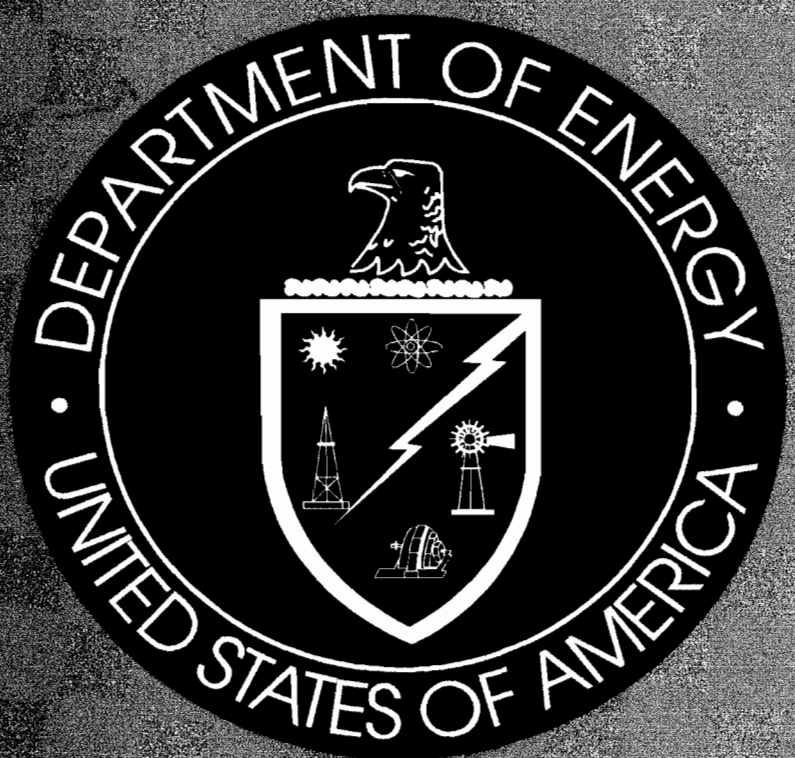
DOE/EA-1193

ENVIRONMENTAL ASSESSMENT

for the Atmospheric Radiation Measurement (ARM) Program North Slope of Alaska and Adjacent Arctic Ocean Cloud and Radiation Testbed (CART) Site



February 1997

United States Department of Energy
Albuquerque Operations Office
Albuquerque, NM

U. S. DEPARTMENT OF ENERGY
FINDING OF NO SIGNIFICANT IMPACT

FINAL ENVIRONMENTAL ASSESSMENT - The United States Department of Energy (DOE) has prepared an environmental assessment (EA) for the Atmospheric Radiation Measurement Cloud and Radiation Testbed (ARM/CART), North Slope of Alaska and Adjacent Arctic Ocean. The purpose of the ARM/CART program is to collect and analyze atmospheric data for the development and validation of global climate change models. The program involves construction of several small facilities and operation of sensing equipment. The EA analyzes the impacts on land use, tundra, air quality, cultural resources, socioeconomics, and wildlife. Separate studies (summarized in the EA) were also conducted to ensure that the operation of the facilities would not adversely affect wildlife. The EA further discusses environmental justice, noise, and cumulative issues. For a detailed description of the proposed action and its environmental consequences, refer to the EA.

FINDING - Based on the EA that analyzes the consequences of the relevant issues of environmental concern and the concerns of the stakeholders, the United States Department of Energy (DOE) finds that there would be no significant impact from proceeding with its proposal to conduct the ARM/CART program. DOE makes this Finding of No Significant Impact pursuant to the National Environmental Policy Act of 1969 (NEPA); 42 U.S.C. § 4321, et seq., the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA, 40 C.F.R. Part 1500; and the DOE National Environmental Policy Act Implementing Procedures, 10 C.F.R. Part 1021. The proposed action does not constitute a major federal action that would significantly affect the human environment within the mandate of NEPA. Therefore, no environmental impact statement is required for this proposal.

Issued this 27th day of February, 1997.

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ANCSA	Alaska Native Claims Settlement Act
ARCO	Atlantic Richfield Company
ARCSS	Arctic Systems Science (NSF Program)
ARM	Atmospheric Radiation Measurement (USDOE Program)
ATV	All-Terrain Vehicle
BEO	Barrow Environmental Observatory
BLM	(United States) Bureau of Land Management
CART	Cloud and Radiation Testbed
CMDL	Climate Monitoring and Diagnostics Laboratory (NOAA)
CZM	Coastal Zone Management
dB	Decibels (Sound Level)
DNL	A-weighted Day-Night Annual Averaged Sound Level
DOE	(United States) Department of Energy
FAA	Federal Aviation Administration
ft^2	Square Feet
GCMs	Global Climate Models
Hz	Hertz (frequency of sound and/or radiowaves)
kW	Kilowatts
m^2	Square Meters
NARL	Naval Arctic Research Laboratory
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NPR-A	National Petroleum Reserve - Alaska
NSB	North Slope Borough
NSA/AAO	North Slope of Alaska and Adjacent Arctic Ocean (CART site)
NWS	National Weather Service
NSF	National Science Foundation
ONR	Office of Naval Research
RASS	Radio-Acoustic Sounding System
SHEBA	Surface Heat Budget of the Arctic Ocean (NSF & ONR Program)
SHIPO	State Historic Preservation Officer
UIC	Ukpeagvik Inupiat Corporation
USAF	United States Air Force
US DOI	United States Department of the Interior

1.0 PURPOSE AND NEED FOR ACTION

1.1 Background

The Atmospheric Radiation Measurement (ARM) program is an ongoing research program funded by the Department of Energy (DOE) to improve understanding of the processes and uncertainties related to global climate changes, with particular emphasis on improving the performance of Global Climate Models (GCMs).

GCMs have been developed as tools for understanding and predicting the potential global climatic impact of gases that accumulate in the atmosphere as a result of man's activities. However, the usefulness of these models is compromised by the large uncertainties in certain key processes affecting the radiant flow of energy through the atmosphere and across the earth's surface. The effects of certain atmospheric constituents, especially clouds, water vapor, and aerosols (e.g., smoke, dust) are in particular poorly understood. Although several government agencies are involved in studies of global climate change, only the ARM program focuses on the impact of clouds and water vapor phenomena on the earth's radiative energy balance.

Under the ARM program, DOE proposes three Cloud and Radiation Testbed (CART) sites located at widely differing latitudes over the globe. A CART site consists of a network of meteorological instruments spread over an area about 300 kilometers (km) (200 miles) on a side. The information obtained at the CART sites should provide long-term measurements over a broad range of climates. The knowledge gained through these sites will allow a more credible prediction of global climate change caused by effluents generated in using energy.

CART siting requirements to meet the ARM objectives (DOE, 1991) include: 1) broad sampling of types and altitudes of clouds (obtainable from the CART sites taken together), 2) relatively homogeneous surface conditions important to minimize uncontrolled variables (topography), 3) minimum logistical constraints, and 4) potential cooperative relationships with other relevant data-gathering programs. In accordance with these criteria, one CART site has been established in the southern great plains of the United States within the states of Oklahoma and Kansas (DOE, 1992) and another in the tropical western Pacific. A high latitude locale is needed for the third CART site to test the cloud and radiative energy transport models because, as the global heat sink, the high latitude regions are especially important to climate and climate changes. Also, at high latitude locales, water occurs primarily in solid, rather than liquid form. Radiative energy transfer through ice clouds and the behavior of ice clouds and snow surfaces is poorly modeled in existing GCMs. In addition, a high latitude CART site is needed to increase understanding of the factors that influence the timing of the annual change from snow and ice-covered land and water, to snow and ice-free surfaces.

1.2 Purpose and Need

The purpose of the ARM program is to reduce uncertainty in GCMs for understanding global climatic changes. The major focus of ARM is the determination of the impact of clouds on radiant energy flow. The project requires meteorological research stations situated in diverse types of terrains and climates. In order to complete the site requirements of the ARM program, a research site is needed in a high latitude region that offers homogenous topography, climatic extremes, and unique water vapor phenomena.

2.1 Proposed Action

The DOE proposes to locate a CART site on the North Slope of Alaska adjacent to the Arctic Ocean (the NSA/AAO site) (Figure 2-1). The CART site would consist of a Central Facility near the town of Barrow, Alaska and two Boundary Facilities, one near Atqasuk and the other near Oliktok Point. In addition to these main facilities, small, unattended Extended Facilities would be located at about a dozen sites scattered primarily within the triangle formed by the three main facilities (see Figure 2-2). These facilities would be developed incrementally over several years. Preparatory work in the Barrow area would begin during February/March, 1997. Work in the vicinities of Atqasuk and Oliktok Point would tentatively begin in 1999 and 2003, respectively. Although a few Extended Facilities might be installed earlier, most would likely be installed in the year 2003 or later. DOE proposes that the NSA/AAO facilities be operated for approximately 10 years.

The North Slope site would meet the desired ARM selection criteria. The proposed facilities at this site would provide data on high latitude regions. The need for a homogeneous surface is met because the tundra and the sea ice provide relatively unvaried surface conditions on the scale of interest, especially in winter. The requirement for minimum logistic constraints is met because Barrow and its outlying communities possess remarkably good infrastructures given their remote locations. In Addition, a high potential exists for cooperation with other relevant programs.

The Central Facility at Barrow would contain extensive instrumentation for characterizing meteorological conditions and the resulting local visible and infrared radiation fields. Office and laboratory space and equipment for capturing, processing, and transmitting data would be located near Barrow in the main building of the former Naval Arctic Research Laboratory (NARL), now owned by Ukpeagvik Inupiat Corporation (UIC) (Figure 2-3). Also, a few transportation containers for storage might be located near the UIC/NARL main building. Approximately 50 square meters (m^2) (500 square feet (ft^2)) of floor space would be required. The Central Facility instruments would be located on the tundra approximately 1.6 km (one mile) from the support facility and would be spread over approximately 8000 m^2 (two acres) on National Oceanic and Atmospheric Administration/Climate Monitoring and Diagnostics Laboratory (NOAA/CMDL) land (see Figure 2-4). Only a small fraction of the acreage would actually be disturbed. The main instrument shelter would be a 2.4 x 2.4 x 12 m (8 x 8 x 40 ft) modular structure on pilings. A 40 meter (m) (130 ft) high meteorological tower would be erected on pilings to accommodate specialized meteorological and radiation measurement instruments. The tower would be equipped with warning strobe lights at the 20 m and 40 m levels and would meet all applicable Federal Aviation Administration (FAA) requirements.

The instruments that require power and shelter include a cloud radar, a micropulse lidar, an infrared interferometer, a lidar ceilometer, a microwave radiometer, a radar wind profiler that is equipped with a Radio Acoustic Sounding System (RASS), a set of upward- and downward-looking passive radiometers, meteorological instruments for determining heat and moisture fluxes, and possibly a balloon-borne sounding (rawinsonde) system. Figure 2-4 is a sketch of the proposed location of these systems near Barrow, and the shelters and decks needed to accommodate them.

Figure 2-1. Alaska State Map

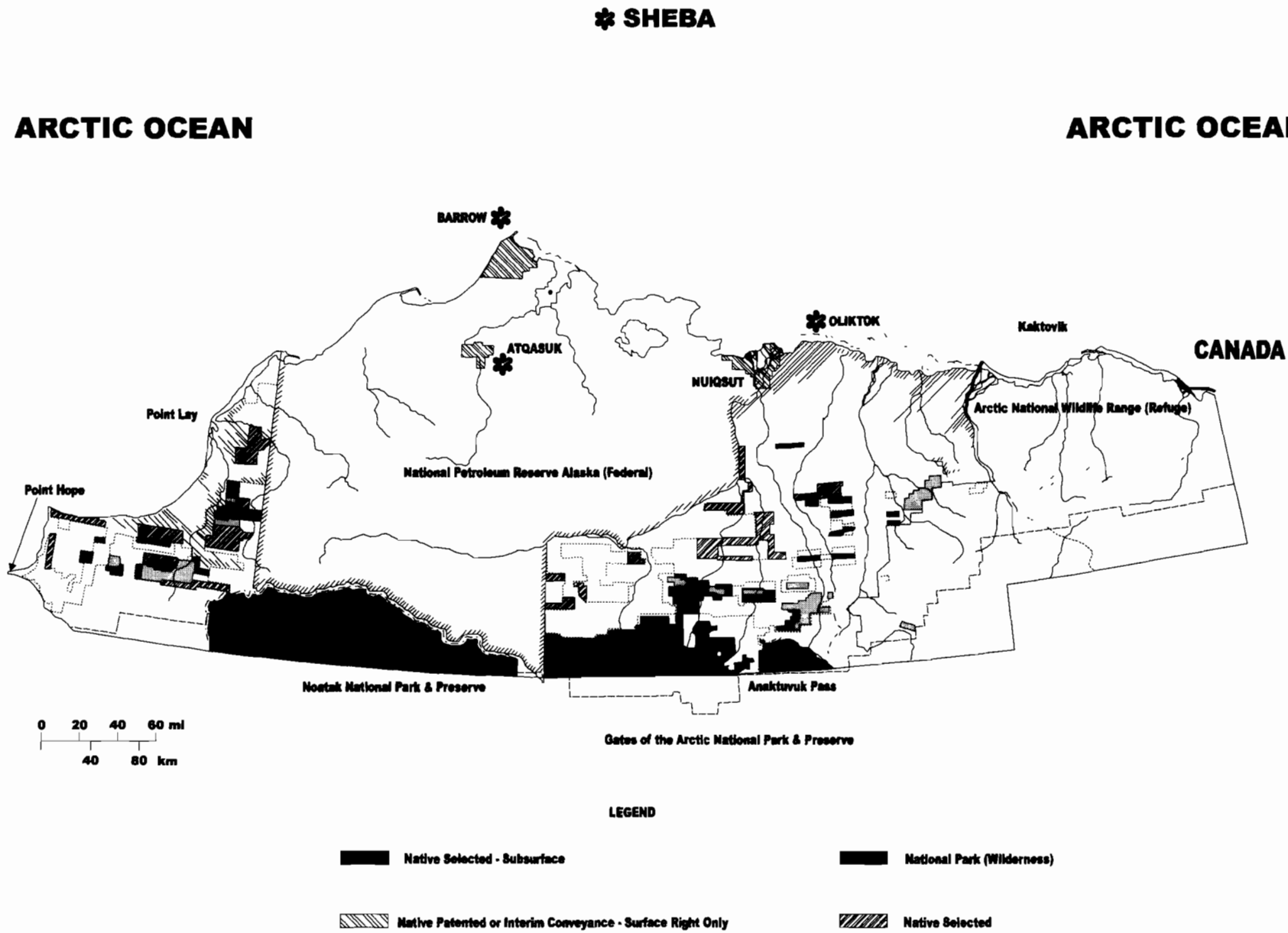


Figure 2-2. Proposed North Slope Facilities Locations (✱)

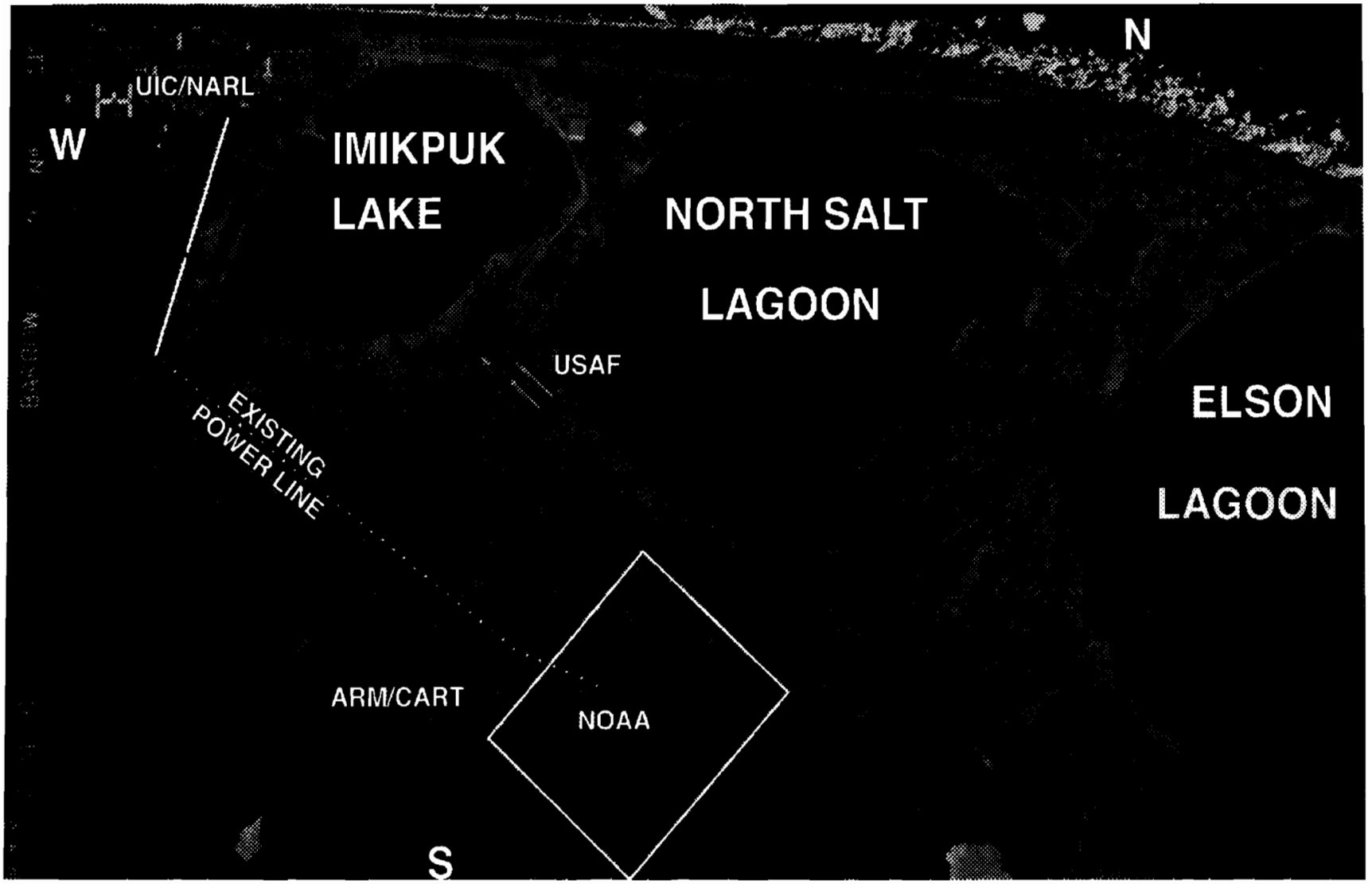


Figure 2-3. Aerial View of the Central Facility Area on NOAA Land (Photo Courtesy of North Slope Borough)

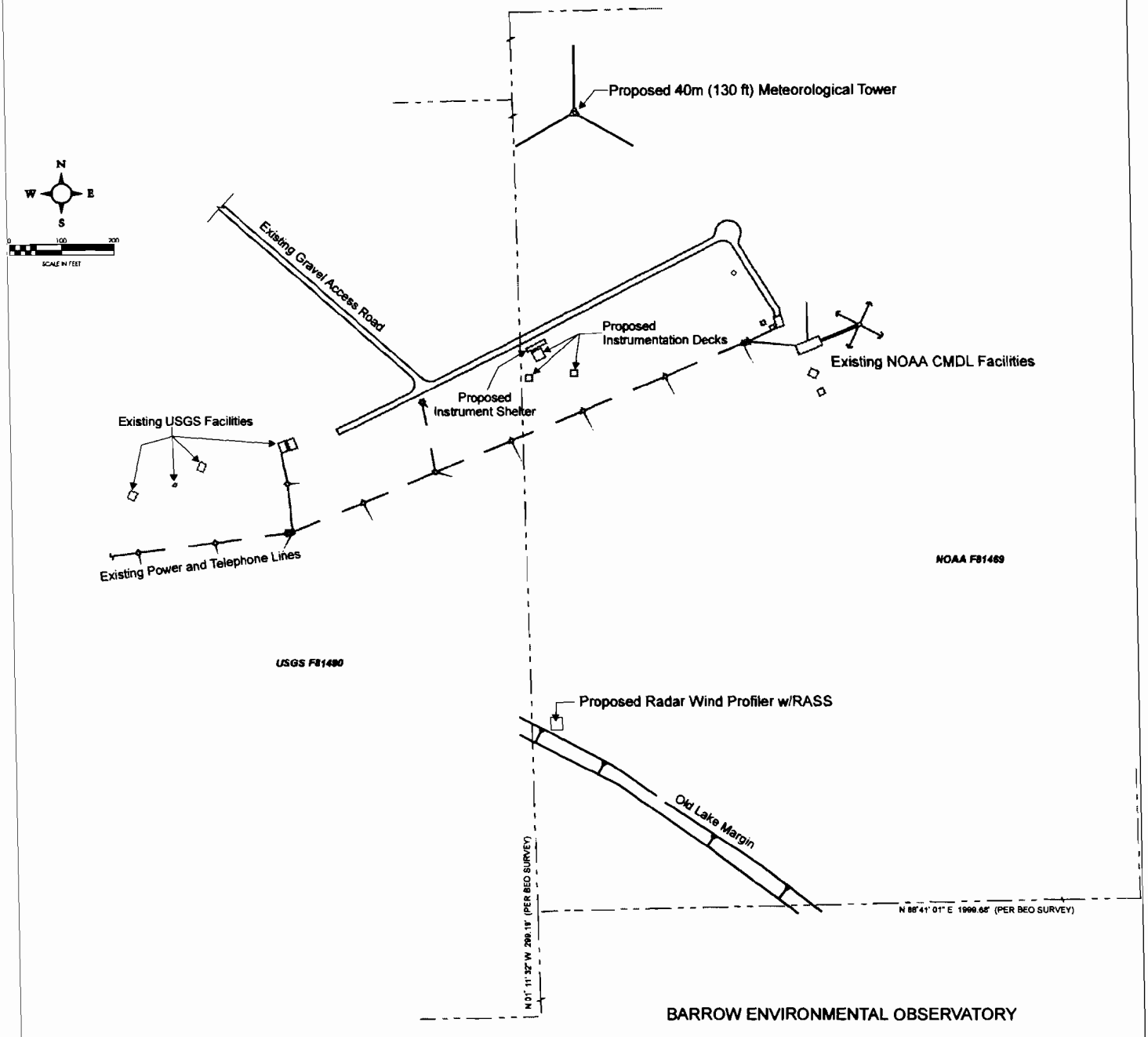


Figure 2-4. Details of the Proposed Central Facility

The Boundary Facilities at Atqasuk and at Oliktok Point would be spread over about 8000 m^2 (two acres) each and would include a subset of the Central Facility's instrumentation and an approximately 2.4 x 2.4 x 12 m (8 x 8 x 24 ft) shelter. Only a small fraction of the acreage at each site would actually be disturbed. As at the Barrow location, a small amount of additional space in existing structures might be rented or leased. For purposes of impact assessment, it is assumed that all the instrumentation similar to that at the Central Facility would also be deployed at the Boundary Facilities, although it is most likely that only a subset of instrumentation would be deployed. The extended facilities would consist of self-contained remote weather stations occupying only several square meters. The exact locations of the proposed extended facilities have not yet been determined. Occasionally, selected instrumentation might be mounted on rolligons or other appropriate transport vehicles and utilized at various locations in a mobile deployment.

The proposed NSA/AAO CART instrumentation is discussed below.

- **Standard Meteorological Instruments** - Sensors for temperature, humidity, pressure, precipitation amount, wind direction, and wind speed to provide direct measurement of the atmosphere. At the Central Facility, the sensors would be mounted on a 40 m (130 ft) tower. Direct measurement of heat flux and moisture flux at heights of 1 to 2 m (3 to 6 ft) above the surface would require a small sawbuck-like structure. Snow and soil temperatures are measured by a vertical stack of small thermocouples, usually buried using a portable hand-operated auger to levels less than 2 m (6 ft) below the surface.

- **Radiometric Sensors** - The various types of passive radiometric instruments would observe the sun's incoming and outgoing shortwave (light) and longwave (heat) radiation and the earth's heat emissions. Radiometric sensors would be used at all facilities.

- **Profilers** - Profiling instrumentation can use sound waves, microwaves, or lasers to probe the atmosphere from heights ranging from just above the surface to an altitude of several thousand feet. Radar wind profilers would be fitted with a RASS, which would probe the atmosphere to produce vertical profiles of virtual temperatures. In this configuration, RASS sound sources are positioned around the Radar system (see Figures 2-5 and 2-6).

  A radar wind profiler with RASS makes a periodic, warbling sound. The sound is generated for 10 minutes every hour. The sound increases slowly and diminishes slowly to minimize any possible startle effect on wildlife or people. The sound equipment consists of large (1.8 m (6 ft) high, 1.8 m (6 ft) in diameter) cylindrical outdoor loudspeakers pointed upward. Although the function of the RASS only requires the sound to travel upward, a small fraction of the sound escapes horizontally. The cylinder helps to reduce the horizontal sound, but does not eliminate it completely.

  A 1993-94 study (Raspet et al., 1996) characterized the sound emissions of a single RASS unit located near Barrow. Acoustic measurements were made sequentially as a function of range along two compass bearings with the acoustic source operating alternately at frequencies of 1000 and 2000 Hertz (Hz) to mimic two different types of RASS. Measurements were A-weighted which accounts for the characteristics of the human ear. Twenty three data sets were obtained during the summer, winter, and spring seasons. Normally, the 1000 Hz sound was

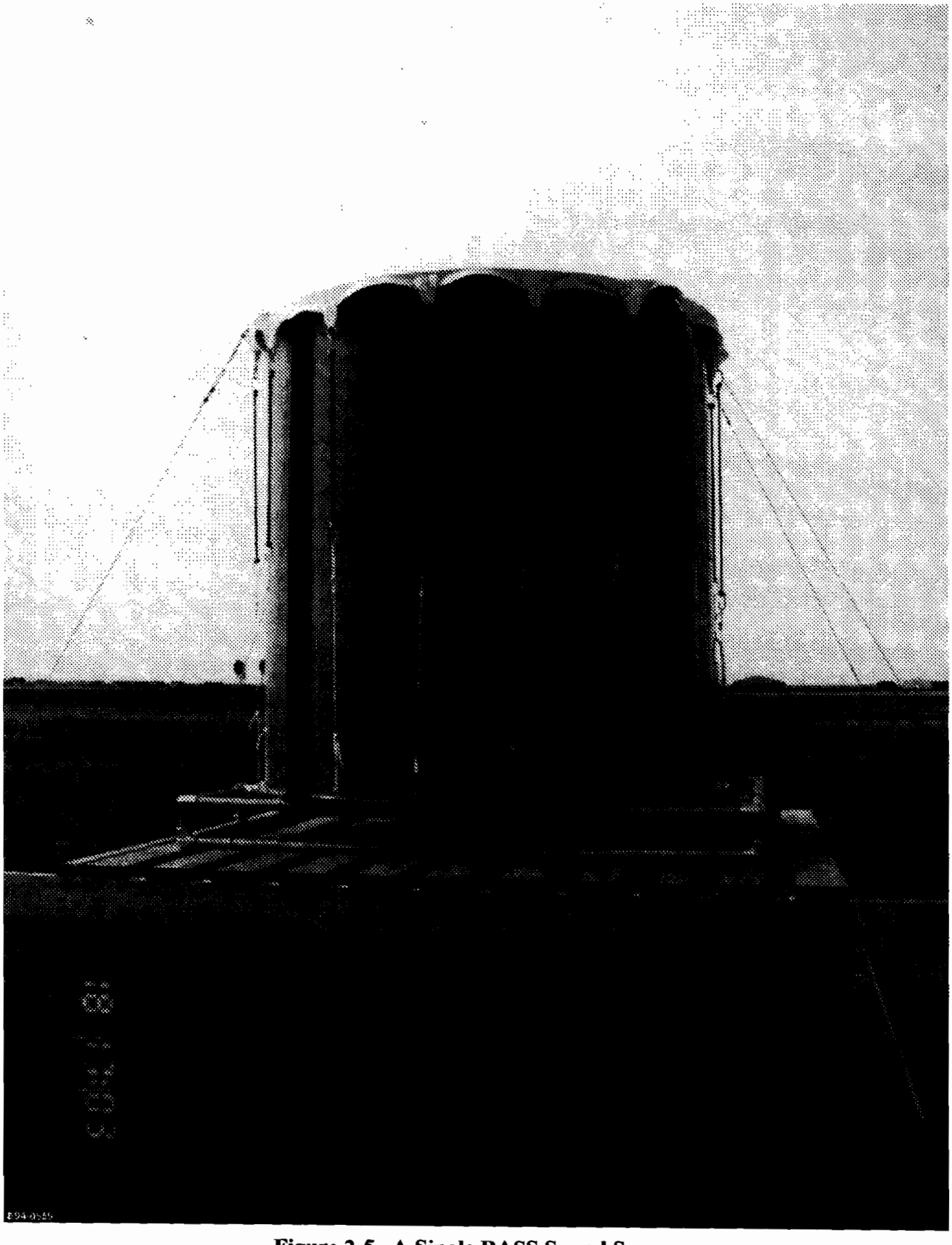


Figure 2-5. A Single RASS Sound Source

Figure 2-6. A RASS Sound System Around a Radar Wind Profiler Antenna

louder at any given range than the 2000 Hz sound. Typically, the 1000 Hz sound level fell to less than 55 decibels (dB) at a distance of approximately 180 m (600 ft), and to less than 35 dB at a distance of about 630 m (2100 ft). A sound level of 55 dB is characteristic of a busy office or restaurant, and 35 dB, characteristic of a quiet hospital or church (Lindsay and Beyer, 1989). For further comparison, the noise level associated with children playing has been measured to be around 65 dB, the noise level in the immediate vicinity of the Barrow electric power generating plant was around 70-75 dB, and the noise level associated with a jet taking off from the Barrow airport was around 95 to over 100 dB (Zak, 1996).

A full RASS system deployed around a radar wind profiler typically consists of four RASS units as depicted in Figure 2-6. The multiple sound sources are required to have the instrument work properly in the presence of wind. One can reliably estimate the sound level which would have been observed from the four sound sources at distances of perhaps 90 m (300 ft) or greater by simply adding 6 dB to the sound levels measured for the one RASS unit (Raspet et al., 1996). However, one must systematically assess the nuisance impact of the RASS sound, and that is complicated. A quantity designated Day-Night Annual Average Level (dB DNL) of sound is used in all land use planning in which noise is a factor (National Academy of Sciences, 1977). The calculation of the dB DNL includes an adjustment for night time emissions. Based upon the measurements and his model results, Raspet concluded that for the four RASS units dB DNL would not be expected to exceed 55 dB DNL beyond 300 m (990 ft), or 35 dB DNL beyond 2,000 m (6,900 ft). External noise levels below 55 dB DNL are considered to impose no impacts of concern on residential areas, and noise levels below 35 dB DNL are considered to impose no outdoor environmental degradation.

Lidars are laser systems used to probe the atmosphere to an altitude of several thousand feet for clouds, precipitation, and aerosols. At present, all proposed lidar systems are eye-safe (incapable of damaging human eyes). Any non-eye-safe lidars that might be proposed in the future for use at the NSA/AAO CART site would be subject to separate FAA, DOE, and local safety reviews. Because lidars cannot penetrate heavy clouds but radars can, radars would also be used to probe the atmosphere at the Central and Boundary Facilities.

- **Rawinsondes** - The rawinsondes include radiosondes and tracking systems. Radiosondes are small (several ounce) styrofoam-encased meteorological instrument packages carried aloft to several tens of thousands of feet by helium or other light gas-filled three-foot-diameter balloons. Radiosondes are used routinely by the NWS at Barrow and elsewhere to measure wind speed, wind direction, temperature, humidity, and air pressure at various altitudes. The NWS station in Barrow has been approached to launch radiosondes for the Central Facility. No attempt would be made to recover radiosondes.

Installing the instrumentation would involve only a small amount of construction activity, primarily augering into the permafrost for placement of pilings, constructing instrument platforms on the pilings, installing the instruments and associated shelters on the platforms, and extending existing utility services. Because the pilings are not considered fill under Section 404 of the Clean Water Act, their use does not require a permit from the U.S. Army Corp of Engineers. Pilings would be installed when the ground is frozen and snow-covered. Local experience has demonstrated that the surrounding tundra is not harmed if pilings are installed under these conditions.

Movement of equipment to and around the Central and Boundary Facilities would be accomplished using existing roads. Most transportation of equipment requiring the use of vehicles to cross the tundra would be done in winter when the tundra is frozen; all such transportation would be conducted in compliance with applicable regulations. During the winter, snowmobiles would typically be used whenever roads were impassable. However, helicopters, rolligons, or other permissible means of tundra travel might also be used when required by circumstances. During the melt season, the instrumentation requiring frequent service would be reached on foot from nearby roads via boardwalks similar to the ones currently in use at CMDL.

All movement across the tundra and construction activities on the tundra would be conducted in accordance with the terms of a Development Permit issued by the North Slope Borough (NSB), and with all applicable requirements of other land holders and relevant regulatory agencies.

Once installation is complete, although routine visits would be required for maintenance, no full-time personnel would be required at the Central and Boundary Facility instrumentation arrays. Operations personnel would be stationed at the combination data acquisition station and office at the UIC-NARL facility. For the Boundary Facilities, any required onsite personnel would be stationed in existing structures rented or leased to house them. It is currently anticipated that the Central Facility would initially require a staff of two or three persons. If all the facilities described herein are installed, it is anticipated that the entire site (Central, Boundary, and Extended Facilities) might eventually require a staff of about eight full time personnel.

In compliance with Section 106 of the National Historic Preservation Act, coordination is being accomplished with the Alaska State Historic Preservation Officer (SHPO) regarding actions necessary to identify and preserve historic properties that may be affected. The proposed action is also being coordinated with the North Slope Borough and other agencies and concerns whose properties may be affected. Consultation with the SHPO and local authorities indicate that the potential for impact on cultural or paleontological resources is low. A goal of facility siting is to avoid any resources identified through coordination and cultural resource surveys. Avoidance is possible because of the relative flexibility of facility siting as well as the small areas required for placement. A survey of the proposed site near Barrow concluded that no potentially significant cultural resources appear to be present at that location (Sheehan, 1996). However, the project would remain responsible for any undiscovered resources that may be found during construction.

Electric power and telephone service would be required for the Central and Boundary Facilities. Where practicable, electric power would be supplied by extending the existing service lines. At the Extended Facilities, electric power would be provided by batteries and/or propane thermoelectric generators. Temporary portable deployments (if needed) might be powered by gasoline or diesel generators mounted on vehicles. Because of concerns about the effect of the noise from generators on wildlife, the generators would be outfitted with mufflers and/or other noise mitigation devices such that noise would not exceed ambient levels beyond 200 m (600 ft).

Small (typically less than 110 gallons) amounts of fuel for small generators and snow machines would be stored primarily at some of the Central and Boundary Facilities. In addition, mobile deployment of instrumentation would require that generator fuel be transported across the tundra. Spill containment methods, including secondary containment trays and absorbent material, would be used to prevent possible contamination of the tundra.

The tundra on which the proposed action would be implemented is characterized as a wetland. In accordance with DOE regulations for compliance with floodplain and wetlands environmental review requirements (10 CFR 1022), a Notice of Wetlands Involvement was published in the Federal Register on October 1, 1996, to provide the opportunity for early public review. Incorporated into this environmental assessment is an analysis of the potential effects of the proposed action on the tundra.

A Coastal Zone Management (CZM) Permit would be required for the proposed action. Also, Development Permits would be required from the NSB for the various stages of the proposed action. A Development Permit was obtained for the initial RASS wildlife impact study (see section 3.4).

No radioactive material would be introduced into the environment as a result of this proposed action.

2.2 No Action Alternative

Under the No Action alternative, a CART site would not be established in a high latitude region. The ARM program would consist of only the two existing CART sites. With this alternative, no data would be available from a high-latitude region and ARM would have no means of accomplishing its objectives for high latitude cold regions. Because this alternative would not complete the site requirements of the ARM program of establishing a CART site in a high latitude region, the No Action alternative does not meet DOE's purpose and need for action. Consistent with the Council on Environmental Quality and DOE National Environmental Policy Act (NEPA) regulations (40 CFR 1500 and 10 CFR 1021 respectively), this alternative is analyzed for comparison of potential effects with those of the proposed action.

2.3 Alternatives Considered but Eliminated from Further Consideration

The potential locales for the high latitude CART site originally included a portion of the North Slope of Canada (east of the Alaska-Yukon Territory border, beyond the terminus of the Brooks Range). This area is quite similar to the NSA. It extends along the northern coast of mainland Canada from the Mackenzie River Delta to north of Hudson Bay. The area of greatest interest was the Mackenzie Delta. Its southern boundary was not sharply defined, but was about where the tundra begins to rise to meet the Canadian boreal forest south of the Arctic Circle. Although the North Slope of Canada has most of the same physical and climatic characteristics of the NSA, it was rejected for the NSA/AAO site. The logistic and bureaucratic difficulties associated with operating in Canada rather than in the United States removed it from further consideration because the location offered no compensating advantages.

The Greenland Ice Plateau is a second alternative locale that was considered but removed from further consideration. A major scientific driver for the high latitude CART site is an increased understanding of the factors that influence the seasonal transition from snow- and ice-covered land and water to snow- and ice-free surfaces. The Greenland Ice Plateau does not undergo this annual cycle, and therefore is not scientifically satisfactory.

The third alternative considered but removed from further consideration was the Antarctic Ice Plateau. Like the Greenland Ice Plateau, the Antarctic Ice Plateau does not undergo a seasonal transition from snow- and ice-covered to snow- and ice-free surfaces. It would not meet the scientific criteria for the research project.

3.0 DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1 General

The Arctic Coastal Plain is characterized by low topographic relief and low vegetation, rising gently from the shore of the Arctic Ocean to an elevation of about 180 m (600 ft). It is bounded 290 km (180 miles) to the south by the Brooks (mountain) Range. The region is sparsely populated with approximately 7000 inhabitants within 228,000 km^2 (88,000 square miles).

The North Slope of Alaska has winter temperatures ranging from -51 degrees Celsius (°C) (-60 degrees Fahrenheit (°F)) to -7°C (+20°F), and summer temperatures ranging from -7°C (20°F) to 24°C (75°F). The area is semiarid with an annual precipitation of 10 to 13 centimeters (cm) (4 to 5 inches (in)). Because of poor drainage and low rates of evaporation in summer, the terrain is characterized by marshes, lakes, melt ponds, partially-drained lake basins, and streams. Available ground water resources are virtually nonexistent because of the 300 to 600 m (1000 to 2000 ft) thick permafrost.

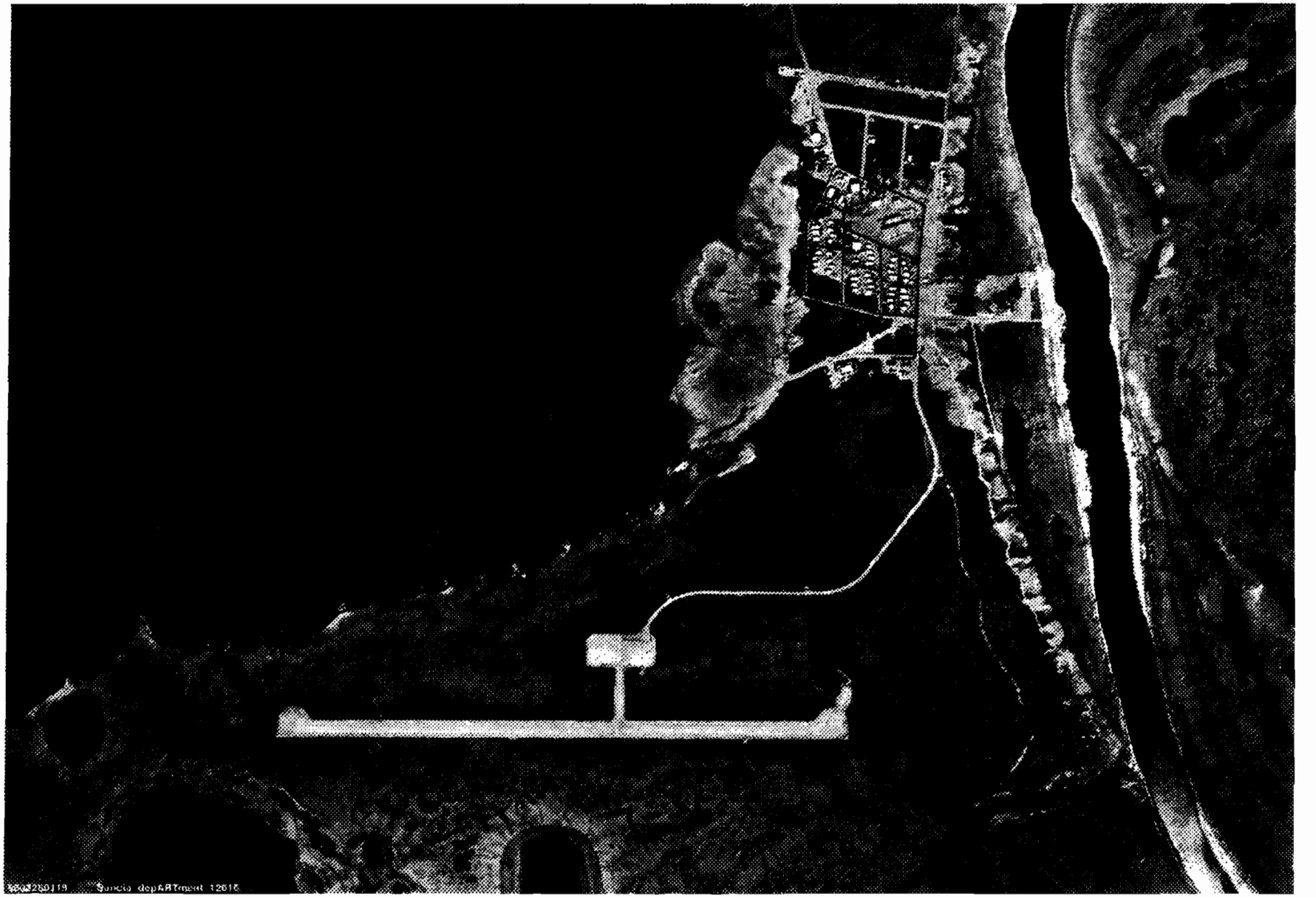
The sea shore is generally 0.6 to 6 m (2 to 20 ft) above the ocean with some higher coastal cliffs about 15 m (50 ft) in height. The sea near shore is ice covered approximately nine months each year. The sea ice usually moves off shore during the summer, but never leaves the central Arctic Ocean.

Barrow, Alaska is the northernmost community in the United States, and is located about 16 km (10 miles) southwest of Point Barrow on the shore of the Arctic Ocean. The seat of the North Slope Borough, Barrow has a population of approximately 4000 people. Figure 2-3 is an aerial photograph of the area northeast of Barrow, which includes the proposed location of the Central Facility, the no-longer-used NARL airstrip, the limited available roads, and the some of the numerous lagoons in the area.

Atqasuk (Figure 3-1) is inland 96 km (60 miles) south of Barrow. This community of approximately 250 individuals is located between the Meade River and Lake Ikmakrak. Atqasuk is somewhat warmer than Barrow in summer and colder in winter. The best area for the NSA/AAO CART instrumentation would be in the vicinity of the airport located south of town.

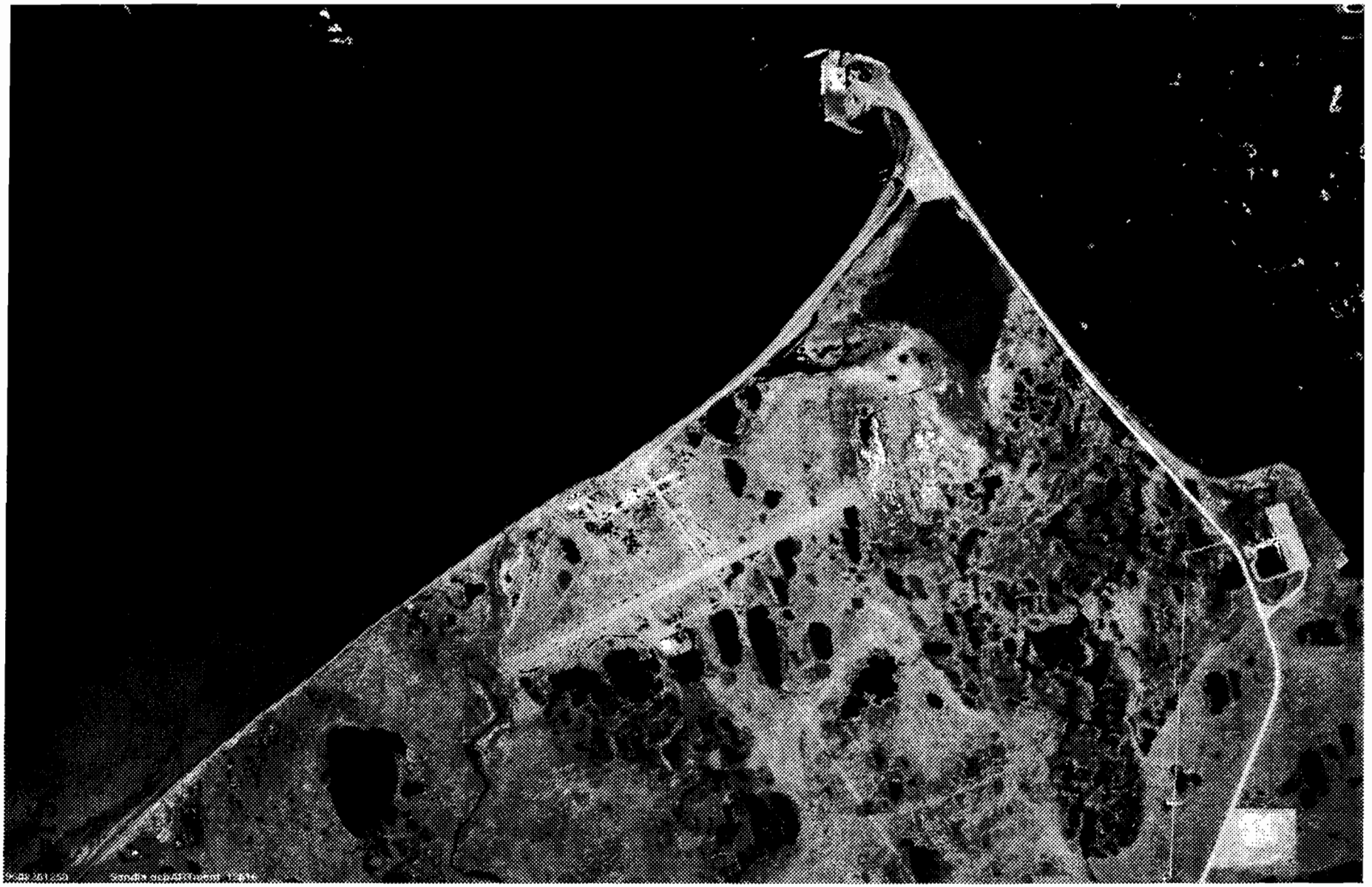
Oliktok Point (Figure 3-2) is located on the coast 280 km (180 miles) east of Barrow. Oliktok is located on the extreme western edge of the Prudhoe Bay oil field complex. It is about 56 km (35 miles) by road from Deadhorse and Prudhoe Bay. The point itself is occupied by an Atlantic Richfield Company (ARCO) water filtration plant. The area immediately inland from the point is occupied by a United States Air Force (USAF) radar station that includes a decommissioned airstrip. There is no community in the immediate vicinity of Oliktok Point, although the village of Nuiqsut is approximately 35 miles away. Oliktok can be reached by road from Deadhorse and Prudhoe Bay. The best area for the NSA/AAO CART instrumentation would be the eastern portion of the USAF land.

A substantial number of atmospheric characterization efforts are active in the NSA/AAO area, including the NOAA/CMDL Observatory, studying primarily the changing chemical composition of the atmosphere, and NOAA's National Weather Service (NWS) surface weather and upper air sounding station. Also, the National Science Foundation Arctic Systems Science (ARCSS) Program, together with the Office of Naval Research (ONR), are planning an instrumented ice station on the arctic ice pack north of Barrow as the centerpiece of a project called Surface Heat Budget of the Arctic Ocean (SHEBA). This is a relatively short-term study (one year) with the purpose of improving GCM



Note: A likely location for CART facilities is in the vicinity of the airport.

Figure 3-1. Aerial Photograph of Atqasuk, Alaska (Photo Courtesy of North Slope Borough)



Note: A likely location for CART facilities is on USAF land near the point.

Figure 3-2. Aerial Photograph of Oliktok Point, Alaska (Photo Courtesy of North Slope Borough)

simulations of the present-day Arctic Ocean climate and of improving interpretations of satellite remote sensing data collected over the Arctic Ocean.

For the purpose of this assessment, those aspects of the environment that could potentially be affected are: land use, wildlife, noise, tundra (wetland), cultural resources, and air quality (see Table 3-1). Geology is not an issue since the area has no active faults (seismic zone 1) (Plafker et al., 1994). Groundwater is virtually nonexistent on the tundra. Surface water is not an issue because the project would involve very little water use and would not discharge liquid effluents.

3.2 Land Use

The North Slope of Alaska contains the National Petroleum Reserve-Alaska (NPR-A; Figure 2-2). This 93,000 km^2 (36,000 square mile) tract was originally designated a Naval Petroleum Reserve in 1923 by then President Warren G. Harding. Opportunities for development are limited within the NPR-A, which is administered by the Bureau of Land Management (BLM). In addition to residential use, the principal current land use in the area of the NSA/AAO CART site is subsistence hunting and fishing.

Each village within the NPR-A is surrounded by extensive lands owned (surface rights only) by the local village corporation and/or by private parties to whom the village corporation has conveyed lots or other parcels. In the vicinity of Barrow, within the boundaries of the village land, there are several plots of federal land such as the land used by NOAA and proposed for the Central Facility instrumentation array. Village lands were conveyed to the local native corporations under the terms of the Alaska Native Claims Settlement Act (ANCSA). Other traditional-use lands were conveyed under

TABLE 3-1: POTENTIAL ISSUES REGARDING THE NORTH SLOPE OF ALASKA /ADJACENT ARCTIC OCEAN CART

POTENTIAL ISSUE	APPLICABILITY	EA SECTIONS
Land Use	Subsistence hunting and fishing	4.2.1
Noise	Nuisance noise	4.2.2
Wildlife	Disruption of waterfowl, caribou	4.2.3
Tundra (wetlands)	Thermokarsting	4.2.4
Air Quality	Air emissions	4.2.5
Cultural Resources	Land disturbance	4.2.6
Socioeconomics	Interference with local economy.	4.2.7
Geology/Seismology	NA - the area is not seismologically active.	Not Applicable
Groundwater	NA - groundwater resources are essentially nonexistent	Not Applicable
Surface Water	NA - project will not use water nor discharge liquid effluents.	Not Applicable

the Native Allotment Act. Other private ownership of land within the NPR-A is limited because of withdrawal by Executive Order in 1923 and the Naval Petroleum Reserves Production Act of 1976. The proposed site of the Atqasuk Boundary Facility is on Atqasuk Corporation land and/or on North Slope Borough land associated with the Atqasuk airport. The proposed site of the Oliktok Point Boundary Facility (outside of NPR-A) is on USAF land associated with the Oliktok Point radar station. The proposed sites of the extended facilities are primarily on NPR-A land administered by BLM and/or on private native allotment land enclosed within the NPR-A.

All the lands proposed to be used for the NSA/AAO CART site lie within the NSB, which includes 228,000 km^2 (88,000 square miles) of territory stretching along the arctic coast of Alaska from the Canadian border in the east to the Bering Sea in the west. The NSB was incorporated on July 1, 1972, and assumed a number of area-wide government powers, including planning, platting, and zoning. The NSB Comprehensive Plan was adopted in 1988. The stated goal of the Borough's Comprehensive Plan is the protection and preservation of the land and water habitat essential to subsistence living and the Inupiat way of life. With only a few specified exceptions, land use actions within the Borough require a Development Permit issued by the Borough, which specifies the time frame, the construction techniques, and all other pertinent aspects of the action.

3.3 Noise

Away from the villages, background noise on the tundra is mostly limited to the calls of wildfowl in summer, and the sound of the wind year round. Hunters, however, do use All-Terrain Vehicles (ATVs), outboard motorboats in summer, and snowmobiles in winter. Within and near the villages, the noise level appears to be comparable to that of most towns of similar size elsewhere. Cars, pickup trucks, buses, ATVs, and snowmobiles are common. In addition, each village has a power plant with multiple generators that operate continuously. Barrow also has several Boeing 737 jet flights daily at its airport and many flights by single- or twin-engine propeller-driven commuter aircraft to the outlying villages. The North Slope Borough Search and Rescue Department operates a fleet of three helicopters and two fixed-wing aircraft. The proposed locations for the Barrow Central Facility and the Atqasuk Boundary Facility are far enough from the respective village limits that the noise of the villages is only a distant hum, except for aircraft, which routinely pass nearby. The proposed location of the Oliktok Point Boundary Facility is within hearing of the Oliktok Point radar station generators. The noise environment of most Extended Facilities would likely be that of undisturbed tundra.

3.4 Wildlife

The NSB supports a wide variety of wildlife. There are over 31 species of waterfowl, 6 raptor species, and 35 species of songbirds (passerines). The mammals found on the tundra include polar bears (*Ursus maritimus*), caribou (*Rangifer tarendus*), wolves (*Canis lupus tundrarun*), arctic foxes (*Alopex lagopus*), red foxes (*Vulpes vulpes*), wolverines (*Gulo gulo*), and lemmings (*Dicrostonyx groenlandicus, Lemmus trimucronatus*). Grizzly bears (*Ursus arctos*) and moose (*Alces alces*) are occasionally sighted on the North Slope. Offshore, polar bears, ringed seals (*Phoca hispida*), walruses (*Odobenus rosmarus*), and bowhead whales (*Balaena mysticetus*), beluga whales (*Delpheinapterus leucas*), other whales, and seals are common during certain seasons of the year.

Wildlife is important to the local community, primarily for subsistence hunting and fishing. Bowhead whales, seals, caribou, waterfowl, and fresh water fish are most important. A few species

have non-subsistence economic importance. The arctic fox, wolves, and wolverine are important furbearers on the North Slope.

The spectacled eider (*Somateria fischei*) and Steller's eider (*Polysticta stelleri*) may utilize the Barrow area during migration and nesting. The spectacled eider is listed as threatened under the Federal Endangered Species Act (Act) and the Alaska breeding population of Steller's eider is proposed for listing as endangered under this Act. Several pairs of spectacled eiders were observed during spring migration in 1993 and 1994 (North Slope Borough, Barrow, Alaska, unpublished data). No spectacled eider nests or broods were seen within 16 km (10 miles) of the proposed Central Facility location in either 1993 or 1994 (Suydam, 1996). Preferred habitats for spectacled eiders are ponded areas with emergent vegetation (Warnock and Troy, 1992). In 1994, there were numerous Steller's eiders in the vicinity of Barrow, but no nests or broods were found in the vicinity of the proposed Central Facility site during the RASS impact study described below. No species listed as endangered by the State of Alaska have the potential to be impacted by this study (Thomas Albert, NSB, personal communication).

To identify possible effects of the RASS units on tundra wildlife, the NSB Wildlife Management Department recommended that the DOE fund a wildlife impact study prior to developing the CART site. For the study, a single RASS sound source was located approximately 8 km (5 miles) northeast of Barrow at the proposed Central Facility location. The field study began in the spring of 1993 and was completed in 1994.

NSB wildlife experts conducted animal behavior observations and periodic nest surveys before and after installation of the RASS in the spring and summer of 1993, and again in the spring and summer of 1994 (Suydam, 1996). Breeding bird surveys, to document nesting density, were conducted on several plots within several kilometers of the RASS in 1993 and 1994 for comparison with historical data. The study determined that there were no observable impacts in the density, behavior, or survival of breeding birds that could be ascribed to the RASS. More breeding pairs were observed in 1994. Little or no behavioral response by the birds was noted in the vicinity of the RASS while the aforementioned warbling sound was being produced (see section 2.1).

Arctic foxes were also observed. A pair built a den under an unoccupied building approximately 270 m (900 feet) from the RASS in 1993. The pair reared eight young and the young were out of the den and exploring the surrounding area during the initial operation of the RASS. When the warbling sound began, the foxes stopped their activity and turned their heads in the direction of the sound. But after a few seconds, they ignored the sound and resumed their play behavior. The single caribou observed in the area did not appear to react to the sound.

The study determined that there was little to no observable negative impacts of the RASS to tundra nesting birds or breeding mammals in 1993 or 1994.

3.5 Tundra (wetlands)

The tundra consists of permafrost covered with a carpet of arctic vegetation including grasses, such as *Dupontia fisheri*, and sedges, such as *Carex aquatilis*, and several species of *Triphorum*. Permafrost is soil, rock, or any other earth material, the temperature of which remains at or below 32°F continuously throughout the year. The arctic coastal plain permafrost has been in this condition for

many thousands of years. The permafrost extends from a foot or two below the land surface to depths ranging from 180 to 600 m (600 to 2000 ft). Each year, the entire soil column remains frozen from October or November until May or June. An active layer between 0.15 and 1.5 m (0.5 and 5 ft) deep thaws every summer. The thaw depth can change dramatically when the surface is disturbed. During the summer, about 30 percent of the coastal plain is covered with water, resulting in thousands of shallow lakes, thaw ponds, and partially-drained lake basins. Most low areas contain marshes.

Generally, any activity that disturbs the protective vegetation cover during the vulnerable summer months results in eventual erosion damage of the underlying soils. The vegetation cover is vulnerable during the melt season, but is relatively invulnerable when frozen and snow covered. The disturbed surface results in enhanced absorption of radiant heat, thawing the underlying permafrost to greater-than-normal depth in the summer. This phenomenon (thermokarsting) encourages ice wedge formation which enlarges the disturbed area, and may result in a surface pattern of polygons.

3.6 Air Quality

Air quality is considered excellent throughout most of the area (US DOI, 1995). Exceptions occur near villages or temporary sites of human activity where occasional smoke and dust may reduce air quality. The greatest effect of smoke is restriction of visibility. Smoke from forest fires in Siberia, tundra fires on the North Slope itself, and flaring of gas in the Prudhoe Bay oil fields, and air pollution from northern Europe sometimes drift over the North Slope and degrade air quality somewhat, especially in spring (arctic haze), but air pollution and smoke concentrations are usually low and are of minimal concern. Visibility is impaired, especially along the coast, by ice and water fog (in winter and summer, respectively), and by "sea smoke". Visibility is also impaired by blowing snow (US DOI, 1995).

3.7 Cultural Resources

The North Slope of Alaska is rich in paleontological and archeological resources. A major find of dinosaur remains occurred in the mid-1980s along the Colville River. Since then, 600 other paleontological sites have been identified on the North Slope. The Bureau of Land Management, in a limited survey, identified 1400 archeological sites and six archeological districts in the National Petroleum Reserve. None of these surveys identified resources on or near the proposed sites. NSB residents are greatly concerned with the preservation of cultural resources and the NSB authorities consider the impacts on these resources prior to issuing permits for activities on the tundra. In the Barrow area, however, significant cultural resource finds are concentrated near the shoreline. Coordination is continuing with the Alaska SHPO to determine the presence of any cultural resources that could be effected by other proposed instrumentation locations. As stated, a preliminary archeological survey of the proposed Barrow Central Facility location concluded that no potentially significant cultural resources appear to be present at that location (G. Sheehan, 1996).

3.8 Socioeconomics

The population of the North Slope is greater than 70 percent Inupiat Native American. The economic base consists of government, petroleum-related activities, tourism (4000 to 5000 visitors a year), and subsistence hunting and fishing. The tax base of the North Slope Borough consists almost entirely of high-value, petroleum industry property in the Prudhoe Bay area. The taxes collected have been used primarily for community infrastructure, including educational, health, and other government services and capital improvements. A subsistence lifestyle is widely practiced and valued by the people.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 General

For purposes of this assessment, the issues of potential environmental impact are: land use, noise levels, wildlife, tundra (wetlands), air quality, cultural resources, and socioeconomics (see Table 3-1).

4.2 Effects of the Proposed Action

4.2.1 Land Use

The proposed activities would occur on lands governed by the NSB, the Village of Atqasuk, and the State of Alaska. So far as is currently known, ownership of affected land resides with NOAA, UIC, Atqasuk Corporation, BLM, and the USAF. Total land occupancy would be less than 24,000 m^2 (six acres). Implementation of this proposed action would not change the predominant current land use of subsistence hunting (see Wildlife, section 4.2.3).

Because the actual area to be occupied is small and the proposed activities are generally nondestructive, the project would have no long-term impact on land use. At such time as the facilities are no longer needed, all structures would be removed, except that the pilings would be left in place but cut off even with the land surface, consistent with local construction practice. It should be noted, however, that the issues of regional and global climate change may well persist beyond the estimated ten-year duration of this project. If this proves to be the case, some or all of the facilities developed for this project may be needed for follow-up studies and may be in use for a considerably longer period. Any extended presence would also not affect land use.

4.2.2 Noise

The RASS units would be located at least 800 m (one-half mile) from populated areas, well beyond the distance at which the effects on residential areas are expected (Raspet et. al., 1996). Although sound attenuation with distance would reduce the levels to barely detectable within populated areas, there was concern that the existence of the sound sources could have some negative effect. Accordingly, residents of Barrow and Atqasuk were invited to visit the RASS location during the two-year RASS study. The few who came expressed no concern. There was no evidence that the local community was negatively impacted in any way by the RASS sound source during the more than two years it has been in operation. Potential effects on wildlife are discussed in section 4.2.3.

4.2.3 Wildlife

Concerns that must be considered in the location and placement of equipment for the CART site are the potential for the site to impact usage of the area for subsistence hunting and fishing, the migration of birds and other animals through the area, and any potential effects on species listed or proposed to be listed as threatened. Studies and personal communication with local scientists (primarily the NSB Wildlife Management Department) concerning noise generation and human activity related to the installation and operation of the NSA/AAO CART site indicate that the project would likely not adversely affect wildlife or subsistence hunting and fishing. One factor in the observed adaption to the noise may be that the noise from the RASS unit increases and diminishes

slowly to minimize startle effect on wildlife. The RASS study also provided no indication that the spectacled and Steller's eiders would be affected by the noise generated by the RASS units. As stated, data collection and maintenance activities would typically be carried out by two to four people in the Barrow, Atqasuk, and Oliktok areas. Extended facilities would be visited only rarely. This limited activity does not appear likely to disturb wildlife in the area.

For migratory caribou, the main potential impact of concern is interference with mating and calving and/or the disturbance of routes of migration. The Barrow location is well north of usual caribou migration routes and is not a historic calving ground. However, Atqasuk is an area frequented by large numbers of caribou. The proposed instrumentation locations in the vicinity of Atqasuk (on or near airport land) are such that any increment to the already existing disturbance would be inconsequential. Because of the dispersed nature of caribou migration, disruption of migratory patterns is unlikely. Also, little if any fencing would be used at instrumentation sites, posing minor if any interference to normal animal movements. As at Barrow, the proposed Oliktok Point location is north of known migration routes and calving areas.

Coordination of the draft environmental assessment surfaced concerns regarding the potential for migrating waterfowl, including the spectacled and Steller's eiders, to strike the meteorological tower or its stabilizing guy wires during conditions of poor visibility. The tower is not far from a waterfowl flight corridor. Investigations into this concern with the station chief of the NOAA/CMDL, which has a 20 m (60 ft) guyed tower adjacent to the proposed facility and a little closer to the flight corridor, found that no birds injured or killed by collisions with the tower have been found in the twelve years he has been on site. Like the proposed tower, the NOAA tower is lighted 24 hours a day (Endres, 1996). While the probability for waterfowl to strike this tower or its guy wires appears to be very small and improbable for the spectacled and Steller's eiders, this finding is tempered by the possibility that an infrequently injured bird at the existing NOAA tower could have been removed by scavenging foxes or gulls. Also, the proposed tower is twice the height of the existing tower. Coordination with the United States Fish and Wildlife Service, Northern Alaska Ecological Services (Service), in accordance with section 7 of the Endangered Species Act, resulted in a determination of "not likely to adversely affect." To provide assurance that listed and proposed eiders would not be adversely affected by the tower, areas around the tower and guy wires would be systematically monitored during peak eider fall migration for the first years of operation. Findings would be coordinated with the Service as would any possible protection measures.

4.2.4 Tundra (wetlands)

As discussed in section 3.5, the tundra can be adversely affected by surface disturbance. Employment of construction methods and timing such as the use of augured pilings, above-ground platforms, and boardwalks and construction during the winter would protect the tundra. Also, transportation methods and timing such as the use of existing roads, snow machines, helicopters, and rolligons, and emphasis on movement during the winter would contribute toward reducing disturbance of the tundra. Implementation of any additional measures required by land holders and regulatory agencies would reduce any adverse consequences. As discussed in section 4.2.3, the ability of the tundra to support plants and animals would not be adversely affected. Contamination of the tundra with fuels is unlikely. The proposed action would have a negligible effect on the tundra when considered in the context of significance of criteria described in 40 CFR 1508.27(b).

TABLE 4-1: EMISSION FACTORS FOR UNCONTROLLED DIESEL INDUSTRIAL ENGINES (LESS THAN 600 HP) (US EPA, 1996)

POLLUTANT	DIESEL FUEL (SCC 2-02-001-02,2-03-001-01) *g/Kw (lb/hp-hr)[POWER OUTPUT]*	EXPECTED EMISSIONS FROM A 25 KW (50 HP) ENGINE *g/hr (lbs/hr)*
NOx	1.88EO1 (3.1E-02)	4.70E02 (1.55)
CO	4.06 (6.68E-03)	1.02E02 (3.34E-01)
SOx	1.25 (2.05E-03)	3.12E01 (1.02E-01)
PM-10[1]	1.34 (2.20E-03)	3.35E01 (1.10E-01)
CO_2[2]	7.04E02 (1.16E00)	1.76E04 (5.8E-01)
Aldehydes	2.8E-01 (4.63E-04)	7.0 (2.3E-02)
Exhaust	1.50 (2.47E-03)	3.75E01 (1.24E-01)
Evaporative	0.00 (0.00)	0.00 (0.00)
Crankcase	0.03 (4.41E-05)	8.0E-01 (2.20E-02)
Refueling	0.00 (0.00)	0.00 (0.00)

4.2.5 Air Quality

For the Central Facility at Barrow and the Boundary Facility near Atqasuk, electrical power would be obtained from the respective community power grids. At Oliktok Point, an ARCO power line runs by the proposed location. It is not clear, however, whether ARCO would be able to supply power to the facility because of legal restrictions related to the fact that ARCO is not a utility. The USAF has indicated a willingness to supply power from the Oliktok Point radar station generators. The instrumentation at the extended facilities would be self-contained and would not require an external power source. If power at either of the Boundary Facilities were to prove unreliable, or if portable operations were undertaken, approximately 25 kilowatts (kW) of generator-supplied power might be required temporarily. Table 4-1 provides an estimate of the air emissions to be expected from a diesel generator.

Light vehicle traffic consisting of truck, van, and snow machine trips would occur as a result of this project. Two vehicles would travel from Barrow to UIC-NARL typically once or twice a day. Additional trips from UIC-NARL to the instrumentation location 1.6 km (one mile) away would be required for equipment maintenance. Similar vehicle usage patterns would represent a maximum for the Boundary Facilities. The traffic associated with this project would be incidental in the context of ongoing community activities and would therefore result in negligible impacts to air quality.

[1] PM-10 = particulate matter less than or equal to 10 micrometer aerodynamic diameter. All particulate material is assumed to be ≤ 1 micrometer in size.

[2] When necessary, the average brake-specific fuel consumption (BSFC) value used to convert from Btu to lb/hp-hr was 7,000 Btu/hp-hr. SCC (Source Classification Code).

4.2.6 Cultural Resources

The activities of the proposed action would not be expected to negatively impact the cultural resources of the area because of protective avoidance measures described in the proposed action (see section 2.1). If artifacts of interest were to be found during project implementation, the Inupiat History, Language and Culture Department of the NSB would be consulted immediately and, if deemed appropriate, the instrumentation would be relocated.

4.2.7 Socioeconomics

The socioeconomic effects of this project on the local community would be minimal. Local contracts would be placed to cover the various elements of site development. A qualified local contractor would be sought to handle subsequent routine site operations.

Because of the limited scope of the project, it would not introduce large numbers of jobs or bring in large numbers of workers for extended periods of time; therefore, the impact on the economy of the North Slope would be almost nondetectable.

4.2.8 Environmental Justice

The population of the NSB is mostly Inupiat Native American. Public meetings were held in November of 1992 at Barrow, Atqasuk, Wainwright, and Nuiqsut to inform the local people about the proposed project. The primary concern reflected in these meetings as well as in the numerous meetings held subsequently with North Slope public officials was the warbling noise generated by the RASS unit and its potential effect on wildlife and subsistence hunting. Meetings with NSB Wildlife Management Department scientists brought about the RASS study described in section 3.4. Subsequent to this study, no further concerns have been expressed about the noise.

Although a population subject to environmental justice considerations is present in the NSB, activities associated with the proposed action are expected to have little or no impact and therefore would not have a disproportionately negative effect on this population. The proposed action would not have adverse consequences on land use, residential noise levels, wildlife, tundra, air quality, cultural resources, or socioeconomics. Therefore, no adverse effects to the resident Native Americans would be expected under the proposed action.

No disproportionate adverse effects to Native Americans are known to occur under current conditions (no action alternative).

4.2.9 Cumulative Effects

The issues analyzed in this Environmental Assessment that could have cumulative impacts with other past, present, and future foreseeable actions within the NSB include noise and adverse impacts to the tundra. Other actions that are considered include non-DOE federal and international scientific research, townsite activities, operations at the local airport, and Barrow Environmental Observatory (BEO) activities. Other local scientific activities include the NOAA CMDL observatory, the NWS surface and upper air sounding station, and the ARCSS Program activities. The National Science Foundation (NSF), together with the Office of Naval Research (ONR) is planning an instrumented ice

station on the arctic ice pack, north of Barrow, as the centerpiece of a project referred to as SHEBA. It is proposed that SHEBA instrumentation be tested in the Barrow area at UIC-NARL.

The addition of periodic and short-term sound emissions (section 2.1) from project activities to the background sounds generated from normal community activities and plane flights would be minor. The proposed development is not considered likely to adversely impact the tundra. Thermokarsting would be prevented by the construction measures described in the proposed action. Because there are no adverse effects to the tundra resulting from the proposed project, there would not be any significant additional impacts to these wetlands. The future cumulative impacts of the proposed action together with those that may be generated by the creation of the BEO are not known because future research use of the BEO cannot be predicted. However, the effects of the proposed action discussed in this section (4.2), when combined with the effects of other known actions discussed above, would not result in cumulatively significant impacts.

4.3 Effects of the No Action Alternative

The no action alternative would have no direct environmental impacts because no CART site would be located on the North Slope of Alaska. However, lack of a high latitude CART site would negatively impact the United States and international capability to accurately anticipate regional and global climate changes now in progress, which could have unknown long-term socio-economic consequences.

5.0 AGENCIES AND PERSONS CONSULTED

The following agencies and individuals were consulted in the course of preparation of this Environmental Assessment.

Alaska Department of Fish and Game
Geoff Carroll

Alaska Department of Governmental Coordination
Vicki Bukovick

Arctic Research Commission
Phil Johnson

Bureau of Land Management, Fairbanks
Michael Kunz
Donald Meares
Dee Ritchie
Paul Salvatore
Mike Worley

Federal Aviation Administration
Bob Durand
Rick Gerard
Jack Schommer

National Center for Physical Acoustics, University of Mississippi
Richard Raspet

National Oceanic and Atmospheric Administration, CMDL
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Kurt Jacobsen
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Ukpeagvik Inupiat Corporation
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Edward Itta
Charles Neakok
Ron Panigeo
Glenn Sheehan
Joe Stankiewicz

University of Alaska, Anchorage, Alaska
Dr. Kim Peterson

US Air Force, Elmendorf AFB
Capt. Ted Hindmarch

US Army Corps of Engineers
Lloyd Fanter
Tim Jennings
Allan Skinner

US Fish and Wildlife Service
Lori Quakenbush
Cathy Donaldson
Philip Martin

US Geological Survey, Fairbanks
Jack Townshend

Many other individuals from Atqasuk, Wainwright, Nuiqsut and Barrow, Alaska, were very helpful in the process of general project planning, as were several individuals with the National Weather Service in Barrow, Fairbanks, and Anchorage, Alaska.

6.0 APPLICABLE LAWS AND REGULATIONS

The project will be conducted in full compliance with all applicable local, state, and federal laws, regulations, and DOE orders. Below is a compilation of applicable laws and regulations.

Table 6-1: APPLICABLE LOCAL, STATE & FEDERAL LAWS, REGULATIONS, & DOE ORDERS

TITLE	CITATION	DESCRIPTION
National Historic Preservation Act	16 U.S.C. &470 et seq.36 CFR Part 800	Enacted to protect the nation's cultural resources; established the Advisory Council on Historic Preservation (ACHP), the State Historic Preservation Officers (SHPO), and the National Registry of Historic Places.
American Indian Religious Freedom Act	42 U.S.C. &1996	States that it is the policy of the United States to protect and preserve the right of Native Americans to believe, express, and exercise their traditional religious and ceremonial rites; requires consultation with potentially affected Native Americans if infringement by a proposed action is likely.
Native American Graves Protection and Repatriation Act	42 U.S.C. &3001 et seq.	Provides for the protection of Native American graves, human remains, and funerary artifacts. Requires notification if such materials are inadvertently discovered.
Clean Air Act	42 U.S.C. &7401 et seq.	Provides for the preservation, protection, and enhancement of air quality, principally in areas of special natural, recreational, scenic, or historic value.
National Primary and Secondary Ambient Air Quality Standards (NAAQS).	40 CFR Part 50	NAAQS establish performance standards for new sources and emission limitations for new and existing sources, which are enforced through a permit program.
Noise Control Act of 1972	42 U.S.C. &4901 et seq.	Requires federal agencies to comply with federal, state, interstate, and local requirements with respect to control and abatement of environmental noise to the fullest extent consistent with their authority.
Endangered Species Act Endangered and Threatened Wildlife and Plants	16 U.S.C. &1531 et seq50 CFR Part 17	Provides protection for threatened and endangered species of flora and fauna.

TITLE	CITATION	DESCRIPTION
Endangered Species Act Consultation Procedures	50 CFR Part 402	Requires a federal agency to consult with the United States Fish and Wildlife Service on potential impacts to species or habitat.
Compliance with Floodplains/Wetlands Environmental Review Requirements	10 CFR Part 1022	Based on Executive Order (EO) 11988 on Floodplain Management and EO 11990 on Protection of Wetlands; applies to all proposed actions in floodplains or wetlands where practical alternatives are still available; a floodplain/wetlands assessment is mandatory if the regulations apply; mitigation measures must be undertaken to minimize potential harm and preserve floodplain values.
Coastal Zone Management Act (CZMA)	16 U.S.C. &1451 et seq	Enacted to preserve, protect, develop, restore, and enhance the nation's coastal zones.
National Oceanic and Atmospheric Administration regulations of federal consistency	15 CFR Part 930, Subpart D	Requires that federal agencies conducting or supporting activities affecting the coastal zone do so in a manner that is consistent with approved state coastal management program.
National Oceanic and Atmospheric Administration regulations regarding program development and operation.	15 CFR Part 923	Requires the preparation of a written consistency determination.
Alaska National Interest Lands Conservation Act (ANILCA)	Pub. L. No. 96-487, 94 Stat. 2371 (1980)	Protects the scenic, wilderness and wildlife resources of Alaska.
Alaska National Interest Lands Conservation Act (ANILCA) Title 8	16 U.S.C. & 3111 et seq.	Requires the Secretary of the Interior to manage wildlife on federal lands in Alaska for purposes of preserving and enhancing the opportunity for native and non-native rural residents of Alaska to engage in subsistence uses of such lands.
Alaska National Interest Lands Conservation Act (ANILCA) Section 810	16 U.S.C. & 3120	Requires that the head of any federal agency who has authority over public lands in Alaska evaluate the impact of any proposed land disposition on subsistence uses of these lands.

TITLE	CITATION	DESCRIPTION
Alaska's Water, Air, Energy and Environmental Conservation Act	Alaska Stat &46.03.140	Gives the Department of Environmental Conservation (DEC) authority to adopt air pollution control regulations that are necessary to prevent, abate or control air pollution.
Alaska Ambient Air Quality Standards	Alaska Admin. Code tit. 18 && 50.020 to .021	Ambient air quality standards and classification of areas as non-attainment, areas for the prevention of significant deterioration and additional areas for the protection of visibility.
Alaska Ambient Air Quality Standards	Alaska Admin. Code title 18 && 50.090,.100	DEC regulations on discharge of air pollutants affecting visibility in areas of potential ice fog and on marine vessels within three miles of the coastline of Alaska.
Alaska Coastal Management Program (ACMP)	Alaska Stat. & 46.40.010 et seq.	Provides standards for the adoption of local coastal management programs, which are subject to approval by the Alaska Coastal Policy Council (CPC).
Alaska Endangered Species Act	Alaska Stat && 16.20.180 to .210	Requires the preservation of habitat and the protection of certain named species.
Alaska Hazardous Waste Regulations	Alaska Stat. & 46.03.299	Mirror federal regulations under Resource Conservation and Recovery Act.
Alaska Historic Preservation Act	Alaska Stat. && 41.35.010 to .240, 41.99.900; Alaska Admin. code tit. 11, && 16.010 to .900	Provides protection to historic, prehistoric and archeological resources situated on lands owned or controlled by the state with certain protection for such resources on private lands.
North Slope Borough Coastal Management Program		Established in accordance with the Alaska Coastal Management Act, Program and Coastal Development standard 6 AAC 80.040, setting forth the general policy statement with respect to coastal development in the North Slope Borough Coastal Management Area.
North Slope Borough Land Management Regulations	Borough Code Title 19	Creates a set of land management principles and procedures for development in the North Slope Borough.

TITLE	CITATION	DESCRIPTION
North Slope Borough Ordinance	Serial No. 75-6-23; Title 19 of the Code of Ordinances of the North Slope Borough	1990 Amendment to land management ordinances.
DOE's General Environmental Protection Program.	DOE Order 5400.1A	Establishes environmental protection program requirements, authorities and responsibilities for DOE operations for assuring compliance with federal and state environmental protection laws and regulations, federal executive orders and internal department policies.
Environmental Compliance Issue Coordination	DOE N 251.65400.5A	Establishes DOE requirements for coordination of significant environmental compliance issues.
National Environmental Policy Act Compliance Program.	DOE 451.1 5440.1EDOE 5440.1D	Establishes DOE policy for implementation of the National Environmental Policy Act of 1969 (NEPA).
Environmental Protection, Safety and Health Protection Standards	DOE N 251.4 5480.4	Specifies and provides requirements for the application of the mandatory environmental protection, safety and health (ES&H) standards applicable to all DOE and DOE contractor operations; provides a listing of reference ES&H standards; identifies the source of the mandatory and reference ES&H standards.
Environmental Protection, Safety and Health Protection Standards	DOE 5480.4	Specifies and provides requirements for the application of the mandatory environmental protection, safety and health (ES&H) standards applicable to all DOE and DOE contractor operations; provides a listing of reference ES&H standards; identifies the source of the mandatory and reference ES&H standards.

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GLOSSARY

Atmospheric Constituents - Gases and particles within the atmosphere.

Boundary Facility - A facility within a CART site located away from the Central Facility and containing a subset of the Central Facility meteorological instrumentation.

Central Facility - The main facility within a CART site; includes the largest complement of meteorological instrumentation.

Cloud and Radiation Testbed Site - An array of meteorological instrumentation spread over several locations within an area several hundreds of miles on a side designed to meet ARM project measurement needs.

Cloud Radar - Radar designed to detect and measure clouds.

Extended Facilities - Unattended, self-contained remote weather stations.

Global Climate Model - A computer model designed to simulate the climate over the entire surface of the earth; a close cousin to numerical weather prediction models used by the National Weather Service.

Infrared - A type of electromagnetic radiation that is also referred to as "radiant heat."

Interferometer - A device for measuring the intensity of electromagnetic radiation as a function of its wavelength.

Lidar (Light Detection and Ranging) - A pulsed laser system that measures reflected light much like a radar system measures reflected radiowaves to probe the atmosphere for clouds, precipitation and aerosols to an altitude of several thousand feet.

Lidar Ceilometer - A Lidar designed to measure the height of cloud bottoms.

Microwave Radiometer - A device for measuring the intensity of electromagnetic radiation at selected wavelengths in the microwave range; allows inference of amount of water vapor and liquid water in the atmosphere.

Micropulse Lidar - A lidar that depends upon many short, low energy pulses of light instead of fewer high energy pulses in order to maintain eye safety.

Passive Instrumentation - Only receives and measures signals; does not send out any energy.

Permafrost - Soil, rock, or any other earth material, that maintains a temperature at or below $32^{o}F$ continuously throughout the year.

Pilings - Wooden or other posts augered into the permafrost upon which other structures may be mounted, usually a few feet above the surface. The purpose of using pilings is the possible avoidance of structures sinking into the tundra, as the soil under them melts. In addition, the placement of pilings avoids burial of structures in snow drifts by allowing blowing snow to pass under.

Profilers - Upward pointing instrumentation using sound waves, microwaves, or lasers to measure the properties of the atmosphere as a function of altitude.

Radar Wind Profiler - An instrument using radar to measure wind speed and direction as a function of altitude.

Radiant Flow of Energy - The flow of electromagnetic energy; for the purpose of this assessment, sunlight and radiant heat.

Radiant Heat - Electromagnetic energy of a wavelength too long to be perceived by the human eye, but which has the capability of warming objects on which it falls.

Radiation - In this context, sunlight and radiant heat; not nuclear or ionizing radiation.

Radiometric Sensors - The various types of passive radiometric instruments to observe the sun's incoming and outgoing shortwave (light) and longwave (heat) radiation and the earth's heat emissions.

Radio Acoustic Sounding System - a combination of a sound source and a radar capable of probing the atmosphere to produce vertical profiles of virtual temperature.

Radiosondes - Small (several ounces by weight) styrofoam-enclosed meteorological instrument packages carried aloft by helium or other light gas-filled balloons up to altitudes of several tens of thousands of feet.

Rawinsonde - The whole system, including radio-receiving equipment on the ground, necessary to obtain meteorological information from radiosondes.

Rolligon - A vehicle (with extremely wide tires) designed to travel across the tundra, preventing damage to the tundra.

Sea Smoke - A fog that forms in arctic regions when very cold air flows over warmer water.

Standard Meteorological Instruments - Sensors for measuring temperature, humidity, pressure, precipitation amount, and wind direction/speed. Unlike profilers, this category of equipment makes measurements only at the point where the sensors are located.

Thermokarsting - Phenomenon resulting from disturbing the surface of permafrost, causing enhanced absorption of radiant heat and thawing of the underlying permafrost to greater depth in the summer (also known as frost heave).

Virtual Temperature - The temperature at which dry air has the same density and pressure as moist air.

Department of Energy
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Dear Interested Party:

Enclosed for your files is a copy of the United States Department of Energy (DOE) Environmental Assessment (EA) entitled "Environmental Assessment for the Atmospheric Radiation Measurement Program North Slope of Alaska and Adjacent Arctic Ocean Cloud and Radiation Testbed Site" and the associated Finding of No Significant Impact (FONSI). This EA was prepared in accordance with the requirements of the National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ) regulations implementing NEPA, and the DOE NEPA regulations.

If you or your staff should require further information, please contact Susan Lacy, DOE/Kirtland Area Office NEPA Compliance Officer, at (505) 845-5542.

George K. Laskar
Assistant Area Manager
for Laboratory Operations

Enclosure

cc w/o enclosure:
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