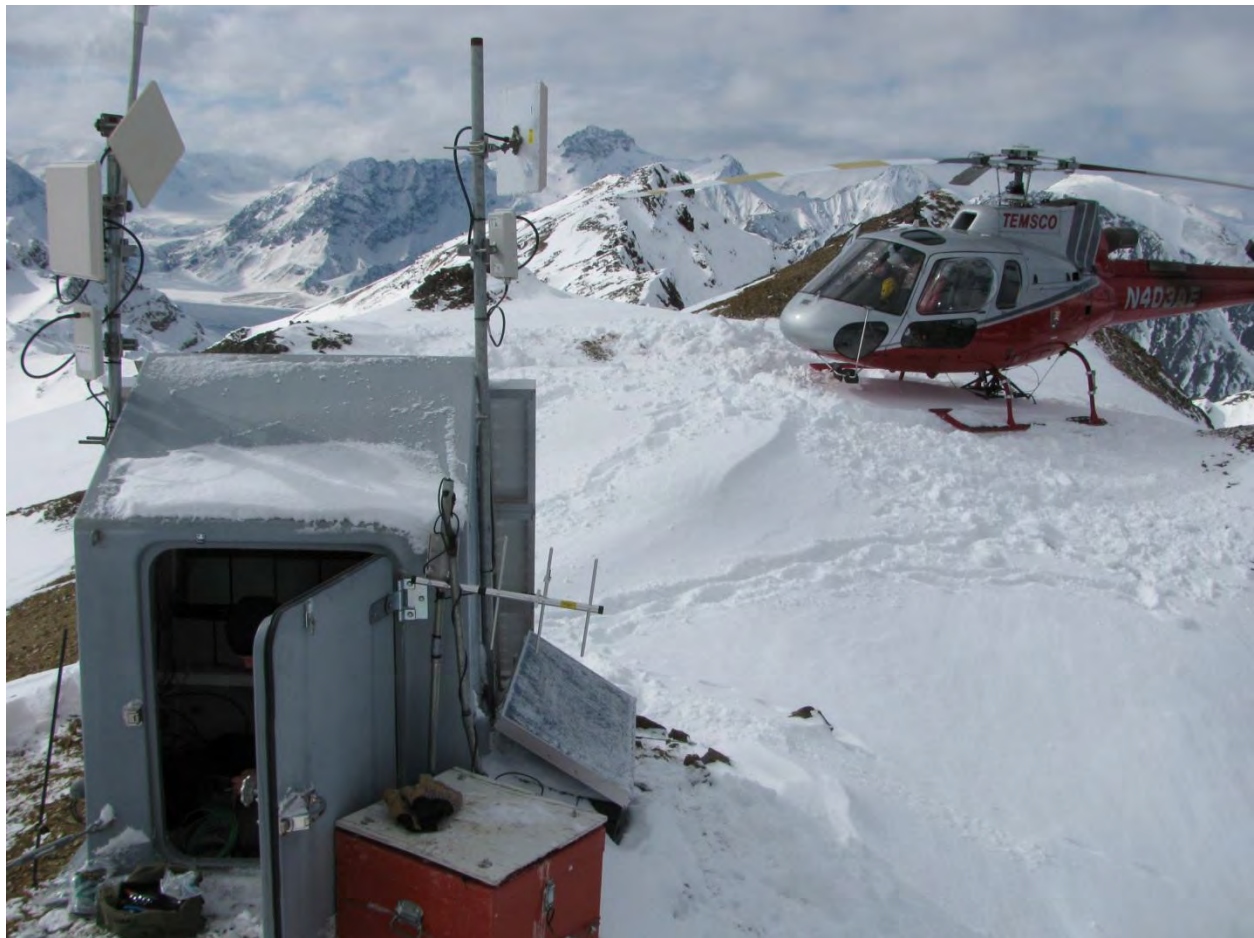


ENVIRONMENTAL ASSESSMENT
FOR TELECOMMUNICATIONS AND CLIMATE MONITORING IMPROVEMENTS IN
DENALI NATIONAL PARK AND PRESERVE

Prepared by
United States Department of the Interior
National Park Service
Denali National Park and Preserve



East Branch Ridge Test Wireless Repeater

May 2013



Comments on this EA should be submitted to the project site at:
<http://parkplanning.nps.gov>

For people wishing to submit comments on this EA: **before** including your address, phone number, e-mail address, or other personal identifying information in your comment, be aware that your entire comment – including your personal identifying information – may be made public. While you can ask us to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so. We will always make submissions from organizations or businesses, and from individuals identifying themselves as representatives of officials or organizations or businesses, available for public inspection in their entirety.

Comments may also be submitted by letter or email to the contacts below:

Steve Carwile, Compliance Officer
Denali National Park and Preserve
240 West 5th Avenue
Anchorage, Alaska 99501
Phone: 907-644-3612
Email: steve_carwile@nps.gov

Don Striker, Superintendent
Denali National Park and Preserve
P.O. Box 9
Denali Park, Alaska 9975

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DENALI NATIONAL PARK AND PRESERVE TELECOMMUNICATIONS AND CLIMATE MONITORING IMPROVEMENTS ENVIRONMENTAL ASSESSMENT

I. PURPOSE AND NEED

The National Park Service (NPS) is considering actions to establish or upgrade telecommunications systems at several locations and add new weather stations in Denali National Park and Preserve (DENA). Some locations have had telecommunication facilities for decades, and a weather station has been attempted on Mt. McKinley for twenty years. Testing of some new sites for remote repeaters has led to a plan for improved coverage for the park radio system, for in-park internet connections, and for voice connections. Radio communications are spotty in several locations along the Denali Park Road, and internet connectivity has been poor to non-existent inside the park other than in the entrance area. Agency programs are becoming more web-based and staff at remote locations need to have secure access to the internet. New telecommunication and weather installations are needed to improve park operations for visitor protection and services, resources management, research, education, park administration and facilities maintenance.

The following objectives are to be addressed by this project:

- Improve or establish internet connectivity and voice connections with remote sites within the park;
- Enhance public education/outreach with new wireless internet technology;
- Provide co-location opportunities for park partners for needed communication facilities
- Support the conversion of the park radio system from analog to digital narrowband technology;
- Improve spotty radio communications along the Denali Park Road;
- Relocate remote repeaters in difficult sites to safer more accessible sites
- Permanently install weather stations on Mt. McKinley; and
- Permanently install a weather station in the Toklat Basin

Upgrades to existing telecommunications sites would need to be established to ensure adequate coverage along the park road and elsewhere in the park for the park's narrowband radio system that is used for public safety, visitor services, and law enforcement (see Figure 1). This would include the possible addition of solar panels and batteries to meet new power needs, and replacement huts and antennas as technologies change

Wireless internet connectivity is needed at the park's Murie Science and Learning Center (MSLC) as a first step to meet the NPS goals for this center to share globally the ecosystems of DENA and seven other national park areas in central and northern Alaska. The wireless internet equipment would provide connections with scientific instruments in remote field locations and integrate research discoveries with visitor education and schools through videoconferencing and distance learning capability. Ultimately, through expansion of this technology, scientists in the

park, throughout Alaska, and around the planet could interact on research and monitoring projects, leading to better ideas and methods to preserve resources in these park areas.

New weather stations are needed high on Mt. McKinley to help local and continental weather prediction, and, in the Toklat Basin, to monitor an area where the warm permafrost is degrading due to climate change.

This Environmental Assessment (EA) analyzes a No Action Alternative and two action alternatives for providing telecommunications and climate monitoring improvements within Denali National Park and Preserve and has been prepared according to the National Environmental Policy Act of 1969 and regulations of the Council of Environmental Quality (40 CFR 1508.9).

Background

Radio

Field communications in the park initially consisted of using a single telephone line that in 1924 was draped on bushes and trees from park headquarters to the Savage River. By 1930 the line had been placed on tripods on a route parallel to the park road from headquarters to the Copper Bar Cabin just beyond the present Eielson Visitor Center. By 1940, the eastern half of the line was stretched from vertical poles. The telephone line proved to be a maintenance headache, with antlered animals, bears and wind causing outages. Radio telephones were purchased prior to WWII, but their contribution was described as “almost total uselessness” (Norris, 2006). By the early 1970s a single side-band radio network had been established to communicate along the park road corridor, but its transmissions were often overpowered at night by more powerful commercial stations.

An analog radio repeater site on the ridge above park headquarters was connected to commercial power by a helicopter-laid armored electric cable in the late 1970s. This repeater was partnered with a new battery-powered repeater on a tower on the ridge above the Eielson Visitor Center. Winter storms played havoc with the initial tower at Vertical Angle Bench Mark (VABM) Thoro (Thoro Ridge) and a new 10 meter tower was installed in 1982. Because the radio transmissions were analog, some areas that were not in line of sight of the towers, such as the Toklat Road Camp, could get radio reception, if you knew where to stand. Another radio repeater was installed on Wickersham Dome in the Kantishna Hills after the 1980 Alaska National Interest Lands Conservation Act (ANILCA) expanded the park boundaries. To allow for radio communications in the Cantwell-Chulitna River area on the south side of the Alaska Range, radio repeaters were installed on Savage Ridge and at Broad VABM in 1995.

The Omnibus Budget Reconciliation Act of 1993 authorized the U.S. Department of Commerce to direct all civilian Federal radio users to convert to a new technology known as narrowband by January 1, 2005. The transition to narrowband radio was intended to create more radio spectrum for Federal users to relieve congestion and better meet emerging national security and privacy needs to assure public safety. The park radios now operate on a narrowband digital signal over a frequency near 150 MHz. The digital signal is a clearer signal than analog, though it can cut out if transmission to locations without line-of-sight involve a number of topographic bounces.

Telephone – Wireless

In the mid-1970s a single telephone was installed at the Toklat Road Camp. The telephone exchange was in Anderson, 50 miles northeast of Toklat, and without a cable or line of sight it was a wonder that the phone worked. The local phone provider has since pulled support for that phone. An Alascom Earth Station installed at the Kantishna Roadhouse around 1990 provided 6 phone lines, including one that found a bounced line-of-sight transmission to the Wonder Lake Range Station, and that link was used for a credit card pay phone for the public. The support for that phone was pulled by the provider in 2000.

Iridium satellite telephones have been used for telecommunications in very remote locations during hunting patrols and winter patrols along the north boundary or for emergency operations.

By 2003 the park became interested in the possibilities of using wireless transmissions to exchange data from the field to park offices and to schools around the world as well as to provide enhanced voice communications from the field to the outside world. That year the park partnered with the Denali Borough School District and the University of Montana to install test site radios and repeaters for this purpose. The test results have been positive and the number of sites has been narrowed down to the minimum necessary to provide service to the park road corridor and important park and visitor facilities at Savage River, Teklanika, Toklat, Eielson Visitor Center, the Wonder Lake Ranger Station, and Kantishna. A repeater located at the existing seismic relay site on the Northeast Knob of Double Mtn. was found to not be able to communicate, at the wireless frequency band, with the Healy Repeater, though the top of Double Mountain, at 700 feet higher in elevation, can. A repeater site located on the East Branch Range can communicate reliably with Toklat and Thoro Ridge and a number of sites southwest of the Eielson Visitor Center can see both Eielson and the existing Thoro Ridge site (see Figures 2, 3 and 4). Internet connections and voice over internet protocol (VoIP) has been successful through the wireless system.

Seismic

Data collected in DENA contributes to a state-wide seismic monitoring program. The Geophysical Institute of the University of Alaska Fairbanks (UAF-GI) installed a seismometer on a hillside above the park entrance area in 1965, as part of a statewide network in response to the 1964 Good Friday earthquake. In 1986 UAF-GI entered into a Memorandum of Understanding with the NPS and DENA to provide seismic monitoring in the park. Three additional co-location sites were chosen within the park for the installations: seismometers and radio transmitters were installed at Wickersham Dome in the Kantishna Hills in 1988, and at Thoro Ridge, near the Eielson Visitor Center in 1989; a simple repeater without seismic equipment was installed at Mount Healy to transmit seismic data through existing equipment to researchers at UAF-GI. Due to an upgrade to a digital signal for seismic data transmission, a new seismic repeater site at 5,200 feet elevation on the Northeast Knob of Double Mountain was permitted in 2003 to relay seismometer data from Thoro Ridge to Healy Ridge. Based on a need to improve earthquake monitoring near the western portion of the Denali Fault, UAF-GI was permitted to install another seismometer at Castle Rocks in the northwestern preserve additions in 2006.

In 2006 the University NAVSTAR Consortium (UNAVCO) was permitted to co-locate Plate Boundary Observatory (PBO) installations at Wickersham Dome and Tokosha Ridge to use GPS instrumentation to help measure strain at the boundary between the North American and Pacific

crustal plates. Both the UAF-GI and UNAVCO seismic networks are authorized under 5-year renewable permits from the park.

Weather Station on Mt. McKinley

Informal weather measurements have been taken on Mt. McKinley since Hudson Stuck during the successful 1913 climb left a thermometer in the rocks at Denali Pass which was next read by the next climbing group in 1932. The Japan Alpine Club carried instruments to the 18,700 foot level in 1990 to measure temperature and winds. Though they returned numerous times during the next 20 years to reset or replace instruments or the supports, the wind instruments never survived the cold, ice and winds at that elevation.

Park Weather Stations

There has been a weather station at park headquarters since 1925. Four other sites in the entrance area also take weather data. Weather stations along the park road include Remote Automated Weather Stations (RAWS) installed at Toklat, at the Eielson Visitor Center (EVC), at the Wonder Lake Ranger Station and a snow measuring site in Kantishna. Backcountry RAWS are at the Stampede and Dunkle Airstrips, near the lower Ruth Glacier and along the McKinley River. None of the weather stations are in wilderness and only EVC (3700 feet asl), Toklat (3,000 feet asl), and Lower Ruth Glacier (4,500 feet asl) are above 2,100 feet elevation. None of the stations are on permafrost.

National Weather Service observers recorded official weather data at Wonder Lake in the late 1920s, at Stampede during the early 1940s, and at the Eielson Visitor Center during the early 1970s.

Park Purpose and Significance

On February 26, 1917, Congress established the original Mount McKinley National Park as "... a public park for the benefit and enjoyment of the people... said park shall be, and is hereby established as a game refuge" (39 Statute 938). In 1922 and 1932 subsequent legislation expanded the park boundaries to the east and north, including lands in the Wonder Lake area, for the purpose of protecting winter game habitat, especially for moose.

The Alaska National Interest Lands and Conservation Act of 1980 (ANILCA) added approximately 2,426,000 acres of public land to Mt. McKinley National Park and approximately 1,330,000 acres of public land as Denali National Preserve and re-designated the entirety Denali National Park and Preserve. ANILCA Title I recognizes that the purposes for the Alaska conservation system units includes their preservation "for the benefit, use, education, and inspiration of present and future generations certain lands ... that contain nationally significant natural, scenic, historic, archeological, geological, scientific, wilderness, cultural, recreational, and wildlife values...." Furthermore, it was the intent of Congress to, "... maintain opportunities for scientific research and undisturbed ecosystems."

Section 202(3)(a) directs that the Denali park and preserve additions are to be managed for the following purposes:

“To protect and interpret the entire mountain massif, and additional scenic mountain peaks and formations; and to protect habitat for, and populations of fish and wildlife including, but not limited to, brown/grizzly bears, moose, caribou, Dall sheep, wolves, swans and other waterfowl; and to provide continued opportunities, including reasonable access, for mountain climbing, mountaineering and other wilderness recreational activities. Subsistence uses by local residents shall be permitted in the additions where such uses are traditional.”

Section 701 (1) of ANILCA established the Denali Wilderness of approximately 1.9 million acres (since re-mapped at 2.1 million acres), which is basically all of the former Mount McKinley National Park minus the park entrance area and road corridor to the old boundary near Wonder Lake with various development nodes along the road corridor.

Legal Context

The National Park Service Organic Act of 1916 (16 USC §§ 1-4, 39 Stat. 535) establishes the National Park Service and directs the agency to:

“...promote and regulate the use of the Federal areas known as national parks, monuments, and reservations... by such means and measures as conform to the fundamental purpose of the said parks, monuments and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.”

The NPS Organic Act and the General Authorities Act of 1970 prohibit impairment of park resources and values.

The 1966 National Historic Preservation Act (NHPA), as amended, provides direction to federal agencies for protection of historic resources. Section 106 of the act requires consideration of adverse impacts to historic resources during the course of any federal undertaking. Section 110 provides for an affirmative role of federal agencies in identifying, preserving, and utilizing the historic properties that are in agency ownership.

The Wilderness Act of 1964 (78 Stat.890) provides that administrative activities in wilderness must meet a “minimum requirements” test in order to be excepted from general prohibitions on temporary roads, use of motorized equipment or motorized or mechanized transportation, landing of aircraft, and structures or installations (the section reads: “...except as necessary to meet minimum requirements for the purpose of this Act...”). A Minimum Requirements Analysis is presented in Appendix B.

The 2006 NPS Management Policies use the terms “resources and values” to mean the full spectrum of tangible and intangible attributes for which the park is established and managed, including the Organic Act’s fundamental purpose and any additional purposes as stated in the park’s establishing legislation. The impairment of park resources and values may not be allowed unless directly and specifically provided by statute. The primary responsibility of the NPS is to

ensure that park resources and values will continue to exist in an unimpaired condition that will allow people to have present and future opportunities for enjoyment of them.

Relationship to Other Park Planning

The DENA General Management Plan and Wilderness Suitability Review (NPS 1986) addressed park management throughout the park and preserve. In addition to the 2.1 million acres of the former Mount McKinley National Park that was designated as wilderness by ANILCA, the 1986 GMP found all of DENA eligible for wilderness designation except the park entrance area, the Denali Park Road Corridor, inholdings, and the Kantishna Mining District.

The wilderness review process required under section 1317(b) of ANILCA has not been completed on the 19 million acres that were determined eligible in the 1984-86 Alaska General Management Plans. Although EISs and Records of Decision were completed by the NPS, no final action was taken in the Secretary of Interior's office and no wilderness recommendation was ultimately conveyed to Congress. Park General Management Plans remain the authority for eligible wilderness until a new wilderness study or an eligibility re-assessment is completed.

The NPS 2006 Management policies state that "eligible wilderness" lands are to be managed "...for the preservation of the physical wilderness resources, [and] planning for these areas must ensure that the wilderness character is likewise preserved...The National Park Service would take no action that would diminish the wilderness eligibility of an area possessing wilderness characteristics until the legislative process of wilderness designation has been completed."

The DENA 2006 Backcountry Management Plan addresses communications facilities and research activity, and specified that new facilities would be considered on a case by case basis using a Minimum Requirements/ Minimum Tool analysis. When reviewing new proposals for installations in wilderness "...the potential disruption of wilderness character and the physical resource would be considered and given more weight than economic efficiency and convenience" (NPS 2006, p.57). New structures would be attached to existing structures wherever possible.

Archeological surveys were conducted in 1986 at Wickersham Dome (007-86-DENA) and Healy Ridge (008-86-DENA), and in 1992 at Thoro Ridge (008-92-DENA). The park approved backcountry radio repeaters at Broad VABM and Tokosha in 1995 and at the West Fork of the Yentna in 2001. The park also approved wireless test installations in 2009 at the Herning Cabin to communicate with Eielson Visitor Center, at East Branch Ridge to communicate with The Toklat Road Camp, and at Double Mountain to link the western wireless network with Healy Ridge. Only the Broad VABM and West Fork of the Yentna sites had completed Section 106 documentation.

The park approved weather stations along the road corridor and in developed areas such as airstrips in various years since 1925. The McKinley River Remote Automated Weather Station (RAWS) has been operating since 1990 and the Ruth Glacier RAWS was approved in 2002. All but the McKinley River RAWS had completed Section 106 documentation.

Issues Considered for Evaluation

To focus the EA, the NPS selected specific issues for further analysis. Discussions of the affected environment and environmental consequences related to each alternative focus on the selected issue topics. A brief rationale for the selection of each issue is given below.

Effects on Vegetation, Wetlands and Soils

The project could result in the removal or disturbance of small plots of tundra vegetation where instruments are installed and where helicopters land.

Effects on Wildlife and Habitat

Helicopter access to the sites could disrupt nearby raptor nesting. Bears and small mammals could visit alpine sites with communications equipment and be attracted to and damage wires, solar panels, and other equipment.

Effects on Natural Sound Environment

Helicopters may be used for site installation and annual maintenance, and they produce loud, pulsating, mechanical noises that would disrupt natural sounds in the park.

Effects on Cultural Resources

Any new site would have reviews and clearance pursuant to Section 106 of the 1966 National Historic Preservation Act. Any site occupied by an installation that has not had a completed Section 106 documentation would also need an archeological survey and cultural resource clearance.

Effects on Visitor Use and Aesthetics

Sites are at generally high elevations, putting them not in general travel corridors, but on some hiking destinations. Equipment shelters and antenna sizes, color, and shapes could all affect site visibility and scenic qualities in the area. Solar panels associated with remote communications facilities could affect the natural scenic integrity of the park at greater distances.

Effects on Wilderness

Some of the existing and test repeater sites and the proposed weather stations on Mt. McKinley are in designated wilderness. Others proposed installations are in areas outside of designated wilderness but are within areas found eligible for wilderness designation. NPS policies state the NPS will take no action that would diminish the wilderness suitability of an area possessing wilderness characteristics until the legislative process on wilderness designation has been completed. (See attached Minimum Requirements Analysis in Appendix B)

Effects on Park Operations

Park operations would be improved by having a communications system that can handle phone and data traffic between park headquarters and in-park remote sites.

Issues Dismissed from Further Evaluation

These topics were considered but dismissed from further evaluation because of the reasons provided below.

Endangered, Threatened, Species of Special Concern

There are no known threatened and endangered species or their habitat at the proposed telecommunications or weather station sites. No rare plants are known from the sites.

Floodplains

None of the sites would be located in floodplains.

Minority and Low-Income Populations

Executive Order 12898 requires federal agencies to incorporate environmental justice into their missions by identifying and addressing high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. The proposed project would not result in disproportionately high direct or indirect adverse effects on any minority or low-income population or community.

Subsistence Resources and Uses

No significant impact or restriction to ANILCA subsistence uses or fish and wildlife resources is anticipated as a result of establishing or upgrading telecommunications systems or weather stations in DENA. The impacts to subsistence of the proposed action as well as the no-action alternatives are discussed more fully in the ANILCA Section 810 evaluation, which is included as Appendix A of this EA.

Local Communities/Socioeconomic Resources - Construction activities and costs associated with the proposed project would provide a negligible stimulus to the local or regional economy.

Permits and Approvals Needed to Implement the Project

A concurrence from the State Historic Preservation Officer would be required for the Assessment of Effect of this project on cultural resources. The park is seeking a conditional “No Adverse Effect” determination in its Section 106 compliance for the proposal. The determination is conditional on having each existing and new site surveyed and no historic properties/adverse effects found at each site. This survey would be conducted before installation at new sites or when the next scheduled maintenance is conducted at existing sites.

II. ALTERNATIVES

Alternatives Development

Site selection and communications criteria for the wireless repeaters were discussed and key points below were noted:

- Potential future sites should be pre-tested with computer programs to ascertain radio connections and line-of sight for wireless internet communications. These site locations should be adjusted to find optimum locations for repeaters and coverage along the Denali Park Road, the south side of the Alaska Range, and resources management areas of concern.
- Because computer programs lack some accuracy when the line of sight decision is close, these sites should be further verified with park radios, portable wireless repeaters, spotting scopes and binoculars, and/or signal mirrors.
- Radio and wireless internet transmission sites should be co-located where reasonable and feasible, and the fewest number of sites in the park is preferable.
- Wireless line-of-sight transmissions reach 27-37 miles, so repeater locations should be adjusted accordingly.
- A wireless communications site is needed to reach into the Toklat Road Camp area. This site would need to connect to other repeater sites at Thoro Ridge and Double Mountain or Savage Ridge.
- Radio repeater and wireless internet communication sites must have a flat area large enough to support the shelter boxes, antenna towers, and a helipad. The helipad diameter is generally 1.5 times the rotor blade length or about 40 feet across.
- Sites need to be located in areas with minimal snow accumulation and southern exposures for solar panels.
- A helicopter pilot should assess site safety before a site is selected for a potential radio/wireless communication site.
- Repeater sites need to be located where radio technicians can walk to the park road if needed.

Actions Common to All Alternatives

All remote stations would be serviced by small helicopter on average once each year to transport maintenance personnel and replacement items like gel cell batteries and solar panels. Helicopter flights would be scheduled to partner with other administrative duties when possible. Driving or hiking to some sites could be possible depending on weather and repair equipment necessary to be carried. Technological improvements and replacements to radios, antennas, batteries, solar panels and other electronics would continue.

An archeological survey would be required for each proposed or previously approved site that does not have one on record.

Alternative 1 – No Action

Under the No Action alternative, there would be continued use and maintenance of grandfathered or approved park radio repeater sites at Healy Ridge, Savage, Thoro Ridge, Wickersham Dome, VABM Broad near Cantwell, and Tokosha Ridge. Seismic stations would continue to be co-located and operated at Thoro Ridge, Wickersham Dome, Tokosha Ridge, and at Castle Rocks, and a seismic relay station would continue on the Northeast Knob of Double Mountain.

Test repeater equipment would be removed from wireless-only sites at Double Mountain, East Branch Ridge and Herning Cabin. The wireless system would be limited to areas within the reach of the Healy repeater station and more distant parts of the park would not have an operative wireless system. The wireless equipment from Thoro Ridge and Wickersham Dome would also be removed.

Existing weather stations along the park road corridor and in the backcountry along the McKinley River, Stampede and Dunkle airstrips and overlooking the lower Ruth Glacier would remain. No new permanent weather stations would be installed.

Actions Common to All Action Alternatives

Under Alternative 2 and 3, the NPS would:

- A. Continue to use, maintain or permit grandfathered or approved park radio repeater sites and seismic installations. The park would continue use of the Savage Repeater, continue to operate a seasonal radio repeater on Mount Crosson for Mount McKinley ranger/rescue operations, and operate a radio repeater on the West Fork of the Yentna as needed for hunting patrols.
- B. For improved internet connectivity and voice communication, the park would:
 - 1. continue to use a new test repeater on the East Branch Ridge for wireless communications to the Toklat Road Camp.
 - 2. continue to use a new test repeater on the top of Double Mountain.
 - 3. move the Herning Cabin test repeater to a new site.
 - 4. adjust the location of the Wonder Lake Campground repeater.
 - 5. add new solar panels and batteries and larger shelters as necessary.
- C. Move the existing Double Mountain seismic relay site when feasible to co-locate with the new wireless installation on the top of the peak.
- D. Co-locate facilities where possible, such as sharing towers, huts and battery power storage.
- E. Install a RAWS in the Toklat Basin at a site named Wigand at 1,700 feet elevation north of the Old Park boundary and west of the East Fork of the Toklat River. This site

had a temporary weather station for a couple of seasons (see Figures in Appendix B) but was removed in 2007. The standard interior Alaska RAWS measures air temperature, relative humidity, rainfall, wind speed and direction, solar radiation, snow depth, and soil temperatures at 3 depths - 10, 20 and 50 cm.

The station would be powered with 2 -100 amp hour sealed lead acid batteries that are charged with a 75 watt solar panel. The tripod height is 3 m and would be anchored at each leg with a rebar pegs that are approximately 0.5 m long. The feet of the tripod would be placed on 50 cm x 50 cm square pieces of plywood so the station does not sink. The station would be surrounded with an electric fence to discourage bears. The fence would have 4 metal stake posts and three strands of poly wire - the fence would be charged by a separate solar panel/battery set-up that hangs on the fence post.

- 1) F. Researchers from the University of Alaska, Fairbanks (UAF) would install a small weather station at the 16,200 feet elevation on Mt. McKinley. The station would include instruments in a small box on a 1-1/2" metal pipe about 3 feet tall, with three wire stays anchored to exposed bedrock. The station would be installed on the ridgeline just above the fixed lines above Windy Corner. Over a five year period UAF would teach park mountaineering rangers how to best maintain the station and then full maintenance would be turned over to the NPS.

Alternative 2 – Wireless Network w/ VABM Muldrow and Two Met Stations

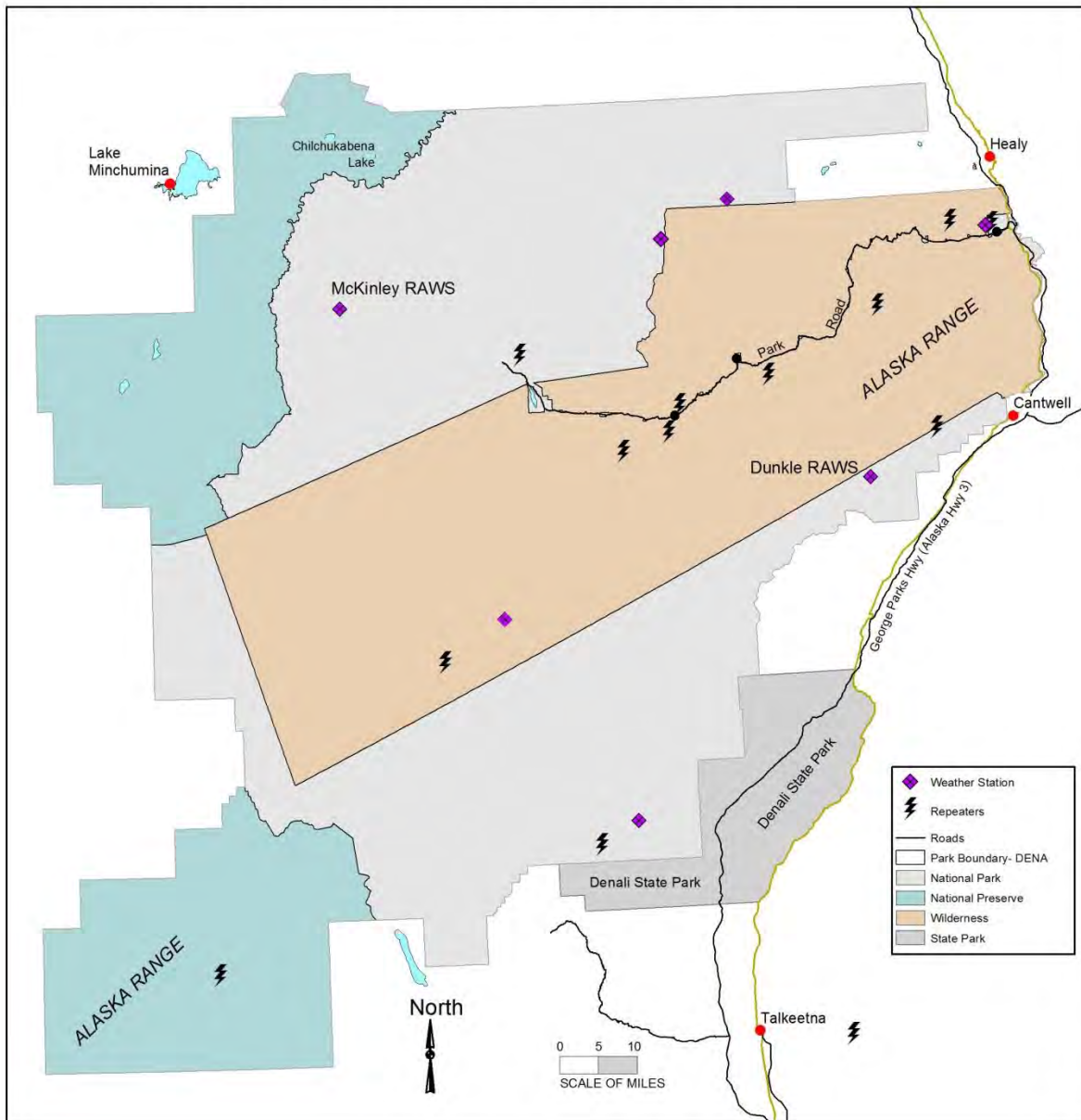
Under Alternative 2, and including the Actions Common above, the NPS would move the Herning Cabin test wireless repeater equipment to Muldrow VABM.

Alternative 3 – Wireless Network w/ Eielson Bench and Three Met Stations (NPS Preferred Alternative)

- 1) Under Alternative 3, and including the Actions Common above, the NPS would move the Herning Cabin test repeater equipment to a site (Eielson Bench) between the Herning Cabin and the Thorofare River where the hut and solar panels would be invisible from the Eielson Visitor Center and from the Herning cabin if possible.
- 2) Researchers from the University of Alaska, Fairbanks (UAF) would install a small weather station at the 17,200 feet elevation on Mt. McKinley. The station would include instruments in a small box on a 1-1/2" metal pipe about 3 feet tall, with three wire stays anchored to exposed bedrock. The station would be installed in the vicinity of the 17,200 foot elevation camp (high camp) that is the common launch point for summit climbers. Over a five year period UAF would teach park mountaineering rangers how to best maintain the station and then full maintenance would be turned over to the NPS.

All Figures have North at the top

Figure 1
DENA Proposed Telecommunication Sites and Weather Stations



Squares on Figures 2-4 are one mile squares.

Figure 2
Four Eastern Park Site Maps

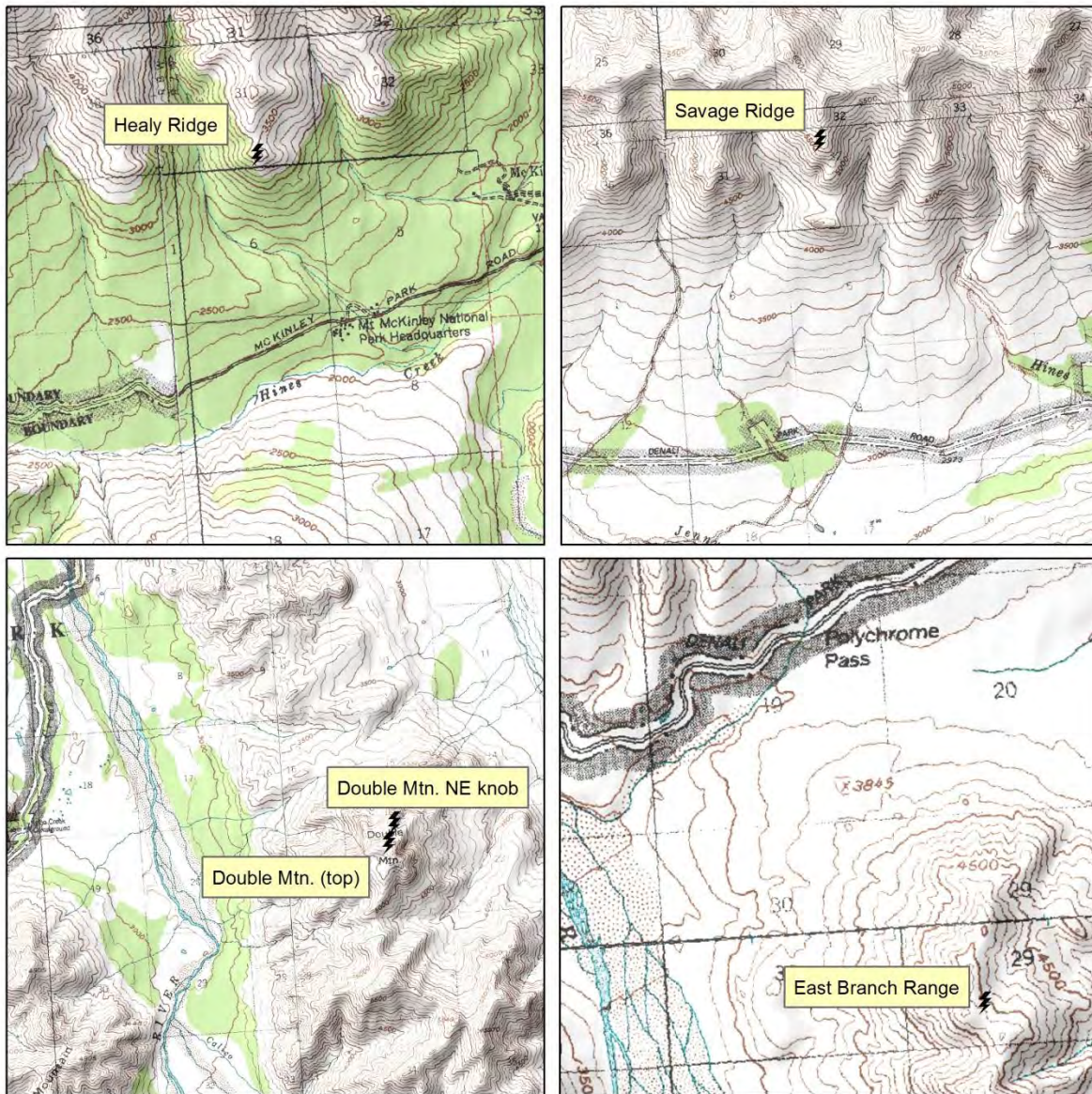


Figure 3
Four Western Park Site Maps

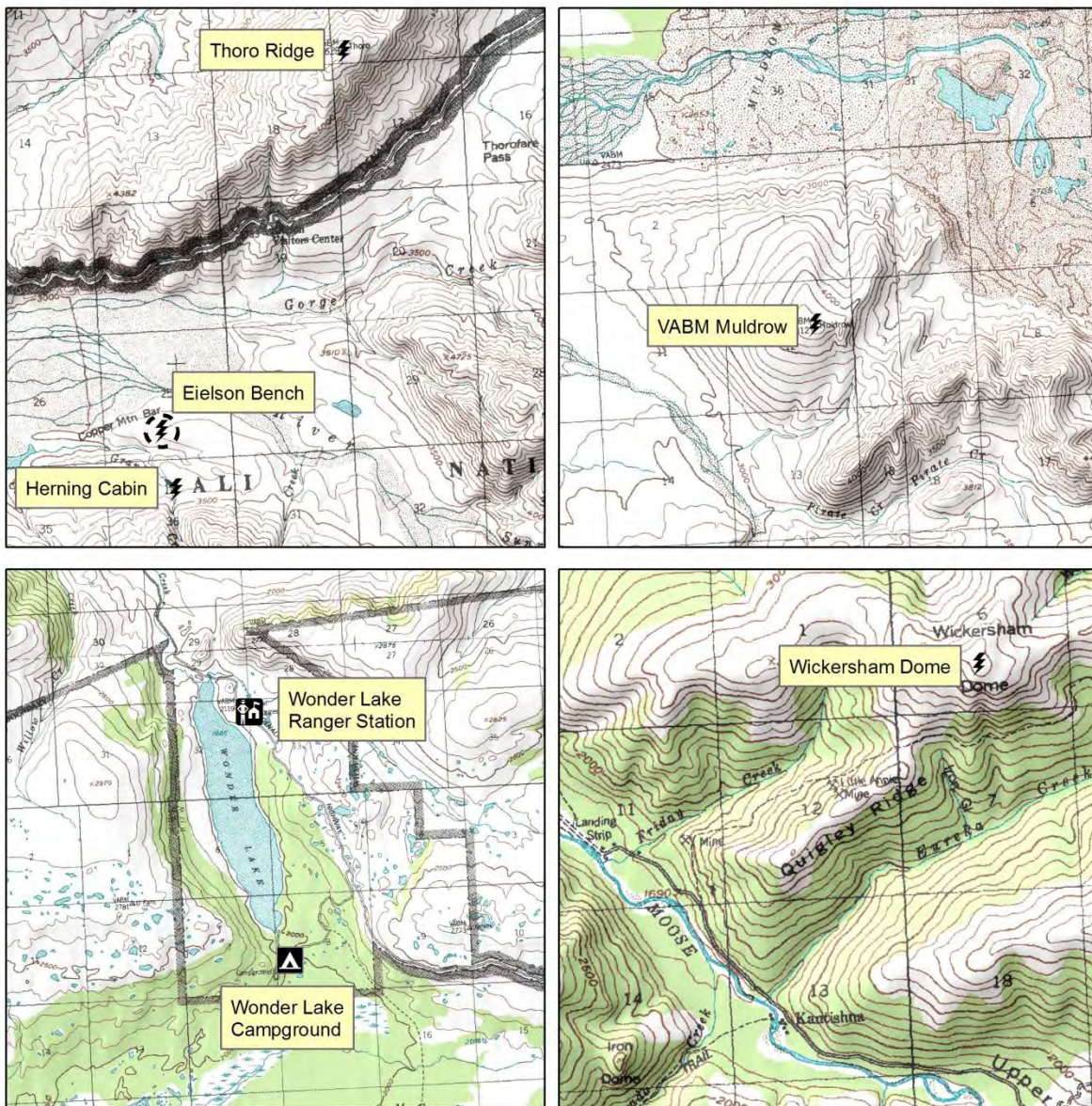


Figure 4
Four Southern Park Site Maps

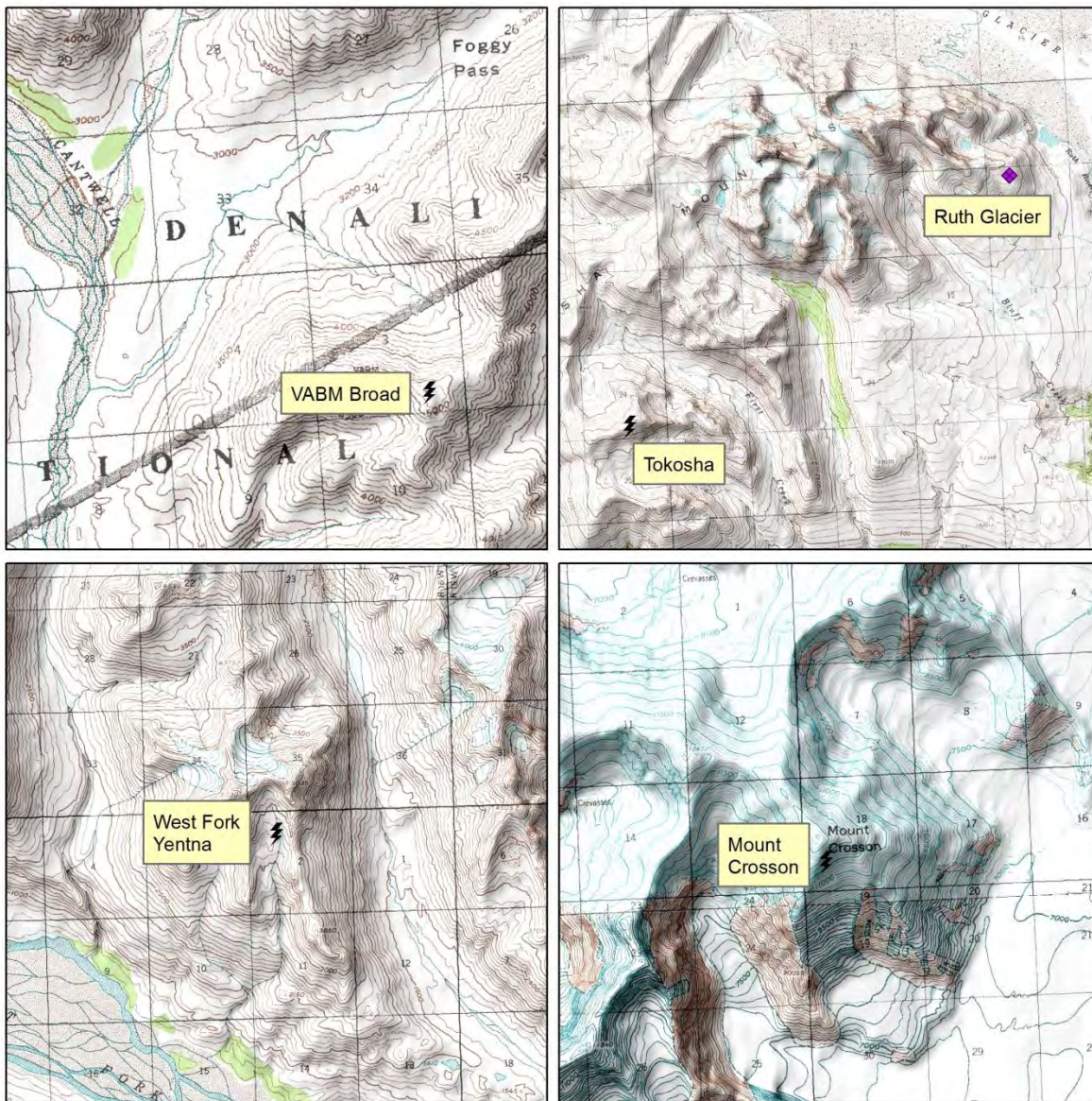


Figure 5
Proposed Weather Stations - Mt. McKinley

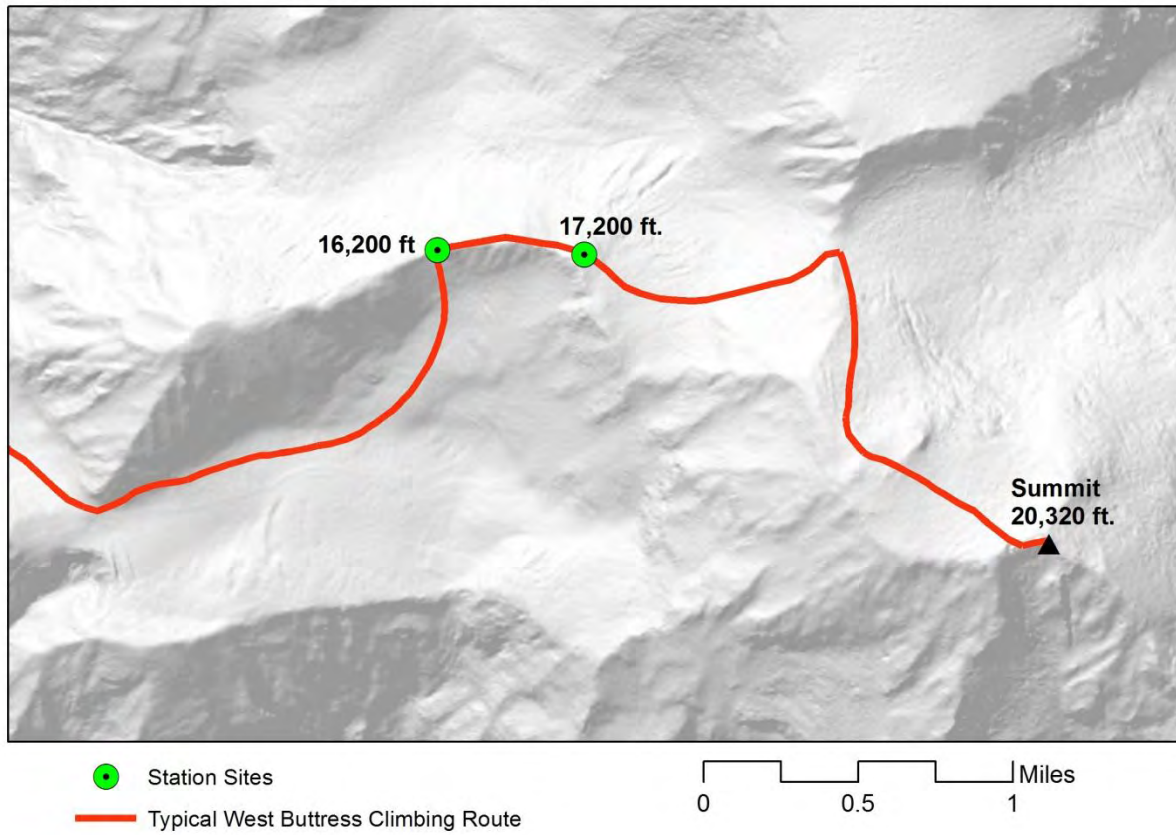
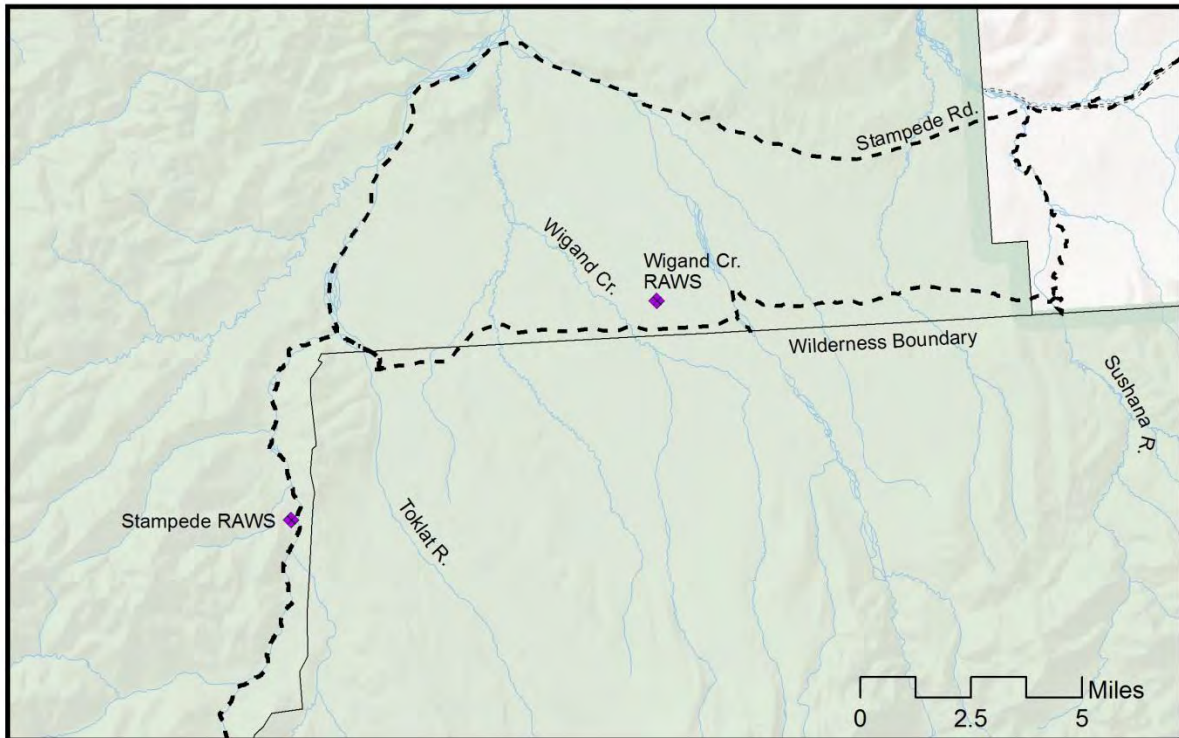


Figure 6 - Proposed Wigand Weather Station



Dashed lines are dog mushing trails.

Alternatives and Actions Considered But Eliminated from Detailed Study

New Intervisible Wireless Site near Thoro Ridge

This alternative would provide more power, new shelters, and taller antennas, as needed, to existing telecommunications sites described in alternative A. To make a line of sight wireless internet connection to the Eielson Visitor Center from the Thoro Ridge communications site, an antenna would need to be located near the edge of Thoro Ridge overlooking Eielson Visitor Center and a cable to the internet processing equipment in the shelter would be placed under the ground surface in conduit, which would be covered with alpine tundra and barren earth. Wireless test sites at Double Mountain and East Branch Ridge would be maintained. This alternative would provide a wireless connection to the Eielson Visitor Center, but that mast and antenna would be very visible from the park road and from the heavily used hiking areas around the visitor center.

Satellite Iridium Phones and Satellite VPN to Remote Locations

This alternative would use existing satellites for wireless internet communications to Toklat, Eielson VC, and Wonder Lake. The satellite technology available to Denali National Park and Preserve is provided solely through a DOI/NPS-wide NetworX contract administered by Verizon. At this point in time all NPS entities such as Parks are obligated to use the NetworX contract satellite provider to the exclusion of other providers of satellite services regardless of the technology. QOS (Quality of Service) voice testing conducted under the previous but similar contract administered by Tachyon revealed that VoIP phone service over the satellite was not usable. The audio was extremely choppy due to excessive jitter and fade. When combined with the unavoidable latency of satellite communication the quality of the audio was too poor to be considered as a viable operational solution. In addition the available speed/bandwidth of the satellite connection we are provided through the contract is 8 times slower on download and over 45 times slower on upload than the tested backhaul bandwidth. This would make it practically impossible to manage necessary multiple voice streams along with multiple data streams to perform meaningful work over the network even if the QOS issues could be resolved. The available bandwidth under the new contract is similar if not identical to the previous contract.

The sole reliance on satellite stations at Toklat, Eielson and Wonder Lake would eliminate future uses such as web-based interactive field classes which are made possible by the proposed backhaul repeater sites. For example, with proper equipment at the repeater sites researchers with near line of sight access to the repeater sites could stream video, audio and/or data in real time to internal or external websites for classroom or other educational/research activities of an interactive nature. Other possible uses are the placement of cameras and sensing equipment for data collection by the LTEM program.

At present the only viable alternative for reliable voice and data services for Toklat, Eielson and Wonder Lake are through the microwave repeater sites. In the future if the Park is allowed to choose satellite providers or if there is a way to provision the current service such that voice and data are possible then a satellite solution might be a viable alternative for those specific sites.

Two Environmental Assessments

The initial plan was to issue an environmental assessment for the proposed wireless repeaters and a separate environmental assessment for the proposed weather stations. Upon reflection it was decided that the installations potentially affected wilderness and cultural resources in similar ways and that it would be better to not “piecemeal” the public evaluation process.

Environmentally Preferable Alternative

Alternative 1 would be the environmentally preferred alternative because the least amount of technological equipment including antennas, instruments, power sources, and processors would be deployed on park lands. Also, because some communications and weather equipment would not be located at remote sites, fewer maintenance trips with helicopters would be needed over and onto park lands under alternative 1. The overall effect on park ecosystems and visitors would be less under alternative 1 than under the other alternatives.

Mitigation and Monitoring

Mitigations are specific actions that reduce impacts, protect park resources, and protect visitors. The following mitigations would be implemented with the project and were assumed in the analysis of effects.

Permits – Research permits are issued to UAF-GI and UNAVCO for five years, renewable upon a detailed project review. A Research Permit details the permitted station location, limits of installation, and use of the NPS facilities and other locations to safely manage fuel and landing of helicopters in the park. If any significant upgrades to the seismograph stations or new stations are proposed, then additional NEPA compliance would be required. The Research Permit would require annual investigator reports and annual coordination with the NPS for a helicopter schedule and flight paths. Similar stipulations would be required in a permit to UAF for installation of weather stations on Mt. McKinley.

Visual Resources - The huts and equipment towers would be painted to blend in with the site.

Cultural Resources – Each site would be visited and surveyed for cultural resources. If during construction, previously unknown archaeological resources were discovered, all work in the immediate vicinity of the discovery would be suspended until the resources could be identified and documented and, if the resources cannot be preserved *in situ*, an appropriate mitigation strategy would be developed in consultation with the State Historic Preservation Officer (SHPO) in accordance with NHPA and its implementing regulations (36 CFR 800.13). The Native American Graves Protection and Repatriation Act (NAGPRA) requires that if inadvertent discovery of Native American Remains or Objects occurs, activity must cease in the area of discovery, a reasonable effort made to protect the item(s) discovered, and immediate notice made to the Superintendent, as well as the appropriate Native American group(s) and SHPO.

The park is seeking a conditional “No Adverse Effect” determination in its Section 106 compliance for the proposal. The determination is conditional on having each existing and new site surveyed and no historic properties/adverse effects found at each site. This survey would be

conducted before installation at new sites or when the next scheduled maintenance is conducted at existing sites.

Wilderness – NPS and permittees would keep records of the number of helicopter trips used to install and maintain the radio, wireless, weather and seismic stations. To reduce visual impacts to park scenery, new shelter boxes and equipment towers would be painted to blend with the surrounding environment. To reduce the impacts to designated and eligible wilderness areas all existing and future telecommunications equipment would be co-located with NPS radio repeaters to the extent feasible, and generally within 100 feet. Examples of other equipment requiring telecommunications relays are seismometers, wireless internet sites, concessioner bus radio networks and GPS stations. When viable technological solutions for internet and voice communications become available that are not dependent on installations in wilderness, those installations would be removed.

Wildlife – The helicopters would fly using existing protocols to keep impacts to a minimum.

Visitor Use and Aesthetics -To reduce noise impacts on park visitors to the extent possible, helicopter operations would be conducted before and after peak summer visitation, particularly for access to sites near the Denali Park Road between June 15 and August 15.

Table 1 – Summary of Alternatives

	Alternative 1 – No Action	Alternative 2 – Keep Wireless Network, incl. VABM Muldrow, and two Weather Stations	Alternative 3 – Keep Wireless Network, incl. Eielson Bench, and three Weather Stations
Wireless Network	Remove microwave repeaters and test equipment	Keep wireless network for communication with remote sites.	Keep wireless network for communication with remote sites.
Internet and VoIP to remote sites	No.	Yes.	Yes
Upgrades to radio and seismic equipment as necessary.	Yes	Yes	Yes
Removal of wireless equipment at Herning Cabin	Yes	Yes	Yes
Wireless connection to Eielson Visitor Center	No	Site at VABM Muldrow	Site at Mt. Eielson Bench
Weather Stations	None new	Toklat Basin RAWs and at 16,200 feet on Mt. McKinley	Toklat Basin RAWs and at 16,200 and 17,200 feet on Mt. McKinley

Table 2 – Summary of Impacts

Impact Topic	Alternative 1 – No Action	Alternative 2 – Keep Wireless Network, incl. VABM Muldrow, and two Weather Stations	Alternative 3 – Keep Wireless Network, incl. Eielson Bench, and three Weather Stations
Vegetation and Soils	Reclaim 300 square feet with negligible impact.	Disturb 310 square feet with minor impact	Disturb 310 square feet with minor impact
Wildlife and Habitat	Negligible impact	Negligible impact	Negligible impact
Natural Soundscape	Short-term minor and no long-term adverse impact.	A minor adverse impact from continued helicopter use.	A minor adverse impact from continued helicopter use.
Cultural Resources	Minor beneficial from removing equipment from Herning Cabin.	Minor beneficial from removing equipment from Herning Cabin. Potential adverse impact on unknown archeological resources.	Minor beneficial from removing equipment from Herning Cabin. Potential adverse impact on unknown archeological resources.
Visitor Use and Aesthetics	Minor beneficial impact from removal of stations at three otherwise natural sites.	Minor adverse impact from new weather station on Mt. McKinley and keeping wireless stations at three otherwise natural sites. The VABM Muldrow site is rarely visited.	Minor adverse impact from two new weather stations on Mt. McKinley and keeping wireless stations at three otherwise natural sites. The Eielson Bench is used by dayhikers.
Wilderness	Minor beneficial impact from reclaiming otherwise undeveloped areas.	Moderate adverse impact by keeping installations at five otherwise undeveloped areas. Minor beneficial from utility of wireless system to help involve visitors and others in wilderness resource monitoring and research.	Moderate adverse impact by keeping installations at six otherwise undeveloped areas. Minor beneficial from utility of wireless system to help involve visitors and others in wilderness resource monitoring and research.

Park Operations	Moderate adverse effect by lowering the quality of life for staff at remote locations as well as making communications between staff and between staff and business contacts more difficult.	Moderate beneficial effect by connecting staff with park headquarters and by connecting real-time interpretation at remote sites with park visitors and others outside the park. Access to the VABM Muldrow site would be difficult with a helicopter. Ranger maintenance of Mt. McKinley weather station would be when available in area.	Moderate beneficial effect by connecting staff with park headquarters and by connecting real-time interpretation at remote sites with park visitors and others outside the park. Access to the Eielson Bench site would be relatively easy on foot. Ranger maintenance of Mt. McKinley weather stations would be when available in area.

AFFECTED ENVIRONMENT

Telecommunications Sites - General

The NPS converted all existing radio systems for Denali National Park and Preserve from analog to narrowband digital systems in 2005. Electronic equipment breaks down on occasion, new equipment is developed, and maintenance trips to the remote sites can be expected most years. Additional solar panels and batteries have been added to the shelters to supply adequate power for the new equipment. The NPS has replaced older radio repeater huts with new larger fiberglass shelters at the Mt. Healy and Savage repeater sites to protect the equipment. Solar panels are attached to anchored supports and the antennas are enclosed within some of the shelters to protect them from rime ice and other inclement weather. Wireless repeater equipment is also housed inside an equipment shelter, but a wireless internet antenna is mounted outside of the shelter because the wireless internet frequency does not transmit through fiberglass.

Existing Developed Communications Sites

All of these sites are in areas evaluated as not eligible for wilderness designation, with the exception of Base Camp, which is in designated wilderness. All of Denali's large mammals are possibly seen at the roadside developed sites at one time or another.

Park Headquarters – C-Camp

Park dispatch now serves as a 24/7 dispatch for all National Park Service units in Alaska. The ten meter tower with antennas and the offices are now located at C-Camp. Wireless facilities are also located at C-Camp and at Park Headquarters.

Savage River Check Station

The Check Station at Mile 15 is the initial site for enforcing restrictions on vehicle use on the park road. The Station has a radio base station and internet access may be added in the future.

Teklanika Field Camp

The Murie Science and Learning Center maintains a summer field camp near the Teklanika Campground at Mile 29 of the park road for education programs and permitted researchers and internet access is likely to be added in the future.

Teklanika Rest Stop

A repeater for the concessioner bus radio system is on the buildings at this site.

Toklat Road Camp and Rest Stop

The Toklat Road Camp at Mile 54 of the park road houses up to 60 employees in the summer and has a 3 meter tower for park radio relays. Equipment for internet access and two dishes for Tachyon and Verizon satellite transmissions (open internet and television) are attached to central buildings. Wireless repeater equipment in an electronics hut in camp allows internet and VoIP phone links to the outside world

Eielson Visitor Center

The Eielson Visitor Center at Mile 66 of the park road is open in summer and receives about 200,000 visits per year. The building has radio and wireless antennas and a satellite dish and cameras installed by the Federal Aviation Administration.

Wonder Lake Ranger Station

The Wonder Lake Ranger Station houses ranger staff and has radio and wireless antennas attached to outbuildings.

Wonder Lake Campground

The Wonder Lake Ranger Station does not have line of sight to the Wickersham Dome repeater, so a wireless transmission connection to the Wonder Lake Ranger Station requires a repeater at the south end of Wonder Lake. An antenna has been attached to a well house near the lake, but a new well was drilled on the hillside above the lake in 2012 and the well house near the lake has become excess. The new well house would need a remote antenna about 175 feet away from the well house, or some of the structures at the administrative site of the trailworker camp could be fitted with antennas and a new power source. This site is in an area evaluated as not eligible for wilderness designation.

Friday Creek Camp

This west end transient employee camp houses up to 20 researchers, resource management, and roads and trails staff. A wireless repeater hut in camp allows internet and VoIP phone links to the outside world.

Base Camp

Base Camp is at 7,200 feet elevation on the Northeast Fork of the Kahiltna Glacier. This site is both the landing strip and the tent encampment for Mt. McKinley expeditions and for ranger patrols on the mountain. Radio transmissions to and from this site are relayed through the Mt. Crosson repeater to Talkeetna.

Talkeetna Ranger Station

This site functions as a base station for the park and preserve lands on the south side of the Alaska Range. A radio connection to the park radio system at park headquarters is facilitated through a standard telephone service.

Existing Remote Communications Sites

These sites include existing and test sites, except for the proposed Eielson Bench and VABM Muldrow sites. The Healy Ridge and Wickersham Dome sites are in areas not eligible for wilderness designation. All other remote sites are found in designated wilderness except VABM Broad, Tokosha Ridge, West Fork Yentna, and Castle Rocks, which are in areas eligible for wilderness designation.

Healy Ridge

The Healy Ridge facilities were installed on a promontory above park headquarters at about 3,600 ft. elevation. Initial facilities may have been installed as early as the 1960s to support a single side-band radio system, and have been repaired, replaced, or improved almost every year since. Antennas for the park radio, wireless network, concessioner bus system and seismic networks are attached to three 7-10 meter towers. A hut houses electronics. Power is supplied by a 1977 era surface-laid one mile long cable that connects to the overhead powerline between the entrance area and C-Camp. The Healy Ridge power cable is to be replaced in 2013. This site is in a park area evaluated as not eligible for wilderness designation. All of Denali's large mammals are possibly seen at the site at one time or another.

Savage Ridge

The Savage Ridge radio repeater installation sits on a small flat spot on a spur ridge of the Healy-Savage ridgeline, at about 5,800 feet elevation. A hut is used to house the antennas, electronics and batteries, with the solar panels attached to a separate angled pole support. This repeater was installed in 1995 to connect with the park radio repeater at VABM Broad for coverage in the Cantwell-West Fork of Chulitna River area. This site is in designated wilderness. All of Denali's large mammals except moose and grizzly bears are possibly seen at the site at one time or another.

VABM Broad

The VABM Broad radio repeater installation is at 5,300 feet elevation and was installed in 1995 at the site of a 1950s era U.S. Coast and Geodetic Survey Vertical Angle Bench Mark (VABM or

Bench Mark). The VABMs are permanent survey monuments and usually included a central vertical rebar and cap, usually pounded into the ground or supported by a rock cairn, and partnered with witness caps. The facility consists of one hut which is used to house the antennas, electronics and batteries, with the solar panels attached to the south outside wall. This site is in a park area eligible for wilderness designation. All of Denali's large mammals except moose are possibly seen at the site at one time or another.

Double Mountain

A seismic repeater site at 5,200 feet elevation on the Northeast Knob of Double Mountain was chosen in 2003 to relay seismic data at 900 MH from the University of Alaska Geophysical Institute seismometer on Thoro Ridge to Healy Ridge and thence to telephone lines and to the University. The site has a small hut housing an internal antenna, electronics and batteries, and has solar panels attached to the south side of the hut. Rock walls are fairly vertical surrounding the flat knob, and the site is only accessible by helicopter. This site has line of sight topography problems in seeing Healy Ridge and East Branch Ridge on the 5.4 GH wireless frequency band. This site is in designated wilderness. Dall sheep may visit the site but it is unlikely that other large mammals have ever gotten to this flat outcrop of bedrock.

A test site for a wireless repeater was placed on the top of Double Mountain in 2008 at 5,900 feet elevation. This site can see Healy Ridge, East Branch Ridge and Thoro Ridge on the wireless frequency. This site is in designated wilderness. Grizzly bears and Dall sheep have been observed in the saddle between the two peaks, but the test site is on exposed rocks at the top.

East Branch Ridge

A test site for a wireless repeater was placed on the top of the East Branch Range in 2008 at 5,500 feet elevation. This site can see Double Mountain and Thoro Ridge on the wireless frequency and has a direct line of sight to the Toklat Road Camp. The site is located on amethyst mining claims which were worked during the 1970s, though there is only evidence of surface collection. This site is in designated wilderness. All of Denali's large mammals except moose are possibly seen at the site at one time or another.

Thoro Ridge

This is the second most important site for park radio communications. The Thoro Ridge facilities were installed on the high point of the ridge behind the Eielson Visitor Center at about 5,600 ft. elevation. Initial facilities may have been installed as early as the 1960s to support a single side-band radio system, and have been repaired, replaced, or improved almost every year since. Antennas for the park radio, wireless network, concessioner bus system and seismic networks are attached to a 10 meter tower. A hut houses the batteries and electronics. UAF installed a seismometer about 200 feet away from the radio repeater tower in 1982, including a buried cable from the seismometer to the tower. This site is in designated wilderness. All of Denali's large mammals except moose are possibly seen at the site at one time or another.

Herning Cabin

A test site for a wireless repeater was placed in the back of the Herning Cabin ruins on the northern slopes of Mt. Eielson in 2009 at 3,300 feet elevation. This site was chosen because Thoro Ridge cannot see the Eielson Visitor Center, but the Herning Cabin can see both; the

equipment generally cannot be seen until one is near the cabin; and the site can be accessed by hiking. There are three main problems with this site: 1) the site has been evaluated as eligible for the National Register of Historic Places and the presence of the wireless repeater equipment in the cabin is adversely affecting the cabin. 2) The cabin logs and remaining roof parts continue to settle and do not provide a stable platform for supporting and hiding the equipment. All of Denali's large mammals are possibly seen at the site at one time or another.

Wickersham Dome

The broad top of Wickersham Dome has been the site of radio and telephone repeaters since at least 1981. A rough road to the top preceded ANILCA, when the Kantishna Hills area was added to Denali National Park. A seismometer was installed about 250 feet away from the huts in 1988 by UAF-GI, and a PBO GPS station was installed in 2008. Currently there is a three meter tower with antennas, three huts with electronics and batteries, and three sets of solar panels. A radio repeater, wireless repeater, and seismic relays are at the site. This site is in a national park area evaluated as not eligible for wilderness designation. All of Denali's large mammals are possibly seen at the site at one time or another.

Tokosha Ridge

This radio repeater site sits on a narrow ridge at 4,800 feet elevation and was put into service in 1995. A single hut houses the batteries, electronics and antenna, with the solar panels mounted on the south side. A PBO GPS facility was completed at the site in 2008. This site provides a relay between the Talkeetna Ranger Station and many of the peaks and valleys and climbing areas on the south side. This site is in a park area eligible for wilderness designation. It is likely that only grizzly bears of Denali's large mammals are seen at the site at one time or another.

Mt. Crosson

This radio repeater is seasonally placed at 12,800 feet elevation to provide radio coverage for additional areas on Mt. McKinley and Mt. Foraker during the main climbing season (April 1 – Mid July). The equipment consists of a stack of two "action packer" type boxes, with the antenna attached to the larger box and the solar panel extending from the upper smaller box. The boxes are fixed to the snow by snow pickets. The repeater is removed after each climbing season. This site is in designated wilderness. None of Denali's large mammals would be seen at this snow-covered site.

West Fork Yentna

This radio repeater is similar to one at Tokosha and the site is at 3,800 feet elevation and is used to provide radio coverage in the Cathedral Spires or Southwest National Preserve area, especially during hunting season. This site is in a national preserve area eligible for wilderness designation. All of Denali's large mammals are possibly seen at the site at one time or another.

Castle Rocks

A new seismometer, electronics hut, solar panels and antenna was installed by UAF-GI on the Castle Rocks ridgeline in 2006. Data is relayed by broad band digital radio signals through the Wickersham Dome repeater site. This site is in a national preserve area eligible for wilderness designation. All of Denali's large mammals are possibly seen at the site at one time or another.

VABM Muldrow

This site has been proposed as a wireless repeater site. The VABM is at 4,300 feet elevation, is west of the 90 degree bend in the Muldrow Glacier, and is about 15 degrees north of a direct line of view between the Eielson Visitor Center and Mt. McKinley. This site is in designated wilderness. All of Denali's large mammals except moose are possibly seen at the site at one time or another.

Mt. Eielson Bench

This area has been proposed as a wireless repeater site. The Mt. Eielson Bench includes an alpine meadow area between the Herning Cabin and the Thorofare River valley that has depressions large enough to hide an electronics hut and solar panel array from visitors at the Eielson Visitor Center. The small antennas would be above general ground level. This site is in designated wilderness. All of Denali's large mammals are possibly seen at the site at one time or another, though moose would be uncommon.

Existing Weather Station Sites

All of these weather station sites are in areas found not eligible for wilderness designation except for the Mt. McKinley sites in designated wilderness and the Ruth Glacier, Wigand Creek, and McKinley River sites in areas eligible for wilderness designation.

Park Headquarters

This National Weather Service weather station has been on site since 1925. Instruments are enclosed in a small fenced area. No wind data is taken.

Headquarters Air Quality Site

In addition to taking air quality measurements, the station tower takes standard meteorological measurements via instruments on a 6 meter tower. Data loggers are enclosed in a heated hut that has fiber optic and electricity connections.

Rock Creek Upper and Lower

Two RAWS are located at different elevations in the Rock Creek Long Term Ecological Monitoring site just uphill from park headquarters.

Denali Visitor Center

A RAWS has been installed at the new Denali Visitor Center in the park entrance area.

Stampede Airstrip

A RAWS was installed at the Stampede Airstrip in 2007.

Toklat Road Camp

A RAWS was installed at Toklat in 2005

Eielson Visitor Center

A RAWS was installed at the new Eielson Visitor Center in 2008

Wonder Lake Ranger Station

A RAWS was installed at the ranger station in 1988

Kantishna

A SNOpack TELelemetry (SNOTEL) site was established in Kantishna in 1990. This site only measures snow depth, at a site that gets less wind than many sites along the park road.

McKinley River

A RAWS was installed on a low bench off of a slough of the McKinley River in 1988.

Dunkle Airstrip

A RAWS was installed adjacent to the Dunkle Airstrip in 2000.

Ruth Glacier

A RAWS was installed in the Tokosha Mtns. overlooking the Ruth Glacier in 1995.

Wigand

A RAWS was installed at this site in 2000 and removed in 2007.

Mt. McKinley

A weather station was attempted at Denali Pass (18,700 elevation) starting in 1990 by the Japan Alpine Club. No wind-measuring instruments survived and by 2008 all the equipment had been removed.

Cultural Resources

There are 297 known cultural resource sites within Denali's boundaries, including both prehistoric and historic sites. Because cultural resource inventories have been limited to date, this number likely represents a small fraction of the park's total sites. While less than 1% of DENA has been surveyed for archeological sites, the known sites in the park show a rich archeological record that dates from the Younger Dryas (13,000 years ago) to the historic mining era.

Denali is viewed by many as untouched wilderness, but it has been home to people from the end of the last glaciation up to the present day. Known resources include archeological and historic sites associated with Athabascan Indian groups, early explorers, mining history, and the early days of the park. Major prehistoric sites in the park include the Teklanika Archeological District, a property listed on the National Register of Historic Places. Many historic structures are in the park headquarters area, which is listed on the National Register of Historic Places as a District, and on the boundaries of the Denali Wilderness (along the original park boundary). These are mainly patrol cabins and other structures dating back to early years of park management. Historic mining activity dates back to the early 1900s in the Kantishna Hills (which includes the national register-eligible Kantishna Historic District), the Stampede area, and the Dunkle Hills near Cantwell.

The State Historic Preservation Officer has a policy to encourage archeological surveys of project sites when an earlier survey of the area is more than ten years old.

Wilderness

The Wilderness Act of 1964 (P.L. 88-577) describes wilderness as an area “untrammeled by man...retaining its primeval character and influence, without permanent improvements of human habitation... [with] outstanding opportunities for solitude or a primitive and unconfined type of recreation...[which] may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.”

ANILCA designated 2.1 million acres of the former Mount McKinley National Park as wilderness in 1980. The 1986 GMP found all of the rest of DENA eligible for wilderness designation except the park entrance area, the Denali Park Road Corridor, inholdings, and the Kantishna and Stampede Mining Districts.

ENVIRONMENTAL CONSEQUENCES

This section describes the methods and assumptions used to analyze impacts for issues and resource topics. It includes definitions of impacts in terms of geographic extent (space), duration and frequency (time), and intensity (a combination or multiplication of space and time factors). Impact thresholds (negligible, minor, moderate, and major) for the various resource topics and issues are described in terms of effects in space and time and the intensity of those effects. The analysis assumes mitigation measures would be followed for both action alternatives.

Geographic Extent of Impact (Space Factor):

Localized – Impacts would affect the resource area only at the project site or its immediate surroundings, and would not extend throughout the park or into the region.

Park/Regional – Impacts would affect the resource throughout the park, extending well past the immediate project site, or would have regional effects in the park and surrounding areas.

National – Impacts would affect the resource on a national level, such as a rare, threatened or endangered species, or set a national precedent.

Duration and Frequency of Impact (Time Factor):

Temporary – Impact would occur only during the site preparation and construction phases. Once construction has ended, resource or public service conditions are likely to return to or exceed the environmental quality preconstruction conditions.

Short-term – Impact would extend past the construction phase, but would last no more than a couple of years, at most, or the interruptions to the resource or public service function would be for short periods each year, a few days at most.

Long-term – Impact would likely last more than a couple of years, over the lifetime of the installations or permanently, and the disruptions to the resource or public service function would be nearly constant.

Intensity of Impact (Space X Time):

Negligible – Minimal (temporary and localized) or no impact on the resource or public service; any change to the resource or public service is not noticeable or measurable.

Minor – Change in a resource or public service occurs, but no more than a short-term and localized or temporary and park-wide effect on the resource or public service results; the change in the resource or public service is perceptible and measurable, but the condition or appearance of the resource remains.

Moderate – Noticeable and measurable change in a resource or public service occurs, but the effect would be no more than short-term and park-wide or long-term and localized. The condition or appearance of the resource would be altered, but the integrity of the resource remains intact.

Major – Substantial impact or change in a resource or public service occurs, which is easily defined, highly noticeable, and measurably alters the condition or appearance of the resource or public service. The effect would be at least long-term and park-wide or short-term and national in scope.

Cumulative Impacts

A cumulative impact is an impact on the natural or human environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of which agency, organization, or person undertakes such other actions (40 CFR 1508.7). Cumulative impacts can result from individually minor and insignificant, but collectively significant actions, taking place over a period of time. Cumulative impacts were assessed by combining the potential environmental impacts of the alternatives with the potential impacts of known projects that have occurred in the past, are currently occurring, or are projected to occur in the future within the region. Known past, current, and reasonably foreseeable future projects and actions in the vicinity of the project site are described below.

Past and Ongoing Projects and Actions

Past and present backcountry installations outside of roadside developed areas in the park and the backcountry sites discussed in the alternatives include RAWs along the McKinley River almost 25 miles northwest of Kantishna, at the Stampede Airstrip east of the Kantishna Hills, at the Dunkle Hills Mine Airstrip south of the Alaska Range, and above the lower end of the Ruth Glacier. None of these installations are in designated wilderness, though all but the Stampede Airstrip installations are lands eligible for wilderness designation. These stations provide meteorological data for the fire management program and for climate monitoring.

Numerous VABMs were established on hill and mountain tops in the early 1950s to allow the federal mapping agencies to use survey triangulation to establish known elevations for mapping purposes. Virtually all of these VABMs still exist and many are in designated or eligible wilderness.

Helicopters and fixed wing aircraft operations would continue over the park for ongoing flight seeing and park research, monitoring, surveillance, and remote facilities maintenance. As part of a trial suggested by the Denali Aircraft Overflights Advisory Council, aircraft operators were encouraged in 2012 to operate directly over the park road corridor (though higher than previously) during the busy summer visitor season to see if that would reduce complaints from backcountry users about backcountry overflights. Snowmobile uses in the 1980 park and preserve additions have increased in recent years and would continue into the future, pursuant to the Denali Backcountry Management Plan.

Research activities vary from year to year but in the higher country may include UAF geology fieldwork in the Polychrome area every other summer, physiological research with mountain climbers on Mt. McKinley, ground-based sheep counts, putting replacement monitoring collars on wolves, caribou, moose and bears, and golden eagle and other large raptor research.

Alternative 1 – No Action

Vegetation, Wetlands and Soils

No additional adverse impact to vegetation, wetlands and soils would occur under the no-action alternative. The test site equipment at Healy Ridge, Double Mtn., East Branch Ridge, Thoro

Ridge, the Herning Cabin, and on Wickersham Dome would be removed. Healy Ridge and Thoro Ridge wireless equipment is stored in existing huts or attached to existing antennas. Removal of the huts and solar panel supports from the other wireless test sites would allow about 300 square feet of soils and dry alpine vegetation to be restored to natural conditions. No weather stations would be removed and no new ones would be installed. No wetland vegetation would be impacted. Because of the vast acreage of alpine soils and vegetation in the park, this alternative would have a negligible beneficial impact on those resources.

Cumulative Effects: The existing radio repeater sites and similarly-sized weather stations within the park and preserve have affected similar small-sized plots, with a total footprint of approximately one acre. The effects from VABM establishment 60 years ago are relatively unmeasurable today. Continuing resource management and research has had little effect on vegetation and soils, and non-helicopter vehicle use in the backcountry – dogsleds and snowmachines in the winter in some areas – does generally not occur without a sufficient snow cover and does not affect much alpine area. The cumulative effects on park alpine tundra vegetation and soils would be minor relative to the area of these vegetation types within the park and preserve and this alternative would contribute a negligible beneficial impact.

Conclusions: The no-action alternative would have a negligible beneficial effect on park alpine tundra, wetlands and soils due to the very small acreage involved.

Wildlife and Habitat

Minimal additional adverse impact to wildlife or habitat would occur under the no-action alternative. The test site equipment at Healy Ridge, Double Mtn., East Branch Ridge, Thoro Ridge, the Herning Cabin, and Wickersham Dome would be removed. Helicopter access to the sites could disrupt nearby raptor nesting, but the nests are generally known and flight paths would be altered accordingly. Healy Ridge and Thoro Ridge wireless equipment is stored in existing huts or attached to existing antennas. Removal of the huts and solar panel supports from the other wireless test sites would allow about 300 square feet of alpine wildlife habitat to be restored to natural conditions. Because of the vast acreage of alpine soils and vegetation in the park, this alternative would have a negligible beneficial impact on wildlife.

Cumulative Effects: Installations for radio repeater and meteorological equipment within remote areas of the park and preserve have affected numerous very small-sized plots. The Healy Ridge and Thoro Ridge sites each have disturbance scattered over ¼ acre, though the other radio repeater sites use much less ground. The Dunkle and Stampede sites are on lands disturbed by airstrip development and the other two sites near the McKinley and Ruth rivers affect about 100 square feet of low riparian and dry alpine habitat respectively. The effects from VABM establishment 60 years ago are relatively invisible today. When combined, these sites impact less than one acre of habitat. Helicopter operations for installation and maintenance of these sites have had and would continue to create short-term noise disturbances to alpine wildlife such as Dall sheep, caribou, grizzly bears, wolves, and other species. Resource management and research flights can also result in short-term displacement of wildlife, though they are careful to limit impacts to the target species for the flight, e.g., for collaring operations. Flightseeing and administrative flights over the park operate under a Federal Aviation Authority advisory to not fly below 2,000 feet above ground level in noise-sensitive areas. The cumulative effects on

wildlife and wildlife habitat would be minor relative to the vast acreage of similar habitat within the park and preserve and this alternative would contribute a negligible impact.

Conclusions: The no-action alternative would have minimal impacts on wildlife and habitat, with mitigation measures to avoid critical bird nesting and migration periods. There would be negligible beneficial impacts to wildlife from the removal of the test wireless equipment.

Natural Sound Environment

Helicopters would be used for removal of test equipment at Healy Ridge, Double Mtn., East Branch Ridge, Thoro Ridge, the Herning Cabin, and on Wickersham Dome. Helicopters produce loud, pulsating, mechanical noises that would disrupt natural sounds in the park. Equipment removal at the sites retained as radio repeaters ties would be accomplished during normal maintenance of the radio equipment. The natural soundscape would be intruded for flights on three to four days to remove equipment at Healy Ridge, Double Mountain, East Branch Ridge, the Herning Cabin and Wickersham Dome. The proposed use of helicopters to remove the test equipment at the three wireless sites would have a short-term minor adverse impact to the sound environment of the area

Cumulative Effects: Other effects to the soundscape in the project area would be from military, passenger jet, or small aircraft overflights and from helicopters operating in the area during firefighting season, for park inventory and monitoring activities, and for annual maintenance of existing park radio repeaters, existing seismometers and repeater sites, and remote automated weather stations. Aircraft flightseeing is somewhat weather dependent but can reach as high as 60 flights per day over the alpine areas of the Old Park. Another six to eight administrative flights are possible on any one day, though there are summer days without administrative flights and an average day might have two such flights. Flightseeing and administrative flights over the park operate under a Federal Aviation Authority advisory to not fly below 2,000 feet above ground level in noise-sensitive areas. The additional noise intrusions from helicopter access to remove the five wireless repeaters in remote areas would not likely exceed current natural sound conditions. The cumulative effects on park soundscape would be moderate given the amount of air traffic possible on any one day during the summer and this alternative would contribute a minor impact to that total.

Conclusions: The proposed use of helicopters to remove the test equipment at the five wireless sites would have a short term minor adverse impact and no long-term impact to the sound environment of the area.

Cultural Resources

Removal of wireless test equipment from the remote sites would have a minor beneficial effect on cultural resources because the solar panels, antennas and boxes of electronics are adversely affecting the Herning Cabin, which has been determined eligible for the National Register of Historic Places. Removal of test equipment from Healy Ridge and Thoro Ridge would not impact cultural resources because the equipment is hung or stored on towers or in huts that would remain. Further site surveys may potentially identify ongoing adverse effects if those towers or huts were located on archeological sites. Removal of isolated test equipment from

Double Mtn., East Branch Range and Wickersham Dome might benefit currently unknown cultural resources.

Cumulative Effects: Most of the existing radio repeater and seismic installations share the factors of being located on high elevation exposed sites that are not-easily accessed. However, hunting and lookout sites are the most common site types in Alaska and the likelihood of finding archeological sites at those locations is medium to high (P. Gilbert, Pers. Comm.). The Northeast Knob of Double Mtn. is considered to be inaccessible except by helicopter. A limited archeological survey of the Castle Rocks seismometer site did not find cultural resources. The Dunkle and Stampede weather station sites are on lands disturbed by airstrip development and the Ruth Glacier RAWS site is similar to the repeater sites in its exposure and accessibility. The McKinley River RAWS site is on a floodplain bench that likely has seen repeated flooding over the past 50 years, which would remove any evidence of prior cultural usage. The VABMs were established 60 years ago and consist mostly of the nest of three survey markers, though some artifacts reflecting overnight occupation can be found at a few sites. The Thoro Ridge, Healy Ridge, and Wickersham Dome sites could have been used as observation points in the past but investigations for archeological resources were limited. No cultural resources were found during the Broad VABM and West Fork of the Yentna site Section 106 documentation, though it is not clear at this time if a full archeological investigation was done. The Tokosha Ridge site was likely not investigated for archeological resources. The cumulative effects on cultural resources in the areas occupied by these sites would be potentially moderate given the medium to high likelihood that cultural resources have been affected by past or present activities other than the installation at the Herning Cabin, and this alternative would contribute a minor beneficial impact to that total by removing the equipment from the Herning Cabin.

Conclusion: The removal of wireless test equipment at Healy Ridge and Thoro Ridge would have no impact on known cultural resources. The removal of wireless test equipment from Double Mtn., East Branch Ridge, Wickersham Dome, and the Herning Cabin site would have a minor beneficial effect on cultural resources in the area.

Visitor Use and Aesthetics

Removal of wireless test equipment at Healy Ridge, Double Mtn., East Branch Ridge, Thoro Ridge, the Herning Cabin, and on Wickersham Dome Sites would have a minor beneficial effect on visitor use and aesthetics. The wireless equipment at the existing radio repeater sites is somewhat indistinguishable from the radio or seismic huts, antennas, etc., and removal would have no effect on visitor use or aesthetics. Removal of the equipment at the wireless-only test sites (Double Mountain, East Branch Ridge, and Herning Cabin) would restore for the public a higher level of discovery to those sites. The East Branch Ridge site is easily reached in a two hour hike from the park road and provides excellent views and route-finding potential. The top of Double Mountain is a high-quality hiking destination, with river crossings, route-finding, a 3,000 foot elevation gain and craggy but safe peak exposure. The Herning Cabin is on an alpine meadow within a two-three hour hike from the Eielson Visitor Center and is representative of the extended efforts that mineral prospectors would go to in isolated areas.

Equipment shelters, solar panels and antennas all affect site visibility and scenic qualities in the area. The solar panels could generally be seen from greater distances except that only at the

Herning Cabin would there be likely areas from which to see them. Since they face south, toward the Alaska Range, the high elevation Double Mountain and East Branch Ridge solar panels can be seen from very little hikeable area aside from at the site itself. Removal of the equipment at the three wireless-only test sites would restore the natural scenic quality at these sites.

Removal of the wireless system would reduce opportunities to transmit real-time research from remote areas to staff, park visitors and others around the world.

Cumulative Effects: Similar installations for radio repeater, seismic and meteorological equipment within remote areas of the park and preserve have affected visitor use in varying ways. Some of the existing sites are more accessible than others. The Castle Rocks, Tokosha, VABM Broad, McKinley River, Ruth Glacier, West Fork Yentna and Northeast Knob of Double Mtn. would have zero visitors in an average year. The Savage Ridge site may see a limited number of visitors per year, and the Healy Ridge site may see few visitors, though most non-park employees would explore the parallel ridge on the nearby Healy Overlook Trail. The Wickersham Dome and Thoro Ridge sites would both see occasional visitation on a few summer days due to their accessibility from either the Lodges in Kantishna or the Eielson Visitor Center. Visitation to other remote sites in the backcountry that have had some development, such as the VABMs, would depend on the accessibility.

Conclusions: The no-action alternative would result in a minor beneficial impact to visitor use and aesthetics by restoring for the public a higher level of discovery and natural scenic quality at these sites, though there would be reduced opportunities to transmit real-time research from remote areas to park visitors.

Wilderness

Three of the wireless test sites to be removed are in designated wilderness. Removal of the equipment and reclamation of any ground disturbance at those sites would restore the undeveloped quality of wilderness at the sites as well as enhancing the solitude and natural qualities at the sites. There would be no impact to the untrammeled quality of wilderness at the sites. At the Thoro Ridge site in designated wilderness wireless equipment would be removed, but there would be little change to the site given the other radio and seismic installations already there and wilderness values would be negligibly affected. The Healy Ridge and Wickersham Dome wireless test sites are in areas found not eligible for wilderness designation.

Cumulative Effects: Three permanent communications and seismometer sites already exist within the designated Denali Wilderness, and are located on Thoro Ridge, at the Northeast Knob of Double Mountain, and at Savage Ridge. The Thoro Ridge site was established before ANILCA designated the Denali Wilderness. The park permitted a seismometer data relay station to be installed on the Northeast Knob of Double Mountain in 2001 after the in-park seismometer data transmission was upgraded from analog to a digital system and required a repeater between the seismometer on Thoro Ridge and the repeater on Healy Ridge. The Savage Ridge Repeater was authorized in 1995 to provide a connection to the VABM Broad repeater, which provided park radio coverage in the Cantwell area. The Mt. Crosson temporary repeater site is in designated wilderness and was selected to provide a radio connection to the climbing base camp.

That repeater sits on a snow platform during the climbing season for Mt. McKinley. The Herning Cabin wireless test site is also located in designated wilderness but would be removed under this alternative. The three other permanent remote communications sites which occur within the 1980 park additions and are in areas eligible for wilderness and proposed by the NPS for future wilderness designation are at VABM Broad, Castle Rocks, and Tokosha. The West Yenta River radio repeater is in the preserve, which is also eligible for future wilderness designation. The NPS has weather stations on the McKinley River and overlooking the lower Ruth Glacier in areas within the park additions eligible for wilderness designation. These installations would not prevent the areas from being established as wilderness pursuant to the Wilderness Act.

These communications sites and facilities in designated and eligible wilderness are considered necessary to meet minimum requirements for the administration of the area to preserve wilderness. The radio system supports essential safety and protection communications for all rangers, researchers, resource managers and other staff in the field, including those that patrol in popular mountain climbing areas. The seismic data gathered at the wilderness sites has been determined to be critical for predicting earthquakes in the area and providing a margin of safety for park users. There has been a moderate adverse impact to wilderness resource values from the installations and helicopters used to support park research and administration. This alternative would reduce that impact because helicopters would be used short term to remove test site facilities but not used long term to maintain the wireless repeater sites.

Conclusions: The no-action alternative would have a minor beneficial impact on wilderness by removing and reclaiming three wireless test sites in the designated Denali Wilderness, but removal of the wireless system would reduce the park's ability to internally communicate and carry out critical administrative function. Three to five days of helicopter flights would be necessary to remove the equipment.

Park Operations

Removal of the test wireless network would stunt some park operations, put more administrative vehicles on the park road, and diminish living conditions for staff at the remote locations. Park operations that would be affected include day-to-day phone calls and data transmissions between staff at remote locations and supervisors at park headquarters. Instructions on complex maintenance actions that could be sent by wireless would require having to travel the park road to get or receive the instructions. Interpretive presentations from remote sites could be seen and responded to in real time using the wireless capability. Staff at Toklat, Wonder Lake, Friday Creek and the Eielson Visitor Center would lose VoIP capabilities for work and off-duty activities. Living conditions for staff are made more 21st century by having the ability to connect to friends and family via email or VoIP.

Cumulative Effects: The park radio system is used mostly to report and monitor ranger patrol actions along the park road corridor and other areas of coverage. The Communications Center has taken on the responsibility to providing radio coverage for other park units in Alaska – and such radio traffic must be limited to primarily visitor protection issues. The radio traffic is one-way at a time and can be very congested during search and rescue, traffic stop and similar efforts. This system is functionally separate from private phone calls and of course would not transmit more than verbal data. A satellite dish at the Toklat Road Camp provides access for

television and email. Satellite phones are sometimes used on patrols in areas remote from radio system coverage, though the usage is expensive and unreliable. There is a long record of weather stations in developed areas of the park. More recently installed stations in the backcountry cover conditions in some of the backcountry landscapes and the data would be used in showing the progress of climate change. The cumulative effects of existing telecommunication systems and weather stations on park operations is moderate and beneficial. The no-action alternative would contribute a moderate negative impact to that capability.

Conclusion: Removal of the test wireless repeater installations would have a moderate impact on park operations by requiring west end staff to communicate with supervisors, order parts, receive training and deal with family business by leaving the work site and travelling the park road to headquarters in order to carry out their business. The additional isolation of staff at the remote worksites, relative to the communication capabilities in the outside world, would lead to a higher rate of staff turnover which would adversely affect the maintenance and operation of the park and service given to visitors.

Alternative 2 – Weather Station on Mt. McKinley, Toklat Basin, and Completing the Wireless Network of Sites Including VABM Muldrow

Vegetation, Wetlands and Soils

Little additional impact to vegetation, wetlands and soils would occur under alternative 2. Soils are rocky at the repeater sites and the alpine vegetation is sparse. The Mt. McKinley weather stations site is on bedrock surrounded by ice and snow. The Toklat Basin RAWs would impact about 10 square feet of sedge-covered wetlands within the 200 square foot area within the electric fence. Wireless repeater sites would be established at Double Mountain, East Branch, and Muldrow VABM. Wireless repeater equipment would be removed from the Herning Cabin. The seismic repeater station at the Northeast Knob of Double Mountain would be moved to the top of Double Mountain to co-locate with the wireless repeater equipment, and the Northeast Knob site would be reclaimed as necessary. To level the sites for the huts and to place guy anchors, the new sites would potentially disturb about 100 square feet of dry alpine vegetation and soils each at the three new sites. The alpine vegetation at the nearby helicopter landing sites would also be crushed up to once per year. The effects on park alpine tundra vegetation, wetlands and soils would be minor relative to the hundreds of thousands of acres of these vegetation types and soil types within the park and preserve.

Cumulative Effects: The existing radio repeater sites and similarly-sized weather stations within the park and preserve have affected similar small-sized plots, and the effects from VABM establishment 60 years ago are relatively invisible today. Continuing resource management and research has had little effect on vegetation and soils, and non-helicopter vehicle use in the backcountry – dogsleds and snowmachines in the winter in some areas – does generally not occur without a sufficient snow cover and does not affect much alpine area. The cumulative effects on park alpine tundra vegetation and soils would be minor relative to the area of these vegetation types within the park and preserve and this alternative would contribute a minor impact.

Conclusions: The proposed disturbance to 300 square feet of alpine vegetation from the new wireless repeater installations and 10 square feet of sedge wetlands would have a minor effect on park tundra vegetation.

Wildlife and Habitat

Helicopter access to the three new repeater sites and the Toklat Basin RAWS could disrupt nearby raptor nesting, but the nests are generally known and flight paths would be altered accordingly. Bears and small mammals could visit alpine sites with communications equipment and be attracted to and damage wires, solar panels, and other equipment, but little damage has been noticed to similar existing high elevation sites. No impact is expected to mammals at the Toklat Basin site and the electric fence would limit impact from mammals. Dall sheep habitat at Double Mtn. and East Branch Ridge would likely be displaced during maintenance visits but that displacement would be temporary and limited. The new wireless sites would have most of the equipment and batteries inside a small metal hut, and although the antennas would be placed externally on the hut or on short attached poles it is unlikely that the sites would interfere with or attract wildlife habitat usage. Antennas at the Herning Cabin test site were damaged by bears, but that site is relatively flat, fully vegetated, and easily accessed. The VABM Muldrow site, though relatively low in elevation for a repeater site, does not provide favored habitat for any of the large mammals because of a lack of escape terrain and a low concentration of edible plants. The micro amount of habitat at the Toklat Basin site is the same at that for miles in most directions from the site and the loss would be negligible. There is no habitat at the 16,200 foot level on Mt. McKinley.

Cumulative Effects: Similar installations for radio repeater and meteorological equipment within remote areas of the park and preserve have affected similar small-sized plots. The Healy Ridge and Thoro Ridge sites each have disturbance scattered over ¼ acre, though the other radio repeater sites use much less ground. The Dunkle and Stampede sites are on lands disturbed by airstrip development and the other two sites near the McKinley and Ruth rivers affect about 100 square feet of low riparian and dry alpine habitat respectively. The effects from VABM establishment 60 years ago are relatively invisible today. When combined, these sites impact less than one acre of habitat. Helicopter operations for installation and maintenance of these sites have had and would continue to create short-term noise disturbances to alpine wildlife such as Dall sheep, caribou, grizzly bears, wolves, and other species. Resource management and research flights can also result in short-term displacement of wildlife, though they are careful to limit impacts to the target species for the flight, e.g., for collaring operations. Flightseeing and administrative flights over the park operate under a Federal Aviation Authority advisory to not fly below 2,000 feet above ground level in noise-sensitive areas. The cumulative effects on wildlife and wildlife habitat would be minor relative to the vast acreage of similar habitat within the park and preserve and this alternative would contribute a negligible impact.

Conclusions: Dall sheep habitat at Double Mtn. and East Branch Ridge and large mammal habitat at the Toklat Basin RAWS site would likely be displaced during construction and maintenance visits but that displacement would be temporary and localized. Effects of the proposed wireless repeater sites on wildlife and habitat would be negligible, with mitigation measures to avoid critical bird nesting areas and periods.

Natural Sound Environment

Helicopters are used for site installation and annual maintenance, and they produce loud, pulsating, mechanical noises that would disrupt natural sounds in the park. The effects would be to park users expecting only natural sounds and to wildlife that depend on a natural sound environment for hearing danger or potential mates. The natural soundscape would be intruded by an average of one helicopter landing and one takeoff per year to access each of the proposed sites for routine annual maintenance, with one flight in and one flight out. If a repeater or meteorological instruments fail and repairs are needed at a site it would typically require two flights – one to assess the problem and one to bring in the necessary parts and accomplish the repairs. No helicopter flights would be made to the Mt. McKinley weather station site.

Cumulative Effects: Other effects to the soundscape in the project area would be from military, passenger jet, or small aircraft overflights and from helicopters operating in the area during firefighting season, for park inventory and monitoring activities, and for annual maintenance of existing park radio repeaters, existing seismometers and repeater sites, and remote automated weather stations. Aircraft flightseeing is somewhat weather dependent but can reach as high as 60 flights per day over the alpine areas of the Old Park. Another six to eight administrative flights are possible on any one day, though there are summer days without administrative flights and an average day might have two such flights. Flightseeing and administrative flights over the park operate under a Federal Aviation Authority advisory to not fly below 2,000 feet above ground level in noise-sensitive areas. The additional noise intrusions from helicopter access to the three wireless repeater remote areas and to the Toklat Basin RAWs would exceed current natural sound conditions for an additional few hours per summer. The cumulative effects on park soundscape would be moderate given the amount of air traffic possible on any one day during the summer and this alternative would contribute a minor additional impact to that total.

Conclusions: The proposed wireless repeater and weather installations and annual maintenance with helicopters would have a minor adverse impact to the sound environment of the area.

Cultural Resources

All new sites and existing sites would have reviews and clearance pursuant to Section 106 of the 1966 National Historic Preservation Act. No cultural resources are expected at the 16,200 foot level on Mt. McKinley. The East Branch site appears to have no surface evidence of occupation during the 6 years that mining claims were located there. VABM Muldrow has the 60 year old survey markers and possibly other artifacts on site, but those would not be impacted by the proposed installation because the small installation would be located off the top where only the 14 inch tall antenna could be seen at the Eielson Visitor Center. The Toklat Basin RAWs would be located in a sea of sedge tussocks and there would have a low likelihood of disturbing cultural resources. Removal of the wireless equipment from the Herning Cabin would eliminate modern equipment unrelated to the historical significance of the cabin or to stabilization efforts for the cabin. Further site surveys may potentially identify ongoing adverse effects if those towers or huts were located on archeological sites.

Cumulative Effects: Most of the existing radio repeater and seismic installations share the factors of being located on high elevation exposed sites that are not-easily accessed. However, hunting and lookout sites are the most common site types in Alaska and the likelihood of finding

archeological sites at those locations is medium to high (P. Gilbert, Pers. Comm.). The Northeast Knob of Double Mtn. is considered to be inaccessible except by helicopter. A limited archeological survey of the Castle Rocks seismometer site did not find cultural resources. The Dunkle and Stampede weather station sites are on lands disturbed by airstrip development and the Ruth Glacier RAWS site is similar to the repeater sites in its exposure and accessibility. The McKinley River RAWS site is on a floodplain bench that likely has seen repeated flooding over the past 50 years, which would remove any evidence of prior cultural usage. The VABMs were established 60 years ago and consist mostly of the nest of three survey markers, though some artifacts reflecting overnight occupation can be found at a few sites. The Thoro Ridge, Healy Ridge, and Wickersham Dome sites could have been used as observation points in the past but investigations for archeological resources were limited. No cultural resources were found during the Broad VABM and West Fork of the Yentna site Section 106 documentation, though it is not clear at this time if a full archeological investigation was done. The Tokosha Ridge site was likely not investigated for archeological resources. The cumulative effects on cultural resources in the areas occupied by these sites would be potentially moderate given the medium to high likelihood that cultural resources have been affected by past or present activities other than the installation at the Herning Cabin, and this alternative would contribute a minor beneficial impact to that total by removing the equipment from the Herning Cabin.

Conclusions: There would be a low likelihood of encountering cultural resources at the proposed weather station sites. The proposed wireless repeater installations for the three remote sites would include a minor beneficial impact to the cultural resources of the area by removing the wireless equipment from the Herning Cabin, and the other repeater sites would be fully investigated before equipment is permanently installed.

Visitor Use and Aesthetics

The three proposed repeater sites and the Mt. McKinley site are at generally high elevations. They are not in general travel corridors but provide hiking destinations for some visitors. The peak of Double Mtn. is usually accessed from the west, after a hike behind Cathedral Mountain, and with a crossing of the glacial Teklanika River. The peak is about 3,000 feet above the river. No statistics are known, but it is likely that the peak sees no more than 2 or three parties per year. East Branch Ridge is easily accessed from the park road at Polychrome Pass (not the Polychrome Overlook). The site is almost 2,000 feet above the pass, but no statistics are known for usage of the site, and there is no water nearby for camping. VABM Muldrow is on the west (wrong) side of the Muldrow glacier from the Eielson Visitor Center area. The Eielson area is very popular for day hiking and overnight trips, but the mile-wide surface of the Muldrow Glacier is not inviting, with dangerous holes in the ice and with hill after hill of loose gravel. VABM Muldrow would be a long round-trip day hike from Eielson. Usage statistics are not known. The only visitors who might encounter the Toklat Basin weather station would be those dog mushing or snowmachining in the area in the winter. It would not likely affect visitor use, but it would be an aesthetic curiosity in that open country.

The 16,200 foot elevation site on Mt. McKinley is near the top of the fixed ropes, but hidden off to the side of the usual climbing route. Guides and other climbers would surely know where the weather station would be, but it would not deter anyone from using the popular (and confined) West Buttress route. Climbers might appreciate the weather information available from the site.

Equipment shelters and antenna sizes, color, and shapes could all affect site visibility and scenic qualities in the area. The huts or shelters would be painted to blend in with the sites but would be visible from certain aspects, from a distance of one to two miles, because the installations are located on exposed ridges. The instrument huts could be visible on the skyline to those passing by in a low-flying aircraft. The antennas for wireless repeaters are generally no more than 2 feet long and are not visible for long distances. The solar panels for the repeaters might be seen at a greater distance, though all would be facing south, which would put their backs to the park road in almost any case. The Toklat Basin RAWS would not likely be seen in the summer.

Scientific research, public education, and interpretation of the Denali Wilderness would be enhanced by opportunities for real time information transfer with the public, such as at the Eielson Visitor Center or while climbing Denali. An example from using the wireless repeaters could include data/photos/commentary gathered at a dinosaur footprint site or remote clean-up site being transmitted to the movie screen at Eielson or to any schoolhouse in the country to encourage wilderness values protection among park visitors and others. Another example could be transmitting real time wildfire mapping and weather data from the field to the agencies responsible for managing the response to fires around remote cabins. The data from the weather stations would inform managers about the changing conditions of vast acres of a warm permafrost landscape, and about changing weather and jet stream conditions on Mt. McKinley.

Cumulative Effects: Similar installations for radio repeater, seismic and meteorological equipment within remote areas of the park and preserve have affected visitor use in varying ways. Some of the existing sites are more accessible than others. The Castle Rocks, Tokosha, VABM Broad, McKinley River, Ruth Glacier, West Fork Yentna and Northeast Knob of Double Mtn. would have zero visitors in an average year. The Savage Ridge site may see a few visitors per year, and the Healy Ridge site may see few visitors, though most non-park employees would travel up the parallel ridge on the Healy Overlook Trail. The Herning Cabin, Wickersham Dome and Thoro Ridge sites would all see visitation on some summer days due to their accessibility from either the Lodges in Kantishna or the Eielson Visitor Center. Visitation to other remote sites in the backcountry that have had some development, such as the VABMs, would depend on the accessibility.

The visibility of the existing sites depends on the location, color and orientation of installation, and antenna height. The Thoro Ridge and Healy Ridge sites with 10 meter towers are easily visible at specific points along the park road, but most of the other sites are fairly invisible from the park road, especially when the site facility consists of one hut with an inside antenna. The Wickersham Dome site is visible once you gain enough elevation - otherwise it is hidden on the broad top of the Dome. The helicopter flights used during maintenance of the sites add to the perceived congestion in the air on some days. Resource management and research flights can also result in short-term displacement of wildlife, though they are careful to limit impacts to the target species for the flight, e.g., for collaring operations. The cumulative effects on visitor use and aesthetics would be minor relative to the vast acreage of similar destinations with undeveloped landscape beauty within the park and preserve. This alternative would contribute a minor impact.

Conclusions: The proposed wireless repeater and RAWs installations would have a minor effect on the visitor use and visual quality and scenic integrity of the area. None of the sites are noted park destinations, except for Mt. McKinley, where the average climber visitor appreciates local weather data. The visual quality and aesthetics at the five sites would be affected by the instrument huts, antennas and solar panel arrays. There would be a minor beneficial impact from the wireless system as it would allow the park to carry out its administrative functions and provide opportunities to electronically connect visitors and others to real-time exploration of wilderness resources and values. There would be a minor beneficial impact from the two new weather stations if the data could be used to inform management strategies on how to best preserve resource values statewide or globally.

Wilderness

The three proposed wireless-only repeater sites would be in designated wilderness. Some wilderness values would be compromised, such as the natural quality of the local ecological processes and a reduction in the opportunity for solitude during the helicopter transport to and from the repeater sites for periodic maintenance and repairs. Few park visitors get to the repeater sites even though they are not very remote; however, those who do may be disturbed by the proposed installations. Human effects at the sites would be evident to visitors and others who value the undeveloped quality of wilderness and the intangible aspect of knowing the area is untrammelled even by the intrusive effects of unseen electronic networks. The VABM Muldrow site was suggested because it can “see” both Eielson and Thoro Ridge and the survey monuments already have established a long term use of the site for “installations.” The East Branch Ridge site was chosen because it is midway between Double Mountain and Thoro Ridge and can “see” Toklat and because the ground surface has had some minor disturbance from the few years that it was part of a mining claim. This site was also selected because it is less of a destination than Divide Mountain, which was the other location considered for siting the repeater.

The Mt. McKinley weather station would be in designated wilderness. The impact of locating a weather station at 16,200, near the fixed lines above Windy Corner, would not degrade opportunities for solitude and natural conditions and would have a minor impact on the undeveloped quality of wilderness. The station would add another installation along a popular climbing route that already has installations at Base Camp, at the 14,200 and 17,200 elevation camps and at the fixed lines above Windy Corner. The West Buttress route is recognized as a popular climbing route with heavy human activity during the climbing season. Weather data from the station could be processed by individual climbers to attempt to make the expedition safer, or it could be seen as an intrusion on the opportunity to focus on self-reliance.

The Toklat Basin RAWs would be in lands deemed eligible for wilderness designation. There would be a minor impact to wilderness resource values from the RAWs due to a negligible impact on primitive recreation, the extremely localized disruption to natural conditions, and the placement of man’s works in an area free of them. The impacts from this alternative would have a moderate adverse effect on wilderness resource values. See the attached Minimum Requirements Analysis summary in Appendix B.

Cumulative Effects: Three permanent communications and seismometer sites already exist within the designated Denali Wilderness, and are located on Thoro Ridge, at the Northeast Knob

of Double Mountain, and at Savage Ridge. The Thoro Ridge site was established before ANILCA designated the Denali Wilderness. The park permitted a seismometer data relay station to be installed on the Northeast Knob of Double Mountain in 2001 after the in-park seismometer data transmission was upgraded from analog to a digital system and required a repeater between the seismometer on Thoro Ridge and the repeater on Healy Ridge. The Savage Ridge Repeater was authorized in 1995 to provide a connection to the VABM Broad repeater, which provided park radio coverage in the Cantwell area. The Mt. Crosson temporary repeater site is in designated wilderness and was selected to provide a radio connection to the climbing base camp. That repeater sits on a snow platform during the climbing season for Mt. McKinley. The Herning Cabin wireless test site is also located in designated wilderness but would be removed under this alternative. The three other permanent remote communications sites which occur within the 1980 park additions and are in areas eligible for wilderness and proposed by the NPS for future wilderness designation are at VABM Broad, Castle Rocks, and Tokosha. The West Yenta River radio repeater is in the preserve, which is also eligible for future wilderness designation. The NPS has weather stations on the McKinley River and overlooking the lower Ruth Glacier in areas within the park additions eligible for wilderness designation. These installations would not prevent the areas from being established as wilderness pursuant to the Wilderness Act.

These communications sites and facilities in designated and eligible wilderness are considered necessary to meet minimum requirements for the administration of the area to preserve wilderness and wilderness resource values. The radio system supports essential safety and protection communications for all rangers, researchers, resource managers and other staff in the field, including those that patrol in popular mountain climbing areas. The seismic data gathered at the wilderness sites has been adjudged to be critical to help monitor and put into long-term context the earthquake “swarms” in the area surrounding Mt. McKinley, the Kantishna Hills and the Denali Fault. The weather stations provide data that can be used to monitor the natural condition of the wilderness as well as warning staff and the public about potentially dangerous weather conditions. There has been a moderate adverse impact to wilderness resource values from the installations and helicopter use used to support park research and administration. This alternative would add a moderate adverse contribution to that impact.

Conclusions: Alternative 2 would have a minor impact on the wilderness values of solitude and undeveloped quality by installing a new weather station in eligible wilderness, and by installing a new weather stations and allowing three test wireless repeater stations to remain in designated wilderness, with annual helicopter flights to the sites for maintenance.

Park Operations

The weather data from both the Toklat Basin and Mt. McKinley weather stations would be used to monitor climate change in undeveloped areas. The weather station on Mt. McKinley would be installed by UAF and maintained by park climbing rangers when feasible. The Toklat Basin RAWs might cost \$10,000 to install, but they have proven to be of low maintenance lately. The data would be shared with professionals around the world so that strategies for resources protection can be proposed and understood should the changing climate disrupt existing ecosystems, such as warm permafrost tundra, or contribute to potentially dangerous processes, such as wildland fire. The Mt. McKinley data would be downloaded in real time by guides and climbers, which would be information that could inform safer climbing decisions. The near top

of Mt. McKinley is a unique location for measuring high elevation conditions in central Alaska, and the data could be used to make aircraft use safer.

Use of the three sites for wireless repeaters would complete a wireless network that connects the main remote workstations and staff residential areas in the park at Toklat, Eielson Visitor Center, Wonder Lake and Kantishna with park administration at park headquarters and with the outside world. The use would also connect the visitors and researchers using the facilities at the MSLC Field Camp near the Teklanika Campground. The VABM Muldrow site would be more difficult to access than the Eielson Bench site, with the result that helicopter use would be required for routine maintenance.

Today's society and workplaces require connectivity to supervisors, parts catalogues, web-based training modules, etc., which may reside 90 miles away or may reside only in digital form on the internet. The use of these forms of communications made possible by the proposed wireless repeaters, including VoIP, however also allows staff interactions to continue that would otherwise require staff driving the park road to meet at headquarters or at the work site, all of which has the effect of reducing the administrative traffic on the park road. Emergency trips by staff along the park road would also decrease because of the ability to take care of business via the wireless internet or phone. This would either lessen impacts to wildlife and wildlife viewability on the park road for park visitors or allow more buses with visitors to travel the road (while still meeting experiential standards). The impacts to park operations from having a wireless network connected to work stations along the park road corridor would be beneficial and moderate.

Cumulative Effects: The park radio system is used mostly to report and monitor ranger patrol actions along the park road corridor and other areas of coverage. The radio traffic is one-way at a time and can be very congested during search and rescue, traffic stop and similar efforts. This system is functionally separate from private phone calls and of course does not transmit more than verbal data. A satellite dish at the Toklat Road Camp provides access to television. Satellite phones are sometimes used on patrols in areas remote from radio system coverage, though the usage is expensive. There is a long record of weather stations in developed areas of the park. More recently installed stations in the backcountry cover conditions in some of the backcountry landscapes and the data would be used in showing the progress of climate change and to predict conditions during administrative flights. The cumulative effects of existing telecommunication systems and weather stations on park operations is moderate and beneficial, and this alternative would contribute a moderate beneficial impact to that capability.

Conclusion: The proposed weather stations and wireless repeater installations would have a moderate beneficial effect on park operations by providing weather data from remote backcountry and by allowing west end staff to communicate with supervisors, order parts, receive training and deal with family business without leaving the work site. The equipment for the wireless network is already on site and the repeater maintenance costs would average less than \$10,000 per year. The weather stations are either on hand or are to be supplied by UAF.

Alternative 3 - Complete the Radio and Wireless Network of Sites Including the Mt. Eielson Bench (NPS Preferred Alternative)

Vegetation and Soils

Little additional impact to vegetation and soils would occur under alternative 3. Soils are rocky at the sites and the alpine vegetation is generally sparse. Both Mt. McKinley weather station sites are on bedrock surrounded by snow and ice. The Toklat Basin RAWs would impact about 10 square feet of sedge-covered wetlands within the 200 square foot area within the electric fence. Wireless repeater sites would be established at Double Mountain, East Branch, and on the Mt. Eielson Bench. The Eielson Bench site would impact less than 100 square feet of alpine meadow vegetation, including trampling during the installation. Wireless repeater equipment would be removed from the Herning Cabin. The seismic repeater station at the Northeast Knob of Double Mountain would be moved to the top of Double Mountain to co-locate with the wireless repeater equipment, and the Northeast Knob site would be reclaimed as necessary. To level the sites for the huts and to place guy anchors, the new sites would potentially disturb about 100 square feet of dry alpine vegetation and soils two of the new sites and alpine meadow vegetation at the other site. The alpine vegetation at the nearby helicopter landing sites would also be crushed up to once per year. The effects on park alpine tundra vegetation and soils would be minor relative to the hundreds of thousands of acres of these vegetation types and soil types within the park and preserve

Cumulative Effects: The existing radio repeater sites and similarly-sized weather stations within the park and preserve have affected similar small-sized plots, and the effects from VABM establishment 60 years ago are relatively invisible today. Continuing resource management and research has had little effect on vegetation and soils, and non-helicopter vehicle use in the backcountry – dogsleds and snowmachines in the winter in some areas – does generally not occur without a sufficient snow cover and does not affect much alpine area. The cumulative effects on park alpine tundra vegetation and soils would be minor relative to the area of these vegetation types within the park and preserve and this alternative would contribute a minor impact.

Conclusions: The proposed disturbance to 300 square feet of alpine vegetation from the new wireless repeater installations and 10 square feet of sedge wetlands would have a minor effect on park tundra vegetation.

Wildlife and Habitat

Helicopter access to the three new sites and the Toklat Basin RAWs could disrupt nearby raptor nesting, but the nests are generally known and flight paths would be altered accordingly. Bears and small mammals could visit alpine sites with communications equipment and be attracted to and damage wires, solar panels, and other equipment, but little damage has been noticed to similar existing high elevation sites. No impact is expected to mammals at the Toklat Basin site and the electric fence would limit impact from mammals. The new wireless sites would have most of the equipment and batteries inside a small metal hut, and although the antennas would be placed externally on the hut or on short attached poles it is unlikely that the sites would interfere with or attract wildlife habitat usage. Antennas at the Herning Cabin test site were damaged by bears, but that site is relatively flat, fully vegetated, and easily accessed. It is likely that bears

would also visit the proposed Mt. Eielson Bench site, since it is situated on similar terrain as the Herning Cabin, and their interest in the antennas and solar panel array would have to be monitored. The micro amount of habitat lost at the Toklat Basin site is the same as that for miles in most directions from the site and the loss would be negligible. There would be no habitat at the 16,200 or 17,200 foot levels on Mt. McKinley.

Cumulative Effects: Similar installations for radio repeater and meteorological equipment within remote areas of the park and preserve have affected similar small-sized plots. The Healy Ridge and Thoro Ridge sites each have disturbance scattered over ¼ acre, though the other radio repeater sites use much less ground. The Dunkle and Stampede sites are on lands disturbed by airstrip development and the other two sites near the McKinley and Ruth rivers affect about 100 square feet of low riparian and dry alpine habitat respectively. The effects from VABM establishment 60 years ago are relatively invisible today. When combined, these sites impact less than one acre of habitat. Helicopter operations for installation and maintenance of these sites have had and would continue to create short-term noise disturbances to alpine wildlife such as Dall sheep, caribou, grizzly bears, wolves, and other species. Resource management and research flights can also result in short-term displacement of wildlife, though they are careful to limit impacts to the target species for the flight, e.g., for collaring operations. Flightseeing and administrative flights over the park operate under a Federal Aviation Authority advisory to not fly below 2,000 feet above ground level in noise-sensitive areas. The cumulative effects on wildlife and wildlife habitat would be minor relative to the vast acreage of similar habitat within the park and preserve and this alternative would contribute a negligible impact.

Conclusions: Dall sheep habitat at Double Mtn. and East Branch Ridge and large mammal habitat at the Toklat Basin RAWS site would likely be displaced during maintenance visits and grizzly bears would be displaced during Eielson Bench installation, but that displacement would be temporary and localized. Effects of the proposed wireless repeater sites on wildlife and habitat would be negligible, with mitigation measures to avoid critical bird nesting areas.

Natural Sound Environment

Helicopters are used for site installation and annual maintenance, and they produce loud, pulsating, mechanical noises that would disrupt natural sounds in the park. The effects would be to park users expecting only natural sounds and to wildlife that depend on a natural sound environment for hearing danger or potential mates. The natural soundscape would be intruded by an average of one helicopter landing and one takeoff per year to access each of the proposed sites for routine annual maintenance, with one flight in and one flight out. If a repeater fails and repairs are needed at a site it would typically require two flights – one to assess the problem and one to bring in the necessary parts and accomplish the repairs. No helicopter flights would be made to the Mt. McKinley weather stations.

Cumulative Effects: Other effects to the soundscape in the project area would be from military, passenger jet, or small aircraft overflights and from helicopters operating in the area during firefighting season, for park inventory and monitoring activities, and for annual maintenance of existing park radio repeaters, existing seismometers and repeater sites, and remote automated weather stations. Aircraft flightseeing is somewhat weather dependent but can reach as high as 60 flights per day over the alpine areas of the Old Park. Another six to eight administrative

flights are possible on any one day, though there are summer days without administrative flights and an average day might have two such flights. Flightseeing and administrative flights over the park operate under a Federal Aviation Authority advisory to not fly below 2,000 feet above ground level in noise-sensitive areas. The additional noise intrusions from helicopter access to the three wireless repeater remote areas and to the Toklat Basin RAWS would exceed current natural sound conditions for an additional few hours per summer. The cumulative effects on park soundscape would be moderate given the amount of air traffic possible on any one day during the summer and this alternative would contribute a minor impact to that total.

Conclusions: The proposed wireless repeater and weather installations and annual maintenance with helicopters would have a minor adverse impact to the sound environment of the area.

Cultural Resources

All new sites and existing sites would have reviews and clearance pursuant to Section 106 of the 1966 National Historic Preservation Act. No cultural resources are expected at the 16,200 or 17,200 foot levels on Mt. McKinley. The East Branch site appears to have no surface evidence of occupation during the 6 years that mining claims were located there. The Toklat Basin RAWS would be located in a sea of sedge tussocks and there would be a low likelihood of disturbing cultural resources. Removal of the wireless equipment from the Herning Cabin would eliminate modern equipment unrelated to the historical significance of the cabin or to stabilization efforts for the cabin. Given the mining-related occupation on the Eielson bench, including around the Herning Cabin, scattered cultural resources may be found at any particular site, but numerous dips in the terrain could be used for the new repeater site, and none would be chosen that would impact such resources.

Cumulative Effects: Most of the existing radio repeater and seismic installations share the factors of being located on high elevation exposed sites that are not-easily accessed. However, hunting and lookout sites are the most common site types in Alaska and the likelihood of finding archeological sites at those locations is medium to high (P. Gilbert, Pers. Comm.). The Northeast Knob of Double Mtn. is considered to be inaccessible except by helicopter. A limited archeological survey of the Castle Rocks seismometer site did not find cultural resources. The Dunkle and Stampede weather station sites are on lands disturbed by airstrip development and the Ruth Glacier RAWS site is similar to the repeater sites in its exposure and accessibility. The McKinley River RAWS site is on a floodplain bench that likely has seen repeated flooding over the past 50 years, which would remove any evidence of prior cultural usage. The VABMs were established 60 years ago and consist mostly of the nest of three survey markers, though some artifacts reflecting overnight occupation can be found at a few sites. The Thoro Ridge, Healy Ridge, and Wickersham Dome sites could have been used as observation points in the past but investigations for archeological resources were limited. No cultural resources were found during the Broad VABM and West Fork of the Yentna site Section 106 documentation, though it is not clear at this time if a full archeological investigation was done. The Tokosha Ridge site was likely not investigated for archeological resources. The cumulative effects on cultural resources in the areas occupied by these sites would be potentially moderate given the medium to high likelihood that cultural resources have been affected by past or present activities other than the installation at the Herning Cabin, and this alternative would contribute a minor beneficial impact to that total by removing the equipment from the Herning Cabin.

Conclusions: There would be a low likelihood of encountering cultural resources at the proposed weather station sites. The proposed wireless repeater installations for the three remote sites would include a minor beneficial impact to the cultural resources of the area by removing the wireless equipment from the Herning Cabin, and the other repeater sites would be fully investigated before equipment is permanently installed.

Visitor Use and Aesthetics

Two of the three proposed repeater sites are at generally high elevations and they are not in general travel corridors, but do provide hiking destinations for some visitors. The peak of Double Mtn. is usually accessed from the west, after a hike behind Cathedral Mountain, and with a crossing of the glacial Teklanika River. The peak is about 3,000 feet above the river. No statistics are known, but it is likely that the peak sees no more than 2 or three parties per year. East Branch Ridge is easily accessed from the park road at Polychrome Pass (not the Polychrome Overlook). The site is almost 2,000 feet above the pass, but no statistics are known for usage of the site, and there is no water nearby for camping. The proposed Eielson Bench site would be in a hiking area used by day hikers and backpackers, though the site itself would be very small and would not be visible from most viewing angles in the area. Usage statistics are not known.

The 16,200 foot elevation site on Mt. McKinley is near the top of the fixed ropes, but hidden off to the side of the usual climbing route. The 17,200 foot elevation site would be adjacent to the high camp, where summit attempts usually begin. Guides and other climbers would surely know where the weather stations would be, but it would not deter anyone from using the popular (and confined) West Buttress route or 17,200 foot camp area. Climbers might appreciate the weather information available from the sites.

The only visitors who might encounter the Toklat Basin RAWS would be those dog mushing or snowmachining in the area in the winter. It would not likely affect visitor use, but it would be an aesthetic curiosity in that open country.

Equipment shelters and antenna sizes, color, and shapes could all affect site visibility and scenic qualities in the area. The huts would be painted to blend in with the sites but would be visible from certain aspects, from a distance of one to two miles when the installations are located on exposed ridges. The instrument huts could be visible on the skyline to those passing by in a low-flying aircraft. The antennas for wireless repeaters are generally no more than 2 feet long and are not visible for long distances. The solar panels might be seen at a greater distance, though all would be facing south, which would put their backs to the park road in almost any case. The Eielson Bench equipment would all be sited below the general ground level in one of the many depressions on that slope, though the antennas would have to extend high enough to see both Thoro Ridge and the Eielson Visitor Center. The Toklat Basin RAWS would not likely be seen by visitors in the summer.

Scientific research, public education, and interpretation of the Denali Wilderness would be enhanced by opportunities for real time information transfer with the public, such as at the Eielson Visitor Center. An example could include data/photos/commentary gathered at a Dinosaur footprint site or remote clean-up site being transmitted to the movie screen at Eielson

or to any schoolhouse in the country to encourage wilderness values protection among park visitors and others. Another example could be transmitting real time wildfire mapping and weather data from the field to the agencies responsible for managing the response to fires around remote cabins. The data from the weather stations would inform managers about the changing conditions of vast acres of a warm permafrost landscape and about the changing weather and Jet Stream conditions on Mt. McKinley. Providing park managers with accurate and detailed information about the status, trend, and spatial distribution of ongoing and projected changes in key climate attributes is critical to the understanding of the climatic drivers and the long-term outlook for additional changes.

Cumulative Effects: Similar installations for radio repeater, seismic and meteorological equipment within remote areas of the park and preserve have affected visitor use in varying ways. Some of the existing sites are more accessible than others. The Castle Rocks, Tokosha, VABM Broad, McKinley River, Ruth Glacier, West Fork Yentna and Northeast Knob of Double Mtn. would have zero visitors in an average year. The Savage Ridge site may see a few visitors per year, and the Healy Ridge site may see few visitors, though most non-park employees would travel up the parallel ridge on the Healy Overlook Trail. The Herning Cabin, Wickersham Dome and Thoro Ridge sites would all see visitation on some summer days due to their accessibility from either the Lodges in Kantishna or the Eielson Visitor Center. Visitation to other remote sites in the backcountry that have had some development, such as the VABMs, would depend on the accessibility.

The visibility of the existing sites depends on the location, color and orientation of installation, and antenna height. The Thoro Ridge and Healy Ridge sites with 10 meter towers are easily visible at specific points along the park road, but most of the other sites are fairly invisible from the park road, especially when the site facility consists of one hut with an inside antenna. The Wickersham Dome site is visible once you gain enough elevation - otherwise it is hidden on the broad top of the Dome. The helicopter flights used during maintenance of the sites add to the perceived congestion in the air on some days. Resource management and research flights can also result in short-term displacement of wildlife, though they are careful to limit impacts to the target species for the flight, e.g., for collaring operations. The cumulative effects on visitor use and aesthetics would be minor relative to the vast acreage of similar destinations with undeveloped landscape beauty within the park and preserve. This alternative would contribute a minor impact.

Conclusions: The proposed wireless repeater and RAWS installations would have a minor effect on the visitor use and visual quality and scenic integrity of the area. Three of the sites are not noted park destinations, and the other requires a crossing of the glacial Thorofare River to access, though dayhiking in the area is not uncommon. Climbers on Mt. McKinley would likely appreciate the real time weather data from the mountain stations. The small weather station should fit in with the camp-like infrastructure at the 17,200 foot high camp. The visual quality and aesthetics at the six sites would be affected by the instrument huts, antennas and solar panel arrays.

Wilderness

The three proposed wireless-only repeater sites would be in designated wilderness. Some wilderness values would be compromised, such as a reduction in the opportunity for solitude during the helicopter transport to and from the sites for periodic maintenance and repairs. Few park visitors get to the sites even though they are not very remote; however, those who do may be disturbed by the proposed installations. Human effects at the sites would be evident to visitors and others who value the undeveloped quality of wilderness and the intangible aspect of knowing the area is untrammelled even by the intrusive effects of unseen electronic networks. The Eielson Bench site was chosen because it can “see” both Thoro Ridge and the Eielson Visitor Center and because it would be easier to access without a helicopter than the VABM Muldrow site. The Eielson Bench site would have the hut hidden in a depression or gully, but the antennas would be visible from the visitor center and from areas along the bench. The East Branch Ridge site was chosen because it is midway between Double Mountain and Thoro Ridge and can “see” Toklat and because the ground surface has had some minor disturbance from the few years that it was part of a mining claim. This site was also selected because it is less of a destination than Divide Mountain, which was the other location considered for siting the repeater.

The Mt. McKinley weather stations would be in designated wilderness. The impact of locating weather stations at 16,200 feet and 17,200 feet would not degrade opportunities for solitude and natural conditions and would have a minor impact on the undeveloped quality of wilderness. The stations would add installations along a popular climbing route that already has installations at Base Camp, at the 14,200 and 17,200 elevation camps and at the fixed lines above Windy Corner. The West Buttress route is recognized as a popular climbing route with heavy human activity during the climbing season. Weather data from the station could be processed by individual climbers to attempt to make the expedition safer, or it could be seen as an intrusion on the opportunity to focus on self-reliance.

The Toklat Basin RAWs would be in lands deemed eligible for wilderness designation. There would be a minor impact to wilderness resource values from the RAWs due to a negligible impact on primitive recreation, the extremely localized disruption to natural conditions, and the placement of man’s works in an area free of them. The impacts from this alternative would have a moderate adverse effect on wilderness resource values. See the attached Minimum Requirements Analysis in Appendix B

Cumulative Effects: Three permanent communications and seismometer sites already exist within the designated Denali Wilderness, and are located on Thoro Ridge, at the Northeast Knob of Double Mountain, and at Savage Ridge. The Thoro Ridge site was established before ANILCA designated the Denali Wilderness. The park permitted a seismometer data relay station to be installed on the Northeast Knob of Double Mountain in 2001 after the in-park seismometer data transmission was upgraded from analog to a digital system and required a repeater between the seismometer on Thoro Ridge and the repeater on Healy Ridge. The Savage Ridge Repeater was authorized in 1995 to provide a connection to the VABM Broad repeater, which provided park radio coverage in the Cantwell area. The Mt. Crosson temporary repeater site is in designated wilderness and was selected to provide a radio connection to the climbing base camp. That repeater sits on a snow platform during the climbing season for Mt. McKinley. The Herning Cabin wireless test site is also located in designated wilderness but would be removed under this

alternative. The three other permanent remote communications sites which occur within the 1980 park additions and are in areas eligible for wilderness and proposed by the NPS for future wilderness designation are at VABM Broad, Castle Rocks, and Tokosha. The West Yenta River radio repeater is in the preserve, which is also eligible for future wilderness designation. The NPS has weather stations on the McKinley River and overlooking the lower Ruth Glacier in areas within the park additions eligible for wilderness designation. These installations would not prevent the areas from being established as wilderness pursuant to the Wilderness Act.

These communications sites and facilities in designated and eligible wilderness are considered necessary to meet minimum requirements for the administration of the area to preserve wilderness and wilderness resource values. The radio system supports essential safety and protection communications for all rangers, researchers, resource managers and other staff in the field, including those that patrol in popular mountain climbing areas. The seismic data gathered at the wilderness sites has been adjudged to be critical to help monitor and put into long-term context the earthquake “swarms” in the area surrounding Mt. McKinley, the Kantishna Hills and the Denali Fault. The weather stations provide data that can be used to monitor the natural condition of the wilderness as well as warning staff and the public about potentially dangerous weather conditions. There has been a moderate adverse impact to wilderness resource values from the installations and helicopter use used to support park research and administration. This alternative would add a moderate adverse contribution to that impact.

Conclusions: Alternative 3 would have a moderate impact on the wilderness values of solitude and undeveloped quality by installing a new weather station in eligible wilderness, and by installing two new weather stations and allowing three test wireless repeater stations to remain in designated wilderness, with annual helicopter flights to the sites for maintenance.

Park Operations

The weather data from both the Toklat Basin and the Mt. McKinley weather stations would be used to monitor climate change in undeveloped areas. The weather stations on Mt. McKinley would be installed by UAF and maintained by park climbing rangers when feasible. The Toklat Basin RAWs might cost \$10,000 to install, but the type of station has proven to be of low maintenance lately. The data would be shared with professionals around the world so that strategies for resources protection can be proposed and understood should the changing climate disrupt existing ecosystems, such as warm permafrost tundra, or contribute to potentially dangerous processes, such as wildland fire. The Mt. McKinley data would be downloaded in real time by guides and climbers, which would be information that could inform safer climbing decisions. The near top of Mt. McKinley is a unique location for measuring high elevation conditions in central Alaska, and the data could be used to make aircraft use safer.

Use of the three sites for wireless repeaters would complete a wireless network that connects the main remote workstations and staff residential areas in the park at Toklat, Eielson Visitor Center, Wonder Lake and Kantishna with park administration at park headquarters and with the outside world. The use would also connect the visitors and researchers using the facilities at the MSLC Field Camp near the Teklanika Campground. The Eielson Bench site would be easier to access than the VABM Muldrow site, because for routine maintenance a day hike would be considered to the Eielson Bench, and during a helicopter malfunction it would be easier to hike out from.

It is perhaps somewhat unfortunate that communication in today's society and workplaces requires connectivity to supervisors, parts catalogues, web-based training modules, etc., which may reside 90 miles away or may reside only in digital form on the internet. The use of these forms of communications made possible by the proposed wireless repeaters, including VoIP, however also allows staff interactions that would otherwise require staff driving the park road to meet at headquarters or at the work site, all of which has the effect of reducing the administrative traffic on the park road. Emergency trips by staff along the park road would also decrease because of the ability to take care of business via the wireless internet or phone. This would either lessen impacts to wildlife viewability on the park road for park visitors or allow more buses with visitors to travel the road (while still meeting experiential standards). The impacts to park operations from having a wireless network connected to work stations along the park road corridor would be beneficial and moderate.

Cumulative Effects: The park radio system is used mostly to report and monitor ranger patrol actions along the park road corridor and other areas of coverage. The radio traffic is one-way at a time and can be very congested during search and rescue, traffic stop and similar efforts. This system is functionally separate from private phone calls and of course does not transmit more than verbal data. A satellite dish at the Toklat Road Camp provides access to television. Satellite phones are sometimes used on patrols in areas remote from radio system coverage, though the usage is expensive. There is a long record of weather stations in developed areas of the park. More recently installed stations in the backcountry cover conditions in some of the backcountry landscapes and the data would be used in showing the progress of climate change and to predict conditions during administrative flights. The cumulative effects of existing telecommunication systems and weather stations on park operations is moderate and beneficial, and this alternative would contribute a moderate beneficial impact to that capability.

Conclusion: The proposed weather stations and wireless repeater installations would have a moderate beneficial effect on park operations by providing weather data from remote backcountry and allowing west end staff to communicate with supervisors, order parts, receive training and deal with family business without leaving the work site. There would be a minor beneficial impact from the wireless system as it would allow the park to carry out its administrative functions and provide opportunities to electronically connect visitors and others to real-time exploration of wilderness resources and values. There would be a minor beneficial impact from the three new weather stations if the data could be used to inform management strategies on how to best preserve wilderness values statewide or globally. The equipment for the wireless network is already on site and the repeater maintenance costs would average less than \$10,000 per year. The weather stations are either on hand or are to be supplied by UAF.

CONSULTATION AND COORDINATION

Consulted in the preparation of this EA were:

Tom Gillett, Alaska Regional Office, Radio Shop Manager
Grady Wilson, Alaska Regional Office, Information Technology Specialist
Elwood Lynn, DENA, Assistant Superintendent for Operations

This EA was prepared by:

Steve Carwile, DENA, Compliance Program Manager
Jon Paynter, DENA, GIS Specialist
Dan Abbe, DENA, Backcountry District Ranger

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APPENDIX A

SUBSISTENCE - SECTION 810(a) OF ANILCA SUMMARY EVALUATION AND FINDINGS

I. INTRODUCTION

This section was prepared to comply with Title VIII, Section 810 of the Alaska National Interest Lands Conservation Act (ANILCA). It summarizes the evaluation of potential restrictions to subsistence uses in Denali National Park and Preserve that could result from the installation and maintenance of new weather stations and a wireless repeater network in Denali National Park and Preserve.

II. THE EVALUATION PROCESS

Section 810(a) of ANILCA states:

"In determining whether to withdraw, reserve, lease, or otherwise permit the use, occupancy, or disposition of public lands . . . the head of the federal agency . . . over such lands . . . shall evaluate the effect of such use, occupancy, or disposition on subsistence uses and needs, the availability of other lands for the purposes sought to be achieved, and other alternatives which would reduce or eliminate the use, occupancy, or disposition of public lands needed for subsistence purposes. No such withdrawal, reservation, lease, permit, or other use, occupancy or disposition of such lands which would significantly restrict subsistence uses shall be affected until the head of such Federal agency -

(1) gives notice to the appropriate State agency and the appropriate local committees and regional councils established pursuant to section 805;

(2) gives notice of, and holds, a hearing in the vicinity of the area involved; and

(3) determines that (A) such a significant restriction of subsistence uses is necessary, consistent with sound management principles for the utilization of the public lands, (B) the proposed activity will involve the minimal amount of public lands necessary to accomplish the purposes of such use, occupancy, or other disposition, and (C) reasonable steps will be taken to minimize adverse impacts upon subsistence uses and resources resulting from such actions."

ANILCA created new units and additions to existing units of the National Park System in Alaska. Denali National Park and Preserve was created by ANILCA Section 202(3)(a):

"The park additions and preserve shall be managed for the following purposes, among others: To protect and interpret the entire mountain massif, and additional scenic mountain peaks and formations; and to protect habitat for, and populations of, fish and wildlife, including, but not limited to, brown/grizzly bears, moose, caribou, Dall sheep, wolves, swans and other waterfowl; and to provide continued opportunities, including reasonable access, for mountain climbing, mountaineering, and other wilderness recreational activities."

Title I of ANILCA established national parks for the following purposes:

" . . . to preserve unrivaled scenic and geological values associated with natural landscapes; to provide for the maintenance of sound populations of, and habitat for, wildlife species of inestimable value to the citizens of Alaska and the Nation, including those species dependent on vast relatively undeveloped areas; to preserve in their natural state extensive unaltered arctic tundra, boreal forest, and coastal rainforest ecosystems to protect the resources related to subsistence needs; to protect and preserve historic and archeological sites, rivers, and lands, and to preserve wilderness resource values and related recreational opportunities including but not limited to hiking, canoeing, fishing, and sport hunting, within large arctic and subarctic wildlands and on free-flowing rivers; and to maintain opportunities for scientific research and undisturbed ecosystems.

" . . . consistent with management of fish and wildlife in accordance with recognized scientific principles and the purposes for which each conservation system unit is established, designated, or expanded by or pursuant to this Act, to provide the opportunity for rural residents engaged in a subsistence way of life to continue to do so."

The potential for significant restriction must be evaluated for the proposed action's effect upon " . . . subsistence uses and needs, the availability of other lands for the purposes sought to be achieved and other alternatives which would reduce or eliminate the use. . . ." (Section 810(a))

III. PROPOSED ACTION ON FEDERAL LANDS

Alternatives 1,2 and 3 are described in detail in the environmental assessment. Customary and traditional subsistence use on NPS lands will continue as authorized by federal law under all alternatives. Federal regulations implement a subsistence priority for rural residents of Alaska under Title VIII of ANILCA.

The NPS proposes to permit the installation and maintenance of a wireless repeater network of sites within Denali National Park. Three new installations would be in the Denali Wilderness and three other sites would co-locate with existing sites, only one of which is outside the boundaries of the former Mt. McKinley National Park. The installations would provide wireless internet and VoIP communications between remote areas of the park and park headquarters and the outside world.

IV. AFFECTED ENVIRONMENT

Subsistence uses within Denali National Park and Preserve are permitted in accordance with Titles II and VIII of ANILCA. Section 202(3)(a) of ANILCA authorizes subsistence uses, where traditional, in the northwestern and southwestern preserves of Denali National Preserve. Lands within former Mount McKinley National Park are closed to subsistence uses.

A regional population of approximately 300 eligible local rural residents qualifies for subsistence use of park resources. Resident zone communities for Denali National Park and Preserve are

Cantwell, Minchumina, Nikolai, and Telida. By virtue of their residence, local rural residents of these communities are eligible to pursue subsistence activities in the new park additions. Local rural residents who do not live in the designated resident zone communities, but who have customarily and traditionally engaged in subsistence activities within the park additions, may continue to do so pursuant to a subsistence permit issued by the Park Superintendent in accordance with state law and regulations.

The NPS realizes that Denali National Park and Preserve may be especially important to certain communities and households in the area for subsistence purposes. The resident zone communities of Minchumina (population 22) and Telida (population 3) use park and preserve lands for trapping and occasional moose hunting along area rivers. Nikolai (population 122) is a growing community and has used park resources in the past. Cantwell (population 147) is the largest resident zone community for Denali National Park and Preserve, and local residents hunt moose and caribou, trap, and harvest firewood and other subsistence resources in the new park area.

The main subsistence species, by edible weight, are moose, caribou, furbearers, and fish. Varieties of subsistence fish include coho, king, pink and sockeye salmon. Burbot, dolly varden, grayling, lake trout, northern pike, rainbow trout and whitefish are also among the variety of fish used by local people. Beaver, coyote, land otter, weasel, lynx, marten, mink, muskrat, red fox, wolf and wolverine are important furbearer resources. Rock and willow ptarmigan, grouse, ducks and geese complete the park/preserve subsistence small game list.

The NPS recognizes that patterns of subsistence use vary from time to time and from place to place depending on the availability of wildlife and other renewable natural resources. A subsistence harvest in any given year may vary considerably from previous years because of such factors as weather, migration patterns and natural population cycles. However, the pattern is assumed to be generally applicable to harvests in recent years with variations of reasonable magnitude.

V. SUBSISTENCE USES AND NEEDS EVALUATION

To determine the potential impact on existing subsistence activities, three evaluation criteria were analyzed relative to existing subsistence resources that could be impacted.

The evaluation criteria are:

- the potential to reduce important subsistence fish and wildlife populations by (a) reductions in numbers; (b) redistribution of subsistence resources; or (c) habitat losses;
- the affect the action might have on subsistence fishing or hunting access; and
- the potential to increase fishing or hunting competition for subsistence resources.

The potential to reduce populations:

Land use activities could have temporary and/or long-term impacts on wildlife habitat, depending on the nature and extent of the disturbance.

The alternatives would not adversely affect the distribution or migration patterns of subsistence resources. Therefore, no change in the availability of subsistence resources is anticipated as a result of the implementation of the proposed action.

Restriction of Access:

The proposed actions are not anticipated to result in a significant restriction to subsistence access. Access for Federal subsistence uses in Denali National Park and Preserve is granted pursuant to Federal and non-conflicting State regulations. Denali National Park and Preserve is managed according to legislative mandates, NPS management policies and the park's General Management Plan.

Increase in Competition:

The proposed actions are not expected to significantly increase competition for ANILCA Title VIII subsistence resources or uses on Federal public lands within the affected area.

VI. AVAILABILITY OF OTHER LANDS

Choosing a different alternative would not decrease the impacts to park resources for subsistence. The preferred alternative is consistent with the mandates of ANILCA, including Title VIII, and the NPS Organic Act.

VII. ALTERNATIVES CONSIDERED

The alternatives considered for this project were limited to the **1)** removal of test wireless equipment from remote sites in Denali National Park (no action); **2)** permanently install and maintain two new weather stations in the Toklat Basin and at the 16,200 foot level of Mt. McKinley and a network of wireless repeater stations in Denali National Park, including one at VABM Muldrow; and **3)** permanently install and maintain three new weather stations in the Toklat Basin and at the 16,200 and 17,200 foot level of Mt. McKinley and a network of wireless repeater stations in Denali National Park, including one on the Eielson Bench. One wireless station would co-located with other repeater and seismic instruments on Wickersham Dome in an area of the 1980 park additions open to subsistence uses. The Toklat Basin weather station would also be located in the 1980 park additions open to subsistence uses. No impacts to subsistence resources or access are expected from these installations. The other stations would be located within the boundaries of the former Mt. McKinley National Park wherein no subsistence uses are permitted.

VIII. FINDINGS

This analysis concludes that the preferred alternative would not result in a significant restriction of subsistence uses.

APPENDIX B WILDERNESS MINIMUM REQUIREMENTS ANALYSIS

“ . . . except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act...”
– the Wilderness Act, 1964

Project Title: _Telecommunications and Weather Installations EA

Step 1 - Summary

Radio communications within DENA and along the Denali Road corridor have historically been spotty and unreliable. Telephone service has been limited and unreliable. Improvements have been made through the installation of test sites and additional equipment however, permanent upgrades have yet to occur. The proposed project would create a more reliable radio communication system along the Park Road corridor and provide an enhanced and more reliable replacement of the telephone system. A voice over internet system would accomplish this and provide internet access along the Park Road corridor.

The improvement of the Telecommunications Network in DENA would provide better protection of Park resources for current and future visitors, enhance the Park’s ability to respond to visitor needs (including in emergency situations), more efficiently and effectively interpret Park resources to a wider public audience, and allow for more efficient and effective administration of the Park due to the increasing reliance on internet based management applications, reporting systems, and timely distribution of information.

The installation of weather stations on Mt. McKinley and in the Toklat Basin would provide data unavailable currently. The NPS Management Policies (2006) direct the agency to monitor the long term condition and trends of wilderness resources. Part of what defines a wilderness areas are the natural resources found in them. In order to manage appropriately, the NPS applies the best available science to document existing conditions and document changes. The NPS Management Policies (2006) state that scientific activities, including assessing physical, biological, and cultural resources and social impacts, are encouraged in wilderness areas as long as they are consistent with Park Service’s responsibility to preserve and manage wilderness. The importance of providing the park and wilderness managers with accurate and detailed information about the status, trend, and spatial distribution of ongoing and projected changes in key climate attributes is critical to the understanding of the climatic drivers and the long-term outlook for additional changes. Without the information provided by these weather stations park and wilderness managers may react to changes as isolated events and take counterproductive actions.

These actions are not legally necessary and do not insure the preservation of wilderness character. However, they do support the public purposes of recreation, science, education, and conservation, and public safety.

Step 2 – Summary Table

It may be useful to compare each alternative's positive and negative impacts to each of the criteria in tabular form, keeping in mind the law's mandate to "preserve wilderness character."

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Untrammelled	1	0	0	
Undeveloped	1	-4	-5	
Natural	1	1	1	
Solitude or Primitive and Unconfined Recreation	1	-1	0	
Unique / Other Features	0	0	0	
Wilderness Character	4	-4	-4	

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Maintaining Traditional Skills	0	0	0	
Special Provisions	0	0	0	
Economics & Timing	-1	2	2	
Other Criteria Summary	-1	2	2	

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Safety (visitors & workers)	-2	2	3	

Step 2 - Decision

The No Action Alternative would most effectively protect the wilderness character of Denali National Park and Preserve by removing the three test sites in designated Wilderness and not adding any new installations to designated or eligible wilderness. The TeleCom test sites of Double Mountain and East Branch Ridge would return to a natural state and the Herning Cabin site equipment would be removed. In addition, the No Action Alternative does not conflict with the planning guidance provided by the Denali National Park & Preserve Backcountry Management Plan, 2006 (DNPP BMP) which states, “For administrative purposes, the National Park Service would phase in the use of satellite phones or similar technology in the backcountry to avoid the need for new temporary or permanent communication facilities in backcountry areas.” (page 56 DNPP BMP). However, the No Action Alternative may conflict with the 2006 *NPS Management Policy* for employee safety and for scientific activities, *Denali National Park and Preserve Resource Stewardship Strategy 2008 – 2027* for resource monitoring, and the *Denali National Park and Preserve 5-Year Strategic Plan 2011 – 2015* for managing through science.

The minimum action alternative would be Alternative 3 which provides for improved administration of the Wilderness and Park through better communications, better positions Park management to predict and protect natural processes in wilderness through the installation of weather stations, and reduces helicopter flights in support of maintenance at the site between the Herning Cabin and the Thorofare River. The action alternatives would allow for the greater alignment with the NPS and DENA management Policy as identified above. The long term stewardship of park resources and protection of visitor experiences would be best served by Alternative 3.

Monitoring and reporting requirements:

All helicopter flights and landings in support of maintenance of the telecommunications network and weather stations would be tracked as administrative use of aircraft and scheduled, as much as possible, to minimize impacts to park resources and the visitors’ experience.

The Park should undertake efforts to document all administrative and research/monitoring impacts to Wilderness that allows for comparison from year to year and over time. Specifically, the Park should develop and maintain a map showing all facilities in Wilderness that is a tool to track annual and cumulative impacts associated with the administration of the area.

APPENDIX C

SITE PHOTOS

Healy Ridge
Savage Ridge
Northeast Knob of Double Mountain
Double Mountain (2 photos)
East Branch Ridge (2 photos)
Thoro Ridge
Herning Cabin (2 photos)
Muldrow VABM – no photo
Wickersham Dome (2 photos)
Castle Rocks (no photo)
VABM Broad
Mt. Crosson – (no photo)
West Fork Yentna
Tokosha Ridge
High Elevation Weather Station in Peru
RAWS on Typical Toklat Basin Landscape
RAWS (not in DENA) Showing Electric Fence



Healy Ridge



Savage Ridge



Northeast Knob of Double Mountain (before repeater installation)



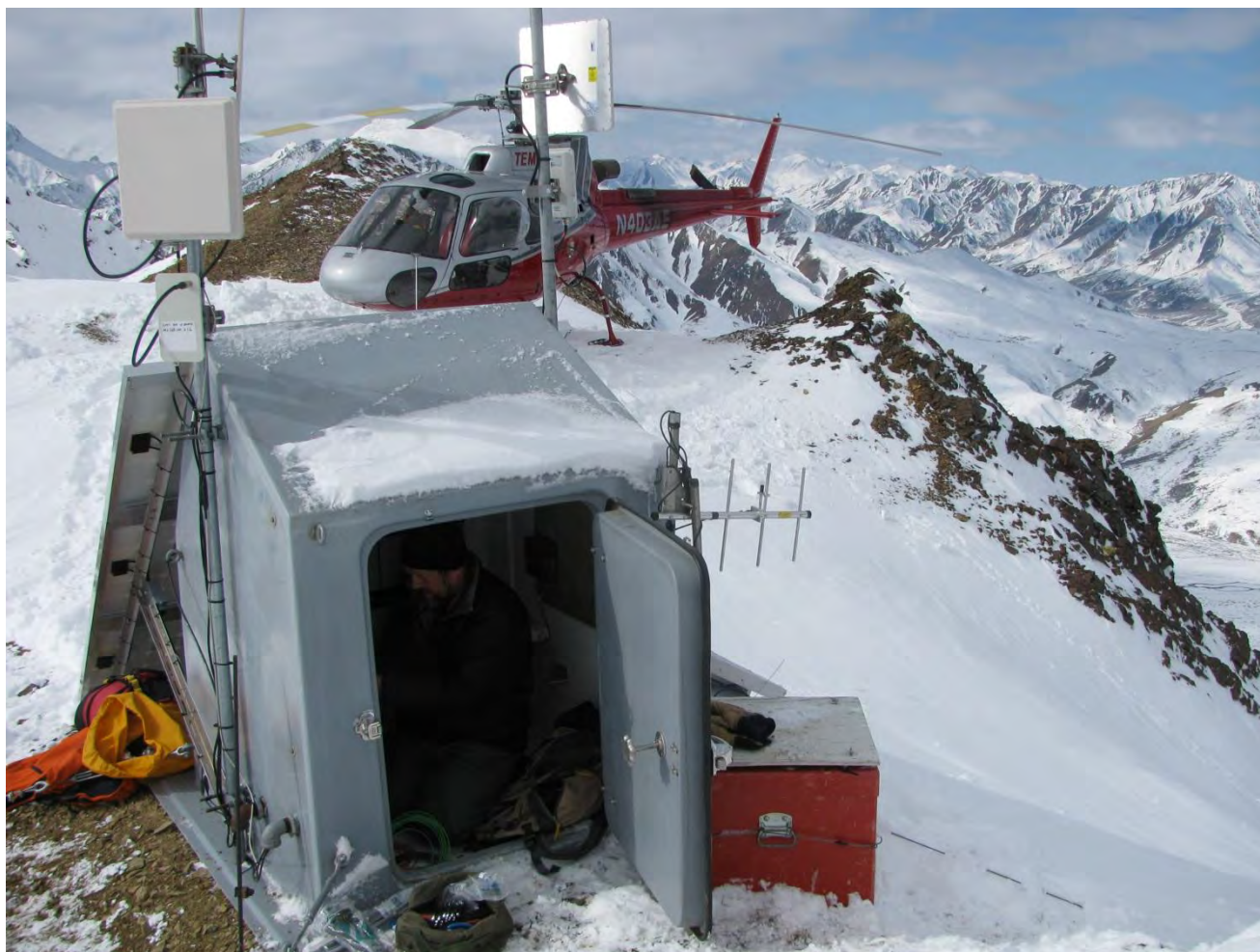
Double Mountain (the upper repeater has been removed)



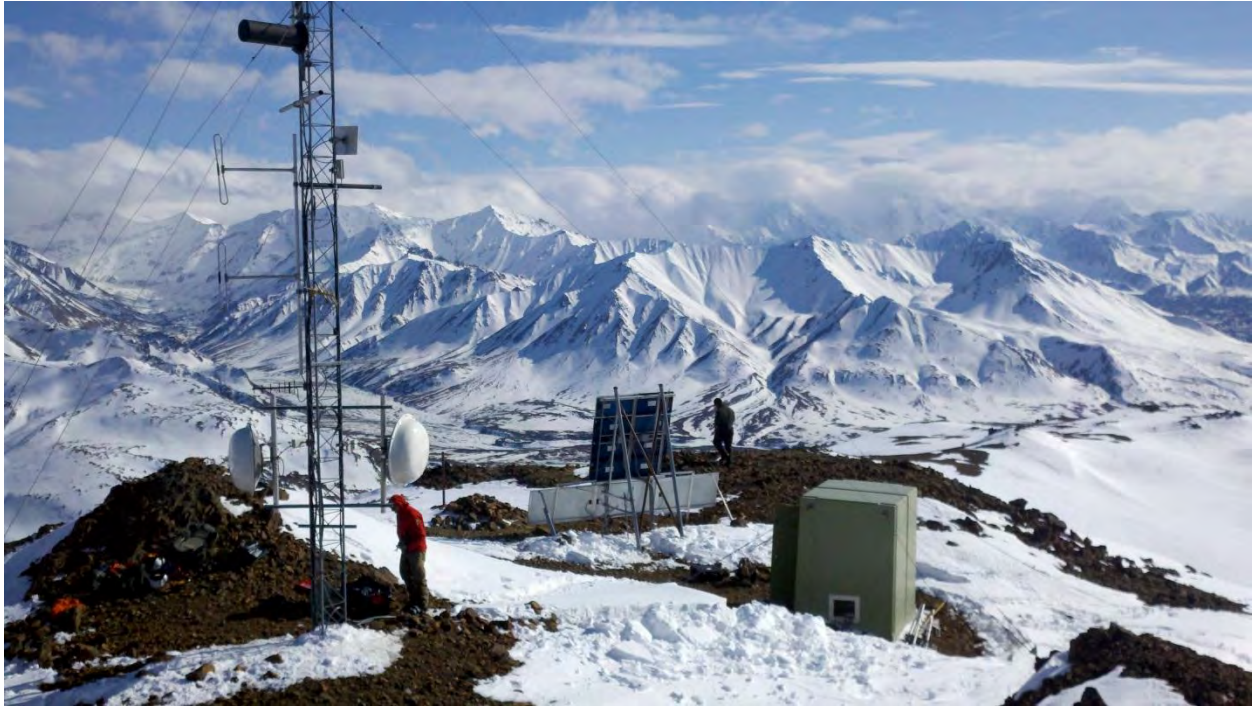
Double Mountain (as with the previous picture, the repeater in this picture has been replaced by a repeater set just below it)



East Branch Ridge looking northeast



East Branch Ridge looking southwest



Thoro Ridge (additional solar panels now are at this site)



Herning Cabin



Herning Cabin



Wickersham Dome looking toward Wonder Lake



Wickersham Dome (PBO installation in foreground and PBO hut is to left of picture)



VABM Broad



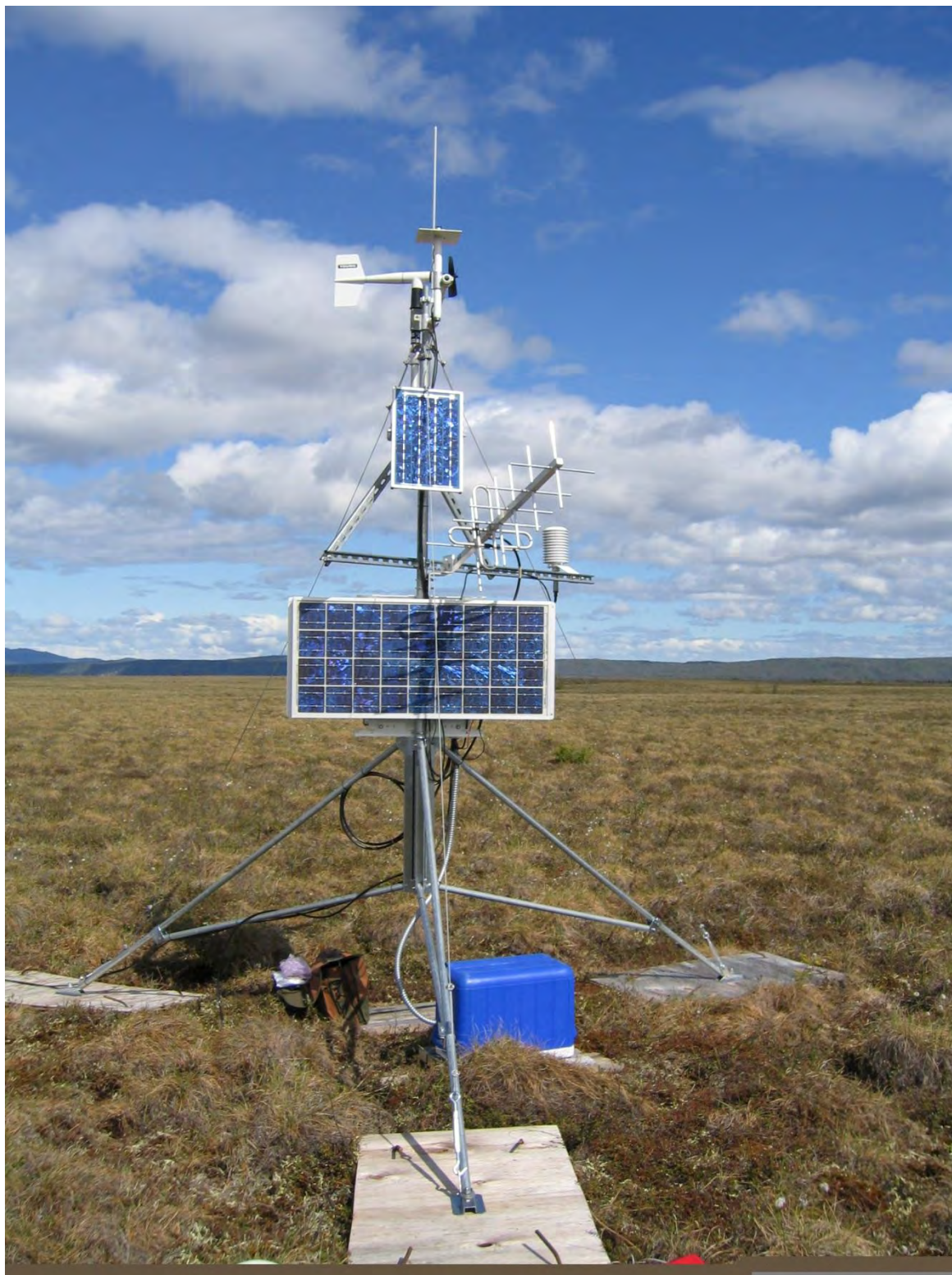
West Fork Yentna



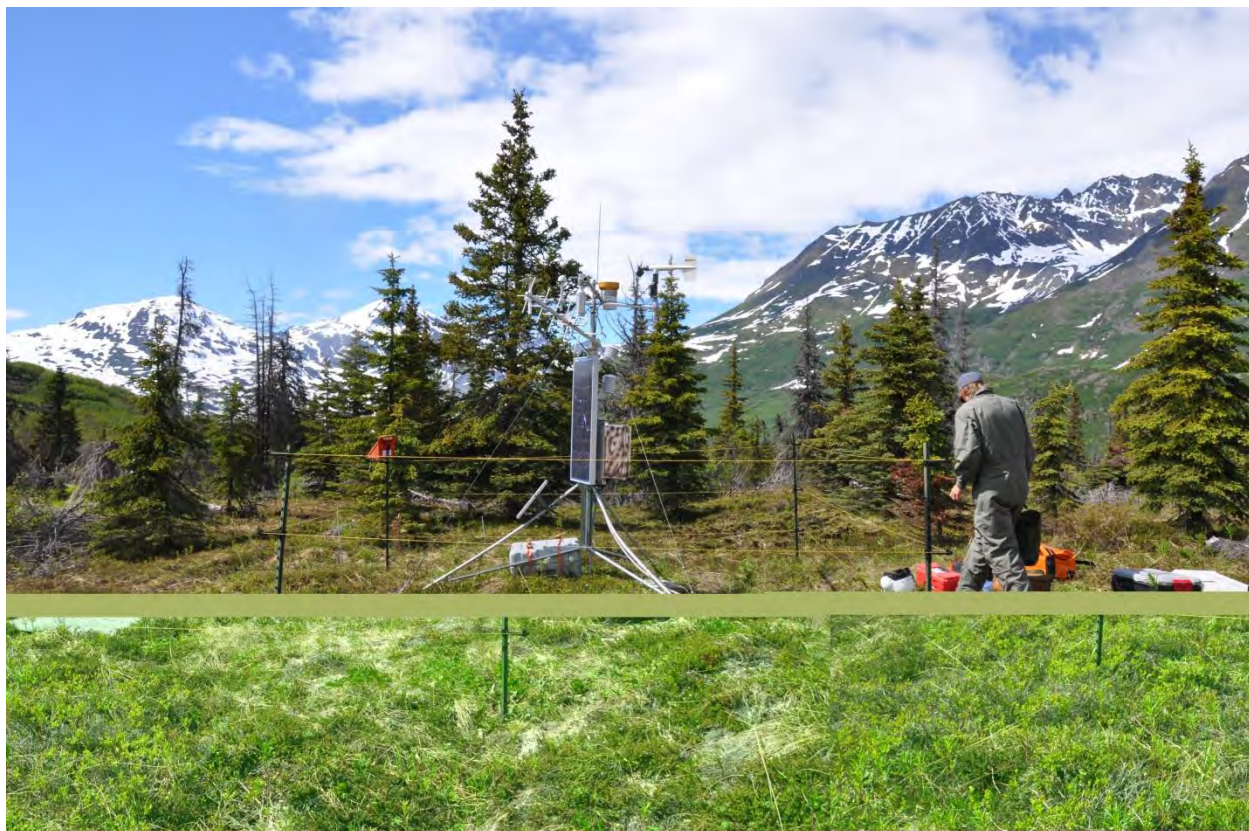
Tokosha Ridge



A similar high-elevation weather station in Peru



Former Wigand RAWS in Toklat Basin area on sedge tussocks and permafrost.



RAWS (not in DENA) showing an electric fence setup.

