[1]	Per Capita Pounds[1]	Percent Total Harvest
Akhiok											
1992	All Resources	100	100	100	96	83		25,735	1,072	322	100
	Fish	100	96	96	67	71		17,909	746	224	70
	Salmon	100	96	96	63	71	2,510	15,961	665	200	62
	Non-Salmon Fish	88	75	67	46	42		1,948	81	24	8
	Marine Mammals	71	42	25	63	33	20	1,552	65	19	6
	Marine Invertebrates	100	88	88	83	54		3,371	140	42	13
Akutan											
1990	All Resources	100	96	96	100	92		47,397	1,529	466	100
	Fish	100	92	92	96	88		26,921	868	265	57
	Salmon	96	76	76	84	64	3,269	12,339	398	121	26
	Non-Salmon Fish	100	92	92	92	76		14,581	470	143	31
	Marine Mammals	92	48	44	84	40	142	10,767	347	106	23
	Marine Invertebrates	88	68	64	72	56		2,866	92	28	6
Atka											
1994	All Resources	100	100	100	100	79		37,307	1,286	439	100
	Fish	96	89	86	93	68		15,152	522	178	41
	Salmon	96	79	79	82	57	2,386	8,051	278	95	22
	Non-Salmon Fish	93	82	75	86	64		7,100	245	84	19
	Marine Mammals	93	61	57	93	57	120	12,797	441	151	34
	Marine Invertebrates	86	61	61	75	57		444	15	5	1
Chenega Bay											
1993	All Resources	100	96	96	100.0	91.3		27,809	993	275	100
	Fish	100	83	78	95.7	78.3		19,980	714	198	72
	Salmon	96	74	70	91.3	60.9	2,686	10,985	392	109	40
	Non-Salmon Fish	96	57	57	87.0	73.9		8,994	321	89	32
	Marine Mammals	57	44	44	56.5	43.5	85	3,528	126	35	13
	Marine Invertebrates	91	74	74	73.9	56.5		1,498	53	15	5
Chignik Bay											
1991	All Resources	100	93	90	100	73		45,610	1,037	357	100
	Fish	100	87	83	80	70		35,846	815	281	79
	Salmon	100	80	80	70	67	4,403	21,825	496	171	48
	Non-Salmon Fish	97	80	67	67	50		14,021	319	110	31
	Marine Mammals	33	13	13	20	17	6	329	7	3	1
	Marine Invertebrates	100	77	70	93	47		4,958	113	39	11
Chignik Lagoon											
1989	All Resources	100	87	80	93	73		8,669	578	211	100
	Fish	100	73	73	93	73		5,937	396	145	68
	Salmon	100	60	60	80	53	833	4,110	274	100	47
	Non-Salmon Fish	100	67	67	87	53		1,826	122	45	21
	Marine Mammals	13	7	7	7	0	2	0	0	0	0
	Marine Invertebrates	87	53	53	80	47		851	57	21	10

Table 3.16-4: Selected Subsistence Harvests and Subsistence Activities for Selected Coastal Communities (Continued)

Alaska Department of Fish and Game Study Year	Resource	Percentage of Households					Estimated Harvest				
		Using	Trying to Harvest	Harvesting	Receiving	Giving	Estimated Number	Total Pounds[1]	Mean Household Harvest[1]	Per Capita Pounds[1]	Percent Total Harvest
Chignik Lake											
1991	All Resources	100	100	100	100	92		57,783	1,751	442	100
	Fish	100	96	96	88	92		32,042	971	245	55
	Salmon	100	96	96	71	92	6,599	26,614	806	204	46
	Non-Salmon Fish	100	79	79	88	71		5,428	164	42	9
	Marine Mammals	71	25	21	63	29	10	539	16	4	1
	Marine Invertebrates	100	79	75	92	67		2,711	82	21	5
False Pass											
1988	All Resources	100	100	100	100	95		28,586	1,299	413	100
	Fish	100	80	80	95	90		17,573	799	254	61
	Salmon	100	65	65	80	60	2,998	13,385	608	193	47
	Non-Salmon Fish	95	70	70	75	75		4,188	190	60	15
	Marine Mammals	60	30	30	55	30		1,753	80	25	6
	Marine Invertebrates	100	80	80	90	70		1,610	73	23	6
Ivanof Bay											
1989	All Resources	100	100	100	100	100		15,677	2,240	490	100
	Fish	100	100	100	100	100		8,057	1,151	252	51
	Salmon	100	100	100	100	71	1,437	5,971	853	187	38
	Non-Salmon Fish	100	100	100	100	86		2,086	298	65	13
	Marine Mammals	86	71	57	71	57	14	878	125	27	6
	Marine Invertebrates	100	100	100	100	100		1,486	212	46	9
King Cove											
1992	All Resources	100	97	96	95	81		143,496	908	256	100
	Fish	97	87	85	75	51		100,569	637	179	70
	Salmon	96	84	83	52	40	17,136	76,647	485	137	53
	Non-Salmon Fish	89	68	67	68	43		23,921	151	43	17
	Marine Mammals	25	13	13	16	9		1,180	7	2	1
	Marine Invertebrates	95	57	57	85	43		9,700	61	17	7
Kodiak City											
1993	All Resources	99	91	88	97	84		915,070	459	151	100
	Fish	98	77	71	91	72		652,493	327	108	71
	Salmon	93	73	69	73	61	69,553	289,229	145	48	32
	Non-Salmon Fish	95	67	64	80	62		363,265	182	60	40
	Marine Mammals	2	1	1	2	1	38	0	0	0	0
	Marine Invertebrates	79	41	40	73	41		57,595	29	10	6
Kodiak Road											
1991	All Resources	96	97	96	92	78		672,909	580	168	100
	Fish	93	90	84	75	70		502,364	433	126	75
	Salmon	91	86	80	59	61	58,722	243,167	209	61	36
	Non-Salmon Fish	84	75	72	53	53		259,197	223	65	39
	Marine Invertebrates	82	47	45	74	36		54,540	47	14	8

Table 3.16-4: Selected Subsistence Harvests and Subsistence Activities for Selected Coastal Communities (Continued)

Alaska Department of Fish and Game Study Year	Resource	Percentage of Households					Estimated Harvest				
		Using	Trying to Harvest	Harvesting	Receiving	Giving	Estimated Number	Total Pounds[1]	Mean Household Harvest[1]	Per Capita Pounds[1]	Percent Total Harvest
Nikolski											
1990	All Resources	100	100	93	100	86		36,945	1,847	761	100
	Fish	100	93	86	86	79		18,629	931	384	50
	Salmon	100	93	86	64	79	1,903	7,819	391	161	21
	Non-Salmon Fish	100	93	86	86	71		10,810	541	223	29
	Marine Mammals	93	64	64	79	64	71	7,469	373	154	20
	Marine Invertebrates	93	71	57	79	43		203	10	4	1
Old Harbor											
1991	All Resources	100	100	100	98	95		84,781	1,285	391	100
	Fish	100	93	93	88	88		60,793	921	280	72
	Salmon	95	91	88	76	76	10,398	44,868	680	207	53
	Non-Salmon Fish	98	81	79	76	74		15,925	241	73	19
	Marine Mammals	62	14	14	55	33	68	6,009	91	28	7
	Marine Invertebrates	98	79	79	86	71		7,885	119	36	9
Ouzinkie											
1993	All Resources	98	92	92	95	85		51,091	720	218	100
	Fish	98	79	79	80	66		32,521	458	139	64
	Salmon	93	75	75	64	62	5,695	23,948	337	102	47
	Non-Salmon Fish	89	62	61	69	53		8,574	121	37	17
	Marine Mammals	41	26	26	26	26	55	3,510	49	15	7
	Marine Invertebrates	93	72	69	77	54		5,122	72	22	10
Perryville											
1989	All Resources	100	100	100	93	85		45,729	1,475	394	100
	Fish	100	93	93	89	67		31,506	1,016	272	69
	Salmon	100	89	89	82	63	5,206	23,451	756	202	51
	Non-Salmon Fish	96	78	74	89	63		8,055	260	69	18
	Marine Mammals	63	41	26	52	30	28	2,967	96	26	6
	Marine Invertebrates	96	89	85	74	63		2,373	77	20	5
Port Lions											
1993	All Resources	100	100	100	100	91		78,371	980	331	100
	Fish	100	87	87	89	76		52,339	654	221	67
	Salmon	100	82	82	62	69	8,991	37,280	466	158	48
	Non-Salmon Fish	96	69	69	82	49		15,059	188	64	19
	Marine Mammals	18	4	4	16	4	14	1,052	13	4	1
	Marine Invertebrates	93	89	87	71	53		7,149	89	30	9
Sand Point											
1992	All Resources	100	94	94	95	69		155,001	760	256	100
	Fish	100	82	79	83	56		116,054	569	191	75
	Salmon	99	76	72	74	47	19,441	83,320	408	137	54
	Non-Salmon Fish	97	74	72	64	39		32,734	160	54	21
	Marine Mammals	25	13	10	17	10		2,848	14	5	2
	Marine Invertebrates	90	64	64	79	39		10,796	53	18	7

Table 3.16-4: Selected Subsistence Harvests and Subsistence Activities for Selected Coastal Communities (Continued)

Alaska Department of Fish and Game Study Year	Resource	Percentage of Households					Estimated Harvest				
		Using	Trying to Harvest	Harvesting	Receiving	Giving	Estimated Number	Total Pounds[1]	Mean Household Harvest[1]	Per Capita Pounds[1]	Percent Total Harvest
Unalaska											
1994	All Resources	97	94	94	95	84		355,081	507	195	100
	Fish	97	79	79	84	73		245,876	351	135	69
	Salmon	92	69	67	71	53	26,963	98,192	140	54	28
	Non-Salmon Fish	95	67	67	76	59		147,684	211	81	42
	Marine Mammals	14	5	4	13	7	170	17,536	25	10	5
	Marine Invertebrates	87	30	30	85	36		50,138	72	27	14
Whittier											
1990	All Resources	94	79	77	87	66		22,308	217	80	100
	Fish	90	60	58	71	63		14,969	145	54	67
	Salmon	77	56	54	53	52	1,596	9,453	92	34	42
	Non-Salmon Fish	82	38	38	61	43		5,516	54	20	25
	Marine Mammals	8	1	1	7	1	7	265	3	1	1
	Marine Invertebrates	52	16	16	44	18		2,494	24	9	11
Total								**2,855,355**			

Source: Alaska Department of Fish and Game, 1998—Community Profile Database.

[1] Units in pounds, as originally provided in the source documentation. Conversion to metric units is omitted in this table for readability. Conversion to kilograms can be made by multiplying the number of pounds by 0.4535924.

The percentage of households that use subsistence resources is high in all communities, ranging from 94 percent in Whittier to 100 percent in 15 of the 20 communities for which data are available (table 3.16-4). Households that try to harvest subsistence foods (79 percent in Whittier to 100 percent in several communities) and do successfully harvest subsistence foods (77 percent in Whittier to 100 percent in several communities) is also high. Similarly, sharing subsistence foods (giving and receiving) was high in all communities, ranging from a low of 63 percent of the households in Whittier to 100 percent of the households in several communities.

The percentage of households that use, harvest, and share fish (both salmon and non-salmon) is higher than the percentage of households that use, harvest, and share marine mammals and marine invertebrates. This difference likely reflects resource availability and cultural preferences in the communities. Fish is the largest component of the subsistence harvest in all communities (table 3.16-4).

The per capita harvest in these communities ranges from 36 kilograms (80 pounds) in Whittier to 345 kilograms (761 pounds) per capita in Nikolski. The total subsistence harvest in the 19 communities (plus Kodiak Road) for the representative data year was 1.29 million kilograms (2.85 million pounds).