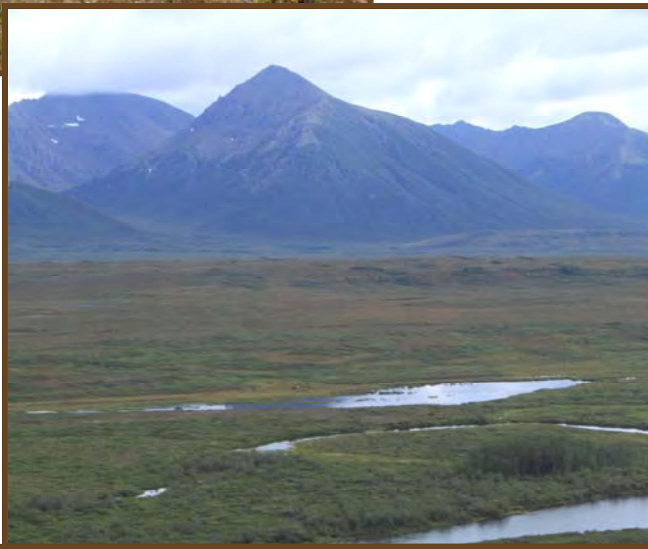
TERRA Southwest
Broadband Telecommunications Project

Prepared for

U.S. Fish and Wildlife Service

Bureau of Land Management

National Park Service



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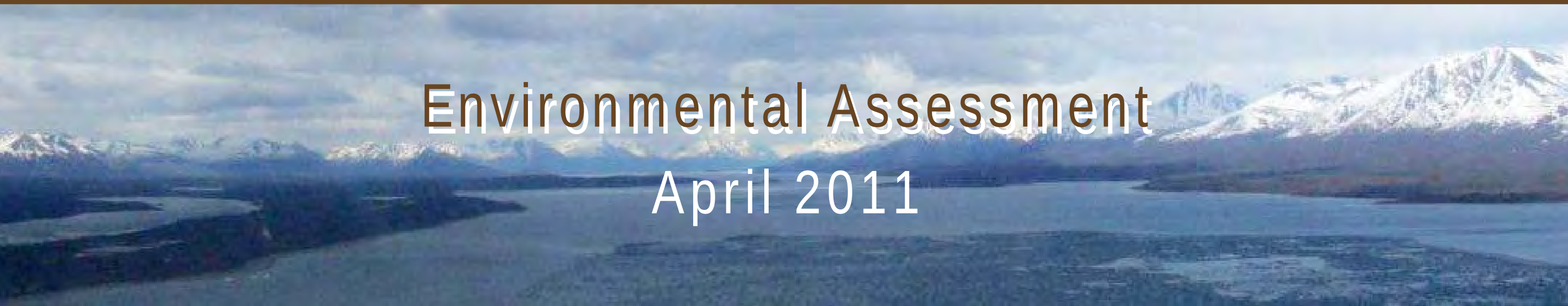

Environmental Assessment

April 2011

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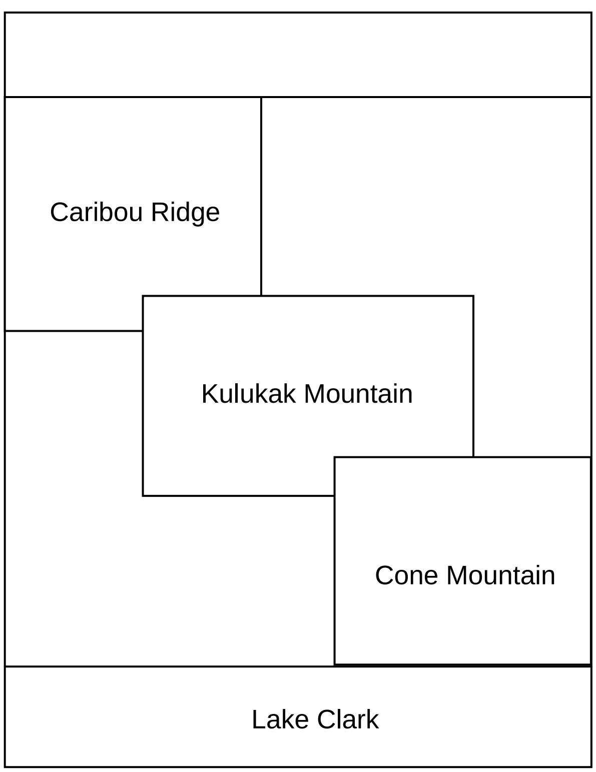
Protecting America's Great Outdoors and Powering Our Future
The U.S. Department of the Interior protects America's natural resources and heritage, honors our cultures and tribal communities, and supplies the energy to power our future.

U.S. Fish & Wildlife Service Mission Statement:

Working with others to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.



National Wildlife Refuge System Mission Statement:

The Mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americas.

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United States Department of the Interior

TAKE PRIDE IN AMERICA

FISH AND WILDLIFE SERVICE
Togiak National Wildlife Refuge
P.O. BOX 270
Dillingham, Alaska 99576

IN REPLY REFER TO:

April 8, 2011

Dear Reader:

The US Fish and Wildlife Service (FWS), in cooperation with the Bureau of Land Management (BLM) and the National Park Service (NPS), has finalized the enclosed Environmental Assessment of the proposed Rights-of-Way and Special Use Permit grants to United Utilities Incorporated (UUI) for the TERRA Southwest (TERRA-SW) project. With fiber optic cable and microwave repeater towers, TERRA-SW would provide terrestrial, non-satellite broadband service from Homer, Alaska to rural communities in Southwest Alaska. TERRA-SW will also connect to the recently installed YK DeltaNet broadband network on the Yukon-Kuskokwim Delta.

The Environmental Assessment analyzes impacts to the natural and human environment from the proposed action and alternatives. The alternatives considered include one that would substitute a marine fiber optic cable between Dillingham and Quinhagak instead of the three proposed microwave repeater towers on Togiak NWR and BLM-administered lands. Issues analyzed include impacts to wildlife (including birds), subsistence, recreation, lands with wilderness characteristics, noise, and visual impacts.

A Public Draft Environmental Assessment was released on February 9, 2011, with a letter and posting of the document on the Togiak National Wildlife Refuge website. Public meetings were held in Dillingham, Goodnews Bay, Togiak, Nondalton, and Port Alsworth from February 16, 2001 to February 28, 2011. In addition to the comments received during the public meetings, a total of 46 electronic mail or written comments were submitted.

Following the issuance of this Environmental Assessment, the three federal agencies will each conclude whether or not to issue a Finding of No Significant Impacts (FONSI). If this determination is adopted, then the agencies will decide whether to grant the Rights-of-Way and Special Use Permit. If an agency decision declines a FONSI, then an Environmental Impact Statement would be required before issuing permits.

If you have questions please contact:

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Sincerely,

Paul A. Liedberg
Refuge Manager

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LIST OF ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ACEC	Area of Critical Environmental Concern
ACMP	Alaska Coastal Management Program
ADEC	Alaska Department of Environmental Conservation
ADFG	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
AGL	above ground level
ANILCA	Alaska National Lands Interest Conservation Act
ARRA	American Recovery and Reinvestment Act of 2009
APE	Area of Potential Effect
bgs	below ground surface
BIP	Broadband Initiatives Program
BLM	U.S. Bureau of Land Management
CFR	Code of Federal Regulations
CCP	Compréhensive Conservation Plan
CEQ	Council on Environnemental Quality
ft^3/s	cubic feet per second
dB	decibel
dBA	A weighted decibel
DCOM	Division of Coastal and Ocean Management
DPS	Distinct Population Segments
EA	Environnemental Assessment
EFH	Essential Fish Habitat
ESA	Endangered Species Act
EPA	U.S. Environmental Protection Agency
FLPMA	Federal Land Policy and Management Act
FONSI	Finding of No Significant Impact
FWS	U.S. Fish and Wildlife Service
Hz	Hertz
IWC	International Whaling Commission
km	kilometers
KOP	Key Observation Points
L_{eq}	equivalent continuous sound pressure level
L_{max}	maximum sound pressure level during a monitoring interval
L_{min}	minimum sound pressure level during a monitoring interval
LWC	Lands With Wilderness Characteristics
µPa	micropascals
MMPA	Marine Mammal Protection Act
msl	mean sea level
NAAQS	National Ambient Air Quality Standards

NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
nmi	nautical miles
NHPA	National Historic Preservation Act
NPS	National Park Service
NREL	National Renewable Energy Laboratory
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
ORVs	Off Road Vehicles
PIP	Public Involvement Plan
PLO	Public Land Order
PV	photovoltaic
RFFA	Reasonably Foreseeable Future Action
RMP	Resource Management Plan
ROW	Right-of-Way
RUS	Rural Utility Services
SHPO	State Historic Preservation Officer
SO	Secretarial Order
SPL	Sound Pressure Level
SPCC	Spill Prevention, Control and Countermeasure Plan
SUP	Supplemental Use Permit
TCP	Traditional Cultural Property
TERRA-SW	TERRA Southwest
THRC	Territory Heritage Resource Consulting
TIER	Times Interest Earned Ratio
Togiak Refuge	Togiak National Wildlife Refuge
TPECI	Travis/Peterson Environmental Consulting, Inc.
TUS	Transportation and Utility System
USC	United States Code
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
UUI	United Utilities, Incorporated
VRM	Visual Resource Management
W/m^2	watts per meter squared
Wh	watt hours
Y-K Delta	Yukon-Kuskokwim Delta

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Executive Summary

Background

The U.S. Fish and Wildlife Service (FWS and the Service), Bureau of Land Management (BLM), and National Park Service (NPS) are considering applications from United Utilities, Incorporated (UUI) to install infrastructure as part of a project to improve internet telecommunications with broadband services for the communities of Southwestern Alaska. The USDA Rural Utilities Services (RUS) awarded a grant to UUI under the Broadband Initiatives Program for the purpose of delivering reliable and affordable broadband service from the internet backbone in Anchorage, Alaska to 65 communities in the remote Bristol Bay and Yukon-Kuskokwim Delta regions of Alaska. UUI refers to the proposed project as TERRA Southwest (TERRA-SW). To build this internet backbone system, UUI has proposed to install a fiber optic cable from the Anchorage network across Cook Inlet to Levelock and other communities in the vicinity of Lake Iliamna and the construction of four remote microwave repeater stations to service communities beyond that location.

Three of these stations are proposed for installation on Federal lands; two sites on the Togiak National Wildlife Refuge (the Refuge or Togiak Refuge), and one on BLM-managed lands. If approved by the Federal agencies these actions would require FWS and BLM to grant federal rights-of-way (ROWs) to build these remote microwave repeater stations in the Togiak Refuge and on BLM-administered lands, and the NPS would need to issue a special use permit (SUP) for activities associated with the installation of the fiber optic cable on submerged lands in Lake Clark, within the boundaries of the Lake Clark National Park and Preserve. Other components of the TERRA-SW Project would be installed on State and private lands, subject to other permits and environmental reviews. (See Section 1.3.1 for discussion of the Categorical Exclusion issues by the RUS, and Section 1.6 for the status additional permitting actions.)

Purpose and Need

The purpose of this Environmental Assessment (EA) is for the FWS, the BLM, and NPS to respond to applications filed by UUI and make decisions on whether or not to issue the ROWs or SUP in accordance with the laws and regulations governing such actions for each individual agency. While the TERRA-SW project includes additional components to be installed on State of Alaska and private lands, these other components are not the actions for which permit applications are under review in this EA.

The FWS reviews ROW applications under the terms of the National Wildlife Refuge System Administration Act of 1966 (16 U.S. C 668dd-668ee) as amended, and the regulations found at 59 CFR Part 29. Additional requirements concerning a transportation and utility system within a National Wildlife Refuge or a National Park, under Title XI of Alaska National Interest Lands Conservation Act (ANILCA) (16 U.S. C. 3161 et seq.) are noted in Section 1.3.3. The BLM is required to respond to two applications (serial numbers AA-92019 and AA-92376) filed under the authority of Title V of the Federal Land Policy and Management Act of October 21, 1976 (90 Stat. 2776; 43 U.S.C. 1761), as amended (FLPMA). FLPMA requires the BLM to manage the public lands on the basis of multiple use and sustained yield unless otherwise specified by law. Additional requirements concerning a BLM review of lands with wilderness characteristics, under Secretarial Order 3310, are noted in Section 1.3.2. The NPS responds to an SUP application under terms of the National Park Service Organic Act of 1916 (16 U.S.C. 1, 2, 3, and 4) as amended, and the regulations found at 36 CFR Section1.6 and Section 13.55.

FWS, BLM, and NPS are also required to evaluate the potential effects on the natural and human environment of the proposed actions and alternatives. This EA provides the technical analysis needed for each agency to independently make an informed decision with regard to approval or rejection of the applications received, and if approved, the appropriate terms and conditions under which such approval would be granted.

Proposed Action

The proposed actions under review in this EA include the construction, operation, and maintenance of three remote microwave repeater sites at Cone Mountain (Seward Meridian, T009S R074W, Sections 27 & 34), Caribou Ridge (T012S R068W Section 1) and Kulukak Mountain (T013S R062W Sections 18 & 19), as well as activities associated with installation of a lake-bed fiber optic cable from Nondalton to Port Alsworth. NPS would decide whether to issue the SUP for activities associated with installation and maintenance of a fiber optic cable from Nondalton to Port Alsworth, where it would rest on the bed of Lake Clark within Lake Clark National Park and Preserve. Temporary staging areas during the proposed late-May to October 2011 construction period would include Carter Bay, Platinum, Togiak, and Kulukak Bay.

FWS and BLM must grant ROWs before UUI can construct the microwave repeater sites on these lands. Installation of the lake-bed fiber optic cable in Lake Clark requires an SUP from NPS. In accordance with NEPA, these federal actions require that an EA be completed before FWS, BLM, and NPS may grant the proposed ROWs or SUP.

In addition, ROW proposals for Transportation and Utility Systems (TUS) in or across conservations system units established by ANILCA fall under the authorities and requirements established in Title XI of ANILCA. ANILCA Title XI and its implementing regulations, 43 CFR 36, established the criteria under which applications for ROWs in conservation system units are to be evaluated.

The proposed microwave repeater sites at Caribou Ridge and Kulukak Mountain are located on Togiak Refuge land and subject to the determinations required under ANILCA Title XI. The lake-bed fiber optic cable in Lake Clark would be installed on submerged lands and the cable egress in Port Alsworth would be sited on private lands. Though a proposed fiber optic cable would occur within the legislated boundaries of Lake Clark National Park and Preserve, it would not be installed on NPS lands; however, the NPS has authority and a standing regulation to issue an SUP to manage activities associated with the installation and maintenance of the cable to protect park purposes and values, notwithstanding ownership of submerged lands. BLM-managed lands in the Cone Mountain area are not part of a conservation system unit, and therefore not subject to the ANILCA Title XI review.

The provisions of 43 CFR 36.7 (a) (2) provide, among other requirements, that each Federal agency in making its decision to approve or disapprove a TUS “shall consider detailed findings supported by substantial evidence as to the portion of the TUS within that agency’s jurisdiction with respect to: (1) the need for and economic feasibility of the TUS; (2) Alternative routes and modes of access, including a determination with respect to whether there is any economically feasible and prudent alternative to routing the system through or within an area.” 43 CFR

36.1(h) defines an economically feasible and prudent alternative route as a route within or outside a Conservation System Unit (an Alaska NWR is a Conservation System Unit) "that is based on sound engineering practices and is economically practicable, but does not necessarily mean the least costly alternative route."

Under Secretarial Order 3310: "All BLM offices shall protect these inventoried wilderness characteristics when undertaking land use planning and when making project-level decisions by avoiding impairment of such wilderness characteristics unless the BLM determines that impairment of wilderness characteristics is appropriate and consistent with applicable requirements of law and other resource management considerations."

Public Involvement

Public Scoping Meetings

The FWS initiated public involvement in this EA with a letter on April 26, 2010, which announced that an EA was to be prepared and invited comments to be received by May 28, 2010. Posters and advertisements were then used to announce the scoping meetings to be held in early May, 2010. In a letter, dated May 10, 2010, FWS again requested public comment on the proposed project, and noted that comments received during the initial scoping period would be used in developing alternatives. Comments were requested by June 15, 2010. The FWS and BLM led two public scoping meetings in the project area in Togiak on May 4, 2010 and in Dillingham on May 5, 2010.

Government-to-Government Consultation with Federally-Recognized Tribes

In compliance with Executive Order 13175, Consultation and Coordination with Indian Tribal Governments, federal agencies are required to consult with federally recognized tribal governments during the NEPA process. FWS identified six tribal governments potentially affected by the project (See Section 1.4.2). Tribes were notified by letter dated December 28, 2010 of the opportunity to consult. No requests for consultation were received.

Issues Raised in Scoping

The scoping process revealed public interest in the project and potential benefits, as well as concern with a variety of issues regarding the project design, alternatives, and potential impacts. Issues identified during scoping that were carried forward for analysis in this EA included the following:

Physical Environment: Meteorology and Air Quality, Geology and Soils, Hydrology and Hazardous Materials and Waste Management

Biological Environment: Vegetation and Wetlands; Fish; Wildlife – Terrestrial Mammals, Birds, and Marine Life; and Threatened and Endangered Marine Mammals and Birds

Social Environment: Socioeconomic Resources, Subsistence, Land Use, Lands with Wilderness Characteristics, Transportation, Recreation, Noise, Visual Resources, Cultural Resources and Environmental Justice

Public review and comments on the Draft EA

On February 9, 2011, the FWS announced the availability of the Public Draft Environmental Assessment with a letter and posting on the Togiak National Wildlife Refuge website. The Refuge sent this notice to the mailing list of persons who had expressed an interest in the project during the scoping period. With a reschedule of two meetings due to weather delays, the five meetings were held as follows:

Dillingham	February 16, 2011 – 24 attendees, plus a Bristol Bay Campus environmental science class participating by teleconference
Nondalton	February 21, 2011 – 16 attendees
Port Alsworth	February 21, 2011 – 14 attendees
Goodnews Bay	February 28, 2011 – 19 attendees
Togiak	February 28, 2011 – 13 attendees

The meetings provided an overview of the project, the alternatives analyzed, and the environmental impacts identified. Questions were answered and public comments were recorded. Through March 18, 2011, in addition to the comments receive during the public meeting, a total of 46 written comments were received. These included e-mail messages and letters from local residents, visitor industry business owners, elected leaders, health and education institutions, environmental organizations, and other individuals. All substantive comments were reviewed and, as appropriate, the EA was revised in response. A summary of public comments and responses is found in Appendix C.

Alternatives

Three alternatives were selected and carried forward for analysis which included: the No Action Alternative, the proposed action alternative as developed by UUI, and an alternative which would bypass the Refuge and BLM lands by using submarine cables from Dillingham (Kanakanak) to Quinhagak. (See Section 2.2 for fuller descriptions and figures illustrating the alternatives.)

No Action – Alternative 1

Under the No Action Alternative, the federal agencies would not grant ROWs and the existing telecommunications and satellite internet service would continue.

Hybrid Fiber Optic/Microwave – Alternative 2 (Proposed Action)

Under the proposed action reviewed in this EA a series of three microwave towers (and associated facilities like a communications equipment shelter, a power module shelter, and fuel tanks), would be constructed on federally managed lands. The towers would be 60 ft tall, with four or five eight foot microwave antennas and four cellular phone service antennas attached. Power would be provided by two 9kW diesel generators, outfitted with hospital grade silencers. A lake-bed spur fiber-optic cable would connect Nondalton and Port Alsworth, with egress on private lands in Port Alsworth.

Additional components of the TERRA-SW project, reviewed only in relation to cumulative effects and not subject to direct review in this EA, would provide connections from Homer to

Quinhagak, including a submarine cable across Cook Inlet, buried cable and above-ground structures, and additional infrastructure installed on non-federally-managed lands.

Hybrid Fiber Optic/Microwave with Submarine Cable – Alternative 3

Based on the feasibility study, FWS selected for analysis a submarine cable system from Dillingham (Kanakanak) to Quinhagak, using a festooned approach with duplicate cables connecting the four proposed sites. The first segment takes the cable from Dillingham to Togiak. The second segment connects Platinum to Quinhagak. The third segment takes the cable from Dillingham to Platinum; and the fourth segment connects Togiak to Quinhagak.

The marine cable routes have been designed to run through the deepest and most continuous channels, where possible. The marine cable routes were designed to avoid all natural or man-made obstructions and all restricted areas, where possible, that may affect the integrity of the marine cable or related survey and installation operations. Once installed, no routine maintenance is required for the submarine cable. Damage and breaks in the cable could occur, and depending on the season repairs may be delayed due to weather. However, the design provides for reliable service in that each site is served by two cable pathways.

Summary of Impacts

The following tables reproduced from Chapter 4 of this EA summarize the direct, indirect, and cumulative impacts under each alternative for all resources.

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Executive Summary Table 1 Alternatives Summary Impacts

Impact Topic	Alternative 1 – No Action Alternative	Alternative 2 – Hybrid Fiber Optic/Microwave	Alterative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable
Meteorology and Air Quality	No changes to air quality.	Impacts to air quality from construction from equipment emissions over a 150 day period are expected to be low in intensity, temporary in duration and affect resources that are common in context. Summary impacts are negligible. Operational impacts would be low in intensity, long term in duration (life of the project) and affecting resources common in context, and not likely to adversely impact air quality of the region. Effects could be further reduced by using wind energy as a supplemental power source, if determined based on site-specific wind and climate data to be collected for three years at the microwave repeater sites. Summary impacts are negligible in isolation, and make negligible cumulative contributions to greenhouse gases.	Emissions from barge equipment during construction and operation likely would be low in intensity, temporary in duration, affecting resources common in context, and not likely to adversely impact air quality of the region. Summary impacts would be negligible in isolation, and make negligible cumulative contributions to greenhouse gases.
Geology and Soils	No changes to geology and soil resources.	Topsoil removal/excavation and facility installation (less than one acre per site) would result in direct and indirect impacts that would be high in intensity for a small localized area, of long-term duration, very localized and affecting resources common in context. The summary impact would be minor.	Topsoil removal/excavation and cable burial and exhumation at ingress and egress points (less than one acre) along the cable routes would result in direct and indirect impacts to soils that would be high in intensity in a small area, of short-term duration, and affecting localized resources common in context. Summary impacts are considered minor.
Hydrology	No changes to hydrology, including water resources and water quality.	One site has anchoring points below the water table which is only eight feet down. Impacts at this site are not known and depend on final design and construction techniques. Risk of fuel spills exists at sights with high water tables, flight paths in and across river valleys, barge staging sites and the egress points at Lake Clark. Spill prevention and response procedures can reduce risk. Spill effects are unknown and could be significant depending on location, season, and circumstances. Barring a fuel spill scenario, impacts would be temporary, localized, short in duration (construction activities), and high in intensity but affecting resources common in context. Given the limited temporal and fuel volume risks, the summary impact of a fuel spill would be considered minor to moderate.	Cable burial and exhumation at ingress and egress points along the cable routes would result in direct and indirect impacts to that would be high in intensity, of short-term duration, localized and affecting resources that are common in context. Impacts experienced would be in developed areas (i.e., villages and towns.) The summary impact would be minor and a negligible contribution to the total area covered by the project throughout Southwest Alaska.

Impact Topic	Alternative 1 – No Action Alternative	Alternative 2 – Hybrid Fiber Optic/Microwave	Alterative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable
Hazardous Materials and Waste Management	No impacts due to hazardous materials result from Alternative 1.	Storage of fuels and hazardous materials onsite create risks of a release. However, containment designs and an approved SPCC plan reduce the risks. Fuel transport during annual re-supply operations represents a larger risk. Refueling occurs during a total of 42 helicopter round trips over 6-9 days annually for the 25 year life of the project. A 500 gallon fuel container represents the volume of a spill incident risk. If such a spill were to occur on land the impact would be high in intensity, short term in duration, local in extent, affecting a common resource. If the spill were to occur in wetland or a water body, the impact would likely be longer term (exceeding two years), and larger in extent, and high in intensity. Given the limited temporal and fuel volume risks, the summary impact of a fuel spill would be considered minor to moderate.	Risk of fuel spills exists from barges and vessels used during construction and placement of the submarine cable, but these can be managed and mitigated. No impacts would occur on the Togiak NWR or BLM-managed lands. Effects would depend on the type of product spilled. If fuel spills were to occur, summary impacts could range from negligible (disturbance/habitat loss in small area and/or small fuel spills) to moderate (large fuel spills).
Vegetation and Wetlands	No changes to vegetation and wetlands resources.	No impacts to wetlands at the microwave repeater tower sites. The potential exists to affect wetlands nearby if a fuel spill occurred. Impacts to vegetation would be long-term but minor based on the duration of the revegetation. Impacts to vegetation would be long lasting, at least as long as the life of the project operations. With invasive species prevention and mitigation measures properly implemented and without accidental fuel or chemical spills, impacts would be considered minor, affecting common resources in a relatively small area, for a long duration. Summary impacts to vegetation at cable landfall would be negligible.	There are no expected impacts to wetlands and vegetation from the placement of the submarine cable in offshore waters. Under Alternative 3 the risk of fuel spills exists but can be managed and mitigated. Barring a fuel spill scenario, implementation of Alternative 3 would be expected to have low intensity, temporary effects in relatively small areas. The summary impact is considered negligible.
Fish	No changes to fish or EFH.	Under Alternative 2 the risk of fuel spills exists but can be managed and mitigated through safety training and procedures. Barring a fuel spill scenario, the effects of Alternative 2 would be of minor intensity, localized in extent, short in duration, and affecting resources that are common. Summary impacts would be minor or negligible to fish and fish habitat.	Under Alternative 3 the risk of fuel spills exists and is managed through safety training and procedures. Barring a fuel spill scenario, Alternative 3 would be expected to be of low intensity, generally temporary, and occurring in small areas. Thus, summary impacts would be negligible to marine fish and minor to marine fish habitat.

Impact Topic	Alternative 1 – No Action Alternative	Alternative 2 – Hybrid Fiber Optic/Microwave	Alterative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable
Wildlife (Terrestrial Mammals, and Birds)	No changes to terrestrial mammals or birds.	Construction at the three microwave repeater sites together would disturb approximately 2.71 acres of wildlife habitat with 0.28 acres affected by excavation and installation of project facilities. Impacts (noise, disturbance) involve common resources, and are of low intensity and temporary in duration. Impacts from helicopters during construction have a medium intensity, and could possibly have a long term effect on seabirds, waterfowl, and shorebirds because Carter Bay is a regionally important area for fall staging birds. Summary impacts to wildlife would be moderate. Some impacts to wildlife would continue from helicopter operations for the 25 year life of the project operations. Bears in particular are known to dislike helicopter operation. Impacts would be reduced through mitigation measures to include flight path selection and altitude of operation. In addition, limiting helicopter supported refueling flights to avoid the period of intensive hunting, fishing, and recreation activity, (estimated at mid-May – Mid-October) will also reduce impacts to wildlife and birds.	Impacts to wildlife would be to seabirds, shorebirds, and waterfowl in the nearshore and offshore marine environments. Impacts would be low intensity, temporary in duration, and affecting resources common in context, with the exception of Steller's eiders. Summary impacts would be negligible, but potential impacts to Steller's eiders would raise this rating to minor.
Marine Life and Threatened and Endangered Species	No changes to marine life, marine mammals and threatened and endangered species.	No impacts at microwave repeater sites or lakebed landfall. Risk of fuel spills exists from barges used at staging areas. Barring a fuel spill scenario, impacts of disturbance are unknown and would only be expected while barges are present during construction affecting resources important in context because this includes marine mammal protected areas, Steller sea lion critical habitat and EFH. Summary impacts are considered minor.	Risk of fuel spills exists from barge and vessel equipment used for placement of submarine cable but can be managed and mitigated. Displacement during barge presence could occur and would depend on the path (proximity to haul-outs. Summary impacts to marine life range from minor (disturbance/habitat loss in small area) to moderate (potential fuel spills).
Socioeconomics	No changes to socioeconomic patterns.	Positive effects of medium to high intensity, long-duration and regional and wider extent. Adverse impacts to the visitor industry sector are possible, but estimated at low intensity over time. Project improvements in communication infrastructure would result in a positive moderate summary impact.	Improvements in communication infrastructure would result in a positive moderate long term impacts.
Subsistence	No changes to subsistence resources or users.	Impacts would be of low intensity and long-duration (operations period) but in a very small area, and affect resources that are common in context. Summary impact would be considered negligible.	Impacts would be low in intensity, limited in spatial extent during cable installation, temporary in duration, but affecting marine mammal resources that are important in context. No direct or indirect impacts expected during operation. The summary impact is negligible.

Impact Topic	Alternative 1 – No Action Alternative	Alternative 2 – Hybrid Fiber Optic/Microwave	Alterative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable
Land Use	No changes to land use.	Noise and construction activities would create disturbances of medium to high intensity at the barge staging areas and the microwave repeater sites construction tower sites but disturbance would be limited to the construction period in localized areas that are common in context. For the microwave repeater sites on Togiak Refuge, lands would be reclassified from minimal to intensive management. This impact is considered minor. Operational impacts are confined to small areas, and are of low to medium intensity, affecting resources that are common in context and would be considered minor. Limiting helicopter supported refueling flights to avoid the period of intensive hunting, fishing, and recreation activity, would reduce impacts to these land uses.	Minor direct impact on land use, and a negligible contribution to cumulative impacts on land use. Potential negative impacts on commercial and subsistence fisheries during the construction period could be avoided by effective mitigation. Once construction of the landfall facilities is completed and the marine cable is laid, there would be no associated ongoing noise or visual disturbance impacts to wilderness characteristics.
Lands with Wilderness Characteristics (BLM-managed lands in the Cone Mountain area)	No changes to lands with wilderness characteristics.	Impacts to lands with wilderness characteristics would be greater during the construction period, but limited to a single season. Together with lesser impacts during operations and annual maintenance, the summary impacts are expected to be minor to moderate. Implementation of Alternative 2 would contribute a minor additive or synergistic effect with other trends affecting the visitor industry and lands with wilderness characteristics. Limiting helicopter supported refueling flights to avoid the period of intensive hunting, fishing, and recreation activity, would reduce impacts to opportunities for solitude and primitive recreation.	No impacts to lands with wilderness characteristics would occur because the cable is installed in marine waters.
Transportation	No changes to transportation.	Impacts would be of medium intensity, temporary in duration, and local and common in context. Impacts would be negligible.	Impacts would be of low intensity, temporary in duration, and local and common in context. Negligible impacts to regional transportation expected.
Recreation	No direct, indirect or cumulative impacts on recreation.	A direct impact includes a minor positive contribution to the visitor industry due to improved telecommunications and web-presence. Disturbance to visitors and recreationalists from construction and operation considered short to long term in duration, low in intensity and affecting resources that are local and common in context. Limiting helicopter supported refueling flights to avoid the period of intensive hunting, fishing, and recreation activity, would reduce impacts to recreation. Summary impact considered minor to moderate.	Potential direct positive impact on the visitor industry due to improved telecommunication support for industry and visitors. Impacts from construction would be of low intensity and occur for a short duration in a local and common context. No impacts would be expected to occur during operation. Summary impact expected to be negligible.

Impact Topic	Alternative 1 – No Action Alternative	Alternative 2 – Hybrid Fiber Optic/Microwave	Alterative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable
Noise/Soundscape	No changes to noise or soundscape.	Although greater noise effects would occur during construction, over the life of the project direct impacts of low intensity, long-term duration, limited in geographic extent, and common in context that would be considered minor. Limiting helicopter supported refueling flights to avoid the period of intensive hunting, fishing, and recreation activity, would reduce noise impacts to these activities.	These effects would be of very low intensity, short duration, limited in geographic extent, and common in context, with a summary impact considered to be negligible.
Visual Resources	No changes to visual resources.	Minor long-term impacts to visual resources. Impacts would be of medium intensity, long-term duration, would be limited in spatial extent when considered in the context of the Refuge and BLM-managed lands as a whole, and would not impact visual resources that are unique to this portion of the Refuge, BLM-managed lands, and other areas in SW Alaska. These impacts, however, are expected to be minimized by the expansiveness of the characteristic landscape, and thereby would not dominate the views experienced by sensitive viewer groups engaged in recreation or subsistence. Summary impact to visual resources is considered minor.	Direct or indirect from construction and decommissioning would be of low intensity, short-term duration, and affecting resources that are common in context. Long-term direct and indirect effects to visual resources from operation are expected to be negligible. The summary impact is considered negligible.
Cultural Resources	No changes to cultural resources.	Construction methods would be used that avoid known cultural resources sites, so no direct or indirect impacts expected. No contribution to cumulative effects would occur.	Since surveys for the near shore cable alignments have not been performed, risk of impacts to cultural resources exists. This could be managed and mitigated through additional surveys and documentation work. No direct or indirect impacts expected.
Environmental Justice	No changes to environmental justice.	Implementation would have positive moderate impacts on socio-economics the region and negligible to moderate effects on other resources. No Environmental Justice concerns are identified.	Implementation would have positive moderate impacts on socio-economics in the region, and negligible to minor impacts to resources. No Environmental Justice concerns are identified.

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1.0 Purpose and Need for the Proposed Action

1.1 Introduction

The U.S. Fish and Wildlife Service (FWS and the Service), Bureau of Land Management (BLM), and National Park Service (NPS) are considering applications from United Utilities, Incorporated (UUI) to install infrastructure as part of a project to improve internet telecommunications for the communities of Southwestern Alaska. The U.S. Department of Agriculture (USDA) Rural Utilities Services (RUS) awarded a grant to UUI under the Broadband Initiatives Program for the purpose of delivering reliable and affordable broadband service from the internet backbone in Anchorage, Alaska to 65 communities in the remote Bristol Bay and Yukon-Kuskokwim Delta (Y-K Delta) regions of Alaska. UUI refers to the proposed project as TERRA Southwest (TERRA-SW). To build this internet backbone system, UUI has proposed to install fiber optic cable from the Anchorage network across Cook Inlet to Levelock and other communities in the vicinity of Lake Iliamna and the construction of four remote microwave repeater stations to service communities beyond that location.

Three of these stations are proposed for installation on Federal lands; two sites on the Togiak National Wildlife Refuge (the Refuge or Togiak Refuge), and one on BLM-managed lands. If approved by the Federal agencies these actions would require FWS and BLM to grant federal rights-of-way (ROWs) to build these remote microwave repeater stations in the Togiak Refuge and on BLM-managed lands, and the NPS would need to issue a special use permit (SUP) to install the fiber optic cable in Lake Clark National Park and Preserve (Figure 1-1).

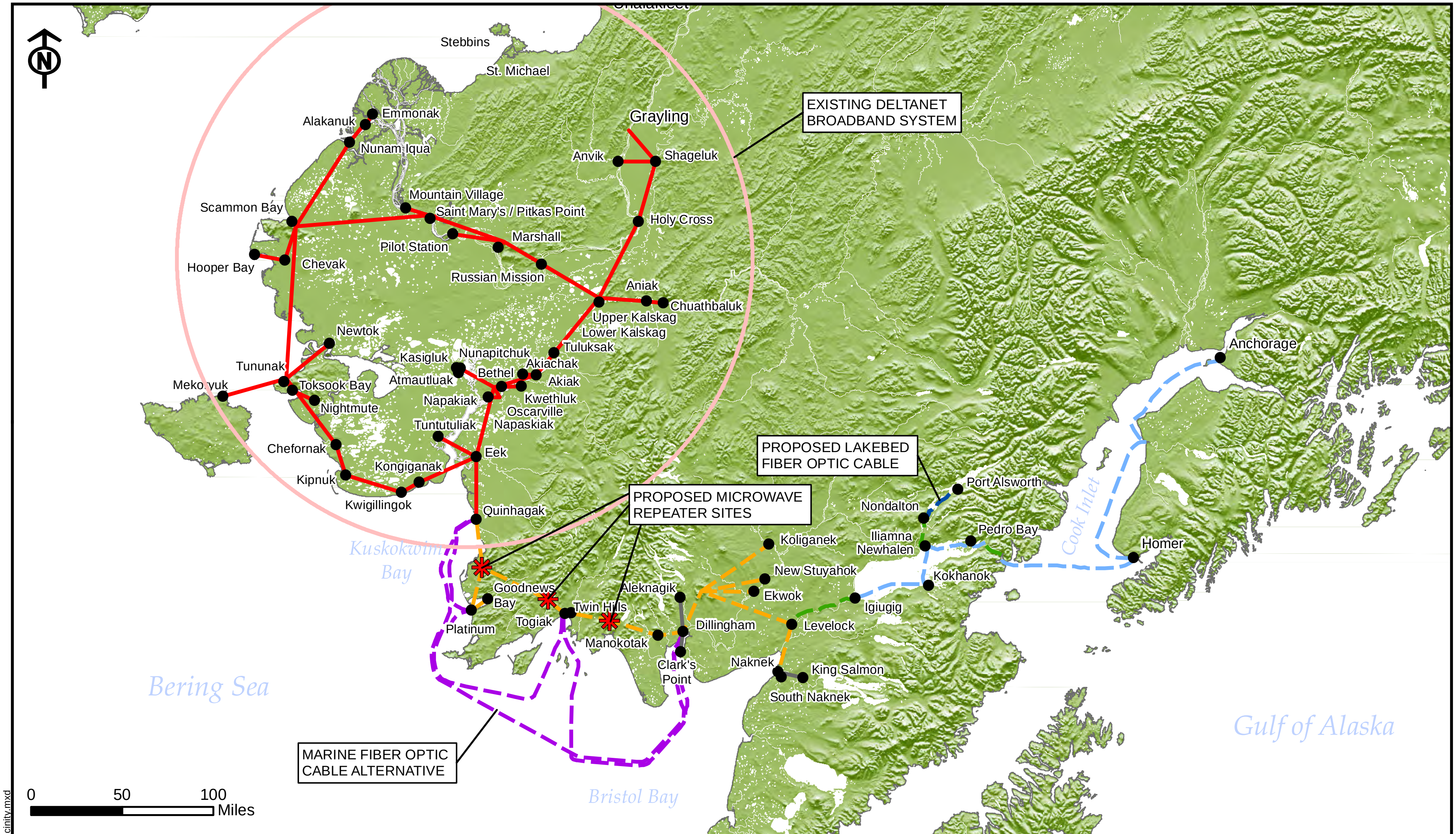
This project would address the need for more reliable terrestrial broadband service from the internet backbone in Anchorage to the 65 communities and more than 9,000 households in the Bristol Bay and Yukon Kuskokwim Delta regions in Southwest Alaska. Twenty-two communities in the Bristol Bay Region would receive new telecommunications facilities and 43 communities in the Y-K Delta Region would have upgraded systems. At present, these regions are linked to the internet backbone by private satellite networks. Although satellite service provides telecommunication services in rural Alaska, its higher cost, higher delays in connectivity and lower reliability limit its capacity to expand to broadband service. The TERRA-SW Project would provide high-capacity, high-speed, low delay connectivity and would improve internet connectivity and reliability. This would provide rural Alaskan communities opportunities to facilitate economic development, improve services to health care providers, schools, government, tribal, and non-profit entities and residential users.

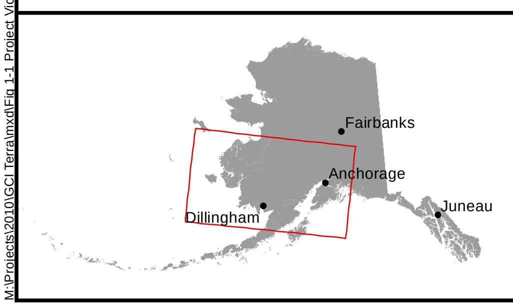
1.2 Purpose and Need

The purpose of this Environmental Assessment (EA) is for the FWS, the BLM, and NPS to respond to applications filed by UUI and make decisions on whether or not to issue the ROWs or SUP in accordance with the laws and regulations governing such actions for each individual agency. While the TERRA-SW Project includes additional components to be installed on State of Alaska and private lands, these other components are not the direct actions for which permits applications are under review in this EA. As noted in Section 1.3.1 and Section 1.6, these other components are subject to reviews and permit deliberations by other regulators and managers, including additional environmental reviews. In addition, under the analysis of cumulative effects from this project, the contribution of the project components reviewed in this EA to additive or synergistic effects will be identified. In other words, the cumulative effects analysis considers the way in which effects might interact to amplify their consequences.

The FWS reviews ROW applications under the terms of the National Wildlife Refuge System Administration Act of 1966 (16 U.S. C 668dd-668ee) as amended, and the regulations found at 59 CFR Part 29. Additional requirements concerning a transportation and utility system within a National Wildlife Refuge or a National Park, under Title XI of Alaska National Interest Lands Conservation Act (ANILCA) (16 U.S. C. 3161 et seq.) are noted in Section 1.3. The BLM is required to respond to two applications (serial numbers AA-92019 and AA-92376) filed under the authority of Title V of the Federal Land Policy and Management Act of October 21, 1976 (90 Stat. 2776; 43 U.S.C. 1761), as amended (FLPMA). FLPMA requires the BLM to manage the public lands on the basis of multiple use and sustained yield unless otherwise specified by law. The NPS responds to an SUP application under terms of the National Park Service Organic Act of 1916 (16 U.S.C. 1, 2, 3, and 4) as amended, and the regulations found at 36 CFR Section1.6 and Section 13.55.

In furtherance of these requirements, the FWS, BLM, and NPS are also required to evaluate the potential effects on the natural and human environment of the proposed actions and alternatives. This provides the technical analysis needed for each agency to independently make an informed decision with regard to approval or rejection of the applications received, and if approved, the appropriate terms and conditions under which such approval would be granted.





M:\Projects\2010\GCI Terra\mxd\Fig 1-1 Project Vicinity.mxd

- Existing DeltaNet Microwave
- Existing Leased Facilities
- Proposed Land-based Fiber
- Proposed Microwave
- Proposed Undersea Fiber
- Proposed Repeater Locations (Alternative 2)
- Lakebed Fiber Optic Cable
- Marine Fiber Optic Cable (Alternative 3)

Source: USGS; USFWS; GCI; ADNR; Alaska Map Science

TERRA - Southwest Environmental Assessment

Figure 1-1:
Project Vicinity

April 2011

1.3 Legal and Regulatory Context

FWS is the lead agency for the Environmental Assessment (EA) with the role of technical analysis, communication, and decision-making under the National Environmental Policy Act of 1969 (NEPA), as amended (42 U.S.C. 4321 et. seq.), and in its implementing regulations (40 CFR parts 1500-1508). The cooperating agencies, BLM and the NPS, contributed to the EA by providing information and reviewing components of the EA to insure it meets their agencies' respective permitting requirements. Each agency will develop the appropriate decision document with regard to the NEPA process for those lands under their management. Due to the fact that each agency has different regulatory authorities, regulations, and policies they must follow, it is feasible that the agencies could arrive at different determinations in their final decision documents.

RUS loan and grant requirements stated in the Notice of Funds Availability for the Broadband Initiatives Program and Broadband Technology Opportunities Program published in the Federal Register at 74 Fed. Reg. 33104 and those included in the Loan/Grant Agreement between UUI and RUS include the following:

> a. Provide broadband middle mile service to a service area that is comprised of 75% or more unserved or underserved rural areas as defined in the Notice of Funds Availability. This includes 65 communities in the Bristol Bay and Y-K Delta regions of southwestern Alaska as stated in UUI's application.
>
> b. Provide 100 Mbps of symmetrical capacity to each of the communities.
>
> c. Network construction and advance of all project funds by RUS (advance will generally follow completion of work) must be complete by May 31, 2013. 67% of award funds must have been advanced by May 31, 2012 (Loan/Grant Agreement Section 5.11.e.2).
>
> d. The Loan/Grant Agreement requires that UUI maintain a Times Interest Earned Ratio (TIER) that reflects the ability to repay prior existing RUS loans and the $44 million American Recovery and Reinvestment Act of 2009 (ARRA) loan. A TIER of 1.5 or greater must be maintained through 2029 (the term of the previous RUS loan to UUI) and a TIER of 1.0 following that until 2034 when the ARRA loan is paid in full (Loan/Grant Agreement Section 5.7/5.8).

The proponent, UUI, applied for funds under the ARRA, funded through the RUS, with the purposes and conditions noted above. The TERRA-SW Project met the funding requirements and RUS awarded the TERRA-SW Project a $44 million grant and a $44 million loan.

1.3.1 NEPA Requirements

NEPA requires federal agencies to integrate environmental values into their decision-making processes. The analysis must identify and disclose to the public the potential environmental impacts of the proposed actions and reasonable alternatives to those actions. This EA analyzes the potential environmental impacts that could result from the alternatives considered, including the No Action alternative. This EA has been prepared in accordance with the NEPA and the implementing regulations of the Council on Environmental Quality (CEQ) at 40 CFR 1508.9. In addition, the EA addresses the requirements of (ANILCA, 16 USC 51), and the BLM's Bay Resource Management Plan (RMP) and Final Environmental Impact Statement (EIS) (BLM, 2008).

This EA provides sufficient evidence and analysis for determining whether there is potential for significant impact, thus requiring an Environmental Impact Statement, or whether there is justification to prepare a Finding of No Significant Impact (FONSI). This EA also provides important information for pending decisions by the FWS, the BLM, and the NPS. The FWS and the BLM would decide whether to issue ROW permits for the construction of the proposed facilities in Togiak Refuge and on BLM-managed lands near Goodnews Bay. The NPS would decide whether to issue the SUP for activities associated with the installation and maintenance of a fiber optic cable from Nondalton to Port Alsworth, where it would occur on the bed of Lake Clark within the boundaries of Lake Clark National Park and Preserve.

On January 14, 2010, RUS issued a Categorical Exclusion for the TERRA-SW Project (RUS 2010) (Appendix A). RUS reviewed the proposal's description and Environmental Questionnaire prepared by UUI and found that that the proposed TERRA-SW Project was

> …consistent with 40 CFR 1508.4 and does not have any extraordinary circumstances or the proposal does not have significant effect on the human environment, therefore, neither an Environmental Assessment or an Environmental Impact Statement is required.

In the accompanying Memorandum dated January 13, 2010, RUS further stated that the project requires multiple permits and that some permit decisions will require additional NEPA analyses.

> In addition, the proposal requires multiple permits from numerous State and federal agencies prior to construction. Some of these actions will require additional NEPA reviews by these agencies prior to them permitting construction on their owned or managed property. Consequently there is limited potential for any significant impacts or effects from construction of this proposal.

1.3.2 Laws, Regulations, and Policies

The TERRA-SW Project would install infrastructure on federal lands managed by the FWS and the BLM. The tower sites on federal lands must be evaluated in relation to the management purposes and resource values of these federal lands. The activities associated with installation of the lake-bed cable from Nondalton to Port Alsworth, subject to an SUP, must be evaluated in relation to the management purposes and resource values of the Lake Clark National Park and Preserve.

The Togiak Refuge was established in its current configuration in ANILCA in 1980. The resource values of the region had previously been recognized as early as the establishment of the Cape Newenham National Wildlife Refuge under Public Land Order 4583 on January 20, 1969. As identified in Section 303(6) (B) of ANILCA, the Togiak Refuge purposes include:

(i) To conserve fish and wildlife populations and habitats in their natural diversity, including but not limited to salmonids, marine birds and mammals, migratory birds, and large mammals (including their restoration to historic levels)

(ii) To fulfill the international treaty obligations of the United States with respect to fish and wildlife and their habitats

(iii) To provide, in a manner consistent with purposes set forth in subparagraphs (i) and (ii), the opportunity for continued subsistence uses by local residents; and

(iv) To ensure, to the maximum extent practicable and in a manner consistent with the purposes set forth in paragraph (i), water quality and necessary water quantity within the Refuge.

In addition to the above noted purposes of the Togiak Refuge, the Togiak Wilderness Area is managed to meet additional purposes that include to secure an enduring resource of wilderness, to protect and preserve the wilderness character of areas within the National Wilderness Resource Preservation System, and to administer this wilderness for the use and enjoyment of the American people in a way that will leave it unimpaired for future use and enjoyment as wilderness (Section 2(a) of the Wilderness Act of 1964). (As shown in Figure 2.1, the TERRA-SW Project would not site any facilities within the Togiak Wilderness Area).

Operation and management of Togiak Refuge is guided by a wide array of laws, treaties, and executive orders, and policies. Among the most important are the National Wildlife Refuge System Administration Act, as amended by the National Wildlife Refuge System Improvement Act, the Refuge Recreation Act, the Endangered Species Act of 1976, and the Wilderness Act of 1964.

The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, 16 U.S.C. 668dd-668ee (Refuge Administration Act) serves as the "organic act" for the National Wildlife Refuge System. The act, as amended, consolidated the various categories of lands administered by the Secretary of the Interior (Secretary) through the Service into a single National Wildlife Refuge System. The act establishes a unifying mission for the Refuge System, and a process for determining compatible uses of refuges, among other important direction. This act states, first and foremost, the mission of the National Wildlife Refuge System be focused singularly on wildlife conservation.

This act identifies six priority wildlife-dependent recreation uses, clarified the Secretary's authority to accept donations of money for land acquisition, and placed restrictions on the transfer, exchange or other disposal of lands within the Refuge System. Most importantly, this act reinforces and expands the compatibility standard of the Refuge Recreation Act. The Refuge Administration Act authorizes the Secretary, under such regulations as he may prescribe, to "permit the use of any area within the System for any purpose, including but not limited to hunting, fishing, public recreation and accommodations, and access whenever he determines that such uses are compatible with the major purposes for which such areas were established."

Under the Comprehensive Conservation Plan (CCP) for the Togiak Refuge, lands affected by the proposed project are categorized as Minimal Management for which the following is an overview of the guidance:

> Minimal Management is designed to maintain the natural environment with very little evidence of human-caused change. Habitats should be allowed to change and function through natural processes. Administration will ensure that the resource values and environmental characteristics identified in the Plan are conserved. Public uses, economic activities, and facilities should minimize disturbance to habitats and resources. Ground-disturbing activities are to be avoided whenever possible (FWS, 2009a).

The BLM manages lands under FLPMA which provides the terms under which the BLM may grant a ROW, for purposes including a communications site. Title V includes the following conditions:

- The natural resources located on public lands administered by a government agency, where the public lands are adjacent to private or other lands are protected.
- Undue or unnecessary environmental damage to the lands and resources is prevented.
- The utilization of ROW in common with the respect to engineering and technological compatibility, national security and land use plans compatibility is promoted.
- Coordination, to the fullest extent possible, takes place with the State, local governments, interested individuals and appropriate non-governmental entities.

The BLM-managed lands involved in the proposed action, located in the Goodnews Bay area, are managed under the Bay RMP and Final EIS (BLM, 2008). The BLM lands in the Goodnews Bay block are managed as general public domain lands, under a multiple use framework. However, the Bay RMP (2008) established the Carter Spit Area of Critical Environmental Concern in the vicinity of Carter Bay for the purpose of protecting habitat for federally-listed migratory bird species (Steller's eiders). BLM-managed lands are also required to comply with BLM-Alaska policy concerning the coordination and management of invasive species actions on public lands within the State (BLM, 2010a).

On December 22, 2010, Secretarial Order (SO) 3310 was signed by Secretary of the Interior Ken Salazar. Under SO 3310 the BLM must evaluate any proposed action for its potential effects on Lands with Wilderness Characteristics (LWC) and if effects are present determine whether those affects would impact or impair the LWC.

Lake Clark National Park and Preserve was established in Section 201 of ANILCA, with direction to manage for the following purposes, among others:

- to protect the watershed necessary for perpetuation of the red salmon fishery in Bristol Bay;
- to maintain unimpaired the scenic beauty and quality of portions of the Alaska Range and the Aleutian Range, including active volcanoes, glaciers, wild rivers, lakes, waterfalls, and alpine meadows in their natural state; [and]
- to protect habitat for and populations of fish and wildlife including but not limited to caribou, Dall sheep, brown/grizzly bears, bald eagles, and peregrine falcons.

Additional guidance for the management of Lake Clark National Park and Preserve is found in the fundamental purpose of the national park system, established by the NPS Organic Act of 1916 and reaffirmed by the General Authorities Act of 1972, as amended. The statutory guidance begins with a mandate to conserve park resources and values. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adverse impacts on park resources and values. The NPS must leave resources and values unimpaired unless a particular law directly and specifically provides otherwise. (Additional discussion of the evaluation and determinations regarding impairment is found in Section 1.6)

1.3.3 ANILCA

With passage of ANILCA in 1980, Congress established or expanded over 100 million acres of federal conservation units, including the National Parks, National Wildlife Refuges, National Forests, National Wild and Scenic Rivers, and National Wilderness areas. Important sections of ANILCA for this EA include Title VIII which provided a priority for subsistence uses by rural residents on federal lands, and Title XI with requires specific analysis of impacts and alternatives to installing a utility within a federal conservation unit.

Under the provisions of Title VIII, Section 810, a federal land manager is required to identify whether a proposed land management action has the potential to significantly restrict subsistence uses. If so, then the manager is required to consult with local subsistence users and to seek to minimize such restrictions.

In Title XI, Congress recognized that Alaska was comparatively young state, with incomplete transportation and utility systems. As a result, in Title XI Section 1101 (b), Congress stated that "to minimize the adverse impacts of siting transportation and utility systems within units established…by this Act and to insure effectiveness of the decision-making process, a single statutory authority...for such systems must be provided" within in which an analysis of alternatives would be conducted.

Section 1104 (g)(2) requires consideration and findings regarding, the following, among others:

(A) the need for, and economic feasibility of, the transportation or utility system;

(B) alternative routes and modes of access, including a determination with respect to whether there is any economically feasible and prudent alternative to the routing of the system through or within a conservation system unit, national recreation area, or national conservation area and, if not, whether there are alternative routes or modes which would result in fewer or less severe adverse impacts upon the conservation system unit;

(C) the feasibility and impacts of including different transportation or utility systems in the same area;

(D) short- and long-term social, economic, and environmental impacts of national, State, or local significance, including impacts on fish and wildlife and their habitat, and on rural, traditional lifestyles;

(E) the impacts, if any, on the national security interests of the United States, that may result from approval or denial of the application for a transportation or utility system;

(F) any impacts that would affect the purposes for which the Federal unit or area concerned was established;

(G) measures which should be instituted to avoid or minimize negative impacts; and

(H) the short- and long-term public values which may be adversely affected by approval of the transportation or utility system versus the short- and long-term public benefits which may accrue from such approval.

The proposed microwave repeater sites at Caribou Ridge and Kulukak Mountain are located on Togiak Refuge land and subject to the determinations required under ANILCA Title XI. The lake-bed fiber optic cable in Lake Clark would be installed on submerged lands owned by the

State of Alaska, and the cable egress in Port Alsworth would be sited on private lands. The NPS is reviewing an SUP for activities associated with installation of the cable in Lake Clark National Park and Preserve pursuant to a standing regulation and notwithstanding ownership of submerged lands, but NPS is not issuing a ROW for installing facilities on Park lands. BLM-managed lands in the Cone Mountain area are not part of a conservation system unit, and therefore not subject to the ANILCA Title XI review.

1.4 Public Involvement and Issue Identification

Since the proposed action is potentially of high public interest and may cause concern in the affected communities, the FWS, BLM, and NPS decided to conduct scoping meetings for this EA. Scoping meetings allow the local communities to learn about the proposed action, to ask questions, to offer ideas, and to raise concerns. The agencies can use the public input to help identify issues to address in the EA and to develop alternatives.

1.4.1 Public Scoping Meetings

The FWS initiated public involvement in this EA with a letter on April 26, 2010, which announced that an EA was to be prepared and invited comments to be received by May 28, 2010. Posters and advertisements were then used to announce the scoping meetings to be held in early May, 2010. In a letter, dated May 10, 2010, FWS again requested public comment on the proposed project, and noted that comments received during the initial scoping period would be used in developing alternatives. Comments were requested by June 15, 2010. The letters were mailed to local communities and those who have asked to be on the refuge mailing list. (Appendix B includes the May 2010 scoping letter.)

The FWS and BLM led two public scoping meetings in the project area in Togiak on May 4, 2010 and in Dillingham on May 5, 2010. Issues and concerns expressed at these scoping meetings were recorded in notes taken by the federal agency representatives. Additional written comments were received from 11 stakeholders by e-mail and postal service.

1.4.2 Government-to-Government Consultation with Federally-Recognized Tribes

In compliance with Executive Order 13175, Consultation and Coordination with Indian Tribal Governments, federal agencies are required to consult with federally recognized tribal governments during the NEPA process. FWS identified tribal governments potentially affected by the project. Letters were sent to six identified tribal governments in late December 2010 inviting them to consult on this project. No responses were received. The tribes contacted were:

Native Village of Kwinhagak	Twin Hills Village Council
Native Village of Goodnews Bay	Native Village of Manokotak
Togiak Traditional Council	Curyung Tribal council (Dillingham)

In addition nineteen tribes, Native corporations, and regional tribal entities were consulted regarding the potential for traditional cultural properties in the area. (See Section 3.4.9.4 for those consulted.) No traditional cultural properties were identified.

1.4.3 Issues Raised in Scoping

The scoping process including information gathered during public meetings, written comments submitted during the scoping period, and issues identified by the lead and cooperating agencies. The scoping process revealed public interest in the project and potential benefits, as well as concern with a variety of issues regarding the project design, alternatives, and potential impacts. The following issues raised during the scoping period are included in Table 1-1.

Table 1-1. Scoping Issues

Issues Raised during Scoping Meetings and in Written Comments	
Impacts to wilderness, including potential economic impacts	Carbon footprint, fuel sources of project
Impacts of facilities, construction, and maintenance on fish and wildlife (collisions, displacement, noise, human activity)	Restoration/decommissioning/clean up
Visual Impacts	Competition versus monopoly for internet service
Noise impacts on wildlife and people	Reliability of new service
Contamination by fuel spills, air emissions	Alternative routes avoiding the Togiak Refuge and BLM sites including alternative repeater locations (ADNR TS003-3)
Invasive species, use of pesticides	Mitigation – cleanup of abandoned industrial sites
Subsistence activity impacts	Submarine cable alternative to avoid towers and impacts
Other uses of the ROW by Off-Road Vehicles (ORVs) for hunting	Land use designation/ modification of Togiak Refuge Comprehensive Conservation Plan
Impacts to soils (compaction)	GCI Lodge use of Togiak Refuge lands during construction and support of TERRA-SW
Impacts to cultural resources including traditional cultural properties	
Additional Issues Noted by the Project Proponent during Outreach Meetings	
Impacts to commercial fishing industry in Bristol Bay, particularly related to installation and maintenance of marine fiber optic cable	Concern about the potential connection (power and/or communications) to the Pebble Mine Project.
Concern that needs of state/regional users of public lands would be valued greater than communication needs of people locally.	

1.4.4 Issues to be Addressed

To focus this EA, specific issues were selected for further analysis and others were eliminated from evaluation. The issues selected for analysis or dismissed were determined by FWS and the cooperating agencies based on review of scoping comments and review of the proposed action by agency specialists. The issues in this EA are evaluated in Section 4.0, Environmental Consequences.

1.4.4.1 Physical Environment

Meteorology and Air Quality – Emissions from the proposed use of diesel generators at the microwave repeater tower sites could affect air quality and contribute to greenhouse gases.

Geology and Soils – Installation of the microwave repeater towers could alter or remove soils at the construction sites.

Hydrology – Construction and operations could affect streams and water bodies, including the case of a fuel spill, and impacts to water quality.

Hazardous Materials and Waste Management – Fuels and other hazardous materials would be employed in implementing the proposed project. Prevention and response measures planned must be identified and evaluated.

1.4.4.2 Biological Environment

Vegetation and Wetlands – Construction and operations may affect vegetation and wetlands, including risks of impacts to wetlands from fuel transportation and refueling operations. Preventative measures to avoid introduction of invasive species must be identified and evaluated.

Fish – Implementation of the project may affect fishery resources, including risks associated with fuel spills.

Wildlife (Terrestrial Mammals and Birds) – Project construction and operations may result in impacts including disruption of wildlife habitats, or disturbance and displacement of wildlife species. Construction activities staged from coastal locations and operations of the microwave repeater sites may affect birds and waterfowl.

Marine Life and Threatened and Endangered Marine Mammals and Birds – Sensitive, threatened and endangered species are potentially affected by the project, including the construction and operations phases.

1.4.4.3 Social Environment

Socioeconomic Resources – Impacts of the project may include changes in employment, income and other economic activities in the region.

Subsistence – Evaluation of the impacts to subsistence users of wildlife, fish and plants should include whether the project may result in displacement of important subsistence species, restrictions on subsistence users, or increases in competition for subsistence resources.

Land Use – The project may affect other land uses in the vicinity. Impacts on the undeveloped natural landscapes of Bristol Bay should be evaluated.

Lands with Wilderness Characteristics – The project may affect lands with wilderness characteristics in the Cone Mountain area and those potential impacts must be evaluate to determine if they impact or impair the wilderness characteristics.

Transportation – The project may affect existing transportation infrastructure and operations.

Recreation – The recreational visitor industry is a keystone of the regional economy, and the project may affect recreational activities and enterprises including recreational fishing and hunting opportunities.

Noise/Soundscapes – During construction and later during annual refueling operations, the use of helicopters would introduce new sound impacts along the transit corridors to the proposed microwave repeater sites. Generators at the tower sites would introduce noise throughout the tower sites surrounding areas. Impacts of the sound levels across these distances should be evaluated.

Visual Resources – The new infrastructure (60 foot towers and associated facilities) at three remote mountain sites in an area that is undeveloped would introduce visual impacts, with potential impacts to recreational and other users.

Cultural Resources – Project construction has the potential to disturb cultural resource sites which are important to indigenous people. Evaluation of impacts should include description of the preventative measures to avoid impacts.

Environmental Justice – The proposed project must be assessed to determine if it would result in disproportionate adverse impacts on minority and low income populations.

1.4.5 Issues Dismissed

NEPA regulations emphasize the importance of adjusting the scope of each EA to the particulars of the project and its setting, and focusing on the specific potential impacts of the project. There is no need, according to the regulations, to include information on resources that would not be affected by the project.

Scoping comments raised concern about misuse of surface trails developed to support construction at the remote mountain sites of the three microwave repeater towers. However, all construction would be supported by helicopters only. All equipment, materials, and personnel for the construction effort would be transported from coastal staging sites to the tower sites via helicopter, and no surface transportation would be employed. As a result this issue was dismissed from further analysis.

Scoping comments asked whether GCI Lodge would use Togiak Refuge lands as a result of the project activities. GCI Lodge would be required to meet any applicable regulatory requirements for use of the Togiak Refuge lands. This is separate from the activities of UUI, Inc., a GCI subsidiary involved in installing and operating the proposed broadband telecommunications project. This issue was dismissed from further analysis.

1.5 Public Review and Comments on the Draft EA

On February 9, 2011, the FWS announced the availability of the Public Draft Environmental Assessment with a letter and posting on the Togiak National Wildlife Refuge website. The Refuge sent this notice to the mailing list of persons who had expressed an interest in the project during the scoping period. The public was invited to provide review comments, with the note that comments were more useful if received by March 8, 2011, but that comments would be accepted and reviewed up until the time the decisions were made by the three agencies. The notice also announced five public meetings.

With a reschedule of two meetings due to weather delays, the five meetings were held as follows:

Dillingham	February 16, 2011 – 24 attendees, plus a Bristol Bay Campus environmental science class by teleconference
Nondalton	February 21, 2011 – 16 attendees
Port Alsworth	February 21, 2011 – 14 attendees
Goodnews Bay	February 28, 2011 – 19 attendees
Togiak	February 28, 2011 – 13 attendees

The meetings provided an overview of the project, the alternatives analyzed, and the environmental impacts identified. Questions were answered and public comments were recorded.

Through March 18, 2011, in addition to the comments received during the public meetings, a total of 46 written comments were received. These included e-mail messages and letters from local residents, visitor industry business owners and clients, elected leaders, health and education institutions, and environmental organizations.

All substantive comments were reviewed and, as appropriate the EA was revised in response. Appendix C provides a summary of comments and responses.

1.6 Permits and Authorizations Needed to Implement the Project

The proposal requires authorizations from the FWS, BLM and NPS. FWS is the agency responsible for issuance of a ROW Permit to the applicant authorizing use of two parcels in the Togiak Refuge for construction of the microwave repeater sites. BLM will evaluate the EA and decide whether or not to issue a Communications Use Lease and a short term construction ROW to the applicant for the Cone Mountain microwave repeater site. The NPS will use the analysis in this EA to decide whether to issue the SUP for activities associated with installation and maintenance of a fiber optic cable from Nondalton to Port Alsworth, where it would occur on the bed of Lake Clark within Lake Clark National Park and Preserve. In reaching the decisions required for permits, each agency will develop terms and conditions, including mitigation measures. The permit terms are legally binding, and agencies monitor compliance. Permit decisions made by each agency can be appealed by the applicant or an affected party, following the procedures of the individual agency.

Other permits and determinations required to implement the proposed action on the federal lands under analysis are summarized below.

Subsistence Impact Evaluation under ANILCA Section 810: The federal land managers must specifically evaluate the potential for the proposed action to significantly restrict subsistence uses of the federal land affected by the project. If the proposed action may result in a significant restriction, then the federal land manager is required to provide notice and conduct hearings with the affected communities. If the proposed action is found not likely to result in significant restrictions on subsistence uses, no further compliance activities are required. After the required public outreach for a proposed action that may significantly restrict subsistence, the federal land manager may determine that the project is necessary, that appropriate mitigation measures have been incorporate, and that the project can be approved.

Cultural Resources: The federal agencies involved require that Section 106 of the National Historic Preservation Act (NHPA) be completed before the project may be authorized. Section 106 involves the identification and evaluation of cultural resources that have the potential to be eligible for listing in the National Register of Historic Places (NRHP).The potential to effect cultural resources will be considered for each alternative evaluated in this EA.

On March 17, 2011, the FWS sent a letter to the State Historic Preservation Officer (SHPO), requesting concurrence in a Determination of No Historic Properties Affected (FWS, 2011a). Based on the historic property inventories performed by Territory Heritage Resource Consulting (THRC), as summarized in Section 3.4.89, the FWS Regional Historic Preservation Officer concluded:

> No archeological sites, historic properties, or traditional cultural properties were identified during extensive field and archival research in the region.

Compatibility Determination: In deciding on issuance of the ROW for use of Togiak Refuge lands, under the Refuge Administration Act, the Refuge Manager must make a determination that the proposed action would not materially interfere with nor detract from the mission or purposes for which the Togiak Refuge was established (See Appendix D).

Lands with Wilderness Characteristics: The area within which the proposed Cone Mountain site is situated has been reviewed with regard to Secretarial Order (SO) 3310. In reviewing the lands within the area of the proposed action, they were found to contain all of the following wilderness characteristics:

1) Size: roadless areas of over 5000 acres of contiguous BLM Lands.
2) Naturalness: affected primarily by the forces of nature, with the works of human substantially unnoticeable to the average visitor.
3) Solitude: outstanding opportunities for solitude or primitive and unconfined type of recreations.

As such, these lands fall under the requirement as outlined in the policy section of SO 3310:

> …All BLM offices shall protect these inventoried wilderness characteristics when undertaking land use planning and when making project-level decisions by avoiding impairment of such wilderness characteristics unless the BLM determines that impairment of wilderness characteristics is appropriate and consistent with applicable requirements of law and other resource management considerations. Where the BLM concludes that authorization of uses that may impair wilderness characteristics is appropriate, the BLM shall document the reasons for its determination and consider measures to minimize impacts on those wilderness characteristics.

Impairment of National Park Resources and Values: To fulfill the requirements of the NPS Organic Act, of 1916, as amended, NPS must evaluate and make determinations regarding the potential for impairment of park resources and values.

An impact on any park resource or value may, but does not necessarily, constitute impairment. An impact would be more likely to constitute impairment to the extent that it affects a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park, or
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or
- identified in the park's general management plan or other relevant NPS planning documents as being of significance.

Impairment may result from visitor activities; NPS administrative activities; or activities undertaken by concessioners, contractors, and others operating in the park. Impairment may also result from sources or activities outside the park.

Impairment findings are not necessary for visitor experience, socioeconomics, public health and safety, environmental justice, land use, and park operations, etc., because impairment findings relate back to park resources and values. The determination of impairment for the preferred alternative is found in Appendix I.

Other components of the project are installed on State of Alaska and private lands. These components include the submarine and terrestrial fiber optic cable from Homer to Levelock, the lake-bed fiber optic cable installed on submerged lands between Nondalton and Port Alsworth, barge landings at Platinum and within the Carter Spit area, and the upgraded communication towers in many communities. These components are not located on federal lands, and are therefore authorized by permits issued by the State of Alaska or by agreements with private land owners. These components are not analyzed within the scope of this EA. Though not authorized by the federal agencies, the potential impacts of those project components installed on State and private lands, which would not be necessary if the federal agencies were to reject the pending applications, must be evaluated in this document because of their close relationship to the project components reviewed in this EA.

The U.S. Army Corps of Engineers reviewed the proposed TERRA-SW fiber optic and microwave broadband network between Homer and Quinhagak in regard to placement in wetlands and tidal areas, as required by Section 10 of the Rivers and Harbors Act of 1899 (33U.S.C. 403) and Section 404 of the Clean Water Act (33 U.S.C. 1344). On January 18, 2011, the Corps of Engineers issued permit number PAO-2010-548, authorizing the proposed project (USACE, 2011).

The TERRA-SW Project would require a number of permits from agencies of the State of Alaska, including, but not limited to the Alaska Department of Natural Resources (ADNR), and the Department of Fish and Game (ADFG). ADNR Division of Coastal and Ocean Management (DCOM), reviewed the TERRA-SW Project (Application AK1011-06AA) for consistency with the Alaska Coastal Management Program (ACMP), under the regulations found at 11 AAC 110 and 112. In a letter dated January 3, 2011, the Final Consistency Response concluded:

> Based on an evaluation review by the Alaska Departments of Fish and Game and Natural Resources and the affected coastal districts, DCOM concurs with your certification that the project is consistent with the ACMP and affected coastal districts' enforceable policies (ADNR DCOM, 2011).

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2.0 Alternatives

NEPA requires review of a reasonable range of alternatives. This chapter provides an overview of the proposed action and notes the importance of ANILCA Title XI in identifying appropriate alternatives to be analyzed when a utility system is proposed for installation on a National Wildlife Refuge. The three alternatives subject to analysis in this EA are then described, followed by a description of additional alternatives considered but dismissed from further analysis.

2.1 Description of Proposed Action

The proposed actions under review in this EA includes construction, operation and maintenance of three remote microwave repeater sites at Cone Mountain (Seward Meridian, T009S R074W, Sections 27 & 34), Caribou Ridge (T012S R068W Section 1) and Kulukak Mountain (T013S R062W Sections 18 & 19), as well as activities associated with installation of a lake-bed fiber optic cable from Nondalton to Port Alsworth. NPS would decide whether to issue the SUP for installation and maintenance of a fiber optic cable from Nondalton to Port Alsworth, where it would rest on the bed of Lake Clark within Lake Clark National Park and Preserve. Temporary staging areas during the proposed June to October construction period would include Carter Bay, Platinum, Togiak and Kulukak Bay.

As described in Section 1.2, the FWS and BLM must grant ROWs before UUI can construct the microwave repeater sites on these lands. Installation of the submarine cable in Lake Clark requires an SUP from NPS. In accordance with NEPA, these federal actions require an EA be completed before FWS, BLM, and NPS may grant the proposed ROWs or SUP.

In addition, as described in Section 1.3, ROW proposals for Transportation and Utility Systems (TUS) within Alaska that include land within a National Wildlife Refuge or unit of the National Park System fall under the authorities and requirements established in Title XI of ANILCA. ANILCA Title XI and its implementing regulations, 43 CFR 36, established the criteria under which applications for ROWs on conservation system and units as defined by ANILCA are to be evaluated.

The provisions of 43 CFR 36.7 (a) (2) provide, among other requirements, that each Federal agency in making its decision to approve or disapprove a TUS "shall consider detailed findings supported by substantial evidence as to the portion of the TUS within that agency's jurisdiction with respect to: (1) the need for and economic feasibility of the TUS; (2) Alternative routes and modes of access, including a determination with respect to whether there is any economically feasible and prudent alternative to routing the system through or within an area." 43 CFR 36.1(h) defines an economically feasible and prudent alternative route as a route within or outside a Conservation System Unit (an Alaska NWR is a Conservation System Unit) "that is based on sound engineering practices and is economically practicable, but does not necessarily mean the least costly alternative route."

UUI, Inc., in its ROW Application identified three alternatives to the three proposed microwave repeater sites: 1) submarine fiber optic cable, 2) alternate microwave repeater sites which would avoid installing communications infrastructure on the Togiak Refuge, and 3) terrestrial fiber optic cable. Of these alternatives, FWS preliminarily determined that only one, the submarine fiber optic cable, has the potential to be economically feasible and prudent alternative.

In order to more fully analyze whether there is an economically feasible and prudent alternative as required by ANILCA Title XI (described in Section 1.3.3), FWS and UUI agreed to contract the services of an independent, third party to conduct a study. The David Ross Group was selected to provide those services. That firm reviewed several alternative configurations for a submarine cable from Dillingham, Alaska to Quinhagak, Alaska which would eliminate the need for the proposed microwave repeater towers on Togiak Refuge and BLM lands. The submarine fiber optic cable alternative reviewed in this EA is based on the report from the David Ross Group and is the alternative among the submarine cable configurations that best meets the technical requirements of the project (for the Executive Summary of the report, see Appendix E). The David Ross Group report has been completed. The report's financial analysis, based upon UUI revenue projections and business case constraints as well as the use of UUI's business model for the project, shows that although the submarine cable is technically feasible, it is not economically feasible or prudent due to its inability to meet the financial criteria established by RUS and UUI. The final determination as to economic feasibility will be made as part of the ANILCA Title XI determinations to be included in the FWS decision document based on this EA.

In addition to the determinations required under ANILCA Title XI, NEPA requires a review of a reasonable range of alternatives. To address both requirements, the submarine cable described in Alternative 3 is included for full evaluation in this EA in order to provide a comparative understanding of the environmental consequences of a reasonable range of alternatives.

2.2 Description of Alternatives Considered

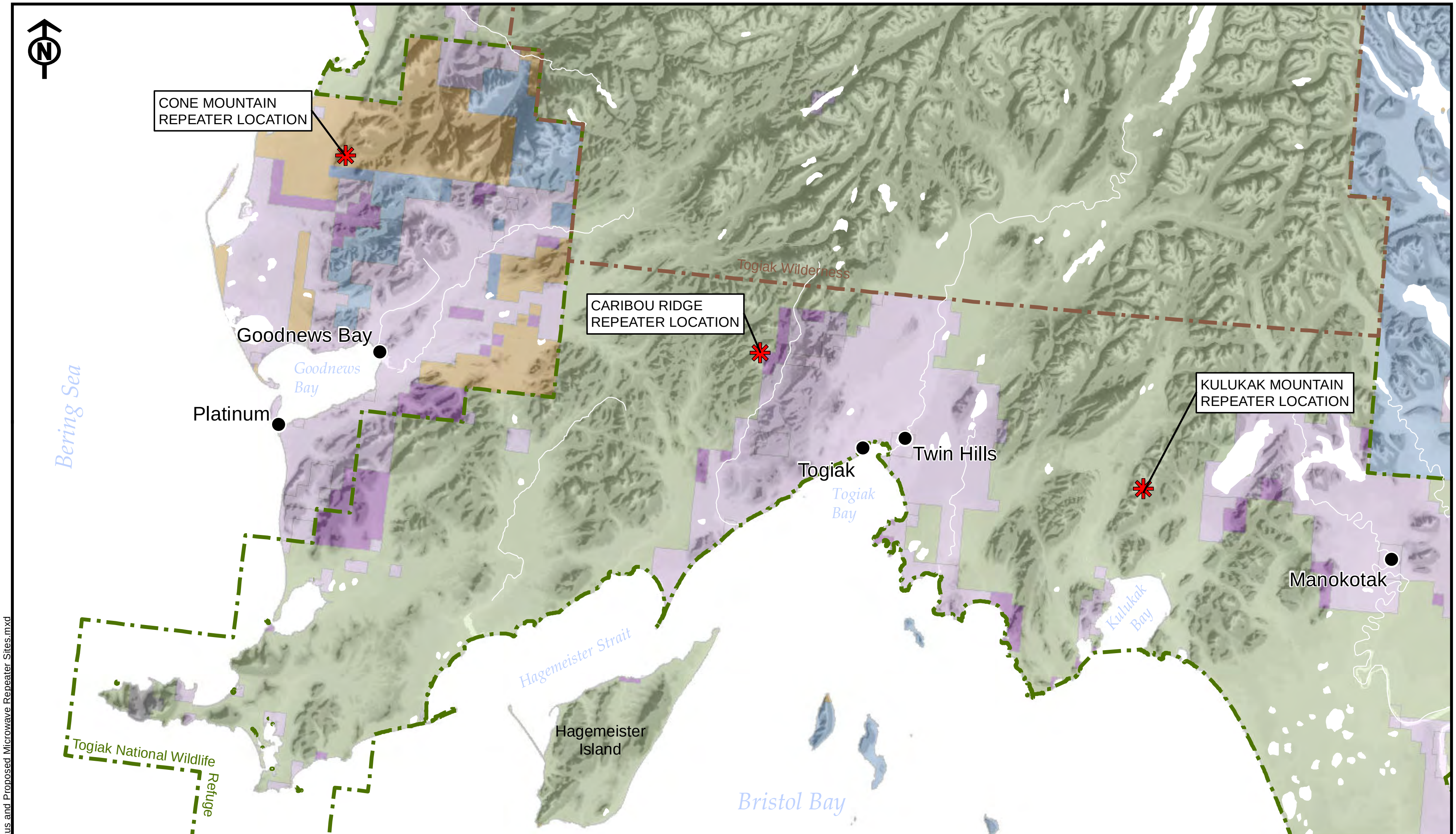
Three alternatives were selected and carried forward for analysis which included: the No Action Alternative, the action alternative proposed by UUI including the granting of ROW by the Service and BLM and issuance of an SUP by the NPS, and an alternative which would bypass the Refuge and BLM lands by using submarine cable from Dillingham (Kanakanak) to Quinhagak.

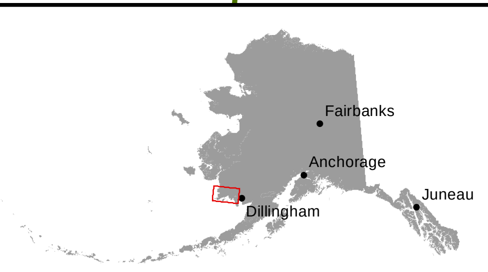
2.2.1 No Action – Alternative 1

Under the No Action Alternative, the federal agencies would not grant ROWs and the existing telecommunications and satellite internet service would continue.

2.2.2 Hybrid Fiber Optic/Microwave – Alternative 2 (Proposed Action)

Under the proposed action reviewed in this EA a series of three microwave towers (and associated facilities like a communications equipment shelter, a power module shelter, and fuel tanks), would be constructed on federally managed lands, along with a lake-bed spur fiber-optic cable connecting Nondalton and Port Alsworth. The microwave repeater sites, along with helicopter transit corridors for the construction period, are shown in Figures 2-1, 2-2, and 2-3. Additional components of the TERRA-SW Project, reviewed only in relation to cumulative effects and not subject to analysis in this EA, would provide connections from Homer to Quinhagak, including a submarine cable across Cook Inlet, buried cable and above-ground structures, and additional infrastructure installed on non-federally-managed lands (as previously shown in Figure 1-1).





- Bureau of Land Management
- Fish and Wildlife Service
- Military
- Alaska Native Corporation Patent or IC
- Alaska Native Corporation Selected
- State Patent or TA
- State Selected

- Proposed Repeater Location
- Togiak NWR Wilderness Boundary
- Togiak NWR Boundary

0 5 10 20 Miles

Source: USGS; USFWS; GCI; ADNR; BLM

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Figure 2-1:
Alternative 2 - Land Status
and Proposed Microwave
Repeater Sites

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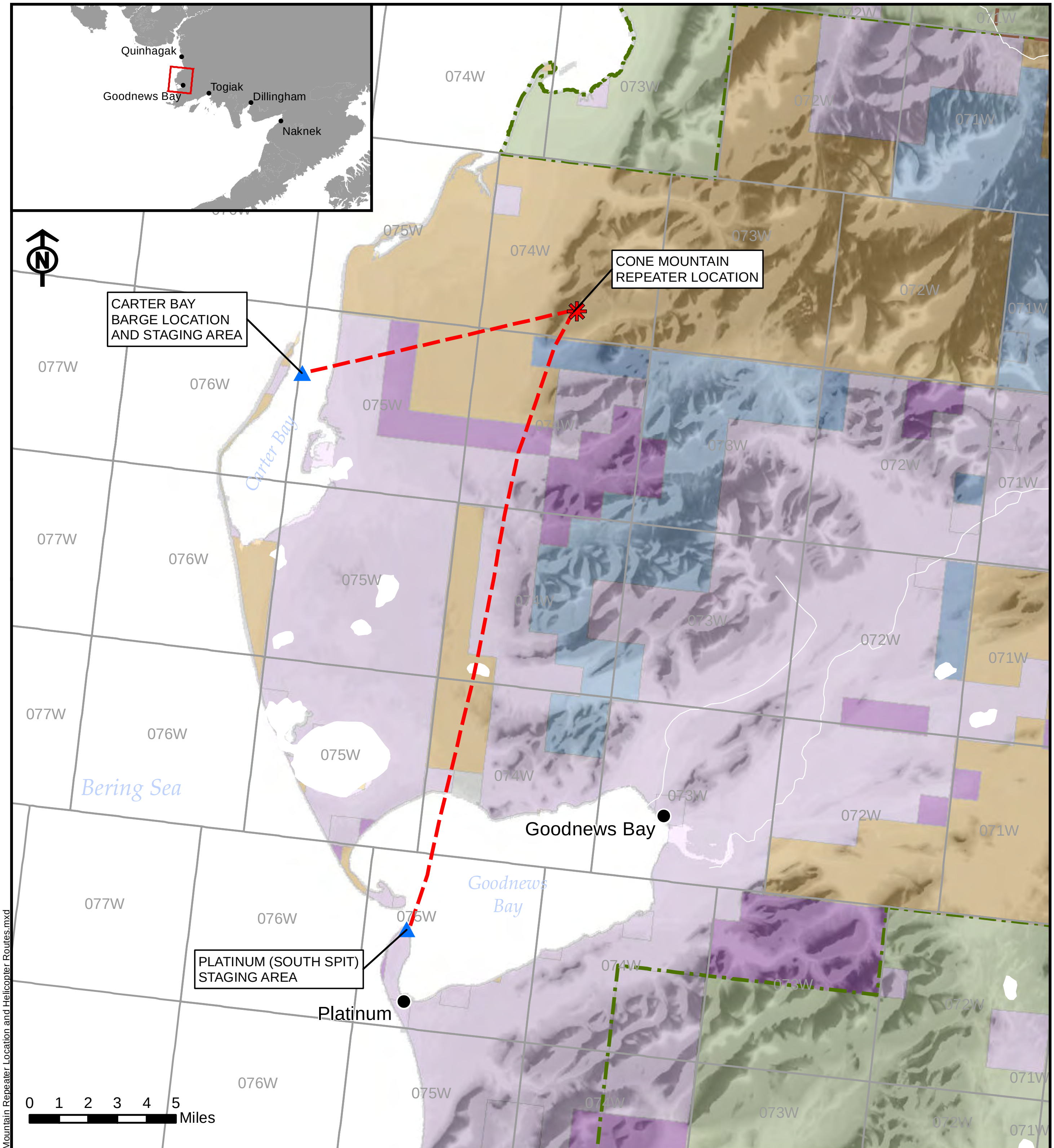

Bureau of Land Management
Fish and Wildlife Service
Military
Alaska Native Corporation Patent or IC
Alaska Native Corporation Selected
State Patent or TA
State Selected

Proposed Repeater Location
Approximate Staging Site for Construction
Helicopter Flight Path
Togiak NWR Wilderness Boundary
Togiak NWR Boundary

Source: USGS; USFWS; GCI; ADNR; BLM

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Figure 2-2:
Alternative 2 - Proposed Cone Mountain Repeater Location and Helicopter Routes

April 2011

M:\Projects\2010\GCI Terra\mxd\Fig 2-2 Cone Mountain Repeater Location and Helicopter Routes.mxd

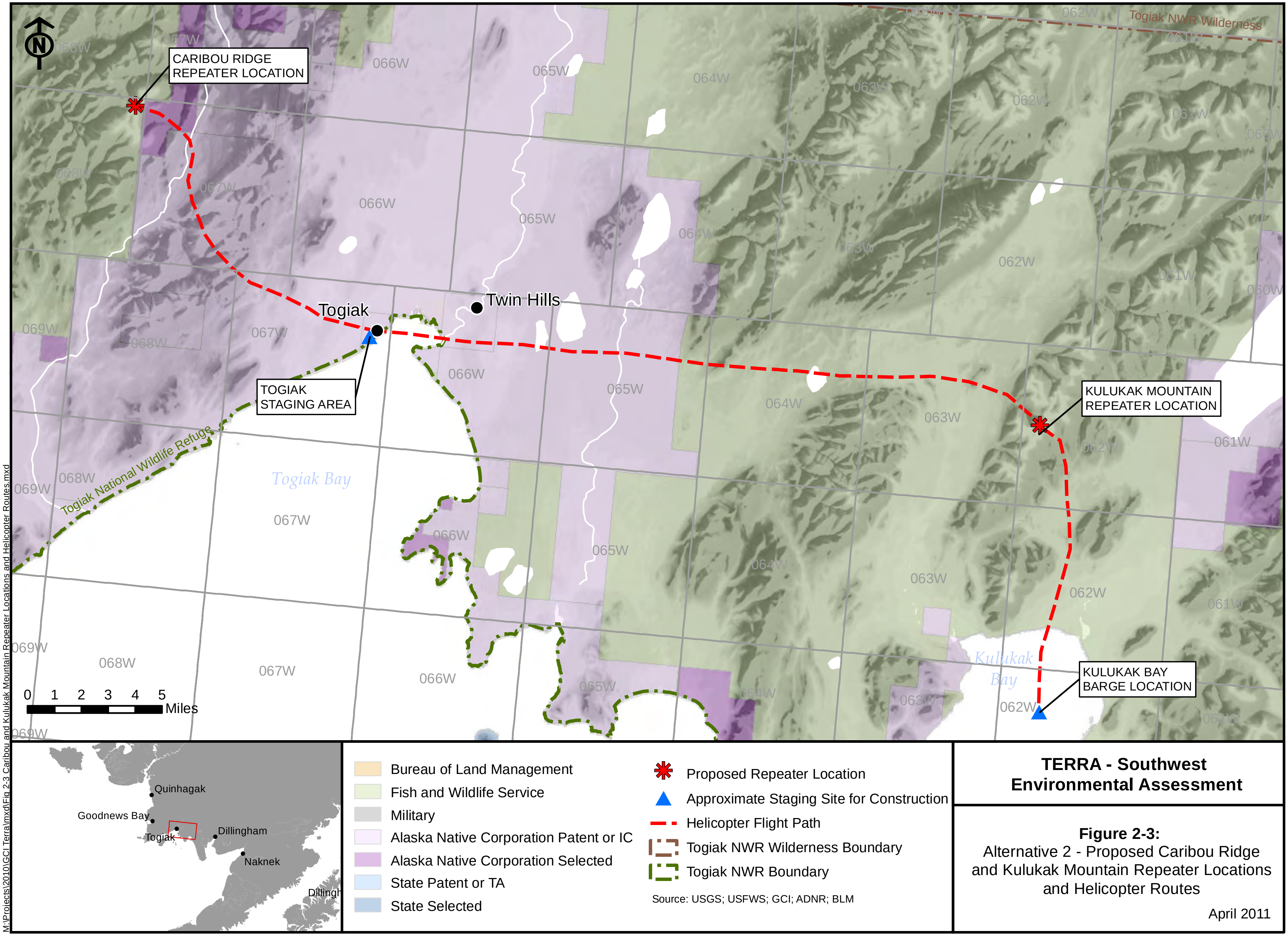

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Figure 2-3:
Alternative 2 - Proposed Caribou Ridge and Kulukak Mountain Repeater Locations and Helicopter Routes

April 2011

M:\Projects\2010\GCI Terra\mxd\Fig 2-3 Caribou and Kulukak Mountain Repeater Locations and Helicopter Routes.mxd

More detailed information on facilities planned at each site is shown in a series of site diagrams, and a summary of facilities and construction operations is provided in tables. One microwave repeater site would be located at Cone Mountain on BLM-managed land (Figure 2-4A and Figure 2-4B). Two microwave repeaters (at Caribou Ridge and Kulukak Mountain) would be located within the Togiak Refuge managed by the FWS (Figures 2-5 and 2-6). The lakebed fiber optic cable would extend from Nondalton to Port Alsworth (Figure 2-7).

During the construction period, temporary facilities would be employed for lodging, food preparation, and waste management (Table 2-1) at the three microwave repeater sites. During construction, a 58,075 square (sq) foot (ft) area (1.33 acres) would be affected at Cone Mountain (due to topography the lodging area would be 630 feet (ft) away from the facilities construction site), while at Caribou Ridge and Kulukak Mountain, a 30,000 sq ft area (0.69 acres) would be affected in each case. Taken together, the sites represent a total of 2.71 acres of land at the microwave repeater sites affected during the construction period.

Table 2-1. Alternative 2: Proposed Temporary Construction Facilities for the Microwave Repeater Sites

Facility	Dimensions	Description
Heavy tent structures	10’ x 20’	Plywood platforms would be constructed under each tent to protect the ground and level the tent. Tents would be secured from high winds using gabion baskets (weight) and “duck bill” anchors.
Cooking facilities	N/A	These would include electric hot plates, a microwave oven, and a conventional oven.
Food Containers	55 gallon drums	Drums would contain dry goods and canned goods. These drums would also be used to contain food waste and deter wildlife from gaining access. Drums would be transported off site for disposal in an approved location and carried back empty.
Portable sanitary facility (toilet):	1 per site	This toilet is equipped with “water gel” beads for absorption and easier removal from the site. All human waste would be transported off site for disposal in an approved location.
Grey water drums	55 gallon drum	Cooking and hand washing wastewater would be contained in a 55 gallon drum and would be transported off site for periodic emptying. This drum would be further contained using “duck pond” physical containment.
Trash bags	N/A	Commercial trash bags would be used for dry garbage (plastic, paper, etc.), and they would be secured from the wind with cargo nets while awaiting transport.
Fuel	55 gallon drums	There would be eight 55 gallon drums of fuel at each site during site construction. Six of these would contain diesel and two would contain gasoline. They would be housed in 4 drum poly storage units. The drum storage units would have integrated containment and would be covered to prevent rain/fuel mixing and overflow.
Additional Equipment	N/A	Freshwater drums, portable heating, chest freezers

When fully installed, each microwave repeater site would include several components as described in Table 2-2. On March 23, 2011, the applicant submitted a modified ROW application to include the installation of antennas for cellular service in the vicinity of the microwave repeaters. Table 2-2 describes the facilities located at the mountain sites, including the dimensions of these cellular service antennas. After installation of the facilities and including the helicopter landing area, during the operations period an area of 8,400 sq ft (0.19 acre) would be affected at Cone Mountain, 7,100 sq ft at Caribou Ridge (0.16 acre), and 7,600 sq ft (0.17 acre) at Kulukak Mountain. Taken together, during the operations period a total of 0.53 acres would be affected at the microwave repeater sites.

Table 2-2. Alternative 2: Proposed Facilities for the Microwave Repeater Sites

Facility	Dimensions	Description
Site Components		
Lattice type tower	60 feet (ft) tall	This tower is free standing and does not require guy wires. The tower would be plain galvanized finish (steel grey) and would not be lighted.
Antennas	8 ft in diameter	Four Ultra-High performance microwave style antennas would be installed at each site. Cone Mountain and Kulukak Mountain would each have an additional 8 ft antenna for communication to Platinum and Togiak, respectively.
Cellular Antennas	94.5 inches (in) (7 ft 10.5 in) x 5.1 in x 14.8 in	Four vertical cellular antennas covered with fiberglass radome would be mounted to the lattice towers at each site. The cover on these antennas would be fiberglass which has a non-reflective quality.
Communications Equipment Shelter	10 ft x 27 ft x 10 ft	The prefabricated shelter would be mounted on foundation piers, fiberglass exterior, and neutral grey in color. Each shelter would contain flooded lead-calcium batteries (C&D, series LCT-1680) for 48 hours of emergency power.
Power Module Shelter	10 ft x 20 ft x 10 ft	The prefabricated power module shelter would also be mounted on foundation piers. It would be metal sided and painted neutral grey. The shelter would contain two (2) Cummins D1703-M (model DSKAA – 9-kW) diesel generators and each would be outfitted with a hospital grade silencer (GTE Industries 201-5102). Arctic grade construction standards include snow hoods to protect exhaust and ventilation systems from malfunction due to snow loads. Drip pans would be in place beneath the engine units. Additionally, any gaps in the floor would be sealed with petroleum resistant sealant and the power module foundation itself would be installed such that floor would be sloped, and any spills to the shelter would flow to the exhaust side of the shelter (the platform edge would be ½ in higher than the opposite edge of the shelter).
Greer Fuel Tanks	4500 gallons	Each site would host two (2) tanks, totaling 9,000 gallons of #1 diesel. The tanks are specified as double wall for containment and they would be connected to the power equipment shelter via dual containment piping (with leak PermAlert Ultra series detection integrated into piping). Each site would also have one re-fueling platform over one tank. They would feature: • Steel Tank Institute design outer wall leak containment and leak detection sumps at each end of the tanks. • Overfill shut-off valve. • Overfill spill containment. • Overfill alarm audible to the operator. • Leak detection sensor in the sump. • Low/high level alarm sensor within the tank. • Remote alarm reporting system that would report to off-site operators.

Facility	Dimensions	Description
Piping	N/A	Piping between the tanks and the equipment shelter would feature the following: • All piping would be above ground. • All piping would be spill-contained, double wall piping. • Piping would be sloped towards the equipment shelter. • Any leaked fuel would be collected in a containment sump within the shelter. • A liquid sensor within the sump would transmit an alarm to off-site operators.
Spill Response Kit	N/A	Spill response materials would be kept on site to support maintenance operations. These would include (at a minimum) sorbent pads, boom, granular sorbent, and disposal drum.
Staging Areas		
For Cone Mountain Site	N/A	Material barges would stop in Platinum to offload shelters and fuel tanks. Chinook helicopters would fly these items to the site in four flights total. The barge would continue to Carter Bay, where it would anchor. UH-1B helicopters would deliver these items to the project site in 60 flights total.
For Caribou Ridge Site	N/A	Material barge would stop in Togiak and offload all materials. Chinook helicopters would deliver shelters and fuel tanks to the site in four flights total. Remaining materials would be flown to the Caribou Ridge via UH-1B helicopters, totaling 60 flights.
For Kulukak Mountain Site	N/A	The materials barge would anchor in Kulukak Bay. UH-1B helicopters would deliver these items to the project site in 60 flights total. The barge would continue to Togiak to offload shelters and fuel tanks. Chinook helicopters would fly these items to the site in four flights total.

Helicopter support operations for construction, annual maintenance, and annual refueling are summarized in Table 2-3.

Table 2-3. Alternative 2: Helicopter Construction and Operations Support – Number of Trips

	Construction			Annual Maintenance	Annual Refueling
	Boeing Chinook 234	Bell UH-1B Huey	R-44 helicopters	R-44 helicopters	Bell UH-1B Huey
Cone Mountain Site	4	60	30-40	2*	14
Kulukak Mountain Site	4	60	30-40	2*	14
Caribou Ridge Site	4	60	30-40	2*	14

* Additional trips may be necessary for emergency maintenance.

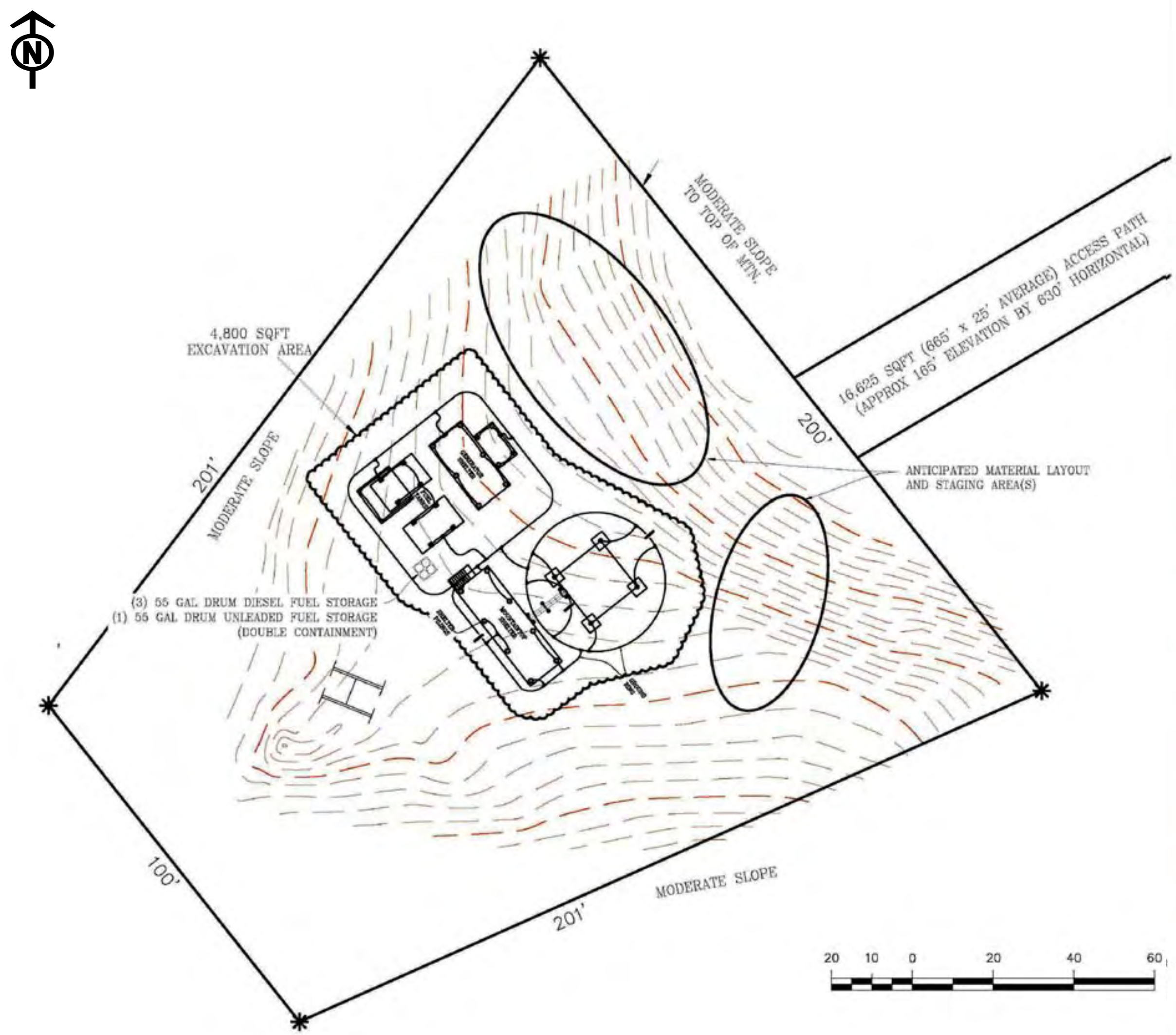
During the operations period, the proposed maintenance and refueling flights would occur on 4-5 days per site. Taking the three microwave repeater sites together, during the operations period, a total of 48 flights would take place over a period of 12 – 15 days each year.

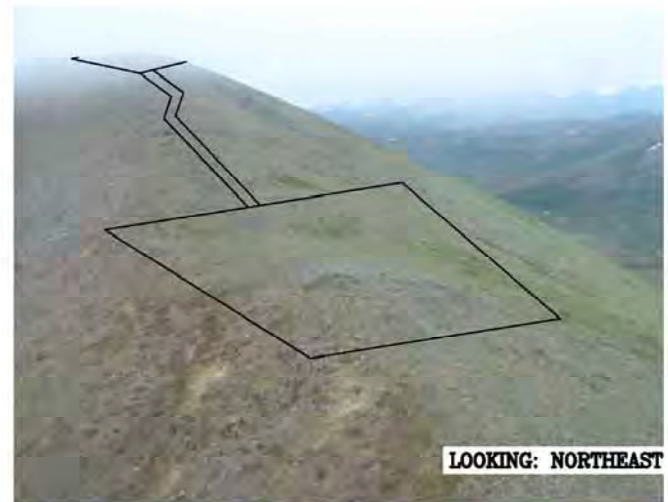
The construction season schedule is summarized in Table 2-4.

Table 2-4. Alternative 2: Construction Schedule

Timing	Activity
May 2011	Mobilization.
Early June 2011	Camp construction and foundation installation.
Late June to Early July 2011	Tower erection and transport of prefabricated shelters and fuel tanks to the site.
July 2011	Antenna, fuel piping (between power module and tanks), battery installation and initial start-up of the site. Fuel transportation and tank filling is expected at this time.
August 2011	Installation of lake-bed fiber optic cable in Lake Clark.
August to September 2011	Communications equipment installation (in the communications shelter), link commissioning (between sites) and site commissioning.
October 2011	Final punch list and acceptance.

Installation of the lake-bed cable in Lake Clark would involve a sectional barge transported and assembled for use in Lake Clark, with dimensions of approximately 50 ft by 115 ft, and a draft of 16-24 inches. Two vessels would be used for towing the barge, and two 15 ft skiffs with 200 hp outboard motors would be shipped to the barge to assist with barge positioning. The cable would be laid from the barge with precise tensioning to insure that it fully conforms to the underwater contours. In the shoreline area between sufficient water depth and the upland cable vault where boat traffic and ice scour may occur, the cable would be armored and buried into the lake-bed using a water injection method.





Note: Temporary building and fuel storage locations to be located within construction boundary as appropriate during construction.

Source: GCI

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Figure 2-4A:
Alternative 2 -
Cone Mountain Site Plan

April 2011

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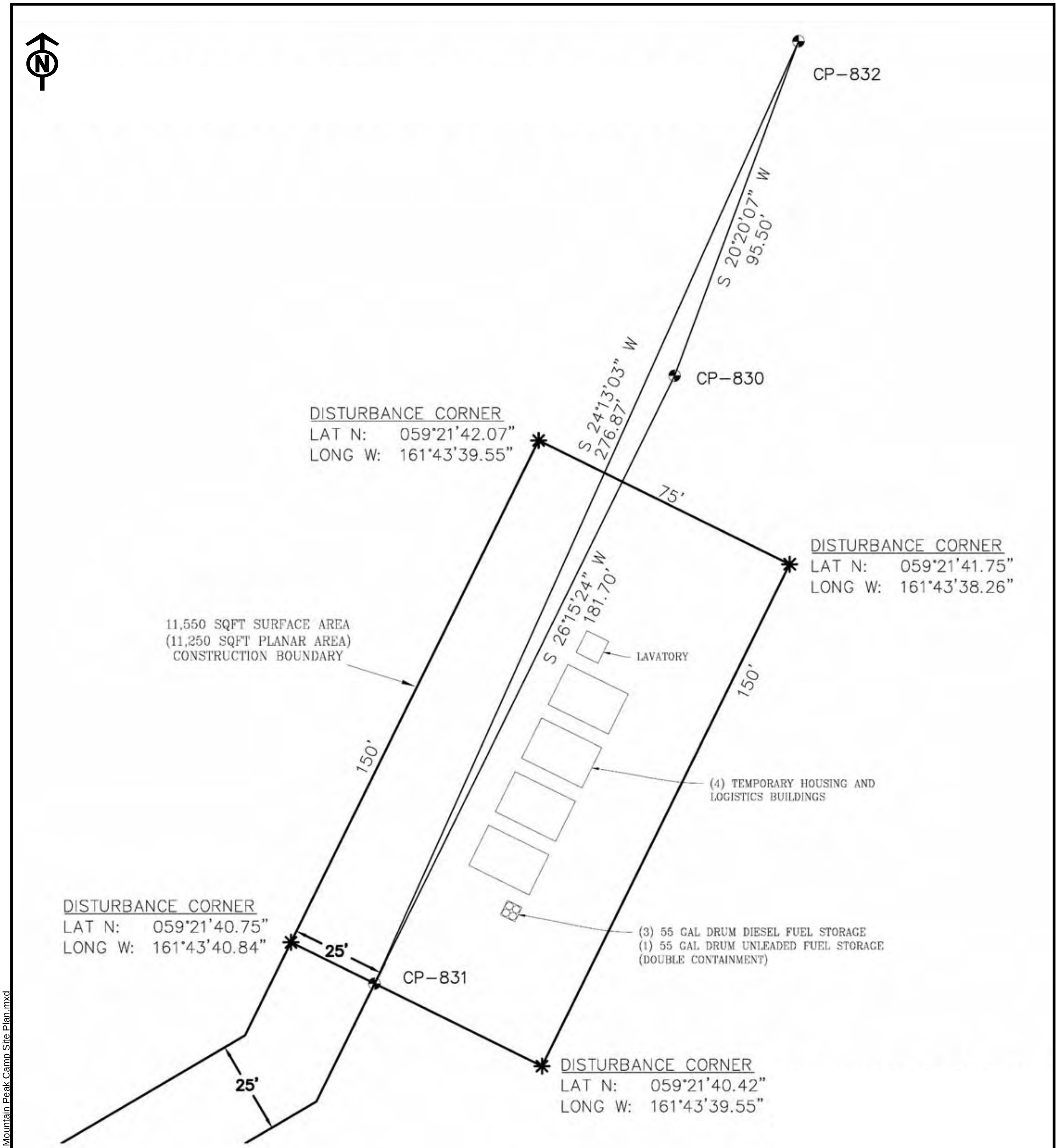

Note: Temporary building and fuel storage locations to be located within construction boundary as appropriate during construction.

Source: GCI

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Figure 2-4B:
Alternative 2 -
Cone Mountain
Peak Camp Site Plan

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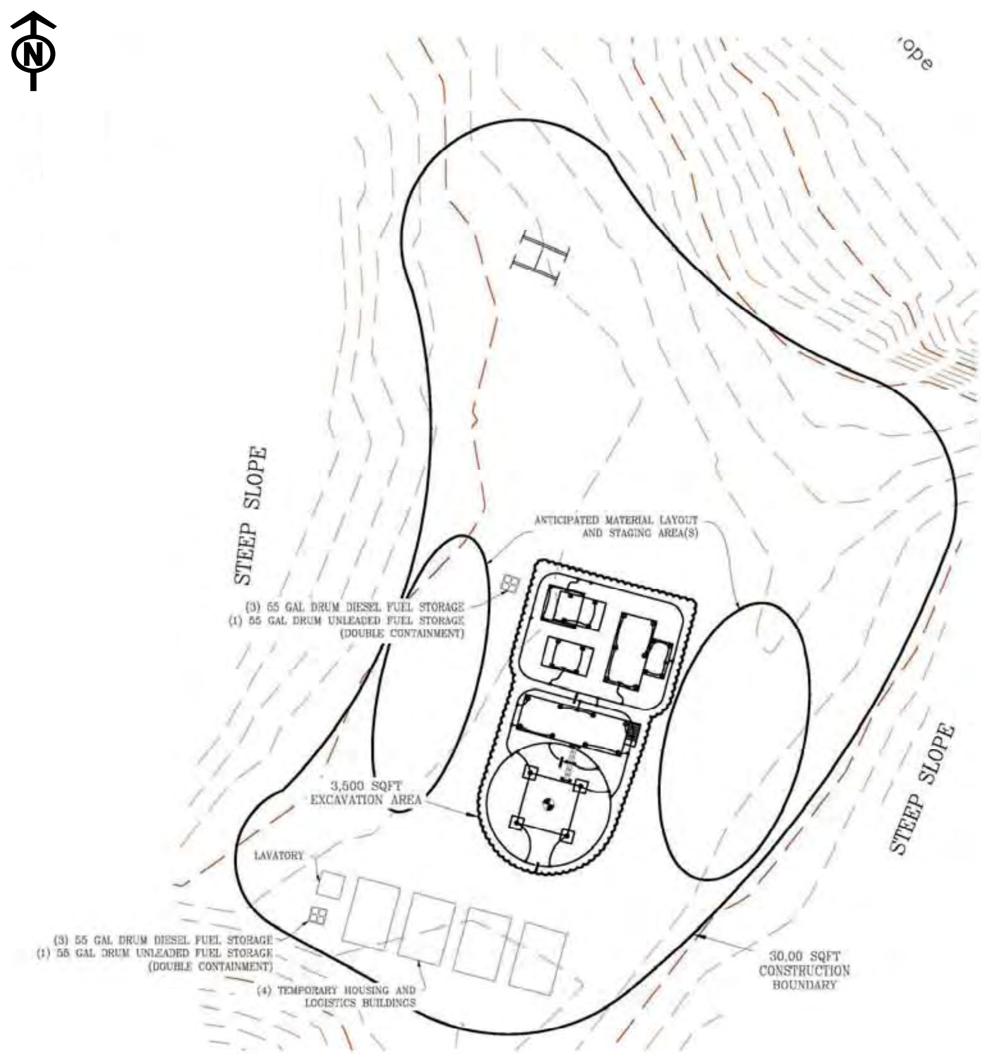

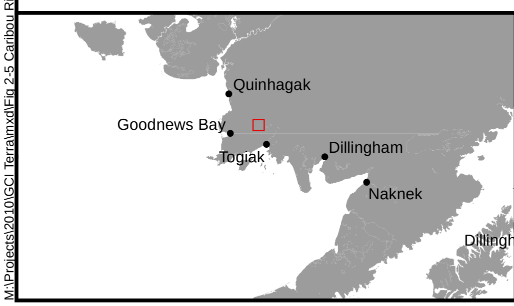

Note: Temporary building and fuel storage locations to be located within construction boundary as appropriate during construction.

Source: GCI

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Figure 2-5:
Alternative 2 -
Caribou Ridge Site Plan

April 2011

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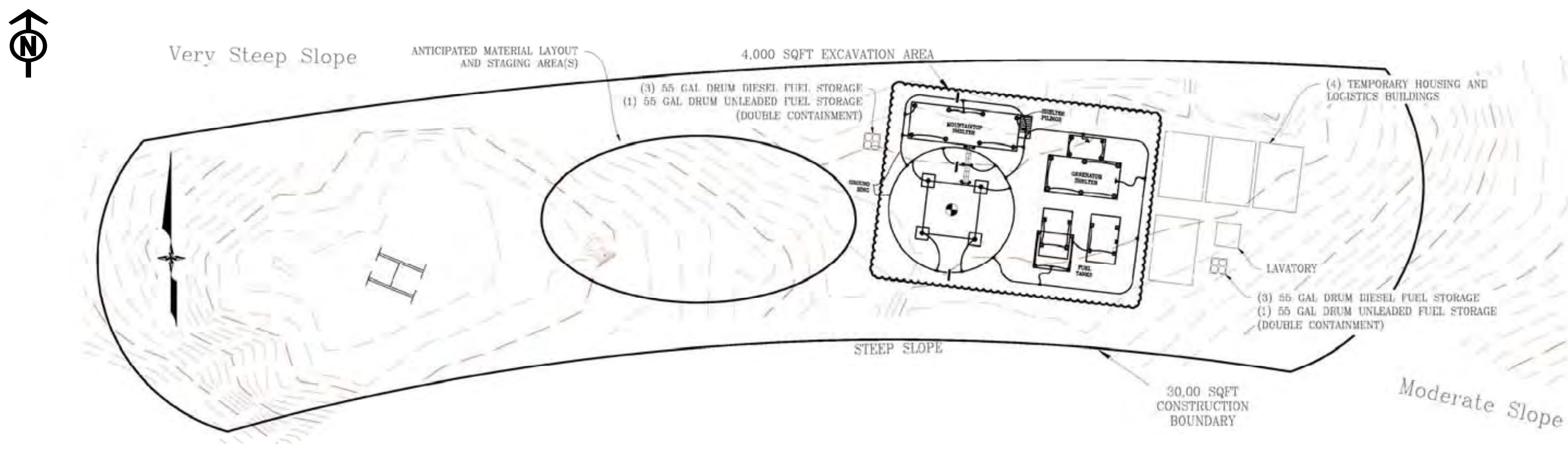

Note: Temporary building and fuel storage locations to be located within construction boundary as appropriate during construction.

Source: GCI

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Figure 2-6:
Alternative 2 -
Kulukak Mountain Site Plan

April 2011

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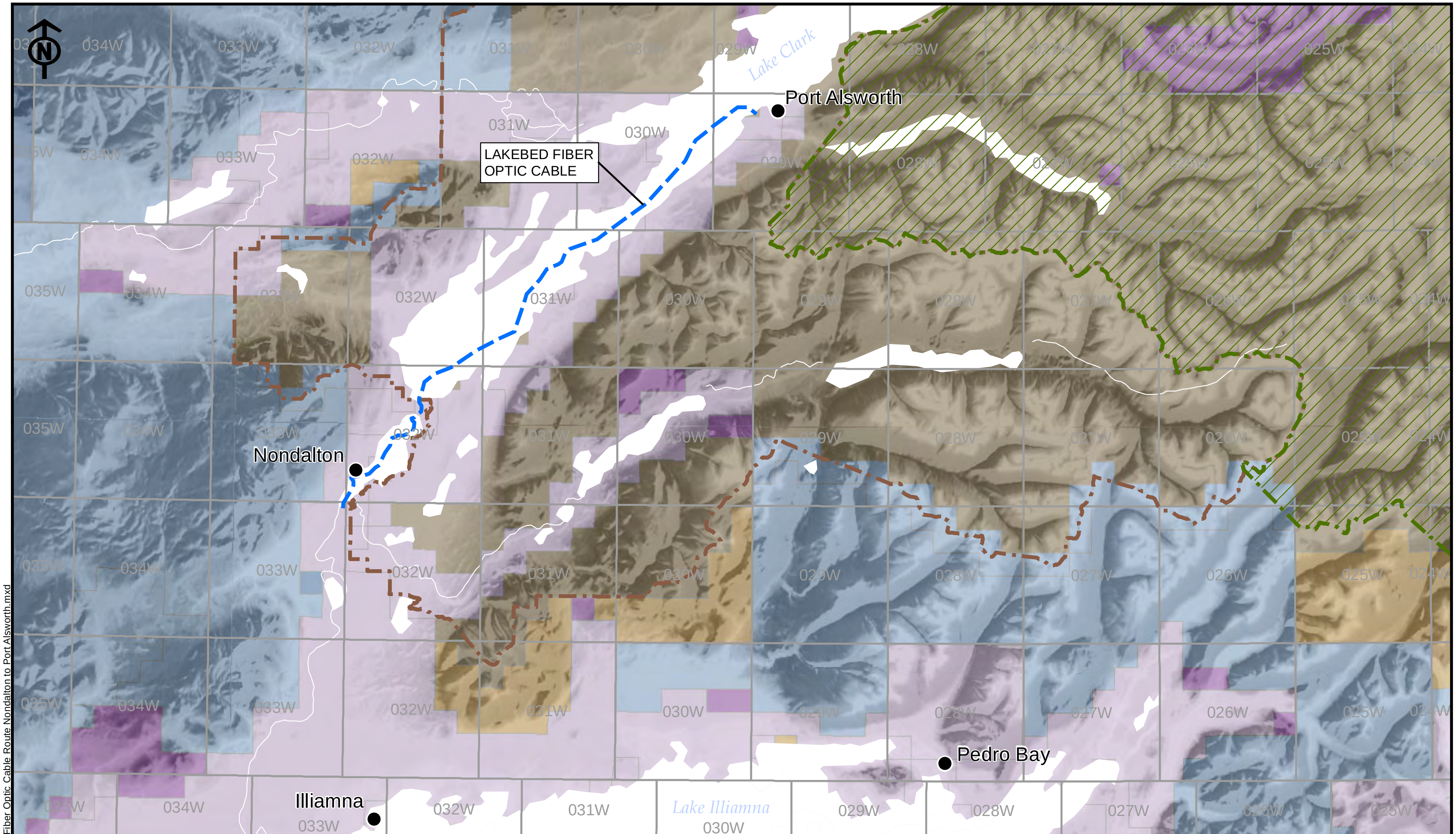

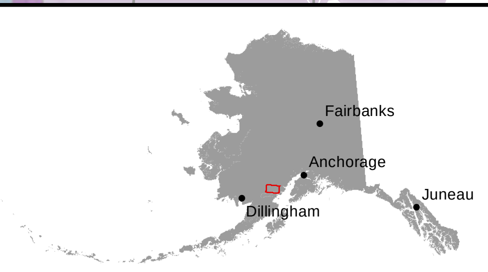

- Bureau of Land Management
- National Park Service
- Alaska Native Corporation Patent or IC
- Alaska Native Corporation Selected
- State Patent or TA
- State Selected
- Lakebed Fiber Optic Cable
- Lake Clark National Park
- Lake Clark National Preserve
- Lake Clark Wilderness Area

0 1 2 3 4 5
Miles

Source: USGS; USFWS; GCI; ADNR; BLM

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Figure 2-7:
Alternative 2 - Land Status and Proposed Lakebed Fiber Optic Cable Route Nondalton to Port Alsworth

April 2011

M:\Projects\2010\GCI Terra\mxd\Fig 2-7 Lakebed Fiber Optic Cable Route Nondalton to Port Alsworth.mxd

2.2.3 Hybrid Fiber Optic/Microwave with Submarine Cable – Alternative 3

Based on the feasibility study described in Section 2.1, FWS selected for analysis a festooned approach, which means that multiple cables connect the sites. Four segments that route the marine cable from Dillingham (Kanakanak) to Quinhagak (Figure 2-8). The first segment takes the cable from Dillingham to Togiak. The second segment connects Platinum to Quinhagak. The third segment takes the cable from Dillingham to Platinum; and the final and fourth segment connects Togiak to Quinhagak.

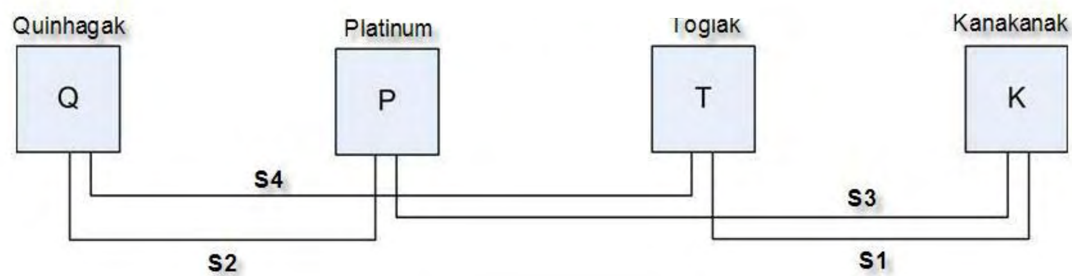

Figure 2-8: Hybrid Fiber Optic/Microwave with Submarine Cable – Alternative 3

The marine cable routes have been designed to run through the deepest and most continuous channels, where possible. Seabed conditions are anticipated to be fairly flat, except where channels exist, and consist of a homogenous mixture of sand, mud and gravel. Sediment cover is expected to be fairly continuous throughout the project area up to a few meters thick; however, areas of hard bottom including rock outcrops are anticipated to exist, particularly east of Hagemeister Island. The marine cable routes were designed to avoid all natural or man-made obstructions and all restricted areas, where possible, that may affect the integrity of the marine cable or related survey and installation operations (Figure 2-9). Once installed, no routine maintenance is required for the submarine cable. However, damage and breaks in the cable can occur, though not at predictable times, and depending on the season repairs may be delayed due to weather. The feasibility study estimated that there is a potential for 1-2 breaks in the cable over the 25 year life of the system. The impact of a cable outage is offset by the fact that under the festooned design, each site is served by two cable pathways.

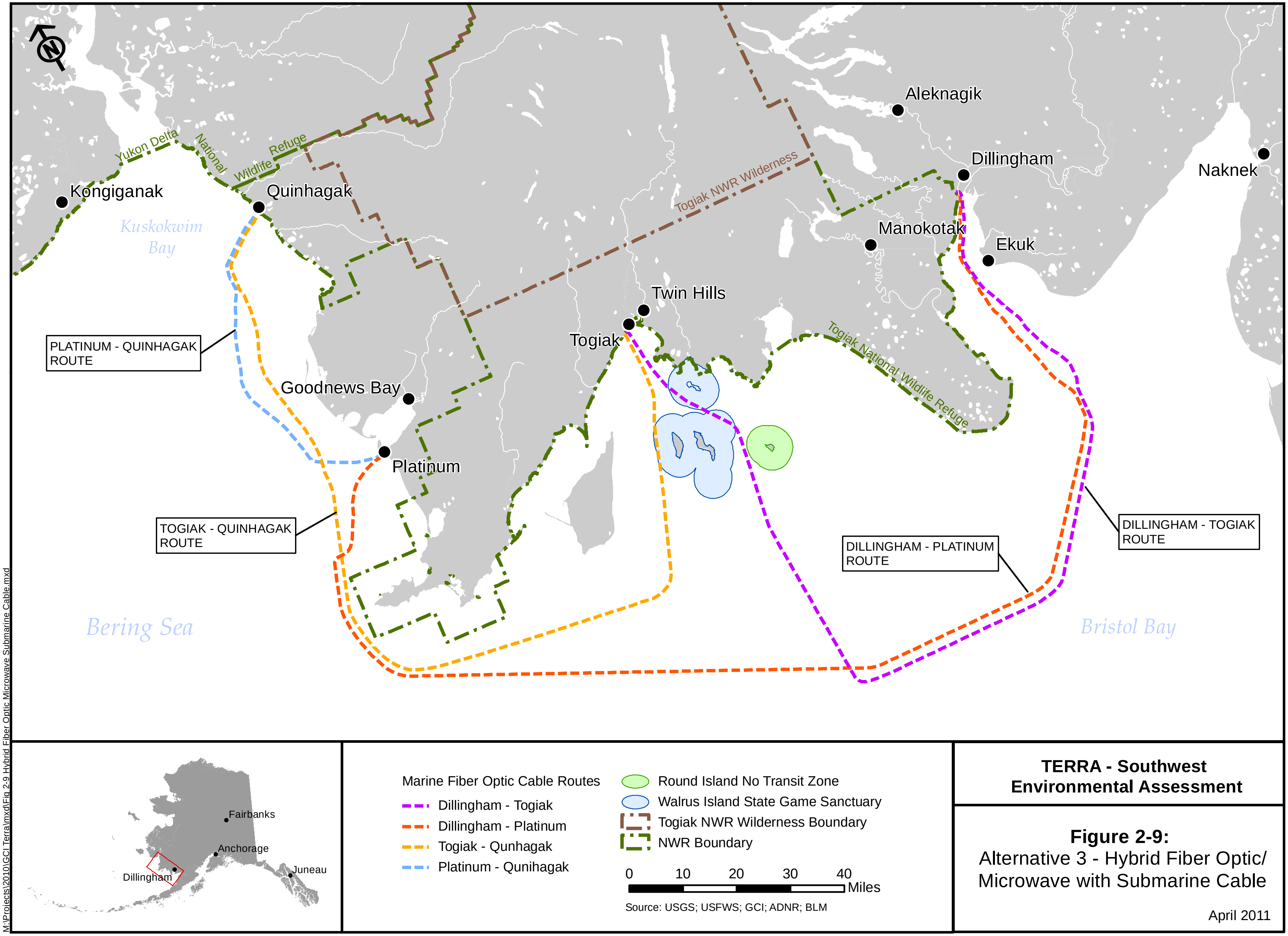

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Figure 2-9:
Alternative 3 - Hybrid Fiber Optic/ Microwave with Submarine Cable

April 2011

2.2.4 Alternatives Considered, but Dismissed from Further Analysis

The following alternatives were dismissed from further analysis. Components of each alternative were examined in combination with segments of each of the other alternatives to arrive at the proposed project routing and sites.

2.2.4.1 Alternate Marine Cable Routes and Configurations

An independent David Ross Group feasibility study for the marine cable alternatives to the proposed TERRA-SW Project, evaluated the feasibility of four alternative cable configurations linking Dillingham (Kanakanak), Togiak, Platinum and Quinhagak, Alaska (for the Executive Summary of this report, See Appendix E). Following evaluation, FWS retained the festooned approach described in Section 2.2.3. A risk assessment of each marine cable configuration included analysis of pertinent conditions such as seabed depths; geological conditions and hazards along the submarine cable segments; weather conditions; permitting considerations; existing cables and pipelines; fisheries considerations; costs; and reliability. Cost differences were a major factor, particularly for satellite backup in the event of a cable break, and only the festooned approach was retained for full analysis. The other configurations were dismissed from further consideration.

2.2.4.2 Alternative Power Sources

The use of alternative fuels and renewable energy as an alternative power source for the Mountaintop Power Module (module) was evaluated based upon the availability of resources to meet module power needs, as well as the feasibility and cost of implementation and maintenance. The following sections evaluate the potential for use of propane, solar, and wind energy. A concluding section examines the potential for a hybrid system, in which alternative, renewable energy sources might supplement a diesel generator system, with a reduction in diesel fuel requirements.

For each of the three microwave repeater sites the energy requirements (based upon 15 months) for the modules are estimated to be 68,492 kilowatt hours per year (Electric Power Systems Inc., 2010). The microwave repeater sites are expected to be un-manned with scheduled maintenance visits expected twice a year (in the spring and fall). Alternative power sources examined included propane fuel, and solar and wind power generation. Hydroelectric and geothermal renewable energy sources were not evaluated as they are highly site specific and are not practical within the vicinity of the three proposed microwave repeater sites.

Use of propane fuel would result in some environmental benefits, including a longer shelf life, cleaner emissions (particularly particulate matter and carbon monoxide), and quieter operation as compared to diesel fuel. Table 2-5 illustrates some of the key aspects in the comparison of the proposed use of diesel fuel with the alternate use of propane fuel. Based on the estimated yearly energy requirements (15 months), the total estimated cost of fuel and bulk storage related requirements were assessed. The number of trips is based on a helicopter lifting capacity of 8,500 lbs (Electric Power Systems Inc., 2010).

As demonstrated in Table 2-5, despite the lower cost of propane fuel, a nearly 3.5 greater volume of fuel would be required, more storage capacity would be necessary, and/or refueling trips would be more frequent. According to the UUI plan of development, for each month of operation, approximately 15 propane tanks of 200 pounds capacity would be required, with a storage foot print approximately equal to that of the tanks needed for an annual supply of diesel (UUI, 2011). Thus, either a larger storage footprint would be required, or monthly resupply trips would be necessary. Given seasonal weather conditions, and the logistics challenges of mobilizing a helicopter to the site on a frequent basis, monthly resupply is not feasible, and a larger storage capacity would be required on site. Based on these factors, propane as a fuel supply was dismissed from further analysis.

Table 2-5. Comparison of Fuel Types Considered (per site)

	Diesel	Propane
Energy Required (kWh/yr)	68,492	68,492
Required Volume (gal/yr)	6,534	23,376
Price per Gallon	$4.00	$2.62
Price per Year	$26,136	$61,246
Weight (lbs)	47,045	98,883
Fill Trips	5.53	11.63

Source: Electric Power Systems Inc., 2010
Notes:
kWh/yr: Kilowatt hour per year
gal/yr: Gallon per year
lbs: pounds

Solar power generation was also evaluated as an alternative to the proposed project. Solar insolation data generated by the National Renewable Energy Laboratory (NREL) was evaluated in the locations of the proposed towers. The annual insolation values (provided on grid cells of approximately 40 km by 40 km) represent watt hours (Wh). The insolation values represent the resource available to a flat plate collector, such as a photovoltaic (PV) panel, oriented due south at an angle from horizontal equal to the latitude of the collector location. This is typical practice for PV system installation, although other orientations are also used. The data was developed from the Climatological Solar Radiation Model. The Climatological Solar Radiation Model was developed by the National Renewable Energy Laboratory for the U.S. Department of Energy (NREL, 2010).

The values present on the tower sites range from 3,276 Wh to 3,517 Wh (Figure 2-10). These values are not suitable for sustained solar power generation and would not meet the module need of approximately 68,492 kWh/yr. Preliminary analysis indicates that comparatively large solar panels would be needed, on the order of 100 sq ft for a panel to produce 1200 watts of generated power. The panels would be required to be installed in an on-edge configuration, which poses a significant risk in regard to wind loads at the remote mountain top sites. Additionally, the values presented are annual averages and do not account for seasonal fluctuations in solar insolation. During winter months at module locations, the insolation values are expected to dramatically decrease. Therefore, solar power is not reliable as a sole energy source for the modules. Additional concerns include the ability of solar technology to withstand extreme weather and high icing, which may damage the equipment. Implementation of a solar power generation system may require additional maintenance trips for mirror washing and other trouble shooting, beyond the bi-yearly planned maintenance. Both the increased maintenance and added costs of the solar power infrastructure would increase project costs and logistics challenges. As such, solar energy would not be expected to provide reliable power to the tower sites. This alternative does not meet the stated purpose of delivering reliable and affordable broadband service and was dismissed from further analysis.

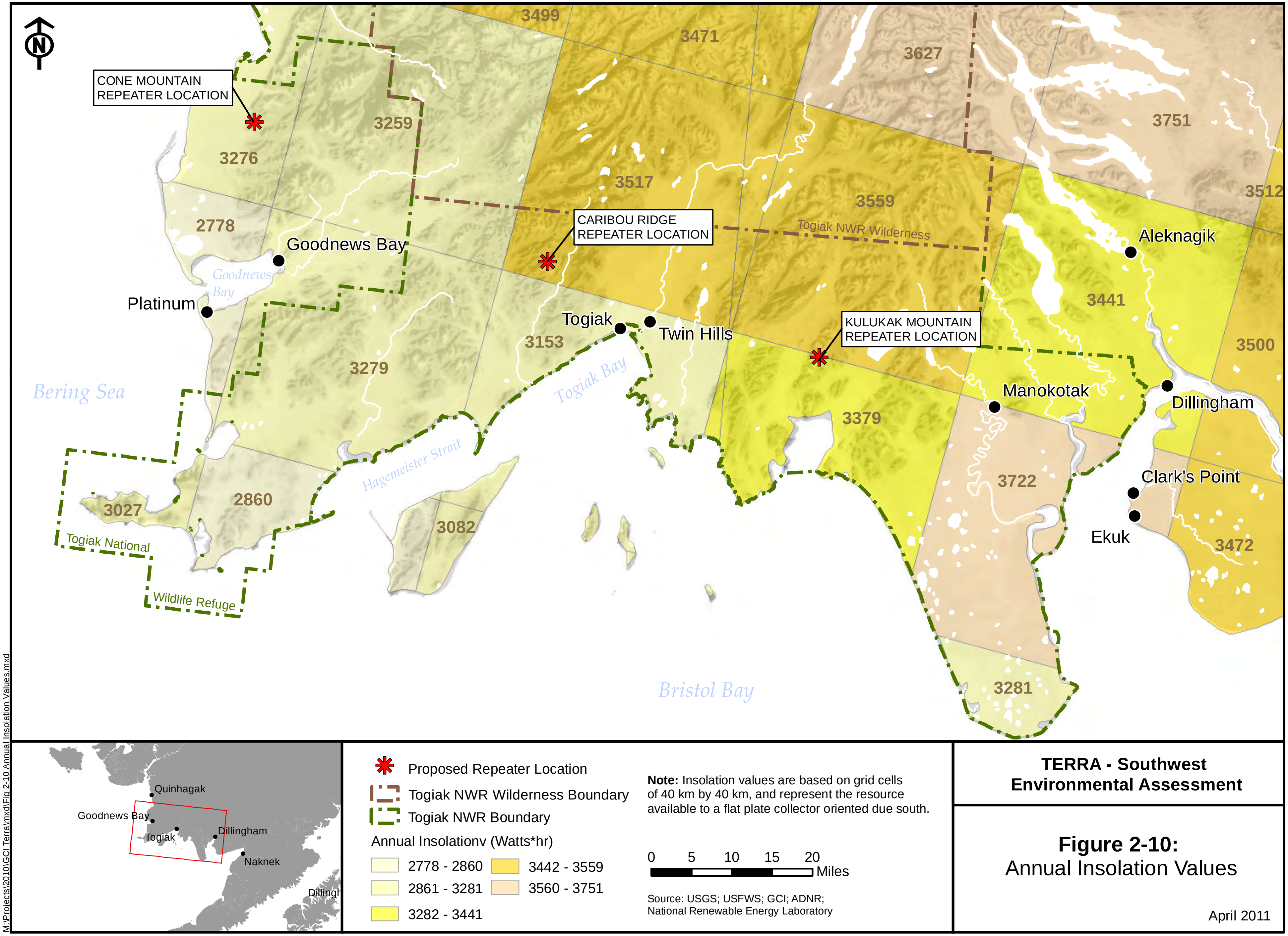


Figure 2-10:
Annual Insolation Values

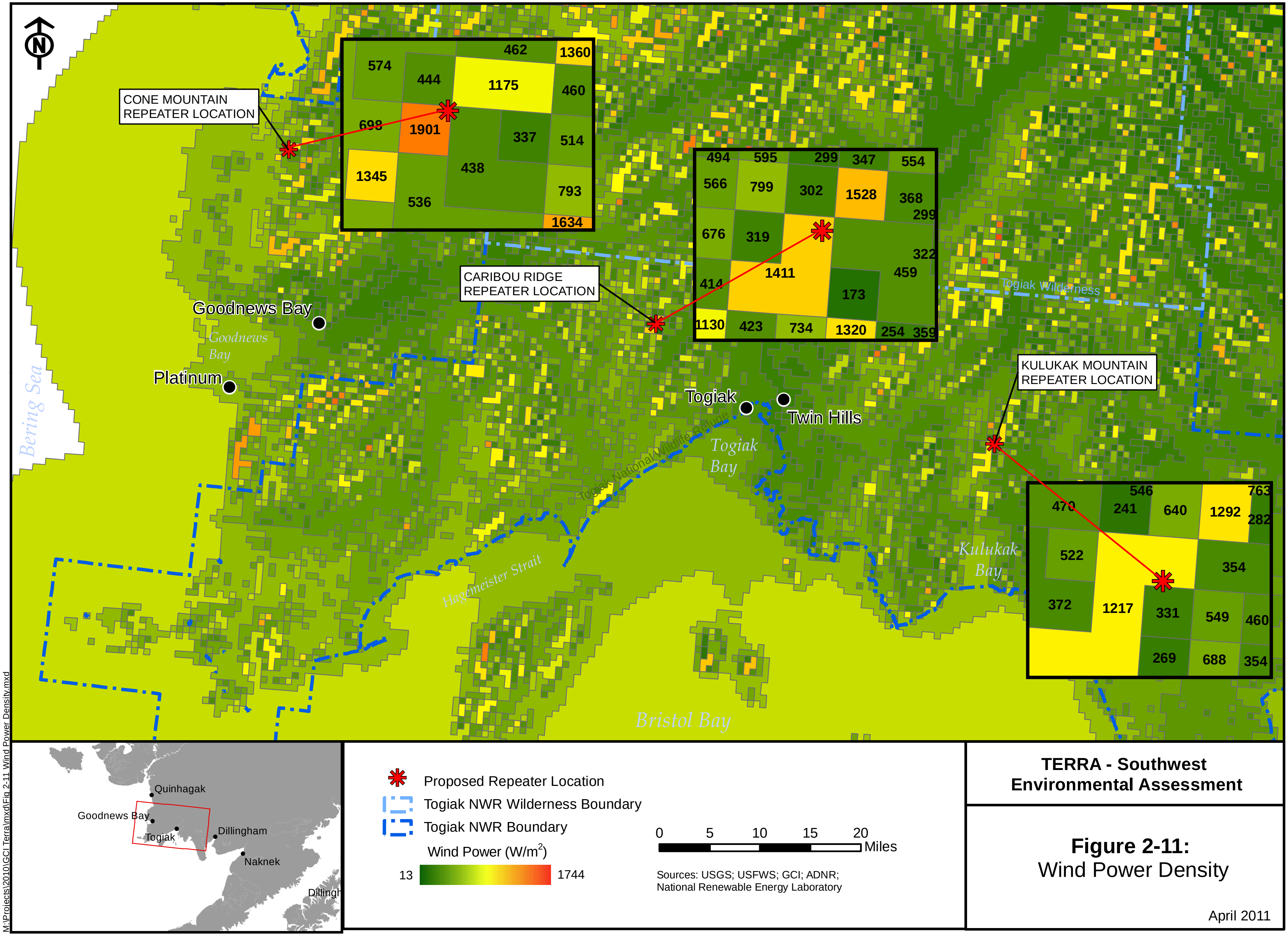
Wind power generation as an alternate power source was evaluated as part of this assessment. The availability of wind resources was evaluated at the locations of the proposed towers using data compiled by NREL. The national wind resource assessment of the United States was created for the U.S. Department of Energy in 1986 by the Pacific Northwest Laboratory and is documented in the Wind Energy Resource Atlas of the United States, October 1986. The wind resource assessment was based on surface wind data, coastal marine area data, and upper-air data, where applicable. In data-sparse areas, three qualitative indicators of wind speed or power were used when applicable: topographic/meteorological indicators (e.g., gorges, mountain summits, sheltered valleys); wind deformed vegetation; and eolian landforms (e.g., playas, sand dunes). The data was evaluated at a regional level to produce 12 regional wind resource assessments; the regional assessments were then incorporated into the national wind resource assessment (NREL, 2010).

According to NREL, wind power density in the vicinity of the tower sites ranges from 173 watts per meter squared (W/m2) to 1,901 W/m2 (corresponding to wind speeds between 12.5 and 26.6 miles per hour [mph]) (Figure 2-11). The large range may be predominantly attributed to the topography of the area and the mountaintops, where the towers would be located, and would have wind power densities on the higher end of the spectrum. The degree of certainty with which the wind power class can be specified depends on three factors: the abundance and quality of wind data; the complexity of the terrain; and the geographical variability of the resource. Wind power densities as low as 400 W/m2 are expected to be suitable for utility-scale wind generation, and rural applications of wind power generation are feasible at even lower wind power densities (NREL, 2010).

Based upon the NREL data, it is expected that the average availability of wind as a power generation source could provide the microwave repeater facility power supply a majority of the time. However, due to the modules highly reliable and continuous power and load requirements, at minimum, a backup diesel supply would be required in conjunction with wind power generation as wind power generation is not expected to have the same level of reliability as a fuel-driven power generation. Additionally, extreme weather conditions and high icing are anticipated to curtail output and damage equipment (Electric Power Systems Inc., 2010) and implementation of a wind power generation system may require additional maintenance trips for trouble shooting, beyond the bi-yearly planned maintenance. The increased cost of developing a wind power generation system in addition to a back-up diesel fuel system in concert with the anticipated increased maintenance, could impact the affordability of the proposed telecommunications. The implementation of wind generation could increase impacts from noise and avian collisions, and contribute to a larger degree of change to the aesthetic values of the viewshed around the towers. Therefore, this alternative was dismissed from further analysis.

While propane, solar, and wind energy are not feasible as standalone power sources for the remote microwave repeater facilities, hybrid or dual source systems were also considered. In this design, solar and wind energy might be considered as supplemental sources, producing a portion of the total energy required, with a commensurate reduction in the demand on the diesel generators and a reduction in the quantity of diesel fuel required each year. For both solar and wind energy, a hybrid system would introduce considerable technical complexity into synchronizing and switching the power source, through which the diesel generators would go to standby, while the alternative energy source provides power. At a remote, unstaffed site, with seasonally extreme weather, this technical complexity would result in a significant impact on stability and reliability of the power generation system. In addition, both alternative energy sources are intermittent, and therefore significant battery storage capacity would be required.

As with the use of solar power as the sole generation source, using solar power as a supplemental source poses significant risk in regards to wind loads at the remote mountain top sites. Wind energy systems may be feasible at the sites although wind, weather and icing conditions are not currently known for the mountain-top sites. UUI plans to install weather stations at the three sites to measure wind speed, barometric pressure, precipitation and air-water content. UUI proposes to reevaluate the potential for supplemental wind energy when sufficient site-specific data are available.



TERRA - Southwest Environmental Assessment

Figure 2-11: Wind Power Density

2.2.4.3 Expand the Use of the Existing Satellite Network

Satellites provide the existing telecommunication services for the Region. In addition to voice service, satellites provide dedicated broadband service to telemedicine and distance learning providers and bandwidth-constrained Internet service to residential and commercial end-users. This system does not provide broadband service, and thus may not meet the needs of the RUS Broadband Initiatives Program.

After analyzing this region of Alaska's unmet existing and projected needs, UUI determined that there is not adequate satellite capacity available to meet the needs. The total satellite capacity is limited by the number of transponders built into currently-operational satellites. It is not possible to add transponders to in-orbit satellites. The solution to increase capacity would be launching another satellite. This deployment is estimated at $230 million and requires a three year construction and planning period.

In addition to high cost and limited available capacity, satellite service generates a much greater delay in the delivery of information from one place to another when compared to terrestrial options because the information must travel to and from a geostationary satellite orbiting more than 22,300 miles above the Earth. This delay is called latency. High-latency satellite networks require software applications, servers, and computer workstations to be specially tuned to achieve adequate performance or else data transfer suffers dramatically. Interactive applications such as telemedicine, distance learning delivery, and video conferencing suffer significantly in high-latency networks. Latency restricts data throughput speeds and ultimately limits user participation. Growth in telemedicine and distance learning within the project area and other rural areas of Alaska already threaten to overwhelm the existing satellite system.

Satellite latency would continue to be a problem since the latency is a product of basic physics and would deter the use of highly desired, modern applications. Therefore, enhancing the existing satellite network is not a feasible solution for providing broadband service in this region. This alternative was determined to not meet the project purpose and need and was dismissed.

2.2.4.4 Overland Fiber Optic Cable

The overland route would require a buried cable that would traverse the Refuge and cross rivers and major streams. This is not compatible with current land management objectives of the Refuge. This alternative was considered but not thoroughly analyzed due to the large project footprint, the impact to the Togiak Refuge and other federal lands, and costs associated with an overland fiber system. This alternative was dismissed.

2.2.4.5 Microwave Network Avoiding Togiak National Wildlife Refuge

In light of the requirements of ANILCA Title XI, the FWS requested that the UUI provide more complete information about the feasibility of siting the microwave repeaters outside of the Togiak Refuge. Based on that information, FWS examined two alternative approaches:

a. Selecting repeaters near but outside of the Togiak Refuge east and west boundaries and an intermediate repeater site generally north of Togiak and Twin Hills that would be on lands selected by the native villages and that could then serve either Togiak or Twin Hills.

b. Same as (a) above, except with no intermediate Togiak/Twin Hills repeater site. In this case, the objective was to "jump over" the Togiak Refuge with a long backbone path and then serve Togiak or Twin Hills from one or both of the repeater sites outside the Togiak Refuge boundaries.

Towers would require line of sight to each other and appropriate distances in order to meet reliability requirements. Due to land ownership and physical and technical requirements affecting the location of microwave sites, there is no opportunity to locate the towers outside of the Refuge and obtain a line of sight and appropriate distances to meet reliability requirements. These alternative locations were dismissed from further analysis.

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3.0 Affected Environment

This chapter defines the project area and the "region of influence" within which the project may exert impacts. The baseline conditions of the affected environment are described, with fuller accounts of the resources identified as matters of concern by the public during the scoping meetings.

3.1 The Project Area

This EA reviews TERRA-SW Project components for which federal ROWs are required from the FWS and the BLM, as well as the activities associated with the installation of the lake-bed fiber optic cable from Nondalton to Port Alsworth, for which an SUP is required from the NPS. The resulting project area consists of the three microwave repeater tower sites at Cone Mountain (AA-92019), Caribou Ridge, and Kulukak Mountain, a short term construction site at Cone Mountain (AA-92376), plus the staging areas at Carter Bay, Platinum, Togiak, and Kulukak Bays, as well as the helicopter travel corridors between these staging areas and the microwave repeater sites. Helicopter corridors for the Cone Mountain microwave repeater site would be between Carter Bay and Cone Mountain and also from a staging area near Platinum (Figure 2-2). The helicopter corridor for Caribou Ridge would be from the staging area at Togiak. The helicopter corridors to the microwave repeater site at Kulukak Mountain would be from Togiak and Kulukak Bay (Figure 2-3). For the lake-bed fiber optic cable component, the project area includes the landfall areas in Port Alsworth where the cable egresses from the lake to the shore, and the cable alignment which the barge will follow while installing the cable. For Alternative 3, the hybrid marine fiber optic submarine cable, the project area would include the land fall areas in the communities of Dillingham (at Kanakanak), Togiak, Platinum, and Quinhagak, as well as the alignments along which the cable is to be installed.

The project components and the project area reviewed in this EA are part of the full TERRA-SW Project, which extends from Homer to Quinhagak, where it joins the recently installed DeltaNet broad-band system. The remainder of the TERRA-SW Project falls on State-managed lands and waters or on private land, and is not directly the subject of this EA. However, in examining cumulative effects, the contribution of the proposed action (i.e. components and activities on Federal lands) to effects on other lands, will be examined.

While the project area can be described in terms of the footprint of the project components under review in this EA, potential impacts are not limited to the immediate vicinity of the project facilities. The term "region of influence" is used to refer to the geographic zone in which the project facilities or activities may have an influence or impact. As an example, impacts to soils may well be limited to the area disturbed by construction, but impacts from helicopter and generator noise might extend out some distance from the site or the transit corridor. Where the project components occupy a portion of the range of a migratory species, the impact analysis must consider the potential effect to the species across its range, and not just in the immediate vicinity of the facility. Thus the project area can be described in compact terms, but the region of influence varies depending on the nature of the resource potentially subject to impacts. In the following sections, the region of influence is identified as appropriate to particular resources.

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3.2 Physical Environment

3.2.1 Meteorology and Air Quality

The Goodnews Bay and Togiak region is located in a transitional climatic zone, exhibiting characteristics of both a marine and continental climate (Alaska Department of Commerce, Community and Economic Development [ADCCED], 2011). Conditions are commonly cool and humid with cloudy skies and moderately heavy precipitation (Palcsak and Dorava, 1994). Fog is most prevalent in summer, when moisture-laden air is warmer than the sea. Heavy fog is most common during July and August. High-velocity winds can continue for days or weeks at a time. Fog and high winds are prevalent during the winter. Average rainfall is approximately 22 inches per year and average snowfall is approximately 43 inches per year. Togiak Bay and Togiak River are ice-free from June through mid-November. Average summer temperatures range from 37 to 66-degrees Fahrenheit and winter temperatures range from 4 to 30-degrees Fahrenheit.

The portion of the project area in the vicinity of Lake Clark falls within the Southcentral climatic zone, affected by both maritime and continental influences. In the Southcentral climatic zone, maritime influences are significant, but the region can also be affected by continental influences from the Interior of Alaska.

The air quality in an area depends on a number of factors, including atmospheric conditions (local meteorology), the air pollutant emissions in the area (type of pollutant, rate, frequency, duration, exit conditions, and location of release), topography and size of the area, and the presence of pollutants transported from outside the area. Air quality in the project area is generally considered good due to minimal human habitation and very sparse industrial development (i.e., salmon canneries, geological exploration). Localized emissions include man-made sources of industrial, residential, and transportation-related emissions, as well as natural sources of windblown dust and volcanic ash which contribute to temporary increases in air pollution. Pollution transported from Asia is a factor under certain circumstances and seasons.

Alaska's air monitoring program focuses on five of the seven criteria pollutants regulated through the National Ambient Air Quality Standards (NAAQS): carbon monoxide (CO), coarse particulate matter (PM10), fine particulate matter (PM2.5), ozone (O3) and lead (Pb) (Alaska Department of Environmental Conservation [ADEC], 2010). The air quality in the proposed project areas of southwestern Alaska is classified as unimpaired, with no major stationary or mobile sources that affect local air quality. ADEC, Division of Air Quality does not maintain air monitoring activities in this area of Alaska. The quantity of mobile sources of emissions that affect air quality in a given area is a function of population density, distance to nearby traffic (trucks, snow mobiles, 4-wheeler off-road vehicles [ORVs] and heavy duty trucks), aircraft flight patterns, and the concentration of air pollutants resulting from such sources depends on weather conditions and topography.

All three of the microwave repeater station sites are located in undeveloped areas where the only potential emissions are expected to be from natural sources, temporary construction activity and operations equipment. Construction activities would require the use of three types of helicopters from transporting materials from the staging areas for the proposed sites and are described in Table 2-3.

Operations equipment at each of the three repeater sites would consist of two generators contained in the power module shelter. Both generators would be Cummins D1703-M (model DSKAA – 9-kW) diesel generators and each would be outfitted with a hospital grade silencer. Fuel would be supplied to the generators by two 4,500 gallon fuel tanks at each site which would have the capacity to store up to 9,000 gallons of diesel. The generators are projected to consume between 7,000 to 7,200 gallons of diesel #1 per year. Annual resupply (refueling) of diesel fuel to each of the three microwave repeater sites would be by helicopter (Bell UH-1B Huey) and approximately 14 round trip flights would be required for refueling (Table 2-3), with the refueling effort lasting 2-3 days per site. Annual maintenance trips would use R-44 helicopters requiring two trips to each microwave repeater site (Table 2-3). Since a majority of the lands around the three microwave repeater sites, the lake-bed fiber optic cable corridor from Nondalton to Port Alsworth, and the marine fiber optic cable alignment are sparsely populated, low existing ambient air quality levels would be expected throughout the project area. The project area is in attainment with the NAAQS and is categorized as a Class II area. Areas throughout the US are categorized by the U.S. Environmental Protection Agency (EPA) as Class I, Class II, or Class III with these designations corresponding to the permissible degree of further air quality deterioration that will be allowed to occur after a baseline date. Areas that meet the NAAQS are designated as “attainment” areas. “Unclassifiable” areas for which measurements were not made are assumed to be in attainment and are assigned Class II status by default.

3.2.2 Geology and Soils

The following section describes the topography, geology, and soils at the three planned microwave repeater site locations-Cone Mountain, Caribou Ridge, and Kulukak Mountain. The lake-bed fiber optic cable from Nondalton to Port Alsworth is installed on submerged lands, and the land fall egress from Lake Clark occurs on private lands. Thus the geology and soils features of the lake-bed cable are not further reviewed in this EA.

3.2.2.1 Regional Physiography and Geology Overview

All three planned microwave repeater sites are located within the Ahklun Mountain physiographic province (Wahrhaftig, 1965). The Ahklun Mountain province is made up of groups of rugged steep-walled mountains separated by broad flat valleys and lowlands. The Ahklun Mountains and the Wood River Mountains are the two prominent mountains systems within the province. The Cone Mountain and Caribou Ridge planned repeater sites are located within the Ahklun Mountains, and the Kulukak Mountain planned microwave repeater site is located within the southern extent of the Wood River Mountains. The Ahklun Mountains are drained by shallow, clear streams that flow directly to the Bering Sea on the south and west, to the Nushagak River via the Nuyakuk River on the northeast, and to the Kuskokwim River on the northwest. The mountains are generally made up of Paleozoic and Mesozoic age sedimentary and volcanic rocks, with minor occurrences of older metamorphic rocks and younger plutonic rocks. These rocks are cut by great northeast trending faults along which many of the valleys have been eroded. Lowland and upland areas are underlain by discontinuous and/or isolated masses of permafrost (Ferrians, 1965). The entire province was intensely glaciated (Wahrhaftig, 1965). All three planned microwave repeater sites are found within the United States Geological Survey (USGS) Goodnews Bay 1° x 2° topographic quadrangle (scale 1:250,000).

3.2.2.2 Cone Mountain Geology and Soils

The Cone Mountain microwave repeater site is located northeast of the Indian River in the central portion of the USGS Goodnews Bay [B-8] 15-minute topographic quadrangle at the top of Cone Mountain at an elevation of 1,500-ft above msl. At the proposed tower site the bedrock consists of the Cretaceous to Ordovician age marine unit consisting of volcanic and sedimentary rocks (Hoare and Coonrad, 1978). Volcanic rocks include many pillow basalts, as well as breccias, crystal-lithic tuffs and flows of mafic and intermediate composition. Sedimentary rocks consist of both deep and shallow marine facies and consist of thin-bedded to massive tuffaceous cherts and siltstones, argillite, graywacke, pebble-cobble conglomerate, and limestone. Pillow basalts and other volcanic rocks are commonly interbedded with tuffaceous cherts or other fine-grained volcanogenic rocks (Hoare and Coonrad, 1978). Cone Mountain is bisected by an intermediate northeast trending normal fault that separates the Cretaceous/Ordovician age volcanic and sedimentary rocks with a low-angle thrust faulted thin-bedded to massive Ordovician age fine-grained gray limestone to the west (Hoare and Coonrad, 1978).

In September 2010, Golder Associates conducted geotechnical site investigation in support of the TERRA-SW Project. The site investigations included advancing one exploratory boring to a depth of 25-ft bgs and three shallow hand-dug test pits. Groundwater was not encountered during advancement of boring CM10-01. Hard, weathered, fractured schistose rock was reported from 0.5 ft to 25 ft bgs (Golder Associates, 2010a).

Soils within Cone Mountain area are classified as Pergelic Cryumbrepts – Histic Pergelic Cryaquepts, very gravelly, hilly to steep association. Histic Pergelic Cryaquepts are poorly drained soils on lower hillsides and steep north-facing slopes. They formed in glacial till or colluvium deposits under a cover of sedges, mosses, and low shrubs. The soils have a thick peaty surface mat of organic matter underlain by gray, very gravelly loam or sandy loam (National Cooperative Soil Survey, 1979). Within each of the three test pits dug by Golder Associates in September 2010, a 2-inch thick organic mat overlies up to 5-inches of very fine-grained silty soil.

3.2.2.3 Caribou Ridge Geology and Soils

The Caribou Ridge microwave repeater site is located west of the Quigmy River in the northern half of the USGS Goodnews Bay [A-5] 15-minute topographic quadrangle at an approximate elevation of 1,700-ft above msl. At the proposed tower site the bedrock consists of Lower Cretaceous to Middle Jurassic age volcanic and sedimentary rocks intruded by Tertiary and Cretaceous age granitic rocks. The volcanic and sedimentary country rock exhibits hornfels texture near the contacts with the younger granitic rocks (Hoare and Coonrad, 1978). The country rock consists of interbedded intermediate to mafic flows, tuffs, tuffaceous sedimentary rocks and argillite. Tuffs and tuffaceous sedimentary rocks associated with the intermediate composition volcanic rocks are commonly laumontitized. The laumontitized rocks are mottled or speckled light green, gray or brownish colored. The area lies within a highly faulted region dominated by the great north-northeast trending Hagemeister Fault to the southeast, and the site lying between two northwest trending perpendicular conjugate faults mapped by Hoare and Coonrad (1978).

In September 2010, Golder Associates conducted geotechnical site investigation in support of the TERRA-SW Project. The site investigations included advancing one exploratory boring to a depth of 16.5-ft bgs and three shallow hand-dug test pits. Groundwater was not encountered during the advancement of boring CR10-02. Fractured dioritic boulders and weathered bedrock was reported from 1 to 7 ft bgs. Hard, dark hornfels with some tuffaceous chert rock was reported from 7 ft to 16.5 ft bgs (Golder Associates, 2010b). Frozen ground or permafrost may be present at this site as indicated by patterned ground and stone circles along the margins of the ridge.

Soils within Caribou Ridge are classified as Pergelic Cryumbrepts very gravelly, hilly to steep-rough mountainous land association. Pergelic Cryumbrepts consist of soils formed in very stony and gravelly colluvium material of variable thickness over bedrock, but some of the soils in valleys and on foot slopes in glaciated areas formed in deposits of till (National Cooperative Soil Survey, 1979). Within each of the three test pits dug by Golder Associates in September 2010, a 2-inch thick lichen dominant vegetative mat overlaid up to 6-inches of very fine grained silty soil.

3.2.2.4 Kulukak Mountain Geology and Soils

The Kulukak Mountain microwave repeater site is located west of Ualik Lake in the southwest quarter of the USGS Goodnews Bay [A-2] 15-minute topographic quadrangle (scale 1:63,360) at an approximate elevation of 2,200-ft above mean sea level (msl). At the proposed tower site the bedrock consists of the Middle to Lower Upper Jurassic age Graywacke of Kulukak Bay (Hoare and Coonrad, 1978) which consists of very hard lithic graywacke and siltstone with local conglomerate. Beds are generally thick or massive. The area lies within a highly faulted region dominated by the great north-northeast trending Togiak-Tikchik Fault to the northwest, and the site lying between the Kulukak and East Kulukak Faults mapped by Hoare and Coonrad (1978).

In September 2010, Golder Associates conducted geotechnical site investigation in support of the TERRA-SW Project. The site investigations included advancing one exploratory boring to a depth of 23-ft below ground surface (bgs) and three shallow hand-dug test pits. Groundwater was not encountered during advancement of boring KLK10-01. Hard, dark gray, metamorphic rock was reported from 0.5 ft to 23 ft bgs (Golder Associates, 2010c).

Soils within the Kulukak Mountain are classified as *Humic cryorthods* very gravelly, hilly to steep association. *Humic cryorthods* consist of very gravelly drift or colluvium capped with a thin mantle of silty loess or a mixture of loess and volcanic ash. On steep mountain sides and high ridges, like Kulukak Mountain, many soils are shallow over bedrock (National Cooperative Soil Survey, 1979). Within each of the three test pits dug by Golder Associates in September 2010, a 3.5-inch thick lichen dominant vegetative mat overlaid up to 10-inches of fine grained silty soil.

3.2.2.5 Regional Physiography and Geology Overview of the Lake Clark Region

The following section describes the topography, geology, and soils at the Port Alsworth egress point within the Lake Clark Region.

The Lake Clark National Park and Preserve is approximately 6,300 square miles in area, including the town of Port Alsworth. NPS, USGS, Alaska Division of Geological and Geophysical Surveys and academic institutions collaborate on many scientific studies relating to the natural sciences. A brief summary of the regional geology of the Lake Clark region is presented based on the previous work of Biekman (1974); Bundtzen and others (1979); Duzel-Bacon, Doyle, and Box (1996); Eakins, Gilbert, and Bundtzen (1978); Haeussler and Saltus (2004) and Nelson, Carlson, and Case (1983).

The Lake Clark region lies within southern Alaska Range physiographic sub-province of the Pacific Mountain System physiographic division (Wahrhaftig, 1965). The southern portion of the Alaska Range is dominated by two of the 41 active volcanoes of the Aleutian Arc; Illiamna Volcano and Redoubt Volcano. The Chigmit Mountains are capped by Illiamna and Redoubt volcanoes that rise to elevations greater than 10,000-ft above sea level. The Chigmit Mountains consist of ridges that trend northeast separated by broad glaciated valleys. The Chigmit Mountains are drained by large braided glacial streams that flow to the Kuskokwim River on the northwest, to the Nushagak River or Mulchatna River to the west and southwest, to the Susitna River to the northeast, and Cook Inlet to the east.

The southern part of the Alaska Range sub-province is underlain by large Mesozoic age granitic batholiths that intrude Paleozoic and Mesozoic age sedimentary and volcanic rocks. The older sedimentary and volcanic rocks are moderately metamorphosed and highly deformed exhibiting medium grade green schist and amphibolite metamorphic mineral assemblages (Duzel-Bacon, Doyle, and Box, 1996). These rocks are cut by prominent north-northeast trending faults. Well-bedded Jurassic age sedimentary rocks form prominent ridges dipping southward from the south flank of the range toward Cook Inlet (Wahrhaftig, 1965). Extensive systems of valley glaciers radiate from the higher mountains. The extent of permafrost is limited to discontinuous bodies and/or isolated masses (Ferrians, 1965).

Port Alsworth Geology and Soils

Port Alsworth is located along the central eastern shore of Lake Clark near the mouth of the Tanalian River that drains Kontrashibuna Lake. Lake Clark lies at an approximate elevation of 250-ft above msl. At the proposed cable egress site at Port Alsworth the bedrock exposed in Tanalian Mountain consists of Mesozoic to Paleozoic age metamorphosed schist, Tertiary age volcanic rocks, and Cretaceous to Tertiary age light-colored, medium-grained intrusive granodiorite (Nelson, Carlson, and Case, 1983). The village of Port Alsworth lies along the shoreline of Lake Clark within Quaternary age glacial outwash deposits, and undivided alluvium and colluvium. The area is within the Lake Clark Fault Zone dominated by right lateral strike-slip displacement (Haeussler and Saltus, 2004).

Soils within the Port Alsworth area near the Tanalian River are classified as *Humic cryorthods* very gravelly, hilly to steep association-Pergelic Cryofibrists, with nearly level association occur in depressions and some valley floors. The soils within Tanalian Mountain and the Chigmit Mountain range are classified as rough mountainous land made up of steep rocky slopes that support sparse vegetation. Thin soils occur in the vegetated areas on lower slopes and in valleys, but almost all are stony and shallow over bedrock or bouldery deposits ((National Cooperative Soil Survey, 1979). *Humic cryorthods* are well drained soils on foot slopes and moraine hills in the vicinity of Lake Clark. They consist of very gravelly glacial till capped with a thin mantle of silty volcanic ash (National Cooperative Soil Survey, 1979).

3.2.2.6 Regional Marine Geology Overview of the Southeastern Bering Sea

The proposed submarine cable (Alternative 3) would be deployed parallel to the northern shorelines of Bristol Bay in relatively shallow water, less than 100 ft deep, on the gently sloping continental shelf deposits extending seaward from the shoreline. Bristol Bay lies within the southeastern Bering Sea and is bounded to the south and east by the Alaska Peninsula and to the north by the Ahklun Mountains and the Nushagak River lowlands. Water depths in Bristol Bay range from 15 to 700 ft.

The USGS, National Oceanic and Atmospheric Administration, BLM, Bureau of Ocean Energy Management, Regulation and Enforcement (formerly Minerals Management Service), Alaska Division of Geological and Geophysical Surveys and academic institutions have collaborated on many scientific oceanic cruises and onshore mapping studies to collect important information regarding the bathymetry and sedimentary basins of the Bering Sea. A brief summary of the regional marine geology of Bristol Bay and southeastern Bering Sea is presented based on the previous work of Abers and others (1993); Austin, Molnia, and Schwab (1980); Hoose and Ashenfelter (1983); Hunter, Sallenger, and Dupré (1979); Marlow and Cooper (1984); Molnia, Schwab, and Austin (1983); Reifenstuhl and Decker (2008); Sherwood and others (2006); Smith and McConnaughey (1999); Stevens and Craw (2003); and Thor and Nelson (1980).

The Bering Sea continental shelf (Bering shelf) and outer continental shelf areas are important for potential domestic oil and gas resources. The near-shore continental shelf consists of recent unconsolidated sediments and Quaternary age sediments discharged from Pleistocene glaciers, the three primary river systems draining the Ahklun Mountains and Nushagak lowlands (Togiak, Nushagak, and Kvichak), and the four main rivers draining the Northwest Alaska Peninsula

(Egegik, Ugashik, Meshik, and Naknek). The extensive shelf surface constitutes a relatively shallow and level area of seafloor bounded offshore by an abrupt, steep break-in-grade at roughly 525 ft depth. Average water depth over the shelf is approximately 197 ft (Smith and McConnaughey, 1999). Underlying a large portion of Bering shelf, north of the Alaska Peninsula is a sediment-filled structural depression known as the Bristol Bay basin or North Aleutian basin (Marlow and Cooper, 1984). Several of the sedimentary deposits found within the basin from recovered drill core are exposed onshore on the northern fringe of the Alaska Peninsula. The basin trends northeastward from the Alaskan Peninsula and about four-fifths of the basin fill lies offshore beneath the flat Bering Sea shelf.

The basin is estimated to have a total thickness of more than 20,000-ft consisting of Cenozoic age deposits. The southeastern half of the North Aleutian basin contains the thickest sedimentary section and may have the greatest potential for source and reservoir rocks. The dominant geological feature of the southwest part of the North Aleutian basin is the Black Hills uplift, or dome, where the Tertiary age source rocks thin to 2,000 to 5,000-ft thick (Sherwood and others, 2006) making access easier to the basement Mesozoic age rocks that might form a source of oil. Tertiary age sedimentary deposits that are prospects for potential oil and gas resources include the Tolstoi Formation, deposits in the Amak Basin within the Black Hills uplift, and the Milky River Formation that has shown to contain biogenic gas. Some of the Mesozoic age basement rocks beneath the basin may also be petroleum source or reservoir rocks (Marlow and Cooper, 1984; Sherwood and others, 2006; Reifenstuhl and Decker, 2008). Mesozoic age sandstones and conglomerates that might form reservoirs for petroleum include the Talkeetna, Naknek, Staniukovich, Herendeen, and Hoodoo Formations (Sherwood and others, 2006).

Most of the possible targets for exploration, known as traps, are associated with stratigraphic pinch-outs, and structural folding and faulting. Most mapped prospects in the North Aleutian basin proper are simple domes draped over the crests of fault-bounded basement uplifts (Sherwood and others, 2006). Faults present in the southwestern portion of the basin occur in a wide, east-west trending zone. This zone is an eastward extension of the St. George graben system. Within it, faults trend approximately east-west with down-dropped blocks (Hoose and Ashenfelter, 1983). Many researches have concluded that the large canyons that cut the Bering shelf and the adjacent outer-shelf basins are fault controlled and potentially active (Abers and others, 1993).

Geologic hazards observed on the surface of the North Aleutian basin from side-scan sonar studies include scours suggestive of active erosion, faults which appear to have a surficial expression suggesting present-day activity, and megaripples and sandwaves suggesting active sediment transport. Physical characteristics on the Bering shelf both influence and reflect these processes. Prevailing sea currents produce a net flow from the Pacific Ocean and out through the Bering Strait. This is manifested in the general northerly direction of currents. Major deviations do exist, including the counter-clockwise gyre in Bristol Bay (Smith and McConnaughey, 1999).

Sediment originates from erosion, surface runoff, and volcanism on the Alaska mainland, which transport material to the coastal environment where waves and currents disperse it offshore. The Kuskokwim River provides the largest outflow to the east-central Bering Sea north of Bristol Bay contributing considerable amount of sediment. Shelf surface strata generally consist of a thin veneer of contemporary sediments, from 3 to 12-ft thick in the southeastern region (Smith and McConnaughey, 1999).

3.2.2.7 Marine Geology and Geologic Hazards

The cable routes are designed in water depths less than 300 ft. Seabed conditions are anticipated to be fairly flat within the Bering shelf, except where channels exist (Dillingham in Nushagak Bay, offshore Platinum and Quinhagak), and consist of a homogenous mixture of sand, mud and gravel. Shoals, outcrops and areas of hard bottom exist in the project area. The most likely area where seafloor outcrops might be encountered will be east of Hagemeister Island, where the bottom appears to be fairly irregular (Fugro Pelagos, 2010).

Sediment Transport

The Togiak and Nushagak Rivers provides the largest outflow to the Bering shelf area within the proposed cable route area contributing a moderate amount of sediment. Longshore sediment transports is the movement of sediment, mostly sand and gravel, in alongshore directions on beaches and in the adjacent shallow-water zone of breaking waves (Hunter, Sallenger, and Dupré, 1979). On most coasts, waves and wave-driven currents are the main transporting agents, but tidal and other currents may be locally important causes of transport. The rate of longshore transport increases with increasing wave size. Along many coasts the transport direction alternates many times a year as wave conditions change (Hunter, Sallenger, and Dupré, 1979).

Geologic Hazards

Geologic hazards along the proposed submarine cable route include earthquakes and faulting, ice gouging, and coastal flooding (Fugro Pelagos, 2010; Stevens and Craw, 2003). The proposed submarine cable route is within a seismic zone having moderate hazard risk. Although no great earthquakes have occurred in this zone since 1899, earthquakes with great intensities could be generated from the shallow-dipping Benioff zone where the North Pacific tectonic plate is being subducted beneath the North American plate south of the project area (Stevens and Craw, 2003). The Togiak-Tikchik fault runs from the Gemuk River through the Tikchik region into the Bering Sea near the village of Togiak. The Togiak-Tikchik fault zone trends northeast with fault traces marked by offsets in unconsolidated alluvial deposits in the central Kuskokwim region (Stevens and Craw, 2003).

Ice gouging occurs in water depths of 100 ft or less, but are most dense in water 30 to 50 ft deep. Ice gouges trend parallel to pack ice movement, which in turn generally move parallel to coastline configuration. Ice impacting the sea floor gouges surficial sediment of the shallow Bering shelf. Ice thick enough to gouge the substrate forms in compression and in shear zones; where moving pack ice collides with and piles up against other pack ice or stationary shorefast ice to develop numerous pressure ridges (Thor and Nelson, 1980). Two types of ice gouge have been recognized on the Bering shelf: single gouge furrow or multiple gouge subparallel groups of gouges. Single gouges are cut by single-keeled pieces of thick ice, whereas multiple gouges are formed by multikeeled, thick, pressure-ridge ice (Thor and Nelson, 1980).

Coastal flooding can result from ice jams, high rainfall, and storm surges. Ice-jam flooding is a known concern on the Nushagak River (Stevens and Craw, 2003). The Nushagak River experienced a 25-year flood event in 1990. Severe storms can cause coastal flooding when the sea is driven above high tide level onto what is normally dry land via a combination of tide levels, wind-driven transport of sea water, and atmospheric pressure. The funnel-shaped embayments of Nushagak and Kvichak bays amplify the tidal bulge to create extremely large tidal ranges. High water levels combined with powerful and destructive surf make coastal floods one of the leading causes of property damage in Alaska (Stevens and Craw, 2003).

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3.2.3 Hydrology

The following section presents the data available regarding the surface and groundwater hydrology, and water quality at the three proposed microwave repeater site locations - Cone Mountain, Caribou Ridge, and Kulukak Mountain. In addition this section presents the data available regarding the climate, surface and groundwater hydrology, and water quality near the Port Alsworth egress point within the Lake Clark Region and physical oceanography of the southeastern Bering Sea region.

3.2.3.1 Regional Hydrology Overview

The three proposed microwave repeater sites would be located within the Ahklun Mountain physiographic province (Wahrhaftig, 1965). The Ahklun Mountain province is made up of groups of rugged steep-walled mountains separated by broad flat valleys and lowlands. The mountains are drained by shallow, clear streams that flow directly to the Bering Sea on the south and west, to the Nushagak River via the Nuyakuk River on the northeast, and to the Kuskokwim River on the northwest. Drainage is roughly radial. The region is cut by large northeast trending faults along which many of the valleys have been eroded (Hoare and Coonrad, 1978; Wahrhaftig, 1965). The entire province was intensely glaciated. The province includes numerous glacial lakes that are long narrow bodies of water in U-shaped canyons. Lake depths have been reported to be as great as 900 ft. A few small cirque glaciers are found in the highest parts of the mountains from Mount Waskey northward (Wahrhaftig, 1965). The occurrence of groundwater in Alaska is allied to the geologic and physiographic framework and is influenced by the presence or absence of permafrost. Lowland and upland areas are underlain by discontinuous and/or isolated masses of permafrost (Ferrians, 1965).

3.2.3.2 Cone Mountain Hydrology

The Cone Mountain microwave repeater site would be located northeast of the mouth of the Indian River at the top of Cone Mountain at an elevation of 1,500-ft above mean sea level. The Cone Mountain microwave repeater site would lie east and north of Cripple Creek and south of Jacksmith Creek. The Indian River empties into Carter Bay to the southwest, Cripple Creek empties into Kuskokwim Bay to the west, and Jacksmith Creek empties into Jacksmith Bay to the northwest. Cripple Creek lies approximately 1 mile south of the proposed repeater site. The Indian River, Cripple Creek, and Jacksmith Creek are identified as anadromous streams by ADFG (1998a).

This proposed microwave repeater site would lie at the top of Cone Mountain that hosts the uppermost reaches of the Cripple Creek watershed. The Cone Mountain microwave repeater site would lie within the USGS Kuskokwim Delta Hydrologic Unit-19030502. Flow discharge rates for the Cripple Creek, Indian River, and Jacksmith Creek were not available for review. There are no real-time discharge stations within Hydrologic Unit 19030502 in the area of the Cone Mountain site (USGS, 2011a).

In September 2010, Golder Associates conducted geotechnical site investigation in support of the TERRA-SW Project. Groundwater was not encountered during advancement an exploratory boring to a depth of 25-ft bgs at the site (Golder Associates, 2010a). Water quality information for the Kuskokwim Delta Hydrologic Unit 19030502 in the area of Cone Mountain was not available for review.

3.2.3.3 Caribou Ridge Hydrology

The Caribou Ridge microwave repeater site would be located west of the Quigmy River at an approximate elevation of 1,700-ft above mean sea level. The Caribou Ridge microwave repeater site would lie between the Matogak River to the west and northwest and Quigmy River to the east and southeast. The Matogak River empties into Hagemeister Strait and the Quigmy River empties into Togiak Bay. Sulutak Creek lies approximately 1 mile north of the proposed microwave repeater site and flows into the Quigmy River. The Matogak and Quigmy rivers are identified as anadromous streams by ADFG (1998a).

The Caribou Ridge microwave repeater site would lie among a topographic divide trending roughly north-south that hosts the uppermost reaches of both the Matogak River and Quigmy River watersheds. The Caribou Ridge microwave repeater site would lie within the USGS Togiak Hydrologic Unit-19030305. Flow discharge rates for the Matogak and Quigmy rivers were not available for review. There are no real-time discharge stations within Hydrologic Unit 19030305 in the area of the Caribou Ridge site (USGS, 2011b).

In September 2010, Golder Associates conducted geotechnical site investigation in support of the TERRA-SW Project. Groundwater was encountered during advancement of one exploratory boring at a depth of 8.5-ft bgs. The groundwater observed in the borehole appeared to be a combination of near surface water infiltration and seepage from the frost fractured bedrock. Frozen ground or permafrost may be present at this site as indicated by patterned ground and stone circles along the margins of the ridge (Golder Associates, 2010b). Water quality information for the Togiak Hydrologic Unit 19030305 in the area of Caribou Ridge was not available for review.

3.2.3.4 Kulukak Mountain Hydrology

The Kulukak Mountain microwave repeater site would be located west of Ualik Lake at an approximate elevation of 2,200-ft above mean sea level. The Kulukak Mountain microwave repeater site would lie between the Kulukak River to the west and northwest and Kanik River to the southeast. The Kulukak and Kanik rivers empty into Kulukak Bay to the south. Tithe Creek lies approximately 3 miles east of the proposed microwave repeater site and flows into the Kanik River. The Kulukak and Kanik rivers are identified as anadromous streams by ADFG (1998a).

The Kulukak Mountain microwave repeater site would lie among a topographic divide trending roughly north-northeast that hosts the uppermost reaches of both the Kulukak River and Kanik River watersheds. The Kulukak Mountain site lies within the U.S. Geological Survey (USGS) Togiak Hydrologic Unit-19030305. Flow discharge rates for the Kulukak and Kanik rivers were not available for review. There are no real-time discharge stations within Hydrologic Unit 19030305 in the area of the Kulukak Mountain site (USGS, 2011a).

In September 2010, Golder Associates conducted geotechnical site investigation in support of the TERRA-SW Project. Groundwater was not encountered during advancement of one exploratory boring advanced to a depth of 23-ft bgs at the site. Water quality information for the Togiak Hydrologic Unit 19030305 in the area near Kulukak Mountain was not available for review.

3.2.3.5 Regional Hydrology and Climate Overview of the Lake Clark Region

The Lake Clark region lies within southern Alaska Range consisting of the Chigmit Mountains. The Chigmit Mountains mark the boundary between the marine climate of Cook Inlet and the continental climate of Interior Alaska (NPS, 2011a). The Chigmit Mountains are drained by large braided glacial streams that flow to the Kuskokwim River on the northwest, to the Nushagak River or Mulchatna River to the west and southwest, to the Susitna River to the northeast, and Cook Inlet to the east. Lake Clark National Park and Preserve contains more than 6,000-miles of streams and rivers (NPS, 2011a). Lake Clark is one of many large lakes that occupy glaciated valleys within and on the margins of the southern Alaska Range, is the sixth largest lake in Alaska, and is one of the largest lakes in the region. The Lake Clark watershed drains 2,942 square miles and is fed from inflow from five major rivers: Chokotonik, Tlikakila, Kijik, Tanalian, and Chulitna; and one major stream, Current Creek (Brabets, 2002; NPS, 2011a). The topography in the Chulitna Basin is relatively flat compared to the other basins in the Lake Clark watershed. In general, the glaciers found on the northwest and west side of the southern Alaska Range are smaller than those found within the southeast side (Wahrhaftig, 1965). The occurrence of groundwater in Alaska is allied to the geologic and physiographic framework and is influenced by the presence or absence of permafrost. Mountainous areas are underlain by isolated masses of permafrost (Ferrians, 1965).

The Lake Clark region is located in a transitional climatic zone, exhibiting characteristics of both a marine and continental climate (Hall, 1995; ADCCED, 2011). The region experiences cool summers and moderately cold winters (Hall, 1995). Average rainfall is approximately 26 inches per year and average snowfall is approximately 70 inches per year. Average summer temperatures range from 42 to 62-degrees Fahrenheit and winter temperatures range from 6 to 30-degrees Fahrenheit (ADCCED, 2011).

Port Alsworth Hydrology

Port Alsworth is located along the central eastern shore of Lake Clark near the mouth of the Tanalian River that drains Kontrashibuna Lake. Lake Clark lies at an approximate elevation of 250-ft above msl and encompasses an area of approximately 128 square miles. It has a length of 41 miles, an average width of 3.1 miles, an average depth of 330 ft, and a maximum depth of 1,000 ft (Brabets, 2002). The Newhalen River drains Lake Clark at its southwest end and empties into Lake Illiamna. Lake Illiamna is drained by the Kvichak River that empties into Bristol Bay.

The Tanalian River, Currant Creek and four unnamed streams along the eastern shore of Lake Clark north and south of Port Alsworth are identified as anadromous streams by ADFG (2009).ADFG (2009). The lower Chulitna River that empties into Chulitna Bay along the west shore of Lake Clark and west of Port Alsworth is also identified as an anadromous stream. Kijik Lake, and the lower branches of the Kijik River north of Port Alsworth on the west shore of Lake Clark are also identified as anadromous streams by ADFG.ADFG.

The western half of the Lake Clark basin is made up of the Chulitna River, Kijik River, and Tlikakila River basins. The eastern half of the Lark Clark basin is made up of the Tanalian River, Current Creek, and Chokotonk River basins. The Lake Clark basin lies within the USGS Lake Clark Hydrologic Unit-19030205. Various types of physical measurements have been collected since 1954 for the Tanalian, Chulitna, Kijik, and Chokotonk Rivers and Currant Creek (USGS, 2011c). Stream-flow discharge measured in on the Tanalian River from 1955 to 1957 showed annual peak flow average of approximately 2,300 cubic ft per second (ft^3/s), and a peak of 3,000 ft^3/s in July 1955. In 1999 to 2001, stream-flow on the Tanalian River ranged from 179 to 5,920 ft^3/s (Brabets, 2002) There is one real-time discharge station within Hydrologic Unit

19030305, located approximately 5 miles above the mouth of the Chulitna River (USGS, 2011c). In 2010, the average stream flow on the Chulitna River was measured at 2,600 ft^3/s, with a peak discharge in August of 5,870 ft^3/s (USGS, 2011c).

Information about the water quality of the Tanalian River along with information regarding the other five major tributaries that flow into Lake Clark was compiled by Brabets in 2002. From 1999 to 2001, the Tanalian River exhibited a range of selected water-quality constituents including: pH (7.0-7.8); temperature in degrees Centigrade (5.5-13.5 °C); dissolved oxygen in milligrams per liter (10.1-13.8 mg/l); alkalinity in mg/L as calcium carbonate (10-13 mg/L); and total suspended sediment (1-5 mg/L). At the Lake Clark outlet: pH (7.0-7.9); temperature (4.5-11.5 °C); dissolved oxygen (10.3-14.1 mg/L); alkalinity (20-21 mg/L); and total suspended sediment (1-5 mg/L). According to the EPAEPA, there are no impacted waters within the Lake Clark Hydrologic Unit-19030205, listed in accordance with Section 303(d) of the Clean Water Act (EPA, 2011).

The community of Port Alsworth uses both private wells and surface water for drinking water supply (ADCCED, 2011). The Lake Clark National Park and Preserve facilities utilize five active groundwater wells for drinking water supply (ADECADEC, Division of Environmental Health, 2011).

3.2.3.6 Physical Oceanography of the Southeast Bering Sea Shelf

The Alternate 3 Marine Cable route consists of four segments of communication cable which includes: Dillingham to Togiak; Platinum to Quinhagak; Dillingham to Platinum; and Togiak to Quinhagak. The proposed cable would be deployed parallel to the northern shorelines of Bristol Bay in relatively shallow water, less than 100 ft deep, on the gently sloping continental shelf deposits extending seaward from the shoreline. Bristol Bay lies within the southeastern Bering Sea and is bounded to the south and east by the Alaska Peninsula and to the north by the Ahklun Mountains and the Nushagak River lowlands. Water depths in Bristol Bay range from 15 to 700 ft. The extensive near shore Bering shelf surface constitutes a relatively shallow and level area of seafloor bounded offshore by an abrupt, steep break-in-grade at roughly 525 ft water depth. Average water depth over the shelf is approximately 197 ft (Smith and McConnaughey, 1999).

The circulation in the Bering Sea is often described as a cyclonic gyre, with the southward flowing Kamchatka Current forming the western boundary current and the northward flowing Bering Slope Current forming the eastern boundary current. Circulation in the Bering Sea is strongly influenced by the Alaskan Stream, which enters the Bering Sea through the many passes in the Aleutian Arc. Circulation on the eastern Bering Sea shelf is generally northwestward (Stabeno, Schumacher, and Ohtani, 1999). Major deviations do exist, including the counter-clockwise gyre in Bristol Bay (Smith and McConnaughey, 1999).

Annual ice cover in the Bering shelf is less than 6 ft. Ice thick enough to gouge the substrate forms in compression and in shear zones, where moving pack ice collides with and piles up against other pack ice or stationary shorefast ice to develop numerous pressure ridges. Gouging is extremely rare inshore of the shear zone, because shorefast ice is relatively static and protects inshore areas from the dynamics of the shear or compression zone and consequent ice gouging (Thor and Nelson, 1980). Two types of ice gouge have been recognized on the Bering shelf: single gouge furrow or multiple gouge subparallel groups of gouges. Single gouges are cut by single-keeled pieces of thick ice, whereas multiple gouges are formed by multikeeled, thick, pressure-ridge ice (Thor and Nelson, 1980).

The hydrographic structure in the southeast Bering Sea has been characterized into three major domains: offshore, middle, and coastal. The coastal domain corresponds approximately with the area between the coast and the 150-ft water depth contour. In this domain, tidal mixing and wind mixing produce intense stirring, which usually results in vertically homogenous water properties and horizontal gradients. The funnel-shaped embayments of Nushagak and Kvichak bays amplify the tidal bulge to create extremely large tidal ranges (Stevens and Craw, 2003). Tidal currents play a vital role in the physical oceanography over the Bering shelf. Tidal currents provide sufficient energy to mix the bottom 120-ft of water over the southeastern shelf, thus setting up a two-layer density structure in water depths of 150 to 300 ft (Stabeno, Schumacher, and Ohtani, 1999).

Salinity of Bering Sea

The salinity of the water in the upper layer of the Bering Sea depends on advection of Pacific Ocean water, the hydrological cycle between the surface layer and atmosphere, continental drainage, ice formation, and melting of ice (Luchin et al., 1999). Currents and mixing of water only redistribute salt. At greater depths, the salinity depends on the currents and water exchange with the Pacific Ocean. Salinity in the Bering Sea increases with depth; however, during the period of ice formation, there may be a slight salinity inversion in the surface layer (Luchin et al., 1999). Seasonal variability in salinity is linked to oscillations in river outflow, the formation of ice cover, the balance between precipitation and evaporation from surface waters, and other factors. Near shore, the density gradient between surface and subsurface waters increases, which impedes exchange between the two layers. Therefore the major salinity oscillations are limited to the upper 150-ft (Luchin et al., 1999).

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3.2.4 Hazardous Materials and Waste Management

3.2.4.1 Hazardous Materials

Since limited development has occurred in the project areas, it is important to establish a baseline for the use and management of hazardous materials. Items such as batteries, gasoline, and diesel fuel are considered potentially hazardous and need to be properly managed in both their use and disposal. Though not common in many of these remote areas, these items are in use in small villages and are found occasionally in camp sites, emergency response efforts, or recreation vehicles (snow mobiles, etc). These materials are common sources for power and have been used successfully in many remote projects.

The hazardous materials and facilities employed in implementation of the proposed TERRA-SW Project are described in Section 2.2.2. Once built, these microwave repeater sites would be unmanned and resupply would occur only once per year under normal planned operations. Periodic aerial surveillance would visually inspect each microwave repeater site for potential problems or necessary unscheduled servicing. Each of the three microwave repeater stations would require the use of batteries and fuels mentioned above for continued operations. Annual refueling operations at each site would involve transportation of 7,000 gallons of diesel fuel in an estimated 14 loads (500 gallons per load) over a period of 2-3 days.

Extensive preventive measures, outline in a Spill Prevention, Control, and Countermeasure (SPCC) plan would be prepared for each site. The plans would include procedures for containment of stored fuels, procedures and temporary containment for refueling equipment, transferring fuels, and moving fuels to and from storage locations. Spill response materials would be stored on site. All non-consumable materials such as batteries or petroleum products and lubricants would be collected and removed offsite for proper disposal or recycling.

3.2.4.2 Facilities Safety

For construction at a remote site in Southwest Alaska, helicopter transport of equipment, materials, and the workforce is necessary. Aircraft use incurs operational risks, with an accident risk much higher than the national average (ADN, 2010). Rapid changes in weather patterns plus extremely rugged terrain are major contributors to the high accident rates. The Aircraft Owners and Pilots Association’s Air Safety Foundation determined that the national rate for general aviation aircraft accidents was 5.8 accidents per 100,000 flight hours (Daily Caller, 2010). In Alaska, the accident rate was more than twice the national rate at 13.59 accidents per 100,000 flight hours between 2004 and 2008 (Daily Caller, 2010). Not all accidents resulted in fatalities.

Helicopter safety is even a greater issue. In 2004, the U.S. civil helicopter accident rate was 8.09 accidents per 100,000 flight hours. This compares to a general aviation accident rate of 6.22 accidents per 100,000 flight hours in 2004 (Kriebel, 2009). A query of the National Transportation Safety Board's aviation accident database identifies 28 reported helicopter accidents between January 1, 2006 and February 3, 2011, but rates per 100,000 flight hours were not reported. Of these 28 reported accidents in Alaska, four included fatalities (NTSB, 2011).

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3.3 Biological Environment

The discussion of the affected environment includes a description of the existing conditions onsite that might be affected by the proposed project. Existing conditions in the vicinity of the sites are also included. Within the vicinity of the proposed microwave repeater sites, a wide diversity of wildlife exists due to the protections offered by the National Wildlife Refuge system, adjacent Wilderness Areas, and remote surroundings. In fact, the Togiak Refuge is home to at least 283 species of wildlife, including 201 species of birds, 31 terrestrial mammals, 17 marine mammals, and 1 amphibian species (FWS, 2009a). The BLM Bay Planning Area encompasses the Bristol Bay and Goodnews Bay region, and encompasses the Togiak Refuge. According to the BLM Resource Management Plan (RMP) for this area, diversity on the BLM-managed lands is similar to that found on the Togiak Refuge, and includes 182 birds, 38 terrestrial mammals, 9 marine mammals, and 1 amphibian species (BLM, 2008).

The Lake Clark portion of the project area is partially within and largely enclosed by the Lake Clark National Park and Preserve, which encompasses a smaller area than the Togiak Refuge and the BLM Bay Planning Area. The Lake Clark National Park and Preserve hosts 36 species of terrestrial mammals, 189 species of birds, and several marine mammals (Bennett, et al. 2006).

3.3.1 Wetlands and Vegetation

During the summer of 2010, a vegetation survey was conducted by Travis/Peterson Environmental Consulting, Inc. (TPECI) at each of the three proposed tower sites. The objective of this survey was to create a baseline understanding of the vegetation present and document the occurrence of any invasive plant species within the proposed project area. Three vegetation plots were sampled at each proposed microwave repeater site to obtain vegetation data. Plots measured 1-meter square and were randomly placed for species identification and are not necessarily representative of the dominant plant species of the site. No invasive plant species were documented at any of the three proposed microwave repeater sites. A summary of the vegetation survey results can be found in Table 3-1. Additionally, ABR described vegetation communities present at the proposed tower sites as part of the on-site bird-habitat evaluation that was conducted in the summer of 2010 (ABR, 2010).

A formal on-site wetlands determination or survey was not conducted at the proposed tower sites. Although some of the vegetation species documented at the proposed sites can occur in wetlands, their presence alone does not determine wetlands, and many species that more commonly occur in upland habitats were also documented at the proposed tower sites. Based on site descriptions, site photographs, the hydrology of the sites (see Section 3.2.3), a review of the National Wetlands Inventory (NWI) Maps (although data is not available for Kulukak Mountain), site location, and review of vegetation surveys, no wetlands are present at any of the three proposed microwave repeater sites which are located high on mountain ridges.

Based on review of the FWS NWI, mapped wetlands do exist downslope of the three tower sites (> 1 mile from the tower sites), primarily in the valley bottoms between ridges, and along river and stream courses in the valleys. However, these wetlands do occur along portions of the flight paths for maintenance and fuel operations. These wetlands are primarily freshwater emergent and freshwater scrub/shrub type wetlands or a mosaic of the two. The emergent wetlands are characterized by erect, rooted, herbaceous hydrophytes, usually dominated by perennial plants, while the scrub/shrub wetlands include areas dominated by woody vegetation less than 20 ft tall, mostly broad-leaved deciduous species including willow and alder species. The scrub/shrub wetlands are more closely associated with river and stream courses while the emergent wetlands cover large areas of valley bottoms.

3.3.1.1 Cone Mountain

The microwave repeater site would be located on Cone Mountain which is a rounded mountain ridge that rises up from the Bering Sea coastal plain with relatively gentle slopes. The proposed site would be located on a small shelf just east of the true summit of Cone Mountain about 4 to 5 miles from the coast at about 1,500 ft in elevation (Figure 2-2). Much of Cone Mountain is characterized by alpine dwarf-scrub vegetation and scattered angular boulders, cobbles, and gravel. The site itself is characterized by exposed rock and patches of alpine tundra and moss/lichen vegetation typical of the windswept ridge tops of the area. No wetlands or trees exist at the site.

On the relatively flat bench where the microwave repeater site is proposed, the vegetation is dominated by dwarf shrubs (*Dryas octapetala*, *Empetrum nigrum*, *Salix arctica*, *Loiseleuria procumbens*, and *Vaccinium vitis-idaea*). Common graminoids that occur include *Carex microchaeta*, *Carex nesophila*, and *Hierochloe alpina*. A few exposed rocky areas also occur, composed mostly of cobbles and gravels with a live vegetative mat less than 2 inches in depth. On the slopes below the ridge/saddle, the same alpine tundra vegetation occurs but with more exposed boulders and cobbles present and very few gravels. Unvegetated scree slopes occur primarily on the steeper eastern slopes below the peak (ABR, 2010).

3.3.1.2 Caribou Ridge

The proposed Caribou Ridge microwave repeater site would be located in a small saddle between two mountain peaks on a larger ridge system that divides the Quigmy and Matagok River drainages at about 1,700 ft in elevation. At its closest point, the site is approximately 10 to 11 miles from the coast at Togiak Bay, with several mountain ridges occurring between the site and the nearest point along the coast (Figure 2-3).

Similar to the Cone Mountain area, the mountain ridges and peaks in the Caribou Ridge region are generally rounded, but the terrain is a bit steeper at the higher elevations and some peaks and ridges are sharper edged with areas of exposed bedrock. As at Cone Mountain, the proposed Caribou Ridge site is in the alpine zone and the vegetation is similarly dominated by patches of moss/lichen and dwarf alpine shrubs (the same species as at Cone Mountain plus *Vaccinium uliginosum* in a dwarf form and *Phyllodoce aleutica*). The most common graminoids present were *Calamagrostis canadensis* and *Carex nesophila*. The Caribou Ridge site is rockier than the Cone Mountain site and is characterized by patches of alpine dwarf-scrub vegetation alternating with broad areas of unvegetated scree slopes with angular boulders, cobbles, and gravels. The ridge-saddle where the microwave repeater site is proposed is relatively flat and well-vegetated, with a vegetative mat between 1 and 2 inches in depth. The slopes below the saddle and along Caribou Ridge in general have large areas of unvegetated scree and rather smaller patches of dwarf-scrub vegetation. Similar unvegetated scree slopes and alpine vegetation are common on the mountain ridges and peaks surrounding Caribou Ridge (ABR, 2010).

3.3.1.3 Kulukak Mountain

The proposed Kulukak Mountain site would be located approximately 7 miles directly north of Kulukak Bay in the Bristol Bay area at 2,200 ft of elevation in a small saddle along a larger ridge/mountain system oriented generally in a northeast/southwest direction. The ridge/mountain system divides the Kanik and Kulukak River drainages, both of which flow into Kulukak Bay (Figure 2-3). Several low mountain ridges occur between the site and the nearest point along the coast of Kulukak Bay, but the site would be readily visible from Kulukak Bay.

The Kulukak Mountain site is higher and in more mountainous terrain than the other two proposed repeater sites. Kulukak Mountain supports patches of alpine dwarf-scrub and moss/lichen vegetation (similar species that occur at the other two proposed microwave repeater sites are dominant here also, plus *Lupinus arcticus*), but unvegetated scree slopes with angular boulders, cobbles, and gravel, and rock outcroppings, sharp ridgelines, rocky peaks, and slopes with exposed bedrock are more dominant in the area. Bare ground cover at the proposed microwave repeater site is between 10 and 30 percent.

This microwave repeater site is proposed to be erected on a relatively flat ridge-saddle dominated by cobbles and gravel, a few boulders and rock outcrops, and scattered patches of alpine dwarf-scrub vegetation with a vegetative mat less than 1.5 inches in depth. Rocky cliffs occur higher along the ridge crest above the site proposed for the microwave repeater. Similar unvegetated scree, exposed bedrock and cliffs, and scattered patches of alpine vegetation are common on the ridges and peaks surrounding Kulukak Mountain (ABR, 2010).

Table 3-1. Vegetation Survey: Average Percent Cover by Species - Normalized

Site	Caribou Ridge			Cone Mountain			Kulukak Mountain		
Plot Number	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
Anemone multifida		6		4	4				1
Arctostaphylos uva-ursi			7						
Arnica alpina							1		
bare ground				1	7		31	14	10
Calamagrostis canadensis		17							
Campanula lasiocarpa									1
*Carex nesophila**	11	30	8	23	7	7	4		18
Carex vaginata							4	3	
Castilleja spp.				1					
Cornus canadensis		2							
Diapensia lapponica							4	3	
Dryas spp.				2	13				1
Empetrum nigrum	27	1	18		1	35	6	10	23
Lichen	17	8	17	32	29	43	30	41	8
Loiseleuria procumbens				3	6		1	9	
Lupinus arcticus									29

Site	Caribou Ridge			Cone Mountain			Kulukak Mountain		
Plot Number	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
Mertensia paniculata		2							
Other/Unknown		2		1			2		
Oxytropis nigrescens			8	1	6				
Pedicularis kanei							2		
Phyllodoce aleutica		24							
Salix rotundifolia	4	3	5	11	7	8	5	5	
Salix spp.				1	1				
Salix spp.							1	1	
Sedum rosea		1		1		1	1		1
Sphagnum spp.	4	4	13	9	13	2	3	3	
Sphagnum spp./Lycopodium spp.									1
Vaccinium uliginosum	21	1	13				1	7	
Vaccinium vitis-idaea	15		12	11	5	3	3	4	7

Site/Plot Locations

	North	West
Kulukak 1	59°2'40.989"	159°40'8.012"
Kulukak 2	59°2'40.763"	159°40'7.579"
Kulukak 3	59°2'40.303"	159°40'7.031"
Caribou 1	59°10'13.07"	160°39'5.595"
Caribou 2	59°10'14.064"	160°39'4.963"
Caribou 3	59°10'12.435"	160°39'3.888"
Cone 1	59°21'36.626"	161°43'52.140"
Cone 2	59°21'37.066"	161°43'52.131"
Cone 3	59°21'37.375"	161°43'53.089"

Source: TPECI, 2010.

3.3.1.4 Nondalton to Port Alsworth Submarine Cable

The proposed installation of a lake-bed cable between Nondalton and Port Alsworth in Lake Clark would require burial of the cable and associated project structures at the shore landing in Port Alsworth (Figure 2-7).

The area in Port Alsworth where the cable transitions from the lake-bed through the shoreline and onto land is a developed area. The area is boreal in character; a mosaic of spruce (*Picea mariana* and *P. glauca*) and birch (*Betula papyrifera*) mixed forest with cottonwood (*Populus* sp.), and alder (*Alnus* sp.) occurring locally. Shrubs and herbs typical of the area include *Viburnum edule*, blueberry (*Vaccinium* sp.), low-lying crowberry (*Empetrum nigrum*), *Cornus* *canadensis*, Labrador tea (*Ledum decumbens* and *L. groenlandicum*), and *Chamerion angustifolium*. Mosses and lichens complete the ground cover.

A 2005 vascular plant inventory of Lake Clark National Park and Preserve found no federally listed threatened or endangered plant species in the park (National Parks Conservation Association [NPCA], 2009). Invasive plant species were found to be limited to developed areas of the park (e.g. roads or private gardens in Port Alsworth) with the exception of dandelions (*Taraxacum officinale*) which have been found along the shores of Lake Clark (NPCA, 2009). A review of the NWI maps indicates that wetlands do not exist in the area proposed for the lake-bed cable landfall at Port Alsworth.

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3.3.2 Fish and Essential Fish Habitat

3.3.2.1 Microwave repeater sites

Proposed microwave repeater sites at Cone Mountain, Caribou Ridge and Kulukak Mountain (Figure 1-1) are atop mountains or along ridgelines away from fish bearing waters; however, flight paths cross numerous fish bearing rivers and streams. Several anadromous fish streams flow along the base of these topographical features and the closest in proximity are listed below (Table 3-2).

Table 3-2. Anadromous fish streams adjacent to proposed microwave repeater sites.

Microwave Repeater Site Location	Anadromous Fish Streams		Documented Fish Species
Cone Mountain	Cripple Creek[1,2]		pink$_s$, chum$_s$, coho$_{pr}$, Chinook salmon$_{sr}$, Arctic char$_p$, whitefish$_p$
	Indian River[2]		pink$_s$, chum$_s$, coho$_r$, Chinook salmon$_{sr}$, Arctic char$_p$, whitefish$_p$
	Nautilus Creek[2]		coho$_r$
	Carter Creek[2]		pink$_{sp}$, chum$_s$, Arctic char$_s$, whitefish$_p$
Caribou Ridge	Quigmy River[1,2]		sockeye$_s$, chum$_s$, coho$_s$, and Chinook salmon$_s$, Arctic char$_p$
	Togiak River[2]		sockeye$_{sr}$, pink$_s$, chum$_s$, coho$_{sr}$, and Chinook salmon$_{sr}$, Arctic char$_p$ whitefish$_p$, Dolly Varden$_p$
	Kurtluk River[2]		chum$_s$
Kulukak Mountain	Kulukak River[2]		sockeye$_s$, chum$_s$, coho$_s$, and Chinook salmon$_s$, Arctic char$_p$
	Negukthlik River[2]		sockeye$_s$, pink$_s$, chum$_s$, coho$_s$, and Chinook salmon$_s$, Arctic char$_p$
	Ungalikthluk River[2]		sockeye$_s$, pink$_s$, chum$_s$, coho$_s$, and Chinook salmon$_s$, Arctic char$_p$

s = spawning r = rearing p = present

1 = flows near base of microwave repeater site

2 = crossed by proposed helicopter route

Source: ADFG, 1998a.

3.3.2.2 Lake Clark Lake-bed Cable

Sockeye salmon (*Oncorhynchus nerka*), varying annually in number from hundreds of thousands to millions, inhabit the Lake Clark Watershed, contribute to productive sport and commercial Bristol Bay fisheries (Woody et al., 2003), and constitute a major subsistence food resource to the region. Sockeye salmon spawn in Kijik Lake and Lake Clark tributaries and along the shores of Lake Clark (Young and Woody, 2007). Spawning distribution was previously estimated to occur 85% of the time in clear-water tributaries of Lake Clark (Russell 1980). However, recent work by Young (2005) suggests that sockeye spawning in glacially turbid stream systems has been underestimated in the past. Lake shore or "beach spawning" is another important component of overall spawning habitat for Lake Clark sockeye salmon (Young and Woody, 2007).

Adult sockeye salmon enter Lake Clark in mid-July through August (Young and Woody, 2007) and spawn from late August until the middle of November (Woody et al., 2003). Peak spawning activity in the watershed has been documented to occur between September 15th and October 15th (Young, 2005). Salmon fry emerge in the spring and mature in the lake system for up to two years before exiting the system via streams and rivers as smolts. Sockeye salmon life history is reviewed in depth by Burgner (1991) and Quinn (2005).

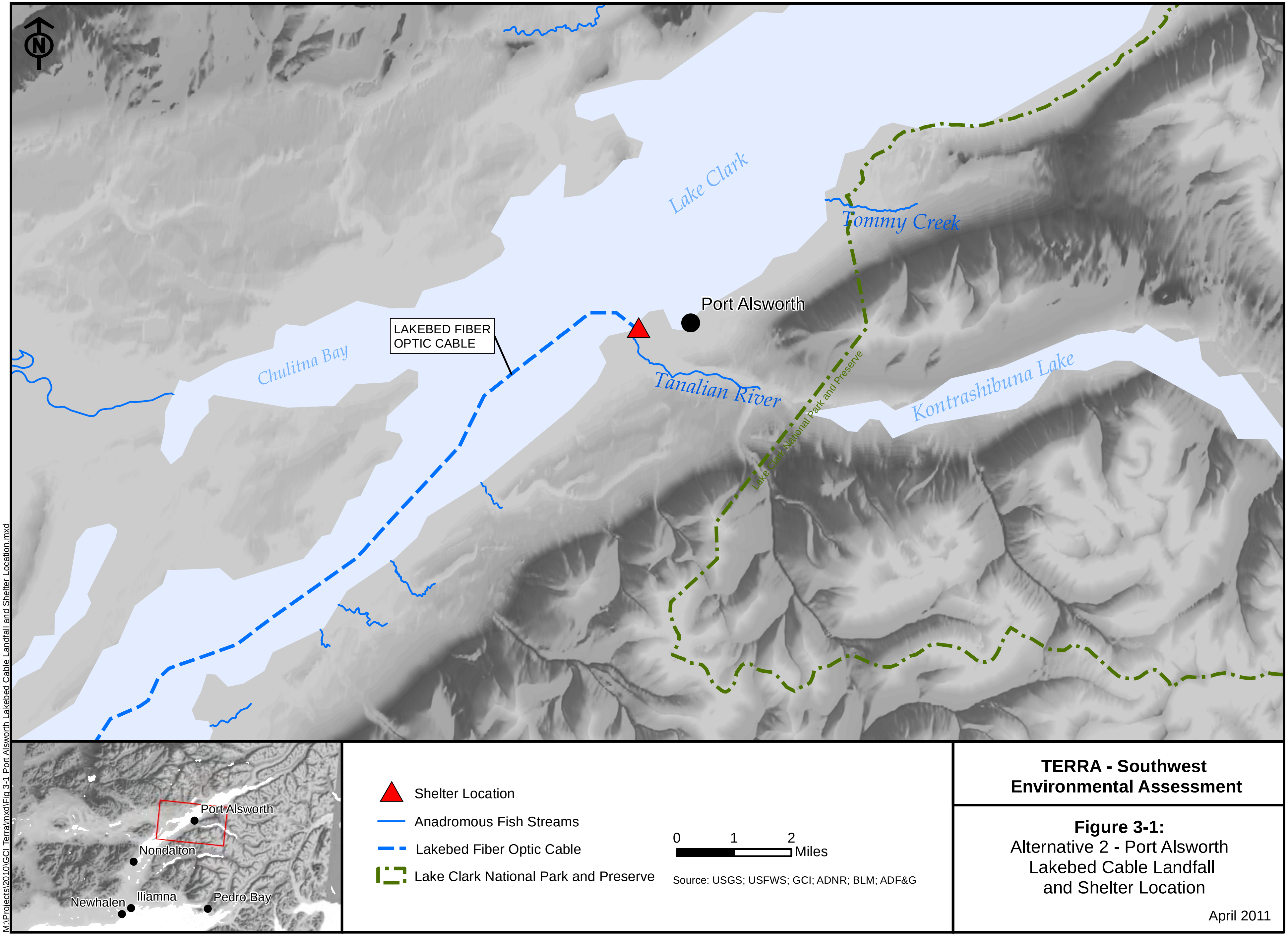
A total of 19 resident and anadromous fish species are present in Lake Clark (Russell 1980) (Figure 3-1) including Arctic grayling (*Thymallus arcticus*), lake trout (*Salvelinus namaycush*), northern pike (*Esox lucius*), burbot (*Lota lota*), round whitefish (*Prosopium cylindraceum*), Chinook salmon (O*ncorhynchus tshawytscha*), and Dolly Varden (*Salvelinus malma*) (Table 3-3). However, the dominant fish species in terms of sheer numbers, commercial value, ecological importance, and human use is sockeye salmon.

Table 3-3. Fish Species in Lake Clark.

Common Name	Scientific Name	Resident	Anadromous	Human Use
Arctic Char	*Salvelinus alpinus*	x		x
Arctic Grayling	*Thymallus arcticus*	x		x
Burbot	*Lota lota*	x		x
Chinook Salmon	*Oncorhynchus tshawytscha*		x	x
Coastrange Sculpin	*Cottus aleuticus*			
Dolly Varden	*Salvelinus malma*	x	x	x
Humpback Whitefish	*Coregonus pidschian*	x	x	x
Lake Trout	*Salvelinus namaycush*	x		x
Least Cisco	*Coregonus sardinella*		x	x
Longnose Sucker	*Catostomus catostomus*	x		x
Ninespine Stickleback	*Pungitius pungitius*	x		
Northern Pike	*Esox lucius*	x		x
Pink Salmon	*Oncorhynchus gorbuscha*		x	x
Pygmy Whitefish	*Prosopium coulteri*	x		x
Rainbow Trout	*Oncorhynchus mykiss*	x		x
Round Whitefish	*Prosopium cylindraceum*	x	x	x
Slimy Sculpin	*Cottus cognatus*	x		
Sockeye Salmon	*Oncorhynchus nerka*		x	x
Threespine Stickleback	*Gasterosteus aculeatus*	x		

Russell, 1980.

Resident fish species such as Arctic char and burbot spend their entire lives within the lake system and its tributaries. Anadromous species like salmon spawn in freshwater lakes and streams. The resulting young grow for a time in freshwater before migrating to the ocean where they remain until returning to spawn. Dolly Varden and some species of whitefish have both resident and anadromous forms within each population.



TERRA - Southwest
Environmental Assessment

Figure 3-1:
Alternative 2 - Port Alsworth
Lakebed Cable Landfall
and Shelter Location

April 2011

M:\Projects\2010\GCI Terra\mxd\Fig 3-1 Port Alsworth Lakebed Cable Landfall and Shelter Location.mxd

Sockeye Salmon Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (U.S. Public Law 94-265; as amended October 1, 1996) mandates identification and conservation of Essential Fish Habitat (EFH) for commercially harvested species. Essential Fish Habitat (50 CFR Part 600) is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. Chinook, coho (*O. kisutch*), pink (*O. gorbuscha*), sockeye, and chum (*O. keta*) are the five species of Pacific salmon occurring in Alaska that have EFH designations. Essential salmon habitat is not located on or near the proposed microwave repeater mountain top sites. For purposes of this EA, a description of salmon habitat along the potential marine route is located in Section 3.3.4.3.

Sockeye salmon essential fish habitat is described as follows in the Final 2005 EFH EIS (National Marine Fisheries Service [NMFS], 2005):

> Freshwater Eggs
>
> EFH for sockeye salmon eggs is the general distribution area for this life stage, located in gravel substrates in those waters identified in ADFG's Catalogue of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes (ADFG, 1998a).
>
> Freshwater Larvae and Juveniles
>
> EFH for larval and juvenile sockeye salmon is the general distribution area for this life stage, located in those waters identified in ADFG's Catalogue of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes (ADFG, 1998a) and contiguous rearing areas within the boundaries of ordinary high water. Juvenile sockeye salmon require year-round rearing habitat. Fry generally migrate downstream to a lake or, in systems lacking a freshwater lake, to estuarine and riverine rearing areas for up to 2 years. Fry out migration occurs from approximately April to November and smolts generally migrate during the spring and summer.
>
> Estuarine Juveniles
>
> Estuarine EFH for juvenile sockeye salmon is the general distribution area for this life stage, located in estuarine areas, as identified by the salinity transition zone (ecotone) and the mean higher tide line, within nearshore waters. Under-yearling, yearling, and older smolts occupy estuaries from March through early August, as depicted.
>
> Marine Juveniles
>
> Marine EFH for juvenile sockeye salmon is the general distribution area for this life stage, located in all marine waters off the coast of Alaska to depths of 50 m and range from the mean higher tide line to the 200-nm limit of the U.S. Exclusive Economic Zone, including the Gulf of Alaska, Eastern Bering Sea, Chukchi Sea, and Arctic Ocean from midsummer until December of their first year at sea.
>
> Marine Immature and Maturing Adults
>
> EFH for immature and maturing adult sockeye salmon is the general distribution area for this life stage, located in marine waters off the coast of Alaska to depths of 200 m and range from the mean higher tide line to the 200-nm limit of the U.S. Exclusive Economic Zone, including the Gulf of Alaska, Eastern Bering Sea, Chukchi Sea, and Arctic Ocean.

> Freshwater Adults
>
> EFH for sockeye salmon is the general distribution area for this life stage, located in freshwaters identified in ADFG's Catalogue of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes (ADFG, 1998a) and wherever there are spawning substrates consisting of medium to course gravel containing less than 15 percent fine sediment (less than 2-mm diameter) and finer substrates can be used in upwelling areas of streams and sloughs from June through September. Sockeye often spawn in lake substrates, as well as in streams."

The proposed cable route between Nondalton and Port Alsworth across Lake Clark would be adjacent to four known sockeye salmon spawning locations that are noted in ADFG's Catalogue of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes (ADFG, 1998a). On the eastern shore the proposed cable route passes offshore of the mouths of three anadromous streams, and one lake spawning area. There are other sockeye salmon spawning areas near the proposed cable route that have not been nominated or recorded in the Anadromous Waters Catalogue. Most Lake Clark sockeye salmon spawn in the Tlikakila River, Kijik watershed and along beaches of Lake Clark and Little Lake Clark (Young, 2005). The aforementioned locations are all to the north of the proposed cable route except for some of the Lake Clark beach spawning locations.

3.3.3 Terrestrial Mammals

3.3.3.1 Caribou

Alaskan caribou comprise the barren-ground subspecies, *Rangifer tarandus granti*, have undergone population fluctuations (ADFG, 2008a; Hinkes et al., 2005). During the more recent history (i.e., 1980s and 1990s), the Kilbuk and Mulchatna herds were utilizing the region encompassing the project area. In 1996 herds had reached a population size of about 200,000. Around this time the range of the Mulchatna herd increased significantly, and the Kilbuk herd may have been incorporated into the Mulchatna herd. The two herds are now difficult to distinguish (FWS, 2010a; Hinkes et al. 2005). Surveys in 2000 suggest that the population of caribou in the area dwindled to an estimated 30,000 (FWS, 2009a).

In 1988, another population of barren-ground caribou was introduced to the Nushagak Peninsula (FWS, 2009a). The population peaked around 1,400 individuals between 1997 and 1998, but has since continually declined. The herd was estimated between 50 and 550 individuals as of October 2007 (FWS, 2010a). The range of the Mulchatna herd comprises most of the proposed project corridor, except for the area encompassing the Nushagak Peninsula, which is inhabited primarily by the sedentary Nushagak herd. A small group of Nushagak herd animals also inhabit the area between Twin Hills and the Kulukak River (Hinkes et al., 2005).

Within the proposed project vicinity, caribou occupy treeless tundra and high mountain habitats year round (ADFG, 2008a). Calving habitat is typically located in mountains or open, coastal tundra while winter range may comprise boreal forests when available (ADFG, 2008a). Movements occur seasonally between winter and summer range and calving grounds. Annual range size varies by herd, though, and is often unpredictable; caribou herds may change their range and migration patterns annually or long-term (Hinkes et al., 2005). The Mulchatna herd moves great distances seasonally, from their typically core calving grounds in the Mulchatna and Upper Nushagak River areas to winter grounds along the Bering Sea coast. The Nushagak herd utilizes a more restricted home range, in which seasonal movements occur almost entirely on the Nushagak Peninsula (Hinkes et al., 2005). Summer diet typically consists of the leaves of willows, sedges, flowering tundra plants and mushrooms. In the fall the diet shifts to lichens, dried sedges, and small shrubs, such as blueberry (ADFG, 2008a). Breeding begins in the fall, with the peak rut occurring in late September and early October. Calving typically occurs during late May to early June (FWS, 2008a).

Suitable year round habitat occurs within the area of the proposed Lake Clark landfall for the fiber optic cable, as well as the proposed Kulukak Mountain and Caribou Ridge microwave repeater sites. During bird surveys for the proposed project, caribou droppings were detected, confirming presence, at the Cone Mountain microwave repeater site (TPECI, 2010). According to James Woolington, Dillingham Area Management Biologist (February 2011), for the past 10 years, most of the Mulchatna caribou calving grounds have been located in two separate areas; the middle Nushagak River drainage, and in the Hoholitna and Stony River drainages. While individual adult female Mulchatna caribou may be observed with newborn calves anywhere throughout the range of the herd, the only substantial calving is to the west of the microwave repeater stations. In fact, in May 2010, approximately 1,500 to 2,000 caribou were observed near Heart Lake, approximately 80 miles north of the proposed microwave repeater tower locations. There are also some caribou that may be resident to the area between Goodnews Bay and Cape

Newenham that have been observed calving. The actual status of this group is not well documented, but is less than several hundred.

Both herds are important for subsistence hunting. These caribou are considered a staple of diets for nearby communities (FWS, 2010a; Bennett, 2006; ADFG, 2008a; BLM, 2008). Caribou comprise 13% of the diet for communities within the planning area of the BLM RMP (BLM, 2008). Caribou hunting also heavily supports Alaska's guide and transportation industry (Bennett, 2006). Both herds were hunted until 2006, when the Nushagak herd declined in numbers thereafter in which hunting was no longer sustainable (FWS, 2010a).

3.3.3.2 Moose

Moose (*Alces alces*) are believed to have historically occurred in low numbers in southwestern Alaska, but populations have increased during the 20th century (Machida, 1987; Van Daele, 1992 in FWS, 2009a). In the mid-1990s, aerial surveys confirmed large increases in the number of moose in the Togiak and Kulukak River drainages (Jemison, 1994; Aderman et al., 1995 in FWS, 2009a). Aerial surveys were conducted in Game Management Unit 17A of the Togiak Refuge in 2006. Survey results indicated a minimum of 1,023 individuals compared to 136 in 1995, which is an approximate 652% increase in population size (Aderman, 2008). The BLM confirms that the Goodnews River drainage in the vicinity of the proposed Cone Mountain microwave repeater site has also had an increase in moose population in the last few years (BLM, 2010b - personal communication).

Moose make seasonal movements up to 60 miles between calving, rutting, and wintering areas. Breeding begins in late September or early October and calving occurs from mid-May to early June. Diet during the spring includes grasses and sedges, while in the summer moose will feed on sedges, horsetail (*Equisetum sp.)*, aquatic plants and grasses. In the fall and winter, green vegetation is hard to come by, leading moose to browse willow, birch, and aspen branches (ADFG, 2008b).

Suitable habitat does not occur within the footprint of the proposed microwave repeater sites, although year round and winter suitable habitat occurs within the wet lowlands and drainages in areas below the proposed microwave repeater sites. Year round and winter habitat also occurs within the nearshore environment of the Lake Clark. Moose are confirmed in both the lowlands below the proposed microwave repeater sites and within the Lake Clark area (Bennett, 2006).

Moose populations in many of the drainages within the project vicinity are currently at a level in which populations can withstand hunting (ADFG, 2010a). Moose are highly valued for subsistence and general hunting as well as non-consumptive uses, and demand has generally been increasing (Bennett, 2006). The populations near the Kanektok and Arolik river drainages are not at a point in which harvest is sustainable. The hunting season for moose is closed for the area south of and including the Kanektok River drainage to the Goodnews River drainage. The Goodnews River drainage and south to the Game Management Unit 18 boundary is open for state harvest, however (BLM, 2010b - personal communication).

3.3.3.3 Bear

Brown and black bears (*Ursus arctos* and *Ursus americanus*, respectively) occur throughout the project area, except black bears are not known to inhabit the Goodnews Bay area near the proposed Cone Mountain microwave repeater site. Brown bears are more common than black bears and are seasonally abundant along salmon spawning areas, particularly along tributaries of the Togiak and Kulukak rivers (BLM, 2008 FWS, 2009a). Density, population trends, key habitat areas, and other aspects of bear populations are not well understood because few surveys have been completed in the region (FWS, 2009a). However, an aerial survey conducted by the FWS and ADFG in 1974 covered all major drainages in the Togiak Refuge, and reported 22 brown bears and 2 black bears after more than 8 hours of flight time (FWS, 1974; FWS, 2009a). In 2003 and 2004, the Togiak Refuge conducted a population estimate of brown bears refuge wide. Estimated population density was 40.3 bears per 1,000 square kilometers (FWS, 2009a).

Suitable habitat for black bears includes lower elevation riparian areas and forested uplands, the habitat of which is often shared with the brown bear. Brown bears are common in most habitats within the proposed project corridor, but are seasonally aggregated around sites with abundant prey. Prey species of brown bear primarily include caribou and moose calves during the spring and salmon during the summer. During the summer, upon emergence from hibernation, brown bears will also graze on sedges and grasses. Berries are foraged upon widely during the fall (BLM, 2008). Black bears also depend on berries during the fall, and are opportunistic omnivores. Diet consists of vegetation, grubs, beetles, crickets, and ants, in addition to small or medium-size mammals, vertebrates, and salmon if available (ADFG, 2008a).

Both brown and black bears hibernate in the winter, in which the trigger is dependent upon temperature and forage availability. Cubs are born in the den during January and February, emerging in May to June. The breeding season ranges from May to July (ADFG, 2008a).

Because bears forage widely and use mountain tops and ridges for this activity, particularly during the spring, suitable habitat for brown and black bears occurs throughout the vicinity of the proposed microwave towers. Suitable habitat also occurs around the periphery of Lake Clark within the nearshore and forested habitats. Brown bear would be expected to be concentrated in the spring time around calving grounds, as well.

Black bears are not commonly sought by non-local sport or recreational hunters, but they are used to some extent for subsistence purposes. As a result, harvest by local communities represents approximately 6% of the total harvest. Brown bears, in contrast, are heavily sought in Southwest Alaska due to accessibility and trophy quality and are an important traditional and economic aspect of life in Alaska (ADFG, 2008a; ADFG 1998b; ADFG 2000). Brown bears are highly valued by the local community for meat and hide, and depending on the community, brown bear are hunted regularly by local residents (Holen et al., 2005).

3.3.3.4 Small Mammals/Furbearers

Common small mammals in the vicinity of the proposed project area include beaver (*Castor canadensis)*, red fox (*Vulpes vulpes*), Arctic fox (*Alopex lagopus)*, coyote (*Canis latrans)*, river otters (*Lutra canadensis)*, porcupine (*Erethizon dorsatum*), red squirrel (*Tamiasciurus hudsonicus*), mink (*Neovision vison*), American marten (*Martes americana*), Canada lynx (*Lynx Canadensis*), Arctic ground squirrels (*Spermophilus parryyii*), short-tail weasel (*Mustela erminea*), least weasel (*Mustela rixosa*), muskrats (*Ondatra zibethica)*, hoary marmots (*Marmota caligata*), snowshoe hare (*Lepus americanus*), pikas (*Ochotona collaris*) and wolverines (*Gulo gulo*) (FWS 2009a; Bennett, 2006; BLM, 2008). Additionally, a wide variety of shrews, mice, lemmings, and voles occur, of which the red-backed vole (*Clethrionmys* spp.) is most abundant (Bennett, 2006; BLM, 2008). Population size for these species is not known because only beavers have been studied to date in the project vicinity. However, the region is believed by land managers to host healthy populations of small mammals and furbearers (FWS, 2009a; BLM, 2008)

Wolverines occur in taiga and boreal habitats and require large expanses of wilderness. This species is widely distributed throughout the project vicinity, preferring higher elevations during the summer and lower elevations during the winter due to varying food availability (ADFG, 2008; BLM 2008). Canada lynx, coyotes, snowshoe hares, and porcupine also range widely throughout the forests and low alpine areas (Bennett, 2006). Canada lynx are known to occur in the vicinity of Lake Clark (Bennett, 2006).

Coyotes are widespread although not abundant in the proposed project area, and occur in a variety of habitats. The Arctic fox, in contrast, is found in treeless coastal areas, occurring primarily along the beaches of the Bering seacoast in the proposed project area (ADFG, 2008b; BLM, 2008). The red fox inhabits broken country, extensive lowland marshes, crisscrossed hills, draws, and occasionally tundra (ADFG, 2008b). Hoary marmots, Arctic ground squirrels, and pikas occur in alpine meadows and boulder fields, while the Arctic ground squirrel prefers open, sloped or convex terrain with well-drained soils (Bennett, 2006; Barker and Derocher, 2010).

Red squirrel and American marten occur in forested habitats. The short-tail weasel also prefers forest, in addition to brushy and broken terrain (BLM, 2008). The least weasel, on the other hand, occurs in and utilizes sparsely distributed forest and tundra habitats (BLM, 2008). Mink, beaver, muskrat, and river otter inhabit ponds, lakes, rivers, and/or adjacent aquatic areas (Bennett, 2006; BLM, 2008). Shrews, mice, lemmings, and voles occur in a variety of habitats. Shrews typically prefer moist habitats. Red-backed voles occur in forested habitats, whereas other voles and mice inhabit grassier habitats. Lemmings prefer treeless regions (tundra), usually in low-lying, flat meadow habitats dominated by sedges, grasses and mosses (ADFG, 2008b).

Within the project area, small mammals known to inhabit the proposed microwave repeater sites include Arctic ground squirrels, and may also include pika or hoary marmots (TPECI, 2010). Voles or mice may also be present. Larger mammals may be transient through the area preying upon the smaller mammals, of which these larger mammals may include coyote, red fox, coyote,

Furbearer populations in the planning area are assumed to be healthy and under-harvested, according to anecdotal information. Commercial and subsistence demand are primary drivers for furbearer harvest. Small mammals, on the other hand, have continually fluctuating abundance (BLM, 2008).

3.3.3.5 Dall sheep

Dall sheep (*Ovis dalli dallii*) are found throughout the Alaska Range, including the southwestern portions of Lake Clark National Park and Preserve immediately south of Lake Clark. Habitat for the Dall sheep is relatively dry country with alpine ridges, meadows, steep slopes, and rugged terrain (ADFG, 2008a). Diet varies by range but typically includes grasses, sedges, and forbs in the spring and summer, and winter forage includes frozen grasses, willow, sedge stems, sage, crowberry, cranberry, and sometimes lichen and moss (Whittaker, 1980). The breeding season is late November or early December. Lambs are born in late May or early June, of which time ewes and their lambs will move to yet more rugged terrain (ADFG, 2008a). Populations in Alaska are generally considered to be healthy. Due to the remoteness and inaccessibility of this species' habitat, sheep have been largely protected. However, human population expansion and increased human use in rugged areas could cause problems (ADFG 2008a).

Dall sheep are hunted occasionally for subsistence by local residents in the vicinity of the Lake Clark portion of the proposed project area, but most often recreationally. However, due to the difficulty of harvesting this species because of the rugged habitat, hunting is rather limited compared to other species (ADFG, 2008a).

3.3.3.6 Wolf

Wolves (*Canis lupus*) are widespread throughout the proposed project area, ranging from the Kilbuk Mountains to the southern tip of Cape Newenham. Wolves are widely distributed in the region and could be found in the vicinity of the tower sites and transport corridors. During late fall, winter, and spring, these prey species include large ungulates and their newborn, lambs, or calves. In the summer while denning with pups, small mammals are typical prey (BLM, 2008). Estimates by ADFG suggest that 780 to 835 wolves, among 40 to 60 packs occur in the BLM RMP planning area (ADFG, 2000). Wolves normally breed between February and March, with litters being born in May or early June. By early winter pups become mobile (ADFG, 2008b).

Wolves are classified as fur bearers and game species in Alaska. Harvests vary widely due to fur prices, access, predator control concerns, and population changes in response to prey population. Wolves in the project vicinity are typically hunted and trapped by local residents, but will also be harvested opportunistically by non-local hunters. Local residents harvest wolves for subsistence and use fur for clothing, cultural, and craft purposes (BLM, 2008).

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3.3.4 Marine Mammals

Marine mammals are the focus of this section but other forms of marine life (i.e. invertebrates, flora) that may be affected by the proposed project and are also described in this section. Barge sites during construction and the submarine cable route may affect the nearshore benthic, pelagic and coastal environment from Dillingham, Alaska, north to Quinhagak, Alaska. This area encompasses large portions of Bristol and Kuskokwim Bays within the Bering Sea. With 600 miles of rocky coast and sand beaches, the Togiak Refuge supports a diverse and abundant marine mammal population. The Cape Peirce and Cape Newenham areas are particularly rich in marine mammals, providing haulout areas for Pacific walrus, harbor seals, spotted seals, and the endangered Steller sea lion (FWS, 2009a). The broad continental shelf, enhanced by nutrient upwelling and intermixing of Pacific Ocean and Bering Sea waters along the Aleutian Chain, provides extremely favorable habitat for a host of marine birds, marine mammals, and fish that are of international and domestic importance (FWS, 2009a).

3.3.4.1 ESA-listed Marine Mammal Species

The Marine Mammal Protection Act (MPA) and the Endangered Species Act (ESA) offer two levels of protection for marine mammals in the proposed project area. Candidate species for ESA listing and species listed as threatened or endangered and known to commonly occur in the shallow marine environment of the proposed project area are Pacific walrus (*Odobenus rosmarus divergens)* (candidate species), Steller sea lion (*Eumetopias jubatus)* (ESA Endangered), Northern sea otter (*Enhydra lutris kenyoni)* (ESA Threatened), and humpback whale (*Megaptera novaeangliae)* (ESA Endangered). ESA-listed or candidate marine mammal species that can occur but are not commonly observed in the shallow marine environment of the proposed project area are blue whale (*Balaenoptera musculus)* (ESA Endangered), fin whale (*Balaenoptera physalus)* (ESA Endangered), North Pacific right whale (*Eubalaena japonica)* (ESA Endangered), and sperm whale (*Physeter macrocephalus)* (ESA Endangered). Marine mammal threatened, endangered and candidate species are addressed in Section 3.3.6.

3.3.4.2 Non ESA-listed Marine Mammal Species

Other, non ESA-listed marine mammal species that are known to or may occur in the proposed project area are minke whale (*Balaenoptera acutorostrata)*, gray whale (*Eschrichtius robustus)*, beluga whale (*Delphinapterus leucas)*, killer whale (*Orcinus orca*), harbor porpoise (*Phocoena phocoena)*, Dall's porpoise (*Phocoenoides dalli)*, harbor seal (*Phoca vitulina richardsi)*, spotted seal *(Phoca largha)*, and northern fur seal (*Callorhinus ursinus)*. Although not listed as endangered or threatened, these marine mammal species are protected under the MMPA.

Minke whales are considered cosmopolitan and occur in polar, temperate and tropical waters in the Atlantic and Pacific Oceans. They can be found in coastal and offshore waters. For management purposes, NMFS has divided the population into four stocks: Alaska, Hawaii, Canadian eastern-coastal, and California-Oregon-Washington. In Alaska, they are migratory, feeding during summer in the colder waters of Alaska, including the Gulf of Alaska, Bering Sea, Chukchi Sea, and Beaufort Sea (Wynne, 1997; Angliss and Allen, 2009). Abundance estimates of minke whales in the central-eastern and south-eastern Bering Sea are estimated to be 810 to 1,003 animals. Minke whale surveys in the Gulf of Alaska to the central Aleutians indicated a population size of 1,233 (Zerbini et al., 2006). Most animals were sighted in the Aleutians in water shallower than 650 ft/200 m (Angliss and Allen, 2009). Breeding is thought to occur in winter, but may occur year-round (Reeves et al., 2002; Wynne, 1997). Females may give birth annually to a single calf after a gestation period of 10–11 months (Wynne, 1997). Minke whales feed primarily on crustaceans, copepods, and schooling fish (Perrin et al., 2002) and can be observed feeding in the bays and shallow coastal Bristol Bay waters in the summer.

Gray whales occur only in the North Pacific and are divided into eastern and western stocks. The western North Pacific stock occurs in the Sea of Okhotsk and Sea of Japan and is listed as Endangered under the ESA and Depleted under the MMPA. The eastern North Pacific stock breeds and winters in Baja, California and migrates north to summer feeding grounds in the Bering, Chukchi, and Beaufort Seas (Reeves et al., 2002; Wynne, 1997). This stock was de-listed from the ESA in 1994. The population estimate is 18,187 based on data from 2000–2002 (Angliss and Allen, 2009), however the population is estimated to be in the range of 18,000 to 30,000. The eastern North Pacific stock is considered common in the Aleutians and passes through Unimak Pass during migrations in spring and fall (Wynne, 1997). They prefer coastal, shallow waters over the continental shelf and feed primarily on benthic amphipods (Reeves et al., 2002). They filter feed in shallow or coastal waters along the bottom sediment, leaving mud-trails in their wake (Reeves et al., 2002; Wynne, 1997). Breeding occurs in November and December, during their southbound fall migration. Females bear a single calf every 2–3 years. Calves are born in January and February after a 13.5-month gestation period (Wynne, 1997).

Beluga whales have a circumpolar distribution, with U.S. population occurring only in the waters off Alaska. This Alaska population is divided into five distinct stocks including the Cook Inlet, Bristol Bay, eastern Bering Sea, eastern Chukchi Sea, and Beaufort Sea stocks (Angliss and Allen, 2009). The Cook Inlet stock was listed as Endangered under the ESA in 2008, however animals of this stock do not occur in the proposed project area. The Bristol Bay and eastern Bering Sea stocks may overlap during winter months when animals occur in or near the ice in offshore waters of the Bering Sea. However, recent telemetry evidence suggests that some portion of the population may stay in the nearshore waters of Bristol Bay throughout the winter (Allen and Angliss, 2010). During summer, they stay generally close to shore near estuaries and river systems in Norton Sound (eastern Bering Sea stock) and Bristol Bay (Angliss and Allen, 2009). Neither of these stocks is listed under the ESA and both have stable populations. The population size of the eastern Bering Sea stock is estimated at 18,142 individuals and the Bristol Bay stock at 2,877 (Allen and Angliss, 2010). Ice cover, tidal conditions, access to prey, temperature, and human interaction influence the seasonal distribution of beluga whales (Lowry, 1985). The Bristol Bay population resides in the northeast bays in summer, following returning salmon and smelt. They are well adapted to both relatively warm, freshwater habitats and cold waters in or near sea ice (Wynne, 1997; Reeves et al., 2002). Belugas breed in spring and have a 14-month gestation period. Females bear a single calf every 2 or more years between May and July (Wynne, 1997) in warmer coastal estuaries, bays and rivers (Angliss and Allen, 2010). Belugas are opportunistic and feed on a variety of prey, including many species of fish, squid, crabs, mussels, snails, and clams (Wynne, 1997; Reeves et al., 2002).

Killer whales have a cosmopolitan distribution and are considered the most widespread cetacean. Killer whales are segregated socially, genetically, and ecologically into three distinct groups: residents, transients, and offshore animals. The diet of residents consists primarily of fish and sometimes squid, and they live in complex and cohesive family groups. They are known to visit the same areas consistently. Transients feed almost exclusively on marine mammals. Unlike residents, transients may not always stay together as a family unit and roam widely along the coasts. Offshore killer whales cruise open oceans and are thought to feed primarily on fish, sharks, and sea turtles. Currently, there is little known about the habits of the offshore population (Wade et al., 2003). A total of eight killer whale stocks are recognized within the eastern U.S. Pacific, mainly based on association patterns, movements, acoustics and genetic differences. In Alaska, killer whales are known to occur year-round in the ice-free waters of the Gulf of Alaska, Aleutians, Bering and Chukchi Seas, and to move as far north as the Beaufort Sea during summer (Wynne, 1997). The stocks that occur, or are most likely to occur, in the proposed project area are: the Alaska resident stock (occurring from southeastern Alaska to the Aleutian Islands and Bering Sea), and the Gulf of Alaska, Aleutian Islands, and Bering Sea transient stock (occurring from Prince William Sound through the Aleutian Islands and Bering Sea). Wade et al. (2003) documented all three ecotypes of killer whales during surveys from the Kenai Fjords to the Aleutian Islands. Relatively high densities were found in waters around the Aleutian Islands Umnak, Seguam Pass, and Unalaska, as well as around Kodiak Island (Wade et al., 2003). Mating and calving occur year-round and females may bear a single calf every 2 or more years (Wynne, 1997).

Harbor porpoises occur in northern temperate and subarctic waters of the north Atlantic and Pacific Oceans. They frequent shallow (<650 ft/200 m), coastal waters and are often found in fjords, bays, estuaries, and harbors (Reeves et al., 2002). NMFS has divided the populations of harbor porpoises inhabiting the US waters into 10 stocks, three of which are in Alaska: Southeast Alaska, Gulf of Alaska, and Bering Sea. The Bering Sea stock is estimated at 48,215 and the most recent estimate for the Gulf of Alaska stock based on survey data from 1998 is 31,046 (Angliss and Allen, 2009). During ice-free months, the Bering Sea stock of harbor porpoises migrates north to the Chukchi and Beaufort Seas. The Gulf of Alaska stock occurs year-round in the Gulf of Alaska extending west to Unimak Pass (Wynne, 1997; Angliss and Allen, 2009). Breeding occurs in summer and females bear a single calf every year after a 10–11 month gestation period (Wynne, 1997). Harbor porpoise tend to feed individually on schooling fish, invertebrates, and cephalopods (Wynne, 1997; Reeves et al., 2002).

Dall's porpoises are found only in temperate to cold ice-free waters of the North Pacific and adjacent seas. NMFS has divided the US population of Dall's porpoises into two stocks: Alaska and California-Oregon-Washington. Based on vessel surveys conducted from 1987 to 1991, the Alaska stock was estimated at 83,400 individuals (Angliss and Allen, 2009). They prefer pelagic waters greater than 8,200 ft (2,500 m) deep. The only apparent distribution gaps in Alaska waters are upper Cook Inlet and the shallow eastern flats of the Bering Sea, so it would be unlikely to encounter Dall's porpoise in the proposed project area.

Harbor seals are found in temperate coastal and estuarine habitats, and haul out on rocks, beaches, and ice (Perrin et al., 2002). NMFS manages seven stocks of US harbor seals, three of which are in Alaska: Southeast, Gulf of Alaska, and the Bering Sea. New genetic information indicates that these stock divisions need to be re-assessed, but this has not yet been completed (Allen and Angliss, 2010). Overall, the Alaska stock is estimated at 180,017 individuals (Angliss and Allen, 2009). This species is non-migratory and remains year-round along the southern Alaska coasts, including the Bering Sea, Aleutians, and Gulf of Alaska. This animal is considered common in the proposed project area throughout the year. Harbor seals and some spotted seals haul out along the refuge coast, with the highest concentrations at Nanvak Bay (Cape Peirce) and Hagemeister Island. Breeding season is between July and August in Alaska and females bear a single pup each year in June after a 10-month gestation period. Nanvak Bay is the northernmost pupping area and the largest haul-out for harbor seals in northern Bristol Bay (Frost et al., 1982). The numbers of seals at Nanvak Bay has increased in the period from 1990 to 2000 (Jemison et al., 2000). Harbor seals are opportunistic feeders with a variety of prey species, including schooling fish, flatfish, crustaceans, and squid (Wynne, 1997). Coastal haul-outs appear to be important for harbor seals principally as a place to rest, give birth, care for and nurture their young, and molt on land (Frost et al., 1982). There are indications that hauling out may be particularly important during the molt. Ready access to water, isolation from disturbance, protection from wind and wave action, and access to food sources have all been mentioned as prerequisites for haulout selection (Burns, 1984).

Spotted seals are distributed from the northern Yellow Sea and western Sea of Japan to the Bering and Okhotsk seas, and north to the Chukchi and Beaufort seas (Angliss and Allen 2009). Spotted seals migrate south in October from the Chukchi Sea and pass through the Bering Strait in November to spend their winters along the southern margin of the ice edge in the Bering Sea (Lowry et al., 1998). They are known to occur generally near the Pribilof Islands, Bristol Bay, and the eastern Aleutian Islands (Angliss and Allen, 2009; Wynne, 1997). There have been reports of spotted seals at Nanvak Bay (Jemison et al., 2000).

The **northern fur seal** is not listed under the ESA but the Pribilof/eastern Pacific population is considered Depleted under the MMPA. This species is endemic to the North Pacific Ocean and their range stretches from northern California to the Bering Sea and west to the Okhotsk Sea and Honshu Island, Japan (Angliss and Allen, 2009). Northern fur seal females are highly migratory, moving to Oregon and California in October and November. Adult males remain in the Gulf of Alaska where they establish territories early in the breeding season in May. Females arrive around mid-June to early July and give birth to one pup. The peak of pupping is usually in early July. The Pribilof Islands support the largest breeding rookery of northern fur seas (57% of the world's fur seal population). Other US breeding rookeries are Bogoslof Island in the southern Bering Sea and San Miguel Island off southern California (NMFS, 2007a). Adult fur seals spend more than 300 days per year (about 80% of their time) foraging at sea. In the open ocean, concentrations of fur seals may occur around major oceanographic features such as seamounts, canyons, valleys, and along the continental shelf break because of the availability of prey in those places (NMFS, 2007a)

3.3.4.3 Commercial Fisheries

Bristol Bay contains some of the largest populations of ground fish and crabs in the world, especially in the eastern portion of the bay and along the north side of the Alaska Peninsula (Bakkala, 1993). Large concentrations of sockeye salmon (*Oncorhynchus nerka*), walleye pollock (*Theragra chalcogramma*), Pacific cod (*Gadus macrocephalus*), Pacific halibut (*Hippoglossus stenolepis*), yellowfin sole (*Pleuronectes asper*), rock sole (*P. bilineatus*), and flathead sole (*Hippoglossoides elassodon*) are found in the proposed project area. Red king crab (*Paralithodes camtschatica*), tanner crab (*Chionoecetes bairdi*) and snow crab (*C. opilio*) are abundant.

The proposed submarine cable route would intersect the boundaries of the Nushagak and Togiak Commercial Fishing Districts within the Bristol Bay Commercial Salmon Fishery. Fishing activity also occurs in Kuskokwim Bay where the cable would approach Platinum and Quinhagak. Legal gear for commercial salmon fishing includes both drift and set gill nets. Sockeye salmon make up the greatest portion of the overall salmon catch averaging 24 million annually with an average annual value of $82.66 million from 1999-2008 (ADFG, 2010b). Chinook, chum, coho, and pink salmon are also harvested in the hundreds of thousands annually. The fishery is managed to meet escapement goals for specific salmon stocks originating from the Naknek-Kvichak, Nushagak, Togiak, Ugashik, and Egegik Rivers while permitting commercial harvest at managed levels. The size of the catch or escapement is controlled by varying the time and duration of scheduled fishery openings. Salmon fisheries begin in June with gillnet openings for spring Chinook and end in mid-September when the coho salmon gillnet fishery closes.

The Togiak Herring Fishing District spans the proposed project area from Cape Constantine to Cape Newenham. This is sack-roe fishery and the largest Herring Fishery in Alaska with an average harvest of 20,000 tons worth an average of $5.83 million annually. Spawn-on-kelp harvests of Herring roe also occurs but infrequently (2 of the last 10 years). Gillnets, purse seines and hand purse seines are legal gear. Spotter aircraft are commonly used in this fishery and will add to the aviation traffic in the region during the project. The timing of the fishery is late April through May.

Crab fisheries in Bristol Bay target five species of crab using steel crab pots deployed at various depths depending on species. The period of lightest crab fishing activity occurs in June, July and August when the season is open for brown king crab only. The only area open to bottom trawling in Bristol Bay and Kuskokwim Bay is the Northern Bristol Bay Trawl Area. The submarine cable route is proposed to run parallel 5 km to the south of the boundary of the Northern Bristol Bay Trawl Area.

3.3.4.4 Marine flora and invertebrates

Eelgrass beds are ecologically important as primary producers in the food web, generating food and nutrients for the soft bottom community through primary productivity and plant decay. Dense eelgrass beds also serve as a refuge from predators for small fish, such as sculpins and gunnels, and invertebrates, such as various species of crabs, spionid polychaetes, sea cucumbers, eelgrass shrimp, nudibranchs, hydroids, clams, snails, and caprellid amphipods. Many commercially and recreationally important species, such as herring (*Clupea pallasi*), Dungeness crab (*Cancer magister*), and juvenile salmon (*Oncorhynchus spp.*), use eelgrass as a nursery area. Herring spawn on eelgrass. Unlike kelp, eelgrass is a flowering, marine vascular plant. Eelgrass is sensitive to turbidity and changes in water quality. Twenty-three eelgrass and eelgrass/kelp beds greater than 1 hectare were identified on Togiak Refuge coastlines by aerial survey in August, 2004 (Winfree, 2005); eighteen on the Bristol Bay coastline and five on the Kuskokwim Bay coastline in Chagvan Bay, Goodnews Bay, and Security Cove. The largest continuous beds occurred in Chagvan and Nanvak Bays. Other large continuous beds were found in Hagemeister Straight, Toungue Point, Togiak Bay, and Ungalikthluk Bay. Remaining smaller beds were continuous, but patchy in the outer reaches of the beds, or continuous and mixed with kelp such as in Metervik Bay. Waterfowl, fish, and invertebrates directly and indirectly depend on eelgrass beds along the Togiak Refuge coastline.

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3.3.5. Birds

The lakes, rivers, tundra ponds, and coastal wetlands within the vicinity of the proposed project provide important resting, staging, breeding, brooding, nesting, and molting habitat for a wide variety of migratory and resident waterfowl, shorebirds, and landbirds (FWS, 2009a; BLM, 2008). In fact, the vicinity of the proposed project area provides staging habitat for the world's largest portion of black brants in Nanvak and Chagvan bays during migration, and hosts the largest migratory population along the west coast of emperor geese, and king and Steller's eiders (FWS, 2009a). The narrow complex of habitats in the region forms a funnel for large numbers of migratory waterfowl and shorebirds from the Yukon Delta, Western Alaska and the North Slope. The project would be within the northern limits of the Pacific Flyway, and the coastal wetlands of Goodnews Bay, Carter Spit and Kvichak Bay are important migration staging sites in Alaska. Designated Western Hemisphere Shorebird Reserve Network sites would be within and adjacent to the proposed area, and Goodnews Bay, Nanvak Bay, Carter Bay and the Kuskokwim River Delta are recognized as key areas for shorebird conservation in the U.S. shorebird conservation plan (BLM, 2008).

Many migrant sensitive species would occur in the proposed project vicinity, including the Steller's eider, olive-sided flycatcher, blackpoll warbler, gray-cheeked thrush, Townsend's warbler, tule white-fronted goose, dusky Canada goose, and trumpeter swan. Additionally, the bristle-thighed curlew and red-throated loon are BLM sensitive species that could potentially occur in the proposed project vicinity (BLM, 2008).

Approximately 25 species of migratory waterfowl are known to breed or use migration staging areas in the project vicinity. Inland waterfowl breeding wetlands and estuaries are found along the Kvichak and Alagnak Rivers and represent some of the highest waterfowl breeding densities in Alaska (BLM, 2008). Other major areas of importance include the Nushagak Peninsula, Kulukak Bay, Osviak Slough, Nanvak Bay, Chagvan Bay, Carter Bay, and Jacksmith Bay. Significant numbers of common eiders, harlequin ducks, and black scoters stop in the area during migration. Nesting populations in the lowlands of the Nushagak Peninsula and north of Goodnews Bay have been estimated at 31 ducks and 1.3 tundra swans per square mile (FWS, 2009a).

At least 39 species of shorebirds use the bays and lowlands in the proposed project vicinity as staging areas en route to and from the Arctic. Eighteen species of shorebirds have been documented breeding in the proposed project vicinity. The various alpine, tundra coastal mudflats, and forest edge habitats are used for breeding, and coastal mud flats are also used for breeding in addition to foraging, staging and migration (BLM, 2008; FWS, 2009a). In fact, several hundred Aleutian terns nest in Goodnews Bay, and Arctic terns are abundant throughout the Togiak Refuge (FWS, 2009a). Additionally, based on surveys, Pogson and Cooper (1983) concluded nesting densities of sandhill cranes on the Nushagak Peninsula are among the highest recorded in Alaska (FWS, 2009a).

The proposed project vicinity also hosts a variety of seabirds. Cliff-nesting habitat for seabirds occurs along Good News Bay, Chavgnana Bay, Cape Newenham, Cape Peirce, Bird Rock, and Shaiak Island. These areas support the largest population of cliff-nesting seabirds in the eastern Bering Sea mainland (FWS, 2009a; BLM, 2008). Coastal tidal nesting habitat for seabirds is found in the Bristol Bay shorelines. Over twenty species of seabirds are known in the project vicinity (BLM, 2008). Common species include common murre, black-legged kittiwake, tufted and horned puffins, pelagic and double-crested cormorants, parasitic and long-tailed jaegers, glaucous and mew gulls, pigeon guillemot, and parakeet auklet (FWS, 2009a; BLM, 2008). Sensitive seabirds that may be found seasonally in the proposed project vicinity include the marbled murrelet, harlequin duck, king eider, long-tailed duck, black scoter, black guillemot, black brant, and surf scoter (BLM, 2008).

Over 20 species of raptors are known to occur in the proposed project vicinity, with 16 species known to breed there (FWS, 2009a; BLM, 2008). This raptor population includes 10 species of owls, 7 hawks, 2 eagles and 4 falcons (BLM, 2008). The most common raptors are bald eagles, northern harriers, rough-legged hawks, merlins, and short-eared owls, in addition to golden eagles, gyrfalcons, peregrine falcons, and northern hawk owls (FWS, 2009a). Based on surveys conducted from 1984 through 1988, the Togiak Refuge bald eagle population included 80 to 90 individuals during the summer, and approximately 20 through the winter (FWS, 2009a).

Five upland game birds, all of which are grouse species, occur in the project vicinity, including spruce and ruffed grouse, and willow, rock, and white-tail ptarmigan (BLM, 2008; FWS, 2009a). Willow ptarmigan are the most common of these species, with flocks of several hundred or more birds occurring (FWS 2009a). Spruce and ruffed grouse inhabit forested areas, rock ptarmigan are on higher elevation barren habitats and tundra throughout, and willow ptarmigan in willow and alder thickets (BLM, 2008; FWS, 2009a). Ptarmigan scat was observed on the proposed Cone Mountain microwave site during a field visit in September 2010 (ABR, 2010).

At least 50 migrant species and 23 resident species of landbirds breed in the forests, shrub field and tall riparian shrub habitats in the proposed project vicinity (BLM, 2008). Examples of these landbirds include: alder flycatchers; black-billed magpies; common ravens; tree swallows; blacked-capped chickadees; Arctic warblers; gray-cheeked and hermit thrushes; American robins; yellow wagtails; orange-crowned, yellow, blackpoll, and Wilson's warblers; northern water thrushes; Savannah, fox, and golden-crowned sparrows; Lapland longspurs; common redpolls; bank and cliff swallows; ruby-crowned kinglets; Swainson's and varied thrushes; American pipits; yellow-rumped warblers; American tree and white-crowned sparrows; snow buntings; and gray-crowned rosy finches (FWS, 2009a). Four migrant species, the olive-sided flycatcher, blackpoll warbler, gray-cheeked thrush, and Townsend's warbler are considered sensitive species (BLM, 2008).

Specifically within the proposed project footprint, the proposed microwave repeater sites were the focus of brief field studies by an experienced bird biologist with ABR. The survey concluded that the sites provide suitable nesting habitat for Kittlitz's murrelets and suitable habitat for a number of alpine and/or arctic tundra-nesting bird species including rock ptarmigan, surfbird, horned lark, American pipit, lapland longspur, and snow bunting. The sites may also be used for foraging willow ptarmigan, common raven, rough-legged hawk, golden eagle, and gyrfalcon (ABR, 2010). Additionally, the proposed Kulukak Mountain microwave repeater site contains rocky cliffs in the area, which are suitable for several nesting raptor species such as rough-legged hawk, golden eagle, and gyrfalcon.

In the Lake Clark proposed project vicinity, over 70 species of landbirds have the potential to occur. Raptors are known to breed in the area, including bald eagle, golden eagle, northern goshawk, sharp-shinned hawk, northern harrier, and merlin. Approximately 50 pairs of bald eagles and 5 to 10 pairs of golden eagles are known to nest in the Lake Clark area, in addition to 2 pairs of osprey. Peregrine falcons also occupy eyries along cliffs in the area. In addition, Lake Clark contains suitable nesting, staging, resting, foraging, and molting habitat. Sensitive species may include the harlequin duck, olive-sided flycatcher, American peregrine falcon, gray-cheeked thrush, Townsend’s warbler, and blackpoll warbler (Bennett, 2006).

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3.3.6 Threatened and Endangered Species

3.3.6.1 Birds and Terrestrial Mammals

Several species listed under the ESA, as well as species designated with special status by management agencies, have potential to occur in the project vicinity. Bird and mammal species and their status are listed in Table 3-4.

Table 3-4. Sensitive species with potential to occur in the Togiak National Wildlife Refuge

Common Name	Species Name	Jurisdiction	Status
Alaskan hare	*Lepus othus*	BLM	Sensitive
American peregrine falcon	*Falco peregrines anatum*	ADFG	Species of Special Concern
Arctic peregrine falcon	*Falco peregrines tundrius*	ADFG	Species of Special Concern
Bering Sea rock sandpiper	*Calidris ptilocnemis tschuktschorum*	BLM	Sensitive
Blackpoll warbler	*Dendroica striata*	ADFG	Species of Special Concern
Bristle-thighed curlew	*Numenius tahitiensis*	BLM	Sensitive
Dusky Canada goose	*Branta Canadensis occidentalis*	BLM	Sensitive
Emperor goose	*Chen canagica*	BLM	Sensitive
Eskimo curlew	*Numenius borealis*	FWS	ESA Endangered
Gray-cheeked thrush	*Catharus minimus*	ADFG	Species of Special Concern
Golden eagle	*Aquila chrysaetos*	BLM	Sensitive
Kittlitz's murrelet	*Brachyramphus brevirostris*	FWS, BLM	ESA Candidate, BLM Sensitive
Marbled murrelet	*Brachyramphus marmoratus*	BLM	Sensitive
McKay's bunting	*Plectrophenax hyperboreus*	BLM	Sensitive
Olive-sided flycatcher	*Contopus cooperi*	ADFG	Species of Special Concern
Osgood's Arctic ground squirrel	*Spermophilus parryii osgoodi*	BLM	Sensitive
Red knot	*Calidris canutus*	BLM	Sensitive
Rusty blackbird	*Euphagus carolinus*	BLM	Sensitive
Short-tailed albatross	*Phoebastria albatrus*	FWS, ADFG	ESA Endangered, Species of Special Concern
Short-eared owl	*Asio flammeus*	BLM	Sensitive
Spectacled eider	*Somateria fischeri*	FWS, ADFG	ESA Threatened
Steller's eider	*Polysticta stelleri*	FWS	ESA Threatened
Townsend's warbler	*Dendroica townsendi*	ADFG	Species of Special Concern
Trumpeter swan	*Cygnus buccinator*	BLM	Sensitive
Yellow-billed loon	*Gagia adamsi*	FWS, BLM	ESA Candidate, Sensitive

Alaskan hare

The Alaskan hare occurs throughout much of the western coast of Alaska, including the Alaska Peninsula, but distribution is not continuous along the Arctic coast and the north slope of the Brooks Range. Habitat includes windswept, rocky slopes and upland tundra. This species feeds on varied plant material, including grasses, buds, twigs, and leaves in the summer and spruce twigs and needles, bark, and buds of hardwood in the winter (ADFG, 2008a). Suitable habitat for this species may occur at the microwave repeater sites, although species specific surveys have not been conducted.

American peregrine falcon and Arctic peregrine falcon

The American and Arctic peregrine falcons were listed as endangered in 1970 under the ESA (35 FR 16047). Subsequently, the Arctic peregrine falcon was delisted in 1994, and the American peregrine falcon was delisted in 1999 (59 FR 50796, 64 FR 46541). Both species are migratory, occurring from Alaska to Argentina, nesting in Alaska during the spring and summer and wintering in southern warmer climates. Nesting habitat generally consists of bluffs or cliffs adjacent to water where there is an abundance of prey species. Arctic peregrines tend to nest in treeless tundra whereas American peregrines favor forested nesting habitat (Wright and Bente, 1999). Both peregrine falcons are known or suspected to nest and migrate in the project vicinity (BLM, 2008; Bennett, 2006). Peregrine falcons primarily hunt smaller birds, but will sometimes take small mammals or insects (FWS, 1999). Historical declines in peregrine falcon populations throughout the U.S. was a result of contamination from organochlorine pesticides (59 FR 50796, 64 FR 46541).

Bering Sea rock sandpiper

The Bering Sea rock sandpiper breeds from Russia east to Alaska, from Seward Peninsula south to Bristol Bay. Wintering is typically in southern Alaska to California. Breeding habitat primarily includes lowland heath tundra along the coast, but may also include mountain subarctic tundra with low vegetation in coastal mountains (O'Brien et al., 2006). Suitable nesting and foraging habitat during the breeding season occurs for this species, although species specific surveys have not been conducted.

Blackpoll warbler

The blackpoll warbler inhabits spruce forests, in addition to tall riparian shrubs, and deciduous forest within taiga/coastal tundra transition zones. This species migrates in August to winter in northern South America, but is known to breed throughout the project vicinity, including Lake Clark (BLM, 2008; Bennett, 2006). Nesting substrates include low spots in spruce trees and occasionally on the ground. The blackpoll warbler is largely insectivorous (BLM, 2008).

Bristle-thighed curlew

The bristle-thighed curlew is a migratory shorebird that nests in mountainous tundra in the project vicinity during the summer (BLM, 2008). Wintering occurs near the Hawaiian Achipelagos. Nesting duration is from May through June, in which nests are made on a depression and lined with tundra mosses. This species feeds on insects and plant matter during the breeding season. Following nesting, bristle-thighed curlews move to pre-migration staging areas on the central and southern Y-K Delta and northern Alaska Peninsula. This staging habitat includes low-lying tundra and meadow habitats. Migration occurs from late July to August. Reasons for the decline of this species are due to their small population size and threats to their non-breeding grounds.

Dusky Canada goose

Dusky Canada geese nest primarily in the Copper River Delta of Alaska and winter in the Pacific Northwest. This subspecies may occur occasionally in the project vicinity as winter residents or between fall and winter migrations. Habitat for the Dusky Canada goose during these periods includes floodplains or other low-lying areas near water with abundant herbaceous vegetation for foraging. This subspecies may also feed on invertebrates. Reasons for the Dusky Canada goose conservation status is due to an earthquake occurring on breeding grounds and reduction in quality and availability of habitat, in addition to long-term habitat changes favoring predators, such as brown bears and coyotes (ADFG, 2008b; Pacific Flyway Council, 2008).

Emperor goose

Emperor geese nest along the Y-K Delta coast and throughout coastal areas of Northwest Alaska and in Siberia, of which the Y-K Delta represents important nesting grounds. Wintering typically occurs along the Aleutian Islands, on the western and south side of the Alaska Peninsula, and on Kodiak Island. Habitat is typically tied closely to nearshore marine habitat. This species feeds on marsh plants and berries during the summer and early fall, and in late fall and winter this species forages on seaweeds, clams, and snails (ADFG, 1994). The emperor goose would be expected to occur in nearshore marine waters and nearshore terrestrial environments of the project area during the breeding and nesting season.

Eskimo curlew

The last documented sighting of an Eskimo curlew was in 1962, in Texas, and the last documented sighting in Alaska was the mid-1800's (BLM, 2008). Reasons for decline were due to unrestricted market hunting in the late 1800's and likely due to loss of habitat. Studies continue in order to observe any remaining Eskimo curlews, but to date have been unsuccessful (ADFG, 2008b). It is unlikely that the Eskimo curlew occurs in the project vicinity.

Gray-cheeked thrush

The gray-cheeked thrush is known to breed and nest in the project vicinity and winter in South America. This bird utilizes a variety of habitats, including willow and alder thickets, upland and riparian deciduous forests, and coniferous forests. Nests are typically in willow, alder, and spruce. The gray-cheeked thrush feeds on beetles, weevils, ants, caterpillars, cicadas, berries, and invertebrates (BLM, 2008). Habitat for this species occurs in the riparian lowlands throughout the project vicinity, and along the periphery of Lake Clark. This species is expected to occur at Lake Clark and other lowland areas within the project vicinity (Bennett, 2006).

Golden eagle

Golden eagles are found throughout Alaska, as far north as the Brooks Range but rarely occur in the Aleutians or Alaska Peninsula. Not all golden eagles migrate, but many will if food becomes scarce. This species typically nest on cliffs, but may also nest in trees (ADFG, 2008a). Breeding and wintering habitat occurs in the project area.

Kittlitz's murrelet

Kittlitz's murrelet are year round residents along the Alaskan coast from Point Lay south to LeConte Bay. Nesting habitat occurs just above the treeline near glaciers, usually a short distance below peaks on coastal cliffs, barren ground, rock ledges, and talus slopes (Day et al., 1983). This bird can be found up to 45 miles inland and are solitary nesters (FWS, 2006). Breeding birds will forage on fish, invertebrates, and microplankton near glacial streams and glacial runoff, whereas non-breeding birds will forage in bays along glaciated coasts (FWS, 2006). Reasons for the population declines have not been conclusively determined, although oil spills and gill nets have been identified to be causes of mortality (FWS, 2006).

Marbled murrelet

The marbled murrelet is a year round resident along the north Pacific coast from the Aleutian archipelago in western Alaska south to central California. While Alaskan populations do not have federal status under the ESA, they are listed as threatened in both Oregon and Washington and as endangered in California (Piatt et al., 2007). This species nests primarily in old-growth conifer forests within close proximity to salt water relative to populations elsewhere (Nelson, 1997). In Alaska, populations are also known to breed and nest on the ground on rocky inland slopes (Piatt et al., 1993). The nesting period begins in late March. After hatching, parents feed young for four weeks, reusing specific flight paths to reach nestlings, often through creeks and drainages or natural blowdowns and gaps (Nelson, 1997). This species feeds on feeds on small, schooling fishes and zooplankton. Reasons for decline are not known, but reduction of old-growth forests suitable for nesting as a result of human disturbance and development and shifting climate in marine ecosystems may be primary causal mechanisms (Piatt et al., 2007).

McKay's bunting

McKay's bunting is only known to breed on two small isolated islands in the Bering Sea, Hall and St. Matthew islands, but may occasionally breed on other islands in the Bering Sea. This bird remains on breeding grounds from May until early October, and winters on the western coast of Alaska from Kotzebue south to the Alaska Peninsula. Wintering range includes the project vicinity. Wintering habitat includes coastal marshes, shingle beaches, and agricultural fields. This species feeds on seeds from weeds and grasses. This species is vulnerable due to the small population size and introduced predators (Lyon and Montgomerie, 1995).

Olive-sided flycatcher

The olive-sided flycatcher breeding range extends from Alaska south through Canada and into the lower 48 states. The species is known to breed in the project vicinity. Wintering occurs primarily in South America. Breeding habitat includes coniferous boreal, riparian bottoms, and coastal forests, constructing nests in spruce trees (BLM, 2008). These birds are insectivores, eating bees, flies, and beetles in flight. Deforestation loss of habitat is the major cause of their population decline (ADFG, 2008b).

Osgood's Arctic ground squirrel

Osgood's Arctic ground squirrel occupies tundra and forest clearings ranging in elevations from sea level to over 6,500 ft in areas where permafrost lies more than three ft beneath the ground surface. Suitable habitat includes areas with sandy or gravelly well-drained soil suitable for digging burrows, and may include eskers, moraines, mountain slopes, river flats and banks, lake shores, and tundra ridges (Government of the Yukon, 2011). Suitable habitat for this species may occur at the microwave repeater sites, although species specific surveys have not been conducted.

Red knot

This shorebird breeds throughout the mountain tundra of northern and northwestern Alaska, outside the project vicinity, and winters in South America (Harrington, 2001). Red knots are known to occur in the Carter Spit area for staging and migration during the fall, however (BLM, 2008). Non-breeding habitat primarily includes intertidal marine habitats, especially near coastal inlets, estuaries, and bays. Red knots typically feed on marine invertebrates. Known threats to red knots include harvesting for sport and subsistence in other countries, as well as vulnerability from anthropogenic environmental perturbations due to their high non-breeding site concentrations (Harrington, 2001).

Rusty blackbird

The breeding range of the rusty blackbird extends from Canada's east coast to Alaska's west coast. Within Bristol Bay, this species is a very rare to causal spring migrant and summer and fall visitor. Wintering typically occurs in the eastern half of the U.S. but may rarely be a winter visitor to south coastal Alaska. Breeding habitat includes wet coniferous and mixed forest from the edge of tundra, within fens, alder-willow thickets and bogs, muskegs, beaver ponds, tall riparian shrub, and wetlands along shores and lakes. During migrations in spring and fall this species will roost in wooded areas or occasionally in open fields (ADFG, 2006). Breeding habitat for this species occurs along the drainages and freshwater wetlands throughout the project vicinity.

Short-eared owl

The short-eared owl is an uncommon breeding migrant to Alaska. Habitat for this species includes open country such as marshes, muskegs, tundra, and prairies. The short-eared owl preys upon voles and lemmings, other small mammals, and occasionally shorebirds and songbirds (ADFG, 1986).

Short-tailed albatross

The short-tailed albatross breeds on two remote islands in Japan, and winters in the Alaskan waters of the Bering Sea, Aleutian Islands, and Gulf of Alaska. Diet includes squid, shrimp, fish eggs, fish, and crustaceans. Vulnerabilities include entanglement in fishing gear, oil spill contamination, commercial fishing vessel's long lines hooks, and egg predation (FWS, 2001). This species could occur in the project vicinity during the fall, winter, and spring, but the population is less than 2,000 and documented sightings are not known from the area so it is unlikely (FWS, 2006).

Spectacled eider

Spectacled eiders historically nested along the coast of Alaska from Nushagak Peninsula to Barrow and the Yukon. Current breeding distribution is restricted to the Y-K Delta and the north coast of Alaska (BLM, 2008). Spectacled eiders migrate between winter and breeding grounds along the Bering and Chukchi shorelines. Molting areas include the eastern portion of Norton Sound and

Ledyard Bay, and wintering occurs in the central Bering Sea south and southwest of St. Lawrence Island. Spectacled eiders do not migrate, breed or molt within the project vicinity (BLM, 2008).

Steller's eider

The Alaska breeding population of Steller's eider is listed as threatened under the ESA (62 FR 31748). The Alaska population of the Steller's eider breeds along the Arctic Coastal Plain, with a small subset breeding on the Yukon-Kuskokwim Delta, outside the project vicinity (FWS, 2002). Steller's eiders winter in coastal areas of the Alaska Peninsula, possibly along the shorelines of the project vicinity, and also use the Goodnews Bay and other adjacent areas for molting and staging between spring and fall migration (BLM, 2008; FWS, 2002). Critical habitat for the Alaska-breeding population of the Steller's eider includes breeding habitat on the Y-K Delta and 4 units in the marine waters of Southwest Alaska, including the Kuskokwim Shoals in northern Kuskokwim Bay, and Seal Islands, Nelson Lagoon, and Izembek Lagoon on the north side of the Alaska Peninsula (66 FR8850). No critical habitat occurs in the project vicinity.

After breeding, birds leave for molting areas between late July and late October, in which the birds remain flightless for approximately 3 weeks. Molting habitat is characterized by extensive marine shallow areas with eelgrass (Zostera marina) beds and intertidal sand flats and mudflats. During the molt, Steller's eiders forage on marine invertebrates such as molluscs and crustaceans. Wintering habitat includes marine waters less than 10 meters deep, typically within 400 meters of shoreline unless shallows (i.e., less than 400 meters) extend farther offshore. Prior to spring migration, Steller's Eiders stage in estuaries and small bays prior to continuing northward to nesting grounds (FWS, 2002).

Although the Steller's eider is listed as threatened, the bird is subsistence hunted in the project vicinity in spring and during fall migration. Causes of decline are poorly understood. Potential causes of decline include predation; hunting; ingestion of spent lead shot in wetlands; changes in the marine environment, affecting either the Steller's eider food supply or other resources; and exposure to oil or other contaminants near fish processing facilities in Southwest Alaska (FWS, 2002).

Townsend's warbler

Townsend's warbler is a neotropical migrant that breeds in mature, coastal coniferous forests of Alaska. The species departs Alaska in late August, wintering in Central America. Although the species is known to occur in the project vicinity, it is likely uncommon (FWS, 2009a; BLM, 2008). The species is among a group of species that is sensitive to losses of mature forest, disruption to connectivity, and possibly warming trends associated with climate change (ADFG, 2006).

Trumpeter swan

Trumpeter swans have expanded their breeding range into Alaska over the last 100 years. Their northernmost breeding range according to current surveys in Alaska occurs throughout the Interior Alaska and west to the Cook Inlet (ADFG, 2008b2008b). Alaska's trumpeter swans winter near coastal waters from Cordova south to the Columbia River in Washington (ADFG, 2008b). A large concentration of trumpeters winters on Vancouver Island. Within the project vicinity, Lake Clark is approximately the westernmost limit of trumpeter swan breeding habitat. About 30 pairs of trumpeter swans nest in the park and preserve, representing the farthest west breeding population

(Bennett, 2006). Trumpeter swans may expand westward into other areas within the project vicinity (e.g., the proposed tower sites) in the near future.

Swans begin nesting as soon as spring thaw occurs. Nesting habitat includes undisturbed marsh or extensive areas of shallow lakes with abundant emergent vegetation. Elevated nest sites are constructed with adjacent vegetation. Adjacent waters and marshes are important for foraging. During summer, swans forage on foliage, seeds, and tubers of marsh plants. Non-breeding trumpeter swans inhabit coastal marshes and large lakes during the breeding season. Swans begin migrating to southern wintering grounds by late September or October (ADFG, 2008b; BLM, 2008).

Yellow-billed loons

The yellow-billed loon may winter in the nearshore waters of Cook Inlet, but high densities of the species are unlikely in the proposed project area as most wintering occurs in Asian coastal waters (FWS, 2009a).The project vicinity is within the distribution of yellow-billed loon breeding range. The yellow-billed loon nests exclusively in coastal and inland low-lying tundra with large, permanent, vegetated, fish-bearing lakes. Non-breeding habitat includes large rivers, and nearshore marine environments. Wintering occurs in nearshore marine waters. Breeding begins in late May, and nests are located typically at the shoreline on islands or points of land. Loons dive for small fish, but also feed on aquatic vegetation, insects, mollusks, and frogs. Threats to loons include predation from gulls, jaegers, and foxes; disturbance to nests from float planes, boats or fishers; motor wakes drowning chicks; or entanglement in discarded fishing line or plastic six-pack holders (ADFG, 2008b).

3.3.6.2 Marine Mammals

A total of 8 species are listed or considered to be listed under the ESA. Candidate species and species listed as threatened or endangered and known to commonly occur in the shallow marine environment of the proposed project area are Pacific walrus, (*Odobenus rosmarus divergens)* (candidate species), Steller sea lion, (*Eumetopias jubatus)* (ESA Endangered), Northern sea otter, (*Enhydra lutris kenyoni)* (ESA Threatened), and humpback whale, (*Megaptera novaeangliae)* (ESA Endangered). ESA-listed or candidate marine mammal species that can occur but are not commonly observed in the shallow marine environment of the proposed project area are blue whale (*Balaenoptera musculus)* (ESA Endangered), fin whale (*Balaenoptera physalus)* (ESA Endangered), North Pacific right whale (*Eubalaena japonica)* (ESA Endangered), and sperm whale (*Physeter macrocephalus)* (ESA Endangered).

Pacific walrus

Walrus are currently not listed under the ESA, but a petition was submitted in February 2008 to consider ESA listing, and FWS is currently in the process of conducting a status review to determine if listing the Pacific walrus is warranted (FWS, 2009b). The Pacific walrus distribution ranges from the Bering Sea, including Bristol Bay, north to the Chukchi Sea, and extends to the northeastern coast of Siberia and Point Barrow (Reeves et al., 2002). Vagrants have been reported in Cook Inlet and Kodiak Island (Reeves et al., 2002). The most recent surveys for the Bering Sea were conducted in 2006 (Speckman et al., 2010) and yielded an abundance estimate of 129,000 with 95% confidence limits of 55,000-507,000 individuals. Walruses move south into the Bering Sea in the winter staying in advance of the ice edge and some of them occur near Bristol Bay and

Kuskokwim Bay. In the summer females and juveniles and most males move north to the Chukchi Sea, however, some males remain in Bristol Bay (Wynne, 1997) where they rest and molt while hauled out on land close to their feeding grounds. These males haul out at Cape Peirce and Round Island or Cape Seniavin and Cape Newenham (Figure 3-2) (Frost et al., 1982; Fay, 1982). Cape Peirce was historically used as a haulout but was abandoned sometime during the first half of the twentieth century. Pacific walrus began re-using the haulout in 1981. Walruses prefer relatively shallow water because they feed primarily on mollusks, other invertebrates, and small fish that live in the bottom sediments (Reeves et al., 2002) up to a depth of about 80-100 meters. A reconnaissance sidescan sonar survey in Bristol Bay revealed marks of walrus foraging in extensive seafloor areas. Most of these marks occurred in water depth of less than 60 m in areas of sandy seafloor that were smooth, hummocky or characterized by degraded bedforms. Locations of these foraging marks were consistent with walrus locations from satellite telemetry studies (Bornhold et al., 2005).

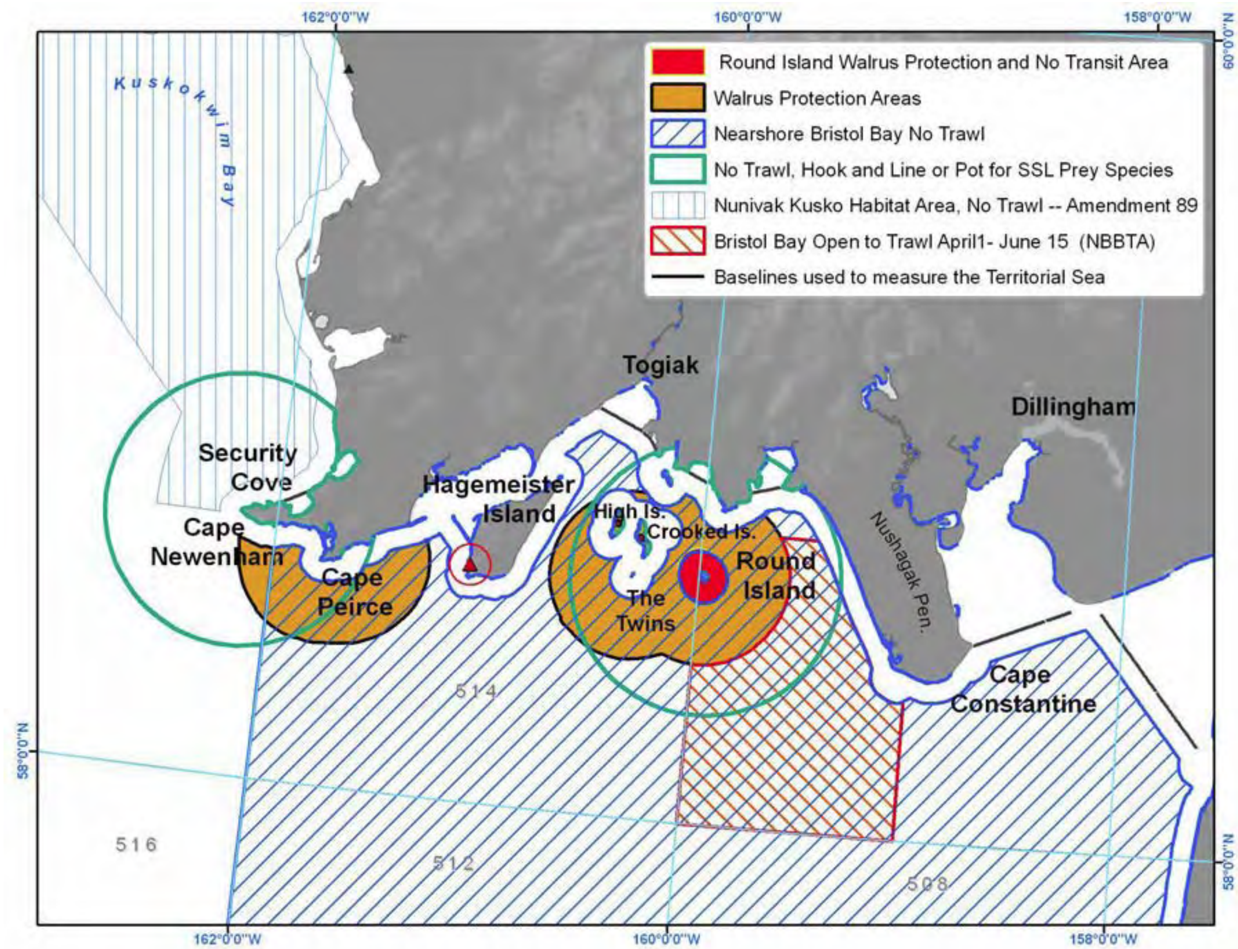


Figure 3-2. Walrus Protection Areas and Haulouts (NPFMC, 2009).

Steller sea lion

Steller sea lions are found in the temperate to sub-arctic waters of the North Pacific Ocean. NMFS has divided the Steller sea lion population into eastern and western distinct population segments (DPSs), based on their occurrence east or west of 144°W (NMFS, 2008a). The eastern DPS includes sea lions that live in southeast Alaska, British Columbia, California, and Oregon. The western DPS includes sea lions that inhabit the central and western Gulf of Alaska, Aleutian Islands, as well as those in the coastal waters of Asia and Russia. The western DPS is listed as endangered under the ESA. The eastern DPS is listed as threatened, however, based on two petitions to delist the eastern (DPS) of the Steller Sea Lion, NMFS announced to determine if the petitioned action is warranted through an updated status review of this DPS. All Steller sea lions are listed as Strategic Stocks and considered Depleted under the MMPA (FWS, 2010b).

Steller sea lions of the western DPS are present in Alaska year-round and not known to migrate. Because of their endangered status, critical habitat has been assigned for the western DPS, defined as 20 nautical miles (23 miles or 37 km) seaward and 3,000 ft (0.9 kilometers [km]) landward of any major rookeries and haulouts (NMFS, 1993). Critical habitat also includes air zones extending 3,000 ft (0.9 km) above these terrestrial and aquatic zones. Based on these criteria, the nearshore area along the Aleutian chain and the Gulf of Alaska has been designated as critical habitat (Figure 3-3). Critical habitat has also been identified in three foraging zones: one in the Gulf of Alaska at Shelikof Strait, and the other two in the Bogoslof Island and Seguam Pass areas along the Aleutian Chain (NMFS, 1993). In addition, "no approach" zones for vessels have been identified within 3 nautical miles (3.5 miles or 5.6 km) of listed rookeries. Much of the critical habitat area is located within the proposed project area.

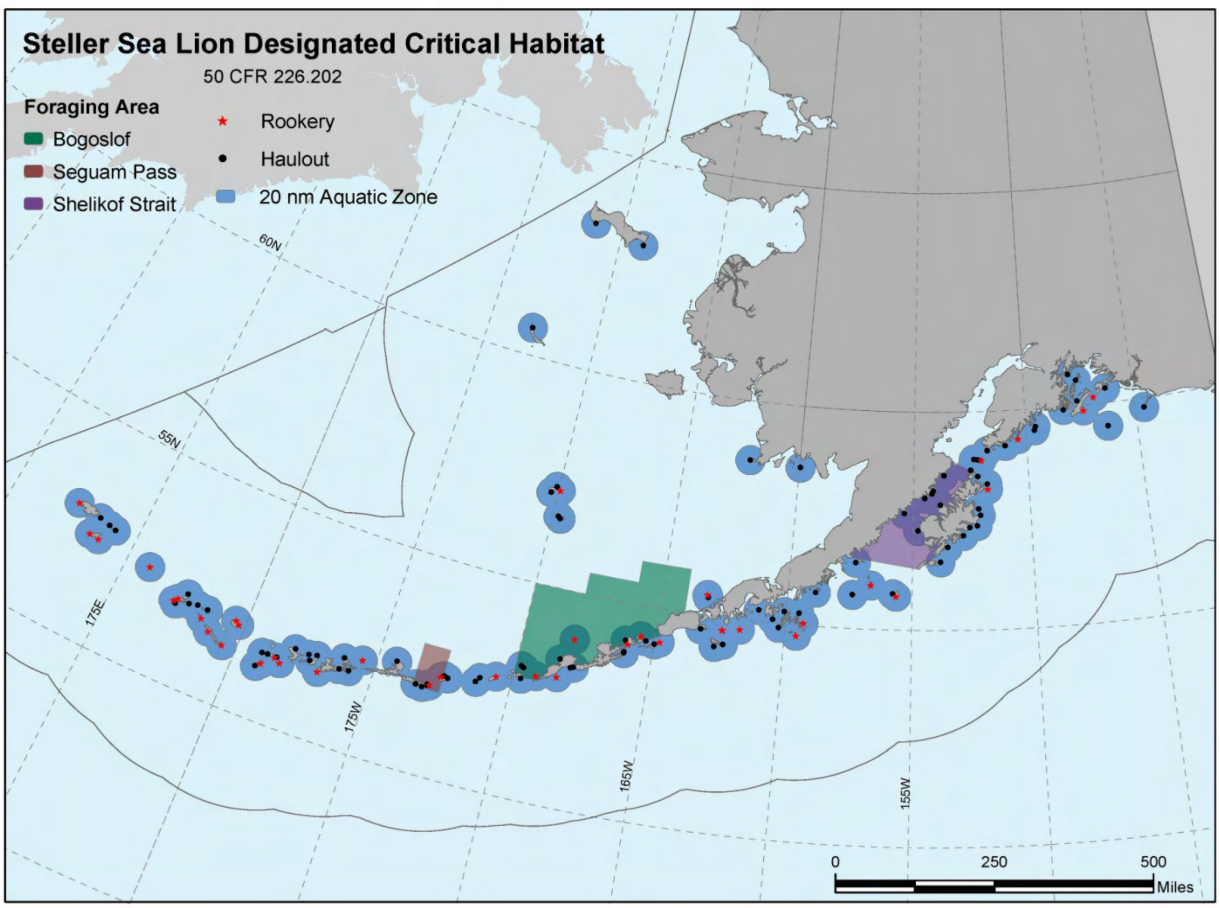


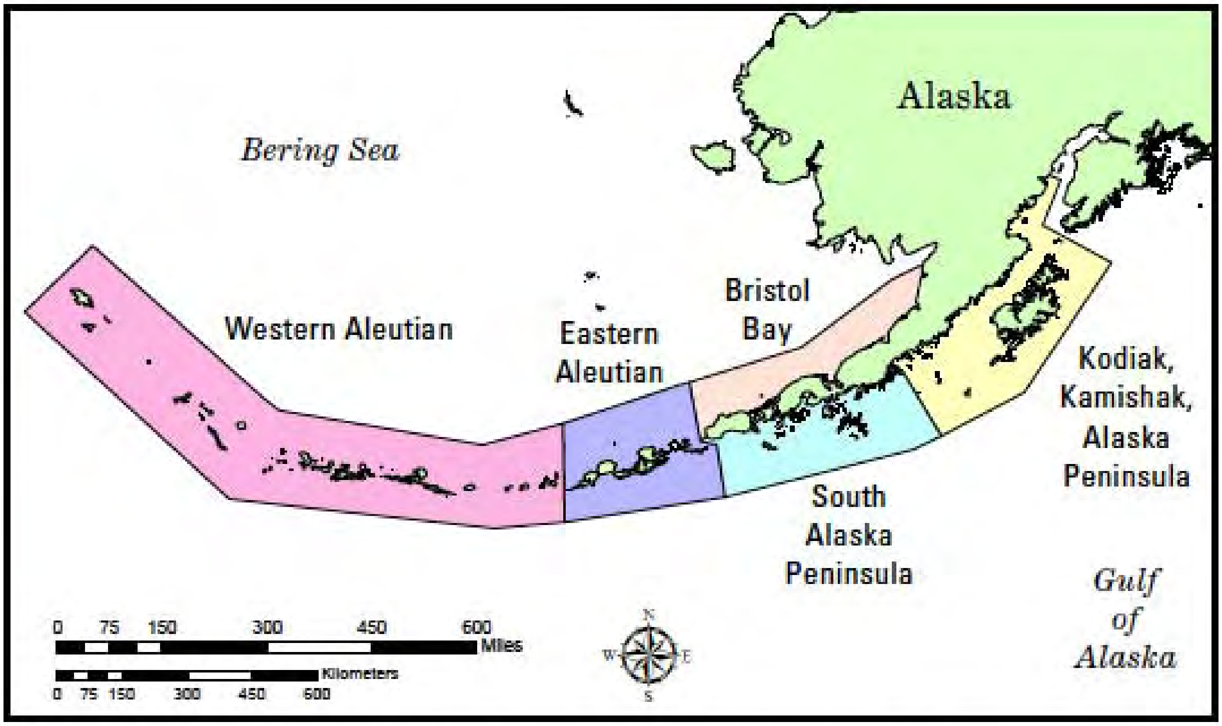
Figure 3-3. Steller Sea Lion Critical Habitat in Alaska. Source: NMFS, 1993.

Breeding occurs at rookeries in summer (mid May to July) and females give birth from late May through early July, with most pups being born in late June (Reeves et al., 2002; Wynne, 1997). The pups are vulnerable to entanglement in fishing equipment, hunting, and killer whale predation (ADFG, 2010c). Females typically return to the same pupping site within the rookery in successive years. Molting occurs from July to November (Wynne, 1997). Steller sea lions feed in pelagic and nearshore waters on a variety of fish, including capelin, cod, herring, mackerel, pollock, rockfish, salmon, and sand lance, as well as bivalves, cephalopods (squid and octopus), and gastropods (NMFS, 2008a). Based on the 2008 count of non-pups (31,246) and the number of pups in 2005 to 2009 (11,120) the total population estimate of the U.S. part of the western DPS Steller sea lion is estimated to be 42,366 (Allen and Angliss, 2010).

Northern sea otter

The Northern sea otters have been divided into three stocks including the southwest, the southcentral, and the southeast Alaska stock. The Southwest Alaska stock includes individuals residing along the coasts of the Alaska Peninsula, Bristol Bay and the Aleutian, Barren, Kodiak, and Pribilof Islands (FWS, 2010c). Relative to the 1975 population estimate of 11,681 in the Bristol Bay area about 40% was remaining in 2000 (FWS, 2010c). Since 2005, the Southwest Alaska stock (DPS) is listed as Threatened under the ESA.

Sea otters are generally found in shallow coastal waters with rocky or sandy bottoms, where they feed primarily on benthic invertebrates including clams, mussels, urchins, crabs, and fish (Wynne, 1997). They do not migrate and do not disperse over long distances. Peak breeding season for sea otters is September–October, and females bear a single pup each year or more after a variable gestation of 5–8 months. Most pups are born in water or on land in May (Wynne, 1997). FWS has jurisdiction over the sea otter and proposed a critical habitat designation on December 16, 2008 for the southwest DPS (FWS, 2008b). They divided the area of proposed critical habitat into five units: (1) Western Aleutian, (2) Eastern Aleutian, (3) South Alaska Peninsula, (4) Bristol Bay, and (5) Kodiak-Amish-Alaska Peninsula (Figure 3-4). The Bristol Bay unit (4) is divided into three subunits, including (4a) Amok Island, (4b) Izembek Lagoon, and (4c) Port Moller/Hereunder Bay (Figure 3-4) (FWS, 2008b). Proposed critical habitat generally includes nearshore marine waters ranging from the mean high tide line to the 66 ft (20 meter) depth contour, as well as waters within 328 ft (100 meter) of the high tide line. Unit 4 is the only unit that includes nearshore kelp forests, a unique habitat that sea otters have been observed to utilize (FWS, 2008b). None of this critical habitat overlaps with the current project area.



Location of critical habitat units. Only areas that meet the definition of critical habitat within these units is actually designated as critical habitat.

Figure 3-4. Location of Sea Otter Critical Habitat. Source: FWS, 2008b.

Humpback whale

The humpback whale is listed as Endangered under the ESA and Depleted under the MMPA throughout its entire range. The humpback whale is distributed globally and is classified in the North Pacific into three stocks: (1) California-Oregon-Washington-Mexico; (2) central North Pacific; and (3) western North Pacific (Angliss and Allen, 2009). Humpback whales are migratory, spending summers feeding on euphausids and small schooling fish in temperate to polar waters and winters breeding in subtropical and tropical waters (Wynne, 1997). During the summer months, animals of all three stocks migrate north. The central North Pacific stock migrates from Hawaii to summer feeding grounds in northern British Columbia, southeast Alaska and Prince William Sound west to Unimak pass. The western North Pacific stock migrates from their breeding areas off the coast of Japan to the Bering Sea, Aleutian Islands, west of Kodiak Island and possible Kuril Islands, Gulf of Anadyr and southeastern Chukotka (Angliss and Allen, 2009). The summer feeding areas of the central and western North Pacific stock of humpback whales overlap.

3.3.6.3 Marine Mammals - Uncommon in Project Area

Blue whale

Throughout its range, the blue whale is listed as Endangered under the ESA and Depleted under the MMPA. The blue whale is distributed globally and inhabits coastal, shelf, and oceanic waters in all oceans (Reeves et al., 2002). The northern hemisphere blue whale is separated into North Pacific and North Atlantic populations based on ocean basin. For management purposes, the North

Pacific stock is divided into eastern and western stocks. The eastern stock winters off Mexico and Central America. During the summer it feeds near the US west coast, in the Gulf of Alaska extending to the Aleutian Islands and the Bering Sea, and in central North Pacific waters (Stafford, 2001). The western stock feeds in summer southwest of Kamchatka, south of the Aleutians, and in the Gulf of Alaska, and winters in lower latitudes of the western Pacific and central Pacific (Stafford et al., 2001). The North Pacific stock of blue whales was estimated at 3,300 individuals (IWC, 2007).

The diet of the North Pacific blue whale includes primarily euphausids (krill) but occasionally fish and copepods (Wynne, 1997). They have no natural predators, but can be seriously harmed if struck by a marine vessel. They migrate south to wintering/calving grounds between 1–10ºN where females give birth to a single calf every 2–3 years after gestation of 12 months (Wynne, 1997). North Pacific blue whales with young calves have often been observed in the Gulf of California from December through March (Sears, 1990) and, therefore, this area is probably an important calving and nursing area for the species.

Fin whale

The fin whale is listed as Endangered under the ESA and Depleted under the MMPA throughout its entire range. Fin whales are distributed globally, but mostly frequent temperate to polar waters where they are found in the offshore and deep coastal zones (Reeves et al., 2002). NMFS identifies four geographic populations around the United States: California-Oregon-Washington, Hawaii, Alaska (Northeast Pacific), and the western North Atlantic (Angliss and Allen 2009). The seasonal movements of fin whales are complex and their breeding and calving grounds are unknown, however it is thought that they mate and calve in temperate waters during winter and migrate to northern latitudes to feed during the summer (Gambell, 1985). Fin whales of the Alaska stock are known to feed during summer in the Gulf of Alaska, Aleutian Islands, and as far north as the Chukchi Sea (Reeves et al., 2002). Surveys conducted in 1999 and 2000 in the central-eastern and southeastern Bering Sea showed that fin whale abundance estimates were five times greater in the central-eastern than in the southeastern Bering Sea (Moore et al., 2000 and 2002), which includes a large portion of the proposed survey area. Dedicated line transect surveys (over 9,053 track lines) conducted in coastal waters of western Alaska and eastern and central Aleutian Islands during July–August 2001–2003 recorded 276 sightings, with a concentration near the Semidi Islands, southwest of Kodiak Island (Zerbini, 2006). The abundance estimate for the entire North Pacific stock of fin whales is unknown, however based on the information from Moore et al. (2002) and Zerbini (2006), the population occurring in waters west of the Kenai Peninsula (150ºW) is estimated at 5,700 individuals (Angliss and Allen, 2009).

Fin whales breed in winter and females give birth to a single calf every two or more years during winter after an 11–12 month gestation period (Wynne, 1997). Fin whale prey consists of krill and various small schooling fish, including herring, capelin, and sandlance (Reeves et al., 2002; Wynne, 1997).

North Pacific right whale

The North Pacific right whale has been listed as Endangered under the ESA since 1973. Based on genetic diversity, the International Whaling Commission (IWC) recommended the north Atlantic, North Pacific and southern right whale populations be considered three separate species (Perrin et al., 2002). It is believed that the North Pacific population is made up of two subpopulations, a western and an eastern population (LeDuc et al., 2001). A current reliable abundance estimate is unavailable but based on available sighting information; Wada (1973) estimated the total population to be 100–200. Another review of sighting records suggested that the abundance of right whales in the western North Pacific was likely in the low hundreds (Brownell et al., 2001). Because of the exceedingly rare sightings of right whales in the eastern North Pacific, this stock is believed to be the one of the most endangered whale populations.

Dedicated aerial and vessel-based surveys have been conducted in the southeastern Bering Sea since 1996 (e.g. Tynan, 1998; LeDuc, 2004). Acoustic call detections and satellite tracking methods have provided useful information on animal movements. Identification of individuals and gender information was obtained through biopsy sampling and photograph analyses (McDonald and Moore, 2002; Wade et al., 2006). All of the right whale sightings since 1997 have occurred within an area of the southeastern Bering Sea referred to as 'the box' (bounded by 56º 30'N and 57º 30'N and by 162º 30'W and 166º 00'W) (LeDuc, 2004). 'The box' lies in the northeastern half of the area recently designated as critical habitat for the North Pacific right whale (Figure 3- 5) (NMFS, 2008b). Long term hydrophone recordings from October 2000 through January 2006 showed that right whales can occur in the southeastern Bering Sea from May to December, with a more intensified presence from mid-summer through early fall (July–October) and peak numbers in August and September (Munger et al., 2008). Very little is known about the migratory patterns of the population. They feed during the summer in the southeastern Bering Sea and Gulf of Alaska near Kodiak Island and may move to low latitudes to breed during winter, possibly as far south as Baja California (Wynne, 1997). Little is known about their winter distribution, and calving areas have not been identified (Scarff, 1991; Clapham et al., 2004). Right whales are zooplankton specialists feeding primarily on euphausids and copepods, specifically *Calanus finmarchicus* (Wynne, 1997; Reeves et al., 2002).

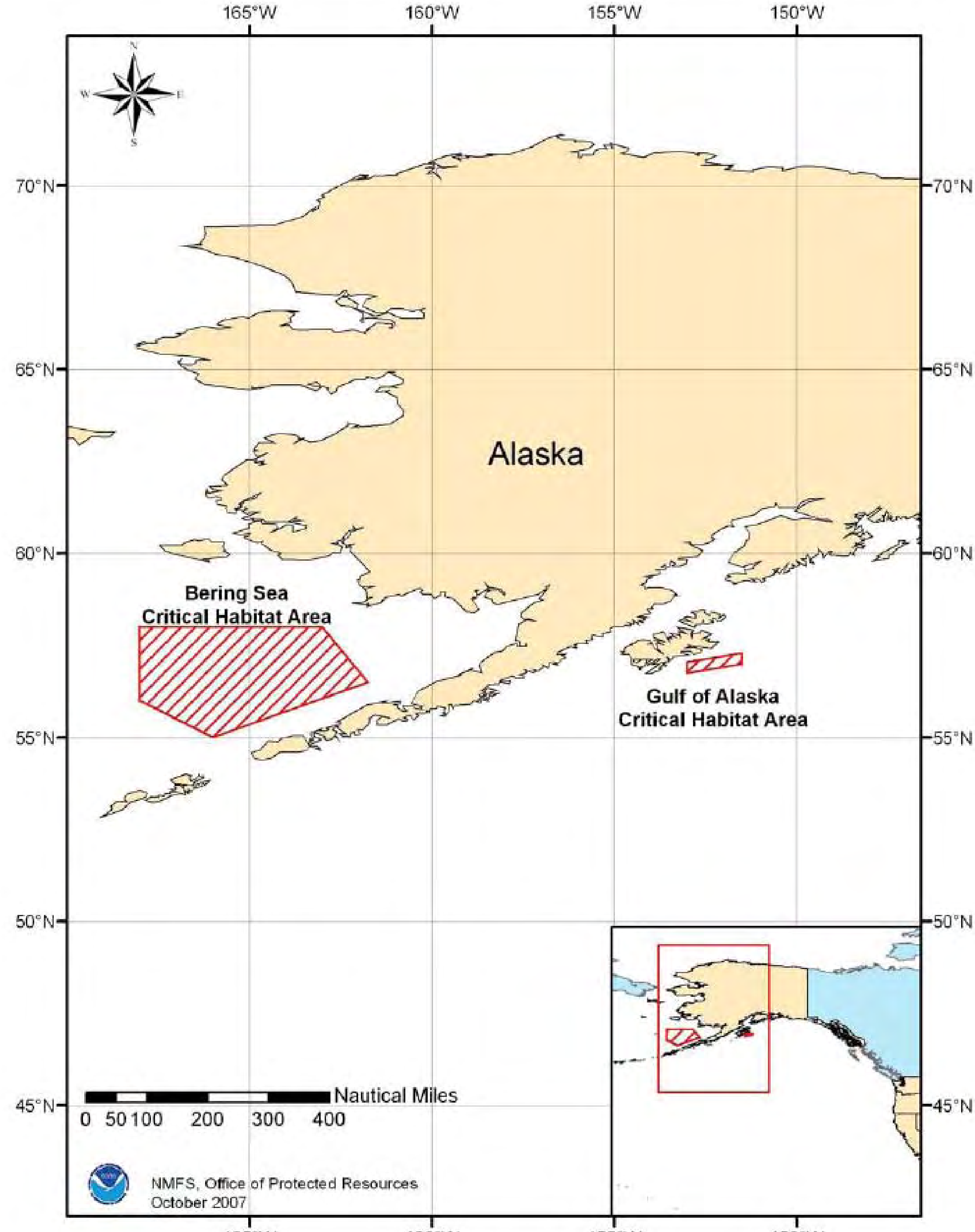


Figure 3-5. North Pacific Right Whale Habitat. Source: NMFS, 2008b.

Sperm whale

The sperm whale is listed as Endangered under the ESA and Depleted under the MMPA throughout its entire range. Sperm whales inhabit all ice-free oceans in both hemispheres and may occur near the ice-pack edge (Reeves et al., 2002; Angliss and Allen, 2009). They usually occur in deep, pelagic waters and frequent canyons, bank edges, and continental slopes. Females and young whales stay in tropical waters year-round (Reeves et al., 2002). Their diet consists primarily of large squid, but also sharks, skates, and fish (Perrin et al., 2002). The migration patterns of the sperm whale vary by age and sex of the whales. Male sperm whales will stay with the females in tropical and subtropical waters until they begin to migrate between the ages of 4–21 years. Older males tend to travel alone or in same-sex aggregations and stay near the ice edge, occasionally returning to the breeding areas (NMFS, 2010).

NMFS has divided the sperm whale into five stocks for management purposes: California-Oregon-Washington, Hawaii, North Pacific (Alaska), North Atlantic, and the northern Gulf of Mexico (Angliss and Allen, 2009). The North Pacific stock occurs in the Gulf of Alaska, Aleutians, and Bering Sea in summer; however it is typically the older males that migrate to feed in these areas. Sperm whales are considered common in the Aleutians. The abundance of sperm whales in the North Pacific was reported to be 1,260,000 prior to exploitation, which by the late 1970s was estimated to have been reduced to 930,000 whales (Rice, 1989 cited in Angliss and Allen, 2009). This estimate includes animals of the California-Oregon-Washington stock and confidence intervals have not been provided. Currently, there is no reliable estimate available for the Alaskan stock (Angliss and Allen, 2009).

Other Marine Organisms

Of the seven known marine turtle species, the leatherback and the green turtle are known to occasionally inhabit Alaskan water. The olive (Pacific) ridley and loggerhead are much less common, although occasional sightings have been recorded in Alaskan waters (ADFG, 2010d). Brief descriptions of the leatherback and green turtle are provided below.

Leatherback turtles are listed as Endangered under the ESA. They are found in pelagic waters worldwide and may reach the Gulf of Alaska and Aleutians via warm currents from Japan (NMFS, 2007b). They are also known to forage in coastal waters. Leatherbacks are highly migratory, moving north to temperate feeding grounds in summer and south in the winter to the tropics to mate and nest (NMFS, 2007b). No nesting occurs in Alaska. Their diet consists primarily of jellyfish and salps (a type of tunicate), which they can grasp with the hooks on either side of their beak (NMFS and FWS, 1998). Leatherback turtles can reach 6.5 ft in length and 2000 lbs in weight (NMFS and FWS, 1998).

The green turtle is listed as threatened under the ESA. In the eastern North Pacific, they range from Baja California to southern Alaska and may reach the Gulf of Alaska and Aleutians by way of the warm currents from Japan (NMFS, 2007c). They most commonly occur south from San Diego. No nesting occurs in Alaska. Adult green turtles are herbivores, eating primarily sea grasses and algae (NMFS, 2007c). Hatchlings and young juveniles are pelagic, and feed mainly on jellyfish, crustaceans, and mollusks (Wynne and Schwartz, 1999).

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3.4 Social Environment

3.4.1 Socioeconomics

For socio-economic resources, the geographic scope for the proposed project area ranges from Goodnews Bay to Port Alsworth. There are no inhabitants in the immediate vicinity of the proposed three microwave repeater sites (Alternative 2) though the communities closest to these would include Dillingham, Togiak, Goodnews Bay, and Twin Hills. For the proposed project component involving a lake-bed fiber optic cable in Lake Clark, the affected communities would be Nondalton and Port Alsworth. Under the submarine fiber optic cable alternative (Alternative 3), the communities that would be connected by the fiber optic cable include Dillingham (from the site at Kanakanak), Togiak, Twin Hills, Goodnews Bay, Platinum, and Quinhagak. Also in or near the project area are seasonal and permanent subsistence fishing and hunting cabins and camps and sport fishing lodges. These facilities support subsistence and recreational activities within the Togiak Refuge, adjacent BLM-managed lands, Lake Clark National Park and Preserve, and would be likely subject to potential socioeconomic effects from the proposed action. The following discussion focuses on population, employment, income, and characteristics of the local communities and their economy.

3.4.1.1 Regional Demographics and Economy

The communities within the region of influence are part of the Bristol Bay Region, which includes the Dillingham Census area in the vicinity of the Togiak Refuge and the Lake & Peninsula Borough, the northern portion of which overlaps with the Lake Clark National Park and Preserve. The regional population is dispersed among a number of smaller communities, and has been stable or slightly declining in the past decade. The regional economy rests on the historic foundation of the salmon commercial fishing industry, supplemented by the governmental sector (employment and funding for programs and infrastructure) as well as the growing visitor industry.

In 2009, the Dillingham Census area had a population of 4,957 and the Lake & Peninsula Borough had a population of 1,547. Both areas saw increases in population in the decade before 2000, and have declined in the years since. The Dillingham Census Area includes eleven communities located in the Nushagak and Togiak areas. The Dillingham Census Area realized the greatest population increase between 1990 and 2002 at a rate of 23 percent. All communities in the area experienced population increases between 1990 and 2000. However, in 2001 and 2002, five communities in the area experienced population declines and over the next six years the Dillingham Census Area's total population declined 2.9 percent (SWAMC, a2010a). From 1990 to 2000, the Lake & Peninsula Borough had a population increase of 9 percent. However, based on population estimates through 2008, this trend has been abruptly reversed as the Lake & Peninsula Borough experienced an almost 15 percent population decline. Moreover, 16 of the 18 communities experienced population declines from 2000 to 2008 (SWAMC, a2010a).

For at least the past 30 years, commercial fishing and fish processing—supported by the highly productive Bristol Bay fishery—have dominated the regional economy. These activities are highly seasonal, with a very distinct peak from May through September. Other important contributors to the regional wage economy are government employment, government funding for public infrastructure, and tourism, often focused on recreational fishing. Because most area communities are so small, the trade and service sectors are not well developed; the small villages depend on the regional center of Dillingham and on Anchorage to provide most support services and retail opportunities (FWS, 2009a).

Economic activity associated with conservation units in Bristol Bay provides insight into the regional economy. Employment (in terms of average annual jobs) and household income generated by activities associated with the Togiak Refuge are important local economic contributors. These activities include refuge management, public recreation use (fishing, hunting, and non-consumptive activities), commercial fishing, and subsistence uses. For recreational activities, economic significance is determined from visitation and expenditure data for four types of use: fishing, big game hunting, waterfowl hunting, and non-consumptive use (e.g., photography, kayaking). Visitation data used to calculate economic impacts are from mid-1990s records kept by Togiak Refuge and ADFG. Expenditure data are estimated for 1997, based on spending patterns identified in several studies conducted in the late 1980s and early 1990s. In 1997, the total economic significance of Togiak Refuge was estimated at 560 average annual jobs and $20.9 million (Table 3-5) (FWS, 2009a).

Table 3-5. Estimated Economic Significance of Activities Associated with Togiak Refuge in 1997

Activity	Income (1997)	Average Number of Annual Jobs
Commercial Fishing	$14,840,000	333
Recreational Activities		
Fishing	$3,750,000	155
Big Game Hunting	$300,000	1
Non-consumptive Use	$300,000	1
Refuge Management	$1,050,000	32
Subsistence	$880,000	38
TOTAL	**$20,940,000**	**560**

Source: Goldsmith et al., 1998

In addition to the commercial fishing sector, Federal, state and local governments are a major employer in the project area, especially in Dillingham and King Salmon, where federal and state agencies have field offices, and where municipal and borough governments and school districts headquarters are based. The majority of financial support for rural schools, and much of the financial support for local municipal governments, comes from state government as the local tax bases are small in most of the region's communities. Many government positions are relatively high-paying, year-round jobs, which provide some stability to the regional economy that otherwise depends heavily on the seasonal commercial fishing (FWS, 2009a).

In regard to unemployment patterns, from 2000 through 2008, the Dillingham Census Area had the highest level of unemployment in Southwest Alaska, ranging from 7.2 percent to 11 percent throughout the period. The average annual unemployment rate over the last nine years in the Dillingham Census Area has been 9.5 percent. The Lake & Peninsula Borough had average unemployment rates of 6.9 percent from 2000 to 2008 (SWAMC, a2010a).

Communities in the Dillingham Census Area are supported primarily by commercial fishing and subsistence activities. The economic base is small, seasonal, and concentrated on Bristol Bay sockeye salmon fishery. Most of the full-time and private sector jobs are located in Dillingham. There are three onshore seafood processing facilities, thirteen floating processors located east of Dillingham in Nushagak Bay and six more floating processors near Togiak. The private support sector, which includes businesses in construction, transportation, retail trade and service, is steadily growing. Most families in the outlying villages depend heavily on subsistence wild foods. Year-round employment in the villages is generally limited to local government, including schools, and the Alaska Native village organizations (BBNA, 2004).

The Lake Clark National Park and Preserve provides similar recreational pursuits in the region as Togiak Refuge and has a similar impact on the local economy in Nondalton and Port Alsworth. Visitors to the park stay at lodges and use guide services that operate during the summer and fall seasons. The Lake Clark National Park and Preserve's wilderness land characteristics draw photographers, hikers, kayaking/rafting enthusiasts, and hunters and fishermen.

With the headwaters of some regional salmon streams located in Lake Clark National Park and Preserve, its resource management has a direct impact on local fisheries and the local economy, including commercial fisheries of Bristol Bay, recreational fishing, and subsistence fishing. According to the Lake Clark National Park and Preserve's Resource Assessment:

> Wild sockeye salmon anchor the economy, traditional lifeways, and ecosystem. Besides providing economic and subsistence values to the people of Alaska, salmon are the cornerstone of the Bristol Bay ecosystem. In the act of returning to freshwater rivers and lakes, such as Lake Clark, from the ocean and dying in vast numbers, the salmon transport millions of tons of nutrients from the rich marine environment to Alaska's freshwater systems and adjacent uplands (NPCA, 2009).

3.4.1.2 Community Profiles

The following section provides an overview that details the demographics, employment rates, household incomes, subsistence characteristics, and major employers for each community. This information is summarized in Table 3-6.

Dillingham

Located in a traditionally Yup'ik Eskimo area with historic Russian influences, Dillingham is now a dynamic hub community with a population of Alaska Natives and non-Natives. The population was 2,348 residents in 2009. The commercial fishing opportunities in the Bristol Bay area are the focus of the local culture. The median household income was $73,833, per capita income was $34,816, and 9.9 percent of residents were living below the poverty level. The 2009 unemployment rate was 6.9 percent (U.S. Census, 2011).

Dillingham is the economic, transportation, and public service center for western Bristol Bay. Commercial fishing, fish processing, cold storage, and support of the fishing industry are the primary activities. Icicle, Peter Pan, Trident, and Unisea operate fish processing plants in Dillingham. In 2009, 227 residents held commercial fishing permits. During spring and summer, the population doubles for the commercial fishing season. The city's role as the regional center for government and services helps to stabilize seasonal employment. Many residents depend on subsistence activities, and trapping beaver, otter, mink, lynx, and fox provides cash income. Salmon, grayling, pike, moose, bear, caribou, and berries are harvested (ADCCED, 2011).

Goodnews Bay

Goodnews Bay is a traditional Yup'ik Eskimo village practicing subsistence, trapping, and fishing lifestyle. The population of the community was 312 in 2009. The median household income was $33,929, per capita income was $10,787, and 28.8 percent of residents were living below the poverty level. The 2009 unemployment rate was 28.3 percent (U.S. Census, 2011).
The city, school, local businesses, and commercial fishing provide the majority of the income, supplemented by subsistence activities. In 2009, 36 residents held commercial fishing permits for salmon and herring roe fisheries. Many residents engage in trapping. Subsistence use of salmon, seal, Pacific walrus, birds, berries, moose, and bear is an integral part of the lifestyle (ADCCED, 2011).

Nondalton

Nondalton is an inland Dena'ina Athabascan village with a fishing and subsistence lifestyle. The population of the community was 161 in 2009. The median household income was $39,375, per capita income was $10,650, and 47.8 percent of residents were living below the poverty level. The unemployment rate at that time was 4.1 percent (U.S. Census, 2011).

Fishing in Bristol Bay is an important source of income in Nondalton. In 2009, five residents held commercial fishing permits. One source of summer employment is firefighting. The community relies heavily on subsistence hunting and fishing. Many families travel to fish camps each summer. Salmon, trout, grayling, moose, caribou, bear, Dall sheep, rabbit, and porcupine are utilized.

Platinum

This community was founded as a commercial center and due to outside influences local traditions have not been retained as much as in other nearby villages. Platinum is one of the few Eskimo villages in the region in which the first language of local children is English. The population of the community was 24 in 2009. The economy is primarily cash-based. The median household income was $27,912, per capita income was $11,892, and 54.2 percent of residents were living below the poverty level. The 2009 unemployment rate was 62.5 percent (U.S. Census, 2011).

Commercial fishing, the school, stores, and the city provide employment. Platinum is a major supplier of gravel to area villages. In 2009, eight residents held commercial fishing permits. Subsistence activities are also an important part of the lifestyle. Salmon and seal are the staples of the diet. The community is interested in developing a marine repair facility and dry dock, a seafood processing plant, specialty seafood ventures, or herring roe aquaculture project (ADCCED, 2011).

Port Alsworth

The population of Port Alsworth was 135 in 2009 and is primarily non-Native. The median household income was $51,042, per capita income was $15,443, and 9.6 percent of residents were living below the poverty level. The 2009 unemployment rate was zero percent (U.S.

Census, 2011). Port Alsworth offers several lodges and outfitters/guides for summer recreational enthusiasts. In 2009, two residents held commercial fishing permits.

Quinhagak

Quinhagak is a large, predominantly Yup'ik Eskimo village, with vigorous cultural traditions and a continuing reliance on subsistence and commercial fishing. The population of the community was 611 in 2009. The median household income was $38,906, per capita income was $11,048, and 37.4 percent of residents were living below the poverty level. The 2009 unemployment was 27.7 percent (U.S. Census, 2011).

Most of the employment is with the school, government services, or commercial fishing. Trapping, basket weaving, skin sewing, and ivory carving also provide income. Subsistence remains an important part of residents' livelihoods; seal and salmon are staples of the diet. In 2009, 86 residents held commercial fishing permits for salmon net and herring roe fisheries. Coastal Villages Seafood LLC, processes halibut and salmon in Quinhagak (ADCCED, 2011).

Togiak

Togiak is a predominantly Yup'ik Eskimo village, with vigorous cultural traditions. The population was 828 residents in 2009. The median household income was $42,778, per capita income was $10,401, and 25.6 percent of residents were living below the poverty level U.S. The 2009 unemployment rate was 39.5 percent (U.S. Census, 2011).

Togiak's economic base is primarily commercial salmon, herring, and herring roe-on-kelp fisheries. In 2009, 224 residents held commercial fishing permits. There is one on-shore fish processor and several floating processing facilities located near Togiak. The community depends heavily on subsistence activities. Salmon, herring, seal, sea lion, whale, and Pacific walrus are among the species harvested. A few residents trap for furbearers (ADCCED, 2011).

Twin Hills

Twin Hills is a traditional Yup'ik Eskimo village with a fishing and subsistence lifestyle. The population of the community was 44 in 2009. Vacant housing units used only seasonally numbered 1. The median household income was $35,313, per capita income was $21,043, and 20.5 percent of residents were living below the poverty level. The 2009 unemployment rate was zero (U.S. Census, 2011).

Steady employment is limited to those working for the village council and post office. In 2009, seven residents held commercial fishing permits, primarily for salmon, herring, herring roe on kelp, or sac roe. Fishermen use special flat-bottomed boats for the shallow waters of Togiak Bay. Togiak Fisheries and other cash buyers provide a market for fishermen. The community depends heavily on subsistence activities for various food sources. Seals, sea lions, Pacific walrus, whale, salmon, clams, geese, and ducks are harvested. An exchange relationship exists between Twin Hills, Togiak, and Manokotak. Seal oil is exchanged for blackfish. Handicrafts also supplement incomes (ADCCED, 2011).

Twin Hills is primarily accessible by air and water. Regular and charter flights are dispatched from Dillingham. There is a state-owned 3,000 ft long by 60 ft wide lighted gravel runway on a ridge east of the village. Most cargo is delivered by air. There is a boat landing area but no docking facilities; bulk goods must be lightered to shore. Cars, ORVs, and snowmachines are used for local transportation. Residents drive along the beach to access the Togiak Fisheries cannery. A winter trail for snowmachines connects Twin Hills with Togiak (ADCCED, 2011).

Table 3-6 provides a summary of information presented in this section.

Table 3-6. Community Summaries

Demographic Characteristic	Dillingham	Goodnews Bay	Nondalton	Platinum	Port Alsworth	Quinhagak	Togiak	Twins Hills
Population	2348	312	161	24	135	611	828	44
Non-white (number)	1584	285	106	24	8	604	785	39
Non-white (percent)	67.5	91.3	17.4	100	22.5	98.8	94.8	88.6
Median Age	33.7	28.8	17.4	45.4	22.5	29.6	24.3	46.8
Median household income	$73,833	$33,929	$39,375	$27,912	$51,042	$38,906	$42,778	$35,313
Income below poverty level (percent)	9.9	28.8	47.8	54.2	9.6	37.4	25.6	20.5
Unemployed (percent)	6.9	28.3	4.1	62.5	0	27.7	39.5	0

Source: U.S. Census, 2011 and ADCCED, 2010).

3.4.2 Subsistence

In Alaska the term "subsistence" refers to the living traditions of hunting, trapping and fishing, through which rural Alaskan communities, many of them predominantly Alaska Native, continue to derive a significant portion of their food from local resources. The subsistence way of life is not only about food production, for cooperative labor, sharing practices and traditional cultural beliefs are also essential elements. Protecting the subsistence way of life has been a centerpiece of Alaska Native political action since the rise of the Alaska Native land claims movement in the 1960's protection. The resulting interplay of Federal and State statutes and the effects of Federal and State court decisions make for a very complex regulatory framework surrounding contemporary subsistence.

Section 803 of ANILCA defines subsistence uses as:

> The customary and traditional uses by rural Alaska residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of inedible byproducts of fish and wildlife resources taken for personal or family consumption; for barter or sharing for personal or family consumption; and for customary trade (16 U.S.C. § 3113).

Within the proposed project area, each of the affected communities is characterized by active participation in subsistence hunting, trapping, and fishing on federal and state lands in Bristol Bay and the Lake Clark area. The Togiak Refuge developed an overview of the regional subsistence harvest practices in the Togiak CCP (FWS, 2009a), and the BLM provided an overview for BLM- managed lands in the Bay Resource Management Plan (RMP) (BLM, 2008).

3.4.2.1 Subsistence harvest practices near the Togiak Refuge and BLM-managed Goodnews Bay Block

The communities utilizing these lands rely on a wide variety of resources, using traditional harvest strategies focused on the seasons and locations in which particular resources are lively to be available and in prime condition. The following statement exemplifies this seasonal round:

> A wide variety of subsistence activities occur year round on or near the Refuge, and other activities last a short time, depending upon the resource. In late winter, spring, and fall, hunting for seals, Pacific walrus, beluga whale, and waterfowl is common. Fishing for herring, smelt, and char; gathering herring roe deposited on the kelp leaves; and collecting gull and murre eggs are also typical in late spring. As spring progresses and changes to summer, salmon fishing is in full swing, starting with chinook, sockeye, and chum, and then progressing to pink and coho salmon in late summer. Caribou and moose hunting, berry picking, firewood-gathering, and the gathering of other plants are primarily fall activities. As fall progresses, Dolly Varden, lake trout, Arctic char, rainbow trout, round whitefish, Arctic grayling, and pike are targeted; as lakes begin to freeze, jigging through the ice for these fish is common. Animals hunted include ptarmigan, ground squirrel, and brown bear. With winter comes trapping. Fox, mink, wolf, beaver, otter, wolverine, and lynx are the major species trapped. Several areas also have winter hunting seasons for moose and caribou (FWS, 2009a).

Subsistence harvest activities are also characterized by a traditional use area specific for each community. Over generations, residents of a community develop an intricate body of environmental knowledge regarding weather, tides, the marine and terrestrial landscape, as well as the likely distribution and behavior of animals and fish within the area. This information is compiled and shared among generations through traditional stories and traditional place names that allow efficient navigation and communication about this highly valued landscape. An example of the traditional subsistence use area for Togiak, taken from the BLM's Bay RMP (2008) shows the wide ranging area used by a community, and the way in which the area encompasses the locations of the proposed microwave repeater towers and associated staging areas and helicopters transit routes. (Figure 3-6).

Additional details regarding subsistence harvest and sharing practices in this portion of the project area are found in recent studies, including Fall et al. (2009), Holen et al. (2005), and Krieg et al. (2007).

3.4.2.2 Subsistence Fishing practices in Lake Clark

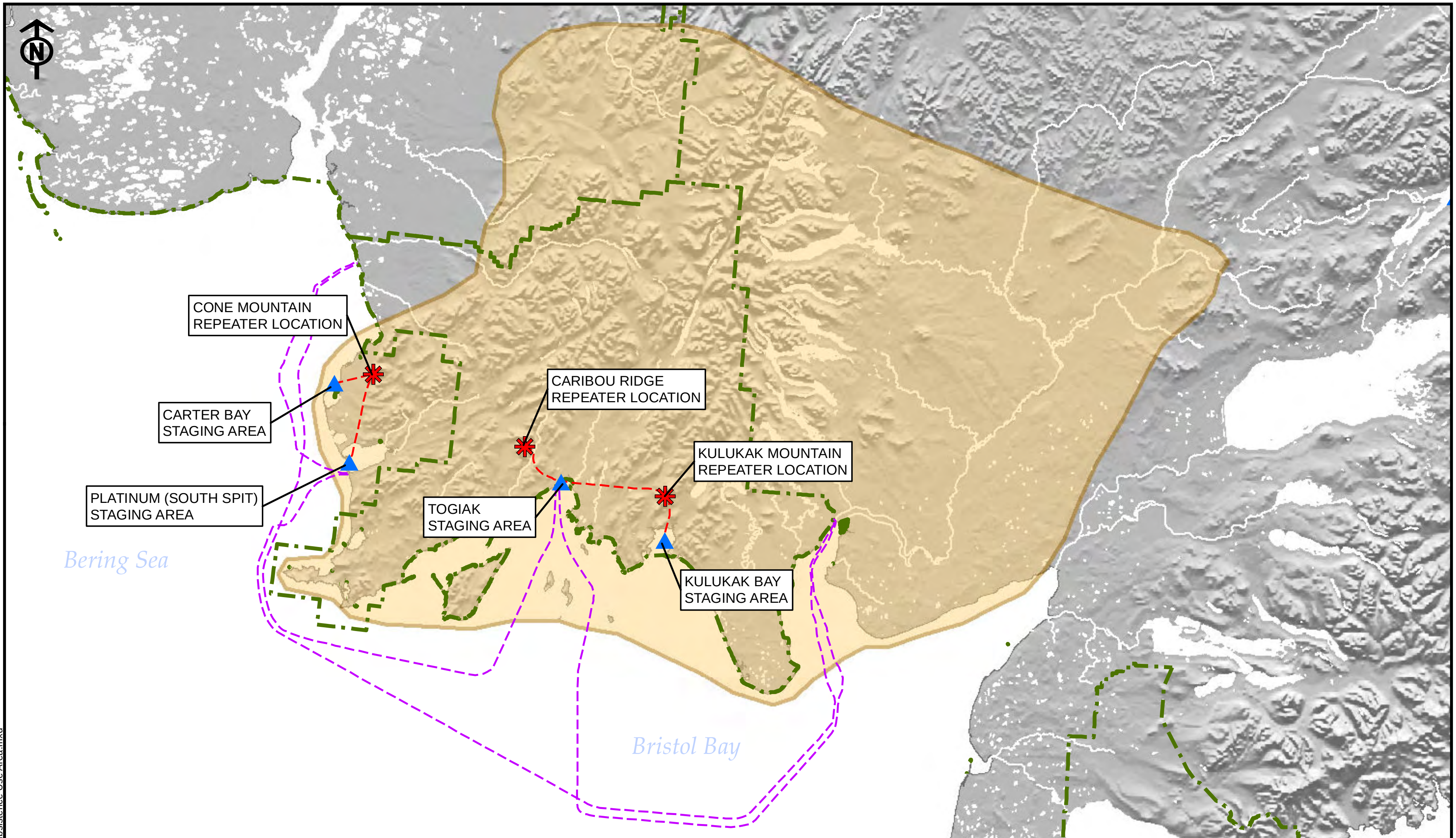
For the Lake Clark portion of the project area, the subsistence resources and season differ, particular in the reliance on salmon and terrestrial mammals. Fishes targeted for subsistence use by residents of Port Alsworth and Nondalton are sockeye salmon, rainbow trout, whitefish, lake trout, Arctic char, Arctic grayling, Dolly Varden, burbot, northern pike and sucker. Subsistence users target northern pike and whitefish in the springtime when the lake is still frozen. Following ice break up, subsistence fishermen move to summer fish camps strategically located to capture salmon as they migrate to their spawning grounds (Gaul, 2007). Humpback whitefish provide year-round local subsistence opportunities as opposed to sockeye salmon which are only available in July and August (Woody and Young, 2006).

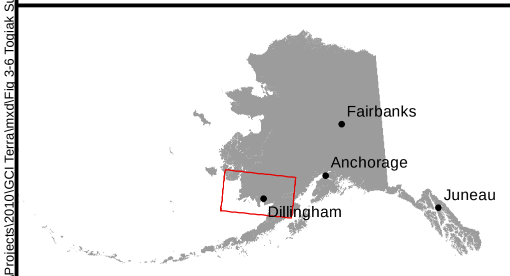
Of particular importance for this EA is the high reliance on subsistence salmon fishing by these communities. In 2004, in Nondalton, some 62% of subsistence harvests were comprised of salmon (out of average household subsistence harvest total of 1,365 pounds usable weight), while the comparable figure for Port Alsworth was 67% (of an average household subsistence harvest 483 pounds usable weight) (Fall et al., 2010).

The seasonal pattern and location of these critical sockeye salmon harvests are characterized in the following statements:

> Bright, pre-spawning sockeye salmon are harvested in Nughil Vetnu (Newhalen River); Ch´qi´un (Alexie Creek); Nundaltin Vena (Sixmile Lake), and at Nughilqutnu (Tazimina River) from late June through late July and at various locations in Qizhejh Vena (Lake Clark) from late July through the middle of August (Stickman et al., 2003).
>
> Most subsistence fishing occurs between Niqanch´qentdeł (Landing) on the Newhalen River and Sixmile Lake, with the greatest concentration of activity taking place at fish camps located immediately below Nondalton near the outlet of Sixmile Lake and at the head of the Newhalen River (Stickman et al., 2003).

More complete details regarding subsistence harvest practices by the communities in the Lake Clark vicinity are also found in Ellanna and Ballutta (1992) and Fall et al. (2006).





Proposed Repeater Location
Approximate Staging Site for Construction
Helicopter Routes
Submarine Cable Route
Togiak Subsistence Use Area
National Wildlife Refuge Boundary

0 10 20 30 40 Miles

Source: USGS; USFWS; GCI; ADNR; BLM; URS

TERRA - Southwest Environmental Assessment

Figure 3-6:
Togiak Subsistence Use Area

April 2011

M:\Projects\2010\GCI Terra\mxd\Fig 3-6 Togiak Subsistence Use Area.mxd

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3.4.3 Land Use

The predominant land uses within the proposed project area include subsistence, commercial fisheries, guided fishing and hunting, and recreational uses. Within the vicinity of the three proposed microwave repeater sites, residents and visitors pursue subsistence hunting, recreational hunting, and non-consumptive recreational activities such as camping, birding, and photography (Section 3.4.6 for discussion of recreational uses). Educators and researchers conduct field education courses and research surveys on Refuge flora and fauna on Refuge lands. Subsistence fishing, recreational fishing, and recreational boating occur within the vicinity of the lake-bed cable in Lake Clark, which would be installed on submerged lands within the boundary of Lake Clark National Park and Preserve. Subsistence fishing and commercial fishing occurs in the vicinity of the staging areas that would be used for the Alternative 2 and Alternative 3 construction activities. The following section provides an overview of land use patterns associated with commercial fisheries and recreational activities, while subsistence uses are described in Section 3.4.2.

Other land owners in the region include Alaska Native regional and village corporations and Alaska Native allotment owners. The Alaska Native corporation land holdings are generally centered on the communities, and beyond the immediate vicinity of the community most of the Alaska Native corporation lands are currently undeveloped. Individual Alaska Native allotments are frequently in areas accessible by water, such as along rivers, and may be in areas historically used by the individual's family group (FWS, 2011b). Many Alaska Native allotment parcels have cabins and subsistence fish processing facilities reflecting a long history of seasonal subsistence use. A small number of mining claims are found in the project area, particularly within the BLM-managed Goodnews Bay Block. Figures 2-2, 2-3 and 2-7 display the land status surrounding the proposed microwave repeater sites and lake-bed fiber optic cable landfall areas.

3.4.3.1 Commercial Fishing

The proposed microwave repeater sites would not be located within the vicinity of commercial fishing activities. However, barge staging areas for construction materials would be located at Carter Bay, Platinum, Togiak, and Kulukak Bay. For Alternative 3, the proposed marine fiber optic cable, including landfalls would occur within the Nushagak and Togiak commercial fishing districts in Bristol Bay and in District 5 (Goodnews Bay) and District 4 (Quinhagak) in the Kuskokwim Management Area. The commercial salmon fisheries activities in these districts include shore-based set gillnets, and small vessels (up to 32 ft in length) employing drift gillnets. The commercial salmon fishery occurs from late May through mid-August. However, the most concentrated effort occurs in the sock-eye salmon fishery, which occurred from June 1 to July 17, 2010 (ADFG, 2010e). The herring fisheries in the Togiak District rely on purse-seine vessels, arriving from other part of Alaska, as well as Bristol Bay salmon fishing vessels employing drift gillnets. The herring fishery in concentrated into a very short time period around the herring spawning, in advance of the commercial salmon seasons. In 2010, the Togiak district herring fishery was opened on May 11, and concluded by May 27 (ADFG, 2010f).

In the further off-shore waters, non-pelagic trawling (trawling on the seafloor) is largely prohibited in state and federal waters in Bristol Bay and Kuskokwim Bay. However, the Northern Bristol Bay Trawl Area is open to trawling from April 1 to June 15 of every year (Fugro Pelagos, 2010). Also well offshore, crab fishing activity is widespread through Bristol

Bay and the Bering Sea and is accomplished by using steel pots dropped on the seafloor. The pots are left stationary with a line extending from each pot to the surface and attached to a buoy marking its location. Crabbing occurs in shallow bays and estuaries and in water depths greater than 100 ft depending on the type of crab targeted (Fugro Pelagos, 2010).

3.4.3.2 Recreational Fishing

For visitors to rivers and lakes found on federal lands in Bristol Bay, both guided and unguided trips are available for sport fishing enthusiasts. The primary sport fish species found within the Togiak Refuge are Chinook, coho salmon, chum salmon, sockeye salmon, pink salmon, Dolly Varden, Arctic char, Arctic grayling, rainbow trout, lake trout, and northern pike. Sport fishing is concentrated during the summer months when a succession of salmon species return to spawn (FWS, 2011b). Lake Clark itself is fished for grayling, lake trout, Dolly Varden, northern pike, and red salmon. Access to Lake Clark is almost exclusively by small aircraft. Float planes land in the many lakes throughout the area, and wheeled planes can sometimes land on beaches and gravel bars (NPS, 2011b).

3.4.3.3 Big Game Hunting and Sport Fishing

The proposed project would occur on lands within Game Management Units 17 and 18 that are managed by ADFG (2011), and areas of the Togiak Refuge and Lake Clark National Park and Preserve (NPS, 2011b). ADFG regulates the seasons, licenses, and bag limits. Primary access to these areas and their river systems is by chartered aircraft. Dillingham is the hub for many of the air taxis that have permits to operate within these areas, with some air taxis also located in the cities of Bethel or King Salmon (FWS, 2011c. For those accessing Lake Clark National Park and Preserve, the hub is Port Alsworth.

Two sport fishing guides conduct fly-in day use trips to the lower Kulukak River during the summer fishing season. These flights originate from lodges in the Wood-Tikchik State Park and the flight path to the lower Kulukak is via either side of the ridge where the proposed tower site is located. Fishing takes place on the lower four to six miles of the river. Several parties each year raft down the lower two-thirds of the Kulukak River each season. These trips are conducted for the purpose of sport fishing, bear hunting, or moose hunting. Parties are picked up by float plane near the mouth of the river. Because of the limited access, areas in the vicinity of the Caribou Ridge proposed tower site receive little on-the-ground use during the snow-free period. Most activity in the area is for hunting via snowmachine during the winter period. There is one big game guide who has a special recreation permit from the BLM for big game hunting with in the area of Cone Mountain. Air-taxi travel through the area would be expected for the purpose of dropping off recreational clients or returning them to Dillingham. Weather often dictates the routes used by air-taxi operators.

3.4.3.4 Wilderness Character and Values (Togiak Refuge)

Under established FWS policies, potential effects on lands with wilderness characteristics or values must be evaluated. Section 304(g) of ANILCA requires FWS to identify and describe the special values of Togiak Refuge, including wilderness values during comprehensive planning efforts. The Wilderness Act (Act) of 1964 recognized wilderness as a resource and established a national system of wilderness lands. The Act defined the fundamental characteristics of wilderness as: "undeveloped, untrammeled, natural, and outstanding opportunities for solitude, or a primitive and unconfined type of recreation."

As directed by Sections 304(g) and 1317 of ANILCA, all Togiak Refuge lands were reviewed during the first refuge planning process in the early 1980s for their suitability for formal wilderness designation. The Record of Decision for Togiak Refuge's CCP (FWS, 1987), recommended that an additional 334,000 acres of the Togiak Refuge be designated as part of the National Wilderness Preservation System. Those areas are near Cape Peirce/Cape Newenham and along the South and Middle Fork of the Goodnews River. This review was updated during revision of the Togiak Refuge CCP (FWS, 2009a). No changes were made to the recommendation as a result of that review update.

Eight areas were again reviewed based on the characteristics of undeveloped, untrammeled, natural and providing abundant opportunities for solitude and primitive recreation (FWS, 2009a). These eight areas are:

- Cape Peirce/Cape Newenham Area
- Hagemeister Island
- Kulukak Bay
- Nushagak Peninsula
- Osviak/Mataogak Rivers Area
- Oyak Creek-Arolik River Area
- South Fork of the Goodnews River Watershed
- Togiak Wilderness Area

Elements of the proposed project would occur in and/or within geographic proximity of these areas (Figure 2-1). These elements would include construction and maintenance operations for both Alternatives 2 and 3 given their proximity to the designated wilderness areas. Table 3-7 provides an overview of which areas are within proximity of the two action alternatives. However, following installation, the submarine fiber optic cable of Alternative 3 leaves no visible impact on the character of the adjacent lands and waters.

Table 3-7. Proximity of Land Wilderness Characteristics to Action Alternatives

Lands with Wilderness Character	Alternative 2	Alternative 3
Togiak Wilderness Area	Within 10 miles of Caribou Ridge Microwave Repeater Site	N/A
Oyak Creek-Arolik River Area	N/A	N/A
South Fork of the Goodnews River Watershed	Within 10 miles of Caribou Ridge Microwave Repeater Site	N/A
Cape Peirce/Cape Newenham Area	N/A	Within 10 miles of cable fiber route
Osviak/Mataogak Rivers Area	Within 10 miles of Caribou Ridge Microwave Repeater Site	N/A
Hagemeister Island	N/A	N/A
Kulukak Bay	Co-located with the staging area	N/A
Nushagak Peninsula	N/A	Within 10 miles of cable fiber route

N/A = not applicable.

The proposed lake-bed fiber optic cable from Nondalton to Port Alsworth would not be located near Lake Clark National Park and Preserve designated Wilderness (Figure 2-7). In addition, following installation, the lake-bed cable leaves no visible impact on the character of the adjacent lands and waters.

3.4.4 Lands with Wilderness Characteristics (Cone Mountain)

The proposed action with regard to Cone Mountain is located on public lands in the vicinity of Goodnews Bay, Alaska described as Seward Meridian, T. 9 S., R. 74 W., Sections 27 and 34. The lands are within the area withdrawn by Public Land Order 5181 (PLO 5181) and are top filed by the State of Alaska. The Cone Mountain area consist of 143,437 acres of which 3,785 acres are under primary selection by either the State of Alaska or the local village and/or regional corporation, 103,432 are currently withdrawn under Public Land Order 5181 and are top filed for selection by the State of Alaska, and 36,220 are BLM-managed lands designated as the Carter Spit ACEC. There are no BLM-managed wilderness areas or wilderness study areas within the Goodnews Bay block (BLM, 2008).The lands involved are also a part of or adjacent to the Carter Spit Area of Critical Environmental Concern (Carter Spit ACEC) (which is a ROW avoidance area that allows ROWs with appropriate resource protection measures

At the time the Bay Resource Management Plan (BLM, 2008), was developed BLM did not evaluate the wilderness characteristics of the lands in the area of potential affect. However under SO 3310, described in section 1.6, the BLM is obliged to examine whether a proposed land use would impact or impair lands with wilderness characteristics (LWC), including the potential to preclude BLM from considering the lands for a future designation as Wild Lands in land use planning efforts. A Wilderness Characteristics Inventory was conducted as part of this planning process (Appendix F). The Inventory included a formal evaluation of the LWC characteristics in the area based on known facts, physical inspection of the lands when possible, knowledge based on available land records, and other ancillary information. The BLM-managed lands at Cone Mountain were determined to be LWC. The following factors are considered in evaluating impacts on LWCs.

Undeveloped

This is the most immediately observable and easily measured wilderness quality. Undeveloped simply means free from roads, structures, and other evidence of modern human presence or occupation. The undeveloped quality strongly influences other core wilderness values, in particular experiential opportunities for solitude and primitive recreation. A lone structure may have only minimal impacts on natural processes while still serving as a constant reminder of human influence for recreational visitors. Certain kinds of structures or improvements may be considered desirable in a given wilderness setting (e.g., trails) or acceptable according to specific legislation, but that does not diminish their negative impact on the undeveloped quality (FWS, 2009a).

Untrammeled

The Wilderness Act states that wilderness is *"an area where the earth and its community of life are untrammeled by man"*. In other words, wilderness is essentially uncontrolled or unrestricted by purposeful human actions. Synonyms for untrammeled include unhindered, unencumbered, free-willed, and wild (Landres et al., 2005). The untrammeled quality of the wilderness resource is diminished when ecological events or processes are constrained or redirected to suit modern human ends (e.g., by suppressing naturally ignited fires or introducing non-native plants or animals) (FWS, 2009a).

Natural

Naturalness is a measure of the overall composition, structure, and function of native species and ecological processes in an area. In contrast to the quality of being untrammeled, the natural condition of an area may sometimes be enhanced through purposeful human action (e.g., to restore an eroded stream bank or eradicate an invasive weed) (FWS, 2009a).

Outstanding Opportunities for Solitude

Solitude in the wilderness context is generally understood to mean freedom from sights, sounds, and other evidence of modern man (Landres et al., 2005). While the relative amount of freedom from these things necessary to *experience* solitude is highly personal and variable, the Wilderness Act states only that outstanding *opportunities* for solitude be provided. Accordingly, encountering other people, hearing mechanized sounds (from aircraft overflights, for example), or seeing the lights of a distant population center are all examples of things that may negatively impact solitude opportunities; while remoteness, low visitor density, and vegetative or topographic screening are things that may enhance solitude opportunities (FWS, 2009a).

Primitive and Unconfined Recreation

Primitive and unconfined recreation occurs in an undeveloped setting and is relatively free from social or managerial controls. Primitive recreation in wilderness has largely been interpreted as travel by nonmotorized and non-mechanical means. Primitive recreation is also characterized by experiential dimensions such as challenge, risk, and self-reliance. Dispersed use patterns, which frequently occur where there are no facilities to concentrate use, enhance opportunities for self-reliance and also enhance opportunities for solitude. Conversely, some actions aimed at maintaining opportunities for solitude, such as restricting visitor access or behaviors, may negatively affect opportunities for unconfined experiences (FWS, 2009a).

The area within which the proposed Cone Mountain site is situated has been reviewed with regard to SO 3310. In reviewing the lands within the area of the proposed action, they were found to contain all of the following wilderness characteristics:

- Size-road less areas of over 5000 acres of contiguous BLM Lands.
- Naturalness-affected primarily by the forces of nature, with the works of human
- substantially unnoticeable to the average visitor.
- Outstanding opportunities for solitude or primitive and unconfined type of recreations.
- As such, these lands fall under the requirement as outlined in the policy section of SO 3310:

> All BLM offices shall protect these inventoried wilderness characteristics when undertaking land use planning and when making project-level decisions by avoiding impairment of such wilderness characteristics unless the BLM determines that impairment of wilderness characteristics is appropriate and consistent with applicable requirements of law and other resource management considerations. Where the BLM concludes that authorization of uses that may impair wilderness characteristics is appropriate, the BLM shall document the reasons for its determination and consider measures to minimize impacts on those wilderness characteristics.

In evaluating LWCs and effects on them it is necessary to understand the definitions of “impact” and “impair’.

- Impact: To make or cause to become worse, or to diminish in value.

- Impair: To preclude the BLM from exercising its discretion to designate an LWC or a portion of an LWC as a Wild Land.

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3.4.5 Transportation

The communities within the proposed project area are arrayed across a vast landscape, often located on coastlines and rivers, reflecting the maritime and commercial fishing history of the region. There are no roads connecting the communities within the proposed project area. The region has daily, year-round air transportation and services provided between Anchorage and the regional hubs of Iliamna, King Salmon, and Dillingham by five commercial airlines and three cargo airlines. Peninsula Airways, Alaska Airlines, and Frontier Aviation provide commercial passenger service from Anchorage to the region, and many small bush airlines fly scheduled and charter flights out of Dillingham, King Salmon, and Iliamna. Most freight is transported via air-cargo or by-pass mail from Anchorage and by barge from Anchorage, Alaska and Seattle, Washington. Within the region, residents travel by personal vehicles, snow machines, 4-wheelers, ORVs, skiffs, and bush airplanes (BBNA, 2004).

Within the Togiak Refuge, transportation is predominantly by airplane, with more limited helicopter activity. Small boats are used for recreational hiking and float trips which occur during the summer, and snowmachines are used during the winter. A special use permit is required to operate commercial aircraft within the Togiak Refuge. Each year Togiak Refuge issues approximately 22 special use permits which allow vendors to operate charters and guide services in and on the Togiak Refuge. Personal aircraft activity is not regulated by the Togiak Refuge and this activity is not monitored or recorded by Togiak Refuge staff. Commercial charter and guide services are often used to support visits by anglers and float trip enthusiasts.

The communities of Nondalton and Port Alsworth are located on Lake Clark. The cable laid in Lake Clark would egress across private lands. The site proposed would not be located near traditional boat launches used by residents, boating and charter guides authorized by NPS, and visitors to the area. Both residents and visitors access Nondalton and Port Alsworth via air and water. Float planes land on Lake Clark; and skiffs and other boats are used for transport of residents, goods, visitors, and for subsistence.

Brief profiles of community transportation facilities follow.

Dillingham

Dillingham can be reached by air and sea. The state-owned airport provides a 6,400 ft long by 150 ft wide paved runway and regular jet flights are available from Anchorage. A seaplane base is available 3 miles west at Shannon's Pond; it is owned by BLM-Division of Lands. A heliport is available at Kanakanak Hospital. There is a city-operated small boat harbor with 320 slips, a dock, barge landing, boat launch, and boat haul-out facilities. This is a tidal harbor and only used seasonally. Two barge lines make scheduled trips from Seattle. There is a 23-mile Alaska Department of Transportation and Public Facilities maintained gravel road to Aleknagik that was constructed in 1960 (ADCCED, 2011).

Goodnews Bay

A state-owned 2,835 ft long by 80 ft wide gravel airstrip is available for chartered or private planes year-round. There are no docking facilities, although locals use boats and skiffs extensively during the summer months. Snowmachines are the primary means of travel during the winter. Winter trails are marked along the Coastal Trail (60.3 mi) and the Arolik Trail (60.1 mi). Barges deliver fuel and other supplies during the summer months (ADCCED, 2011).

Nondalton

Nondalton is primarily accessible by air and water. A state-owned 2,800 ft long by 75 ft wide gravel runway services the community. Scheduled and charter air services are available. Bulk goods are received in Iliamna then taken by the State of Alaska-maintained Iliamna to Nondalton gravel road to Fish Camp, located across from Nondalton on the east side of Six Mile Lake. From there supplies are ferried by skiff or barge to the village on the west side. There are no docking facilities (ADCCED, 2011).

Platinum

The community relies heavily on air transportation for passengers and mail and cargo service. There are two gravel airstrips. One is state-owned and 3,300 ft long by 75 ft wide with a 1,924 ft long by 40 ft wide crosswind runway. The second is a 2,000 ft long by 75 ft wide privately-owned, gravel airstrip. A seaplane landing site is also available. Barge services deliver goods twice a year. Boats, snowmachines, and ORVs are used for local travel and subsistence activities (ADCCED, 2011).

Port Alsworth

There are two privately-owned and -operated airstrips in the area: a 4,200 ft and 100 ft wide gravel airstrip and a 3,000 ft long by 100 ft wide dirt/gravel airstrip operated by Glen Alsworth and The Farm Lodge (ADCCED, 2010).

Quinhagak

Quinhagak relies on air transportation for passenger mail and cargo service. A state-owned 4,000 ft long by 75 ft wide gravel airstrip is available. Float planes land on the Kanektok River. A harbor and dock serves barges deliveries of heavy goods at least twice a year. Boats, ORVs, snowmachines, and some vehicles are used for local transportation. Winter trails are marked to Eek (39 mi) and Goodnews (39 mi) (ADCCED, 2011).

Togiak

A state-owned 4,400 ft long by 75 ft wide lighted gravel airstrip with a 981 ft long by 59 ft wide crosswind airstrip is available. Scheduled and chartered flights are dispatched from Dillingham. Freight is brought in by air or barge and lightered to shore. There are no docking facilities. Skiffs, autos, ORVs, and snowmachines are used for local transportation (ADCCED, 2011).

Twin Hills

Twin Hills is primarily accessible by air and water. Regular and charter flights are dispatched from Dillingham. There is a state-owned 3,000 ft long by 60 ft wide lighted gravel runway on a ridge east of the village. Most cargo is delivered by air. There is a boat landing area but no docking facilities; bulk goods must be lightered to shore. Cars, ORVs, and snowmachines are used for local transportation. Residents drive along the beach to access the Togiak Fisheries cannery. A winter trail for snowmachines connects Twin Hills with Togiak (ADCCED, 2011).

Table 3-8 provides a summary of the methods of transportation employed by local residents and visitors to the communities in the proposed project area.

Table 3-8. Proposed Project Area Transport Capabilities by Community

Community	Aerial Transport	Marine Transport
Dillingham	State-owned airport, paved runway	Small boat harbor
	BLM-owned sea plane base	Dock
	Heliport at Kanakanak Hospital	Barge landing
		Boat launch
Togiak	State-owned lighted gravel airstrip	Barge- freight lightered to shore
Twin Hills	State-owned lighted gravel airstrip	Boat landing area
Platinum	State-owned gravel airstrip	Barge services
	Privately-owned gravel airstrip	
	Seaplane landing	
Goodnews	State-owned gravel airstrip	Boats and Skiffs
		Barge delivery for fuel
Quinhagak	State-owned gravel airstrip	Dock
	Float planes	
Nondalton	State-owned gravel airstrip	Skiff and barge services
Port Alsworth	Two Privately-owned gravel airstrip	None

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3.4.6 Recreation

Visitors to the proposed project area can access undeveloped lands managed by the Togiak Refuge, BLM and the Lake Clark National Park and Preserve, as well as other state and private owned lands for a variety of recreational purposes. These include:

- Bird-watching
- Fishing
- Flight-seeing
- Hiking, Backpacking, and Eco-touring
- Hunting
- Photography
- River Rafting and Kayaking
- Wildlife Viewing

Recreational attractions to the area include the scenic beauty, variety of terrain, animals, traditional harvest methods employed by subsistence users, and anglers visit for recreational and sport fishing. Visitors may view fish and wildlife, ranging from brown bears and Pacific walrus to tiny shorebirds. A popular area for wildlife viewing is Cape Peirce, at the extreme western edge of Bristol Bay, an area of rocky cliffs and rugged beaches. Visitors have the opportunity to see Pacific walrus, spotted and harbor seals, and a variety of nesting seabirds including horned and tufted puffins, common murres, pelagic cormorants, and black-legged kittiwakes. Both local residents and visitors enjoy viewing at least 214 staging, migrating, or breeding bird species. Bird species groups that can be observed in the area include landbirds, shorebirds, seabirds, raptors, and waterfowl. Birds from the North American Pacific Flyway and several Asiatic routes migrate through this area (NPS, 2011b and FWS, 2011b).

Backpackers who visit the remote portions of the project area can experience a true backcountry experience in that there are only occasional game trails, which require hikers to orient themselves using maps and compasses. Another method for visitors to enjoy the backcountry occurs by kayaking and rafting the lake and river systems. Access to much of the remote portion of the proposed project area requires air transport. Local guides and outfitters provide flight seeing tours to visitors that include views of winding channels of rivers and streams, some dammed by beavers, huge stretches of tundra or brushy wetlands, and snow-capped mountains (FWS, 2011b).

3.4.6.1 Wildland Recreation

Recreationalists and visitors who travel to designated wilderness and remote areas of Bristol Bay experience wilderness where the natural environment is largely empty of human traces (e.g., noise, light pollution, and visual profiles). To protect these characteristics, visitors are asked to observe Leave No Trace practices. This means proper disposal of human waste, burning of trash, scattering of fire ring and fire elements, and otherwise ensuring that no other visitors can identify that visitors have camped or used the area (FWS, 2011b).

3.4.6.2 Guided Fishing and Big Game Hunting

The proposed project area includes world-class recreational hunting and fishing lands. With 1,500 miles of streams and rivers, and over 500 lakes larger than 25 acres, Togiak Refuge offers some of the finest remote sportfishing in the world. Visitors come from throughout the U.S. and the world to stay at renowned lodges and to participate in exceptional recreational fisheries. The

Kanektok, Goodnews, and Togiak rivers are among the most productive destinations for anglers in Togiak Refuge. Chinook, sockeye, chum, pink, coho salmon as well as Dolly Varden char, arctic char, arctic grayling, rainbow trout, lake trout and northern pike occur in waters within the proposed project area at various times throughout the year (FWS, 2011b). Within Lake Clark National Park and Preserve fishing opportunities occur at Two Lakes, Twin Lakes, Telaquana Lake, and Turquoise Lake. Lake Clark itself is fished for Arctic grayling, lake trout, Dolly Varden, northern pike, and red salmon. Other lakes that provide opportunities for recreational fishing include Kontrashibuna, Crescent, Portage, Lachbuna, Kijik, Fishtrap, and Tazimina Lakes, in addition to many smaller lakes (NPS, 2011b).

Visitors who access fishing, hunting, and recreational pursuits in the region are local residents, Alaskans, U.S. citizens from other states, and international visitors. The latter two categories pay a considerable fee to travel to, stay in, and obtain permits to access these fishing and hunting resources. They consider the region's pristine beauty a unique attribute. According to the Togiak Refuge CCP, "Most anglers surveyed in 1995 and 2001 indicated that they expected to find "primitive recreation" within the Togiak Wilderness, defined as a setting "where one can expect to find solitude and very few traces of previous use." On average, surveyed anglers expected a more primitive setting than what they actually encountered on the Refuge.

Both Lake Clark National Park and Preserve and Togiak Refuge offer subsistence and sport hunting opportunities, including caribou, moose, brown bears, wolves, waterfowl and upland game birds. More than 150,000 caribou from two different herds are found on Togiak Refuge seasonally (Section 3.3.3). Hunting guide services are available for some species, and unguided hunting is also popular. Nonresident brown bear hunters are required to use the services of a registered guide (NPS, 2011b and FWS, 2011c).

There are currently 33 registered guides with permits to provide services in Togiak Refuge. Of these, there are 3 eco-touring outfitters; 2 big game guides; 16 sport fishing guides; and 1 big game and air taxi guide. The remaining 11 permitted users are air taxi services. BLM previously issued a permit for the Cone Mountain area to one registered guide service. There are 23 registered guides with permits to operate in Lake Clark National Park and Preserve.

3.4.7 Noise

Existing noise levels in the environs of the proposed microwave repeater sites are low, while ambient noise levels in the vicinity of nearby population centers (Section 3.4.1) are influenced by man-made (anthropogenic) noise sources, being higher than ambient noise levels in undeveloped areas. The following sections provide information on acoustics and noise measurement, relevant laws, ordinances, regulations, and standards related to environmental noise, and the existing noise environment in the vicinity of the proposed project.

3.4.7.1 Acoustics

Noise is generally defined as loud, unpleasant, unexpected, or undesired sound that is typically associated with human activity and interferes with or disrupts normal activities. Although exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to typical environmental noise exposure levels is annoyance. The responses of individuals to similar noise events are diverse and influenced by many factors including the type of noise, the perceived importance of the noise, its appropriateness to the setting, the time of day and the type of activity during which the noise occurs, and noise sensitivity of the individual.

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air, and are sensed by the human ear. Sound is generally characterized by several variables, including frequency and amplitude. Frequency describes the sound’s pitch (tone) and is measured in cycles per second (Hertz [Hz]), while amplitude describes the sound’s pressure (loudness). Because the range of sound pressures that occur in the environment is extremely large, it is convenient to express these pressures on a logarithmic scale that compresses the wide range of pressures into a more useful range of numbers. The standard unit of sound measurement is the decibel (dB).

Typical sound levels of familiar settings are depicted in Figure 3-7 and include the approximate decibel levels of commonly known sound sources (NPS, 2007). It should be noted that the decibels are logarithmic and a difference of 10 decibels is perceived as a doubling or halving of loudness. The range of audible sound levels for humans is generally considered from 0 – 130 dBA. Sound sources in Figure 3-7 that have no associated distance listed are at typical operational distances. More information on sound and sound measurements is found in Appendix G: Background Material for Analysis of Noise.

dBA	Perception	Outdoor Sounds	Indoor Sounds
130	Painful		
120	Intolerable	Jet aircraft at 50 feet (ft)	Oxygen torch
110	Uncomfortable	Turbo-prop at 50 ft	Rock band
100		Jet fly over at 1,000 ft	Blood-curdling scream
90	Very noisy	Lawn mower/nearby thunder	Hair dryer
80		Diesel truck 50 miles per hour (mph) at 50 ft	Food blender
70	Noisy	2-stoke snowmobile 30 mph at 50 ft	Vacuum cleaner
60		4-stroke snowmobile 30 mph at 50 ft	Conversation
50	Moderate	Croaking raven flyover at 100 ft	Office
40		Snake River at 100 ft	Living room
30	Quiet	Summer backcountry	Quiet bedroom
20	Very quiet	Winter backcountry	Recording studio
10	Barely audible	Below standard noise floor	
0	Limit of audibility	Quiet winter wilderness	

Figure 3-7. Approximate decibel levels of commonly known sound sources. **Source: NPS, 2007**

3.4.7.2 Applicable Laws, Ordinances, Regulations, and Standards

There are a number of laws and guidelines at the federal level that direct the consideration of a broad range of noise issues, including the Noise Control Act of 1972 and EPA recommendations regarding environmental noise levels. Because the project does not fall within the purview of the Federal Energy Regulatory Commission, the proposed project is not directly subject to federal noise regulations other than the Occupational Safety and Health Administration. More information on applicable laws, regulations, and standards is located in Appendix G: Background Material for Analysis of Noise.

3.4.7.3 Existing Noise Conditions

The proposed microwave repeater sites would be located in lands owned and managed by FWS and BLM. Ambient noise levels vary throughout the proposed project area that would be used for project equipment staging, construction and operation. Noise levels vary based on population density, distance to nearby traffic (trucks, snow mobiles, 4-wheelers, ORV's, aircraft flight patterns, nearby wildlife (for example, passing waterfowl), natural features (water), weather and other various conditions. The three proposed microwave repeater sites are located in undeveloped areas where the only sources of noise would be expected to occur from natural sources.

Since a majority of the lands around the staging areas are scarcely populated, low ambient noise levels can be expected along much of the project. No empirical data are available to definitively document ambient noise levels at the site affected by the proposed project. In an EIS prepared by BLM (2002), it is stated that typical ambient noise levels in sparsely populated rural areas can range from 15 dBA to 45 dBA L_{eq} (21 dBA to 51 dBA L_{dn}) (BLM, 2002). These measures take into account changes in sound levels over a 24 hour period, and not just minimum or maximum sound levels (See Appendix G for explanation of the dBA L_{eq} measurement). Other research has provided empirical measures of sound levels in remote backcountry locations, including 30dBA in summer backcountry and 20dBA in winter backcountry (NPS, 2007), as shown in Figure 3-7.

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3.4.8 Visual Resources

3.4.8.1 Introduction

The analysis area for visual resources focused primarily on the proposed installed infrastructure, and includes all the areas located within 10 miles of each proposed microwave repeater site (Figure 3-8). The majority of the analysis are situated in the Togiak Refuge and managed by the FWS. A portion of the analysis area is located on public lands managed by BLM in the vicinity of Goodnews Bay. The installed infrastructure may be visible from ground level and from the air, while passing nearby in transit. A discussion of the analysis of Key Observation Points for each proposed microwave repeater site is included in Appendix H. During the construction period, helicopters taking equipment, materials, and personnel to the microwave repeater tower sites, would also be visible (See Figures 2-2 and 2-3 for helicopter flight paths).

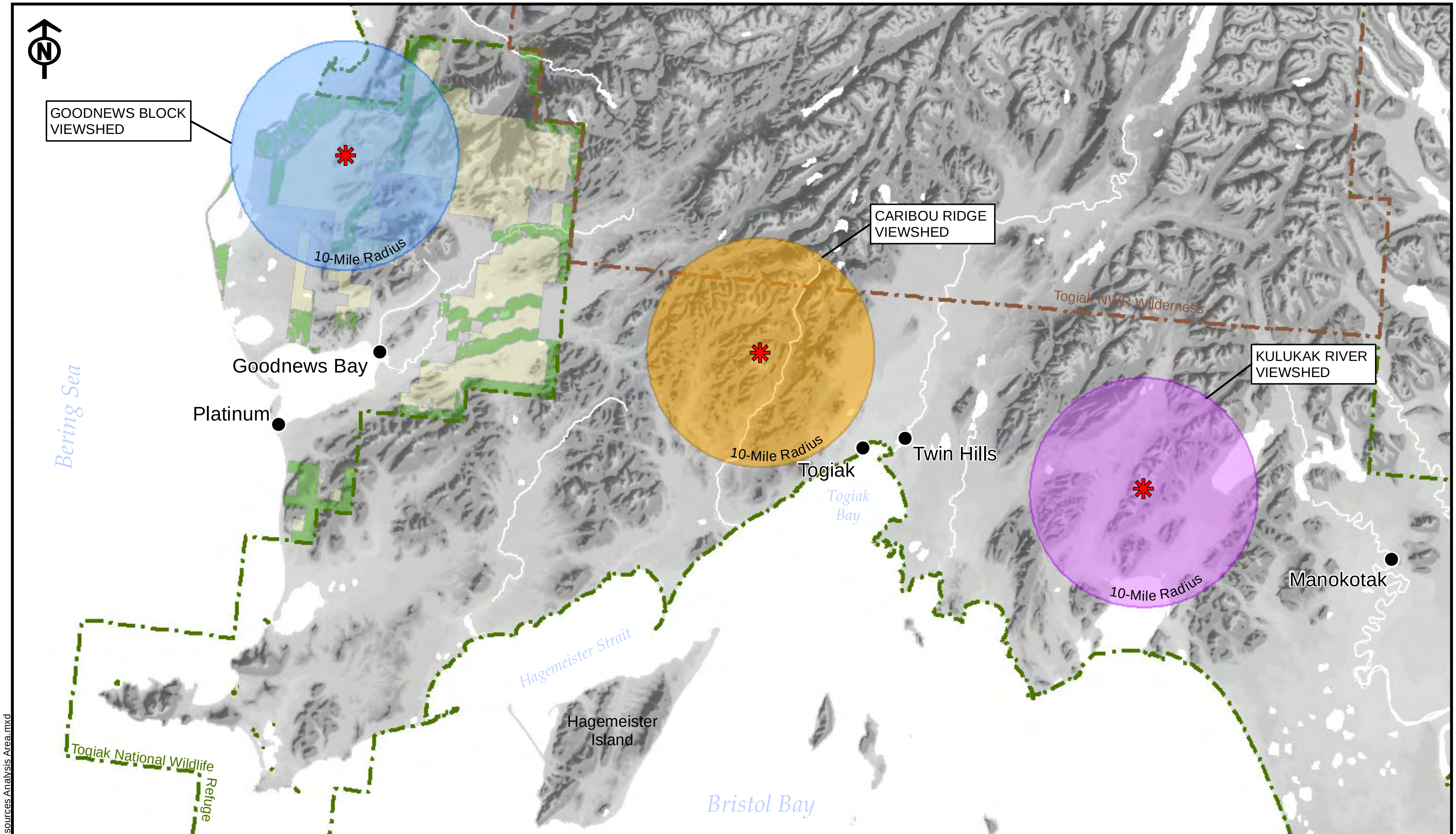
3.4.8.2 Regulatory Setting

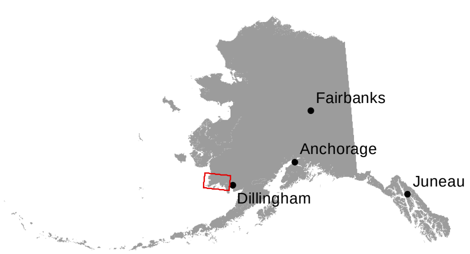
Visual resources within Togiak Refuge are managed under the terms of the CCP (FWS, 2009a), which addresses Section 304(g) of ANILCA. Section 304(g) of ANILCA requires the FWS to identify and describe special values of Togiak Refuge. A stated goal of the CCP is to "minimize the visual impacts of refuge development and use. All activities and facilities on the Refuge will be designed to blend into the landscape to the extent practical". An additional goal is to "Protect the integrity of the natural and cultural resources of the Refuge."

Visual resources on BLM -managed lands are managed according to Visual Resource Management (VRM) System (BLM, 1984). Lands located within the analysis area are managed according to Class III and IV objectives, defined below:

> VRM Class III Objective: Partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view.
>
> VRM Class IV Objective: Provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high but every attempt should be made to minimize the impact of activities.

Finally, visual resources within the Togiak Wilderness are managed under the terms of the Wilderness Act of 1964 (16 U.S.C 1131 1136) and the Wilderness Stewardship Policy (FWS, 2008c). The Wilderness Stewardship Policy indicates that the natural, scenic condition of the land should be maintained.





Proposed Repeater Location
Visual Resource Management Class
Visual Resource Management Class
Togiak NWR Wilderness Boundary
Togiak NWR Boundary
Goodnews Block Viewshed
Caribou Ridge Viewshed
Wood River Mountains Viewshed

0 5 10 15 20 Miles

Source: USGS; USFWS; GCI; ADNR; BLM; URS

TERRA - Southwest Environmental Assessment

Figure 3-8:
Alternative 2 - Visual Resources Analysis Area

April 2011

M:\Projects\2010\GCI Terra\mxd\Fig 3-8 Visual Resources Analysis Area.mxd

3.4.8.3 Landscape Character

Landscape character is defined as the overall impression created by an area's unique combination of features, such as land, vegetation, water, and existing structures (cultural modification). Although considerable overlap exists among visual resources present across the analysis area, it was divided into three primary viewsheds for the purposes of this discussion. Each viewshed was centered on a proposed microwave communication tower, described as follows: (1) Goodnews Block, (2) Caribou Ridge, and (3) the Kulukak River. The landscape across all viewsheds is enclosed, due in large part to the numerous peaks of the Ahklun Mountains. All areas are natural in appearance, with no roads present on lands administered by the Refuge (FWS, 2009a). Each viewshed is described below in terms of predominant landform, vegetation, and existing structures.

The Goodnews Block Viewshed

The Goodnews Block viewshed is centered at the proposed the Cone Mountain microwave repeater site. This viewshed includes portions of the Ahklun Mountains located between the Goodnews River to the east, and the Kuskokwim Bay to the west. The area is primarily administered by BLM (BLM, 2007). The area is characterized by the dramatic visual relief of the of the Ahklun Mountains as they rise from the extensive coastal plain of the Kuskokwim Bay to the west, and the broad river plain of the Goodnews River to the east. The terrain of the Ahklun Mountains in this area varies from steep, to more gentle tundra-clad slopes. Cirques and other glacial features, rock outcrops, talus slopes and cliffs are also common in the area (BLM, 2007). The mountainous terrain creates dominant diagonal lines in the landform, in contrast to the oval to elliptical shapes created by wetlands of the coastal plain.

Vegetation in the Goodnews Block viewshed is dominated by shrubs and tundra. Trees are limited to the broad riverine bottoms and along various tributaries where alder and willow predominate. Expansive tundra-covered coastal plains are bisected by sinuous west-flowing waters including the Indian River and Cripple Creek which flow into the Kuskokwim Bay on the western side of the Goodnews Block (BLM, 2007). The dominant color hues of non-winter months include yellows and browns, with more vibrant greens observed in lowland areas.

The Goodnews Block viewshed is undeveloped, with the exception of a winter trail located along the coastline of Kuskokwim Bay, and a trail extending north into the Ahklun Mountains from Goodnews Bay. When viewed from the air, this area appears remote, rugged, and expansive, with high degree of naturalness.

Caribou Ridge Viewshed

The Caribou Ridge Viewshed is centered at the proposed Caribou Ridge microwave repeater site. The viewshed is located on the eastern edge of the Ahklun Mountains, northwest of Togiak Bay. The viewshed includes Refuge lands and a small portion of the Togiak Wilderness (FWS, 2009a). Predominant landforms off the viewshed include the southern portion of the Gechiak Mountains; the Matiogak, Quigmy, and Kukaklik rivers and the broad Togiak River valley. The predominant lines created by the mountains are diagonal, in contrast to the bold horizontal line where the mountains intersect with the lowland river valleys. The rivers create curving lines that extend for up to 5 miles.

Vegetation in the Caribou Ridge viewshed is dominated by low-growing shrubs and moist tundra (FWS, 2009a). Trees and larger shrubs are present in river valleys. The dominant color hues of non-winter months include yellows and browns, with more vibrant greens observed in lowland areas. Seasonal color variation is most prominent in river valleys, where large trees and shrubs are found.

The Caribou Ridge Viewshed is undeveloped, with the exception of the towns of Togiak and Twin Hills, both of which include landing strips. A winter trail connecting the town of Goodnews Bay, located to the west, and Togiak Bay passes through the southern portion of the viewshed. When viewed from the air, this area appears remote, rugged, and expansive, with high degree of naturalness.

Kulukak River Viewshed

The Kulukak River Viewshed is centered at the proposed Kulukak microwave repeater site. The viewshed is located within Togiak Refuge lands situated east of Togiak Bay, in the southern portion of the Wood River Mountain Range. Predominant landforms include the Wood River Range, the Kulukak River valley to the west, and Ualik Lake to the east. Numerous smaller drainages intersect the viewshed in a predominantly north-south trending orientation. The predominant lines of the mountains are diagonal, with a horizontal line created where the mountains meet the lowland river valleys. The wetlands and other waterbodies of the Kulukak River basin are curvilinear, oval and elliptical. A strong horizontal and gently curving line is also created from the shoreline of Ualik Lake. The mountains are largely vegetated, with the exception of the upper portions, where expose rock appears coarse and grey in color. Waterbodies are luminous, with variable color hues. The Kulukak River Viewshed is undeveloped, with the exception of a winter trail connecting the towns of Manokotak and Togiak which crosses the Kulukak River about one mile upstream from Kulukak Bay. When viewed from the air, this area appears remote, rugged and expansive, with high degree of naturalness.

3.4.8.4 Viewer Sensitivity

Visual sensitivity is defined as a measure of public concern for the scenic quality of a given area, (BLM, 1984) and the landscape character for each land administrative area. Visual sensitivity across the analysis area was estimated as high, medium or low based on criteria described in BLM Manual 8410 (BLM, 1984). The criteria include the following:

- Type of Users
- Amount of Use
- Public Interest
- Adjacent Land Uses; and
- Special Areas.

The primary viewer groups within the analysis area include local residents, seasonal workers (fishing industry), and recreational/guided fishermen and hunters. Local residents include Alaska Native (Yup'ik Eskimo) populations, who rely heavily on natural resources for subsistence. Fishing is the primary recreational use in the area, attracting visitors from around the world. Recreational visitors place a high degree of importance on the "wilderness setting where they can view scenery and wildlife…" (FWS, 2009a). A survey of non-resident anglers documented that some consider aesthetic conditions, including scenery and solitude, to be important factors when choosing a fishing location (FWS, 2009a). Visitors target locations including the Kanektok River, Kagati Lake, the Goodnews River, Goodnews Lake, the Togiak River drainage, and Cape Pierce (Section 3.4.6). The recreation experience includes is destination-based, but includes the experience of traveling by air to a remote destination. Air travel routes, such as that leading from Togiak north to Togiak and Kagati Lake, are commonly used by outfitters to transport passengers to these remote areas by plane. Such air travel is typically at low elevations (~2,000 ft), where views are vast but distinct landscape features are noticeable.

Viewer sensitivity in the analysis area is assumed to be high based on the following rationale:

- The area is a highly valued recreational destination that is experienced from air and land
- The area is used by local residents for traditional subsistence purposes
- The area includes lands in the vicinity of the formally designated Togiak Wilderness
- The Refuge is managed for preservation of scenic quality

In confirmation that viewer sensitivity is high, a number of recreational visitor business operators and their clients submitted comments on the Public Draft EA, expressing their very high regard for the undeveloped characteristics of the lands they visit in the Togiak Refuge. For more information, see Appendix C.

3.4.8.5 Climate

Weather conditions in the analysis area vary throughout the year. The intersection of the maritime climate of the Bering Sea, and that of Interior Alaska, results in the majority of the year being overcast or cloudy. It is assumed that visibility is reduced for large portions of the year, with the greatest visibility achieved during the spring and summer months, when precipitation is lowest (FWS, 2009a).

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3.4.9 Cultural Resources

Aboriginal Alaska Native peoples have occupied the proposed project area for at least 9,000 years. Over these centuries, the first occupants adapted to local ecological conditions, establishing seasonal and longer-term settlements. The cultural resources of the region reflect this long-term occupation, and the contemporary Alaska Native peoples of the project area, the Yup'ik of the Bristol Bay the Inland Dena'ina of the Lake Clark region, value this story of survival and adaptation.

Under NEPA, the analysis of environmental effects must include "historic and cultural" effects (43 CFR Part 46 and 40 CFR Part 1500). More specifically, Section 106 of the National Historic Preservation Act (NHPA) of 1966 requires the federal government to consider the effects of a federally funded, licensed of permitted activity on any eligible historic property.

3.4.9.1 Methodology

Methods employed to examine cultural resources within the proposed project area included two literature reviews: one for the three proposed microwave repeater tower sites, and a second that focused on terrestrial and submerged cultural resource presence and potential along or in the vicinity of the lake-bed landfall areas and marine cable routes. These reviews were followed by site surveys during July-August 2010 at the three TERRA-SW Project proposed microwave repeater tower sites.

The literature reviews involved examination of numerous databases listing potential and known terrestrial and submerged cultural resources, including Alaska Heritage Resource Survey site files, BLM and ADNR lands records, Bureau of Indian Affairs Archaeology site files, BIA-ANCSA 14(h)(1) historical places and cemetery sites, Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE, formerly Minerals Management Service) Alaskan shipwreck database, and the National Oceanic and Atmospheric Administration Automated Wreck and Obstruction Information System (THRC, 2010a and 2010b).

The Area of Potential Effect (APE) for the site surveys at the three proposed microwave repeater tower sites expanded considerably from specific tower locations in order to provide useful data should any changes in tower placement occur. The survey method was limited to pedestrian surface investigation over the widened APE (THRC, 2010a).

3.4.9.2 Terrestrial Cultural Resources

During the pedestrian site surveys conducted at the three proposed microwave repeater tower locations on FWS and BLM-managed lands, there were no cultural resources identified at any location. Surveys were conducted with 100 percent ground visibility. While these mountain areas could have historically served as lookout spots, Yup'ik place names for the Bristol Bay region, gathered from oral histories and cemetery sites and historical places applications, do not include locations near these three proposed tower locations (THRC, 2011a).

There is one on-shore locations associated with the lake-bed fiber optic cable component within the project area. The Port Alsworth submerged cable landing was subject to cultural resource field surveys in 2010 and no historic properties (as defined by Section 106 of the NHPA) were identified at these locations (THRC, 2011b). Table 3-9 identifies the 9 known terrestrial cultural resources within 1-2 miles of the Lake Clark APEs. Eight of these locations are within one mile of the APE, and seven are within one mile of the landing. There are five locations with buildings/structures, two locations with cemeteries or burials, and two locations listed as eligible for the National Registry of Historic Places (NRHP).

Table 3-9. Known Terrestrial Cultural Resources within 1-2 Miles of Lake Clark APEs

Location	AHRS #	Buildings	Cemetery	NRHP-eligible	Within one mile of landing
Port Alsworth	XLC-030*	X			X
	XLC-031*	X			X
	XLC-049*	X	X		X
	XLC-050*		X		X
	XLC-103*				X
	XLC-160*	X		X	
	XLC-182*	X			
	XLC-216*				X
	XLC-250*				X

Source: THRC, 2010b
* locations within one mile of APE
National Register of Historic Places (NRHP)

There are four locations identified for marine fiber optic cable landings within the proposed project area. Field surveys were conducted in the Dillingham (Kanakanak) and Platinum at a potential tower location, but the survey did not extend to potential landings toward the shorelines (THRC, 2011b). Table 3-10 identifies the 43 known terrestrial cultural resources within 1-2 miles of the APEs for Dillingham (Kanakanak), Togiak, Platinum and Quinhagak. Thirty six of these locations are within one mile of the APE, and thirty-three are within one mile of the landing. There are 17 locations with buildings/structures, six locations with cemeteries or burials, and one location listed as NRHP-eligible.

Table 3-10. Known Terrestrial Cultural Resources within 1-2 Miles of the Dillingham (Kanakanak), Togiak, Platinum and Quinhagak APEs.

Location	AHRS #	Buildings	Cemetery	NRHP-eligible	Within one mile of landing
Dillingham (Kanakanak)	DIL-012*				X
	DIL-054*		X		X
	DIL-055*				X
	DIL-180*		X		X
	DIL-181*		X		
	DIL-182*				X
	DIL-187*	X			X
	DIL-188*	X			
	DIL-189*	X			

Location	AHRS #	Buildings	Cemetery	NRHP-eligible	Within one mile of landing
	DIL-190*	X			X
	DIL-234*	X			X
	XNB-030	X			
Togiak	GDN-201*				X
	GDN-202*				X
	GDN-206*				X
	GDN-209*				X
	GDN-193*				X
	GDN-194*				X
	GDN-195*				X
	GDN-207*				
	GDN-208*		X		
	GDN-017	X			
	GDN-203				
Platinum	GDN-001*				X
	GDN-217*				X
	GDN-239*			X	X
	GDN-249*				X
	GDN-251*	X			X
	GDN-252*	X			X
	GDN-253*	X			X
	GDN-254*	X			X
	GDN-255*	X			X
	GDN-256*	X			X
	GDN-257*	X			X
	GDN-258*	X			X
	GDN-259*	X			X
	GDN-260*	X			X
	GDN-218		X		
	GDN-234				
	XHI-090				X
	XHI-091				X
Quinhagak	GDN-242*				X
	GDN-245*		X		X

Source: THRC, 2010b
* locations within one mile of APE

3.4.9.3 Submerged Cultural Resources

Potential submerged cultural resources within the lake-bed or marine portions of the TERRA-SW Project area may be either prehistoric or historical in nature. Potential prehistoric submerged cultural resources could include submerged habitation sites in areas formerly above water, and coastal sites such as fish traps or weirs. Historical submerged cultural resources could include shipwrecks, sunken aircraft, or land-based industrial sites such as docks and jetties (THRC, 2011b).

A bathymetric survey of the lake-bed fiber optic cable route at Lake Clark was conducted in August 2010. The area was assessed for its archaeological probability, and the potential for both prehistoric and historical cultural resources. The bathymetric data indicated that the submerged terrain where submarine cables would be buried does not appear to have landforms that possess physiographic and environmental characteristics where archaeological sites are likely to occur. However, in areas where submarine cable would need to be trenched into the subsurface, the State Historic Preservation Office has required further cultural resource investigations on past projects, so additional cultural resource work could be necessary.

A literature search and research identified 49 known submerged cultural resources in the greater northern Bristol Bay region from the Nushagak River west and Kuskokwim Bay. The resources have all been identified as shipwrecks in the BOEMRE database. The location and current state of preservation of these 49 known shipwrecks within the project area associated with a marine fiber optic submarine cable is unknown. Apart from the shipwrecks database, there is no other survey work or other database with which to identify submerged cultural artifacts along the seabed cable corridor. Certain submerged features, such as submerged terraces near paleo-river channels, lakes, lagoons and pale-shorelines can be considered of medium-high probability for cultural resources (THRC, 2011b).

3.4.9.4 Traditional Cultural Properties

A Traditional Cultural Property (TCP) documentation process was also undertaken for the TERRA-SW Project regarding the environs of the three mountaintop locations proposed for microwave repeater towers. This included identification of federally-recognized tribes and other appropriate Alaska Native stakeholder entities that might attach religious and cultural significance to historic properties in the area of potential effects, and gathering and interpreting culture historical data to evaluate any potential affects to the cultural environment.

According to the National Park Service (1998):

> The traditional cultural significance of a historic property … is significance derived from the role the property plays in a community's historically rooted beliefs, customs, and practices … A traditional cultural property, then, can be defined generally as one that is eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community.

The TCP documentation covers the specific mountaintop repeater locations and the surrounding landscape within the reasonable viewshed of the proposed towers. The area of focus was identified as more expansive than just the mountaintop locations with the idea that the visible presence of a microwave repeater tower could impact traditional cultural beliefs or practices occurring nearby, thereby impacting the overall integrity of the place.

Mountains in Southwest Alaska are routinely considered by social scientists as potential TCPs. Fairly recent research has documented some traditional land use locations in this part of the Bristol Bay region through Yup'ik placenames gathered in the 1980s and 1990s from ANCSA Section 14(h)(1) applications for conveyance of cemetery sites and historical places, and during oral histories with Native elders (THRC, 2011c).

A combination of 19 tribes, Native corporations, and regional tribal consortia were originally consulted regarding TCPs, representing a large portion of the Bristol Bay region, stretching from Nushagak Bay on the southeast to Quinhagak on the northwest. Alaska Native entities with which consultation was initiated include:

- Aleknagik Traditional Council
- Aleknagik Natives Ltd.
- Arviq, Inc. (Platinum)
- Association of Village Council President
- Bristol Bay Native Association
- Bristol Bay Native Corporation
- Choggiung Ltd.
- Curyung Tribal Council
- Kuitsarak, Inc. (Goodnews Bay)
- Manokotak Village Council
- Manokotak Natives Ltd.
- Native Village of Goodnews Bay
- Native Village of Kwinhagak
- Platinum Traditional Village Council
- Qanirtuuq, Inc. (Quinhagak)
- Togiak Native Corporation
- Togiak Traditional Council
- Twin Hills Native Corporation
- Twin Hills Village Council

In October 2010, these groups were sent a TCP consultation package by regular mail, which consisted of an explanatory/descriptive letter and area maps. This delivery was followed up with email communication and subsequent telephone calls through March 2011. This consultation did not resulted in the identification of any TCPs within the area of impact. While there are some recorded place name locations approaching the general proximity west of Cone Mountain and south of Caribou Ridge and Kulukak Mountain toward Togiak and Kulukak bays, none of those places are within or near viewsheds of the three proposed repeater locations (THRC, 2011c).

3.4.10 Environmental Justice

Under Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, federal agencies are to develop strategies to address environmental justice concerns in their approach to their regular operations. Federal agencies:

> shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.

Under EPA implementing policies the intention is to insure fair treatment, which means that no group of people, including racial, ethnic, or low-income groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs or policies. This requires identifying whether disproportionately high and adverse effects to human health or environmental effects would fall upon minority or low-income populations, which includes Native American or Alaska Native communities (EPA, 1998).

Section 3.4.1 (Socioeconomics) provides an overview of the nearest communities to the proposed project area. The communities potentially affected by the proposed action are predominantly Alaska Native, with lower incomes than Alaska and U.S. averages. As a result of these socioeconomic characteristics, the analysis of environmental consequences of the proposed action and alternatives in Section 4.4.10 (Environmental Justice) will determine whether there are disproportionate adverse impacts on these communities as a result of the proposed project.

4.0 Environmental Consequences

This section provides an evaluation of the potential effects or impacts of each of the alternatives on the resources described in the issue statements presented in Section 1.4.4. Issues to be Addressed.

4.1 Introduction

The direct, indirect, and cumulative impacts are described for each issue (impact topic) and where applicable by project phase (construction, operation and decommissioning). The impacts for each issue are based on the intensity (magnitude), duration, and context (extent) of the impact. Summary impact levels (negligible, minor, moderate, or major) are given for each issue. Definitions are provided below.

4.1.1 Impact Factors and Ratings

Intensity

Low: A change in a resource condition is perceptible, but it does not noticeably alter the resource's function in the federal lands ecosystems, cultural context, or visitor experience.

Medium: A change in a resource condition is measurable or observable, and an alteration to the resource's function in the federal lands ecosystems, cultural context, or visitor experience is detectable.

High: A change in a resource condition is measurable or observable, and an alteration to the resource's function in the federal lands ecosystems, cultural context, or visitor experience is clearly and consistently observable.

Duration

Temporary: Impacts would last only a single season or for the duration of discreet activity, such as construction of a trail (generally less than two years).

Long-term: Impacts would extend from several years up to the life of the plan.

Permanent: Impacts are a permanent change in the resource that would last beyond the life of the plan even if the actions that caused the impacts were to cease.

Context

Common/ Local: The affected resource is not rare and not protected by legislation. The portion of the resource affected does not fill a unique role. Impact would occur only at a limited site or immediate surroundings and would not extend into the region.

Important/ Regional: The affected resource is protected by legislation or is rare within the locality or region. The portion of the resource affected does not fill a unique role within the locality or region. Impact would affect the resource at a regional level, extending well beyond the initial impact site.

Unique/ Statewide:	The affected resource is protected by legislation and the portion of the resource affected uniquely fills a role within the locality or the region. Impact would affect the resource on a state-wide or national level, extending well beyond the region.

The Togiak Refuge purposes, outlined in Section 1.3.2, include conservation of many fish and wildlife populations and their habitats. While this is part of the legislative context, the rating of context must also take into account whether the species affected fills a unique ecological role in the locality or region. Where a resource is widespread through the Togiak Refuge and the surrounding region, the context will be rated as common. However, if a species is protected by statute, such as the MMPA or ESA, or if the population affected fills a unique ecological role, then the rating would be important or unique.

4.1.2 Summary Impact Levels

Summaries about the impacts on the resource synthesize information about context, intensity, and duration, which are weighed against each other to produce a final assessment. While each summary reflects a judgment call about the relative importance of the various factors involved, the following descriptors provide a general guide for how summaries are reached.

Negligible:	Impacts are generally extremely low in intensity (often they cannot be measured or observed), are temporary, and do not affect unique resources.
Minor:	Impacts tend to be low intensity or of short duration, although common resources may have more intense, longer-term impacts.
Moderate:	Impacts can be of any intensity or duration, although common resources are affected by higher intensity, longer impacts while unique resources are affected by medium or low intensity, shorter-duration impacts.
Major:	Impacts are generally medium or high intensity, long-term or permanent in duration, and affect important or unique resources.

4.1.3 Cumulative Impacts

Cumulative impacts are the additive or interactive effects that would result from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions (40 CFR 1508.7). Interactive impacts may be either *countervailing* – where the net cumulative impact is less than the sum of the individual impacts or *synergistic* – where the net cumulative impact is greater than the sum of the individual impacts. Cumulative impacts were assessed by combining the potential environmental impacts of the alternatives with the impacts of projects that have occurred in the past, are currently occurring, or are proposed in the future within the TERRA-SW Project area.

4.1.3.1 Past Actions

In the vicinity of the TERRA-SW Project there are several communities in the Lake Clark/Lake Iliamna area, as well as communities across Bristol Bay, from Dillingham to Quinhagak. These regions are characterized by small communities, with hubs in Iliamna and Dillingham. The modern development history of the region has been marked by the rise of the commercial salmon fisheries of Bristol Bay starting in the late 19th century. A variety of generally small-scale mining efforts emerged across the region during the mid-20th century. Government services and appropriations for capital improvements emerged as important economic sectors in the post-WW II era, with significant public investments in schools and health and safety facilities during the last three decades. The visitor industry has become an important sector in the past several decades (FWS, 2009a). The region remains remote to the larger population centers of Alaska, and local communities are not connected by roads. Instead the region relies on aircraft and marine transportation. In the telecommunications sector, RCA Alascom installed satellite-based telecommunication systems throughout the region in the late 1970's. Earth-stations and satellite dishes brought telephone and television services to most regional communities.

4.1.3.2 Present Actions

In the recent decade since 2000, population and economic growth has slowed, as the commercial salmon industry adjusted to new world market conditions set in motion by the rise of farmed salmon. After significant reductions in value in the late 1990's due to international market effects of farmed salmon, the Bristol Bay commercial fishing sector has shown recovery in recent years. Significant reductions in public sector spending have affected local government employment and services. Rising energy costs have also added strain to local economies.

Fixed wing aircraft flights occur daily throughout the project area, including air-taxis and charter services between the hubs at Iliamna and Dillingham and surrounding villages. Seasonally, general aviation services to support the visitor industry are widespread, including remote lodges and recreation activities. Helicopter use is more limited, and is generally associated with specific resource exploration or development projects.

Current efforts to upgrade telecommunications facilities include the DeltaNet project on the Y-K Delta. Initiated in 2005 with a multi-million dollar grant from the Regulatory Commission of Alaska, this project provided improved broadband access to 47 villages.

As discussed in Sections 1.2, 1.3.1 and 1.6, in components not under review in this EA, the TERRA-SW Project would link broad-band services in Southcentral Alaska across Bristol Bay and to the DeltaNet on the Y-K. Facilities in the DeltaNet would be upgraded and services would be improved. These additional components include a submarine cable from Homer to Williamsport, an overland fiber optic cable from English Bay to Pile Bay, submarine cables from Pile Bay across Lake Iliamna, and overland cables from Igiugig to Levelock, and a microwave repeater site in the Muklung Hills, north of Dillingham (See Figure 1-1). In the analysis of cumulative effects, the potential contributions of the tower sites under review in this EA to additive or synergistic effects of the whole TERRA-SW project will be identified.

4.1.3.3 Reasonably Foreseeable Future Actions

The term, Reasonably Foreseeable Future Action (RFFA), is used in concert with the Council on Environmental Quality (CEQ) definitions of indirect and cumulative effects, but the term "reasonably foreseeable" itself is not further defined in the regulations. For this analysis, RFFAs are those actions that are likely or reasonably certain to occur. Often, they are based on publicly available documents such as existing plans, permit applications, or announcements. Actions may also be reasonably foreseeable if they are uncertain in some aspects but probable. Potential actions which are considered speculative or are not likely to occur are not considered reasonably foreseeable.

The population of communities in the Bristol Bay region is not currently projected to grow significantly in coming decades. The government sector is expected to remain flat or slightly decline, continuing recent trends into the next several decades. Capital project funding in the affected villages is expected to be modest. The visitor industry may grow slightly.

The Southwest Alaska Municipal Conference 2009 Listing of Capital Improvement Projects shows four capital projects in Dillingham that had secured funding amounting to $4.2 million (of full project costs estimated at $58 million). Projects included school renovation, water and sewer and road improvements, as well as a community center (SWAMC, 2010a). No funded Capital Improvement Projects were shown for the near future for Togiak or Goodnews Bay.

In the telecommunication sector, providers have developed proposals for two projects to expand rural broadband service. However, neither proposal has currently secured funding. The Kodiak Kenai Cable Company has developed a proposal for a fiber-optic cable service it terms the Northern Fiber Optic Link. This would extend submarine fiber optic cables from Kodiak Island to the Aleutian Islands, Western Alaska, and the Arctic (SWAMC, 2010b). GCI prepared an application for funding for the TERRA-Northwest project, which is designed to extend terrestrial broad-band service to Norton Sound and Kotzebue Sound. This project is designed to connect into an existing fiber optic cable along the Dalton Highway creating a ring from Anchorage to Southwestern and Northwestern Alaska (K. Johnsen, Personal Communication). As both proposals lack funding commitments, they must be characterized as speculative rather than reasonably foreseeable.

The TERRA-SW microwave repeater tower locations make them candidates for additional antenna systems, including meteorological stations and similar remote systems. The installation of these options would be reviewed under separate permit applications. The applicant is aware of the potential for these add-on features and has designed the facilities to accommodate them, if new permits are approved. These actions would not change the footprint or design of the facilities. Methods used to install these features cannot be forecasted at this time. It is unknown whether or not each additional antenna would be installed separately or if the permit stipulations would require them to be bundled and installed during annual maintenance, thereby mitigating potential impacts from additional helicopter flights. As no additional components are proposed or funded currently, they must be characterized as speculative rather than reasonably foreseeable future actions.

Currently in the exploration and pre-permitting studies phase, the Pebble Limited Partnership is examining a world-class copper, gold, and molybdenum resource outside of Nondalton in the Lake and Peninsula Borough. The Pebble Limited Partnership is investing significant sums of money in the exploration phase, and if this project were to proceed to development, it would be a major economic force in the region. However, the project is controversial, with strong opposition expressed by those reliant on the commercial salmon fishery, while some communities seek the benefits of broader economic diversification. At this time, the Pebble project cannot be classified as reasonably foreseeable. Moreover, a project of this magnitude would most likely include its own telecommunications infrastructure, along with access roads and power infrastructure.

With approved permits from U.S. Army Corps of Engineers and BLM, Platinum Creek Mine has been exploring their claims, located south of Platinum, since 2009. The company accesses the site using a road connecting from the airport in Platinum and fixed winged aircraft to land on a dirt airstrip at the site of operations. In current activities the Platinum Creek Mine employs local residents of Platinum in a variety of support jobs. In 2009, the company brought in mining equipment using a barge that moored at Platinum. Platinum Creek Mine has other mining claims in both BLM and FWS lands, and is currently working with those agencies and the U.S. Army Corps of Engineers to develop a Plan of Operations to expand to those adjacent lands within the next 5 to 10 years. Should the agencies permit expansion, the area may see an increase in economic opportunities (i.e., employment) and air and barge traffic. Because these permits are not yet applied for or approved, the expansion of the Platinum Creek Mine exploration program cannot yet be classified as reasonably foreseeable.

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4.2 Physical Environment

4.2.1 Meteorology and Air Quality

4.2.1.1 Alternative 1 – No Action Alternative

Direct and Indirect Impacts

Under Alternative 1 (No Action) the three microwave repeater sites and fiber optic cable would not be built or installed; thus there would not be an increase in pollutant emissions from project-related construction or operational equipment. There would be no direct or indirect impacts to air quality as a result of Alternative 1.

Cumulative Impacts

With no direct or indirect impacts to air quality under Alternative 1 there would be no contribution to cumulative impacts to this resource.

Conclusion

Implementation of the No Action alternative would have no impact upon air quality.

4.2.1.2 Alternative 2 - Hybrid Fiber Optic/Microwave

Direct and Indirect Impacts

Construction

A direct impact to air quality would occur from mobile emission sources which would be the heavy equipment used during the 150 day construction period and during ongoing operation activities. Construction activities at Cone Mountain, Caribou Ridge, and Kulukak Mountain would temporarily require the use of fueled equipment for placement of the towers, communication equipment shelters, power module shelters, and fuel tanks. The construction area footprint varies for the three microwave repeater sites, from 30,000 sq ft at Caribou Ridge and Kulukak Mountain to 58,075 sq ft at Cone Mountain. Taken together the three sites would have a total area subject to disturbance during construction of 118,075 sq ft or 2.71 acres. The excavation areas, in which project components would be installed, are about one-tenth of the construction area. The excavation areas range from 3,500 sq ft at Caribou Ridge, to 4,000 sq ft at Kulukak Mountain and 4,800 sq ft at Cone Mountain, along with 60 ft X 60 ft helipads at each site. Taking the three sites together the total area in which excavation and project component installation would take place is 23,100 sq ft or 0.53 acres.

Construction crews for placement of the microwave repeaters would consist of approximately two crews of 4 to 5 workers. For purposes of discussion regarding air quality, there is not a need to break out the construction activities for each site into separate locations because the construction activities and duration of emissions from equipment used are expected to remain constant regardless of location.

Emission sources from heavy equipment and fuels expected to be used during microwave repeater construction may include the following:

- Mini Backhoe – Kubota 3200 or equivalent: used for site excavation and material handling. In addition, capstan winches can be attached to the backhoe to support tower erection.
- 185 CFM air compressor: used for leveling of competent rock (with jackhammer attachment) as well as drilling of rock anchor holes (with 60 pound drill attachment).
- Two Diesel generators 10 kW portable Honda generators would be used for camp and tool power.
- Two Robinson R-44 helicopters used for crew transport and light freight. R-44 may also be used for tower erection support if weather permits with approximately 30 to 40 flights expected per site during construction.
- Bell UH-1B "Huey" helicopter used for medium sized lifts and initial material/supply for transportation to the sites (including tower steel). These would also be used when camps are taken down upon completion. Approximately 60 flights are expected per site for the UH-1B helicopter during construction.
- Boeing Chinook 234: heavy lift; twin rotor helicopter would be used for the transport of both shelters and fuel tanks from staging areas noted above. Four flights per site are expected for the Chinook (two for shelters and two for fuel tanks during construction).

UUI would be transporting eight 55 gallon drums of fuel to each site. Once transported, the fuel would be stored and used for construction of the project at each location. The fuel type includes six55 gallon drums of diesel and 2-55 gallon drums of gasoline. The 4 drum poly storage buildings have integrated containment and are covered to prevent rain/fuel mixing and the containment capacity is 62 gallons (Table 2-1).

Construction at each microwave repeater site and placement of the fiber optic cable at the landfall egress is expected to occur over a 150 day construction period. All site equipment would be transported by barge to Southwest Alaska in late May to a location in the vicinity of the project sites, and all camp and foundation materials would be transported to the sites via helicopter (Bell UH-1B).

Also during construction, backhoes, trucks and four wheelers would be utilized to transport materials and crews from mobilization and staging areas. Equipment and materials would be shipped to the project sites in consecutive stages during construction of each microwave repeater site. The two 10 kW diesel generators would be used for camp facilities during construction. The primary mobile emission sources during construction would include exhaust emissions from heavy construction equipment, associated construction vehicles, worker commuting vehicles (helicopters), and fugitive dust from disturbed areas due to grading, excavating, constructing the microwave sites, backfilling, helicopter use, and restoring the disturbed areas. The construction activities would be the same at each microwave repeater site and include rock drilling (as needed), and excavation, delivery and installation of concrete at the pads, installation of the towers and placement of associated infrastructure (shelters and fuel tanks).

The Port Alsworth lake-bed cable landfall area would be disturbed during installation of the fiber optic cable through trenching and/or plowing and emission sources could include backhoes and/or excavators, trucks, a rock saw, splicing truck and trailer, a four wheel small off-road vehicle (a four wheeler), D-9 winch cat, D-6 reel/plow, drills, water trucks, an auger and a pile driver. In addition, a ditchwitch and bucket truck would be used for specific tasks and pickup trucks would be used to transport construction crews. Construction crews for placement of the fiber optic cable would consist of approximately four workers.

Fugitive dust emissions would be expected to occur at the tower sites during construction. Specifically, clearing, excavation, material handling, storage of soils, backfilling, and wind erosion on exposed surfaces would all create fugitive dust emissions. It is likely that winds at the tower sites would disperse any potential pollutants, though winds may also stir up dust. Mitigation measures would be incorporated, as needed, to minimize fugitive dust emissions as much as possible. Some of these mitigation measures could include wetting areas to be disturbed (as needed), and reduced vehicle speeds to 10 miles per hour in staging areas. Incorporation of these typical mitigation measures greatly reduces fugitive dust emissions at construction sites. Impacts from the construction activities that would emit fugitive dust are expected to be low in intensity and temporary in duration.

The proposed construction emissions and the corresponding impacts to air quality are expected to be relatively constant over a construction period of 150 days. Impacts during construction from equipment emissions are expected to be low in intensity, temporary in duration and common in context and are not likely to adversely impact air quality of the project area. Therefore, the impact of construction of the three microwave sites and installation of the fiber optic cable at the landfall area is considered negligible.

Operations

No emissions are expected as a result of operation of the lake-bed optic fiber cable component. Operation of the three microwave repeater sites would result in a direct impact of emissions from mobile and stationary sources. Stationary emissions would be from the generators located at each of the three sites. The generators would be contained in the power module shelter and are planned to be two (2) Cummins D1703-M (model DSKAA – 9-kW) diesel generators each would be outfitted with a hospital grade silencer. Fuel would be supplied to the generators by two 4,500 gallon fuel tanks at each site. The generators are projected to consume between 7,000 to 7,200 gallons of diesel #1 per year per site (Table 2-2). Although capable of generating up to 9 kW, the generators would be expected to normally run at less than half this capacity (around 4 kW), stepping up to about 5 kW when the backbone capacity is upgraded to a full 2.4 Gigabit/second.

Mobile emission sources would be the helicopters that would transport fuel to resupply the generators (once a year) and transport crews to perform maintenance visits approximately twice a year (spring and fall). Helicopters planned to be used for this purpose are a Bell UH1B. Annually, approximately 14 round trip helicopter flights would be required for refueling, with the refueling effort lasting 2-3 days per site (Table 2-3). For all three sites, this would represent approximately 42 round trip helicopter flights over 6-9 days annually during the 25-year life of the project.

Impacts to air quality from operation are expected to be low in intensity, long term in duration (life of the project) and common in context, and are not likely to adversely impact air quality of the region significantly. Therefore, the impact of operation of the proposed three microwave sites and presence of the fiber optic cable at the lake-bed cable landfall during operation is considered negligible.

Decommissioning

Impacts of decommissioning activities would be expected to be similar to construction and are considered negligible. Decommissioning activities would be similar to construction impacts. Impacts during construction from equipment emissions are expected to be low in intensity, temporary in duration and common in context and are not likely to adversely impact air quality of the project area.

Hazardous air pollutants

Hazardous air pollutants (HAPs) are created as a combustion byproduct when fuel is burned in combustion sources. The amount of HAPs emitted depends on the type and quantity of fuel consumed. Coal and diesel fuels typically emit more HAPs than natural gas, but the rates of HAP emissions are typically very small when compared to the criteria pollutant emissions. There are likely to be small amounts of HAP emissions from the vehicles used during construction and generators and helicopter usage for routine maintenance during operation. There are currently no state-operated HAP monitoring stations in Alaska. Impacts from the fuel-burning activities that might create HAPs are expected to be low in intensity, temporary to long term (25 year life of project) in duration, and localized, affecting resources that are common in context. Together these effects are considered negligible.

Greenhouse gases

Some gases in the atmosphere affect the Earth's heat balance by absorbing infrared radiation. This layer of gases in the atmosphere functions much the same as glass in a greenhouse (i.e., both prevent the escape of heat). This is why global climate change is also known as the "greenhouse effect." Increased emissions of these gases due to combustion of fossil fuels and other activities have increased the greenhouse effect, leading to global warming and other climate changes. Gases responsible for global climate change are carbon dioxide (CO2), chlorofluorocarbons (CFCs), methane, and nitrous oxide (N2O). It is widely accepted that continued increases in greenhouse gases (GHG) would contribute to global climate change, although there is uncertainty concerning the magnitude and timing of future emissions and the resultant warming trend. Human activities associated with industrial manufacturing, utilities, transportation, residential, and agricultural sectors contribute to these GHG. Emissions of CO2 and N2O are byproducts of fossil fuel combustion. Methane, a highly potent GHG, results from off-gassing associated with agricultural practices, landfills, and wastewater treatment.

Unlike criteria air pollutants and HAPs, which are pollutants of regional and local concern, global warming is a global problem and GHGs are global pollutants. Impacts of GHG emissions are a function of their total atmospheric concentration and most GHGs are globally well mixed atmospheric constituents. This means that the location of a particular GHG emission does not change its local environmental impact.

Urban areas frequently have numerous construction projects ongoing at any one time. These construction projects incorporate equipment that burn fossil fuel and create GHG emissions. Also, residences and businesses are heated with fuel oil and wood which also create GHG emissions. Given the global nature of GHGs and their ability to alter the Earth's climate, it is not anticipated that a single development project would have a measurable effect on global climate conditions. Construction of this project is expected to last 150 days and GHG emissions from this project are expected to be fairly small during operation and life of the project (25 years).

This project would not be expected to have a measurable effect on global warming over the life of the project. Impacts from the activities that would emit GHG are expected to be low in intensity, temporary in duration, and common and local in context. GHG emissions were calculated for the diesel engines at the three proposed microwave repeater sites combined assuming both engines at each site would operate continuously throughout the year at half capacity (4.5 kW per engine). The calculated CO_2 emissions from this activity come out to about 65 tons per year. This is far below the emission threshold of 100,000 tons per year that was recently specified by EPA for triggering federal permitting requirements for sources of GHG emissions. In fact, according to EPA website, 64 tons per year is roughly equivalent to the GHG emissions associated with annual electricity use in about 8 typical US homes (EPA, 2011). Emissions of GHG during construction would occur at a higher rate for the larger equipment fleet (helicopters), but this would occur over only the construction period and during scheduled annual maintenance and refueling flights.

Cumulative Impacts

Past actions that have impacted the project area and RFFAs that could occur within the project area are described in Section 4.1.3. Past and present actions that have or could impact air quality include emissions from facilities, gravel roads (fugitive dust) in the larger communities and regional general aviation traffic. Emissions in small quantities have had, and would likely continue to have, temporary to short-term impacts on area air quality. Future actions that could impact air quality are uncertain and speculative, rather than reasonably foreseeable and therefore were not considered. The contribution to cumulative impacts to air quality from the proposed project resulting from past, present, and RFFAs is expected to be negligible given the short duration that sources of emissions would be used for project construction and the low level of emissions that would occur in connection with project operations, including maintenance and refueling activities. The project components under direct review in this EA are not expected to make a negligible contribution to cumulative effects for air quality from the TERRA-SW project components installed on State and private lands.

Conclusion

While fuel combustion equipment would be required for construction and operations of Alternative 2, the associated emissions would occur at a low rate. Effects could be further reduced by using wind energy as a supplemental power source, if determined feasible based on site-specific wind and climate data to be collected for three years at the microwave repeater sites. In consideration of the cumulative impact to region air quality over the 25 year life of the project, the summary impact would be considered negligible.

4.2.1.3 Alternative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable

Direct and Indirect Impacts

Construction

Installation of the fiber optic cable under Alternative 3 would require the use of barges or vessels for cable laying. These mobile emission sources would be used during cable laying for a short period of time during installation. Impacts from the activities that would emit mobile emissions are expected to be low in intensity, temporary in duration, and common and local in extent.

Operations and Decommissioning

Impacts that occur as a result of operation of the fiber optic cable would be associated with emissions from barges or other vessels used for periodic repairing submarine cables and from power generation to support operation of optical equipment. The applicant estimates that two repairs to the underwater cable would be required over the system lifetime. A vessel capable of hoisting, repairing and repositioning a submarine cable is not materially different from one needed to place the submarine cable in the first instance. Vessels required for construction were discussed in the Supplemental Information for UUI Right-of-Way Application to Place Two Microwave Towers in the Togiak National Wildlife Refuge (UUI, 2011).

In addition to repair vessels, each fiber terminal would require approximately 2kW raw DC power for optical equipment. Accounting for rectifier inefficiency and the anticipated power draw to meet building HVAC requirements, generation at each site would be provided by diesel engines rated at 3-4 kW, or approximately 12-16 kW for the four terminals of the marine cable alternative.

Since power generation for Alternative 3 would be comparable to the expected actual generation for Alternative 2, the associated emissions of both air pollutants and greenhouse gases would be roughly the same in either case. Emissions from barge equipment during construction and operation likely would be low in intensity, temporary in duration and common in context, and are not likely to adversely impact air quality of the region to a significant degree. Impacts from project decommissioning would be similar to those for construction. Therefore the impacts to air quality due to construction, operation, and decommissioning under this alternative are considered to be negligible.

Cumulative Impacts

Past actions that have impacted the project area and RFFAs that could occur within the project area are described in Alternative 2. The contribution to cumulative impacts to air quality from Alternative 3 is expected to be negligible given the short duration that sources of emissions would be used for project construction and the low level of emissions that would occur in connection with maintenance activities during project operations.

Conclusion

While fuel combustion equipment would be required for construction and operations of Alternative 3, the associated emissions would occur at a low rate, and this alternative would not be expected to adversely affect air quality and is considered negligible.

4.2.2 Geology and Soils

4.2.2.1 Alternative 1 – No Action Alternative

Direct and Indirect Impacts

Under implementation of Alternative 1, no direct or indirect impacts to soils would occur since no excavation or ground disturbance would occur at the proposed microwave repeater station facilities or through annual fueling activities staged from Quinhagak and Togiak. Under Alternative 1, no disturbance occurs at the staging areas at Kulukak Bay, Carter Bay, and Togiak for facility construction activities, and no disturbance occurs within the Nondalton to Port Alsworth submarine corridor.

Cumulative Impacts

With no direct or indirect effects to soils expected under Alternative 1, there would not be a contribution to cumulative impacts on these resources.

Conclusion

Implementation of Alternative 1 would have no direct or indirect impact to soils.

4.2.2.2 Alternative 2 - Hybrid Fiber Optic/Microwave

Direct and Indirect Impacts

Construction

Implementation of Alternative 2 would disturb a total of less than 2.71 acres of shallow subsurface soil for the three sites together at Cone Mountain, Caribou Ridge, and Kulukak Mountain and at the construction staging areas at Carter Bay, Platinum, Togiak and Kulukak Bay. Of that total, 0.28 acres would be affected by project excavation and installation of facilities, with 0.53 acres affected if the helicopter landing area is included. Direct impacts on soils as a result of Alternative 2 would be of high intensity in a small, localized area and would include excavation, grading and compaction, and direct loss of soil cover by exposure in the area of the new facilities, and exposure of soils to localized runoff and erosion.

Another potential impact to soil could arise from an uncontained release of fuel or other hazardous materials. Alaska lands are regulated by the Alaska Department of Environmental Conservation in accordance with Alaska Administrative Code (AAC), Title 18, Chapter 75-Oil and Other Hazardous Substances Pollution Control (18 AAC 75) (ADEC, 2008). The risk and impact of an uncontained release is reviewed in Section 4.2.4 as are the measures to reduce this risk.

Operations and Decommissioning

Direct impacts from the initial project activities would be highest during construction, but would be reduced in the period following the installation, during annual refueling and operation and maintenance activities. Direct impact from construction activities and disturbance of vegetation would expose new soil and rock exposing soil to erosion due to potential channelization of runoff. Revegetation is extremely slow in arctic alpine environments and so the impact is of long duration, possibly the life of the project. The disturbance impacts would be repeated with decommissioning.

Indirect impacts on soils would occur under this alternative; however, these impacts would be minor. Examples of indirect impacts could be the subsequent or longer term alteration of permafrost characteristics in the local areas following construction of the microwave repeater stations, if those areas contain permanent frozen ground. Direct and indirect impacts at the staging areas in Carter Bay, Platinum, Togiak, and Kulukak Bay would be highest during construction, but would be reduced in the period following the installation and during annual refueling and operation and maintenance activities, during which Quinhagak and Togiak would be the staging sites. No direct or indirect impacts to surface or shallow subsurface soils would occur within the submerged portions of the Nondalton to Port Alsworth submarine cable corridor with the Lake Clark landfall area. However, during construction activities both direct and indirect impacts to soils would occur at the land-based portions near shore at the Port Alsworth egress points, and would be highest during construction activities and minor following installation. Direct impacts on soils would be of high intensity to a small, localized area (less than an acre for both egress points) and would include excavation, grading and compaction, and direct loss of soil cover by exposure in the area of the ingress and egress points. Examples of indirect impacts could be the longer term alteration of permafrost characteristics in the local ingress and egress points, if those areas contain permanent frozen ground.

Cumulative Impacts

Actions that may have impacted soils at the three microwave repeater sites and staging areas include past, present, and future helicopter-supported resource exploration activities involving drilling rig placement, operation, fueling, and demobilization. Present activities also include hand dug soil exploration test pit advancements conducted in support of the TERRA-SW Project in September 2010. Cumulative impacts related to these activities include the mobilization of equipment, fuel, and supplies, advancement of exploratory borings, and erosion of soil due to potential channelization of runoff. RFFAs that may occur within the project area may be related to recreational hunting. Impacts from these activities would be highest during peak spring, summer, and fall months, however are considered to be negligible.

The implementation of Alternative 2 could directly result in disturbance of ground cover on a total for all three sites of up to 2.71 acres of regionally common soils. The area subject to excavation for installing project components would total 0.28 acres for all three sites, or 0.53 acres if the helicopter landing areas are included. The soils that would be lost as a result of past and present (ongoing) activities are a protected habitat on refuge land by regulation and would likely be permanently altered. The project components under direct review in this EA would make a negligible contribution to cumulative effects for geology and soils from the TERRA-SW project components installed on State and private lands, since all components are small in footprint and widely dispersed across a large area.

The cumulative negative impacts attributable to implementation of this alternative would be considered minor and permanent.

Conclusion

Topsoil removal/excavation and facility installation would result in direct and indirect impacts to soils that would be high in intensity, permanent in duration, but would be very localized and affect resources that are common in context. The impact would be minor because less than three acres of a NWR would be impacted.

4.2.2.3 Alternative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable

Direct and Indirect Impacts

Construction

Direct impacts on soils as a result of Alternative 3 would be a high intensity to a localized area and would include excavation, grading and compaction, and direct loss of soil cover by exposure in the area of the cable ingress and egress points onshore, and exposure of soils to localized runoff and erosion. Direct impacts from the initial project activities would be highest during construction, but would be minimal to low following the installation. Indirect impacts on soils would occur under these alternatives; however, these impacts would be minor. Direct and indirect impacts at the staging areas for the cable installation would be highest during construction. Direct impacts to unconsolidated marine sedimentary deposits would occur within the submerged portions of the Alternative 3 submarine cable corridors (Fugro Pelagos, 2010). During construction activities both direct and indirect impacts to soils would occur at the land-based portions near shore at all ingress and egress points, and would be highest during construction activities and minor following installation. Direct impacts on soils would be a high intensity to a localized area and would include excavation, grading and compaction, and direct loss of soil cover by exposure in the area of the ingress and egress points.

Operations and Decommissioning

Impacts to soils would be expected to be minimal to low as a result of operations. No direct or indirect impacts to surface or shallow subsurface soils would occur within the submerged portions of the Alternative 3 submarine cable corridors during operations. Impacts to soils from decommission activities would be similar to construction.

Cumulative Impacts

Past, ongoing, and future actions that have had and would continue to have minor impacts to soils at the project areas are described above under Alternative 2. The implementation of Alternative 3 could directly result in the loss of ground cover on up to one acre of regionally common soils (at the cable egress points in the four communities). The soils that would be lost as a result of past, ongoing, and RFFAs are a small fraction of the existing disturbed lands of which the project area covers. The less than one acre of soil impacts would be a negligible contribution to any disturbed areas that already exist on lands of the project area. Thus, the implementation of Alternative 3 would contribute a relatively small increase to the already low amount of surface soils lost in Southwest Alaska. The cumulative negative impacts attributable to implementation of this alternative would be minor and short-term.

Conclusion

Topsoil removal/excavation and cable burial and exhumation at ingress and egress points along the cable routes would result in direct and indirect impacts to soils that would be high in intensity, of short-term duration, and very localized affecting resources that are common in context. The impact would be minor because less than one acre is negligible contribution to the total acreage covered by the project throughout Southwest Alaska.

4.2.3 Hydrology

4.2.3.1 Alternative 1 – No Action Alternative

Direct and Indirect Impacts

Under implementation of Alternative 1, no direct or indirect impacts to water resources or water quality would occur since there is no standing water at or water body near the proposed microwave repeater sites at Cone Mountain, Caribou Ridge or Kulukak Mountain. Under Alternative 1 no staging areas would be utilized for off-loading equipment from barges and subsequent ferrying of equipment and supplies by helicopter to the proposed microwave repeater sites. Under Alternative 1 no potential impact to water resources or water quality would occur at Lake Clark near Nondalton and Port Alsworth.

Cumulative Impacts

With no direct or indirect effects to water resources or water quality expected under Alternative 1, there would not be a contribution to cumulative impacts on these resources.

Conclusion

Implementation of Alternative 1 would have no direct or indirect impacts to water resources and water quality.

4.2.3.2 Alternative 2 - Hybrid Fiber Optic/Microwave

Direct and Indirect Impacts

Construction

Waters of the State of Alaska (surface water and groundwater) are regulated by the ADEC in accordance with Alaska Administrative Code (AAC), Title 18, Chapter 70-*Water Quality* (18 AAC 70) (ADEC, 2009a); Chapter 75-O*il and Other Hazardous Substances Pollution Control* (18 AAC 75) (ADEC, 2008); and Chapter 80-*Drinking Water* (18 AAC 80) (ADEC, 2009b).

Under Alternative 2, no direct or indirect impacts to water resources or water quality would occur at the proposed repeater sites since there is no standing water at or water body immediately adjacent the proposed repeater station facilities at Cone Mountain, Caribou Ridge, or Kulukak Mountain. The staging areas at Carter and Kulukak bays would include barge anchorage sites off-shore, and lightering of materials to a coastal beach location. Staging activities at Platinum and Togiak would involve barge landings at established sites. Barges would be stationed at the staging areas, but only temporarily and with no substantial change to water quality or water resources. Increases in turbidity near shore would increase during mobilization of the barge in shallow areas, but would likely be of very short duration. Supplies would be offloaded from barges using methods to prevent fuel spills. Similar increases in turbidity and the potential of fuel and lubricant spills would be temporary within the Nondalton to Port Alsworth lake-bed cable corridor and the egress point at Port Alsworth.

Direct impacts on water resources and water quality as a result of Alternative 2 would be of high intensity to a localized area and would include the off-loading of equipment and supplies from barges near-shore at the staging areas for the microwave repeater sites and the lake-bed fiber optic cable ingress and egress points at Nondalton and Port Alsworth. Direct impacts from the initial project activities would be highest during construction, but would be reduced in years following the installation, during annual refueling and operation and maintenance activities.

Indirect impacts on water resources and water quality would occur under this alternative; however, these impacts would be minor. Examples of indirect impacts could be the alteration of water quality in the local areas where the staging areas would be located, if those areas experienced increased turbidity over time. Direct and indirect impacts at the staging areas in Carter Bay, Platinum, Togiak, and Kulukak Bay would be highest during construction, but would be reduced during annual refueling and operation and maintenance activities.

Direct and indirect impacts to water resources and water quality may occur at Port Alsworth along the shores of Lake Clark. However, during construction activities both direct and indirect impacts to water quality would occur near shore at both the Port Alsworth and Nondalton egress points, and would be highest during construction activities and minor following installation. Direct impacts on water resources and water quality would be of high intensity and temporary duration to a localized area and would include increased turbidity, and potential release of fuel and lubricant compounds near shore of the ingress and egress points.

Operations and Decommissioning

No impacts would be expected to water resources and water quality as a result of operations. Impacts to water quality from decommission activities would be similar to construction.

Cumulative Impacts

Actions that may affect water resources and water quality at the three proposed microwave repeater sites and staging areas include past, present, and future helicopter-supported resource exploration activities. RFFAs that may occur within the project area may be related to recreation hunting. Impacts from these activities would be highest during peak spring, summer, and fall months, however they would be considered negligible. Impacts related to these activities include erosion of soil due to potential channelization of runoff thereby increasing sediment load into the nearest water body, however they would be negligible.

The implementation of Alternative 2 could directly result in the increase of turbidity at near shore locations of the staging areas at Kulukak Bay, Togiak, Quinhagak, Platinum, and Carter Bay. The water resources that would be impacted as a result of past, ongoing, and RFFAs are a small fraction of the existing water bodies of which the project area covers. The project components under direct review in this EA would make a negligible contribution to cumulative impacts to water resources from the TERRA-SW Project components installed on State and private lands. The cumulative negative impacts attributable to implementation of this alternative would be minor and long-term.

Conclusion

Under Alternative 2 there are no expected impacts to water resources or water quality at the proposed microwave repeater sites. Barges would likely be staged during construction at coastal areas for the microwave repeater sites and at the Nondalton and Port Alsworth ingress and egress areas that may increase turbidity near shore in a localized area. However, this would be a temporary, localized impact that would be short term in duration (during construction activities), high in intensity but affecting resources common in context. The summary impact would be considered minor.

The potential release of fuel and/or lubricants would exist during construction activities at the coastal barge staging sites for the microwave repeater stations, from an in-flight jettison of sling loads for safety of aircraft and crew, and at the ingress and egress points at Lake Clark. Safety management, spill prevention, and spill response practices can reduce risk and impact. As described in Section 4.2.4, fueling or refueling operations occur during an estimated total of 42 days during construction for all three microwave repeater sites, and on an annual basis for 6-9 days per year for the 25 year life of the project. In addition, the fueling and refueling operations employs a Fuel Easy, 500 gallon container, which represents the volume of a spill incident risk. If such a spill were to occur on land, the impact would be short term in duration, local in extent, high in intensity to a common resource. If the spill were to occur in wetland or a water body, the impact would likely be longer term (exceeding two years), and larger in extent, and high in intensity. Given the limited temporal and fuel volume risks, the summary impact of a fuel spill would be considered minor to moderate.

4.2.3.3 Alternative 3 - Hybrid Fiber Optic/Microwave with Submarine Cable

Direct and Indirect Impacts

Construction

Direct and indirect impacts to water resources and water quality are likely at onshore ingress and egress points of cable burial along each segment of the cable route.

Direct impacts on water resources and water quality as a result of Alternative 3 would be a high intensity to a localized area and would include increase in turbidity, and accidental releases of fuels or lubricants in the area of the cable ingress and egress points near shore. Direct impacts from the initial project activities would be highest during construction, but would be minimal to low following the installation and would include a risk of accidental release of fuel and lubricant compounds. Indirect impacts on water resources and water quality would occur under these alternatives; however, these impacts would be minor. Examples of indirect impacts could be the alteration of water quality in the local areas where the staging areas would be located, if those areas experienced increased turbidity over time. Direct and indirect impacts at the staging areas for the cable installation would be highest during construction. Impacts to water resources or water quality would occur within the submerged portions of the Alternative 3 submarine cable corridors would be limited to temporary, localized increases in turbidity. However, during construction activities both direct and indirect impacts to water quality would occur at the near shore at all ingress and egress points, and would be highest during construction activities and minor following installation. Direct impacts on water resources and water quality would be of high intensity and temporary duration, limited to a localized area and affecting common resources. These impacts would include increased turbidity and potential accidental release of fuel and/or lubricant compounds in the area of the near shore ingress and egress points.

Operations and Decommissioning

Limited impacts would be expected to water resources and water quality as a result of operations. Impacts to water quality from decommissioning activities would be similar to those occurring during construction.

Cumulative Impacts

Past, ongoing, and future actions that have had and would continue to have minor impacts to water resources and water quality at the project areas are described above under Alternative 2. The implementation of Alternative 3 could directly result in the increase in turbidity at near shore locations at cable ingress and egress points and along the entire submerged cable route. The water resources that would be lost as a result of past, ongoing, and RFFAs are a small fraction of the existing water bodies which the project area covers. The implementation of Alternative 3 would contribute a relatively small, temporary increase to the already low amount of turbid waters in Southwest Alaska. The cumulative negative impacts attributable to implementation of this alternative would be minor and short-term.

Conclusion

Cable burial and exhumation at ingress and egress points along the cable routes would result in direct and indirect impacts to water resources and water quality that would be high in intensity, of short-term duration, localized, and affecting resources that are common in context. The impact would be minor and a negligible contribution to the total area covered by the project throughout Southwest Alaska.

4.2.4 Hazardous Materials and Waste Management

4.2.4.1 Alternative 1 – No Action Alternative

Direct and Indirect Impacts

Under Alternative 1, the three microwave sites and fiber optic cable would not be built or installed; thus there would there are no direct or indirect impacts to hazardous materials and waste management.

Cumulative Impacts

With no direct or indirect impacts under Alternative 1 there would be no contribution to cumulative impacts of this resource.

Conclusion

Implementation of Alternative 1 would have no direct or indirect impacts to hazardous materials and waste management.

4.2.4.2 Alternative 2 - Hybrid Fiber Optic/Microwave Alternative

Direct and Indirect Impacts

Construction

Under Alternative 2, reliance on helicopters for transport of equipment, supplies and fuel represents an activity with operational safety risks. Helicopter flights for each of the three microwave repeater sites would occur during the 150 day construction phase (Table 2-4). Development plans for each microwave repeater site call for 4 trips using a Boeing Chinook 234 helicopter, 60 flights for construction supplies and construction camp removal utilizing a UH-1B "Huey" helicopter and 30 to 40 flights for the Robinson R-44 helicopter for crew rotation and resupply. Considering the three sites together this would represent just over 300 flights during the 150 day construction period. Plans call for an average of three flights per day during daylight hours, which would represent about thirty flight days per site. Generally, the three sites are separated by large distances, and most residents would perceive the activity at a single site. As a result, the intensity of this activity would be considered medium. Since this activity would be expected to occur over the 150 day construction period, the duration would be considered to be temporary. Helicopter activity is not frequent in the area. However, during the summer months there is fixed wing aircraft activity related to the commercial fisheries (i.e. 12 -15 herring spotter planes), recreational trip drop-offs, and transportation to area lodges.

Construction fuel requirements would be expected to transport and store eight 55-gallon drums of fuel at each site, with resupply every 20 days. Two poly storage buildings would be constructed on each site within an integrated containment system and would be covered to prevent rain/fuel mixing. These self-contained poly storage buildings that would be used for fuel storage and containment have a capacity of four 55 gallon fuel drums (Table 2-2).

The construction equipment fuel needs would be approximately 2,000 gallons of diesel fuel and 700 gallons of gasoline per site during the construction period. These fuels would be confined to the poly drum storage area that would be controlled within the integrated containment system and covered to prevent fuel/oil mixing in the containment system. With significant spill prevention design and procedures, the risk of an accidental release into the environment is comparatively low, and the use of this limited amount of fuel would be considered to have a low effect on other resources due to the limited and confined quantities, the temporary and/or short duration of use and common context of area resources.

Operation

The operational phase of the hybrid microwave repeater sites would require annual fuel resupply over a 2-3 day period. This would require roughly 14 trips to transport the 7,000 gallons of fuel required to each microwave repeater site and would utilize a UH-1B “Huey” helicopter over the life of the project (25 years). Two annual trips to each microwave repeater site for annual maintenance would use R-44 helicopters (Table 2-3). Taking all three sites together, this would represent 42 trips and 6-9 days of helicopter activity for refueling each year, plus 6 trips each year for annual maintenance.

Fuel transfer would be conducted using a proven fuel transfer system for helicopters similar to the Fuel Easy system. This consists of a high strength urethane-coated nylon fuel bladders contained within an external high strength metal frame. The rigid frame helps ensure the bladder maintains a symmetrical configuration in flight. When flying partial loads, the bladder collapses into itself, which would create the specific amount of aerodynamic drag necessary to fully stabilize the unit in flight. The unit has simple filling and emptying camlock fittings with fittings on top for top-filling and bottom-emptying. This system minimizes handling onsite, eliminates vapor space, and would reduce the risk of fuel contamination by eliminating transfer between drums. The storage tanks would be enclosed within a “duck pond” portable berm and secondary containment device. During refueling, the fuel bladder would be placed within a temporary “duck pond” secondary containment device, next to the main onsite fuel tanks and fuel would be transferred using onsite pumps.

During the operational phase of this project, the annual fuel resupply would be considered a low intensity impact with up to seven trips per day if the task is completed during a two-day period. However, this activity only occurs once per year and the duration of the activity would be considered very short. These impacts would affect resources that would be considered common in context. During the operations phase of the project the 48-hour back up power supply would generate electricity using lead-calcium batteries containing battery acid (five gallons per cell for 72 cells). The dry battery jars require five gallons of acid per cell (total 72 cells per site) and would also be contained in a “Duck pond” style containment system. Once filled, the batteries would be secured with straps in storage racks inside the communications shelter. This provides the power supply with a covered, enclosed facility to protect the batteries from inclement weather. These battery cells would be filled once during the construction process. During the lifespan of the project (25 years), the batteries are anticipated to be replaced once. Secondary containment systems minimize potential for a release of hazardous materials to the environment.

During operations, hazardous materials on-site include stored fuel and battery acid. Secondary containment systems, including double-walled tanks, and alarms, promote secure storage. A greater risk is found in resupply operations, including helicopter transportation and refueling operations at the microwave repeater sites. A Spill Prevention, Control, and Countermeasure Plan (SPCC) would be prepared and approved prior to the start of operations providing detailed mandatory standards and procedures to prevent and respond to any release. Reporting and response procedures would be specified in the SPCC. Response supplies would be stored on-site.

Risk of spills during fuel transportation could occur during an estimated total of 42 days during construction for all three microwave repeater sites. During the operations period, for all three sites, annual refueling flights would occur on 6-9 days per year (4 percent of days per year) for the 25 year life of the project. The fueling and refueling operations employs a Fuel Easy, 500 gallon container, which represents the volume of a spill incident risk. If such a spill were to occur on land, the impact would be high in intensity, short term in duration, local in extent, and affecting a common resource. If the spill were to occur in wetland or a water body, the impact would likely be high in intensity, longer term (exceeding two years), larger in extent, and affecting common resources. Given the limited temporal and fuel volume risks, the summary impact of a fuel spill would be considered minor to moderate.

Decommissioning

Decommissioning of the microwave repeater sites would likely be similar to construction activities. In summary, the proposed project's potential impact to resources during construction would be considered negligible due to the short duration of activities, the number of flights, and the limited quantities of hazardous materials involved. Utilization of the proposed safety devices and practices (properly designed secondary containment systems and development of a project specific SPCC Plan) would further reduce the potential impacts of hazardous materials from the proposed project.

Cumulative Impacts

The proposed microwave tower site is sparsely populated and undeveloped. Construction and refueling activities originate in a more densely populated village. Past, ongoing, and RFFAs would contribute impacts to federal lands. The project components under direct review in this EA would make a negligible contribution to cumulative effects for hazardous materials from the TERRA-SW project components installed on State and private lands. The proposed project's contribution to cumulative effects would be considered minor as the project only adds a minor degree of additional risk to existing activities in the region.

Conclusion

With the containment designs and operational response measures included as features of the proposed project, potential impacts from hazardous materials at the microwave repeater sites would be expected to be of low intensity, localized in extent, but lasting over the 25-year life of the project. The greater risk comes in annual refueling transportation from staging area in Quinhagak and Togiak to the microwave repeater sites. Risk of spills during fuel transportation could occur during an estimated total of 42 days during construction for all three microwave repeater sites, and on an annual basis for 6-9 days per year for the 25 year life of the project. The fueling and refueling operations employs a Fuel Easy, 500 gallon container, which represents the volume of a spill incident risk. If such a spill were to occur on land the impact would be short term in duration, local in extent, high in intensity to a common resource. If the spill were to occur in wetland or a water body, the impact would likely be longer term (exceeding two years), and larger in extent, and high in intensity. Given the limited temporal and fuel volume risks, the summary impact of a fuel spill would be considered minor to moderate.

4.2.4.3 Alternative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable

Direct and Indirect Impacts

Construction, Operation and Decommissioning

Under Alternative 3 fuel spills into the marine environment from vessels used to install the submarine cable could occur leading to habitat disturbance/loss of marine life. The probability of spills and the potential volume at risk of release would be no greater than other marine traffic of that size and type. Selection of experienced captains and crews would limit the risks of fuel spills. Best management practices including halting work during poor weather or low visibility conditions; and the use of fuel containment systems while refueling or during fuel transfers may further decrease the risk of fuel spills. The likelihood of a fuel spill large enough to cause measurable harm to the marine environment would be low. Project personnel would be operating under an approved oil spill discharge and contingency plan that would be activated in the event of a fuel spill in the marine environment.

Cumulative Impacts

Past, ongoing and reasonably foreseeable future actions affecting the marine environment associated with Alternative 3 include commercial fishing, subsistence hunting and fishing activities, marine shipping, and other maritime traffic. Routine activities by the cable-laying vessel would represent a negligible contribution to cumulative effects. A fuel spill in the marine environment during cable-laying or during subsequent repair activities would be of low probability, but in the event of a small volume to large volume spill, temporary to long term effects to marine life may be expected.

Conclusion

Under Alternative 3 the risk of fuel spills exists but can be managed and mitigated. Implementation of Alternative 3 would be expected to have effects to the marine environment ranging from negligible (small fuel spills) to moderate (large fuel spills).

4.3 Biological Environment

4.3.1 Wetlands and Vegetation

None of the alternatives would impact wetlands as proposed, but wetlands have the potential to be affected by accidental fuel spills. However, vegetation in some areas would be impacted by Alternatives 2 and 3.

4.3.1.1 Alternative 1 – No Action Alternative

Direct and Indirect Impacts

Under the Alternative 1, no development would occur and there would be no direct or indirect impacts to vegetation or wetlands.

Cumulative Effects

With no direct or indirect impacts effects to vegetation or wetlands under Alternative 1, there would be no contribution to cumulative impacts effects of these resources.

Conclusion

Implementation of Alternative 1 would have no impacts to wetlands or vegetation.

4.3.1.2 Alternative 2 – Hybrid Fiber Optic/Microwave

Wetlands would not be impacted affected under Alternative 2 as proposed. Vegetation would experience both temporary/short-term and long-term impacts under Alternative 2.

Direct and Indirect Impacts

Construction

Temporary and long-term effects to vegetation would be expected to occur at the proposed Cone Mountain, Caribou Ridge, Kulukak Mountain, and Port Alsworth lake-bed cable landfall. The proposed microwave repeater sites would be disturbed both in the short-term and over the long-term as vegetation is disturbed, removed, and/or displaced by the construction of the proposed towers, communication equipment shelters, power module shelters, and fuel tanks. The construction footprint would total 2.71 acres for the three microwave repeater sites, with excavation areas and permanent project structures affecting 0.28 acres (or 0.53 when helipads are included) for the three microwave repeaters sites combined. The Port Alsworth cable landfall facility is expected to disturb less than 1.0 acre of land.

Construction disturbances at the proposed microwave repeater sites include site and equipment traffic, construction camp installation, tower/shelter installation, and multiple helicopter landings, but would end when the project facilities are in place. Damaged vegetation would expose soil to erosion, as noted in Section 4.2.2. Staging areas would include two barges anchored in Carter Bay and Kulukak Bay, along with existing facilities in Platinum and Togiak. Construction would last approximately 150 days at each of the proposed microwave repeater sites and is proposed to commence in June, 2011. All construction camp waste including liquids would be contained in drums or large, commercial trash bags and would be removed from the site.

Almost all subarctic plants are perennials with seedlings that grow very slowly with most early growth concentrated in the roots. Revegetation that provides surface erosion control and improved visual quality can take decades in the alpine, subarctic environment such as ridgetops in Southwest Alaska where the tower sites are proposed.

Vegetation at the proposed Lake Clark cable landfall in Port Alsworth would be disturbed by construction as it is removed and/or displaced by the proposed cable trench and small utility shelter. Construction disturbances to vegetation at the proposed landfall sites would include site and equipment traffic, shelter installation, and cable excavation. Approximately 3,000 feet of cable would be buried in the Port Alsworth area with most of this disturbance being allowed to revegetate immediately following construction. Effects to this vegetation would be direct, but temporary. Damaged vegetation would expose soil to erosion.

Vegetation would be directly affected by the construction of a small equipment shelter at the cable landfalls in Lake Clark and effects would be long-term (at least as long as the project). Vegetation would be displaced at this site for the life of the project and an underdetermined amount of time thereafter. Once the site is decommissioned, the ground would be re-graded back to original grade and fertilized. Seeding with native plants would be needed to increase the rate of revegetation. Revegetation that provides surface erosion control and improved visual quality can take many years in the boreal environment that exists at this site.

Operations

For the life of the project, a tower, two shelters, and two fuel tanks would be permanent components of each of the three proposed microwave repeater sites and a small utility shelter would be a permanent component of the lake-bed cable landfall. The total excavation/structure area for the three proposed microwave repeater sites together is 0.27 acres. Vegetation would be displaced at these sites for the life of the project and an underdetermined amount of time thereafter. Portions of affected areas are lacking vascular plants, but lichens and mosses would be disturbed. After construction of the foundations is complete, the ground would be re-graded back to original grade and fertilized. Seeding with native plants may be needed to increase the rate of revegetation. Direct long-term effects to vegetation would be primarily at the construction sites and structure locations. Maintenance and re-fueling visits to the microwave repeater sites would occur once per year and would be expected to have negligible effects on the vegetation through site traffic and the potential to introduce non-native species and/or potential fuel spills both at the site and during transfer.

Changes to vegetation at the sites may include the introduction of invasive plant species to the remote microwave repeater sites and to the Lake Clark cable landfall area. Soil disturbance and the use of potentially infested equipment and materials from off-site increase the risk of invasive species introduction. The UUI development plans includes mitigation measures to reduce the risk of introducing invasive species, including spraying with water all materials bundles and construction before transportation to the project sites, removal of invasive species, and an inspection by a qualified botanist to monitor the site (UUI, 2011).

The infrequency of visits and implementation of invasive species prevention, monitoring, and mitigation measures would reduce this risk. Rocky soils, a short growing season, and windy conditions make growing conditions at these sites difficult for any species of plants to establish themselves and would retard revegetation rates. However, the potential for introduction of invasive species remains a possibility if for example, mitigation measures do not require plans to clean aircraft that might act as a vector), the potential for introduction remains a possibility. Permit stipulations could also be used to reduce this possibility, and to require a site and project specific monitoring and mitigation plan to address and prevent the introduction of invasive plant species to the tower sites.

Portions of affected areas of the proposed project areas are unvegetated and therefore in these areas there would not be expected impacts to vegetation. After construction of the foundations for the towers at the microwave repeater sites is complete, the ground would be re-graded back to original grade and fertilized or seeded if necessary. Long-term effects to vegetation would be limited primarily to the actual location of structures or their foundation. Substantial changes to vegetation at the sites are not expected because the footprints of the facilities are small relative to the surrounding areas.

The potential for diesel spills and or battery acid spills would exist during construction and operation of the microwave repeater sites. Environmental effects to vegetation would be expected to be minor to moderate depending on the volume spilled, location of spill, and timing of the spill.

Direct long-term effects to vegetation could occur at the shelter site at the Lake Clark landfall area during operations. The potential for minor changes to vegetation at this site over the long-term exist. Invasive/non-native plant species have been documented in the vicinity of the Lake Clark landfall with the potential to spread. A potential consequence of this alternative would be the spreading of invasive plant species in the area. Permit stipulations could be used to reduce this possibility, including mandatory monitoring. To address and prevent the spread of invasive plant species in the area, a site and project specific monitoring and mitigation plan for invasive species would be developed prior to start of construction activities. The plan would be developed in consultation with the FWS and BLM and include prevention measures such as cleaning construction equipment (e.g. backhoes, shovels, boot soles, helicopter skids) that could act as a vector for invasive seeds, and specified monitoring duration, protocol, and reporting requirements. Otherwise, impacts could be of moderate intensity, localized, and long lasting.

Decommissioning

The microwave repeater sites would be decommissioned at the end of the life of the facility by removing all fuel and batteries from the site along with all above ground structures. Decommissioning would likely repeat many of the impacts of construction and restart the long revegetation process. Once the site is decommissioned, it would be expected that the ground be re-graded back to original grade and fertilized. Seeding with native plants would be needed to increase the rate of revegetation.

Cumulative Impacts

Past, ongoing, and future actions that have had and may continue to have effects to wetlands and vegetation in the project area are confined mostly to areas adjacent to population centers and limited to the development of transportation infrastructure, such as roads and trails, small airstrips and helicopter pads; the installation of scientific research facilities, such as weather and seismic stations; and the development of private property. The cumulative impacts attributable to implementation of Alternative 2 would be minor and potentially long-term (i.e. changes to vegetation community in the immediate vicinity of the microwave repeater sites).

In the event of an accidental fuel spill at any of the proposed tower sites, impacts to wetlands would be expected to be negligible because the sites are relatively far away from wetlands, unless the spill occurred over wetland habitats during transport of the fuel to the site. A fuel spill on-site would have additive effects to site vegetation already disturbed and displaced from construction and operation. Impacts from a fuel spill during helicopter transportation are identified in Section 4.2.4. Increased traffic through the staging areas and to the sites would add to the overall potential for spreading invasive plant species in the region. The project components under direct review in this EA would make a negligible contribution to cumulative effects for vegetation from the TERRA-SW project components installed on State and private lands, because these effects are highly localized and the various sites are widely dispersed.

Conclusion

No environmental consequences to wetlands would occur at the microwave repeater tower sites under Alternative 2. The potential exists to affect wetlands nearby if a fuel spill occurred. Consequences to vegetation would be long-term but minor based on the duration of the revegetation, which may be decades, and the size of the construction footprint of the three sites together (118,075 sq ft or 2.71 acres), and an operational phase footprint (32,100 sq ft or 0.53 acres with helipads at each site). Most impacts to vegetation would be long lasting, up to the life of the project. With invasive species prevention and mitigation measures properly implemented and without accidental fuel or chemical spills, impacts would be considered minor as they would occur for a long duration in a relatively small area with common resources.

4.3.1.3 Alternative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable

Direct and Indirect Impacts

Wetlands would not be impacted under Alternative 3 as proposed. Impacts to vegetation would be both temporary and long-term under Alternative 3 at the marine route landfall sites where damaged vegetation would expose soil to erosion from precipitation, run-off, and wind. Channelization from erosion could cause additional damage to the landfall sites. There are no expected impacts to vegetation from the placement of the submarine cable in offshore waters.

Cumulative Impacts

Past, ongoing, and future actions that have had and may continue to have effects to wetlands and vegetation in the project area are confined mostly to areas adjacent to population centers and limited to the development of transportation infrastructure, such as roads and trails, small airstrips and helicopter pads; the installation of scientific research facilities, such as weather and seismic stations; and the development of private property. The cumulative impacts attributable to implementation of Alternative 3 would affect very small areas, but would potentially be long-term (i.e. changes to vegetation community).

In the event of an accidental fuel spill, impacts to tidal wetlands would be expected to be small, assuming strong spill prevention and spill response measures are required for the cable laying vessel. A fuel spill could have additive effects to site vegetation already disturbed and displaced from shore-side construction and operation.

Conclusion

There are no expected impacts to wetlands and vegetation from the placement of the submarine cable in offshore waters. Under Alternative 3 the risk of fuel spills exists but can be managed and mitigated. Barring a fuel spill scenario, implementation of Alternative 3 would be expected to have low intensity temporary effects in relatively small areas. The summary impact would be considered negligible.

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4.3.2 Fish and Essential Fish Habitat

Potential environmental consequences of the proposed project would be damage to or loss of fishery and aquatic habitats if a fuel or battery acid spill were to occur, increased erosion of adjacent landforms and sedimentation of affected water bodies.

4.3.2.1 Alternative 1 – No Action Alternative

Direct and Indirect Impacts

Under the No Action Alternative, no modification of any of the sites would take place and no new impacts to fish and fish habitat would occur.

Cumulative Impacts

With no direct or indirect impacts to fish or fish habitat under Alternative 1, there would be no contribution to cumulative impacts on this resource.

Conclusion

Implementation of Alternative 1 would have no impact on fish or fish habitat.

4.3.2.2 Alternative 2 – Hybrid Fiber Optic/Microwave

Direct and Indirect Impacts

The proposed microwave repeater tower sites would be at the tops of peaks or ridges and it would be unlikely that fuel or battery acid would spill in a quantity sufficient to contaminate fish streams unless dropped in a jettisoned sling load or aircraft accident near a water body. The risks of impacts from a spill during helicopter transit for refueling are examined in Section 4.2.4. Double-walled fuel tanks and the use of best management practices while refueling would further reduce spill risk. No in-water work would be necessary for the construction of the microwave repeater towers therefore no impacts to fish or fish habitats would be expected from these project components.

Soil disturbance caused by constructing and maintaining microwave repeater sites may increase erosion in the immediate area. The likelihood of potential erosion being of a magnitude sufficient to cause indirect effects to fish or fish habitat would be low.

Fuel spills into Lake Clark from vessels used to lay underwater fiber optic cable would be possible. If such a spill were to occur it could potentially be harmful to fish and fish habitats. Vessels used for this component of the project would be relatively small in size with limited capacity to store fuel onboard, and spill prevention and response procedures would be required. The likelihood of a fuel spill large enough to cause measurable harm to fish or fish habitats would be considered low.

Installation of the fiber optic cable would cause brief disturbance to the Lake Clark cable landfall in Port Alsworth. Sedimentation would be likely to occur due to trenching and underwater hand jetting necessary to secure the cable. These impacts would be expected to be short in duration as disturbed sediments quickly settle. The setting in which these impacts would be expected to occur is at a glacially turbid portion of Lake Clark (Young, 2005). In areas where sediment accumulates, cables are often rapidly buried by natural processes or simply settle into soft substrates (Carter et al., 2009). Most sockeye salmon spawning areas are at or adjoining the northern end of Lake Clark (Young, 2005) away from the proposed cable route and away from potential impacts that may be caused by its placement on the lake bed. The action of installing the cable to the lake-bed of Lake Clark is not expected to hinder or impede the migration or movement of fish into or within the lakes.

To best avoid impacts, the cable installation activities at the Port Alsworth land fall should avoid the peak period of sockeye salmon spawning which is estimated to occur between September 15 and October 15. Based on hydrographs and water table measures, mid-August may be the best month for the barge to install the lake-bed cable. While project activities during August would have the potential of conflicting with local subsistence activities, the estimated rate of progress for the cable installation would result in very short duration (i.e. less than one day) overlaps with subsistence uses at specific locations. However it may not be logistically feasible to completely avoid overlapping either or both sockeye salmon peak spawning and the peak of subsistence activities. Clear communications with the subsistence communities and careful project planning are essential to minimize any potential conflicts.

No impacts to fish or fish habitat in the barge staging areas of Carter Bay, Platinum, Togiak, and Kulukak Bay would be expected but fuel spills are possible. Project personnel would be operating under an approved oil spill discharge and contingency plan which would be activated in the event of a fuel spill in the marine environment, Lake Clark, or at any of the microwave repeater sites.

Sound waves, such as those produced during construction, travel underwater and fish may temporarily avoid areas near the sources of underwater sounds. However sounds would need to be very loud to harm fish (for example underwater explosions or pile driving). Underwater sounds produced by tug boats pulling the sectional barges that would lay the underwater cable would be similar to sounds produced by existing non-project boat traffic and would be considered negligible as a source of disturbance.

Cumulative Impacts

Past actions that have impacted fish and fish habitat in the project area include limited development of transportation infrastructure, such as roads and trails, small airstrips and helicopter pads; the installation of scientific research facilities, such as weather and seismic stations; and the development of private property. The impacts attributable to implementation of Alternative 2 would be minor and short-term (local, temporary increase in turbidity due to hand jetting) unless a fuel spill were to occur. The project components under direct review in this EA would make a negligible contribution to cumulative effects for fisheries from the TERRA-SW project components installed on State and private lands. In the event of a small fuel spill at any of the microwave repeater sites, impacts to fish or fish habitat would be expected to be negligible because the microwave repeater sites are relatively far away from fish habitat unless the spill occurred during transport of the fuel to the site due to an accident. In the event of a small fuel spill in Lake Clark, or the marine environment, moderate, long-term impacts to fish and fish habitat are expected that could contribute to other cumulative impacts previously stated.

Conclusion

Under Alternative 2 the risk of fuel spills exists but can be managed and mitigated. Barring a fuel spill scenario, the effects of implementing Alternative 2 would be expected to be of minor intensity, short in duration, localized in extent, and affecting resources that are common. Thus, implementation of Alternative 2 would be expected to have negligible or minor impacts to fish and fish habitat.

4.3.2.3 Alternative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable

Direct and Indirect Impacts

The fish and fish habitat of Lake Clark would not be impacted under this alternative. The existing conditions of commercial fisheries potentially affected by the submarine cable route and commercial fisheries are described in Section 3.3.4.3.

Pelagic marine and marine phase anadromous fishes would be not expected to experience potential effects other than temporary disturbance as the submarine cable is being installed. Benthic and demersal (bottom-dwelling) fish species may experience low intensity temporary effects to resources ranging from common to important (in regard to marine EFH). These potential effects may include temporary physical disturbance of the sea floor and temporary benthic habitat loss after the cable is buried. Habitat disturbed during burial would recover and so the effect would be considered temporary. Cables laid on the sea floor may settle into soft substrates or be buried by the natural processes of sedimentation (Carter et al., 2009). The amount of potential habitat loss would be very small relative to the total habitat area available to benthic organisms and demersal fishes.

Cumulative Impacts

Past, ongoing, and future actions that have had or may have impacts on marine fish include commercial, sport, and subsistence fishing, oil spills, and tourism. The cumulative effects attributable to implementation of Alternative 3 would be minor and temporary (temporary loss of benthic habitat in a small area) unless a fuel spill was to occur. In the event of a fuel spill, impacts to fish and fish habitat would be dependent on the volume spilled. Volumes would be expected to be low because of the size of the vessels and regulated methods of fuel transfer on marine vessels. The likelihood of a fuel spill large enough to cause measurable harm to marine fish or fish habitats would be considered low. Alternative 3 impacts would be additive in nature to those of activities mentioned previously but considered negligible.

Conclusion

Under Alternative 3 the risk of fuel spills exists but can be managed and mitigated. Barring a fuel spill scenario, implementation of Alternative 3 would be expected to have low intensity temporary effects in relatively small areas. Thus, this alternative would have negligible effects to marine fish and minor effects to marine fish habitat.

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4.3.3 Wildlife (Terrestrial Mammals and Birds)

4.3.3.1 Alternative 1 – No Action Alternative

Direct and Indirect Impacts

Under implementation of the No Action Alternative, no direct or indirect impacts to wildlife would be expected to occur since there would be no disturbances beyond existing conditions.

Cumulative Impacts

Under implementation of the No Action Alternative, there would be no contribution to cumulative impacts to wildlife.

Conclusion

Under implementation of the No Action Alternative, no direct, indirect or cumulative impacts to wildlife would be expected to occur.

4.3.3.2 Alternative 2 – Hybrid Fiber Optic/Microwave

Direct and Indirect Impacts

Construction

Construction at the three proposed microwave repeater sites taken together would disturb 2.71 acres of wildlife habitat, of which 0.53 acres would be affected by excavation and installation of project facilities and the helicopter landing area. Habitat loss would include common wildlife habitat such as shelter and foraging habitat for some small mammals; foraging habitat for caribou; and nesting, foraging and/or shelter habitat for birds, including Kittlitz's murrelet, rock ptarmigan, surfbird, horned lark, American pipit, lapland longspur, snow bunting, willow ptarmigan, common raven, rough-legged hawk, golden eagle, and gyrfalcon (ABR, 2010). The construction period would occur between June 2011 and October 2011, corresponding to the reproductive and rearing season for most terrestrial wildlife species, including breeding, nesting, and brood-rearing for birds, and calving and rutting for caribou.

Construction at the proposed microwave repeater sites would result in noise and visual disturbance from equipment, helicopter access, and human activity. These disturbances could displace wildlife in the project vicinity, potentially resulting in abandonment of breeding or nesting activities. Noise at each proposed microwave repeater site during the summer from construction equipment would be expected to attenuate to a level of 30 dBA L_{eq} at a distance of 6,585 feet in each direction, over soft, partially vegetated terrain. Noise levels during the summer from construction equipment and generators used in the construction activities would be expected to attenuate to a level of 30 dBA L_{eq} at a distance of 6,700 feet in each direction. Much of the caribou population would be located on calving grounds known to occur outside of the affected area, although a few transient non-breeders may be found within the project footprint. The construction period also overlaps with moose, bear, and wolf birthing and breeding; however, habitat for these species is largely outside of the affected area although transient individuals may be present. Bears would not be hibernating during the construction period. Impacts to wildlife from construction of the proposed microwave repeater sites would be low intensity and temporary in duration. Generally, only common wildlife and habitat would be affected, but because suitable nesting habitat for Kittlitz's murrelet occurs in the proposed footprint, habitat would be important in context should these birds nest in the area.

During construction, food would be stored in 55 gallon drums and would be transported off-site for disposal, then transported back empty. All camp and construction waste would be contained in drums or large, commercial trash bags and would be removed from the site periodically. The trash bags would be used for dry garbage (plastic, wood pieces, etc.) and would be secured from the wind with cargo nets while awaiting transport. These measures would deter wildlife such as bears from accessing garbage or food at the proposed tower sites, although attraction may still occur, and would also minimize dangerous interactions or ingestion that could injure or kill wildlife.

The proposed microwave repeater sites would be accessed during construction by helicopters using established flight paths (Figures 2-2 and 2-3). Flight paths originate at either a barge or nearby town, and continue to each microwave repeater site. The estimated numbers of trips for mobilization, demobilization, and supply and personnel movements are described in Table 2-3. Of these trips, approximately 60 trips would utilize a Bell UH1 helicopter to and from the barges, 4 trips would utilize a Chinook 234 helicopter to and from nearby towns, and 30 to 40 trips would utilize a Robinson R-44 helicopter to and from nearby towns. Helicopters would travel at an altitude of 1,500 feet above ground level (AGL). Habitats within the helicopter flight paths include riparian, wetland, tundra, wind-swept ridges, and rocky-outcrops, potentially inhabited by passerines and small and large mammals that would be breeding or rearing young during this time period. Brown bears, in particular, would likely be disturbed from their natural behaviors, as well as moose that occur in brushy drainages along the flight paths and would be calving during this time period. Known primary caribou calving grounds are located outside of the helicopter flight paths, however.

Response to helicopter noise ultimately depends upon the species and individuals of a population, and responses may be greater in remote areas that are typically quiet. Potential noise disturbance from helicopters may directly cause stress, ranging from mild annoyance to severe stress, which could contribute to panic and escape behavior. These responses could lead to accidental injury; reproductive losses such as nest flushing, separation of adults from young and disrupted parental attendance; and energy losses that could affect food intake, growth, rearing, migration, and reproduction. The frequent number of helicopter trips over the 150 day construction period may ultimately lead to habitat avoidance and abandonment (NPS, 1994). There would also be potential for bird collisions. Impacts to wildlife within the vicinity of the flight paths would be medium intensity but temporary in duration. Generally, only common wildlife and habitat would be affected.

Impacts of helicopter noise may be more acute in the vicinity of the barges because helicopters would be departing, arriving, and landing. Of the aforementioned helicopter trips, a total of 60 round trips with a Bell UH1 helicopter would originate from a barge in Carter Bay, and 60 round trips would originate from a barge in Kulukak Bay. Both of these bays are inhabited by a large number of seabirds, shorebirds, and waterfowl involved in breeding, nesting, foraging, molting, brood rearing, and fall staging during these time periods. Carter Bay, in particular, would contain a significant number of the region's fall staging birds towards the end of the construction period. Included among these birds is the ESA-threatened Steller's eider (molting and staging only). Effects to waterbirds from helicopter noise would be similar to those described in the previous paragraph. Additionally, waterbirds may respond by flying, diving, or swimming away from the aircraft, of which often whole colonies of birds will flush together. The high energy requirements of waterbirds during the molting season, and most particularly, fall staging in preparation for long distance migrations, may not be met if these birds continuously swim, dive, or run from aircraft (NPS, 1994). Because these areas are important to a large number of the region's migratory birds and impacts may be noticed after one season, impacts to wildlife from helicopter noise near the barges would be medium intensity and possibly long term in duration. These birds have an important context regionally and many are designated as special status species.

The towers for the microwave sites would be pre-assembled on the barges in Carter and Kulukak bays. The barge would remain in Carter Bay only for the initial mobilization of equipment and materials from late May to early June, after which, the staging for the Cone Mountain repeater site would be based in Platinum. The barge in Kulukak Bay would remain for a larger portion of the construction period. In addition to helicopter disturbances, human activity, equipment noise, and the barge's physical presence may disturb and displace breeding, foraging, molting, brood rearing, and fall staging seabirds, waterfowl, and shorebirds. Noise associated with preassembling the microwave repeater towers on the barges is expected to be less than the noise associated with helicopter ingress and egress. However, construction on the barges would likely result in consistent noise and activity (as opposed to helicopter flights). Waterbirds would likely maintain a constant distance, resulting in habitat displacement for the duration of construction rather than numerous energy expenditures.

During construction on the barges, there also exists the potential for fuel or other oil spills causing mortalities to seabirds, shorebirds, and waterfowl. This risk would be minimized because an Oil Discharge Prevention and Contingency Plan would be prepared and implemented. An Emergency Response Plan would also be prepared in order to immediately control and clean-up a spill should one occur. Generally, impacts to wildlife from construction on barges would be low intensity and temporary in duration. These birds have an important context regionally and many are designated as special status species. Within Kulukak Bay, waterbirds are not typically hunted for subsistence, but at Carter Bay waterbirds are heavily used for subsistence hunting (Abraham, 2011 – Personal Communication). If a large oil spill were to occur, the intensity of impacts would be high and long-term in duration.

Installation of the lake-bed optical fiber cable at Lake Clark would occur between September 15, 2011 and October 15, 2011. Installation would primarily occur on a barge, utilizing a tugboat as necessary for positioning, and the cable would be laid on the lake-bed. The two onshore segments would require burial with a backhoe to the water line and possibly hand-jetting by divers underwater. Cranes, miscellaneous water transport, pick-up trucks, and ORVs would also be used as supporting equipment. The construction/installation time period would be outside of the bird breeding and nesting season, although molting or staging waterfowl may be present. Other wildlife may be present, as well, using the lake for watering or feeding. Construction activities would be limited to a discrete location, within a large amount of common habitat. Wildlife may be temporarily displaced during construction, but effects would be temporary and low intensity.

Operations

The physical presence of the proposed microwave repeater towers may cause mortalities to birds from collision during flight, including the ESA-threatened Steller's eider. The proposed microwave repeater sites would be located along ridges between 1,577 feet and 2,100 feet in elevation, adjacent to major migratory bird staging areas such as Carter Bay, Nushagak Bay, and Y-K Delta. These areas are also used for molting, wintering, breeding, and nesting. Shorebirds and waterfowl are more likely to be affected than songbirds because Carter Bay, Nushagak Bay, and Y-K Delta are important shorebird staging areas, and also because waterfowl and shorebirds are often flying faster and are less agile than songbirds.

The immediate trajectories of migrating birds are species specific and depend on varying factors (e.g., wind currents, geomagnetism, and visual cues, among others). Some may follow the coast line, avoiding the proposed microwave repeater towers, whereas some may head due south from Y-K Delta, in which flight paths may intersect the proposed towers. The higher ridgelines in which the proposed microwave repeater towers would be located may not represent a topographical barrier for birds migrating south from the Y-K Delta. Studies show that large numbers of migrating birds fly over the crests of ridges and passes rather than following mountain fronts. Furthermore, migrants flying near ridges and in passes may be flying at lower elevations than broad-front migration (Kerlinger, 1995).

Birds may be migrating in a trajectory aligned with the proposed microwave repeater sites, but the expected rate of collisions is unknown because flight pattern field work was not conducted during 2010. Specific data on migration routes would be needed to adequately assess strike potential. In the absence of this data, studies show that most migrants fly at 180 feet or more under clear weather conditions, and this is well above the height of the proposed towers at 60 feet. In fact, studies show that bird flight paths are typically at heights between 656 feet and 2,461 feet above ground level (Longcore et al., 2008; Able, 1970; Bellrose, 1971; Mabee et al., 2006). Mabee and Cooper (2004) found that only 2percent to 15 percent of migrants flew below 300 feet above ground level during clear weather (Able, 1970; Bellrose, 1971; Mabee et al., 2006). However, inclement weather is common at the sites, and higher winds and lower cloud layers may contribute to lower altitude flights (Able, 1970). Mortalities from collision would be reduced significantly because guy wires and lights would not be used on the proposed towers (Longcore et al., 2008). Any lights used for construction or operational maintenance would be down-turned. If collisions should occur, mortalities could be high because adjacent areas are epicenters for staging migrants, and birds are generally concentrated while migrating. Therefore, although the risk would be low due to the height and design of the towers, impacts to birds from the tower physical presence could be medium intensity and long term in duration. Because special status birds occur in the area, birds with an important context may be affected.

Spills may potentially occur from helicopters transporting fuel tanks, during generator fueling operations, or from on-site tanks storing generator fuel. Jettison of sling loads as an emergency safety procedures adds some risk. Some spills would be unlikely due to designed controls, and the potential would be minimized by implementation of an Oil Discharge Spill Prevention, Control, and Countermeasure Plan. Additionally, an Emergency Response Plan would be prepared and implemented to minimize the impact should a spill occur. It would be unlikely that a spill would occur, and the impact would be primarily over land and confined to a discrete area. Therefore, impacts from a spill would be medium intensity and long term in duration to a generally common resource.

Noise from generators would be constant during operation of the microwave repeater sites and would be a long-term affect as a result of the project. Noise from generators would attenuate during the winter to a level of 20 dBA L_{eq} at a distance of 4,590 feet in each direction of each of the proposed towers, which would represent an area of 2.37 square miles for each site. Taking the three sites together, there would be a permanent disturbance over approximately 7.11 square miles of common wildlife habitat (birds, small mammals, caribou forage), extending beyond the permanent footprint of the project as described at the beginning of this section. Should black or brown bear dens occur within the footprint of the noise disturbance, dens may be abandoned for the duration of the project; however this information is unknown because den surveys have not been conducted. Because noise would be constant, impacts to wildlife would result in long-term displacement rather than expenditures of energy. Therefore, impacts from generator noise would be low intensity but long term in duration to generally common resources.

The proposed microwave repeater sites would be visited twice per year for maintenance (spring and fall), using helicopters for access. In addition, annual refueling operations for the generators at each site would be accessed by helicopter over a period of two to three days. The annual refueling operation would require 14 round trip flights by helicopter. As a mitigation measure, refueling operations would be limited to a seasonal window outside of the months of intensive hunting, fishing, and recreational activity, estimated at mid-May to Mid-October. During the time period in which maintenance would occur, wildlife may be involved in foraging, nest building, breeding, molting or staging activities. Wildlife may be temporarily displaced and may exhibit physiological and behavioral responses similar to the helicopter noise impacts described previously. Hibernating brown or black bears would be disturbed if dens occurred within the flight paths. However, the frequency, duration, and seasonal timing of these visits would be limited enough that the impacts would be low intensity and temporary in duration to generally common resources.

Nuisance wildlife could be attracted to the proposed microwave repeater sites due to the periodic human activity associated with operations and maintenance. Nuisance wildlife could potentially out-compete native wildlife for resources or prey upon them, the nests, or their young. However, the potential for attracting nuisance wildlife would be minimized because food and garbage would not be stored on location following the construction period, and human presence would be minimal. Therefore, impacts from attraction of nuisance species would be low intensity and temporary in duration to a generally common resource.

Decommissioning

Decommissioning impacts to wildlife would be similar to construction, including those such as noise from helicopters at microwave repeater sites, along flight paths, and at barges; visual disturbance; and fuel spills.

Cumulative Impacts

The Bristol Bay area is experiencing some industrial growth, although most future projects would be considered speculative due to a lack of secured funding. Recreational and visitor growth has also been on a recent upward trend, and some non-industrial capital projects are expected to occur in the near future. Introducing and/or upgrading broadband communications in the area could lead to a rise in visitor and residential growth, particularly if jobs are created from growth in the industrial sector. Visitor and residential growth may contribute to an increase in marine and air traffic and development, increased recreation use and increased hunting pressure resulting in greater wildlife disturbance to currently remote areas. The project components under direct review in this EA would make a negligible contribution to cumulative effects for wildlife from the TERRA-SW project components installed on State and private lands, because the effects are generally localized, and the various components are dispersed across a wide array of bio-geographic systems, from Cook Inlet to Lake Iliamna and the Togiak Refuge.

Conclusion

Under implementation of Alternative 2, impacts to wildlife vary depending on the geographical location and activity. Generally, impacts involve common resources with some exceptions and would be of low or moderate intensity and temporary or long-term in duration. In particular, given the locations and tower configuration, bird strikes are a concern that cannot be estimated without additional work. Impacts resulting from helicopters during construction have a medium intensity, and could possibly have a long term effect on seabirds, waterfowl, and shorebirds because Carter Bay is a regionally important area for fall staging birds. Mitigation measures limiting helicopter-supported refueling operations to the seasons outside of the period intensive hunting, fishing, and recreational activity also reduce impacts to wildlife during the summer months throughout the operations period. Therefore, Alternative 2 would have a moderate impact on wildlife.

4.3.3.3 Alternative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable

Direct and Indirect Impacts

Wildlife habitat along the nearshore environments at the point of egress would be temporarily disturbed and wildlife would be displaced as a result of cable burial activities. The range of impacts would vary depending on construction timing. Habitat for mammals and landbirds is generally common, though, and impacts would be confined to the immediate area and short-term. Nearshore impacts to shorebirds, waterfowl, and/or seabirds may be greater as these environments may be used by nesting, breeding, foraging, wintering or staging birds. In particular, the nearshore areas of Nushagak, Carter, and Kuskokwim bays are regionally important for staging seabirds, shorebirds, and waterfowl, including the ESA-threatened Steller's eider. During the nesting season, nearshore cable burial may destroy ground nests along the shoreline or cause nest abandonment. Noise or visual disturbances generated from equipment, human activity, or marine or air traffic may temporarily displace these birds and disrupt their nearshore breeding, foraging, resting, or molting activities. Installation activities would also temporarily disturb marine invertebrate habitat, which is a primary food source for many shorebirds. However, the impact of cable installation disturbance to wildlife would be minimized because all points of egress are located near towns and villages in which disturbance from human activity is typical. Therefore, impacts to wildlife in the nearshore environment would be of low intensity and temporary in duration, but affecting wildlife with an important context, due to the presence of Steller's eider.

Waterbirds are less likely to occur in offshore environments, and should displacement occur, offshore habitat is abundant; therefore, impacts from offshore cable installation activities would be a negligible impact. Although some sensitive birds may be present, effects to birds in offshore areas would be low intensity, temporary in duration, and primarily involve common wildlife resources.

Cumulative Impacts

Cumulative impacts associated with Alternative 3 would be similar to cumulative impacts associated with Alternative 2.

Conclusion

Under implementation of Alternative 3, impacts to wildlife would be primarily related to seabirds, shorebirds, and waterfowl in the nearshore and offshore marine environments. This alternative would result in impacts that would be low intensity, temporary in duration and to resources generally considered common except for the Steller's eider. The summary impact would be negligible, but potential impacts to Steller's eiders would raise this rating to minor.

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4.3.4 Marine Life and Threatened and Endangered Marine Mammals

As the environmental consequences for marine mammals are similar regardless of ESA listing, the following discussion includes non-ESA listed, ESA-listed and candidate species of marine mammals. ESA-listed species and candidate species that are most likely to experience project effects, particularly under Alternative 3, are Pacific walrus, Steller sea lion, and northern sea otter, mainly because proposed project activities take place in or in close proximity to critical habitat (Steller sea lion, northern sea otter) or important haulout sites (Pacific walrus). Other ESA-listed marine mammals that could be observed in the area (e.g. North Pacific right whale) could potentially be disturbed by project activities though no critical habitat or unique feeding grounds are affected. Blue whale, fin whale, and sperm whale are not expected to be observed in the shallow marine environment of the proposed project area. This would also be true for marine turtles.

Potential environmental consequences of the proposed project are physical damage to or loss of benthic marine habitat, disturbance to marine mammals in special protection areas and species-specific critical habitat areas, marine mammal-vessel collision risks, conflicts with subsistence and commercial fisheries, risk of contamination of marine habitat in the event of a fuel spill, and conflicts between submarine cable and benthic feeding marine mammals.

4.3.4.1 Alternative 1 – No Action Alternative

Direct and Indirect Impacts

Under the No Action Alternative, no modification of any of the sites, including the proposed submarine cable route, would take place and therefore no marine life would be affected.

Cumulative Impacts

With no direct or indirect impacts to marine life under Alternative 1, there would be no contribution to cumulative effects.

Conclusion

Implementation of Alternative 1 would not impact marine life in the project area.

4.3.4.2 Alternative 2 – Hybrid Fiber Optic/Microwave

Direct and Indirect Impacts

Alternative 2 would involve construction of microwave repeater towers and a lake-bed fiber optic cable from Nondalton to Port Alsworth. Other than barge staging areas, all work would occur far from the marine environment hence no effects to marine life would be expected except for fuel spill risks and potential brief disturbance to marine mammals.

Occasional impacts to marine life in the barge staging areas of Carter Bay, Platinum, Togiak, and Kulukak Bay would be expected and fuel spills are unlikely but possible.

Disturbance may include displacement from haulouts. Regarding fuel spills, project personnel would be operating under an approved oil spill discharge and contingency plan that would be activated in the event of a fuel spill in the marine environment. Fuel spill effects in the marine nearshore environment would be characterized as medium intensity, temporary effects in an important context due to proximity in and near marine mammal protection areas and EFH.

Potential disturbance to marine life, including marine mammals, may occur due to barging activities, scheduled to occur from June to October over a period of approximately 150 days. Material barges would anchor but not land at Carter or Kulukak Bays so disturbance to marine life in these areas is expected to be minimal. Barges would land at established sites in Togiak and Platinum so the potential for disturbance to marine life, in these areas would be higher due to their close proximity to Steller sea lion critical habitat. Transportation of materials and equipment from the barges to work sites, as well as work crew transportation, would be expected to require approximately 110 helicopter flights per site during the June to October time period (Table 2-3). Potential disturbance effects in the marine environment would be characterized as low in intensity, temporary in duration, but affecting resources that are important in context due to proximity in and near marine mammal protection areas. Close coordination between project personnel and ADFG, NMFS, and commercial fishermen and subsistence resource users would be necessary to limit disturbance to marine mammals and special protection areas; and to limit conflicts with commercial fisheries or subsistence activities.

Cumulative Impacts

Past actions that have affected marine life are commercial fishing (including salmon, crab, groundfish, shellfish, and herring fisheries), subsistence activities (including fishing, hunting, and whaling), oil and gas resources development, transportation of oil and gas, oil spills, timber harvesting in coastal areas, cruise ship and other maritime traffic, mining, fish hatcheries, and the introduction of non-native species. The effects attributable to implementation of Alternative 2 would be minor and temporary (temporary disturbance due to barge and helicopter traffic) unless a fuel spill was to occur. In the event of a fuel spill in the marine environment moderate, temporary effects to marine life are expected that could contribute to other cumulative effects previously stated. Due to the low potential for impacts on marine resources, the project components under direct review in this EA would make a negligible contribution to cumulative effects for marine resources from the TERRA-SW project components installed on State and private lands.

Conclusion

Under Alternative 2 the risk of fuel spills exists but would be managed and mitigated. Barring a fuel spill scenario, implementation of Alternative 2 would be expected to have low intensity, temporary effects to resources considered important in context which includes marine mammal protected areas, Steller sea lion critical habitat and EFH. The summary impacts are considered minor.

4.3.4.3 Alternative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable

Direct and Indirect Impacts

Installation of the submarine cable would be expected to briefly disturb the shallow marine benthic environment along the continental shelf from Dillingham, Alaska to Quinhagak, Alaska. This brief disturbance would be characterized as a low intensity, temporary effect with a context ranging from common to important (with respect to protected marine mammal resources).

Temporary habitat loss or alteration could occur along the length of the submarine cable where recovery from burial would change the benthic habitat until it recovered to a usable state by marine organisms. This effect would be likely to vary in intensity according to time and location as the interaction of tides, wind, waves and ocean currents bury or expose portions of the submarine cable. These effects would be characterized as low in intensity, localized in a narrow linear corridor, and long-term, with effects ranging in context from common to important (in respect to protected marine mammal resources).

The proposed submarine cable route would traverse EFH (as defined under the Magnuson-Stevens Fisheries Conservation and Management Act) of the Nunivak Island, Etolin Strait, and Kuskokwim Bay Habitat Conservation Area and other protected non-pelagic trawling areas. Effects to EFH in these areas would be characterized as low-intensity with limited spatial extent, temporary habitat disturbance and potential temporary habitat loss in an important context (in respect to EFH). Close consultation with NMFS would be necessary to ensure that submarine cable installation effects to these resources are minimized and mitigated.

Installation of the submarine cable would be expected to cause brief disturbance of marine mammals (i.e. Steller sea lion, Pacific walrus) which are known to be sensitive to human activities such as noise from boat traffic and aircraft. These effects would be characterized as low intensity, limited in spatial extent, temporary effects in an important context (in respect to protected marine mammal resources). The proposed submarine cable route would enter the boundaries of Steller sea lion protected habitat near Cape Newenham and Round Island. There is a 3 nautical mile zone around the important walrus haul out site on Round Island that restricts the entrance of all boat traffic. The proposed submarine cable route avoids this 3 nautical mile protection zone. Steller sea lion critical habitat, in effect, extends this protection to a radius of 20 nautical miles from Round Island where commercial fishing is prohibited but other boat traffic is allowed. In order for the submarine cable to reach landfall areas Steller sea lion critical habitat would be traversed. Careful selection of cable landing areas would be necessary to minimize disturbance to marine mammals and avoid Steller sea lion and walrus haulouts. Authorization for incidental "take" of Pacific walrus and Steller sea lion as defined under the MMPA may be necessary prior to submarine cable installation.

Barges, tugs and other marine vessels used for submarine cable installation have the potential to collide with marine mammals causing injury or death. This risk can be partially mitigated by restricting work activities to daylight periods when the presence of marine mammals can be visually detected and avoided. This effect would be characterized as a low intensity, limited spatial extent, temporary effect in an important context (in respect to protected marine mammal resources).

Barges, tugs, and other marine vessels used for submarine cable installation have the potential to interfere or conflict with subsistence and commercial fisheries or fishing gear. These effects would be characterized as low intensity, limited spatial extent, temporary effects ranging in context from common to important (in respect to protected marine mammal resources and EFH). The risks can be partially mitigated through close communications with user groups (commercial and subsistence) and management agencies (ADFG, NMFS); and by avoiding active fishing locations and periods of peak fishing activity.

Fuel spills into the marine environment from vessels used to install the submarine cable could occur. If such a spill occurred it could potentially be harmful to marine life. These effects would be characterized as low intensity, temporary effects in a context ranging from common to important (in respect to protected marine mammal resources and EFH). The cable lay ship would be likely to be relatively small in size with limited capacity to store fuel onboard. Selection of experienced captains and crews would limit the risks of fuel spills. Best management practices including halting work during poor weather or low visibility conditions; and the use of fuel containment systems while refueling or during fuel transfers may further decrease the risk of fuel spills. The likelihood of a fuel spill large enough to cause measurable harm to marine life would be low. Project personnel would be operating under an approved oil spill discharge and contingency plan that would be activated in the event of a fuel spill in the marine environment.

Conflicts between the submarine cable and benthic feeding marine mammals such as gray whale or Pacific walrus would be possible. These effects would be characterized as low intensity, limited spatial extent, long term effects in a context ranging from common to important (in respect to protected marine mammal resources). Large benthic feeding organisms could potentially damage the cable or be harmed by it. The likelihood of a marine mammal becoming entangled or somehow injured by the cable would be low due to the size, weight, and armoring of the cable surface. Portions of the cable are likely to be buried by sediment due to the combined action of tides, wind, waves and ocean currents. The risk of conflict between the submarine cable and benthic feeding marine mammals would be expected to be less in areas where the cable is buried although this may be dependent on burial depth.

Cumulative Impacts

Past, ongoing, and future actions that have had and may continue to have impacts to marine life in the project area are described above under Alternative 2. The cumulative effects (habitat disturbance/loss, potential fuel spills, marine mammal disturbance, commercial fishing and subsistence conflicts, and conflicts with benthic feeding marine mammals) attributable to implementation of Alternative 3 are potentially synergistic in nature in that they could combine with or worsen the effects caused by activities previously stated under Alternative 2. In the event of a fuel spill in the marine environment, moderate, temporary effects to marine life may be expected that could contribute to other cumulative effects previously stated. However, the likelihood of a fuel spill large enough to cause measurable harm to marine life and habitats would be low.

Conclusion

Under Alternative 3 the risk of fuel spills exists but can be managed and mitigated. Implementation of Alternative 3 would be expected to have effects to marine life ranging from minor (disturbance/habitat loss in small area) to moderate (potential fuel spills).

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4.4 Social Environment

4.4.1 Socioeconomics

The following section describes the potential impacts on socioeconomics by each of the alternatives. These sections analyze the potential positive and negative impacts on population, employment, income, and lifestyle experienced in the region of influence.

4.4.1.1 Alternative 1 – No Action Alternative

Direct and Indirect Impacts

Under Alternative 1 (No Action) the three microwave sites and fiber optic cable would not be built or installed. Telecommunications and internet connectivity in the area would continue with existing technology. Healthcare, education, government, and private businesses may find existing telecommunication and connectivity infrastructure a limitation on improving and expanding services.

Under Alternative 1, no disturbance to existing economic activities would occur at the staging areas at Carter Bay, Platinum, Togiak, and Kulukak Bay, or within the Nondalton to Port Alsworth lake-bed fiber optic cable corridor. No local employment associated with the proposed project would occur.

Socioeconomic impacts resulting from implementation of Alternative 1 would be low in intensity, long-term in duration, and regional in context, affecting communities in the proposed project area.

Cumulative Impacts

Past actions and present actions affecting the regional economy include the existing satellite telecommunications services and current levels of government investment in schools and health and safety. Other major economic sectors, such as commercial fishing, mining, and the visitor industry have emerged and developed in response to market opportunities.

Recent economic trends in the region resulted in slight to moderate declines in village populations and strains on local households. These dynamics include a fluctuating market value for salmon, rising energy costs; and reduction of government funding for the public sector infrastructure and services. Future activities may include additional expansion projects for rural broadband service. However, these are at the proposal stage, and do not have secure funding. One of the proposals would depend on construction of the TERRA-SW Project, so under the No Action Alternative, the TERRA-Northwest project would become less likely to proceed.

The communities continue to seek capital improvement project appropriations. The only community in the region of influence that has secured funding for capital improvement projects is Dillingham. These projects include school renovations, water and sewer and road improvements, and a community center. These infrastructure upgrades improve upon quality of life and help retain and attract residents to the community.

Conclusion

Implementation of Alternative 1 would perpetuate the existing condition with limitations on telecommunications infrastructure and service; no new impacts would be generated. Thus Alternative 1 would not contribute to cumulative impacts to socioeconomic conditions.

4.4.1.2 Alternative 2 - Hybrid Fiber Optic/Microwave

Direct and Indirect Impacts

Implementation of Alternative 2 would create and strengthen the telecommunications infrastructure of the region, with the potential for long-term improvements to the region's economy, population, income, and businesses. The addition of cell phone antennas to the microwave repeater towers would extend cell phone services to the vicinity of the tower sites. Health services relying on telemedicine and education programs relying on distance education would see improved services and efficiencies. Government agencies, businesses, and local residents would expect improvements in speed and reliability of telecommunications. There are no quantitative models to characterize the economic benefit or potential economic growth likely to result from increased efficiencies in telecommunication, but qualitatively, these would be positive impacts, of medium to high intensity, occurring over the long-term life of the project, and regional in geographic context.

Construction

Direct impacts to employment and income would be highest during construction, but would be reduced in the period following the installation, during annual refueling and operation and maintenance activities. The construction footprint includes the barge landings for the three microwave repeater sites, and the lake-bed fiber optic cable egress points at Nondalton and Port Alsworth. A major goal of American Recovery and Reinvestment Act of 2009 is the creation of jobs in areas of high unemployment. The use of local labor and contracting resources is strongly encouraged. UUI's contractors have worked in these villages previously, and have trained local laborers who can operate equipment and support the project. Contractors would lead the crews and maintain an adequate staff to ensure quality and safety while supplementing working crews with skiff operators, welders and laborers (UUI, 12011). Another direct, temporary impact of construction may be displacement or reduction of recreation-based tourism within the vicinity of the staging and construction areas. Recreational guide businesses may alter their preferred areas to other locations during the one season construction period.

An indirect impact of this construction period would be the increase in use of local goods and services, such as lodging and restaurants.

Operations

The regional direct and indirect impacts from the installation and maintenance of these repeater sites include increased bandwidth to support telemedicine and distance education needs in the region and increased telecommunication capacity for public safety and other governmental functions. The addition of cell phone service in the vicinity of the towers would add a margin of safety in that travelers would be able to use cell phones in the event of an emergency. Increased opportunities for a web-presence and improved advertisement would arise for regional visitor industry small businesses. An indication of local perspectives on the urgency of improvement to telecommunications infrastructure was seen in comments on the Public Draft EA submitted by leaders from regional health corporations (Bristol Bay Area Health Corporation, Yukon Kuskokwim Health Corporation); education institutions (Lower Kuskokwim School District), Alaska Native Corporations (Choggiung, Inc., Bristol Bay Native Corporation, Calista Corporation) and governmental leaders (Mayor of the Lake and Peninsula Borough, Alaska Legislature delegations from Southwest and Northwest Alaska, and Alaska Congressional delegation members).

These institutional and agency commenters described specific, significant improvements in services that would result from improved broadband service. Health care programs, schools, businesses and government agencies could overcome the bandwidth, lower speed, and higher delay (latency) problems associated with existing satellite communications.

An adverse impact from the operational phase may be a decrease in eco-tourism as a result of the perception that some popular recreational areas would no longer be pristine as a result of installation of the microwave repeaters. A number of recreational industry business owners and their clients offered review comments to this effect. While these commenters stated that they would avoid the affected lands near Cone Mountain and the Kulukak River, as noted in the analysis of impacts to recreation in Section 4.4.6, it is unlikely that large-scale avoidance of the Togiak Refuge and BLM-managed lands would result. Recreational guide businesses may have to alter their preferred locations for future clientele; shifting their guiding into other areas of Southwest Alaska. It is also possible that the visual and noise impacts would be less severe than some stakeholders currently fear, and that recreation businesses would adapt with minor redirection of effort. This adaptive response would probably result in little impact on the revenue generated from these services.

Cumulative Impacts

Past, ongoing, and future actions that have had and would continue to have minor overall impacts to socioeconomics at the project areas are described above under Alternative 1. The implementation of Alternative 2 could result in economic stability and lay foundations for growth in the region, particularly when seen in relation to the other components of the TERRA-SW project not directly under review in this EA. By improving connections among villages and the larger economy via broadband access, health, education and governmental services would be improved, and business opportunities would extend beyond the region. The constraints on businesses from remote locations and a small regional population would be reduced. The proposed action under alternative 2 could positively contribute to the impacts of other economic development activities in the region.

Conclusion

Alternative 2's implementation would have positive effects of medium to high intensity, long-term duration and regional and statewide context. Adverse impacts to the visitor industry sector are possible, but estimated at low intensity over time. In summary, project improvements in communication infrastructure would result in a positive moderate summary impact.

4.4.1.3 Alternative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable

Direct and Indirect Impacts

Implementation of Alternative 3 would employ an alternate technology to improve telecommunications infrastructure, with positive impacts on socio-economic conditions, similar to those identified under Alternative 2. In one technical difference, the marine cable would not provide a platform for new telecommunication capacities, such as cell-phone antennas expanding service from the mountain top microwave repeater sites.

Direct impacts from the initial project activities would be highest during construction, but would be reduced in the period following the installation. The direct impact of staging construction crews in these communities would be positive. As in Alternative 2, UUI's contractors would be encouraged to hire locally, which would be expected to have a positive impact on the local economy.

A potential indirect impact of Alternative 3 would be the timing of the cable's installation, with potential for displacement, if the construction period were to coincide with the intensive commercial fishing seasons. The proposed route seeks to avoid near shore commercial salmon fisheries, crab fisheries, and related operations, UUI would need to mitigate potential displacement during construction by engaging local fishing industry early in the surveying and planning stages of the project. As stated in Section 3.4.1, fishing is a large segment of the local economy and sustains the subsistence lifestyle practiced by many residents.

Cumulative Impacts

Past, ongoing, and future actions that have had and would continue to have minor overall impacts to socioeconomics at the project areas are described above under Alternative 1. As with Alternative 2, the implementation of Alternative 3 would improve telecommunications infrastructure and contribute to other activities in government services and economic development.

Without appropriate mitigation measures for the construction period, the installation of the cable could have a negligible short-term impact on local fisheries, in the discrete areas affected during parts of the construction period. However, this risk can be significantly reduced through appropriate mitigation measures, developed in consultation with fisheries managers and industry representatives.

Conclusion

Socioeconomic impacts of implementing Alternative 3 would be positive with moderate intensity, long-duration, and regional to state-wide context. Potential negative impacts on commercial and subsistence fisheries during the construction period could be avoided by effective mitigation. Project improvements in communication infrastructure would result in a positive moderate summary impact.

4.4.2 Subsistence (ANILCA Section 810 Evaluation)

ANILCA Section 810 requires an evaluation of the effects on subsistence uses for any action to withdraw, reserve, lease, or otherwise permit the use, occupancy, or disposition of public lands. This evaluation consists of:

- A finding of whether or not a proposed action would have a significant restriction on subsistence uses
- A notice and hearing if an action is found to have a significant restriction on subsistence uses
- A three-part determination prior to authorization of any action if there is a significant restriction on subsistence uses.

The following serves as the basis for that evaluation.

As noted in Section 3.4.2 the analysis of impacts to subsistence focuses on the non-commercial, customary and traditional hunting, fishing and trapping activities of rural residents within the proposed project area. The types of impacts to subsistence to be considered include:

- Reductions in the abundance or availability of subsistence resources due to project impacts on population or habitats, (derived from analysis of impacts to the biological environment in Section 4.3),
- Reductions in access to subsistence harvest areas (due to legal or physical barriers associated with the proposed project) and;
- Increases in competition for subsistence resources, resulting from the proposed project.

4.4.2.1 Alternative 1 – No Action Alternative

Direct and Indirect Impacts

Implementation of Alternative 1 would have no direct or indirect impacts on subsistence uses in the proposed project area.

Cumulative Impacts

With no direct or indirect impacts to subsistence, Alternative 1 would not contribute to cumulative effects on these resources or uses.

Conclusion

Implementation of Alternative 1 would have no direct or indirect impacts on subsistence and would make no contribution to cumulative impacts.

4.4.2.2 Alternative 2 - Hybrid Fiber Optic/Microwave

Direct and Indirect Impacts

The implementation of Alternative 2 would strengthen regional telecommunications capacities through installation of microwave repeater towers at three remote locations and through installation of a lake-bed fiber optic cable from Nondalton to Port Alsworth. These project components are within areas utilized by regional subsistence users.

Effects on Subsistence Resources

During the 150 day construction period, from May to June, the proposed project would introduce noise disturbance that may temporarily displace land mammals and birds from the affected areas. The proposed project would have no impact on fish populations and fish habitat (Section 4.3.2), provided that appropriate measures are taken to prevent a spill of fuels during construction at the microwave repeater sites, or on the barge installing the lake-bed cable in Lake Clark. Section 4.3.3 examined potential impacts on important subsistence resources including caribou, moose, and waterfowl. This analysis noted that the construction period overlaps with reproductive and rearing seasons for some terrestrial wildlife species. However, the affected areas do not include known caribou calving grounds and only a few non-breeding transient caribou would likely be affected. Moose, bear, and wolf habitats are largely outside the affected area. Other habitats affected by the microwave repeater sites would include shelter and foraging habitat for small mammals, and nesting, foraging, and/or shelter habitat for birds. The helicopter transit corridors would result in impacts of medium intensity but for only a short duration. Helicopter noise impacts would be more intense in the staging areas, and these include important habitats for seabirds, shorebirds, and waterfowl. Within Kulukak Bay, waterbirds are not typically hunted for subsistence, but at Carter Bay waterbirds are heavily used for subsistence hunting (Abraham, 2011 – Personal Communication). The analysis concluded that summary impacts would be moderate, based on low intensity and temporary duration, affecting resources that are local in extent and common in context.

For the proposed project area from Nondalton to Port Alsworth, the sockeye salmon run is an especially important subsistence resource. Section 4.3.2.2 concluded that direct impacts to the sockeye salmon resource are unlikely, provided that effective measures are taken to avoid fuel spills. Installation of the fiber optic cable at the landfall sites in Nondalton and Port Alsworth would cause brief disturbances in sedimentation, due to trenching and underwater hand jetting necessary to secure the cable. However, these impacts would be short in duration, and would likely occur in a glacially turbid portion of Lake Clark. Moreover, most sockeye salmon spawning areas are at or adjoining the northern end of Lake Clark, away from the proposed cable route.

During the operations period, there are noise impacts in the area adjacent to the microwave repeater sites and along helicopter flight paths during the estimated 6-9 days per year of helicopter refueling flights for all three microwave repeater sites and the estimated 6 days with helicopter flights for maintenance. As a mitigation measure, helicopter-supported refueling would occur during a seasonal window that avoids the intensive hunting, fishing and recreational activity period, estimated at mid-May to mid-October. This would also reduce impacts to subsistence users during the late spring and summer period. During de-commission, the disturbance from activity and helicopters would be similar to that of the construction period.

The proposed project would not be expected to adversely affect important subsistence wildlife populations and their abundance. However, the staging activities in Carter Bay should be concluded early in the construction season, (currently schedule to conclude by the end of July) to avoid impacts to waterfowl and to subsistence hunters.

Effects on Access to Subsistence Resources

During the 150 day construction period, the immediate area around the barge and staging activities in Carter Bay, Platinum, Togiak, and Kulukak Bay would not be conducive to subsistence harvests. With effective consultation with local communities, the cable-laying activity in Lake Clark can be managed with no expected displacement of sockeye salmon subsistence harvests. Over the 25-year operation of the project the immediate areas of the microwave repeater sites would unavailable to subsistence users. Noise from the generators would be expected to dissipate to low levels (20 dBA) at a distance of 4,590 ft from the microwave repeater sites during the winter. Thus, subsistence resources and subsistence users may avoid an area approximating a one-mile radius, or 3.14 square miles per site or a total of 9.42 square miles for the three sites together.

The proposed project would limit access to subsistence use areas only in the near vicinity of the microwave repeater sites, which is considered a negligible part of the total subsistence use area.

Once installed, the lake-bed cable in Lake Clark would not limit access or activities involved in subsistence fishing.

Increased Competition for Subsistence Resources

The proposed project would use helicopters to transport materials, equipment, and personnel to the construction sites. There are no new roads or trails associated with construction of the microwave repeater sites. The scale of the proposed project is such that a small workforce, including local hires as possible, would be expected to complete construction during a single season. The project would not be expected to bring a new permanent workforce to the region. For these reasons, the proposed project would not be expected to increase competition for subsistence resources in the project area.

Cumulative Impacts

Past, present, and RFFAs include trends of economic strains and population declines in some regional communities. A number of regional organizations are attempting to promote economic development and to develop public infrastructure and services through capital improvement appropriations. Alternative 2 would bring improvements in the regional communication infrastructure that may improve the efficiency and web-presence of the visitor industry, resulting in minor increases in visitor levels across the region. However, the effects of this increased recreation usage would be minor to moderate intensity, and long duration spread over the region’s recreational areas, specifically Togiak Refuge, the BLM-managed lands, and Lake Clark National Park and Preserve. Implementation of Alternative 2 would contribute little to cumulative effects on subsistence resources, access to subsistence resources, or competition for subsistence resources. As a result, the project components under direct review in this EA would make a negligible contribution to cumulative effects on subsistence from the TERRA-SW project components installed on State and private lands.

Conclusion

Implementation of Alternative 2 would have effects on subsistence uses of low intensity and long-term duration but in a very small area (localized extent), and affecting resources that are common in context. The summary impact of Alternative 2 on subsistence would be considered negligible.

4.4.2.3 Alternative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable

<u>Direct and Indirect Impacts</u>

Effects on Subsistence Resources

Installation of the marine fiber optic cable under Alternative 3 would have negligible direct and indirect effects on subsistence resources and subsistence user access to the waters associated with the marine cable alignment. Section 4.3.2.3 concluded that pelagic marine environment and marine fish would not be expected to experience potential effects other than temporary disturbance as the submarine cable is being installed. With appropriate prevention measures, the likelihood of a fuel spill large enough to cause measurable harm to marine fish or fish habitats would be considered low. In regard to marine mammals, Section 4.3.4.3 concluded that installation of the submarine cable would be expected to cause brief disturbance of marine mammals (i.e. Steller sea lion, Pacific walrus) which are known to be sensitive to human activities such as noise from boat traffic and aircraft. These effects would be characterized as low in intensity, temporary in duration, localized in spatial extent, and affecting resources that are important in context (in respect to protected marine mammal resources).

The effects of implementation of Alternative 3 would not be expected to result in the reduction of marine subsistence resource populations or availability.

Effects on Access to Subsistence Resources

The installation of a marine fiber optic under Alternative 3 would result in very limited, temporary displacement to subsistence users, during the time that the cable-laying vessel transits a subsistence use area. Once installed, the marine cable would not displace subsistence fishing or marine mammal harvesting. Thus, Alternative 3 would not be expected to restrict access to subsistence resources.

Increased Competition for Subsistence Resources

Alternative 3 would involve a smaller workforce during installation than Alternative 2, and would not be expected to contribute to an increase in competition for subsistence resources.

<u>Cumulative Impacts</u>

Past, ongoing, and RFFAs are estimated to have minor impact on subsistence resources and use patterns. As with Alternative 2, Alternative 3 would bring improvements in the regional communication infrastructure that may improve the efficiency and web-presence of the visitor industry, resulting in minor increases in visitor levels across the region. However, the effects of this increased recreation usage would be of minor to moderate intensity, and long duration spread over the region’s recreational areas, specifically Togiak Refuge, BLM-managed lands, and Lake Clark National Park and Preserve. Implementation of Alternative 3 would have a negligible contribution to cumulative effects on subsistence resources, access to subsistence resources, or competition for subsistence resources.

Conclusion

Implementation of Alternative 3 would have negligible direct, indirect, effects on subsistence uses, and a negligible contribution to cumulative effects on these resources and uses.

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4.4.3 Land Use

4.4.3.1 Alternative 1 – No Action Alternative

Direct and Indirect Impacts

Under implementation of Alternative 1, land use would remain the same. There would be no direct or indirect impacts to commercial fisheries, subsistence and recreational uses, mining claims, Alaska Native corporation land holdings, or Alaska Native allotments.

Cumulative Impacts

Since Alternative 1 has no direct or indirect effects on land use, it would not contribute to the cumulative effects of past, present, and reasonably foreseeable future actions.

Conclusion

Implementation of Alternative 1 would have no direct or indirect impacts on land use and no contribution to cumulative effects on this resource.

4.4.3.2 Alternative 2 - Hybrid Fiber Optic/Microwave

Direct and Indirect Impacts

In order to allow the proposed facilities on the Togiak Refuge, the Togiak CCP would be amended to change the management category from Minimal Management to Intensive Management for areas in the vicinity of the microwave repeater sites. The change to Intensive Management would allow impacts to the naturalness of the environment and show distinct evidence of human-caused change. These impacts would be evident not only within the footprint of the Intensive Management, but also within the 10 mile viewshed of the proposed project. Habitats would be disturbed and their ability to function through natural processes may be impaired. These impacts also may be evident beyond the footprint of the Intensive Management. These impacts would be medium to high in intensity, local to regional in extent, and long-term to permanent in duration.

Construction

Direct impacts of implementation of Alternative 2 on land use patterns would be greatest during the 150 day construction period. The staging areas to support the construction of the microwave repeater sites would be in Carter Bay, Platinum, Togiak, and Kulukak Bay. At Togiak and Kulukak Bays construction staging activities could potentially overlap with commercial fishing. The temporary period of staging activities, particularly helicopter use to move equipment, supplies, and personnel, would be expected to result in little physical displacement of the fisheries, but the noise associated with the helicopters would be noticeable. At the microwave repeater sites helicopter and construction activity would not physically displace recreational fishing or hunting during the temporary construction period. However, noise and visual disturbances would affect recreational and guided hunting and fishing uses, with the result that they may avoid affected areas for the construction season.

The laying of the lake-bed fiber optic cable in Lake Clark would affect a very small area for a brief period of time. Subsistence uses would only be displaced from the immediate site of the landfall construction activities, and this would occur during a very short period. The use of a small barge to lay the cable would not be expected to displace subsistence activities, and would introduce only a low level of noise and activity disturbance to subsistence users. In addition, the cable installation operator would coordinate with local communities about the seasonal timing of the cable installation and the barge's rate of progress through sensitive areas to best avoid impacts. Direct and indirect impacts of Alternative 2 from the construction period would include a high level of intensity in the staging area and a medium level of intensity at the microwave repeater sites. The effects during construction would be temporary, limited by the 150 day construction period, and would affect resources that are local in extent and common in context.

Operations

Following construction, direct and indirect impacts would be limited to effects of the physical infrastructure installed at the three microwave repeater sites and the landfall structures for the lake-bed cable located at Port Alsworth. The installed infrastructure would affect an area of 0.53 acres for the long term, and would result in negligible direct displacement of other land uses. The noise and visual disturbance from the operations of the project would include noise from the operation of generators, and visual effects within sight of the microwave repeaters towers. In addition, annual refueling and maintenance flights by helicopters, would affect the sites on 9-15 days per year for the life of the project (about 4 percent of days per year). As a mitigation measure, helicopter-supported refueling would occur during a seasonal window that avoids the intensive hunting, fishing and recreational activity period, estimated at mid-May to mid-October. These noise and visual disturbances may lead recreational and guided hunting and fishing users to select alternate areas within the Refuge. A fuller discussion of noise impacts is found in Section 4.4.7, and visual impacts are assessed in Section 4.4.8. The impacts are considered of low to moderate intensity, diminishing quickly at distances from the sites, though these would be permanent effects, through the life of the project, and affecting resources that are local and common in context.

Decommissioning

Impacts from decommissioning activities would likely be similar to construction impacts.

<u>Cumulative Impacts</u>

Past, ongoing, and future actions that have had and would continue to have minor impacts to land use in the proposed project area include on-going capital improvement projects, generally in the immediate vicinity of the communities. As noted in Section 4.1, there are potential projects, including the Pebble project, which could change the land use characteristics in portions of Bristol Bay, outside of the Togiak Refuge and the BLM-managed lands. However, these projects are not yet permitted or funded, and so they are set aside from analysis as speculative at the present time.

If a large project of this sort were to proceed to development, the remaining undeveloped lands in the region would be of greater value to recreational visitors. With improved telecommunications infrastructure, businesses may improve their efficiencies, and extend the reach of their advertisement. The visitor industry may extend the reach of its advertising, with minor increases in visitor volume. The effects of this increased usage would be of minor intensity, long-term duration, and spread across the region, including the Togiak Refuge, the BLM-managed lands in the Goodnews Bay Block, and Lake Clark National Park and Preserve. The project components under direct review in this EA would make a negligible contribution to cumulative effects to land use patterns from the TERRA-SW project components installed on State and private lands. Lands affected by those components have different characteristics and land use patterns and fall under other management regimes. In particular, displacement of recreational uses to other lands affected by other TERRA-SW project components is considered a low likelihood. Implementation of Alternative 2 would have a negligible contribution to past, present, and RFFAs having cumulative impacts on land use.

Conclusion

Taking into account the intensity, duration and context of impacts on land use during the construction and operations phases, implementation of Alternative 2 would have a minor summary impact. While noise and activity disturbances would be of high or medium intensity at the staging area and the microwave construction tower sites respectively and along the helicopter flight paths, this is limited to the 150 day construction period, and these activities affect localized areas, whereas the resources are common in context. As noted in Appendix D, under the Togiak Refuge CCP, permits for the construction of the microwave repeater sites at Caribou Ridge and Kulukak Mountain would require a revision to the plan, reclassifying these sites from minimal to intensive management. During the operations phase, the impacts are confined to small areas, and are of low intensity, affecting resources that are common in context and would be considered minor.

4.4.3.3 Alternative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable

Direct and Indirect Impacts

Direct impacts of Alternative 3 would be the highest during construction season, as the staging areas for the laying of the cable are Quinhagak, Platinum, Togiak, and Dillingham are also access hubs for commercial fishing, recreational, and personal fishing vessels. Commercial and subsistence fishing occurs along portions of the marine cable route, and there would be minor disruption as the cable-laying vessel passes through. Vessels transporting recreational users also pass through the project area on an intermittent basis. Scheduling construction activities in coordination with other vessels would minimize these impacts. The potential overlap of staging and cable-laying activities under Alternative 3 with existing land uses would be a temporary, minor impact to land use.

The proposed route seeks to avoid near shore commercial salmon fisheries, crab fisheries, and related operations. UUI would need to mitigate potential displacement during construction by engaging local fishing industry early in the surveying and planning stages of the project. Mitigation would offset this potential negative short-term impact of local marine resources and their use.

Cumulative Impacts

Past, ongoing, and future actions in the project area would continue to have minor impacts to land use at the staging and cable-laying alignment for Alternative 3. As with Alternative 2, the implementation of Alternative 3 would contribute to long-term improvements to the business efficiency of visitor industry and may contribute to minor increases in recreational land use levels. The effects of this increased usage would be of minor intensity, and long-term in duration spread out over the region's recreational areas, including the Togiak Refuge, the BLM-managed lands, and Lake Clark National Park and Preserve. As stated above, mitigation measures may offset a negative short-term impact on local fisheries during parts of the construction period.

Conclusion

Implementation of Alternative 3 would be expected to have a minor direct impact on land use, and would make a negligible contribution to cumulative impacts on land use. Potential negative impacts on commercial and subsistence fisheries during the construction period could be avoided by effective mitigation. Thus, implementation of Alternative 3 would result in a minor impact on land use patterns.

4.4.3.4 Wilderness Character and Values (Togiak Refuge)

The following analysis reviews potential impacts on the wilderness character and values within a ten mile radius of the project components within the Togiak Refuge (Figure 4-1). A very small area in the northern portion of the Caribou Ridge 10-mile radius viewshed extends into the Togiak Wilderness, but otherwise the lands under consideration in this analysis are not formally designated as Wilderness, under the terms of the Wilderness Act of 1964. Section 3.4.4 identified the lands in the Togiak Refuge to be analyzed. In addition, definitions were offered for the key characteristics: undeveloped, untrammeled, natural, outstanding opportunities for solitude, and primitive and unconfined recreation in Section 3.4.4. (Due to the specific requirements of SO 3310, a separate analysis of impacts to BLM-managed Lands with Wilderness Characteristics is found in Section 4.4.4).

4.4.3.4.1 Alternative 1 – No Action Alternative

Direct and Indirect Impacts

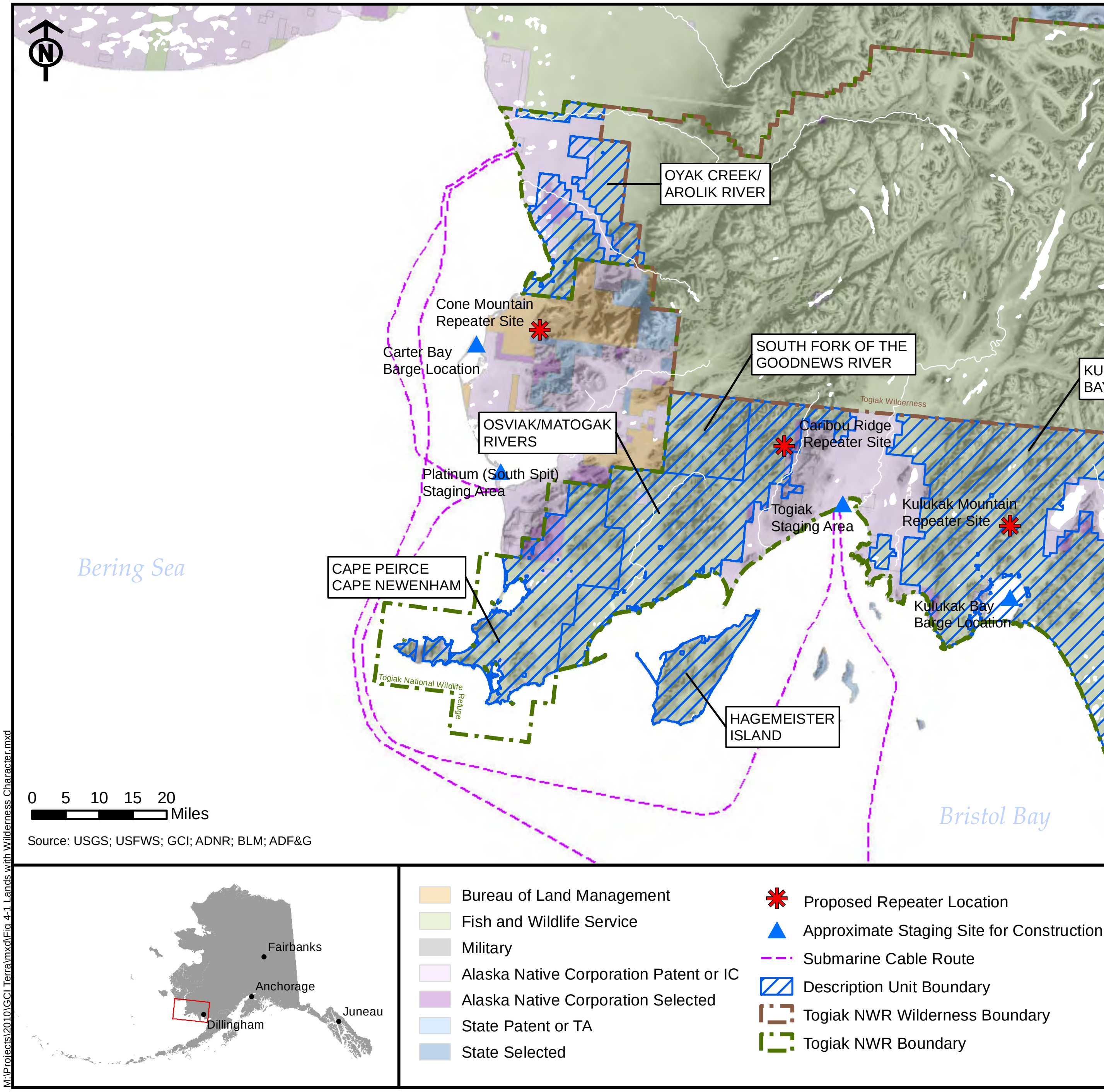
Under implementation of Alternative 1, there would be no changes to existing conditions, thus no direct or indirect impacts to wilderness character and values would occur.

Cumulative Impacts

With no direct or indirect impacts to wilderness character and values Under Alternative 1, there would be no contribution to cumulative impacts.

Conclusion

Implementation of Alternative 1 would have no direct or indirect impacts on wilderness character and values, and would make a negligible contribution to cumulative effects on these resources.



TERRA - Southwest Environmental Assessment

Figure 4-1:
Lands with Wilderness Character

April 2011

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4.4.3.4.2 Alternative 2 - Hybrid Fiber Optic/Microwave

Direct and Indirect Impacts

Implementation of Alternative 2 during construction, operations, and maintenance of the proposed microwave repeater towers in remote undeveloped areas would affect wilderness character and values. However, the intensity, duration and context (extent) of this impact must be considered in order to reach a summary impact conclusion.

Construction

The analysis of noise impacts (Section 4.4.7) indicates that during the 150 day construction helicopter noise and construction activity would introduce noise levels in excess of 30 dBA L_{max}, within an irregular corridor along the helicopter flight paths and at distances of 5 to 10 miles from the centerline. During the subsequent operations and maintenance period, a comparable level of helicopter transit would occur for 8 to 10 days a year (about 3 percent of days in the year). At the microwave repeater sites, the sound of construction equipment and the generators used during the summer construction period would attenuate to a level of 30 dBA L_{eq} at a distance of 6,585 feet. During the winter period, the sound of generators at the remote microwave repeater sites would attenuate to 20 dBA at a distance of 4,590 feet. Thus the noise disturbance can be characterized as high intensity for a temporary period within a limited geographic extent. Impacts to wilderness characteristics would be greatest during construction due to the numerous helicopter flights and construction activity. During operations the generators would operate full time, but would disturb a small area, even when a lower sound threshold for winter time is taken into account.

There would be a continuing visual impact due to tower and structures in addition to transitory impact caused by the noise and visual impact of helicopter inspection and refueling flights for an estimated 12 to 15 days each year during the operational life of the project. The analysis of visual impacts in Section 4.4.8 modeled the locations and visibility of the 60 ft microwave repeater towers as affected by the surrounding topography. While the towers would be visible from locations up to 10 miles away, they would not be high contrast features in relation to the surrounding topography.

The installation of the lake-bed fiber optic cable from Nondalton to Port Alsworth would involve negligible noise and visual effects during installation, and no permanent visible infrastructure outside of the landfall cable housing shelter in the two communities. As a result, this project component would not affect LWCs.

Thus the construction phase of implementing of Alternative 2 would adversely affect the undeveloped, untrammeled, and natural qualities of lands, as well as opportunities for solitude within 10 miles of the microwave repeater sites and along the helicopter transit corridors. However, this effect would be of medium intensity, and temporary duration, and affect resources that are localized and common in context, as it concerns noise and the construction period.

Operations

For the operations and maintenance period, noise impacts from generators would be of low intensity, long-term duration, and affecting resources that are localized and common in context. Annual maintenance and refueling flights by helicopters would be of medium intensity, over a larger area, but would occur for 8 to 10 days per year for the two sites on the Refuge over the 25 year life of the project. As a mitigation measure, helicopter-supported refueling would occur during a seasonal window that avoids the intensive hunting, fishing, and recreational activity period, estimated at mid-May to mid-October. Visual impacts following construction are based on the long-term duration of the installed microwave repeater towers. Given the weak-contrast characteristic when taking into account the topography of the surrounding area, this impact would be of medium intensity, long-term duration, and affect resources that are local and common in context.

The characteristics of opportunity for solitude and ability to participate in primitive and unconfined recreation are related to the analysis of impacts to Recreation (Section 4.4.6). These characteristics are highly desired by backcountry recreational visitors, whether they use the services of world-class fishing lodges and regional air taxis, or rely more on hiking and floating a river. These characteristics also reflect the perception of visitors and the expectation they bring to their backcountry experience. As described in the discussion of noise and visual impacts, following the more intense effects of the 150 day construction period, long-term impacts from the microwave repeater towers are expected to be of low to medium intensity and confined to a relatively small geographic extent. The mitigation measure creating a seasonal window for helicopter refueling flights, outside of the period of intensive recreation activity would considerably reduce noise impacts to recreation uses. For those recreational visitors who continue to use areas such as the mouth of the Kulukak River, which is on the outer edge of the ten-mile radius, the tower would have a weak contrast rating as it relates to the surrounding topography. Recreation service providers and recreational visitors seeking solitude and primitive recreation could be displaced from the helicopter flight path and the construction sites during the construction season and from close proximity to the tower sites during the life of the project.

Decommissioning

When the site is decommissioned all physically visible structures would be removed and the noise and visual impacts to other land uses during decommissioning would be similar to those of the construction period. When the site decommissioning is completed, all physically visible structures would be removed.

<u>Cumulative Impacts</u>

Past, present, and RFFAs with effects on socioeconomics, subsistence, and recreation are discussed in Sections 4.4.1 and 4.4.2 and 4.4.6 respectively. To the extent that these resources rely on the health of the visitor industry, the reliability of productive habitats for subsistence resources, and the perception of visitors that the region still provides a quality wildland experience, these have an influence on the trends and effects on wilderness character and values. General trends indicate the potential for increases in the visitor industry, based on continuing economic development efforts.

Under Alternative 2, visitors may experience more over-flights, and in high-use areas (e.g., fishing along rivers), more evidence of human presence. The implementation of Alternative 2 would contribute to cumulative effects on wilderness character and values in the project area. The introduction of the microwave repeater towers and associated project components would be the first facilities of this sort in the remote undeveloped areas of the project area. Some recreational users place particular value on the undeveloped character of the landscape they observe in Bristol Bay. The impacts would be considered to be long-term but of low to moderate intensity and local geographic context. Recreation service providers and backcountry visitors may perceive a loss in the wilderness characteristics and may redirect their activities to areas where the towers are no longer noticeable.

Conclusion

Under Alternative 2 the construction impacts would be limited to one season. During the operations phase, impacts would include noise disturbance from tower site generators in a one-mile radius, visual disturbance from the installed telecommunication facilities at Caribou Ridge and Kulukak Mountain, and noise disturbance associated with helicopter-supported refueling operations. Impacts from refueling would be reduced by the mitigation measure limiting activities to the period outside of the principal hunting, fishing, and recreation seasons. In all, the impact on wilderness character and values would be minor. Implementation of Alternative 2 would contribute a minor additive or synergistic effect with other trends affecting the visitor industry and wilderness character and values in the project area.

4.4.3.4.3 Alternative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable

Direct and Indirect Impacts

The construction of the proposed marine fiber optic cable would introduce construction related noise into the waters close to the four communities hosting the land fall facilities during a brief period. However, waters near these communities are sites of intensive commercial fishing activity during the summer months, and the activity of a cable-laying vessel would not be a new introduction of mechanized transport into waters that are otherwise undeveloped, untrammeled, and natural. Once construction of the landfall facilities is completed and the marine cable is laid, there would be no associated ongoing noise or visual disturbance to the project area.

The characteristics of opportunity for solitude and ability to participate in primitive and unconfined recreation are related to the analysis of impacts to recreation, found in Section 4.4.6. These characteristics are highly desired by backcountry recreational visitors, whether they access the area by air or by water taxi from the nearby communities. Given the intensive summer months when commercial fishing occurs in near-shore waters within the marine cable alignment, recreational visitors would understand that solitude is possible only after the commercial fishing season ends or at a distance from the commercial fisheries. If the marine cable were to be installed, then Alternative 3 would have no expected impact on the characteristics of solitude and primitive recreation.

In order to avoid impacts to marine resources, the Alternative 3 marine cable alignments avoid important wildlife zones, such as the Round Island exclusion area (a Pacific walrus haul-out) and Cape Peirce.

Cumulative Impacts

Coupled with past, present, and RFFAs, Alternative 3 would be considered to have a negligible contribution to cumulative impact to wilderness character and values along the proposed festooned cable route.

Conclusion

Implementation of Alternative 3 would result in negligible direct and indirect impacts on wilderness character and values on Refuge lands, and make a negligible contribution to cumulative impacts on these resources.

4.4.4 Lands with Wilderness Characteristics (Cone Mountain)

As a result of the specific review requirements in SO 3310, impacts to BLM-managed Lands with Wilderness Characteristics (LWCs) in vicinity of Cone Mountain are separately analyzed in this section.

4.4.4.1 Alternative 1 – No Action Alternative

Direct and Indirect Impacts

Under implementation of Alternative 1, no direct or indirect impacts to LWCs would occur.

Cumulative Impacts

With no direct or indirect impacts to LWCs, there would be no contribution to cumulative impacts on these resources.

Conclusion

Implementation of Alternative 1 would have no direct or indirect impacts on LWCs, and would make a negligible contribution to cumulative effects.

4.4.4.2 Alternative 2 - Hybrid Fiber Optic/Microwave

The BLM-managed and administered contiguous lands within the Cone Mountain area consist of 143,437 acres of which approximately 1.3 acres would be temporarily impacted during the construction phase and 0.19 acres during the long-term operation of the facility. The following relevant information was used in determining that the proposed action would "impact" but not "impair" the LWC:

- The proposed action would not do anything to diminish the size of the roadless area to less than 5,000 acres, especially given that the construction/infrastructure support would all be done via helicopter.
- One cell tower and associated facilities affecting 1.3 acres (at maximum extent) within 143,437 acres does not constitute substantially noticeable works of humans.
- Solitude in the immediate area may be temporarily *impacted*, but once construction is completed, this would not permanently *impair* this wilderness characteristic. Opportunities for primitive recreation would not be impacted.

Implementation of SO 3310 does not allow for the creation of buffers (a buffer is an area of land adjacent to a designated land use where the non-designated lands are managed the same as or similar to those within the designation thus creating a de facto expansion of the designated lands) within LWC areas and does allow for the exclusion of small land parcels from the LWC if they have developed ROWs. The exclusion of the proposed site (1.3 acres at maximum extent) from LWC would not impair the BLM's ability to designate in a future land use planning action all or part of the remaining LWC lands (approximately 143,437 acres) as Wild Lands. The primary criteria used in determination of the boundary of an LWC area is based on wilderness inventory roads (none present in this area) and naturalness (the removal of the 1.3 from the larger area of 143,437 acres does not substantially impact LWC.) Though important, when determining the boundary for LWC, those boundaries should not be constricted solely on the basis of opportunity for solitude or primitive and unconfined recreation (which would be slightly more impacted by the proposed action due to the visual and noise impacts of the proposed action. As a mitigation measure, helicopter-supported refueling operations (14 trips, over a period of 2-3 days to the Cone Mountain site) would be limited to a seasonal window outside of the period of intensive hunting, fishing, and recreational activity, estimated to occur from mid-May to mid-October. Throughout the project operations period, this would reduce noise impacts to the characteristics of solitude and primitive recreation during most of the period when recreational visitors are active.

Direct and Indirect Impacts

Implementation of Alternative 2 during construction, operations, and maintenance of the proposed microwave repeater tower in the remote undeveloped area would affect the wilderness characteristics of the lands. However, the intensity, duration and context (extent) of this impact must be considered in order to reach a summary impact conclusion.

Construction

The analysis of noise impacts (Section 4.4.7) indicates that during the 150 day construction period helicopter noise and construction activity would introduce noise levels in excess of 30 dBA L_{max}, within an irregular corridor along the helicopter flight paths and at distances of 5 to 10 miles from the centerline. During the subsequent operations and maintenance period, a comparable level of helicopter transit would occur for 4 to 5 days a year (about 1 percent of days in the year). At the microwave repeater site, the sound of construction equipment and the generators used during the summer construction period would attenuate to a level of 30 dBA L_{eq} at a distance of 6,585 feet. During the winter period, the sound of generators at the remote microwave repeater sites would attenuate to 20 dBA at a distance of 4,590 feet. Thus the noise disturbance can be characterized as high intensity for a temporary period within a limited geographic extent. Impacts to wilderness characteristics would be greatest during construction due to the numerous helicopter flights and construction activity. During operations the generators would operate full time, but would disturb a small area, even when a lower sound threshold for winter time is taken into account.

There would be a continuing visual impact due to tower and structures in addition to transitory impact caused by the noise and visual impact of helicopter inspection and refueling flights for an estimated 4 to 5 days each year during the operational life of the project. In accordance with the direction of SO 3310, when appropriate, wilderness characteristics may be impacted when in accordance with requirements of law and other resource management considerations. If approved, the proposed action would fulfill an important need of the communities involved by providing needed broadband service which would enhance public health and safety and provide for potential economic development in the areas served. In addition, all of the impacts could be mitigated and removed by decommissioning the site, if in the future, the BLM decided to designate the lands involved as Wild Lands as described in SO 3310.

The analysis of visual impacts in Section 4.4.7 modeled the location and visibility of the 60 ft microwave repeater tower as affected by the surrounding topography. While the tower would be visible from locations up to 10 miles away, (visible from approximately 54,038 acres of BLM-managed lands) it would not be a high contrast feature in relation to the surrounding topography and would not be an impairment of LWC because of the legal requirement not to create buffers around LWC.

The installation of the lake-bed fiber optic cable from Nondalton to Port Alsworth and construction of the proposed towers within the Togiak Refuge would involve no BLM-managed lands which would be subject to SO 3310. As a result, these project components would not affect LWCs.

Thus the construction phase of implementing Alternative 2 would adversely affect the undeveloped, untrammeled, and natural qualities of lands within 10 miles of the microwave repeater site on Cone Mountain and along the helicopter transit corridors. However, this effect would be of medium intensity, and temporary duration, and affect resources that are local and common in context, as it concerns noise and the construction period.

Operations

For the operations and maintenance period, noise impacts from generators would be of low intensity, long-term duration, and affecting resources that are considered common in context. Annual maintenance and refueling flights by helicopters would be of medium intensity, over a larger area, but would occur for up to 5 days per year over the 25 year life of the project. As a mitigation measure, refueling flights would be limited to a seasonal window outside of the period of intensive hunting, fishing and recreational activity, estimated at mid-May to mid-October. Visual impacts following construction are based on the long-term duration of the installed microwave repeater tower. Given the weak-contrast characteristic when taking into account the topography of the surrounding area, this impact would be of medium intensity, long-term duration, and affecting resources that are local and common in context.

The characteristics of opportunity for solitude and ability to participate in primitive and unconfined recreation are related to the analysis of impacts to Recreation (Section 4.4.5). These characteristics are highly desired by backcountry recreational visitors, whether they use the services of world-class fishing lodges and regional air taxis, or rely more on hiking and floating a river. These characteristics also reflect the perception of visitors and the expectation they bring to their backcountry experience. As described in the discussion of noise and visual impacts, following the more intense effects of the 150 day construction period, long-term impacts from the microwave repeater tower is expected to be of low to medium intensity and confined to a relatively small geographic context. Recreation service providers and recreational visitors seeking solitude and primitive recreation would be displaced from the helicopter flight path and the construction sites during the construction season and from close proximity to the tower site during the life of the project.

Decommissioning

When the site is decommissioned all physically visible structures would be removed and the noise and visual impacts to other land uses during decommissioning would be similar to those of the construction period. When the site decommissioning is completed, all physically visible structures would be removed.

<u>Cumulative Impacts</u>

Past, present, and RFFAs with effects on socioeconomics, subsistence, and recreation are discussed in Sections 4.4.1 and 4.4.2 and 4.4.6 respectively. To the extent that these resources rely on the health of the visitor industry, the reliability of productive habitats for subsistence resources, and the perception of visitors that the region still provides a quality wild land experience, these have an influence on the trends and effects on LWCs. General trends indicate the potential for increases in the visitor industry, based on continuing economic development efforts.

Visitors may experience more over-flights, and in high-use areas (e.g., fishing along rivers), more evidence of human presence. The implementation of Alternative 2 would contribute to cumulative effects on LCWs in the project area. The introduction of the microwave repeater tower and associated project components would be the first facilities of this sort in the remote undeveloped area of the project area. Some recreation users place particular value on the undeveloped character of the landscape they observe. The impacts would be considered to be long-term but of low to moderate intensity and limited geographic context. Recreation service providers and backcountry visitors may perceive a loss in the wilderness characteristics and may redirect their activities to areas where the tower is no longer noticeable.

Conclusion

Under Alternative 2 the construction impacts would be limited to one season. During the operations phase, impacts would include noise disturbance from the Cone Mountain tower site generators in a one-mile radius, visual disturbance from the installed telecommunication facilities, and noise disturbance associated with helicopter-supported refueling operations. Limiting helicopter supported refueling flights to avoid the period of intensive hunting, fishing, and recreational activity, will reduce impacts to opportunities for solitude and primitive recreation. In all, the impact on LWCs would be minor to moderate. Implementation of Alternative 2 would contribute a minor additive or synergistic effect with other trends affecting the visitor industry and LWCs in the project area.

4.4.4.3 Alternative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable

Direct and Indirect Impacts

Since Alternative 3 would install a fiber optic cable in marine waters offshore from Bristol Bay, it does not enter the BLM-managed LWCs in the Cone Mountain area under review in this section. Alternative 3 would have no direct or indirect impacts on the BLM-managed LWCs.

Cumulative Impacts

With no direct or indirect impacts on BLM-managed LWCs, implementation of Alternative 3 would make no contribution to cumulative effects on the LWCs.

Conclusion

Implementation of Alternative 3 would have no direct or indirect on BLM-managed LWCs and would make no contribution to cumulative effects.

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4.4.5 Transportation

4.4.5.1 Alternative 1 – No Action Alternative

Direct and Indirect Impacts

Under implementation of Alternative 1, local and regional transportation methods would remain the same. There would be no direct or indirect impacts to transportation.

Cumulative Impacts

With no direct or indirect impacts to transportation, Alternative 1 would have no contribution to cumulative impacts.

Conclusion

Implementation of Alternative 1 would be expected to have no direct or indirect impacts on transportation.

4.4.5.2 Alternative 2 - Hybrid Fiber Optic/Microwave Alternative

Direct and Indirect Impacts

Construction

During the construction period, there would be increased helicopter traffic from the staging areas to the microwave repeater tower sites. Figures 2-2 and 2-3 display the routes traveled by Chinook, Huey, and Raven helicopters during construction and operation. The proposed helicopter route for each microwave repeater site would experience an average of 110 trips total. Transportation of materials, equipment, and personnel for the implementation of Alternative 2 would represent an intense, but short-term, increase in regional transportation activities. Project-related transportation would be concentrated along specific corridors and would be temporary, lasting no more than 150 days. The project would secure transportation services, without competing for or displacing current users of regional transportation services.

The laying of the lake-bed cable from Nondalton to Port Alsworth would involve a shallow-draft barge during the brief construction period, and this would not be expected to displace existing transportation in the Lake Clark area.

Operations

The annual maintenance trips to each of the three microwave repeater sites via helicopter would follow the same routes taken during the construction period. The annual maintenance and refueling transportation by helicopter would involve 15 days per year for the three sites, but occurring on an annual basis for the life of the project. The impacts would be of medium intensity, intermittent and long-term in duration, and affecting resources that are local and common in context.

Decommissioning

As with construction, the use of helicopters for decommissioning would represent an intense, but short-term, increase in regional transportation activities resulting in a medium intensity, short-term duration impacts affecting resources that are common in context.

Cumulative Impacts

Past, ongoing, and RFFAs would have minor impacts to regional transportation in the proposed project area. Aircraft and marine transportation are major regional modes of travel in the project area. There are no roads connecting the communities within the proposed project area, but small boats, ORV's and snowmachines support seasonal travel between communities. There are no capital improvement projects currently funded for inter-community road projects; thus, the regional transportation patterns are expected to remain the same.

RFFAs affecting the major economic sectors of commercial fishing, government sector, and the visitor industry are expected to help stabilize and potentially contribute to small growth in the regional population and economic activity. While population growth and improved economic development in the region would increase the demand for additional transportation services, there are no quantitative data with which to estimate transportation demands. An increase in population and economic activity, including in the visitor industry, may result in growth in regional transportation services.

The implementation of Alternative 2 could result in an increase in transportation activity, particularly during the construction period and in the vicinity of the staging areas and helicopter transit corridors to the microwave repeater sites. These contributions to trends in regional transportation would be negligible, as impacts would be limited to a short duration (150 days for the construction period) and to a confined set of corridors, followed by intermittent activity over the 25-year life of the project. As a result, the project components under direct review in this EA would make a negligible contribution to cumulative effects to transportation systems from the TERRA-SW project components installed on State and private lands.

Conclusion

Implementation of Alternative 2 would be expected to be of medium intensity, temporary in duration, and local and common in context. Impacts to transportation would be expected to be negligible.

4.4.5.3 Alternative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable

Direct and Indirect Impacts

Direct impacts of Alternative 3 on existing transportation patterns would occur during the construction period. The staging areas for the laying of the marine fiber optic cable would be at Quinhagak, Platinum, Togiak, and Dillingham and these are also centers for transportation relating to commercial fishing, subsistence uses, and recreational service providers. Construction activities would be based on marine vessels moving along the proposed marine cable alignment route. This would be unlikely to affect existing transportation services, or to displace current maritime transportation. Direct and indirect impacts on regional transportation would be of low intensity, temporary duration, and affecting resources that are local and common in context.

Cumulative Impacts

As with Alternative 2, past, ongoing, and RFFAs would likely have minor impacts to regional transportation near the proposed project areas. Implementation of Alternative 3 would contribute additional maritime transportation to the region during marine cable placement. The project would be expected to have a negligible contribution to cumulative effects on regional transportation patterns.

Conclusion

Implementation of Alternative 3 would be expected to be of low intensity, temporary in duration, and local and common in context. Alternative 3 would be expected have a negligible impact to regional transportation.

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4.4.6 Recreation

4.4.6.1 Alternative 1 – No Action Alternative

Direct and Indirect Impacts

Under implementation of Alternative 1, recreational use within the region would remain the same. There would be no direct or indirect impacts to recreational uses.

Cumulative Impacts

With no direct or indirect impacts to recreation, Alternative 1 would have no contribution to cumulative impacts on recreation.

Conclusion

Implementation of Alternative 1 would have no direct or indirect impacts on recreation, and would make no contribution to cumulative impacts on recreation.

4.4.6.2 Alternative 2 - Hybrid Fiber Optic/Microwave

Direct and Indirect Impacts

The implementation of Alternative 2 would strengthen telecommunications infrastructure, and which could provide for greater efficiency and outreach in the web-presence of the Bristol Bay visitor industry. This may in turn lead to a minor increase in the recreational and tourism industry, over a long duration, and across the region, including Togiak Refuge, BLM-managed lands, Lake Clark National Park and Preserve, and adjoining marine areas. Improved telecommunications infrastructure is also likely to improve health care (through tele-medicine) and government services, including search and rescue and emergency response. These would be positive, indirect impacts to the recreation sector.

Construction

There are no quantitative data available to gauge how many visitors may be currently using areas affected by construction activities. Visitors and residents who recreate near the staging areas, along the helicopter transit routes, and near the mountain sites of the proposed microwave repeaters would experience noise and visual impacts during the estimated 150 day construction season. The analysis of noise in Section 4.4.7 notes that during an individual landing or departure from both the staging areas and the repeater sites, visitors within a 1,000 feet of the areas would experience loud (>90 dBA L_{max}) noise levels. However, noise dissipates quickly as a function of distance and topography (Section 4.4.7). At distances of .5 to 1.5 miles away from the helicopter flight path, the sound level would attenuate to <45 dBA L_{max} and to <30 dBA L_{max} at distances of 5 to 10 miles. Visitors may be disturbed by noise from the helicopter traffic in the flight paths from the staging areas to the proposed microwave repeater sites. This direct impact would be of moderate intensity, and short-term in duration. In close proximity to the microwave repeater sites, the helicopter or construction activity would negatively affect a visitor's perception of traveling in a relative remote and undeveloped, natural landscape. For the guided recreational fishermen transiting from lodges in the Wood Tikchik State Park to Kulukak Bay, described in Section 3.4.3.3, a flight path to the lower Kulukak River on either side of the ridge where the propose microwave tower is located, would result in ready visibility of the microwave repeater and facilities at Kulukak Mountain a considerable distance. This would affect perceptions about the landscape, but may not dissuade fisherman from using the productive waters of the lower Kulukak River.

The direct impact to recreation and visitors from vessel noise during installation of the lake-bed fiber optic cable from Nondalton to Port Alsworth would be expected to occur for only a short period of time. While these activities would be audible and visible to visitors, impacts would be considered low in intensity, occur for a short-term duration, and affecting resources that are local and common in context. Once installed, the cable would not be visible to recreational visitors.

Operations

Each microwave repeater site would require annual maintenance to service and refuel the generators. For each site, an estimated 14 round trip flights of a Bell UH-1B helicopter each year would be required to deliver the fuel, and it is anticipated that this effort would take 2-3 days per site, with two additional flights per site for seasonal maintenance. The primary noise source at each of the proposed microwave repeater sites during operations would be the Cummins D1703-M diesel generators, for which noise level is 20 dBA Leq at a distance of 4,590 feet during the winter. As a mitigation measure, refueling flights would be limited to avoid the intensive hunting, fishing, and recreation period, estimated at mid-May to mid-October. Operational impacts would be considered low in intensity, localized, and intermittent (i.e. several days per year) for the long-term life of the project. Decommissioning activities would be similar to construction.

The visual impacts for each repeater site would be medium intensity for the long-term duration of the project, but affecting resources that are common in context. Because the Refuge and BLM-managed lands are home to a variety of flora, fauna, and topographic features of interest, visitors would have alternative areas to explore. Both guide services and recreational visitors to the Refuge and BLM-managed lands may choose to continue recreating in areas within sight of the microwave repeaters because the visual impacts are less than feared, and due to cellular phone service providing increased ability to communicate in an emergency.

Others may opt for alternative areas they perceive as pristine. An adverse impact from the operational phase may be a decrease in eco-tourism as a result of the perception that some popular recreation areas within the Refuge and BLM-managed lands are no longer pristine as a result of installation of the microwave repeaters. A number of recreation industry business owners and their clients offered review comments to this effect.

Decommissioning

When the site is decommissioned all physically visible structures would be removed and the noise and visual impacts to other land uses during decommissioning would be similar to those of the construction period. When the site decommissioning is completed, all physically visible structures would be removed, eliminating of visual impacts to recreation.

Cumulative Impacts

Past, present, and RFFAs include the rise of the visitor industry and growth in recreational activities throughout the region. The guided fishing lodges of Bristol Bay provide and are expected to continue to provide world class fishing opportunities for a discerning clientele of anglers. Adventure tourism and backcountry recreation are expected to continue to grow in popularity.

RFFAs affecting potential growth in recreational activities would be expected to help stabilize and potentially contribute to small growth in the regional population and economic activity. While population growth and improved economic development in the region would likely increase the demand for recreation related infrastructure and guide and transportation services, there are no quantitative data with which to estimate these demands. An increase in population and economic activity, including in the visitor industry, may result in growth in regional recreational services.

As noted in Section 4.4.1, the implementation of Alternative 2 could result in positive benefits to the recreation sector including improvements to communication services available to visitors in the region and expanded recreation business opportunities. The visitor services in the region currently face constraints due to their location in a rural region at a distance from large population centers, and improved telecommunications would reduce these limitations. The proposed action under Alternative 2 could positively contribute to future economic development of recreation activities in the region. As for potential adverse impacts to recreation, implementation of Alternative 2 would contribute to the completion of the full TERRA-SW project, which would include another microwave repeater tower on State lands on the Muklung Hills, north of Dillingham. That region is not perceived as pristine, in the same way that the Togiak Refuge and BLM-managed lands in the vicinity of Cone Mountain may be. Thus, the tower sites under direct review in this EA would not significantly contribute to greater impacts on recreation by the whole TERRA-SW project.

Conclusion

A direct impact from construction of Alternative 2 could include a minor positive contribution to the visitor industry due to improved telecommunications and web-presence. The mitigation measure limiting helicopter-supported refueling operations to a period outside of the months of intensive recreation activity would considerably reduce impacts to recreation throughout the project operations period. Disturbance to visitors and recreational visitors from construction and operation (including noise and visibility of facilities) would be considered minor to moderate.

4.4.6.3 Alternative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable

Direct and Indirect Impacts

Installation of the marine fiber optic cable under Alternative 3 would have negligible direct and indirect effects on recreational uses in the project area. During the construction period, a cable-laying vessel would be staged from the communities of Quinhagak, Platinum, Togiak, and Dillingham, and would transit the cable alignment. The proposed route seeks to avoid wildlife zones, such as Round Island, Cape Peirce, and other points of interest to visitors to the Togiak Refuge and the BLM-managed lands near Cone Mountain. Coordination and consultation with the visitor industry in the surveying and planning stages of the proposed project could avoid or minimize any potential negative impacts to recreation users during installation of the marine cable.

Cumulative Impacts

Past, ongoing, and RFFAs are estimated to have minor impact to recreation within the project area. As with Alternative 2, improvements in the communication infrastructure may improve the efficiency and web-presence of the visitor industry, resulting in minor increases in visitor levels across the region. The implementation of Alternative 3 would improve telecommunications infrastructure and contribute to other activities in government services and economic development in the region.

Conclusion

Implementation of Alternative 3 would potentially have a positive effect on the visitor industry due to improved telecommunication support for industry and visitors. Impacts from construction would be of low intensity and occur for a temporary duration, affecting resources that are local and common in context. No impacts to recreation would be expected to occur during operation. The summary impact of Alternative 3 is expected to be negligible.

4.4.7 Noise

4.4.7.1 Alternative 1 – No Action Alternative

Direct and Indirect Impacts

Under the No Action Alternative, there would be no direct or indirect effects to the acoustic environment as there would not be any flight, construction, or operational activities.

Cumulative Impacts

With no direct or indirect impact on the ambient noise environment within any of these communities under Alternative 1, there would be no contribution to cumulative effects on this resource.

Conclusion

Implementation of Alternative 1 would not result in the generation of any noise impact on any of the existing communities within the area. There would be no direct or indirect impacts to the acoustic environment and no contribution to cumulative impacts on this resource.

4.4.7.2 Alternative 2 – Hybrid Fiber Optic/Microwave

Direct and Indirect Impacts

Construction

There are three sources of noise that would be associated with Alternative 2: helicopter flights to and from each of the repeater sites for construction and site maintenance; construction equipment during site setup; and the diesel generators used to power the sites during normal operation. The helicopter flights for the Cone Mountain site would originate from a barge in Carter Bay and from an existing site near Platinum. Helicopter flights for the Caribou Ridge and Kulukak Mountain repeater sites would originate from Togiak and from a barge in Kulukak Bay. It is anticipated there would be a total of approximately 110 helicopter flights to each of the microwave repeater sites during the construction period. A Robinson R-44 helicopter would be used for crew transport and light freight. A Bell UH-1B "Huey" helicopter would be used for medium sized lifts and initial material supply transportation to the sites. A Boeing Chinook 234, a heavy lift, twin rotor helicopter would be used for the transport of shelters and fuel tanks from the project staging areas. The noise from these projected helicopter operations was calculated along the individual flight tracks and at selected noise sensitive sites between the staging areas and the three repeater sites. The Federal Aviation Administration's Integrated Noise Model Version 7.0b was used to calculate noise levels from these operations to a level of 45dBA L_{max}. The Bell UH-1B "Huey" helicopter is known for the low frequency rumble which is due to blade slap against the air, and it is predominantly heard when the helicopter is approaching. The Integrated Noise Model takes this noise into account and the noise values listed in Tables 4-1 through 4-5 include this effect.

The results of the helicopter noise modeling for the operations at each of the microwave repeater sites are described in Tables 4-1 through 4-5. These tables list the maximum noise level, and the areas of the total contour areas in square kilometers, square miles, and in acres. Tables 4-1 to 4-5 represent the maximum noise levels generated by each of the three helicopter types for a single flight event to and from each of the repeater locations. The noise contours for the three proposed microwave repeater sites are described in Figures 4-2 and 4-3. Additional information regarding noise is included in Appendix G.

Table 4-1. Projected Helicopter Noise Levels Between Cone Mountain and Carter Bay

Helicopter Noise Level (dBA L_{max})	Total Contour Area (sq. km.)	Total Contour Area (sq. mi.)	Total Contour Area (acres)
30	507.2	195.8	125,331
35	325.9	125.8	80,520
40	222.9	86.1	55,092
45	149.8	57.8	37,022
50	99.3	38.3	24,527
55	66.0	25.5	16,300
60	41.1	15.9	10,156
65	20.2	7.8	4,982
70	2.6	1.0	644
75	0.9	0.3	223
80	0.3	0.1	65
85	0.0	0.0	1

Table 4-2. Projected Helicopter Noise Levels Between Cone Mountain and Platinum

Helicopter Noise Level (dBA L_{max})	Total Contour Area (sq. km.)	Total Contour Area (sq. mi.)	Total Contour Area (acres)
30	1,609.5	621.4	397,705
35	985.1	380.3	243,418
40	623.5	240.7	154,060
45	402.4	155.4	99,443
50	260.2	100.5	64,295
55	164.4	63.5	40,615
60	87.4	33.7	21,595
65	27.1	10.5	6,694
70	10.5	4.0	2,583
75	2.6	1.0	634
80	0.6	0.2	159
85	0.1	0.1	34

Table 4-3. Projected Helicopter Noise Levels Between Caribou Ridge and Togiak

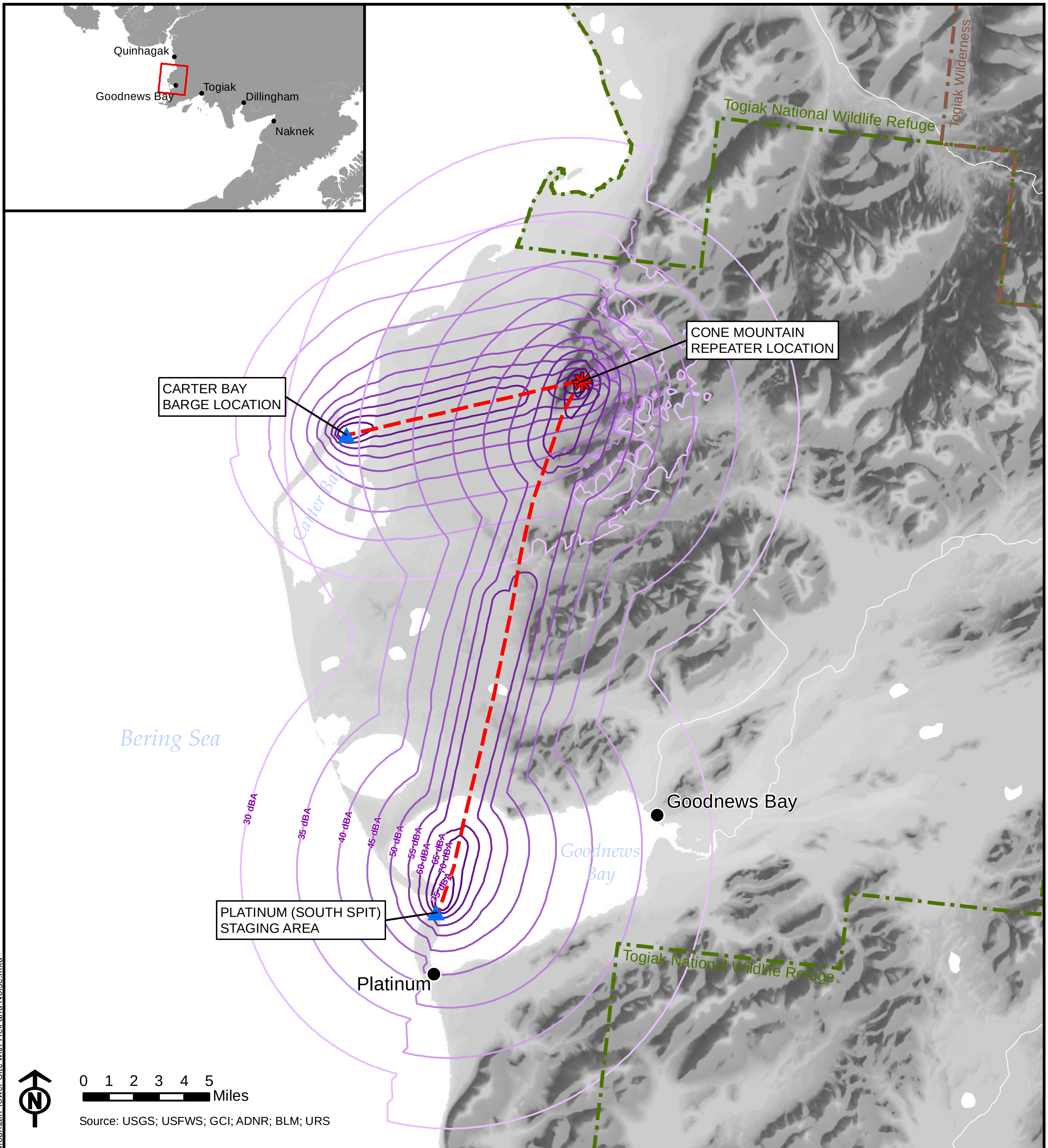
Helicopter Noise Level (dBA L_{max})	Total Contour Area (sq. km.)	Total Contour Area (sq. mi.)	Total Contour Area (acres)
30	1,094.0	422.4	270,325
35	688.9	266.0	170,234
40	439.4	169.7	108,578
45	279.5	107.9	69,058
50	183.6	70.9	45,375
55	118.3	45.7	29,237
60	78.2	30.2	19,325
65	47.1	18.2	11,645
70	19.9	7.7	4,911
75	3.1	1.2	761
80	1.0	0.4	248
85	0.2	0.1	61

Table 4-4. Projected Helicopter Noise Levels Between Kulukak Mountain and Togiak

Helicopter Noise Level (dBA L_{max})	Total Contour Area (sq. km.)	Total Contour Area (sq. mi.)	Total Contour Area (acres)
30	1,635.7	631.5	404,189
35	1,029.7	397.6	254,439
40	665.0	256.7	164,315
45	431.0	166.4	106,505
50	274.1	105.8	67,721
55	161.4	62.3	39,892
60	78.4	30.3	19,378
65	23.3	9.0	5,753
70	9.2	3.6	2,283
75	2.6	1.0	643
80	0.8	0.3	202
85	0.1	0.0	21

Table 4-5. Projected Helicopter Noise Levels Between Kulukak Mountain and Kulukak Bay

Helicopter Noise Level (dBA L_{max})	Total Contour Area (sq. km.)	Total Contour Area (sq. mi.)	Total Contour Area (acres)
30	724.8	279.8	179,091
35	485.4	187.4	119,935
40	321.1	124.0	79,342
45	213.0	82.2	52,630
50	137.8	53.2	34,044
55	84.7	32.7	20,937
60	40.6	15.7	10,024
65	8.7	3.4	2,144
70	2.4	0.9	604
75	0.9	0.3	212
80	0.2	0.1	59
85	0.1	0.0	15



Proposed Repeater Location
Approximate Staging Site for Construction
Helicopter Flight Path
Togiak NWR Wilderness Boundary
Togiak NWR Boundary

Noise Contours

30 dBA Noise Contour
45 dBA Noise Contour
60 dBA Noise Contour
75 dBA Noise Contour

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Environmental Assessment

Figure 4-2:
Alternative 2 - Cone Mountain Repeater Site Location Showing Helicopter Flight Paths and Noise Contours During Summer Construction and Annual Maintenance

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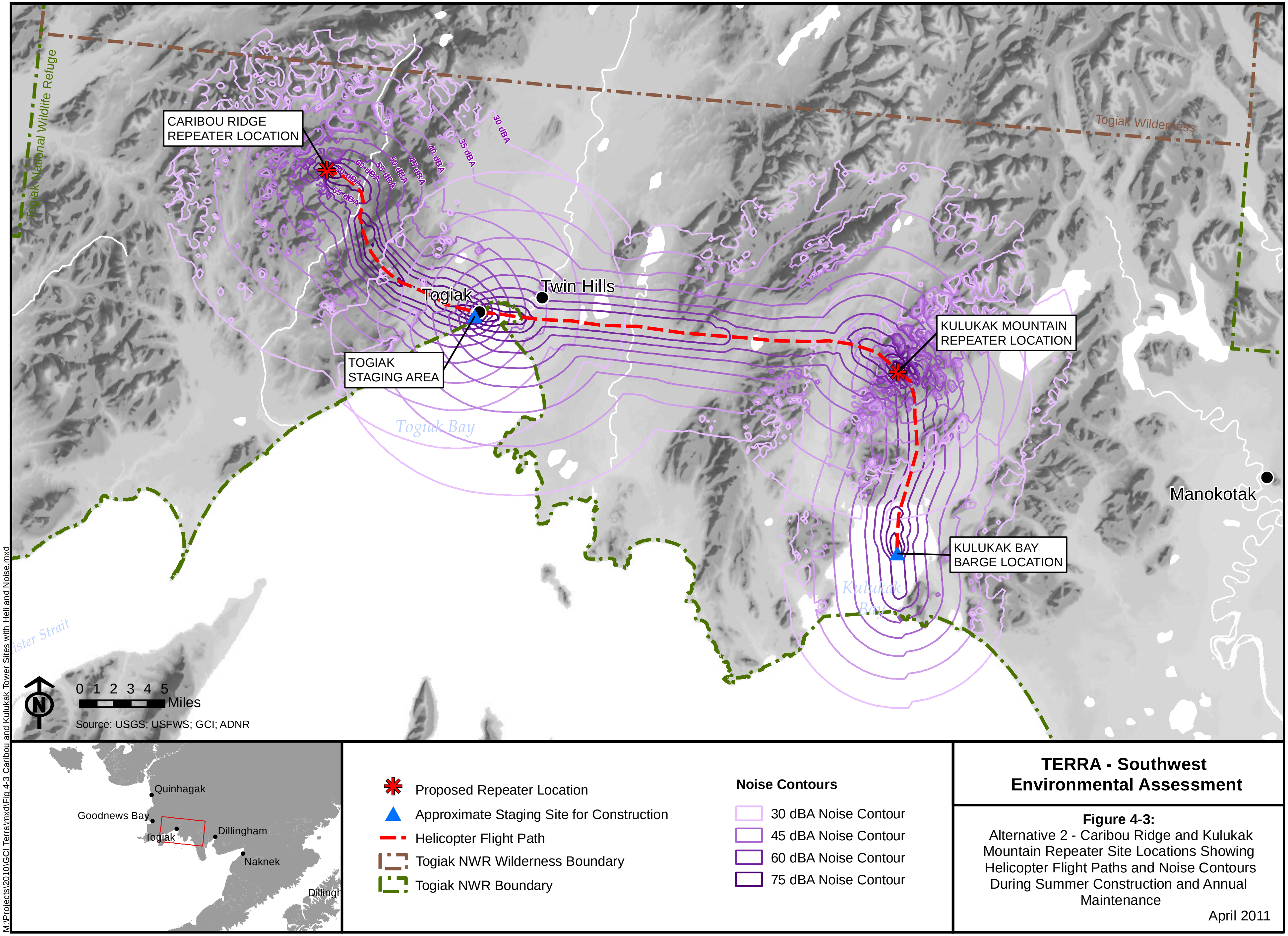

TERRA - Southwest Environmental Assessment

Figure 4-3:
Alternative 2 - Caribou Ridge and Kulukak Mountain Repeater Site Locations Showing Helicopter Flight Paths and Noise Contours During Summer Construction and Annual Maintenance

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In the locations where helicopters would be coming from two different locations to the microwave repeater site (e.g., Cone Mountain); the noise contours at this site would overlap (Figure 4-2). The loudest areas of helicopter noise would occur at the staging/departure sites and at the microwave repeater sites. Project construction at each site is expected to take approximately 150 days, and the construction of the three sites is proposed to occur simultaneously. Of these trips, approximately 60 trips would utilize a Bell UH1 helicopter to and from the barges, 4 trips would utilize a Chinook 234 helicopter to and from nearby towns, and 30 to 40 trips would utilize a Robinson R-44 helicopter to and from nearby communities. Helicopters would travel at an altitude of 450 meters. With a total of 110 flights projected for each site during construction, the average number of flights during this period would be less than one per day. On-site construction of the repeater sites would involve the use of a backhoe, an air compressor, two portable generators, a jackhammer, and various electrically and pneumatically driven power tools. Each of these tools is expected to generate a substantial level of noise as each repeater site is constructed. The sound levels would be higher than the existing ambient natural levels at each site; however these noises would be temporary. These levels would attenuate to a noise level of 60 dBA L_{eq} at a distance of 820 feet, and would attenuate to a level of 45 dBA L_{eq} at a distance of 4,612 feet. Noise levels from construction equipment alone during the summer construction period would attenuate to a level of 30dBA L_{eq} at a distance of 6,585 feet. Summer time noise levels from the combined construction equipment and generators for construction would attenuate to a level of 30dBA L_{eq} at a distance of 6,700 feet.

Under implementation of Alternative 2, there would be direct impacts to the soundscape at Cone Mountain, Caribou Ridge, and Kulukak Mountain, as well as direct impacts at the staging areas in Carter Bay, Platinum, Togiak and Kulukak Bay. During the construction phase, the effects to the repeater sites are expected to be of high intensity, temporary in duration, and local and common in context. The maximum noise levels at the microwave repeater sites or the staging sites would be loud (>90 dBA L_{max}) during an individual landing or departure, however the duration of the construction activities would be limited to a single season, therefore the duration would be temporary.

Operations

During normal operations at each of the microwave repeater sites, a power source is required for operation of the repeaters. The microwave repeaters for this site have been designed to utilize two 9 kW diesel generators. One would be used as a primary power source and the other would be used as a back-up. These generators would be the dominant noise source at each of the repeater sites during normal operation. The Cummins D1703-M diesel generators proposed for each site are expected to generate a noise level of 78 dBA L_{eq} at a distance of 23 feet. These generators would use "hospital grade" silencers (GTE Industries 201-5102) which would be expected to decrease the levels of noise. These levels would attenuate to a noise level of 60 dBA L_{eq} at a distance of 183 feet, and would attenuate to a level of 45 dBA L_{eq} at a distance of 1,027 feet. The generators at each site are expected to burn approximately 7,000 gallons of diesel fuel per year, and each site would be serviced to replenish the fuel supply. During the winter the generators are expected to attenuate at 20 dBA L_{eq} at a distance of 4,590 ft. It is anticipated that 14 round trip flights of a Bell UH-1B helicopter each year would be required to deliver the fuel, and it is anticipated that this effort would take 2-3 days per site. Maintenance flights are expected to take place once a year, with two trips per site and using an R-44 helicopter. The maximum noise levels from the individual helicopter operations expected to occur during typical site maintenance would the same as the maximum noise levels presented for construction.

During normal operations, the number of individual helicopter flights would drop significantly to a total of 48 flights over 12-15 days per year for the three sites combined. As a mitigation measure, helicopter-supported refueling would occur during a seasonal window that avoids the intensive hunting, fishing and recreation activity period, estimated at mid-May to mid-October. In this case, the intensity would be low to medium, but the duration would be increased to intermittent and long-term as the flights would occur during the life of the project. Also during normal operations, the generators at each repeater site would be operating on a continuous basis. The source would have a 20 dBA L_{eq} noise footprint extending to approximately 4,590 feet from the site. The intensity is expected to be low but the duration would be long-term. There are no recreation areas or areas of public use located within this distance of any of the proposed microwave repeater sites.

Decommissioning

Decommissioning impacts would be expected to be similar to construction activities.

Cumulative Impacts

All of the ongoing activities within the region establish a baseline acoustic environment that has remained relatively unchanged as in the recent decade, population and economic growth has slowed. Fixed wing aircraft flights occur daily throughout the project area. As a result, residents are somewhat acclimated to noise from flight events. All of the RFFAs for this area are not expected to have any substantial impact on the overall noise environment. Any possible major projects are still in the conceptual stages and cannot be classified as reasonably foreseeable. Once this project was constructed and operating as planned, the number of flight operations for the three sites would total 54 helicopter flights, occurring on 12-15 days per years (about 4 percent of days in the year). This would result in a minor overall effect to the existing or future acoustic environment, but the impact would be intermittent and long-term. For a community that currently experiences daily flights within the environment, this project would not contribute significantly to the existing and reasonably foreseeable future noise environment.

The project components under direct review in this EA are not expected to significantly contribute to cumulative effects for noise from the TERRA-SW project components installed on State and private lands. Helicopter support for construction and annual operations would be required for a microwave repeater site on the Muklung Hills. Other components would involve marine vessels for installing the submarine cable across Cook Inlet and in Lake Iliamna. Overland vehicle support would be needed for installing overland cables, such as the Igiugig to Levelock line. Given the diversity of these noise sources and the widely dispersed geography of the other components, little contribution to cumulative effects is expected from the three tower sites and the activities associated with installation of the Lake Clark cable.

Conclusion

Impacts from noise associated with helicopters could be minimized through the development and implementation of site specific mitigation plans developed in consultation with FWS and BLM. Helicopter overflights and landings would cause a degree of disturbance, but the effect would be temporary in nature. The 282 estimated helicopter flights would be dispersed over multiple flight paths and the aircraft are required to fly at or above a relatively high altitude of 1500-feet which would lessen the magnitude of sound at ground level and thereby minimize noise impacts. The mitigation measure establishing a seasonal window for helicopter-supported refueling activities would considerably reduce noise impacts to recreation users during the time of year when they are most active. Impacts from noise associated with the generators at the microwave repeater sites are of low intensity and confined to a small area. Implementation of Alternative 2 with mitigation measures would result in summary effects to the acoustic environment that would be minor. These effects would be of low intensity, long-term duration, and affecting resources that are local and common in context.

4.4.7.3 Alternative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable

Direct and Indirect Impacts

Under Alternative 3 submarine cable installation would be conducted off of a locally chartered vessel(s), either a self-propelled landing craft or a barge and tug combination. The vessel would be fully modified to land the cable safely and accommodate the required crews. The vessel would be designed to operate in shallow water and be capable of going dry on the mud flats without concern to the vessel integrity or safety. Cable burial would likely have to occur from land using both terrestrial equipment and a barge equipped for cable burial. The schedule for installation of the submarine cable would range from 38 to 66 days. Once the cable is installed, the system would be subject to occasional maintenance.

The installation of the cable would use local vessels, not introducing new sound sources to the area. Therefore, the intensity of this portion of the project is expected to be low. Any noise associated with the installation would cease once the cable has been installed. These effects would be temporary in duration as the installation is anticipated to be completed in one season. Maintenance of the cable system would be low in intensity as activities would take place only on an as-needed basis, however, the duration would be long-term in a local context.

Cumulative Impacts

The cumulative effects for Alternative 3 would also be the same as Alternative 2. Under Alternative 3 the noise impacts from the submarine cable in the project area would be low in intensity and short-term, limited to the construction period and the very intermittent repair activity. Implementation of Alternative 3 would not contribute to cumulative effects to the acoustic environment of the area.

Conclusion

Implementation of Alternative 3 would result in effects to the overall acoustic environment that would be of low intensity, short-term duration, and affecting local resources that are common in context. The summary impact would be negligible.

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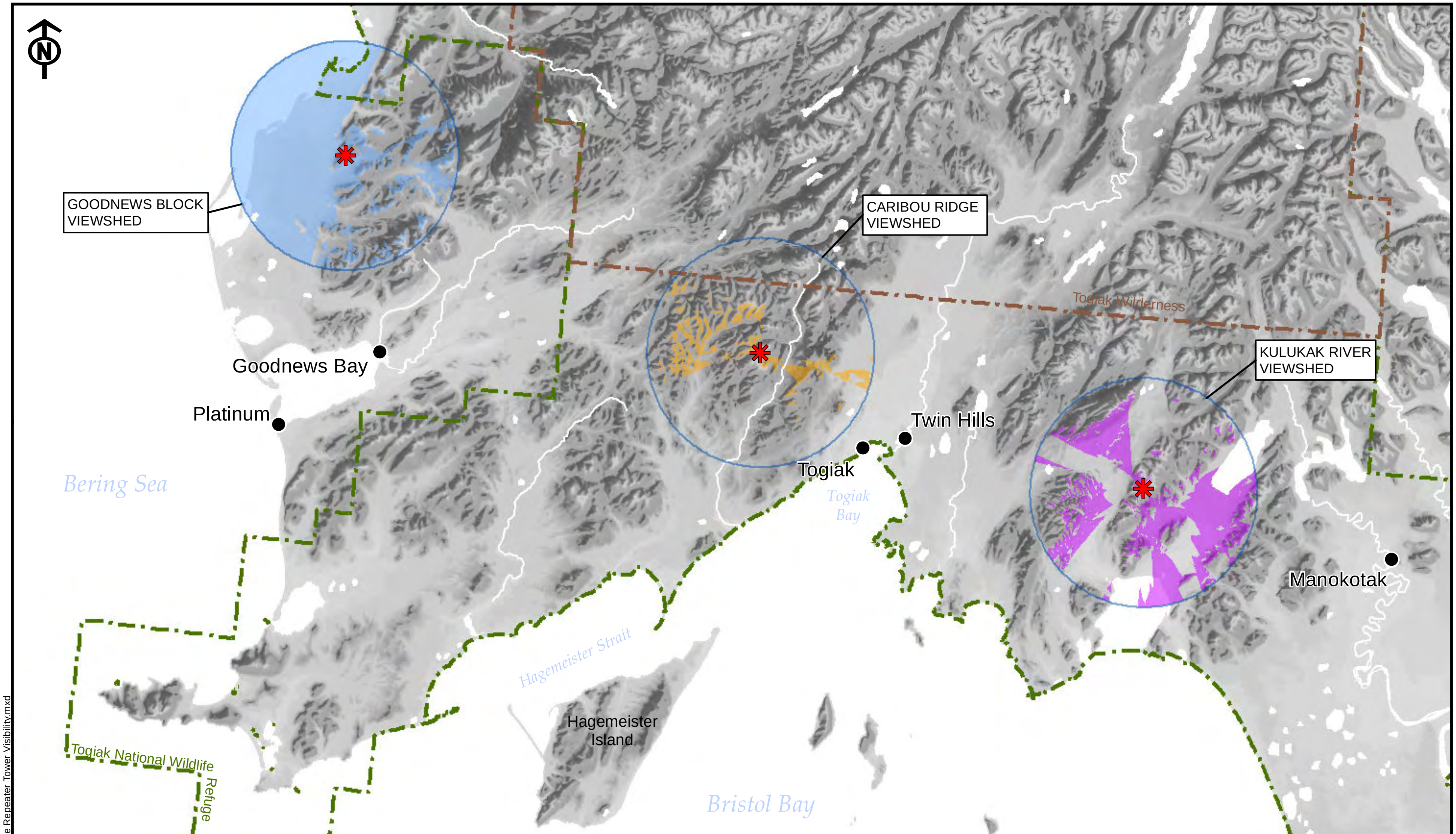
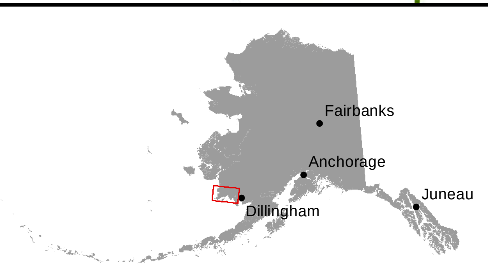
4.4.8 Visual Resources

Direct and indirect effects expected to result from the No Action Alternative, and two proposed Action Alternatives is summarized below. The analysis area used to identify potential direct and indirect effects of the proposed project included all areas located within 10 miles of the project that contain views of project features ("Seen Area") (Figure 4-4). The Seen Area was calculated using a Geographic Information System viewshed analysis tool using a tower height of 60 ft. The impact analysis was restricted to within 10 miles of the project area based on the assumption that the visual contrast between project features (i.e., towers and associated project components) and natural landscape declined beyond this distance (Figures 4-5, 4-6, and 4-7). The Seen Area included the Togiak National Wildlife Refuge and public lands managed by the BLM. Views of the proposed project area from the Togiak Wilderness are shielded by topography, so no further discussion of potential impacts to designated Wilderness is presented in this section. A visual simulation for the Cone Mountain, Caribou Ridge, and Kulukak Mountain microwave repeater sites was developed and is presented in Figures 4-8, 4-9, and 4-10. Additional details of this analysis are included Appendix H.





Proposed Repeater Location
10-Mile Viewshed Boundary
Togiak NWR Wilderness Boundary
Togiak NWR Boundary
Cone Mountain Tower Visibility
Caribou Ridge Tower Visibility
Kulukak Mountain Tower Visibility

0 5 10 15 20 Miles

Source: USGS; USFWS; GCI; ADNR; BLM; URS

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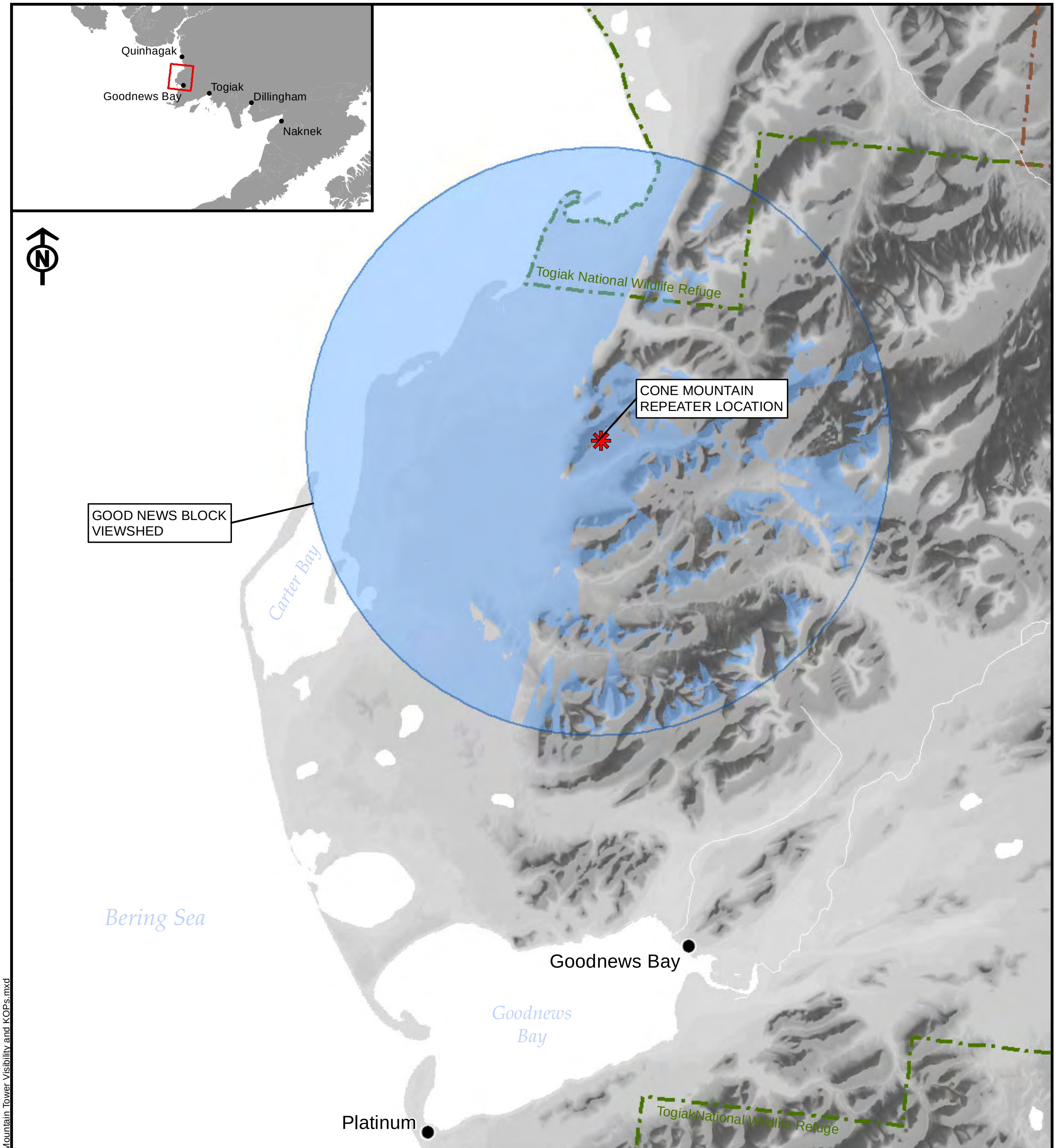
Figure 4-4: Alternative 2 - Microwave Repeater Tower Visibility

April 2011

M:\Projects\2010\GCI Terra\mxd\Fig 4-4 Microwave Repeater Tower Visibility.mxd



Proposed Repeater Location
Key Observation Point
10-Mile Viewshed Boundary
Cone Mountain Tower Visibility
Togiak NWR Wilderness Boundary
Togiak NWR Boundary

0 1 2 3 4 5 Miles

Source: USGS; USFWS; GCI; ADNR; BLM

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Figure 4-5:
Alternative 2 - Cone Mountain Tower Visibility and Key Observation Points

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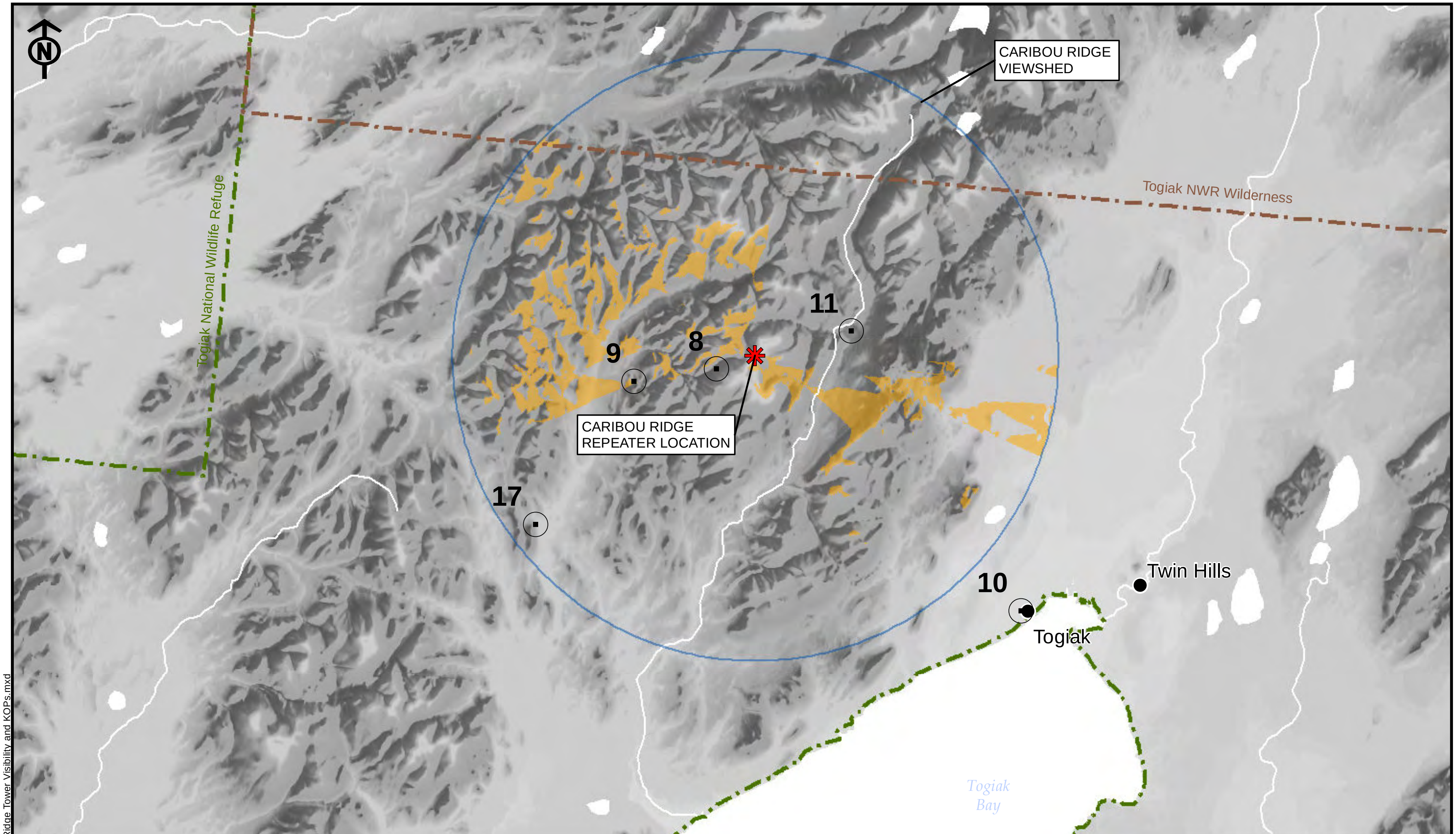
M:\Projects\2010\GCI Terra\mxd\Fig 4-5 Cone Mountain Tower Visibility and KOPs.mxd



- Proposed Repeater Location
- Key Observation Point
- 10-Mile Viewshed Boundary
- Caribou Ridge Tower Visibility
- Togiak NWR Wilderness Boundary
- Togiak NWR Boundary

0 1 2 3 4 5 Miles

Source: USGS; USFWS; GCI; ADNR; BLM

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Figure 4-6:
Alternative 2 - Caribou Ridge
Tower Visibility and
Key Observation Points

April 2011

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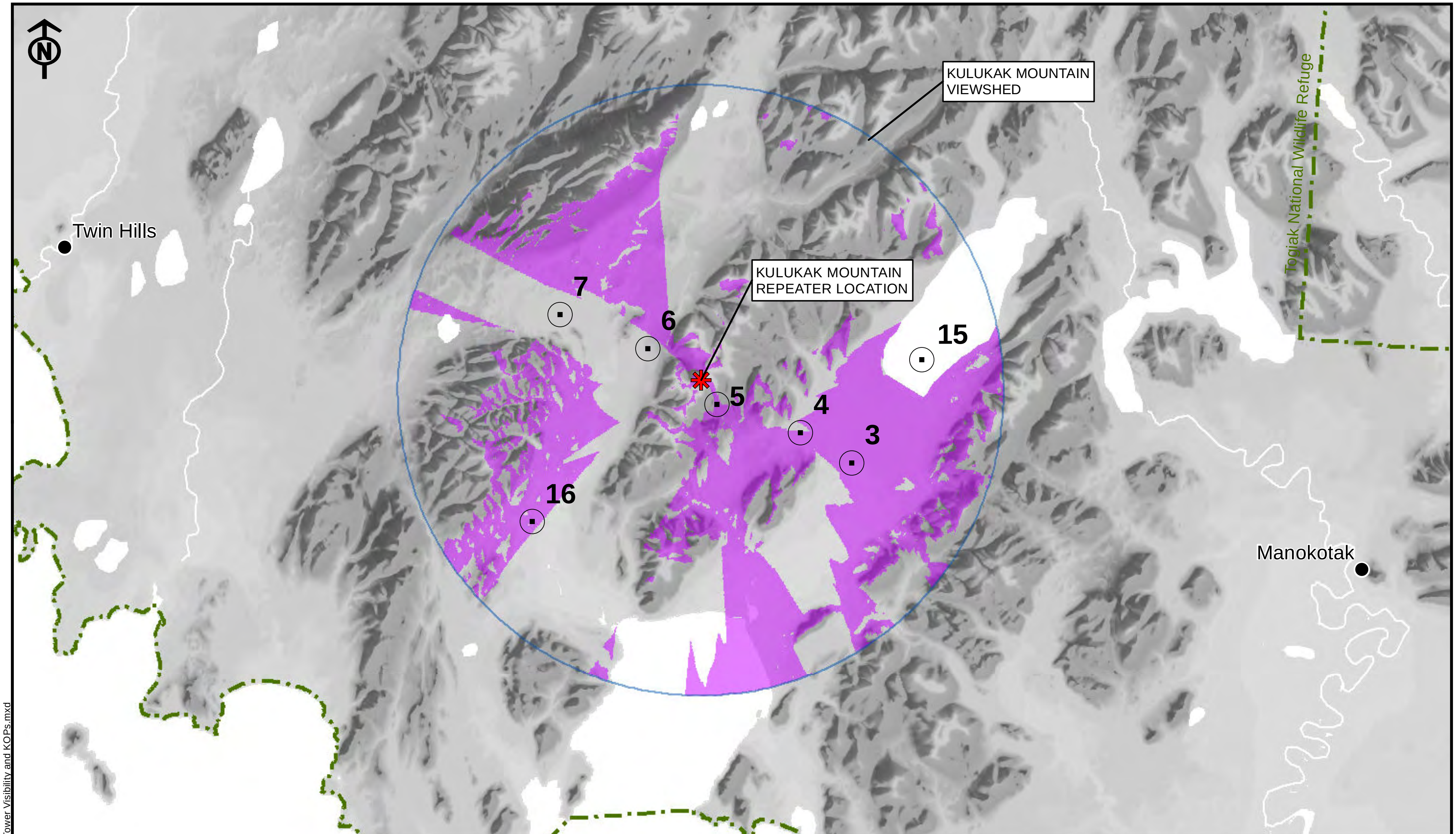

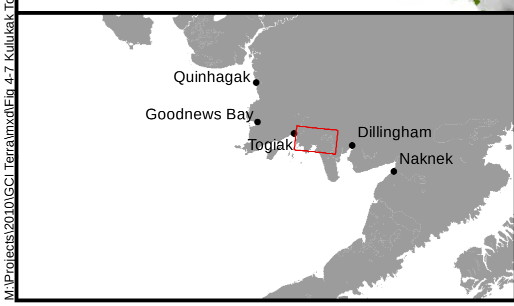

Proposed Repeater Location
Key Observation Point
10-Mile Viewshed Boundary
Kulukak Mountain Tower Visibility
Togiak NWR Boundary

0 1 2 3 4 5 Miles

Source: USGS; USFWS; GCI; ADNR; BLM

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Figure 4-7:
Alternative 2 - Kulukak Mountain Tower Visibility and Key Oberservation Points

April 2011

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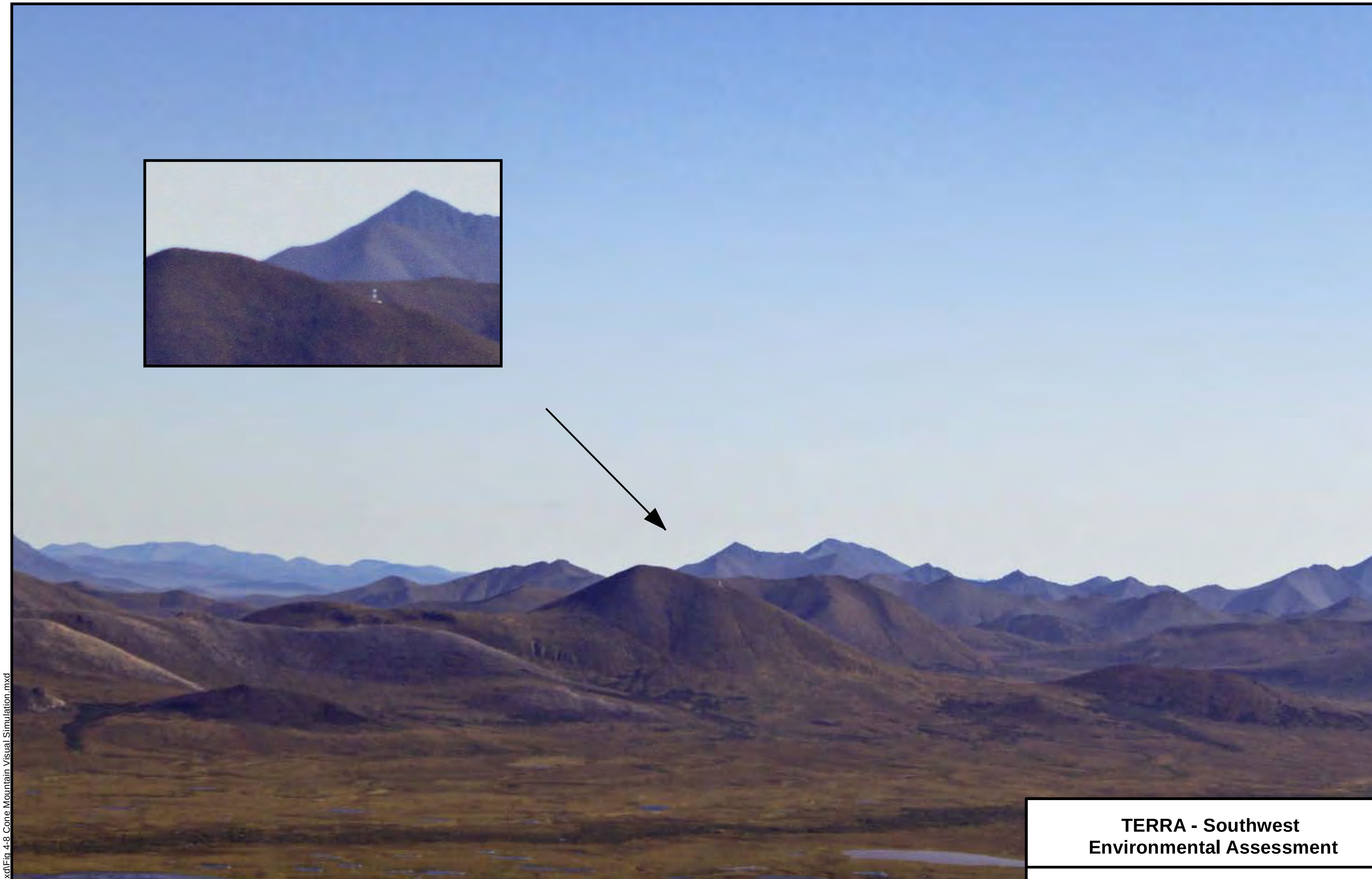

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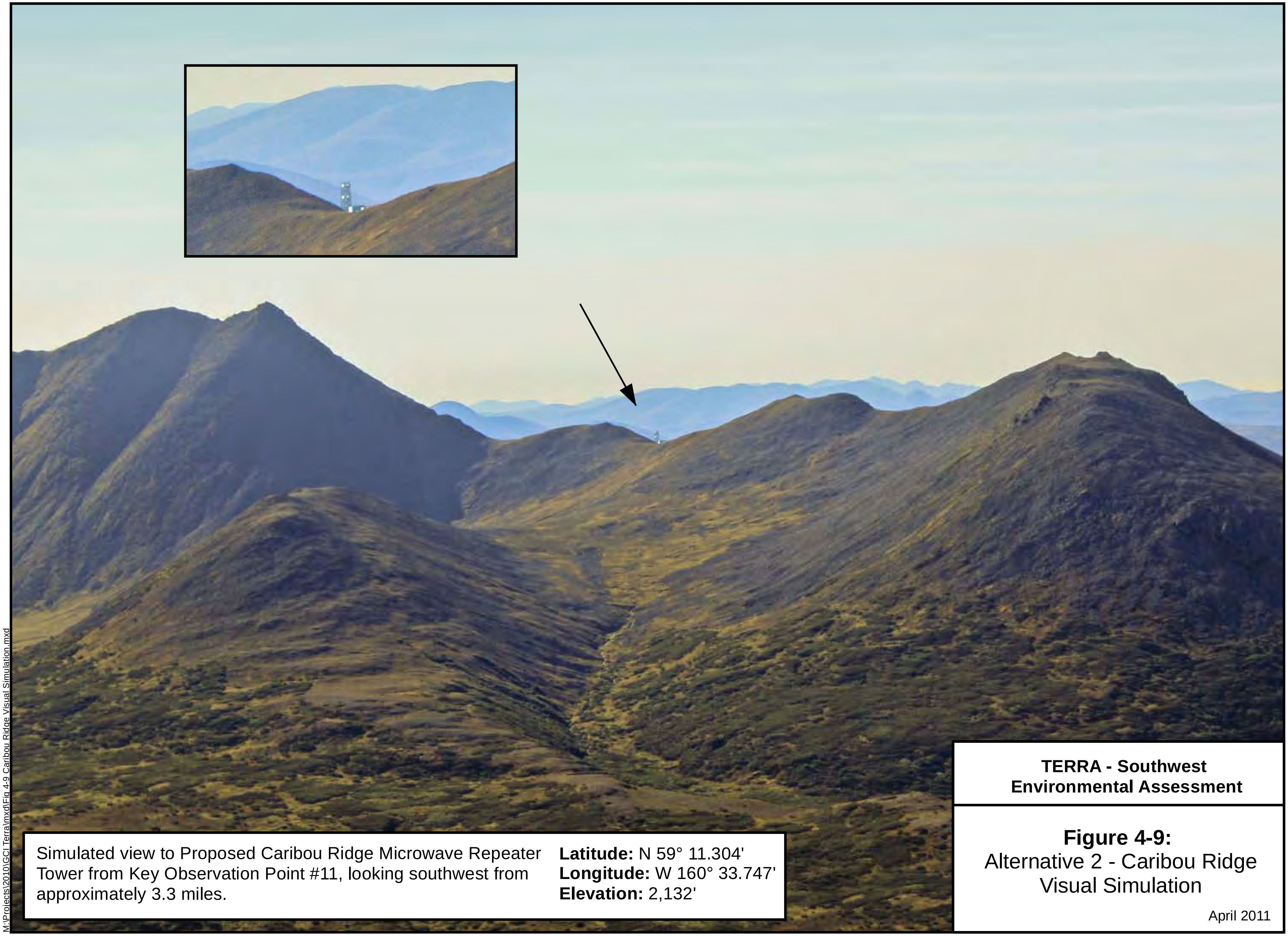
Figure 4-8:
Alternative 2 - Cone Mountain
Visual Simulation

April 2011

Simulated view to Proposed Cone Mountain Microwave Repeater Tower from KOP Cone Mountain, looking southeast from approximately 8.1 miles.

Latitude: N 59° 25.480'
Longitude: W 161° 55.320'
Elevation: 2,084'

M:\Projects\2010\GCI Terra\mxd\Fig 4-8 Cone Mountain Visual Simulation.mxd



Simulated view to Proposed Caribou Ridge Microwave Repeater Tower from Key Observation Point #11, looking southwest from approximately 3.3 miles.

Latitude: N 59° 11.304'
Longitude: W 160° 33.747'
Elevation: 2,132'

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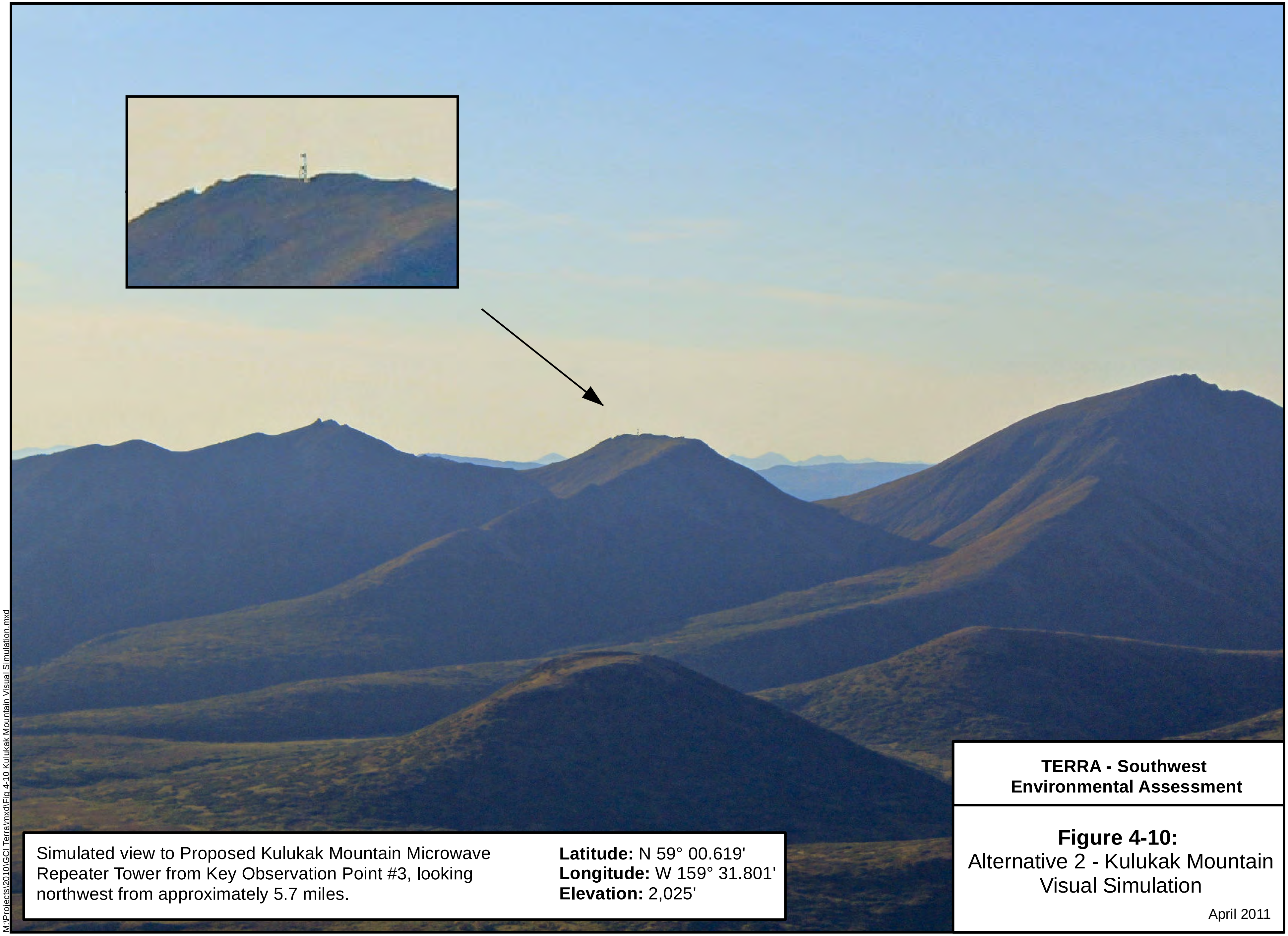
Figure 4-9:
Alternative 2 - Caribou Ridge Visual Simulation

April 2011

M:\Projects\2010\GCI Terra\mxd\Fig 4-9 Caribou Ridge Visual Simulation.mxd



Simulated view to Proposed Kulukak Mountain Microwave Repeater Tower from Key Observation Point #3, looking northwest from approximately 5.7 miles.

Latitude: N 59° 00.619'
Longitude: W 159° 31.801'
Elevation: 2,025'

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Figure 4-10:
Alternative 2 - Kulukak Mountain Visual Simulation

April 2011

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4.4.8.1 Alternative 1 – No Action.

Direct and Indirect Impacts

No direct or indirect effects would result from the implementation of Alternative 1, as there would be no change to the visual character of the analysis area.

Cumulative Impacts

With no direct or indirect impacts to visual resources, Alternative 1 would make no contribution to cumulative impacts on these resources.

Conclusion

Implementation of Alternative 1 would not affect visual resources.

4.4.8.2 Alternative 2 - Hybrid Fiber Optic/Microwave

Direct and Indirect Impacts

Construction

Construction of the proposed microwave towers would be expected to result in moderate temporary direct effects to visual resources. Direct effects would likely result from the intensity of the action at each project site, including increased activity on land and movement overhead as a result of air transport of materials and personnel. A change in perception by recreational visitors, air travelers, or people engaged in subsistence activities within sight of the construction activity may result from construction activities. Such viewer groups may select against areas with views of construction activities during this time. Construction-related action is expected of medium intensity, temporary in duration, and local in context (i.e. limited in spatial extent as compared to the Refuge and BLM-managed lands). It is also expected that areas with similar landscape character are common in the Refuge and BLM-managed lands, and that opportunities to experience similar views are available.

Operations

Microwave towers and auxiliary structures would be characterized by distinct vertical lines and smooth texture that are expected to result in weak, long-term contrast against the prevailing diagonal lines and rough texture of the landscape. A weak element contrast is consistent with the Class IV Visual Resource Management (VRM) objective assigned to BLM-managed lands at the location of the proposed Cone Mountain repeater (BLM, 1984, and 2007). Weak element contrast is also consistent with the visual resource management goals of the Togiak Refuge (FWS, 2009a). Perceived contrast would be expected to be minimized by the high degree of absorption provided by the expansive scale of the characteristic landscape. No more than one tower is visible from any location on the ground, further reducing the level of perceived visual contrast. Although more than one tower may be visible when traveling by air, it is unlikely that individual structures would be detectable at a distance greater than 10 miles, thereby reducing the chance that air travelers would view two structures from proximate locations at the same time. The speed of travel, angle of observation and scale of the landscape viewed from the air would further reduce the level of perceived contrast detected by air travelers. Light reflection from the facility components at the microwave repeater sites could potentially increase contrast. However, mitigation measures including painting the tower and associated structures with a non-reflective, matte, or light absorbing finish, would reduce perceived contrast, even if the color is grey depending on the finish at the sites. The weak contrast and the degree of landscape absorption is expected to limit the aerial extent of impacts to visual resources, particularly when compared to the Refuge and BLM-managed lands taken as a whole.

It is possible that operation and maintenance of the proposed project may alter the perception of the affected landscape by sensitive viewers. Similarly, overland flights transporting recreational visitors to remote camps may also select against flight paths that would expose their clients to views of the microwave towers. Such impacts are considered a medium-intensity action, as a change in visual resources would be measurable, and could alter visitor experience.

Decommissioning

Decommissioning of the proposed microwave towers is expected to result in moderate, short-term direct effects to visual resources. Direct effects would likely results from the level of activity at each project site, and the increased movement overhead as a result of air transport of materials and personnel. Moderate indirect effects may result from changes in perception of the landscape character of the viewshed areas, as recreational visitors, individuals engaged in subsistence, or air travelers may avoid areas within the analysis area to engage in such activities.

Cumulative Impacts

There are no past actions that have altered visual resources within the project area. Existing established trails within the Cone Mountain and Caribou Ridge Viewsheds are natural in appearance and do result in deviations from the overall landscape character. (No established trails are found within the vicinity of Kulukak Mountain.)

Current efforts to upgrade telecommunications facilities on the Yukon Kuskokwim Delta, including linking broad-band services across Bristol Bay, may affect visual resources by introducing structures that contrast in the prevailing form, line, color, and texture of the existing characteristic landscape. No reasonably foreseeable future actions exist within the vicinity of the analysis area. Due to the diversity of components and dispersed geography, the project components under direct review in this EA would make a negligible contribution to cumulative effects for visual impacts from the TERRA-SW project components installed on State and private lands. Additional development within the telecommunications sector is considered speculative. Based on ongoing efforts to upgrade telecommunications facilities within the vicinity of the analysis area, the cumulative negative impacts attributable to operation of the Alternative 2 are expected to be minor. Structures are expected to be isolated geographically, with no more than one tower visible from any location.

Conclusion

Alternative 2 would be expected to result in minor long-term impacts to visual resources. Impacts would be of medium intensity, long-term duration, would be local in context (spatial extent) when considered in the context of the Refuge and BLM-managed lands, and would not impact visual resources that are unique to this portion of the Refuge and BLM-managed lands or other areas in Southwestern Alaska. These impacts, however, are expected to be minimized by the expansiveness of the characteristic landscape, and thereby would not dominate the views experienced by sensitive viewer groups engaged in recreation or subsistence. The expected weak contrast is consistent with land management objectives of lands administered by the BLM (2007) and the Refuge (FWS, 2009a).

4.4.8.3 Alternative 3 - Hybrid Fiber Optic/Microwave with Submarine Cable

The level of perceived contrast expected to result from implementation of Alternative 3 was based on the project components.

Direct and Indirect Impacts

Construction

Minor short-term direct or indirect effects to visual resources are expected to result from construction of Alternative 3. Effects to visual resources may include increased movement and activity during construction at cable egress sites. Indirect effects may result from changes in perception of a localized area surrounding the egress sites, but these are expected to be limited to ground-level viewer positions. Because of the proximity of cable landing sites to existing roads and structures, these areas are not expected to attract attention of viewers traveling by aircraft.

Operations

Long-term direct and indirect effects to visual resources are expected to be negligible. Visible elements of the submarine route would be limited to cable landing sites situated near existing roads and structures, and are also expected to be limited to ground-level viewer positions. Because of the proximity of landing sites to existing roads and structures, these areas are not expected to attract attention of viewers traveling by aircraft. Given the context and scale of the proposed project, perceived visual contrast of associated structures is expected to be low in intensity, temporary in duration, and local and common in context.

Decommissioning

Minor short-term direct or indirect effects to visual resources are expected to result from decommissioning of Alternative 3 and impacts would be similar to construction.

Cumulative Impacts

No past actions have been identified that affect visual resources have been identified. Current efforts to upgrade telecommunications facilities on the Yukon Kuskokwim Delta, including linking broad-band services across Bristol Bay, may affect visual resources by introducing structures that contrast in the prevailing form, line, color, and texture of the existing characteristics of the communities. Additional development within the telecommunications sector is considered speculative. Based on ongoing efforts to upgrade telecommunications facilities within the vicinity of the analysis area, the cumulative impacts attributable to operation of the Alternative 3 are expected to be negligible. Landing areas are expected to blend with the surrounding area in a way that does not significantly change the overall landscape character of the area.

Conclusion

Impacts to visual resources are expected to be of low intensity, temporary in duration, and local and common in context resulting in a summary evaluation of negligible effects.

4.4.9 Cultural Resources

4.4.9.1 Alternative 1 – No Action Alternative

Direct and Indirect Impacts

The existing condition of cultural resources and any Traditional Cultural Properties within the project area would not be directly or indirectly altered from the implementation of Alternative 1; no soil would be disturbed, and no facilities would be constructed.

Cumulative Impacts

With no direct or indirect effects to cultural resources expected under Alternative 1, there would not be a contribution to cumulative impacts on these resources.

Conclusion

Implementation of Alternative 1 would have no direct or indirect impact to cultural resources and there would be no contribution to cumulative effects on these resources.

4.4.9.2 Alternative 2 – Hybrid Fiber Optic/Microwave Alternative

Direct and Indirect Impacts

No known cultural resources were identified in the APEs for the three microwave repeater sites associated with Alternative 2, based on a literature review and field surveys (THRC, 2011a). There have also been no TCPs identified in the project vicinity (THRC 2011c). Therefore, there would be no expected direct or indirect impacts to terrestrial cultural resources under Alternative 2 at the three microwave repeater sites. There would also be no direct or indirect impacts to TCPs within the tower locations and associated viewsheds under this alternative. Staging areas associated with construction of the three microwave repeater sites are located in previously developed areas, and therefore would have no direct or indirect impacts to cultural resources.

Bathymetric survey data of Lake Clark indicated that the area that would be disturbed during installation of the fiber optic cable through trenching is unlikely to contain archaeological sites (THRC, 2011b). As a result, there would be no direct or indirect impacts to submerged cultural resources along the proposed cable route.

There were terrestrial cultural resources identified within the APE of the cable landing sites in Port Alsworth. There are seven sites (XLC-030, -031, -049, -050, -103, -206, and -250) (Table 3-10) that lie within one mile of the Port Alsworth landing. Given the information gathered about these cultural resource sites during field surveys in 2010, there was no additional cultural resource work recommended associated with the development of Alternative 2 (THRC, 2010b). As known sites, construction activities would be conducted in a manner to avoid any impact to these cultural resources.

There are no direct or indirect impacts to cultural resources associated with the construction, operation or decommissioning of Alternative 2.

Cumulative Impacts

With no direct or indirect effects to cultural resources expected under Alternative 2, there would be a no contribution to cumulative impacts on cultural resources.

Conclusion

Taking into account construction methods that avoid known cultural resources sites, implementation of Alternative 2 would have no direct or indirect impacts on cultural resources, and would make no contribution to cumulative effects on these resources.

4.4.9.3 Alternative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable

Direct and Indirect Impacts

While there are no sites within the APE there were 43 known terrestrial cultural resource sites identified within 1-2 miles of the APEs for the Dillingham (Kanakanak), Togiak, Platinum and Quinhagak cable landing areas associated with Alternative 3 (Table 3-11). Thirty-three of these sites are located within one mile of the proposed landing locations. Field surveys were conducted in 2010 at potential tower locations at the Dillingham (Kanakanak) and Platinum sites, but the surveys did not extend to the potential landing areas toward the shorelines (THRC, 2010b).

Forty-nine known submerged cultural resources in the greater northern Bristol Bay region from the Nushagak River west and Kuskokwim Bay were also identified. The resources have been identified as shipwrecks in the BOEMRE database. The location and current state of preservation of these 49 known shipwrecks within the project area associated with a marine fiber optic submarine cable is unknown.

Localized direct and indirect impacts to cultural resources could occur as a result of ground disturbing activities during the construction phase at the four cable landing locations. Additional cultural resource work, including baseline worksite field documentation, and archaeological surveys and documentation, could be required to be conducted at these locations before ground disturbing activities could occur. While the disturbance associated with construction at cable ingress and egress points onshore could impact cultural resources, proposed surveys and documentation would likely minimize potential impacts to cultural resources under Alternative 3. If cultural or archaeological resources are discovered during construction, work would need to be stopped, and rerouted to avoid the archeological sites.

A comprehensive route survey for the submarine cables would also need to be completed to identify any high probability areas for prehistoric archaeological sites within the submerged cable route and to identify any shipwrecks within the proposed project area that could be damaged by barges or vessels being used for cable laying. Areas where the submarine cable would be trenched into the subsurface under Alternative 3 could require further cultural resource surveys and documentation in order to avoid potential impacts.

It is assumed for analysis purposes, that additional field surveys and documentation would be incorporated into planning and design prior to construction of Alternative 3, thereby resulting in no direct or indirect impacts to cultural resources.

Cumulative Impacts

With no direct or indirect effects to cultural resources expected under Alternative 3, there would be no contribution to cumulative impacts on cultural resources, including those associated with the installation of additional components of the TERRA-SW project on State and private lands.

Conclusion

Under Alternative 3, the risk of impacts to cultural resources exists, but this could be managed and mitigated through additional surveys and documentation work. Implementation of Alternative 3 would be expected to have no direct or indirect impacts to cultural resources, and no contribution to cumulative impacts.

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4.4.10 Environmental Justice

As described in Section 3.4.10, the evaluation environmental justice examines whether disproportionate and adverse impact human health and environmental impacts fall upon minority or low-income populations. Section 3.4.1 demonstrated that the potentially affected communities of Dillingham, Togiak, Twin Hills, Goodnews Bay, Platinum, Quinhagak, Nondalton, and Port Alsworth are considered minority or low-income communities. This section examines whether the proposed action or the alternatives would result in disproportionate, adverse human health or environmental impacts.

4.4.10.1 Alternative 1 – No Action Alternative

Direct and Indirect Impacts

Under Alternative 1, the proposed project would not be constructed; thus, it would have no direct or indirect human health or environmental effects on the communities.

Cumulative Impacts

With no action, Alternative 1 would not contribute to these cumulative effects to minority or low-income populations. In the absence of proposed improvements in the telecommunications infrastructure of the region, health, education, government, and businesses would continue to operate with current limitations in communications technologies.

Conclusion

Implementation of Alternative 1 would not result in disproportionate and adverse human health or environmental impacts on the affected communities. As a result, with Alternative 1 there are no Environmental Justice concerns.

4.4.10.2 Alternative 2 – Hybrid Fiber Optic/Microwave

Direct and Indirect Impacts

The review of the environmental impacts of implementing Alternative 2 on four categories of physical resources and seven categories of biological resources (Section 4.2 and 4.3) revealed negligible, minor and potential moderate impacts. Section 4.4 analyzed environmental impacts of implementing Alternative 2 on resources within the social environment. Taking into account intensity, duration, and context, these analyses concluded that implementation of Alternative 2 would have negligible to moderate impacts on resources, including negligible effects on subsistence. The analysis of socio-economic environmental consequences in Section 4.4.1 concluded that implementation of Alternative 2 would have a moderate positive impact due to improvement to the telecommunications infrastructure and resulting improvement in quality of life and increased efficiency of health, education, government, and business services.

Cumulative Impacts

As described in Section 4.4.1 (Socioeconomics) implementation of Alternative 2 would make a moderate positive contribution to past, present and RFFAs toward improved telecommunication infrastructure and improved economic foundations in the region, including the TERRA-SW project components installed on State and private lands.

Conclusion

No disproportionate adverse human health or environmental impacts are associated with implementation of Alternative 2. Instead, implementation of Alternative 2 would have positive moderate impacts on the socioeconomic characteristics of the region and negligible to moderate impacts on other resources, including subsistence. Implementation of Alternative 2 raises no Environmental Justice concerns.

4.4.10.3 Alternative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable

Direct and Indirect Impacts

Alternative 3 would adopt a different technology to achieve the same objectives of improvements to telecommunications infrastructure in the region. Sections 4.2 and 4.3 review the potential impacts on the physical and biological environment of implementing this marine cable alternative and reveal minor or moderate impacts. Section 4.4 discussions analyze potential impacts of Alternative 3 on the social environment. As with Alternative 2, the improvements to telecommunications infrastructure under Alternative 3 would have a moderate positive impact due to resulting improvement in quality of life and efficiency of health, education, government, and business services.

Cumulative Impacts

As describe in Section 4.4.1, Socioeconomics, and implementation of Alternative 3 would make a moderate positive contribution to past, present and RFFAs toward improved telecommunication infrastructure and improved economic foundations in the region.

Conclusion

No disproportionate adverse human health or environmental impacts are associated with implementation of Alternative 3. Instead, implementation of Alternative 3 would have positive moderate impacts on the socioeconomic characteristics of the region and negligible to minor impacts on other resources. Implementation of Alternative 3 raises no Environmental Justice concerns.

4.5 Mitigation Summary

The proposed TERRA-SW project includes many design features and operational plans to reduce impacts. Additional mitigation measures are summarized in Table 4-6.

Table 4-6. Mitigation Measures (Not Already Proposed in Project Design)

Air Quality	The feasibility of a supplemental power from wind generators will be evaluated using wind and climate data collected for three years at the microwave repeater sites. A feasibility analysis of wind potential, icing conditions, and appropriate wind generator technologies (i.e. vertical axis wind generators) will be reviewed with the federal agencies.
Fugitive dust control	Watering areas (as needed) to be disturbed during construction and excavation. Reduce vehicle speeds to 10 miles per hour in staging areas. Cover stockpiles of soil, sand, and other material.
Spill Prevention and Response	Project design includes secondary containment facilities. Detailed Spill Prevention, Control and Countermeasure Plan (SPCC) required as part of permit stipulations, for construction sites hazardous materials storage, helicopter fuel transportation, fueling operations. For marine vessels involved in staging materials and laying the lake-bed cable, Oil Discharge Prevention and Contingency Plan and Emergency Response Plan are required.
Prevention of invasive plant species	A monitoring and mitigation plan for invasive species will be developed in consultation with FWS and BLM. This plan will include: - Preventative measures in project design include power wash of materials and equipment prior to transit, along with mid-season inspection. - Employ native species in revegetation. - Perform annual monitoring during annual site maintenance to insure identification and removal of invasive plants at remote tower sites and reporting. The duration of the monitoring will be specified in the plan.
Erosion control	Operate under approved Storm Water Pollution Prevention Plan to control erosion at tower sites.
Disturbance to wildlife	Helicopters to travel at altitude of 1,500 ft. above ground level. During the operations period of the project, helicopter flights for refueling the microwave repeater sites will be limited to a period outside of the intensive hunting, fishing, and recreation activities, estimated at mid-May to mid-October. The seasonal window for helicopter-supported refueling will reduce the impacts on wildlife.
Bird mortality	Design features, including 60 ft height, lack of guy wires, and lack of tower lighting reduce risk of bird mortality. Lights used during construction or operational maintenance should be downturned. Conduct bird mortality surveys at tower sites, including monitoring of Steller's eider mortalities.
Disturbance to marine birds	Project plans call for initial mobilization of supplies in Carter Bay from late May to early June only. Minimize disturbance of Steller's eider during key stages of its life cycle by avoiding construction activities in late summer and fall in Carter Bay. The seasonal window for helicopter-supported refueling (avoiding the period of intensive hunting, fishing, and recreation activities) will reduce the impacts on marine birds.
Impacts to commercial and subsistence fisheries	Coordinate with commercial and subsistence fishery representative to plan and conduct construction staging activities with minimum disruption. The seasonal window for helicopter-supported refueling (avoiding the period of intensive hunting, fishing, and recreation activities) will reduce the impacts on commercial and subsistence fisheries.

Impacts to subsistence waterfowl hunters in Carter Bay	Project plans call for initial mobilization of supplies in Carter Bay from late May to early June only. Coordinate with subsistence users to minimize disruption to waterfowl hunting in Carter Bay. The seasonal window for helicopter-supported refueling (avoiding the period of intensive hunting, fishing, and recreation activities) will reduce the impacts on subsistence waterfowl hunters in Carter Bay.
Disruption to recreation	Coordinate with guided fishing and hunting operations to inform about the construction season activities to, so they can consider alternate locations. The seasonal window for helicopter-supported refueling (avoiding the period of intensive hunting, fishing, and recreation activities) will reduce the impacts on recreation.
Lands with Wilderness Characteristics	The seasonal window for helicopter-supported refueling (avoiding the period of intensive hunting, fishing, and recreation activities) will reduce the impacts on lands with wilderness characteristics, during the time when most recreation visitors are active in the vicinity of Cone Mountain.
Visual impacts	Painting the tower, facilities, structures and fuel tanks, with a paint that is a matte, non- reflective or light absorbing finish to reduce reflection. Antennae covers would also use a non-reflective color scheme. (Shadow Grey [[Standard Environmental Color Chart CC-001: June 2008, BLM/WY/ST-08/015+8450])]).
Impacts from construction camps	Construction personnel would be required to keep the camp area clean, including waste disposal and erosion control. Personnel would not be allowed to use all-terrain vehicles.

4.6 Summary of Impacts

A summary of impacts is found in Table 4-7.

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Table 4-7. Alternatives Summary Impacts

Impact Topic	Alternative 1 – No Action Alternative	Alternative 2 – Hybrid Fiber Optic/Microwave	Alterative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable
Meteorology and Air Quality	No changes to air quality.	Impacts to air quality from construction from equipment emissions over a 150 day period are expected to be low in intensity, temporary in duration and affect resources that are common in context. Summary impacts are negligible. Operational impacts would be low in intensity, long term in duration (life of the project) and affecting resources common in context, and not likely to adversely impact air quality of the region. Effects could be further reduced by using wind energy as a supplemental power source, if determined based on site-specific wind and climate data to be collected for three years at the microwave repeater sites. Summary impacts are negligible in isolation, and make negligible cumulative contributions to greenhouse gases.	Emissions from barge equipment during construction and operation likely would be low in intensity, temporary in duration, affecting resources common in context, and not likely to adversely impact air quality of the region. Summary impacts would be negligible in isolation, and make negligible cumulative contributions to greenhouse gases.
Geology and Soils	No changes to geology and soil resources.	Topsoil removal/excavation and facility installation (less than one acre per site) would result in direct and indirect impacts that would be high in intensity for a small localized area, of long-term duration, very localized and affecting resources common in context. The summary impact would be minor.	Topsoil removal/excavation and cable burial and exhumation at ingress and egress points (less than one acre) along the cable routes would result in direct and indirect impacts to soils that would be high in intensity in a small area, of short-term duration, and affecting localized resources common in context. Summary impacts are considered minor.
Hydrology	No changes to hydrology, including water resources and water quality.	One site has anchoring points below the water table which is only eight feet down. Impacts at this site are not known and depend on final design and construction techniques. Risk of fuel spills exists at sights with high water tables, flight paths in and across river valleys, barge staging sites and the egress points at Lake Clark. Spill prevention and response procedures can reduce risk. Spill effects are unknown and could be significant depending on location, season, and circumstances. Barring a fuel spill scenario, impacts would be temporary, localized, short in duration (construction activities), and high in intensity but affecting resources common in context. Given the limited temporal and fuel volume risks, the summary impact of a fuel spill would be considered minor to moderate.	Cable burial and exhumation at ingress and egress points along the cable routes would result in direct and indirect impacts to that would be high in intensity, of short-term duration, localized and affecting resources that are common in context. Impacts experienced would be in developed areas (i.e., villages and towns.) The summary impact would be minor and a negligible contribution to the total area covered by the project throughout Southwest Alaska.

Impact Topic	Alternative 1 – No Action Alternative	Alternative 2 – Hybrid Fiber Optic/Microwave	Alterative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable
Hazardous Materials and Waste Management	No impacts due to hazardous materials result from Alternative 1.	Storage of fuels and hazardous materials onsite create risks of a release. However, containment designs and an approved SPCC plan reduce the risks. Fuel transport during annual re-supply operations represents a larger risk. Refueling occurs during a total of 42 helicopter round trips over 6-9 days annually for the 25 year life of the project. A 500 gallon fuel container represents the volume of a spill incident risk. If such a spill were to occur on land the impact would be high in intensity, short term in duration, local in extent, affecting a common resource. If the spill were to occur in wetland or a water body, the impact would likely be longer term (exceeding two years), and larger in extent, and high in intensity. Given the limited temporal and fuel volume risks, the summary impact of a fuel spill would be considered minor to moderate.	Risk of fuel spills exists from barges and vessels used during construction and placement of the submarine cable, but these can be managed and mitigated. No impacts would occur on the Togiak NWR or BLM-managed lands. Effects would depend on the type of product spilled. If fuel spills were to occur, summary impacts could range from negligible (disturbance/habitat loss in small area and/or small fuel spills) to moderate (large fuel spills).
Vegetation and Wetlands	No changes to vegetation and wetlands resources.	No impacts to wetlands at the microwave repeater tower sites. The potential exists to affect wetlands nearby if a fuel spill occurred. Impacts to vegetation would be long-term but minor based on the duration of the revegetation. Impacts to vegetation would be long lasting, at least as long as the life of the project operations. With invasive species prevention and mitigation measures properly implemented and without accidental fuel or chemical spills, impacts would be considered minor, affecting common resources in a relatively small area, for a long duration. Summary impacts to vegetation at cable landfall would be negligible.	There are no expected impacts to wetlands and vegetation from the placement of the submarine cable in offshore waters. Under Alternative 3 the risk of fuel spills exists but can be managed and mitigated. Barring a fuel spill scenario, implementation of Alternative 3 would be expected to have low intensity, temporary effects in relatively small areas. The summary impact is considered negligible.
Fish	No changes to fish or EFH.	Under Alternative 2 the risk of fuel spills exists but can be managed and mitigated through safety training and procedures. Barring a fuel spill scenario, the effects of Alternative 2 would be of minor intensity, localized in extent, short in duration, and affecting resources that are common. Summary impacts would be minor or negligible to fish and fish habitat.	Under Alternative 3 the risk of fuel spills exists and is managed through safety training and procedures. Barring a fuel spill scenario, Alternative 3 would be expected to be of low intensity, generally temporary, and occurring in small areas. Thus, summary impacts would be negligible to marine fish and minor to marine fish habitat.

Impact Topic	Alternative 1 – No Action Alternative	Alternative 2 – Hybrid Fiber Optic/Microwave	Alterative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable
Wildlife (Terrestrial Mammals, and Birds)	No changes to terrestrial mammals or birds.	Construction at the three microwave repeater sites together would disturb approximately 2.71 acres of wildlife habitat with 0.28 acres affected by excavation and installation of project facilities. Impacts (noise, disturbance) involve common resources, and are of low intensity and temporary in duration. Impacts from helicopters during construction have a medium intensity, and could possibly have a long term effect on seabirds, waterfowl, and shorebirds because Carter Bay is a regionally important area for fall staging birds. Summary impacts to wildlife would be moderate. Some impacts to wildlife would continue from helicopter operations for the 25 year life of the project operations. Bears in particular are known to dislike helicopter operation. Impacts would be reduced through mitigation measures to include flight path selection and altitude of operation. In addition, limiting helicopter supported refueling flights to avoid the period of intensive hunting, fishing, and recreation activity, (estimated at mid-May – Mid-October) will also reduce impacts to wildlife and birds.	Impacts to wildlife would be to seabirds, shorebirds, and waterfowl in the nearshore and offshore marine environments. Impacts would be low intensity, temporary in duration, and affecting resources common in context, with the exception of Steller's eiders. Summary impacts would be negligible, but potential impacts to Steller's eiders would raise this rating to minor.
Marine Life and Threatened and Endangered Species	No changes to marine life, marine mammals and threatened and endangered species.	No impacts at microwave repeater sites or lakebed landfall. Risk of fuel spills exists from barges used at staging areas. Barring a fuel spill scenario, impacts of disturbance are unknown and would only be expected while barges are present during construction affecting resources important in context because this includes marine mammal protected areas, Steller sea lion critical habitat and EFH. Summary impacts are considered minor.	Risk of fuel spills exists from barge and vessel equipment used for placement of submarine cable but can be managed and mitigated. Displacement during barge presence could occur and would depend on the path (proximity to haul-outs. Summary impacts to marine life range from minor (disturbance/habitat loss in small area) to moderate (potential fuel spills).
Socioeconomics	No changes to socioeconomic patterns.	Positive effects of medium to high intensity, long-duration and regional and wider extent. Adverse impacts to the visitor industry sector are possible, but estimated at low intensity over time. Project improvements in communication infrastructure would result in a positive moderate summary impact.	Improvements in communication infrastructure would result in a positive moderate long term impacts.
Subsistence	No changes to subsistence resources or users.	Impacts would be of low intensity and long-duration (operations period) but in a very small area, and affect resources that are common in context. Summary impact would be considered negligible.	Impacts would be low in intensity, limited in spatial extent during cable installation, temporary in duration, but affecting marine mammal resources that are important in context. No direct or indirect impacts expected during operation. The summary impact is negligible.

Impact Topic	Alternative 1 – No Action Alternative	Alternative 2 – Hybrid Fiber Optic/Microwave	Alterative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable
Land Use	No changes to land use.	Noise and construction activities would create disturbances of medium to high intensity at the barge staging areas and the microwave repeater sites construction tower sites but disturbance would be limited to the construction period in localized areas that are common in context. For the microwave repeater sites on Togiak Refuge, lands would be reclassified from minimal to intensive management. This impact is considered minor. Operational impacts are confined to small areas, and are of low to medium intensity, affecting resources that are common in context and would be considered minor. Limiting helicopter supported refueling flights to avoid the period of intensive hunting, fishing, and recreation activity, would reduce impacts to these land uses.	Minor direct impact on land use, and a negligible contribution to cumulative impacts on land use. Potential negative impacts on commercial and subsistence fisheries during the construction period could be avoided by effective mitigation. Once construction of the landfall facilities is completed and the marine cable is laid, there would be no associated ongoing noise or visual disturbance impacts to wilderness characteristics.
Lands with Wilderness Characteristics (BLM-managed lands in the Cone Mountain area)	No changes to lands with wilderness characteristics.	Impacts to lands with wilderness characteristics would be greater during the construction period, but limited to a single season. Together with lesser impacts during operations and annual maintenance, the summary impacts are expected to be minor to moderate. Implementation of Alternative 2 would contribute a minor additive or synergistic effect with other trends affecting the visitor industry and lands with wilderness characteristics. Limiting helicopter supported refueling flights to avoid the period of intensive hunting, fishing, and recreation activity, would reduce impacts to opportunities for solitude and primitive recreation.	No impacts to lands with wilderness characteristics would occur because the cable is installed in marine waters.
Transportation	No changes to transportation.	Impacts would be of medium intensity, temporary in duration, and local and common in context. Impacts would be negligible.	Impacts would be of low intensity, temporary in duration, and local and common in context. Negligible impacts to regional transportation expected.
Recreation	No direct, indirect or cumulative impacts on recreation.	A direct impact includes a minor positive contribution to the visitor industry due to improved telecommunications and web-presence. Disturbance to visitors and recreationalists from construction and operation considered short to long term in duration, low in intensity and affecting resources that are local and common in context. Limiting helicopter supported refueling flights to avoid the period of intensive hunting, fishing, and recreation activity, would reduce impacts to recreation. Summary impact considered minor to moderate.	Potential direct positive impact on the visitor industry due to improved telecommunication support for industry and visitors. Impacts from construction would be of low intensity and occur for a short duration in a local and common context. No impacts would be expected to occur during operation. Summary impact expected to be negligible.

Impact Topic	Alternative 1 – No Action Alternative	Alternative 2 – Hybrid Fiber Optic/Microwave	Alterative 3 – Hybrid Fiber Optic/Microwave with Submarine Cable
Noise/Soundscape	No changes to noise or soundscape.	Although greater noise effects would occur during construction, over the life of the project direct impacts of low intensity, long-term duration, limited in geographic extent, and common in context that would be considered minor. Limiting helicopter supported refueling flights to avoid the period of intensive hunting, fishing, and recreation activity, would reduce noise impacts to these activities.	These effects would be of very low intensity, short duration, limited in geographic extent, and common in context, with a summary impact considered to be negligible.
Visual Resources	No changes to visual resources.	Minor long-term impacts to visual resources. Impacts would be of medium intensity, long-term duration, would be limited in spatial extent when considered in the context of the Refuge and BLM-managed lands as a whole, and would not impact visual resources that are unique to this portion of the Refuge, BLM-managed lands, and other areas in SW Alaska. These impacts, however, are expected to be minimized by the expansiveness of the characteristic landscape, and thereby would not dominate the views experienced by sensitive viewer groups engaged in recreation or subsistence. Summary impact to visual resources is considered minor.	Direct or indirect from construction and decommissioning would be of low intensity, short-term duration, and affecting resources that are common in context. Long-term direct and indirect effects to visual resources from operation are expected to be negligible. The summary impact is considered negligible.
Cultural Resources	No changes to cultural resources.	Construction methods would be used that avoid known cultural resources sites, so no direct or indirect impacts expected. No contribution to cumulative effects would occur.	Since surveys for the near shore cable alignments have not been performed, risk of impacts to cultural resources exists. This could be managed and mitigated through additional surveys and documentation work. No direct or indirect impacts expected.
Environmental Justice	No changes to environmental justice.	Implementation would have positive moderate impacts on socio-economics the region and negligible to moderate effects on other resources. No Environmental Justice concerns are identified.	Implementation would have positive moderate impacts on socio-economics in the region, and negligible to minor impacts to resources. No Environmental Justice concerns are identified.

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5.0 Consultation and Coordination

5.1 Agency Consultation and Coordination

The FWS is the lead agency in the development of this EA, with the BLM and the NPS contributing as cooperating agencies. Participation in public scoping and the identification of issues is described in Section 1.4.

Each agency will reach a final decision and provide a decision record for publication. This may come in the form of a Finding of No Significant Impact (FONSI), which would take into account any new information and public comment. If an agency concludes with a FONSI, then a decision document would select an alternative to implement, make additional agency findings, and identify mitigation measures and stipulations. If a Finding of No Significant Impact is approved, it would be sent to those individuals and organizations that commented during the public review period, and/or it would be available on the Togiak Refuge website (http://togiak.fws.gov/) and the BLM website (http://www.blm.gov/ak/st/en/fo/ado.html). As a result there will be three findings.

5.2 List of Agencies, Organizations, and Persons Contacted

The lead and cooperating federal agencies have undertaken an extensive effort to provide information and invite the comments of communities and organizations potentially affected by the proposed action. Federal, State and local governments were contacted as were Alaska Native Tribes, Corporations, and Regional Tribal organizations. Land owners, visitor industry stakeholders, and Non-Governmental Organizations were also contacted, using a mailing list, developed by Togiak Refuge for this EA.

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This EA was developed by URS Group, Inc., and Oasis Environmental, Inc. of Anchorage, Alaska, under a contract with United Utilities, Inc. The FWS holds final responsibility for all content.

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APPENDICES

LIST OF APPENDICES

APPENDIX A

Rural Utilities Service Memo and Categorical Exclusions Form
(January 2010)

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January 13, 2010

Memorandum for File

SUBJECT: 93 – United Utilities, Inc.

FROM: Mark S. Plank, Director
Engineering and Environmental Staff
Rural Utilities Service

I have reviewed the Environmental Questionnaire provided by United Utilities, Inc. This proposal includes a number of construction activities:

- Fiber optic cable installation:
  - Coastal , Submerged and Navigable/Lakebed – cables to be laid within State of Alaska navigable waters
  - Submarine – cables to be laid in Iliamna Bay/Cook Inlet
  - Underground cables along existing road right-of-ways and through wetland areas (installation will occur during winter season to minimize impacts)
- Towers – 4 new repeaters and 10 new community towers

The proposal crosses and affects private lands, State of Alaska lands (several Departments, e.g., DOT, DNR), Alaskan Native Corporation land, and federal lands managed by the U.S. Fish and Wildlife Service.

Basic information obtained from the AK State Historic Preservation Office for the Environmental Questionnaire indicates that there are historic properties within the areas of potential effect of the proposal construction activities therefore in accordance with the National Programmatic Agreement follow-on Section 106 consultation will be a condition precedent to the release of federal funds. In addition, notification of the applicable consulting parties will be achieved through use of the FCC's Tower Construction Notification System.

The proposal includes the laying of submarine cable in the Iliamna Bay/Cook Inlet. Of all of the construction activities included in this proposal this action has the greatest potential for environmental impacts. The application materials include the following documentation of a conversation with the National Marine Fisheries Service staff:

> "I called Mr. Brad Smith of the National Marine Fisheries Service (NMFS) to discuss endangered species and critical habitats in Lower Cook Inlet. I described the submarine cable project and asked what type of mitigation would NMFS require to permit this project. There are two critical habitat designations in Lower Cook Inlet. They protect the sea otter and the beluga whale.

Mr. Smith stated that NMFS will not be requesting mitigation for laying a submarine cable in Lower Cook Inlet. He said the impact is minimal and the animals are not found in high densities in this area.

Mr. Smith said that his agency will become involved in the project during the U.S. Army Corps of Engineers permit process. He said that we will not receive any objections from his department."

The amount and level of detail of project-related information provided in the Environmental Questionnaire for this proposal approaches that which would be typically provided in a full Environmental Report without the effect determinations. Because of time constraints in the ARRA BIP application reviews and awards, the agency is requiring, in accordance with applicable environmental laws and negotiated agreements, the completion of conditions precedent on the release of federal funds. These follow-on requirements for concluding Section 106 and ESA, Section 7 review must be completed and provided to the agency for approval prior to release of funds (and construction). Given these conditions, discussions with the applicant and my review of the provided application materials I conclude that this proposal will not result in significant environmental impacts. If such impacts were to be encountered during follow-on review requirements the agency will require an Environmental Assessment or Environmental Impact Statement be prepared prior to any construction activities.

In addition, the proposal requires multiple permits from numerous State and federal agencies prior to construction. Some of these actions will require additional NEPA reviews by these agencies prior to them permitting construction on their owned or managed property. Consequently there is limited potential for any significant environmental impacts or effects from the construction of this proposal. Of particular note and a major contributing factor to my conclusions is the documentation of discussions with NFMS staff.

USDA, Rural Utilities Service **Broadband Infrastructure Program (ARRA)**	**Environmental Checklist for** **Categorical Exclusions Form**
Name of Project: United Utilities, Inc.	Application No.: 93 TCNS No.: 59788

Location (City/County/State): Anchorage, AK

Environmental Questionnaire/Environmental Report[1] Prepared: NO ☐ EQ ☒ ER ☒

S. 106 Findings - Not Undertaking ☐ Need Programmatic Agreement ☒ Proposal Includes Towers/Use FCC TCNS/e106 Process ☐

Undertaking - No Potential to Cause Affects ☐ No Historic Properties Affected ☐ No Adverse Effect to Historic Properties ☐

Resources	**Resources Present**		**Effects to Resources**			**Mitigation** [2]
	Yes	**No**	**No Effect**	**Affected**[3]	**Conversion**[4]	**Check Where Applicable**
Formally Classified Lands (Parks, Monuments, Wild and Scenic Rivers, National Forest System Lands, other Federal or State Lands etc.)	☒	☐	☐	☒		☐
Floodplains (100 or 500 year floodplains)	☒	☐	☒	☐	☐	☐
Wetlands	☒	☐	☐	☒	☐	☐
Historic Properties/Cultural Resources (Historic Properties listed or eligible for listing in the National Register of Historic Places, sites of cultural or religious significance to tribes)	☒	☐	☐	☐		☐
Biological Resources (Vegetative Clearing, Threatened or Endangered Species, Critical Habitat, State Listed Species)	☒	☐	☐	☐		☐
Water Quality (National Pollutant Discharge Elimination System or Water Appropriation Permits, Sole Source Aquifers)	☐	☒	☒	☐		☐
Coastal Resources (Coastal Zone Management Areas or Coastal Barrier Resources System; Consistency Determination)	☒	☐	☒	☐		☐
Socio-Economic/Environmental Justice Concerns[5]	☐	☒	☒	☐		☐
Miscellaneous Issues (Air Quality, Transportation, Noise, Odors, etc.)	☐	☒	☒	☐		☐

	Yes	No
Is the proposal controversial for environmental reasons. If so, attach a summary of the controversy(ies) and any actions taken and resolutions necessary to respond to the concerns.	☐	☒
Is the proposal controversial for other than environmental reasons. If so, attach a summary of the controversy(s) and any actions taken and resolutions necessary to respond to the concerns.	☐	☒

1 This form can be used to document the consideration and adoption of environmental documentation prepared for or by other Federal agencies and for the incorporation of environmental information from any source.

2 Check where mitigation measures are required. Summarize and attach a list of all mitigation measures required for proposals (this list will be integrated in the Letter of Conditions).

3 For resources that are affected, prepare and attach a narration(s) explaining the effect and outline any mitigation measures necessary to avoid or minimize impacts.

4 Refers to construction of a facility (not utility lines) in a floodplain or wetland. If any of these boxes are checked, preliminary and final public notices are required, see Section 5.0 in Bulletin 1794A-602.

5 If necessary, National Office staff will document whether the proposal has any disproportionate adverse impact to minority or low income populations; use of USEPA EJ Geographic Assessment Tool http://www.epa.gov/oecaerth/environmentaljustice/assessment.html

Finding:

I find that the proposal meets the criteria established in 7 CFR §§1794.21 (a) and (c) Categorically excluded proposals without an ER or §§1794.22 (b) or (c) Categorically excluded proposals requiring an Environmental Report. Upon review of the proposal's description, Environmental Questionnaire or the Environmental Report I find that the proposal is consistent with 40 CFR §1508.4, Categorical Exclusion and does not have any extraordinary circumstances or that the proposal individually or cumulatively does not have a significant effect on the human environment and, therefore, neither an Environmental Assessment nor an Environmental Impact Statement is required.

Signatures:

Mark S. Plank

Signature of National Office Environmental Staff

1/14/10

Date

EES Staff Person's Name: Mark S. Plank

Title: Director, Engineering and Environmental Staff

Signature of Approval Official

Date

Approval Official's Name:

Title:

If a proposal includes a facility (does not include buried utility lines) that proposes to convert a wetland, i.e., requires an individual Clean Water Act, Section 404 permit (not using a nationwide permit) or is located in a floodplain (does not include buried utility lines), Executive Orders 11990, Protection of Wetlands, and 11988, Floodplain Management require public input into the proposed action prior to the agency taking the action. For proposals that are otherwise consistent with 1794. 21 and 22 this requires publication of a Preliminary Public Notice and after a 30-day comment period a Final Public Notice by the applicant. Upon completion of the 30-day comment period the National Office Environmental Staff will review any public notice and provide a summary below (negative response necessary):

APPENDIX B

Scoping Letter

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Togiak National Wildlife Refuge
P.O. BOX 270
Dillingham, Alaska 99576

IN REPLY REFER TO:

May 10, 2010

Dear Interested Parties:

The US Fish and Wildlife Service (FWS), in cooperation with the Bureau of Land Management (BLM) and the National Park Service (NPS), are preparing an environmental assessment for proposed Rights-of-Way and Special Use Permit grants to United Utilities Incorporated (UUI) for the TERRA-SW project in southwest Alaska. TERRA-Southwest (TERRA-SW or the Project) would provide terrestrial, non-satellite broadband service from Anchorage, Alaska to rural communities in the Yukon-Kuskokwim Delta and Bristol Bay.

UUI proposes to install and maintain microwave repeater towers at Caribou Ridge (12 miles northwest of Togiak village) and in the Kulukak Mountains (six miles north of Kulukak Bay) within the Togiak National Wildlife Refuge (NWR), and Cone Mountain (18 miles north of Goodnews Bay) and Muklung Hills (18 miles north of Dillingham) on BLM administered lands. As part of the Kulukak Mountains site construction, UUI has proposed a temporary barge staging area in Kulukak Bay. They also propose to bury fiber optic cable between Igiugig and Levelock, a portion of which is land managed by BLM, and install submerged fiber optic cable in waters within Lake Clark National Park and Preserve managed by NPS.

As the lead agency, the FWS is seeking public comment on these Rights-of-Way requests, concerns about the impacts of the use of federal lands, and any specific issues which should be addressed in the environmental assessment. Attached are a general route overview, and concept information on the proposed remote repeaters.

Alternatives to the proposed action may be developed depending on issues identified during this initial "scoping" period. At this time, we would like to hear any comments, issues, and concerns you have that would help shape or further develop the project proposals. We are contacting you so your concerns or ideas can be considered early in the development of the project proposals. Your comments will be most useful if they are received by June 15. However, comments will be accepted and reviewed up until the time the decisions on the projects are made.

Please send comments to: Maggi Arend, Division of Comprehensive Planning and Policy
US Fish and Wildlife Service
1011 East Tudor Road, MS 231
Anchorage, AK 99503
fw7_togiak_planning@fws.gov

If you have questions please contact:

Paul Liedberg, Togiak National Wildlife Refuge Manager
(907) 842-1063
Paul_Liedberg@fws.gov

Harrison Griffin, Realty Specialist BLM
(907) 267-1210
hgriffin@blm.gov

Doug Campbell, US Fish & Wildlife
(907) 786-3907
Douglas_Campbell@fws.gov

Dugan Nielsen, Dillingham Field Station
BLM (907) 842-4300
dugan_nielsen@blm.gov

Sincerely,

Paul A. Liedberg
Refuge Manager

Travis/Peterson Environmental Consulting, Inc.

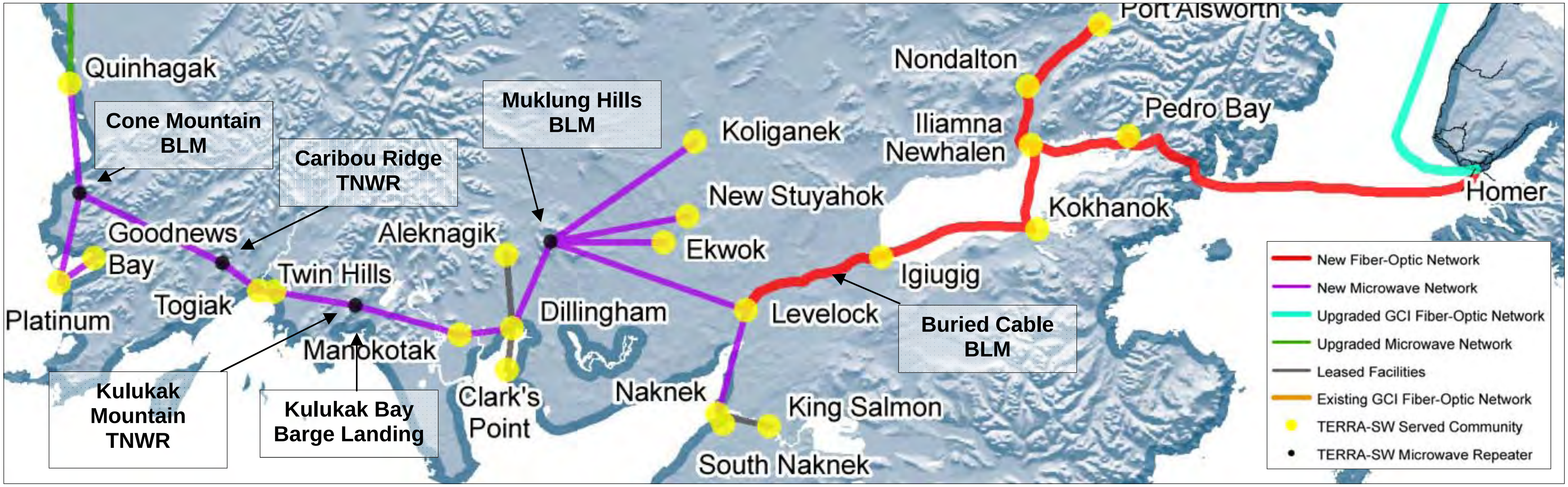
Proposed TERRA-SW

Telecommunications Network Project

TRAVIS/PETERSON ENVIRONMENTAL CONSULTING, INC.

3305 ARCTIC BLVD.
ANCHORAGE, AK 99503

MIKE TRAVIS
(907) 522-4337



Cone Mountain – T9S, R74W, SM, Sections 27 & 34
This is the proposed location of a remote repeater located on BLM lands.

Caribou Ridge – T12S, R68W, SM, Section 1
This is the proposed location of a remote repeater site located within the Togiak National Wildlife Refuge.

Kulukak Mountain – T13S, R62W, SM, Section 19
This is the proposed location of a remote repeater site located within the Togiak National Wildlife Refuge.

Kulukak Bay Barge Landing Site – T13S, R63W, SM, Section 36
This is the proposed location of a barge landing site in the Togiak National Wildlife Refuge to stage the Kulukak Mountain microwave repeater equipment during construction.

Muklung Hills – T10S, R54W, SM, Section 12
This is the proposed location of a remote repeater located on BLM lands.

Buried Fiber Optic Cable – T11S, R43W, SM, Section 4
Subject to final design, a small portion of the fiber optic cable routing may cross lands managed by the BLM. This site would require a 1,320' long by 20' wide fiber optic cable linear right of way. The cable would be installed using a wintertime direct burial method.

APPENDIX C

Public Comments and Responses Report

Public Comments and Responses Report

In addition to public comments received during five public meetings on the draft Environmental Assessment during February 2011, 44 written submissions were received. These public comments were categorized in 21 issue categories. Under each issue area, similar comments were clustered together for a summary response. For example, in regard to Air Quality emissions and impacts (AIR 1) a total of 4 commenters made two comments, for which a single summary response is offered. Following the specific comment, the comment is identified by family name, institutional affiliation if offered, type of comment submission, and date of the comment.

The issue areas which received comments are the following:

Issue Category **Page**

1. Air Quality

AIR 1: Microwave tower generators would create emissions that impact air quality and wildlife.

Comment(s):

1. Generator runs 24 hours a day. What are the impacts to air quality? And to wildlife?

   -- Public Commenter, Dillingham Public Meeting, 02/16/2011

2. The air quality finding is dubious at best. 3 diesel generators that will run 365 days/year in a pristine environment with no pre-existing industrial emissions.

   -- Sory, Email, 03/04/2011
   -- Speer, Email, 03/03/2011
   -- Grant, Tikchik Airventures, Email, 03/07/2011

Summary Response:

The largest diesel generators (for Alternative 2) are rated individually at 9 kW (12 horsepower [hp]) and will normally be operated at less than half this level. Operation of such engines would be continuous, but emissions of air pollutants would be quite low by any industrial standard. For example emissions of oxides of nitrogen (NOx) from a diesel engine producing 4.5 kW (6 hp) would be expected to be on the order of one-half pound per hour based on standard EPA emission factors for diesel engines. For perspective, a typical snowmobile is rated at about 120 to 140 horsepower, i.e. at least 10 times larger than the rated capacity of the proposed generator engines.

AIR 2: Generation of pollutants will ruin air quality during ice-fog periods.

Comment(s):

1. Through omission no mention was made in the EA of the potentially significant air quality degradation that the generators will create during wintertime air stagnation and “ice fog” periods. Do the generators create the same kind and amount of pollutants when the ambient air temperature is -40F? As when the air temperature is 65F? No data is given. General statements in the EA require data from mountainous terrain in Alaska’s winter climate to support alternative 2 impact [rating as] “negligible.” Reliable data from similar generators in Alaska is needed to forecast what the air quality will be in the valleys below the generators during the winter months at times when considerable subsistence activities occur (hunting, trapping, ice fishing). Are village caribou hunters going to pass through diesel ice fog when cold air is trapped in the adjacent valley? In my experience in rural Alaska, significant local atmospheric degradation is highly likely during atmospheric inversions.

   -- Rutherford, Email, 03/02/2011

Summary Response:

Power output and emissions of air pollutants from the small generators for either the microwave or fiber optic cable alternative may vary fractionally as a function of ambient temperature, but will remain quite low. These emissions could produce very localized effects on air quality in the immediate vicinities of the generator locations during stagnant or inversion conditions, but are considered too low to be an appreciable factor in air quality over an extended area, such as a valley.

AIR 3: No mitigation of 65+ tons of Carbon dioxide

Comment(s):

1. It is unacceptable that there are not considerations proposed to remediate or mitigate the 65+ tons of Carbon dioxide generated annually as greenhouse gas by the generators, non-polluting alternatives exist.

   -- Sory, Email, 03/04/2011
   -- Speer, Email, 03/03/2011
   -- Grant, Tikchik Airventures, Email, 03/07/2011

Summary Response:

Section 2.2.4.2 evaluated alternative energy sources and found that propane, solar, and wind energy were not feasible as a sole energy sources for the project. Additional analysis was added to this section to consider hybrid renewable and non-renewable energy systems. A new mitigation measure has been added to Section 4.6 requiring collection of site-specific climate and wind information at each tower site for three years. This will form the basis for further evaluation of supplemental use of wind energy, with a resulting reduction in reliance on diesel fuel and carbon emissions.

AIR 4: Department of Interior leadership role in carbon management and CO2 reduction not met by this project.

Comment(s):

1. The Department of interior has a leadership role in carbon management. [not met by this project]

   -- Sory, Email, 03/04/2011
   -- Speer, Email, 03/03/2011
   -- Grant, Tikchik Airventures, Email, 03/07/2011

Summary Response:

The Department remains committed to a leadership role in carbon management. Additional analysis was added to Section 2.2.4.2 this section to consider hybrid renewable and non-renewable systems. A new mitigation measure has been added to Section 4.6 requiring collection of site-specific climate and wind information at each tower site for three years. This will form the basis for further evaluation of supplemental use of wind energy, with a resulting reduction in reliance on diesel fuel and carbon emissions.

2. Cell Service

CEL 1: Cell Service would add value to the project and should be considered.

Comment(s):

1. Could you confirm that my cell service would not be improved because there are no cell towers included in the proposal?

   -- Public Commenter, Dillingham Public Meeting, 02/16/2011

2. Positive benefits to better communications in the area include: Less energy consumption, greater efficiency, less environmental impact with phone call vs. search.

-- Alsworth, Sr., Port Alsworth Public Meeting, 02/21/2011

3. How far will the phone service go?

   -- Lagusuk, Togiak Public Meeting, 02/28/2011

4. Would this make cell service available to people in the tundra subsistence hunting? This should be a positive finding for subsistence and other wilderness recreational activities.

   -- Alsworth, Sr., Port Alsworth Public Meeting, 02/21/2011

Summary Response:

Section 2.2 amended to include ROW Permit Application modification for cell antennae installation. Additional language added to Section 4.1.3.3 regarding benefits.

CEL 2: The marine alternative precludes the possibility of future cellular service.

Comment(s):

1. The construction of cellphone towers is not in the analysis, but I know the plan is to put cell repeaters there in the future. Marine cable does not provide the future opportunity for cell repeaters. I was in a situation recently where cellular service was a life or death situation.

   -- Public Commenter, Dillingham Public Meeting, 02/16/2011

Summary Response:

Additional language added to Section 4.4.1 to make this point.

3. Cultural Resources

CUL 1: The spiritual aesthetics of Kulukak Bay should be protected.

Comment(s):

1. Kulukak Bay has many ancestral village sites and a traditional heritage of great spiritual importance for the regions native peoples. The "View Shed" of this tower repeater will have extreme negative impacts on these two beautiful valleys and the spiritual aesthetics of Kulukak Bay.

   -- Johns, Email, 03/07/2011

Summary Response:

Additional language added to Section 4.4.9 regarding consultation with tribes on Traditional Cultural Properties. The tribes did not identify spiritual aesthetics of Kulukak Bay as a matter of sensitive Traditional Cultural Properties.

4. Cumulative Effects

CE 1: Installation of TERRA-SW makes additional, expansion project feasible.

Comment(s):

1. Although the northwest expansion of TERRA is not funded at this time, the decisions made related to TERRA-SW will affect the ability of the people of Northwest Alaska to get broadband in the future. In order for our region to get broadband access, a

terrestrial network through Southwest Alaska must be complete first be completed. Broadband is critical to the long-term future of the rural economy and our business.

-- Ivanoff, NSEDC, Email, 03/10/2011

2. Broadband in rural Alaska is critical to the economic future of our communities and will improve education, health and economic opportunities.

   -- Olson, NW Legislators, Email, 02/24/2011

3. The TERRA-SW project is of great importance to rural Alaska and the residents of Unalakleet. Broadband is essential for the future economy, education, and health of rural Alaska. Unalakleet is hopeful that the TERRA-SW project will provide expanded terrestrial facilities that will service our community in the near future, but without the necessary permits to build TERRA-SW, this will never happen.

   -- Johnson, Email, 03/02/2011

Summary Response:

Comment address in Section 4.1.3.3. Cumulative impacts updated with regional benefits.

CE 2: Pebble Mine

Comment(s):

1. No cumulative impacts from the proposed Pebble Mine were evaluated despite the fact that exploration and temporary water use has been ongoing and significant for the past 21 years. This is especially true for the impacts of helicopter activity, which will be required for the life of the project to maintain the microwave repeater towers.

   -- Smith, Alaska Center for the Environment, Email, 03/11/2011

Summary Response:

The Pebble Mine project is considered speculative and was dismissed from analysis as it is not considered a reasonably foreseeable future action and no nexus could be made between the type, timing, context, duration, and intensity of this project compared to the proposed project.

5. Fish

FSH 1: Echoes and vibrations under water could affect fish.

Comment(s):

1. Echoes and vibrations go a long way under water? Would the sound effect the fish?

   -- Balluta, Nondalton Public Meeting, 02/21/2011

Summary Response:

Comment addressed in Section 4.3.2.2.

FSH 2: Lakebed cable installation could impact habitat and fish.

Comment(s):

1. What are the impacts to lake bottoms?

   -- Balluta, Nondalton Public Meeting, 02/21/2011

2. We don’t want cable to disrupt fish coming into the lake.

-- Public Commenter, Port Alsworth Public Meeting, 02/21/2011

Summary Response:

Comments addressed in Section 4.3.2.2.

FSH 3: Schedule construction activities to minimize impact to fisheries and subsistence users.

Comment(s):

1. We request that the company avoid construction activities during July and August in order to minimize impacts to fisheries and subsistence users.

   -- Blair, NPCA, Email, 03/08/2011

Summary Response:

Comment addressed in Section 4.3.2.2.

6. Hazardous Materials

HAZ 1: What is the plan for potential diesel fuel spills?

Comment(s):

1. I certainly have serious concerns about the potential of a 2,000 gallon diesel fuel spill [at Kulukak Mountain].

   -- Vermillion, Royal Coachman Lodge, Email, 02/23/2011

2. Sometimes there can be accidents. How do you plan to deal with spills?

   -- Public Commenter, Goodnews Bay Public Meeting, 02/28/2011

3. My concern is the fuel, and you said the tanks are double walled to contain the piping? How fast can an offsite operator respond to any mishaps?

   -- Public Commenter, Togiak Public Meeting, 02/28/2011

4. If the 500 gallon tank is dropped [by helicopter] what type of cleanup is prepared for that type of spill?

   -- Public Commenter, Togiak Public Meeting, 02/28/2011

5. The requirement of diesel fuel to operate site generators in perpetuity and the safe transport, transfer, and store of diesel fuel troubles me. Fuel spill remediation is very costly and troublesome. Based on a project life of 25 years, each site will require at least 175,000 gallons of fuel for operation. Best practices aside, there will be fuel spills in the life of this project

   -- Muir, Email, 03/08/2011

Summary Response:

Comment addressed in Section 4.2.4 Terms of the Spill Prevention Control and Countermeasures Plan would govern the response for prevention and response preparation.

HAZ 2: Recommended design modifications for snow loading.

Comment(s):

1. It appears winter snow loading on the power module shelters could be an issue. We recommend the shelters include special features that provide air intake for the generators when the shelters are covered in snow and air flow is limited. Limited air flow could cause generators to malfunction, which would increase the need to access the sites for maintenance purposes.

   -- Magee, Gov. Parnell's Office, Email, 03/08/2011

Summary Response:

Additional language regarding snow hoods added to Table 2.2. This snow hood design mitigates the risk of snow loading and blockage to exhaust systems.

HAZ 3: Recommend additional security measures.

Comment(s):

1. We also recommend ensuring the 4,500 gallon diesel tanks include security devices to prevent theft or vandalism.

   -- Magee, Gov. Parnell's Office, Email, 03/08/2011

Summary Response:

The fuel tanks have leak detection, secondary containment and other spill prevention design features. They will also be secured by locks.

7. Lakebed Cable

CAB 1: Is there good engineering for the stream crossings on the highway route?

Comment(s):

1. What happens with fiber optic on land crossing streams?

   -- Public Commenter, Nondalton Public Meeting, 02/16/2011

2. There are quite a lot of creeks between Nondalton and Port Alsworth.

   -- Balluta, Nondalton Public Meeting, 02/16/2011

Summary Response:

Permits for stream crossings, require professional engineering design. No crossing would occur in the sections of the project under analysis in the EA.

CAB 2: What are the cable dimensions; how are breaks repaired; and what are the consequences?

Comment(s):

1. What if the cable did break?

   -- Balluta, Nondalton Public Meeting, 02/16/2011

2. How big is the cable?

   -- Public Commenter, Port Alsworth Public Meeting, 02/28/2011

Summary Response:

When the break is located, a hook is used to raise the cable to the surface for a splicing repair. The most problematic area will be near the shore, so extra armor would be used as a preventative measure.

CAB 3: How much of the cable is overland?

Comment(s):

1. In the Iliamna Lake area, how much is overland? Why can't overland be used in other areas?

   -- Public Commenter, Togiak Public Meeting, 02/28/2011

Summary Response:

Overland portions of the TERRA-SW Project are outside the direct analysis of this EA. Figure 1.1 shows overland components.

CAB 4: How is lakebed cable laid and what impacts are expected from laying the cable?

Comment(s):

1. What kinds of impacts would you expect from laying the cable?

   -- Public Commenter, Port Alsworth Public Meeting, 02/28/2011

2. What kind of boat will be used to lay the cable?

   -- Public Commenter, Port Alsworth Public Meeting, 02/28/2011

Summary Response:

Additional language regarding installation of the lake-bed cable included in Section 2.2.2, and Chapter 4 identifies impacts from the installation and operation of the lake-bed cable.

8. Lands with Wilderness Characteristics

LWC 1: Telecommunication sites are not new to this area.

Comment(s):

1. Weren't there previously installed telecommunications sites near the proposed sites?

   -- Public Commenter, Dillingham Public Meeting, 02/16/2011

Summary Response:

These are new facilities.

LWC 2: The ecosystem value that is lost due to this project should be analyzed with the proper valuation methodology.

Comment(s):

1. If you take a piece of wilderness out of commission, you've taken a piece of real estate out of production. I don't think it is a large value, but it does have a value in the concept of ecosystem management.

   -- Radenbaugh, Dillingham Public Meeting, 02/16/2011

Summary Response:

Comment Acknowledged.

LWC 3: The service that telecommunications towers provide will be obsolete soon, but wild remote areas cannot be replaced.

Comment(s):

1. I hope you all reconsider your proposed plans to start stamping cell towers in these wild remote areas. ... It would be a real shame to have these archaic towers in these wilderness areas when the service they provide will soon be extinct.

   -- Frey, Email, 02/24/2011

Summary Response:

The purpose of this project is to provide broadband coverage to these communities. Availability of cell phone reception is an ancillary benefit. The EA analyzes the decommissioning of the towers, per the applicant's final removal plan.

LWC 4: Lower impact Alternative 3 may be a more economical alternative, when fuel prices are considered.

Comment(s):

1. The EA did not address what effect changing fuel prices might have on Alternative #2. Currently diesel fuel in Dillingham costs about $5.88/gallon whereas in 2003 it cost less than $1.00 /gallon. As world oil prices rise in the future at what point will the broadband microwave system be unsustainable? If fuel prices double in the next 5 years will the towers remain economical? The EA did not properly address what effect changing fuel prices might have on Alternative #3. At what price point is Alternative #3 clearly and competitively the most economical alternative?

   -- Rutherford, Email, 03/02/2011

Summary Response:

A comparative economic feasibility analysis was included in the David Ross Group Report. See Appendix E for the executive summary of this report.

LWC 5: Installation of Towers will impair lands with wilderness characteristics.

Comment(s):

1. Please leave this area untouched as it has been for thousands of years.

   -- Deming, Sportsman's News, Email, 02/26/2011

2. My concern is for the area of wilderness in question and we are absolutely speaking of one of the most remote areas in Alaska, virtually teeming with game and fish...and more importantly, virtually void of people. I couldn't imagine that one silly communications tower and the very small need for such an implement (in an area consisting of mainly cultural and traditional-use villages, which have done fine without such communications for literal eons) could in anyway justify the introduction of such a man-made structure in such a brilliant and remote corner of our state.

-- Shrum, Email, 02/24/2011

3. Due to the nature of this projects ridgeline exposures, its mandatory needs for continuous helicopter support, its high contrast visual offenses and its disruptive noise pollution issues, this project will have a significant negative environmental impact on a large amount of the Togiak National Wildlife Refuge, its wilderness character and wildlife.

   -- Johns, Email, 03/07/2011

4. The wilderness quality of this beautiful place would be ruined with an eye sore of a tower and, most importantly, that special feeling that runs up your spine when the plane departs and you realize you are truly alone in the wilderness with no sign of man; well that's gone now. Forever.

   -- Schroeder, Email, 03/03/2011

5. Wilderness grows ever more scarce. Wilderness is constantly being infringed upon, nibbled away, and reduced worldwide while bandwidth grows ubiquitous. The Federal conservation lands within the project area will not be improved by added bandwidth while the wilderness character will be significantly impacted for the life of the project or beyond.

   -- Rutherford, Email, 03/02/2011

6. The Kulukak site is highest proposed tower elevation at altitude 2200 feet above msl. A tower constructed at Kulukak will be a significant infringement upon the wilderness solitude character of the Kulukak river corridor used by subsistence users, by sport fishermen and women, by sport hunters, by guided groups and by unguided adventure recreationists.

   -- Rutherford, Email, 03/02/2011

7. Based upon my experiences floating the Kulukak River the noise emitted might be an unacceptable infringement upon the wilderness solitude character of the Kulukak river corridor for Subsistence users, Sport fishermen and women, by Sport hunters, by guided groups and by unguided adventure recreationists.

   -- Rutherford, Email, 03/02/2011

Summary Response:

The proposed facility and operations may be authorized in public lands. Mitigation measures added to require seasonal refueling windows to reduce potential impacts on recreationalists and wildlife and noise and visual resources. Section 4.4.4 amended to reflect new conclusions from visual resources potential impacts on visitors and recreationalists.

LWC 6: Evaluation of effects on LWC lacks data on user opinions, concerns.

Comment(s):

1. No social data was submitted in the EA to reflect actual local, national, or international visitors concerns about building microwave towers and installing generators on Togiak Refuge. No data was presented to quantify the wilderness values of the tower areas as they exist in their natural state.

-- Sory, Email, 03/04/2011
-- Speer, Email, 03/03/2011
-- Grant, Tikchik Airventures, Email, 03/07/2011

2. To my knowledge no sampling of “User” opinion from local, national, international visitors to Togiak Refuge was conducted.

   -- Rutherford, Email, 03/02/2011

Summary Response:

User surveys have not been conducted. The public has been invited to voice their concerns through this public comment effort.

LWC 7: The project's overall impact on wilderness character would be minor.

Comment(s):

1. Page 4-48, 4.4.3.4, Lands with Wilderness Character: We concur with the EA’s conclusion that for Alternative 2, the project’s overall impact on wilderness character would be minor.

   -- Magee, Gov. Parnell's Office, Email, 03/08/2011

Summary Response:

Comment Acknowledged.

9. Land Use

LU 1: Development displaces recreational users from shrinking areas of wildlands.

Comment(s):

1. As development occurs in Alaska and worldwide it squeezes recreationists into the smaller and smaller acreage of remaining wildlands. It is in this context of shrinking wildlands that the proposed towers and generator operations will have a significant impact and not as the EA suggests: “Taking into account the intensity, duration and context of impacts on land use â€¦ minor summary impact.”

   -- Rutherford, Email, 03/02/2011

2. As development occur in Alaska and worldwide it squeezes recreational providers and recreational users like myself into the smaller and smaller acreage remaining. How can it be in the USFWS Refuge system's interest to take something very rare and valuable, undeveloped wildlands, for something common and ubiquitous, i.e., bandwidth?

   -- Sory, Email, 03/04/2011
   -- Speer, Email, 03/03/2011
   -- Grant, Tikchik Airventures, Email, 03/07/2011

Summary Response:

NEPA requires analysis of direct impacts to lands and resources within the project area, as well as the contribution of the proposed activity to cumulative effects. See Section 4.4.4 and 4.4.6 for the analysis of impact to Lands with Wilderness Characteristics and Recreation respectively.

LU 2: Development limits education and ecological research in pristine ecosystem.

Comment(s):

1. The TNWR also provides outstanding educational opportunities, promoting stewardship in native communities and outreach via an impressive array of outdoor activities.... Over the years I have taken many students to conduct ecological research in the TNWR. These students were all in awe during our trips to the refuge...Preserving the pristine ecosystems of the TNWR is something we owe to future generations.

   -- Hu, Email, 03/05/2011

Summary Response:

Section 3.4.3 amended to include educational uses of Togiak NWR.

10. Marine Cable Alternative

MAR 1: The marine cable alternative will prevent spoiling a pristine terrestrial landscape.

Comment(s):

1. I'm sure there are other alternatives than ruining this area with unsightly towers.

   -- Deming, Sportman's News, Email, 02/26/2011

2. We have a safe and non-disruptive alternative; installing a submerged marine fiber optic cable along the ocean floor around the coastline of SW Alaska. This type of project and technology is routinely installed and used for thousands of remote communities around the coastal areas of the globe

   -- Johns, Email, 03/07/2011

3. An undersea cable can provide the residents with technological advances without dramatically altering the unique relationship that Native Alaskans have with their natural environment. To destroy the natural wonder of this place with telecommunication towers and service roads, especially when a much more environmentally sound and slightly more expensive option is available.

   -- Hu, Email, 03/05/2011

4. The implementation of Alternative 3 will provide better service to Alaska's villages, more bandwidth for rural Alaskans, require much less maintenance, and is much more compatible with US DOI taking a leadership role in greenhouse gas management, while managing the Togiak Refuge under the existing Comprehensive Conservation Plan.

   -- Rutherford, Email, 03/02/2011

5. Towers will visually impact the wilderness and the installation and service will also have a negative impact. These impacts are greatly reduced with the underwater cable option.

   -- Ash, Email, 03/07/2011

6. I am in favor of Alternate 3. I believe it will have the least negative impact on the goals of the refuge system while simultaneously providing the most reliable service.

   -- Muir, Email, 03/08/2011

Summary Response:

The Section 4.4.4 review of Alternative 3 acknowledges that after construction, Alternative 3 involves no ongoing noise or visual disturbance to the project area.

MAR 2: Additional mitigation measures may be necessary should Alternative 3 be selected.

Comment(s):

1. While not the preferred alternative, should Alternative 3 be selected, additional mitigation measures may be necessary to address potential impacts to walrus and grey whales in Togiak Bay, Round Island area and Bristol Bay, southwest of Cape Constantine. If necessary, we request ADF&G be consulted in determining appropriate mitigation measures.

   -- Magee, Gov. Parnell's Office, Email, 03/08/2011

Summary Response:

The alignment for Alternative 3 was designed to avoid impacts. If selected and developed, coordination with ADF&G would occur.

11. Microwave Repeater Tower Sites

TOW 1: How much will it cost to use generators at the tower sites, and are there alternative energy options?

Comment(s):

1. How much will it cost to run the generators 24 hours a day for years, and are there any alternatives, like wind turbines?

   -- Public Commenter, Togiak Public Meeting, 02/28/2011

2. Could alternative energy be used to power the remote sites?

   -- Alsworth, Sr., Port Alsworth Public Meeting, 02/21/2011

Summary Response:

Comparative costs are reviewed in Section 2.2.4 on alternative energy sources.

TOW 2: Will towers add additional features? (Scalability)

Comment(s):

1. Pressure will grow to install additional features on the sites such a cellular telephone, State and Federal radio repeaters, “Tower Cams,” Remote Automated Weather Stations (RAWS) flight service radio repeaters etc. How will the land managers respond to requests to permit incremental changes i.e. “mission creep”? Will those “add on features” contribute to give UUI a monopoly on regional data flow?

   -- Rutherford, Email, 03/02/2011

Summary Response:

New equipment added to the site would require agency review and possible modifications to the ROW permit. The potential environmental footprint of any additional equipment would be considered.

TOW 3: Support for the route.

Comment(s):

1. The proposed microwave route is the best option for cost-effective deployment and environmentally responsible use of federal lands. This land based project, as designed, will have no significant impact on federal land according the EA prepared by the Service, which UUI has ensured by implementing full environmental safeguards.

   -- Begich, Senator, Email, 03/08/2011

Summary Response:

Comment Acknowledged.

12. Mitigation Measures

MIT 1: What is our assurance the invasive plant mitigation plan will be implemented?

Comment(s):

1. It should be considered to clean the helicopters with every trip to mitigate the impact of invasive species. I also didn’t see anything in the EA making sure camping equipment and temporary housing stuff is cleaned before it is out there. The construction workers’ clothing, they are very good vectors.

   -- Public Commenter, Dillingham Public Meeting, 02/16/2011

Summary Response:

Comment addressed in Section 1.5 to include legally-binding permit conditions and mitigation measures.

MIT 2: What are the requirements for camp cleanliness to avoid attractive nuisance?

Comment(s):

1. Will the camp be kept clean? Certain bugs and animals get driven-off during the construction phase. Afterwards, different bugs and animals can be attracted by the waste that crews leave.

   -- Abraham, Dillingham Public Meeting, 02/16/2011

Summary Response:

Comment addressed in Section 4.5

MIT 3: There should be air quality mitigation for the 65plus tons of carbon dioxide generated annually.

Comment(s):

1. It is unacceptable that there are no considerations proposed to remediate or mitigate the 65plus tons of carbon dioxide generated annually as greenhouse gas by the generators. The EA does not present credible data to justify burning hydrocarbons when non-polluting alternatives exist.

   -- Sory, Email, 03/04/2011
   -- Speer, Email, 03/03/2011
   -- Grant, Tikchik Airventures, Email, 03/07/2011

Summary Response:

Comment addressed in Sections 4.2.1.2 and 4.2.1.3 to provide correct information on the operational sources of greenhouse gas emissions associated with the project during the operations period.

MIT 4: Recommended maintenance timing either before or after summer seasons.

Comment(s):

1. The allowable calendar "window" for refueling towers will have to be precisely spelled out to minimize wildlife disturbance and conflict with wilderness recreation. In my opinion all flights should be completed after the closure of fall sport hunting and before June 1, when anglers and wilderness travelers begin to intensively use the Refuge lands. It might be prudent to consult local brown bear guides as to when their operations are occurring in the tower areas and schedule tower maintenance when hunters are not normally afield.

   -- Rutherford, Email, 03/02/2011

Summary Response:

Mitigation measure added to reflect seasonal windows for refueling activity, avoid the principal hunting and recreation periods. This would reduce the impacts to users on the Refuge and BLM-managed lands.

MIT 5: Use of Off Road Vehicles [ORVs]/All-Terrain Vehicles [ATVs] by construction crews.

Comment(s):

1. ATV's associated with construction crews. The EA did not completely address how ATV use might be managed on and off the job nor what impact ATV's might have. It is common for Alaskan workers to use ATV's after hours in pursuit of fish and wildlife and outdoor motorized recreation. In some soil types ATV use will cause significant long-term damage to the environment. This deficiency in the Environmental Assessment should be corrected and impacts of ATV use considered for each mountain top site and staging area.

   -- Rutherford, Email, 03/02/2011

Summary Response:

Comment addressed in Section 4.5. Construction personnel will not be allowed to use all-terrain vehicles outside of the construction site. Consumptive recreational activities (i.e., hunting and fishing) are not allowed under the permit stipulations.

13. Noise

NOI 1: Noise level and impact conclusions are incorrect

Comment(s):

1. In reality the noise from two hundred and eighty two (282) Helicopter flights would be significant impact in New York City or in a Middle East war zone, not to mention that number of flights in the pristine TNWR plus monthly logistical supporting flights in the TNWR. Quite opposite of the EA conclusion the reality is that the noise levels would be extreme to the point of disruptive and destructive to the environment, wildlife and birdlife of the TNWR.

   -- Johns, Email, 03/07/2011

Summary Response:

Comment addressed in Section 4.4.7.2 which describes how impacts from noise will be minimized through the implementation of site-specific mitigation including limits to a seasonal window for helicopter supported refueling flights during the operations period.

14. Recreation

REC 1: The Cone Mountain tower would disturb my recreation experience.

Comment(s):

1. I come to this region of the world on an annual basis to enjoy the wilderness and lack of human footprint in some of your beautiful areas. One of the camps that I book is in the Cone mountain area where you are considering installing the fiber optic tower and it disturbs me that the state is considering such a pristine place for this tower.

   -- Deming, Sportman's News, Email, 02/26/2011

2. Last May I hunted in the Goodnews Bay area. One of the main intrigues for me to spend my money in your state is the allure of WILD Alaska. That is what we all dream about when we dream of visiting the Alaskan wilderness, the pristine wilderness, the adventure. [Communications] towers, pipelines, and all permanent structures like that ruin those dreams and take away that allure.

   -- Rawlake, Email, 02/24/2011

3. I feel putting a tower for the TERRA Project at Cone Mountain is a big mistake. I know you wouldn't want that tower in your backyard and I definitely don't want the tower in an area that is special to me and my family.

   -- Sparks, Email, 02/24/2011

Summary Response:

The analysis of Visual impacts in Section 4.4.8 was revised to recognize viewers' high sensitivity to the installation of the towers, including at Cone Mountain.

REC 2: Installation of the Kulukak tower would impair recreational fishing experience.

Comment(s):

1. I am very concerned about the Kulukak tower. This is one of the most pristine salmon fisheries that I have seen in Alaska. Both drainages on either side of Kulukak Mountain get very good salmon runs. The Kulukak River gets all five salmon species. The drainage on the East side gets at least good runs of Sockeye Salmon and Silver Salmon (and maybe more).... Impact [to] clients' perspective [represents] a threat.

   -- Vermillion, Royal Coachman Lodge, Email, 02/23/2011

Summary Response:

Perceptions regarding the Kulukak repeater site and construction addressed with additional language in Section 4.4.6.2.

REC 3: Helicopter traffic during construction and annual maintenance will be likely intrusive to recreational users

Comment(s):

1. The proposed Kulukak Mountain Tower in particular would create a significant negative impact to the experience of rafters, anglers, hunters, and wilderness adventure travelers that visit Kulukak drainage each year. Helicopter operations during the hunting fishing, Eco touring, and rafting seasons seems to be at cross-purposes with the other refuge objectives.

   -- Sory, Email, 03/04/2011
   -- Speer, Email, 03/03/2011
   -- Grant, Tikchik Airventures, Email, 03/07/2011

Summary Response:

Under development 3/30/2011

15. Regulatory Process

REG 1: If marine fiber optic cable is uneconomical, why is it an alternative?

Comment(s):

1. Two companies have already looked at fiber and found it wasn't economically feasible. So why are we still looking at it?

   -- Public Commenter, Dillingham Public Meeting, 02/16/2011

2. What is the cost difference between the Alternatives 2 & 3? (This includes on-going fuel use in the next 20 years, maintenance risks, generators.)

   -- Public Commenter, Port Alsworth Public Meeting, 02/21/2011

Summary Response:

Alternative 3 is a technically possible alternative with different environmental impacts from those of the applicant's proposal (Alternative 2). It was included for analysis in order to provide a reasonable range of possible alternatives for consideration. The EA is updated with the conclusions from the David Ross Group feasibility report (Appendix E).

REG 2: How does each agency make its decision and who makes the final decision?

Comment(s):

1. Who makes the final Go/No Go decision for the FONSI?

   -- Public Commenter, Dillingham Public Meeting, 02/16/2011

2. I'm not clear the Park's role in the process.

   -- Public Commenter, Port Alsworth Public Meeting, 02/21/2011

3. What are the benefits to the region versus the mission of the Refuge to protect wildlife? How do you weigh these things?

   -- Public Commenter, Dillingham Public Meeting, 02/16/2011

Summary Response:

The regulatory requirements for each agency to make its independent decision are found in Section 1.3.

REG 3: Can UUI appeal if its permits are denied?

Comment(s):

1. Is the agencies decision appealable by the company? Is there some other recourse?

   -- Public Commenter, Dillingham Public Meeting, 02/16/2011

Summary Response:

Clarifying language added to Section 1.5.

REG 4: How is the independent study of technically feasible and practicable alternative used to make decisions?

Comment(s):

1. The study USFWS had done on the marine cable. What did they determine?

   -- Public Commenter, Dillingham Public Meeting, 02/16/2011

2. There is a difference between technically feasible and practical or advisable?

   -- Public Commenter, Dillingham Public Meeting, 02/16/2011

3. Did the David Ross Group study factor annual maintenance and installation costs? Is the Cook Inlet cable compared?

   -- Public Commenter, Dillingham Public Meeting, 02/16/2011

Summary Response:

This analysis allows federal decision-makers to understand the possible alternatives which may have lesser environmental impacts while still allowing for the transportation and utility system needs of the public. These alternatives are not necessarily the least costly. The David Ross Group analysis of the alternatives did include maintenance and installation costs, see pages 12 and 17 of the executive summary of the final report in Appendix E. Alternative C1, the most technically feasible and least costly of the alternatives included the cost to install and maintain a cable across Cook Inlet that would be redundant to the cable UUI would install as a part of the TERRA-SW Project in order to meet UUI's requirements for the restoral of service in case of a break in the main cable. As proposed and evaluated by the USDA Rural Utility Service and in this EA, UUI's TERRA-SW Project does not include redundant or backup cable across Cook Inlet.

REG 5: Why don’t we have an EA of the overall TERRA-SW Project? What were the impacts for other portions of the route?

Comment(s):

1. Why don’t we have an EA of the overall TERRA-SW Project?

   -- Public Commenter, Dillingham Public Meeting, 02/16/2011

2. When was the EA done from Iliamna to Port Alsworth?

   -- Balluta, Nondalton Public Meeting, 02/21/2011

3. The Anchorage to Homer portion- I didn’t hear about impacts

   -- Public Commenter, Port Alsworth Public Meeting, 02/21/2011

4. NEPA prohibits agencies from dividing projects into smaller components to avoid reviewing a project’s cumulative effects. See 40 C.F.R. Â§ 1502.4(a). There can be no question that if the portions of the project located within Lake Clark, the Togiak National Wildlife Refuge, and on BLM lands in Goodnews Bay go forward, then the other segments in Cook Inlet, Lake Iliamna, and from Cook Inlet to Lake Iliamna must also be constructed in order for the broadband connections to be made for the entire system. Thus, the project does not pass the “independent utility” test and the agencies must analyze the entire project in one EA and properly evaluate the cumulative impacts of this project.

   -- Smith, Alaska Center for the Environment, Email, 03/11/2011

Summary Response:

No change has been made to the EA. The funding agency, Rural Utilities Service, found that the TERRA-SW Project was consistent with a Categorical Exclusion in accordance with 7 CFR 1794 (See Appendix A). DOI agencies required additional analysis in order to make decisions on required permits and chose to conduct and environmental assessment to provide that analysis. The potential impacts of the TERRA-SW Project between Homer and Dillingham have been addressed as cumulative impacts.

REG 6: Recovery Act creates presumption in favor of approval, intrudes on NEPA process.

Comment(s):

1. The impetus behind the “push” to develop the environmentally destructive repeater tower alternative using support helicopters to construct and maintain microwave repeater towers across our wild lands is profit driven. Another impetus behind the “push” is a possible Government Stimulus Funding Package that was acquired prior

to even being permitted for the project. Most Stimulus Funding Packages have timelines and deadlines - so the easiest, quickest and most profitable avenue is being pursued. This avenue would be most destructive to our wild lands, wildlife and birdlife resources.

-- Johns, Email, 03/07/2011

Summary Response:

The agencies conduct a technical review, as required under NEPA, and the funding source does not affect the review.

REG 7: ANILCA provisions for Togiak Wilderness are also important alongside the Wilderness Act.

Comment(s):

1. Page 1-5, 1.3.2 Laws, Regulations and Policies: The last paragraph indicates the Wilderness Act is the sole purpose of the Togiak Wilderness Area. ANILCA Section 303(6) (b) established the purposes of the Togiak Refuge, including designated Wilderness. ANILCA Section 707 states that designated Wilderness is administered in accordance with applicable provisions of the Wilderness Act, except as expressly provided for in ANILCA.

   -- Magee, Gov. Parnell's Office, Email, 03/08/2011

Summary Response:

The text has been clarified to indicate that the Togiak Wilderness shares all of the purposes of the Togiak Refuge in addition to the purposes set forth in the Wilderness Act.

REG 8: ADNR permitting actions to add

Comment(s):

1. Cone Mountain Repeater Site: Lands underlying the proposed Cone Mountain repeater site have been selected by the State (BLM File Number AA 76499, DNR File Number GS 6659) and as such, BLM needs state concurrence on the proposed issuance of a right of- way grant. Based on available information, the State anticipates such concurrence; however, the response is pending final review and approval of a separate repeater site proposed on state lands (ADL #231129) that is also associated with the TERRA-SW Project Nondalton to Port Alsworth Fiber Optic Cable. The State is also currently processing an application for authorization (ADL 230698) to install fiber optic cable associated with the TERRA-SW Project on an estimated 305 non-contiguous miles of state lands. Water Use Permit - Should the TERRA-SW Project need to draw a significant amount of water for construction activities, such as site preparation or cement mixing, an ADNR temporary water use authorization pursuant to 11 AAC 93.035 may also be required.

   -- Magee, Gov. Parnell's Office, Email, 03/08/2011

Summary Response:

Additional language added to describe that ADNR permits may be required, i.e. "including but not limited to."

REG 9: ADFG permitting actions to add.

Comment(s):

1. Fish Habitat Permit FH 11-11-0010 issues;

   -- Magee, Gov. Parnell's Office, Email, 03/08/2011

Summary Response:

Additional language added to describe that ADFG permits may be required, i.e. "including but not limited to".

REG 10: The purpose and need statement for the project is narrow and meaningless.

Comment(s):

1. A purpose and need statement that merely responds to applications and results in the issuance of permits is extremely narrow and does not allow for the agencies to develop a reasonable range of alternatives. It also means that the project itself is the only potential decision by the agency, making the purpose and need meaningless for determining the least environmentally damaging alternative, whether the project should proceed, and a well-informed decision about the project and other priorities and activities in the area. Thus, the purpose and need statement for the project does not meet the requirements of NEPA and illegally constrains the environmental analysis in the EA.

   -- Smith, Alaska Center for the Environment, Email, 03/11/2011

Summary Response:

The agencies believe that the Purpose and Need Statement correctly reflects the administrative responsibilities of the DOI agencies and that the range of alternatives considered was adequate.

REG 11: The range of alternatives is too narrow.

Comment(s):

1. Another reasonable alternative that should have been evaluated and considered, the broadband project by the Kodiak Kenai Cable Company, LLC

   -- Smith, Alaska Center for the Environment, Email, 03/11/2011

Summary Response:

No change was made to the EA. The agencies believe that including Alternative 3, the submarine cable avoiding the FWS and BLM sites provides an adequate range of alternatives.

16. Service Characteristics Of Broadband Improvements

SER 1: Would all Bristol Bay communities receive the benefits of this project? Would it put them on par with every other city in the U.S.?

Comment(s):

1. Would the locations where fiber option cable is laid, what are the communities served?

   -- Public Commenter, Dillingham Public Meeting, 02/16/2011

2. Randy Alvarez told me that he was invited to speak with FCC in DC as a rural telephone utility board member. Rural America was only being allowed the tiniest band width in comparison to the rest of America. Would this system make us as good as any city in the country?

   -- Alsworth, Sr., Port Alsworth Public Meeting, 02/21/2011

Summary Response:

The TERRA -SW Project would provide new or enhanced broadband capacity in 65 Bristol Bay and YK Delta communities. The service would be comparable to larger urban areas in Alaska.

SER 2: The alternative that provides the best level of service and reliability should be chosen.

Comment(s):

1. Is there any difference level of service between microwave and fiber optic?

   -- Public Commenter, Dillingham Public Meeting, 02/16/2011

2. What about reliability?

   -- Public Commenter, Port Alsworth Public Meeting, 02/21/2011

Summary Response:

As discussed in Section 4.0 of the EA, the reliability of service and lower delay times (latency) were key criteria in the decision by UUI to propose a project using fiber optic technology, rather than satellite service. Agency decisions focus on impacts, including benefits and adverse impacts. No change in the document needed.

17. Socioeconomics

SOC 1: Increasing communications can improve safety in an area; a positive impact of the project.

Comment(s):

1. Do you consider improved safety as a feature?

   -- Public Commenter, Dillingham Public Meeting, 02/16/2011

2. Positive benefits to better communications in the area include: 1) Less money spent on S & R activities, 2) Less risk to searchers, 3) More productivity from people because they are not displaced from work to assist in search, 4) Reduces stress which elevates chance of bad decisions, which create more problems to deal with.

   -- Alsworth, Sr., Port Alsworth Public Meeting, 02/21/2011

3. Public safety for our local and non-local folks who get out to the far reaches of our beautiful area to hunt, fish, and simply look at, and take in, the beauty of our region will be improved with this better connectivity, by putting in cellular coverage.

   -- Clark, BBAHC, Email, 03/07/2011

Summary Response:

Positive benefits to safety addressed in Section 4.4.1.

SOC 2: This technology is critical for improved health care, educational programs, economic development.

Comment(s):

1. This technology is critical for the health & welfare of people here. This is very important for students and educators. Improvement of medical services is on our minds now.

   -- Clark, BBHC, Dillingham Public Meeting, 02/16/2011

2. BBAHC provides health care services in some of the most remote and geographically challenging places in the nation. BBAHC continues to expand usage of the latest telemedicine technologies including digital imaging and high-definition video conferencing. This development will allow us to make improved distance diagnosis and treatment, utilizing our local Community Health Aides and Behavioral Health Aides, especially important when inclement weather delays travel and possible medevac.

   -- Clark, BBAHC, Email, 03/07/2011

3. The availability of robust, reliable communication network is critical for our continued usage of these technologies. Our current reliance on satellite communications with limited bandwidth, high costs and high latency hinders our ability to deploy advanced applications and improve services for our villages.

   -- Clark, BBAHC, Email, 03/07/2011

4. This project will have a numerous positive impact on the Alaska Native communities that it will serve. Among the benefits ....to 65 villages; dependable high speed connectivity to hospitals and clinics, including HDTV video teleconferencing for improved patient care; distance education opportunities expanded education in remote communities via video conference; access to on-line resources for students and teachers; post-secondary education and training resources; new economic opportunity and job opportunities; better connectivity for public safety; and improved cellular coverage in emergencies from GCI-UUI towers.

   -- Young, Alaska Representative, Email, 03/08/2011

5. This fiber optic and microwave network will bring high speed and low latency broadband internet to our region and have many benefits, ranging from improved health care and education, to many improvements in local administration, savings from reduced travel costs and opportunities for economic development and job creation. Terra-SW is a historic project and has great importance for our health corporation and our region, both of which face many challenges from our remoteness and poor economy.

   -- Peltola, YKHC, Email, 02/28/2011

6. This will enable new economic opportunities, better health delivery, and distance education for our shareholders who live in a remote area of the state with limited access. This Terra-SW Telecommunication project is necessary for the survival and development of even the very basic business economy of our region. Having basic

and dependable communications is needed for both life safety and socio-economic benefits for the people living and working in Southwest Alaska.

-- Guy, Calista Corporation, Email, 02/28/2011

7. As a for profit business in the southwest Alaska region, we know how that broadband connections are vitally necessary for increased economic development. Our shareholders and our subsidiaries would greatly benefit from the completion of this first ever-terrestrial telecommunications network in the region. We also agree that TERAA-SW has tremendous socio-economic benefits that would last for years to come.

   -- Calaway, Choggiung, Email, 03/01/2011

8. The TERRA-SW Project will bring much needed broadband to our region and enable new economic opportunities, better health care delivery and distance education for our shareholders

   -- Metrokin, BBNC, Email, 02/28/2011

9. Broadband availability and a terrestrial telecommunications network will greatly improve the economy, income, health, education and overall well-being of the people in southwest Alaska. The conclusion of "positive effects of moderate intensity" seriously underestimates the potential positive socioeconomic impact of this project

   -- Metrokin, BBNC, Email, 02/28/2011

10. Terrestrial broadband service is vital for education in rural Alaska. In schools throughout the country, students use broadband access to the Internet to augment their textbooks, enrich this classroom experience, and access additional learning opportunities. Currently in rural Alaska, terrestrial Internet represents a digital divide for my students. Not only are they disadvantaged by their remoteness and lack of specialized education resources in their schools, but that is compounded by the lack of appropriated broadband infrastructure. Equal access to education is a civil right of our children and in rural Alaska that lack of adequate terrestrial broadband prohibits that equality. With broadband technology, our students and teachers will have the shackles of distance removed from the classroom. Students will have access to distant resources and interactive technology and teachers will have access to the broader education community and resources to enhance their curriculum. Alaska's ability to provide rural schools with a full range of courses and with access to highly qualified teachers is dependent on its broadband infrastructure.

    -- Metrokin, BBNC, Email, 02/28/2011

11. TERRA-SW will dramatically expand communications opportunities for residents; improve crucial telemedicine; distance learning; and public safety services; support private/public economic development efforts; and enhance the operations of government, tribal, and non-profit entities. Terrestrial broadband service will allow rural businesses to participate in the global economy, encourage the development of small to mid-sized and home based businesses, and enable large businesses outside the Region to tap talent within the Region.

    -- Russell, UUI, Email, 03/08/2011

12. The TERRA-SW project will provide a reliable terrestrial broadband network that will allow us to provide power more effectively and efficiently in the future. In addition to broadband for our business, TERRA-SW will bring much needed economic opportunity to our villages by connecting them to the global economy.

    -- Kohler, AVEC, Email, 03/08/2011

13. All but one of the 65 communities to be served by TERRA-SW are federally recognized Indian tribes, and the Federal Communications Commission has classified the entire Region as tribal lands for purposes of federal telecommunications policy-making. As evidenced by the EA Comments received from Yukon-Kuskokwim Health Corporation and the Bristol Bay Health Corporation, tribal consortiums that represent the 64 tribes to be served by TERRA-SW, tribal support for the terrestrial broadband is virtually continuous.

    -- Russell, UUI, Email, 03/08/2011

Summary Response:

Positive benefits to health, education, and local government are addressed in Section 4.4.1 of the EA. Additional language inserted to recognize the public comments on this point.

SOC 3: Poor broadband service slows education, health, business, and personal activities as well as hinders economic development opportunity.

Comment(s):

1. We are so limited by bandwidth. I don’t think you can even comprehend (2 KB). Togiak has quicker service than us.

   -- Public Commenter, Dillingham Public Meeting, 02/16/2011

2. The TERRA-SW project will bring the first ever terrestrial broadband network to 65 communities in Southwest Alaska and end our dependence on unreliable and limited satellite connectivity. Broadband in rural Alaska is critical to the economic future of our communities. Without broadband our communities will not enjoy the education, health and economic benefits that broadband provides.

   -- Hoffman, SW Legislators, Email, 02/24/2011

3. Currently I am a subscriber to satellite internet and although adequate for me it would probably not be sufficient for businesses and is probably not affordable for everyone.

   -- Sands, Email, 02/17/2011

4. As the scope of these services grows the liabilities of satellite delivery have become apparent. It is not just the expense and limitations of the bandwidth, but the inherent latency in the delivery. The newest communications protocols being designed and implemented assume low latency, high bandwidth terrestrial service. As more and more services, both private and Government, move to internet as their primary, or sometimes only, means of communication, and as low latency broadband drives the design of those services, it will isolate to an increasing degree anyone without terrestrial based broadband access.

   -- Himschoot, Letter, 02/16/2011

5. As more and more services, both private and Government, move to internet as their primary, or sometimes only, means of communication, and as low latency broadband drives the design of those services, it will isolate to an increasing degree anyone without terrestrial based broadband access. The technologies that should enable rural Alaska will instead become another source of isolation.

   -- Himschoot, Letter, 02/16/2011

6. The latency inherent in satellite service substantially limits the usefulness of the service in providing next-generation Internet, computer, telemedicine, distance learning, emergency response, and commercial applications.

   -- Russell, UUI, Email, 03/08/2011

Summary Response:

Comment addressed in Section 4.4.1 of the EA.

SOC 4: The installation of permanent communication sites will provide more economic benefit to the state than sport fishing businesses that largely benefit out-of-state residents.

Comment(s):

1. I would ask which is more of an environmental liability: A: to permit a temporary base camp for motorboat sport fishing, operated to make as high a profit margin as possible by someone with limited resources, with the total commitment defined by the duration of the salmon runs, with every bit of infrastructure designed to be packed up and skirted away. Not to mention the fuel necessary to run a camp like that and the human waste in all its forms. Or B: with a completely engineered and stamped permanent sites, maintained by a corporation with a long history of operations in rural Alaska, and a huge investment in rural Alaska. There may also be distinction made that these temporary permits are a more traditional use of the Refuge. Maybe so, but to who's benefit?

   -- Himschoot, Letter, 02/16/2011

2. From my experience in the peripheries of the Sports Fishing business I know a large number of these businesses are owned by out of state entities or people. I know a large number of the guides employed do not reside in Alaska, and that most of the clientele is not from Alaska. I don't argue that most of these camps do add to the economy of the area, but by and large the money they make leaves the state, and the services they provide are for the benefit of out of state residents as well.

   -- Himschoot, Letter, 02/16/2011

Summary Response:

Comment Acknowledged. Benefits of the proposed project are noted in Section 4.4.1; however, the residence of business owners has not been taken into account as a factor in the analysis.

SOC 5: Installing towers in remote areas would have a negative financial impact on wilderness adventure and ecotourism businesses which benefit the economy.

Comment(s):

1. If the structures are approved we will have to discontinue our use of the area [Cone Mountain], our clientele would never agree to come on a wilderness adventure in remote Alaska and camp near a large communication structure, it would defeat the purpose. Discontinuing these trips would have a very negative financial impact on my business.

   -- Renfro, Renfro's Alaska Adventures, Email, 02/23/2011

2. Our [Royal Coachman Lodge] clients come every year to our lodge to fish this pristine area [Kulukak]. It is one of the major reasons our guests come to fish with us.

   -- Vermillion, Royal Coachman Lodge, Email, 02/23/2011

3. This tower would adversely affect my business as my clients pay a premium to visit unspoiled portions of Alaska.

   -- Williams, Email, 02/26/2011

4. The impact of the increased air traffic to the area [Kulukak] during the set up and annual maintenance will also have an impact from a client's perspective.

   -- Vermillion, Royal Coachman Lodge, Email, 02/23/2011

5. For the past 6 years we have spent a few weeks each fall in this area and enjoying the pristine wilderness filming and sharing our Alaskan Wilderness adventures with millions of viewers across North America and overseas. It is important to everyone to try and keep these areas as natural as possible, please understand we are not activists that put no dollars back into the local economy or government departments. We are sportsmen and women and we purchase hunting licenses, special permits and when we purchase our archery, shooting and hunting equipment we also pay the 11% Pittman Robertson Federal Excise Tax.

   -- Ciancianulo, Archer's Choice TV Show, Email, 02/25/2011

6. If you take away the scenic pristine wilderness experience not only will you lose the sporting community but your ECO tourism searching for the last wilderness breathtaking adventure will go elsewhere too.

   -- Ciancianulo, Archer's Choice TV Show, Email, 02/25/2011

Summary Response:

Section 4.4.1.2 updated to include direct impacts of construction and operational phases.

SOC 6: The benefit to communities outweighs the small impacts to the federal lands.

Comment(s):

1. Although there will be a very small footprint in the Togiak National Wildlife Refuge (TNWR) I do not believe that the impacts of these stations would be that detrimental to TNWR and the benefits to the communities of Southwest Alaska far outweigh the minor to negligible impacts.

   -- Sands, Email, 02/17/2011

2. The visual, noise, and other related impacts of the proposed mountaintop repeaters is extremely minor compared to the projects potential to save lives, create jobs, provide health services and improve education.

   -- Clark, BBAHC, Email, 03/07/2011

3. The noise and visual impacts of this project are minor in comparison to the Togiak National Wildlife Refuge visual impacts (4.7 million acres) and considerable BLM land in our region that is available without noise and visual disturbance. The benefits of this project far outweigh the minimal impact small mountaintop repeaters will have on the view and noise in the areas around these sites. The EA clearly shows the noise and visual disturbance of this project are minimal and will not interfere with traditional or recreational uses.

   -- Metrokin, BBNC, Email, 02/28/2011

Summary Response:

NEPA requires the full consideration of both positive and adverse impacts from a proposed project.

18. Subsistence

SUB 1: Would the lakebed cable interfere with subsistence fishing?

Comment(s):

1. Would the cable, once it’s installed, interfere with fishing?

   -- Public Commenter, Nondalton Public Meeting, 02/21/2011

2. Will fishing gear be affected by the submarine cable?

   -- Public Commenter, Togiak Public Meeting, 02/28/2011

Summary Response:

Additional language added to Section 2.2.2 concerning design and installation of the lake-bed cable. Additional language inserted in Section 4.4.2 to clarify that the lake-bed cable will not affect subsistence fishing.

SUB 2: The EA's review of potential subsistence impacts was thorough.

Comment(s):

1. BBNC appreciates the thorough review of any potential subsistence impacts of the project and agrees with the EA's conclusion that this project does not have the potential to significantly restrict subsistence users.

   -- Metrokin, BBNC, Email, 02/28/2011

Summary Response:

Comment Acknowledged.

19. Vegetation

VEG 1: Prevent introduction of invasive species.

Comment(s):

1. We would also urge additional emphasis on preventing the introduction of invasive weeds. We recommend contractors be required to clean any equipment coming in from outside the immediate area by removing any mud or debris that may contain nonnative seeds. Additionally, mud, dirt, and plant material should also be removed from footwear and clothing prior to traveling to the remote sites.

   -- Blair, NPCA, Email, 03/08/2011

2. Construction workers will need to have cleaned their personal items, like boots, luggage or backpacks etc. Invasive seeds are carried on such items and will grow in the area

   -- Robinette, Email, 03/09/2011

3. Cleaning of helicopters should seriously be taken into account....because of wind we must not forget that a hitchhiking seed has the potential to be blown downwind from the helipads. Invasive plants are becoming more and more successful in Alaska and many seeds that last for 80 years until the conditions are right for germination.

   -- Robinette, Email, 03/09/2011

Summary Response:

Comments are addressed in Section 4.3.1.2. Section revised to add invasive species management and monitoring plan for the project that would be developed in consultation with FWS and BLM.

VEG 2: Monitoring the introduction of invasive species throughout the life of the project?

Comment(s):

1. How many years will this [managers] be monitoring the area? Many of our most invasive plants’ seed viability are seven years.

   -- Robinette, Email, 03/09/2011

Summary Response:

Comment is addressed in Section 4.3.1.2. Section revised to require that the duration of monitoring be included in the project specific management and monitoring plan for invasive species would be included in the Invasive Species Management and Monitoring Plan.

20. Visual Impacts

VIS 1: Installing cell towers in pristine areas would impair the visual characteristics and harm the experience for the majority of users.

Comment(s):

1. We [Renfro's Alaskan Adventures] conduct hunts in this area [Cone Mountain] every year and have attached a portion of a map submitted in January 2009 when we

renewed our 5 year permit (the yellow X indicates camps we use). Looking at the map you will notice Cone Mountain is in the middle of several of the areas we use. There is no doubt that putting a large man made structure for everyone to see would definitely change the experience for the majority of the users.

-- Renfro, Renfro's Alaska Adventures, Email, 02/23/2011

2. Please reconsider the placement of the Cone Mountain Communications Tower to another area. This area is known to me and it's a pristine wild area. The placement of that tower would spoil the region in my humble opinion.

   -- Lietzau, Email, 02/24/2011

3. That is what we all dream about when we dream of visiting the Alaskan wilderness, the pristine wilderness, the adventure. [Communications] towers, pipelines, and all permanent structures like that ruin those dreams and take away that allure. A big tower in the distance just ruins the whole picture.

   -- Rawlake, Email, 02/24/2011

4. To leave your neighborhood and have the opportunity to feel like you are in an area that may have never been visited by another is priceless. Trust me, I would not have been here this long if it were not so beautiful. I have visited the area of the proposed communication tower [Cone Mountain] and will always remember it as God's country. That would and will not be so if there is a huge manmade eye sore in its location.

   -- Huckert, Email, 02/23/2011

5. I certainly have serious concerns about the visual impact of the tower [Kulukak]. Although putting up a tower has a small impact on such a large area, the value of fishing or hunting an area void of signs of humanity is only becoming more rare and valuable.

   -- Vermillion, Royal Coachman Lodge, Email, 02/23/2011

6. I would like to document my disgust with the proposal of the placement of said tower at Cone Mountain. I have been hunting the surrounding area since 2004-2010 and plan to return this year. The environmental impact and the compromise of aesthetics [are] appalling.

   -- Ferguson, Email, 02/24/2011

7. This is truly a wilderness area and would no longer have that sense of natural, pure beautiful scenery in this remote area if the tower is placed there. I appreciate your help to maintain this area in a natural state for many generations to come.

   -- Sparks, Email, 02/24/2011

8. A tower constructed at Kulukak will be an unacceptable infringement upon the view-scape of the Kulukak river corridor used by subsistence users, by sport fishermen and women, by sport hunters, by guided groups and by unguided adventure recreationists. Based upon my experiences floating the Kulukak River the tower would be visible for 4 days of a 7-day float trip.

   -- Rutherford, Email, 03/02/2011

Summary Response:

Comment was addressed in Section 4.4.8. Language was added to clarify expected changes based on the degree of structure visible in the landscape. The environmental effect rating was changed to acknowledge direct impacts of medium intensity. As a result of this change, the overall effect of the proposed project to visual resources was changed to moderate.

VIS 2: Inadequate methods for visual modeling used.

Comment(s):

1. The photos put in the Environmental Assessment description of the Kulukak Mountain Site Plan Figure 2-6 are misleading. The photo is directed straight down the mountain instead of horizontally outward which would show the vista and the exposure to the broad expanse of the exposed Kulukak Valley. The photo taken towards the Kanik River Valley was taken from a position pointing the camera at the ridge in front of them on a day with low clouds instead of being taken realistically from the ridge showing the actual dramatic sight exposure to the broad and gentle Kanik River Valley below.

   -- Johns, Email, 03/07/2011

2. In the EA they photo shopped in a "pretend" view of the microwave repeater towers. These make believe views are very misleading in trying to make the reader assume little visual impact to the ridgeline in order to substantiate their written report and low impact conclusions. In reality the visual impact of the repeater tower and facilities would be highly significant and grotesquely obvious from the Kulukak Bay, Kulukak River valley and the Kanik River valley.

   -- Johns, Email, 03/07/2011

Summary Response:

An effort was made to obtain photographs during typical conditions, and from common perspectives. Views from the air are intended to demonstrate the view experienced by recreational visitors as they travel toward remote destinations. Photo simulations were accurately georeferenced, and structures were rendered per project specifications.

VIS 3: The towers' placement is not consistent with the TNWR's visual resource management goals

Comment(s):

1. With a footprint of 80 feet horizontally and 60feet vertically upon the ridge, the obvious visual impact no matter what color you paint it is going to be considered high contrast and strong visual impact. A high contrast and strong visual impact is not consistent with the visual resource management goals of the Togiak National Wildlife Refuge.

   -- Johns, Email, 03/07/2011

Summary Response:

The action was analyzed from common viewer located situated at distances of >3 miles. Based on the simulations of the proposed structures, contrast was determined to be weak. Despite the

60ft tower height, the type of landscape panoramic and scale of the landscape increases in ability to absorb visual contrast. The effects rating was changed to moderate to include direct effects that may result from introduction of structures to a landscape that is otherwise largely free of cultural modifications.

21. Wildlife

WLF 1: Microwave towers and lights could cause bird strikes and other impacts to wildlife.

Comment(s):

1. Can you clarify that there are no lights? 60 feet is not high, but people have flown into towers. Is it blinking?

   -- Public Commenter, Dillingham Public Meeting, 02/16/2011

2. Introduction of a communications tower in [Cone Mountain] is ridiculous when confronted with the impact of such a thing on the wildlife and low impact users common to this area.

   -- Shrum, Email, 02/24/2011

Summary Response:

Comment addressed in Section 4.3.3.2. The planned towers will not be lighted. Impacts to wildlife, and subsistence and recreational users of the affected lands will be minimized through the implementation of site-specific mitigation and monitoring plans.

WLF 2: Could benthic feeders be impacted by marine cables?

Comment(s):

1. Every year gray whales go through Togiak Bay and Togiak Islands. They’re both benthic feeders. Would a benthic cable impact marine mammals? Would they basically scrape the cable when they feed?

   -- Sands, Dillingham Public Meeting, 02/16/2011

2. My main concern has to do with gray whales and Pacific walrus. These large marine mammals feed on the bottom in the area that is proposed for the marine cable. It is my understanding that the proposed marine cable would be laid on the surface of the ocean floor and it two cables will pass just outside of the three mile protected area of Round Island.

   -- Sands, Email, 02/17/2011

3. Are two cables that are laid on the seabed surface going to bury themselves deeply enough to be out of the way of walrus feeding? While it is a big ocean the proximity of these two proposed cables to a major walrus haulout and sanctuary seems risky. Whether the walrus would be hurt or whether the proposed cables would be damaged I don't know, but with a viable alternative the potential for bad interaction with walrus concerns me.

   -- Sands, Email, 02/17/2011

4. I have personally observed several hundred gray whales at one time feeding in the area proposed to be transected by the cables in Alternative 3. The gray whales migrate through this area every spring in significant numbers.... I think more consideration needs to be given to the possible impacts that might be created by these proposed cables.

   -- Sands, Email, 02/17/2011

5. Will there be any impact on marine mammals or fish from the submarine cable?

   -- Public Commenter, Togiak Public Meeting, 02/28/2011

Summary Response:

Comment addressed in Section 4.3.4.3. The risk of harming benthic feeding gray whales is low. There has not been a single documented case of whale entanglement leading to injury or death since 1959 due to advancements in submarine cable design (Carter et al., 2009). The risk of harming benthic feeding gray whales or Pacific walrus is low due to the size, weight, and armoring of the proposed submarine cable.

WLF 3: Helicopter traffic during construction and annual maintenance will be extremely damaging to seabird, waterfowl, and brown bears.

Comment(s):

1. This support will be done with a minimum EA projected two hundred eighty two (282) helicopter flights and a minimum of sixteen (16) helicopter support and refueling flights annually. This will create a violent intrusion into the biological system of the TNWR. This will have detrimental effects on the TNWR areas numerous seabird colonies and the waterfowl breeding, resting and feeding areas. There is nothing that instills a greater and more violent fear reaction in wildlife than the loud roar of and the “thumping” vibration sound of a helicopter. This project will fearfully impact the brown bear population and their traditional use of the Kanik River and Kulukak River drainages. The project will completely destroy the areas natural habits of the brown bears and their feeding and cub rearing areas with ongoing systematic helicopter use.

   -- Johns, Email, 03/07/2011

2. It should be mandatory to put people in the field to do a real Environmental Assessment and video the reactions of the seabirds, waterfowl, shorebirds, swans, hawks, falcons, eagles, bears. I have sadly sat on tundra vantage points and observed the disruption of the environment and wildlife due to the noise inducing fear caused by a helicopter flight through a pristine area. Many times I have observed the drastic difference between wildlife’s unconcerned reaction to the noise of fixed wing aircraft versus the desperation, fear and flight reaction of the same wildlife from the noise of a helicopter.

   -- Johns, Email, 03/07/2011

Summary Response:

Comment addressed in mitigation measure to apply seasonal refueling windows that would minimize potential impacts to wildlife. Impacts to wildlife will be minimized through the implementation of site-specific mitigation and monitoring plans. Helicopter overflights will be temporary in nature. In addition the 282 estimated helicopter overflights will be dispersed over multiple flight paths and the aircraft would be required to fly at relatively high altitudes (1,500 feet) which would lessen the magnitude of sound at ground level. Fixed wing aircraft may cause less disturbance to wildlife; however, they are not a viable option for this project.

WLF 4: Construction of telecommunication towers would most likely destroy the integrity of ecosystems and dramatically alter wildlife habitats.

Comment(s):

1. I have collected abundant scientific data demonstrating that the ecosystems within the TNWR have evolved without major human disturbance over the past ~15,000 years. Construction of telecommunication towers would most likely destroy the integrity of these ancient ecosystems and dramatically alter wildlife habitats, which can have devastating cascading effects.

   -- Hu, Email, 03/05/2011

Summary Response:

Comment acknowledged. Ecosystem impacts will be minimized through the implementation of site-specific mitigation and monitoring plans.

WLF 5: Impacts to wildlife are not adequate due to lack of field data.

Comment(s):

1. The EA does not seem to accurately estimate the impacts to wildlife because no relevant field data from the wildlife refuge was cited to support Alternative 2. . . . Field data is required about brown bear den locations, raptor nests, caribou calving areas, herring spawning, distribution and abundance of waterfowl and the location of Kittlitz's Murrelet, (a species of concern) nesting areas in relation to the proposed towers.

   -- Rutherford, Email, 03/02/2011-- Sory, Email, 03/04/2011
   -- Speer, Email, 03/03/2011
   -- Grant, Tikchik Airventures, Email, 03/07/2011

Summary Response:

Existing survey data is substantial and limited field studies were conducted in preparation for this EA. This provided a sufficient basis for the analysis within this EA based on the limited scope of this activity. Raptors that occur in the project area are described in Section 3.3.5, Birds. The herring fishery is addressed in Section 3.3.4.3.

APPENDIX D

US Fish and Wildlife Service Determinations, Findings, and Comprehensive Conservation Plan Amendment

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US Fish and Wildlife Service Determinations, Findings, and Comprehensive Conservation Plan Amendment

The Fish and Wildlife Service is required to make a variety of determinations, findings, authorizations and a Comprehensive Conservation Plan amendment before the proposed action could be implemented. Following public comment on this environmental assessment, the FWS will make a finding as to whether there is a significant impact likely to result from the proposed action. If a significant impact is likely, and environmental impact statement would be required before a final decision could be made.

In addition to a decision finding on this environmental assessment, 43 CFR 36.7 states:

(2) Each appropriate Federal agency in making its decision shall consider and make detailed findings supported by substantial evidence as to the portion of the TUS within that agency's jurisdiction, with respect to:

- *(i) The need for and economic feasibility of the TUS;*
- *(ii) Alternative routes and modes of access, including a determination with respect to whether there is any economically feasible and prudent alternative to routing he system through or within an area and, if not, whether there are alternative routes or modes which would result in fewer or less severe adverse impacts upon the area;*
- *(iii) The feasibility and impacts of including different TUSs in the same area;*
- *(iv) Short and long term social, economic and environmental impacts of national, State or local significance, including impacts on fish and wildlife and their habitat and on rural, traditional lifestyles;*
- *(v) The impacts, if any, on the national security interests of the United States, that may result from approval or denial of the application for the TUS;*
- *(vi) Any impacts that would affect the purposes for which the Federal Unit or area concerned was established;*
- *(vii) Measures which should be instituted to avoid or minimize negative impacts;*
- *(viii) The short and long term public values which may be adversely affected by approval of the TUS versus the short and long term public benefits which may accrue from such approval; and*
- *(ix) Impacts, if any on subsistence uses.*

Some of these findings would be incorporated into other determinations such as the compatibility determination (refuge purposes), and ANILCA 810 evaluation (impacts to subsistence uses). Other topics will be included in the decision document for this environmental assessment.

If there is a Finding of No Significant Impact on this EA and, based on other findings, the proposed action is chosen for implementation, an amendment to the Togiak NWR Comprehensive Conservation Plan will prepared concurrently with the final decision. This amendment would reclassify small areas of the refuge from minimal management to intensive management accommodate the project. Other activities otherwise allowed in intensive management would not be allowed within these areas.

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APPENDIX E

Executive Summary of Economically Feasible and Prudent Alternative, Evaluation of Alternatives to United Utilities, Inc. TERRA-SW Project, Final Report. February 21, 2011.

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Economically Feasible and Prudent Alternative
Evaluation of Alternatives

To

United Utilities, Inc. TERRA-SW Project

FINAL REPORT

DRG-UUI20110210-01

February 21, 2011

Prepared for

U.S. Fish and Wildlife Services

Anchorage, AK

by

DavidROSSGroup

Table of Contents

EXECUTIVE SUMMARY

The David Ross Group, Inc. (DRG) was contracted by United Utilities, Inc. (UUI) of Alaska to perform a feasibility study for the U.S. Fish & Wildlife Service (FWS) to determine whether or not there is an economically feasible and prudent alternative to a section of a proposed project that would locate microwave towers in the Togiak Wildlife Refuge pursuant to Title XI of the Alaska National Interest Lands Conservation Act. The proposed project would replace existing satellite service that currently provides telecommunication connectivity to a local network that serves the Bristol Bay and Yukon-Kuskokwim Regions of Southwest Alaska. The project, Terra-SW, would upgrade telecommunication service to these regions by delivering terrestrial broadband service through extension of the telecommunications backbone from Anchorage.

Four Submarine Cable System Alternatives (Alternatives) were developed and analyzed as options to replace the proposed microwave towers within the Togiak Wildlife Refuge. The Alternatives were developed using input provided by UUI, FWS, and Requests for Quotes from credible suppliers, and then evaluated on Technical Performance, Implementation Schedule, and Price/Financial Performance. All four developed alternatives meet the required Technical Performance Criteria. The required Implementation Schedule(s) for each system is very aggressive and will require a near term decision on the Project implementation, and immediate execution of Program Initiation tasks such as Proposals, Permitting, and Contracting in order to meet the RUS Grant and Loan requirements. Financial Performance of each submarine cable alternative was evaluated utilizing a business case that replicated UUI's business case to RUS and was based on information supplied by UUI that included revenue assumptions, revenue projections and commercial loan rates and terms. The results of that analysis demonstrates that none of the submarine cable alternatives meet the minimum financial criteria of Internal Return on Revenue, Payback Period, and Net Present Value of the System over the 12 year projection horizon.

INTRODUCTION

The David Ross Group, Inc. (DRG) was contracted by United Utilities, Inc. (UUI) of Alaska to perform a feasibility study for the U.S. Fish & Wildlife Service (FWS) to determine whether or not there is an economically feasible and prudent alternative to a section of a proposed project that would locate microwave towers in the Togiak Wildlife Refuge pursuant to Title XI of the Alaska National Interest Lands Conservation Act. The proposed submarine cable would connect the Alaskan communities of Dillingham (Kanakanak), Togiak, Platinum and Quinhagak and would be part of a larger telecommunications project by UUI called TERRA-SW, to replace the current satellite connectivity for southwest Alaska with a hybrid microwave and fiber optic cable backbone extending from Anchorage. As a result, DRG has evaluated four submarine cable alternatives which eliminate the microwave towers in the Togiak National Wildlife Refuge, to determine which alternative is best and whether or not an undersea system alternative is economically feasible and prudent. This report is a summarized version of a comprehensive Appendix 1.0, DRG_UUI20110113-01, "Terra-SW Alternatives Feasibility Study Project Report", which in turn is supported by a series of 2nd level Appendices A through K.

EVALUATION METHODOLOGY

To perform the feasibility study, the four alternatives were designed to meet specific system requirements and developed to a point so that the technical performance and costs could be adequately understood. The designs for the four alternatives allowed cost estimates to be made for both the initial capital expense and the expected operating expenses over a 25-year time horizon. To support the cost estimates, DRG developed RFQs which were sent to various suppliers, and then analyzed the responses. The designs and cost estimates for the four alternatives then allowed for an evaluation from both technical and commercial standpoints using a set of evaluation criteria agreed upon by FWS, UUI, and DRG. As part of the commercial analysis, a business case was constructed using the revenue projections provided by UUI. During the whole process of performing the feasibility study, there was extensive exchange of information between DRG, UUI and FWS.

CONSIDERED ALTERNATIVES

The four considered alternatives are as shown and described below. Each alternative was designed to meet the following requirements:

1. Minimum initial capacity of 2.5 Gb, upgradeable to a minimum of 10 Gbps
2. System availability of at least 99.98% assuming a four-hour window for repair
3. End-point and mid-point connectivity
4. Interoperability with planned local services
5. Ability to restore capacity in the event of a single undersea fault
6. Design life of 25 years

Alternative B.1 is a festoon architecture, with single cable landings at the endpoints of Kanakanak and Quinhagak, and dual cable landings at the midpoints of Togiak and Platinum. Each cable segment is equipped with 2 fiber pairs. The Route Map and undersea cable connectivity diagram (Segment lengths shown in km) for Alternative B.1 are shown in Figures 1 and 2 respectively.

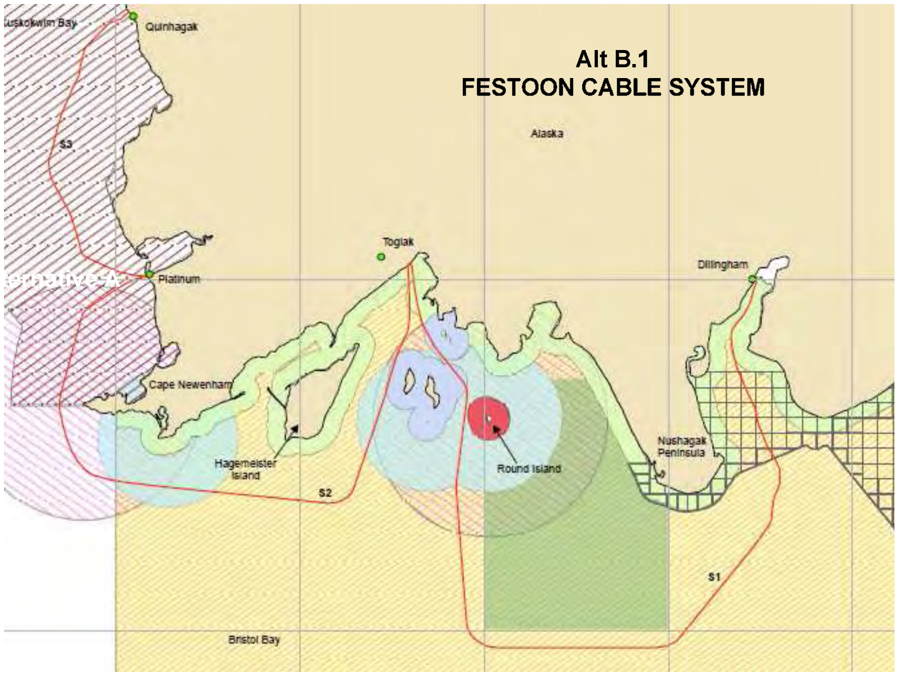


Figure 1: Alternative B.1 - Route Map

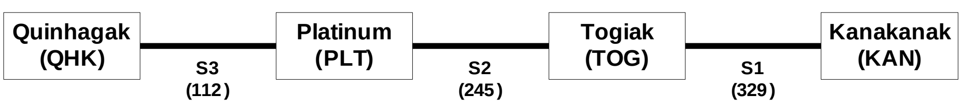


Figure 2: Alternative B.1 – Undersea Cable Connectivity Diagram

Alternative B.2 is a passive branching unit architecture, with a single cable landing at each of the four communities. Each cable segment is equipped with 2 fiber pairs. The Route Map and undersea cable connectivity diagram (Segment lengths shown in km) for Alternative B.2 are shown in Figures 3 and 4 respectively.

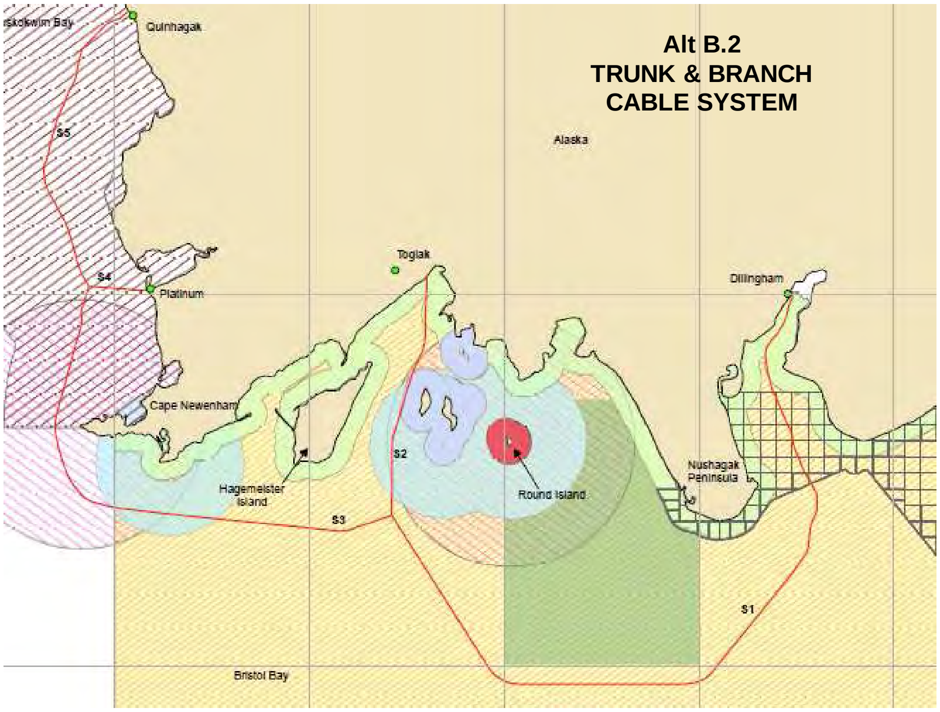


Figure 3: Alternative B.2 - Route Map

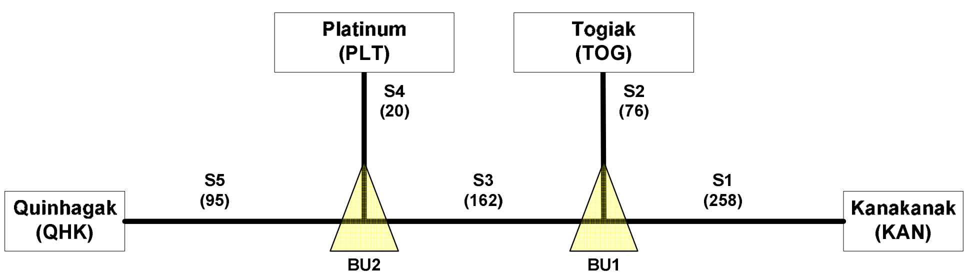


Figure 4: Alternative B.2 - Undersea Cable Connectivity Diagram

Alternative C.1 is similar to that of Alternative B.1 in that they are both festoon architectures. The difference, however, is that Alternative C.1 is a redundant festoon architecture, with an additional cable to support an architecture that provides redundancy in the event of a single undersea fault anywhere on the system. Alternative C.1 has dual cable landings at each of the four communities. Each cable segment is equipped with 2 fiber pairs. The Route Map and undersea cable connectivity diagram (Segment lengths shown in km) for Alternative C.1 are shown in Figures 5 and 6 respectively.

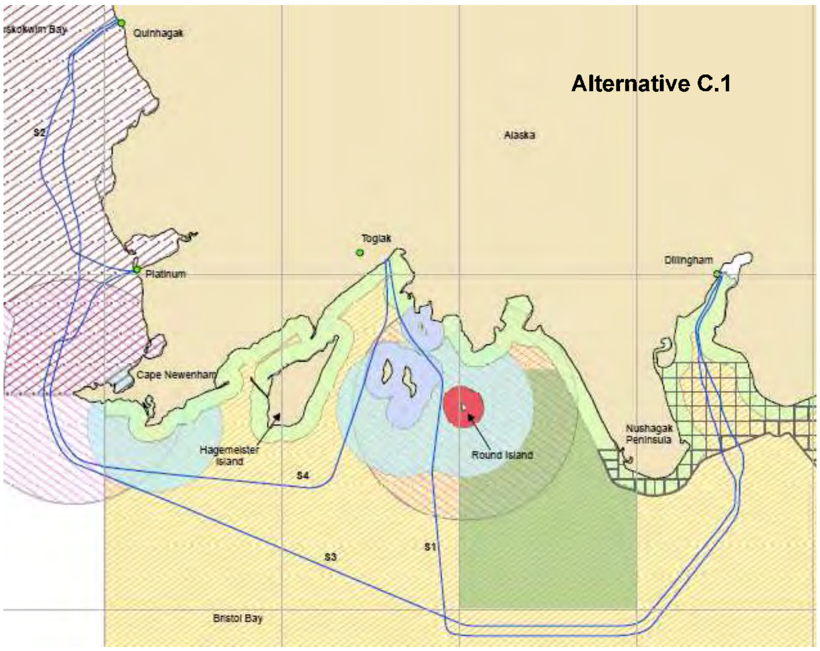


Figure 5: Alternative C.1 - Route Map

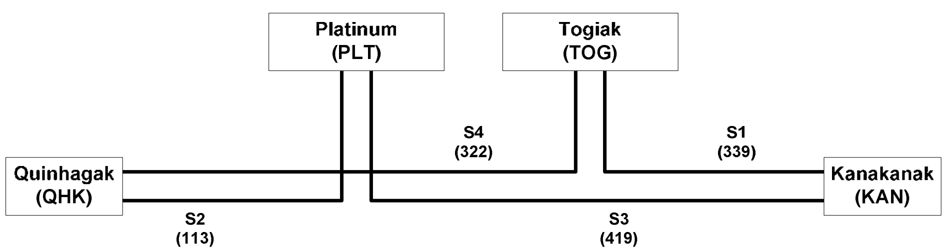


Figure 6: Alternative C.1 - Undersea Cable Connectivity Diagram

Alternative C.2 is similar to that of Alternative B.2 in that they are both trunk and branch architectures. The difference, however, is that Alternative C.2 is comprised of redundant trunk and branch systems. If there is a single undersea fault in either one of the cables systems, the other cable system will provide redundancy. Cable segments 1, 3, 4 and 6 are equipped with 2 fiber pairs while the branch cable segments 2 and 5 are equipped with 4 fiber pairs. The Route Map and undersea cable connectivity diagram (Segment lengths shown in km) for Alternative C.2 are shown in Figures 7 and 8 respectively.

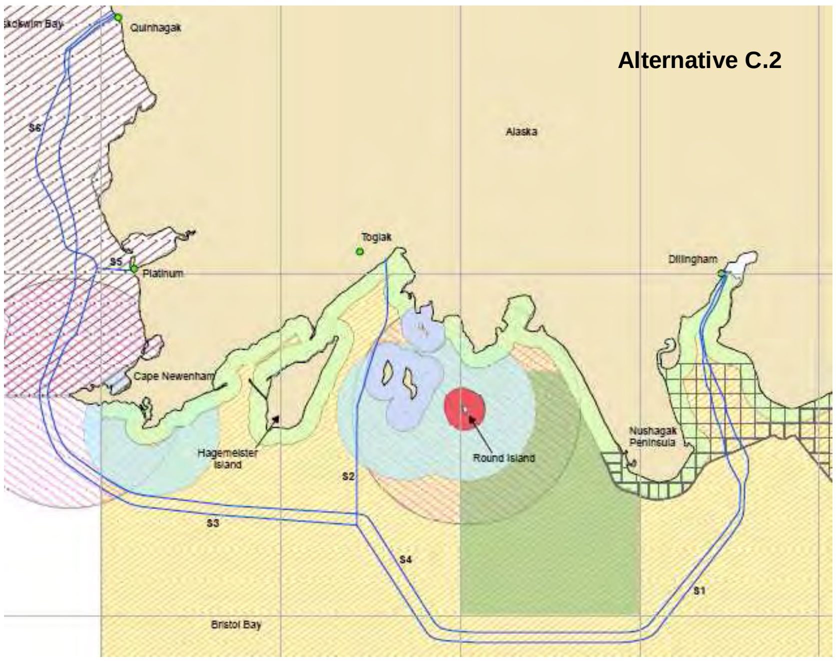


Figure 7: Alternative C.2 - Route Map

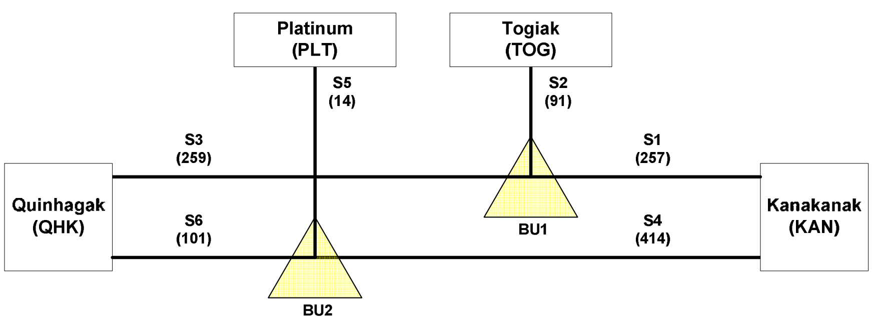


Figure 8: Alternative C.2 - Undersea Cable Connectivity Diagram

Since Alternatives B.1 and B.2 are not redundant, a single fault in the submarine cable system will isolate one or more communities, depending upon where the break occurs. For example, in alternative B.1, if Segment 1 is cut, all communities west of Dillingham would lose service, and therefore, all four of these communities would require satellite in order to restore service. The amount of bandwidth required would be that needed to support all communities west of Dillingham. In the case of a failure of segment S2 in alternative C.2, only Togiak would be cut off. Similarly, a failure of segment S5 would only cut off Platinum (and Goodnews Bay). The other communities have redundant paths, so they would not be isolated by a single failure. Therefore, only Togiak and Platinum require satellite back-up in alternative C.2, and only for the amount of bandwidth they require. Alternative C.1 is a fully redundant submarine cable architecture using a SONET ring approach. As such, there is at most a 50ms loss of service in the event of a cable failure.

DEVELOPMENT OF ALTERNATIVES

This section will discuss some of the key factors that influenced the design and costing of the alternatives.

Wet Plant Design

As part of this feasibility study, Fugro Pelagos investigated the major factors that would influence the routing and protection of the undersea cable for each alternative. The outcome of the investigation resulted in the specification by Fugro of a route for each alternative, as well as burial and armoring recommendations to ensure the safety of the cable.

The major risks that could potentially affect the cable were identified as ice scouring and the presence of Nearshore Bristol Bay Trawling Area (NBBTA), the only area where trawling is allowed along the routes of any of the four configurations. The risk of the cable being damaged by a trawler has been mitigated by having the routes for all four configurations routed outside of the zone where trawling is permitted. The risk of damage to the cable by ice scouring has been mitigated by the use of double armor cable, burial, and split pipe. Fishing and shipping activities are not expected to pose a significant risk to the cable.

The maximum Digital Line Section (DLS) length between any two of the communities is 440 km for DLS2 (S1+S3+S4) of Alternative B.2. This means that all of the segments can be implemented without repeaters with un-repeatered cable and terminal equipment. This results in a simpler design with significant cost savings compared to a repeatered system.

Dry Plant Design

Terminal equipment has been selected for transmission over the undersea cable that provides an initial 10 Gbps of capacity for each fiber pair of the segments, upgradeable to a minimum of 200 Gbps. This is four times greater than the initial requirement of 2.5 Gbps and will provide sufficient margin for any foreseeable future requirements. An additional bay of equipment will be required in each cable station to provide the SONET equipment to interface with the terrestrial network.

There is enough room in the existing cable stations to install the two additional bays required for undersea transmission and interface to the terrestrial network. Additional battery plant will be required, however, to provide sufficient back-up power for these two additional bays.

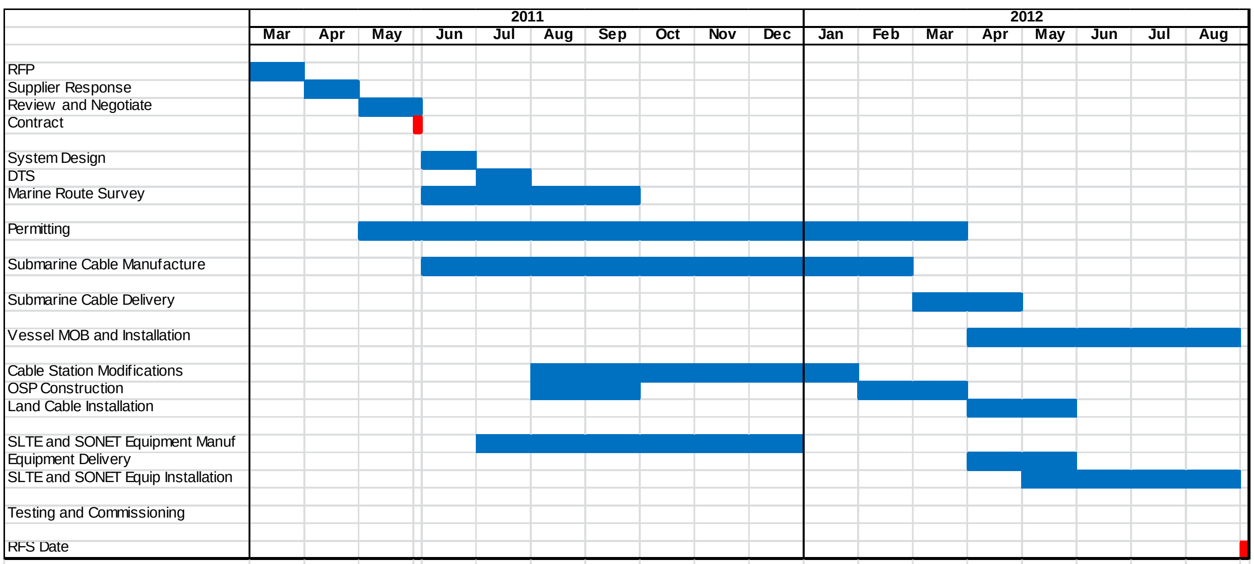
Satellite Restoration

As mentioned above, three out of the four alternative configurations require the use of satellite restoration to meet the system availability requirement in the event of a fault in the undersea cable. Alternatives B.1 and B.2 require satellite restoration at each of the four communities, and Alternative C.2 requires satellite restoration at Togiak and Platinum for branch cable failures. For each of these alternatives the cost of initial satellite equipment purchases and services has been included to provide coverage during a wet plant out-of-service fault.

Implementation

With aggressive program management, all four of the alternatives can be implemented by the required operations date of May 2013 as depicted in Figure 9 below. This assumes that the permitting and procurement start by March 2011. The major factor affecting the schedule will be the marine service weather window from late April to mid to late September, after the ice melts, and before the weather starts to worsen again.

All respondents to marine services, both Marine Survey and Marine Installation indicated that the required services could be performed within the available weather windows.



	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Payment Schedule %				15%	15%		15%			10%		10%	15%		10%		5%	5%
Cumulative Payment %				15%	30%	30%	45%	45%	45%	55%	55%	65%	80%	80%	90%	90%	95%	100%

Figure 9: Implementation and Billing Schedule

There are two main strategies that can be used to approach the implementation. One approach is to use a single "turn-key" contractor who will be responsible for everything. Another approach is for UUI to function as a general contractor (or hire a consultant to assist), procuring the various parts of the project from different companies, and making sure that everything fits together. The general contractor approach results in a less costly system, but there will be more risk in the coordination of independent organizations and suppliers. In addition, the general contractor approach offers the ability to sequence contracting to suppliers in order to prioritize required early start services. The advantage of the turn-key approach is that one company will have a financial incentive to complete the work efficiently and effectively. The disadvantage of the turn-key approach is that UUI will have to pay more to minimize the financial risk, and contracting negotiations will be more complex and difficult.

Operations and Maintenance

The costs for operations and maintenance of the wet plant, dry plant, and satellite equipment required to realize each alternative have been factored into the analysis.

For wet plant maintenance, two repairs to the undersea cable will be required for each alternative over the system lifetime based on historical fault data and analysis of the likely risks. The cost of using a vessel of opportunity to make these repairs at the time of the fault has been factored into the maintenance cost.

For dry plant operations and maintenance, costs associated with staffing a Network Operations Center and the cable stations have been included. In addition, maintenance contracts for the SONET equipment and equipment to interface with the wet plant have also been included.

It should be noted, that once the magnitude of the satellite restoration services were understood, and determined to be prohibitively expensive, efforts were suspended to determine the required Operations and Maintenance costs for Earthstation Equipment.

Pricing

Budgetary quotes were requested from various suppliers for each of the four alternatives for the desktop study, marine survey, turn-key supply of the alternative, and the separate supply of the major parts of the alternative. The quotes were evaluated, and where necessary, interpreted and adjusted to reflect continuing development of the alternative designs utilizing DRG experience from previous projects so that valid comparisons can be made.

A range of prices were obtained for each of the Alternatives from the three turnkey providers and a mixed supplier approach. A summary of the pricing is shown in the table below.

	Turnkey Supplier Pricing				**Comments**
Alternative	**Alter "A"**	**Alter "B"**	**Alter "C"**	**Mixed Pricing***	
B.1	$75.4M	$46.4M	$50.3M	$39.0M	Incl Satellite Earth Station Equipment
B.2	No Bid	$45.5M	No Bid	$37.4M	Incl Satellite Earth Station Equipment
C.1	$92.1M	$46.6M	$54.4M	$35.9M	Satellite Earth Station Equipment is not required.
C.2	$88.3M	$54.2M	No Bid	$37.3M	Incl Satellite Earth Station Equipment

Table 1: Summary of CapEx Pricing for Alternatives

<u>*Mixed Pricing:</u> The mixed pricing consists of pricing obtained from various suppliers (Marine Survey, Environmental Assessment, Cable Manufacture, Installation, Terminal Equipment, etc.) required to provide all of the materials and services to implement the Alternative Submarine Cable System. The Mixed Pricing shown in Table 1 is an aggregation of those prices which would result in a minimum cost for the associated Alternative Submarine Cable System so that a lower limit for the Price could be established for Financial Analysis. This does not constitute a recommendation of these Suppliers by DRG.

The corresponding compilation of NPV CapEx and OpEx (Operations and Maintenance) Pricing is shown in Table 2 below.

	Turnkey Supplier Pricing				Comments
Alternative	**Alter "A"**	**Alter "B"**	**Alter "C"**	**Mixed Pricing***	
B.1	$123.8M	$94.8M	$98.7M	$87.4M	Incl Satellite Earth Station Equipment and Satellite restoration costs.
B.2	No Bid	$93.9M	No Bid	$85.7M	Incl Satellite Earth Station Equipment and Satellite restoration costs.
C.1	$95.6M	$50.2M	$57.9M	$39.4M	Satellite restoration is not required.
C.2	$96.4M	$62.2M	No Bid	$45.4M	Incl Satellite Earth Station Equipment and Satellite restoration costs.

Table 2: Summary of CapEx and OpEx Pricing for Alternatives

As shown in Table 2 above, the addition of Satellite Restoration costs as part of OpEx results in C.1 as the "Best Candidate" Alternative Submarine Cable solution.

Focusing on Alternative C.1, an assessment of the Pricing was conducted consisting of expected negotiation discounts, Impact of Performance Bonding, allocation of Contingency Funds, and possible System Cost savings through reduction of test equipment and management systems and implementation of minimal upgrade capability. Table 3 below provides the pricing adjustments and the expected final pricing.

	Alter "A"	Alter "B"	Alter "C"	Mixed
CapEx	$92,078,974	$46,626,756	$54,362,649	$35,882,408
Anticipated Negotiating Dis	30%	15%	20%	10%
Negotiation Target	$64,455,282	$39,632,743	$43,490,119	$32,294,167
Performance Bonding %	0.50%	0.50%	0.50%	1.50%
Performance Bonding Adj	$644,553	$396,327	$434,901	$968,825
Contingencies	$2,800,970	$2,800,970	$2,800,970	$3,800,970
SubTotal	$67,900,805	$42,830,040	$46,725,990	$37,063,962
Potential Cost Savings	($1,402,000)	($1,402,000)	($1,402,000)	($1,402,000)
Total Projected Cost	**$69,302,805**	**$41,428,040**	**$45,323,990**	**$35,661,962**

Table 3: Adjusted Alternative C.1 Pricing

The Mixed Pricing is the minimum reasonable price that one might expect for Alternative C.1. As changes to selected Suppliers are made this price would change accordingly. Note that the Contingency Funds allocated for the Mixed Pricing (11.8%) is greater than that allocated to a Turnkey implementation to account for additional risks to the program.

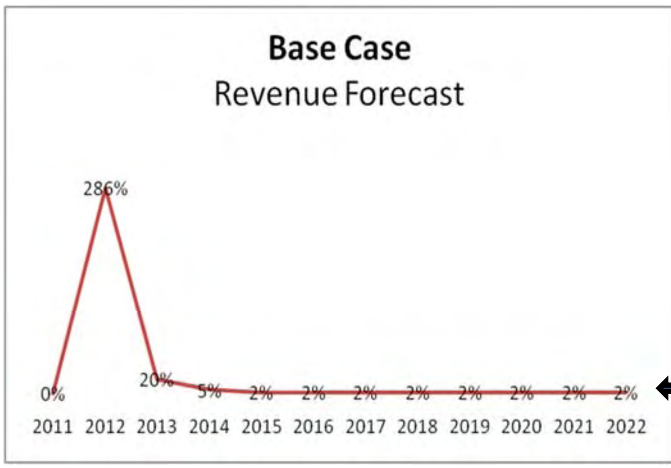
FINANCIAL ANALYSIS

Business Case Development

With focus on "Beat Candidate" Alternative C.1, a financial analysis was performed utilizing a business case that replicated the UUI business case used in support of the Baseline Microwave System for the RUS Grant and Loan Application. The business case was then modified to the extent necessary to implement Alternative C.1. Implementation of Alternative C.1 requires more capital than currently provided by the RUS Grant and Loan. A commercial loan was included in the business case to cover the differential in capital. The Business Case with a 12 year projection horizon was constructed around the following Input Parameters and Assumptions based on the UUI microwave only business case.

- Uses the UUI Revenue Projections without alteration
- Input Parameters:
    - Inflation Rate 2.73%
    - Discount Rate 9%
    - RUS Loan Interest 5%
    - RUS Loan Amortization Period 20 years
    - Commercial Loan Interest 9%
    - Commercial Loan Amortization Period 20 years
    - Cost of Capital 9%
- RUS Grant $44M
- RUS Loan $44M
- Commercial Loan $ differential required in Capital
- Asset (based on Debt) Depreciation 20 years
- Income Tax 40% Payable on Positive EBT

– Key Assumptions
  - The IRR and MPV calculation considers only the Debt portion of the required capital with no Tax payment, and no Loan Principal or interest payment.
  - Revenue from the TERRA-SW Project is used to reduce required capital using Average Revenue
  - Equal and Simultaneous utilization of the RUS Grant and Loan Funds (50% / 50%)
  - Any additional capital requirements are covered using a commercial bank loan with a 9% interest rate payable the first year, NO principal payment, and payback period of 20 years.



2% Growth Rate

Business Case Evaluation Criteria

Three financial criteria were considered to assess the feasibility of Alternative C.1. These are:

Internal Rate of Return (IRR): Rate of return used in capital budgeting to measure and compare the profitability of investments - calculated on Debt only.

Criteria: IRR > Cost of Money

Payback Period: Period of Time required for the return on an investment to "repay" the sum of the original investment.

Criteria: Payback should be Net Positive projection horizon of 12 years.

Net Present Value (NPV): Indicator of the value of an investment in terms of today's dollars.

Criteria: NPV should be Net Positive over the project horizon.

A Time Interest Earned Ratio (TIER) was also calculated over the project horizon to determine if the project met RUS requirements for TIER.

Business Case Evaluation Results

Table 4 below contains the key Input Parameters and Results for both the Baseline and C.1 Submarine Cable System implementation.

Parameter	Baseline Case Microwave Only Scenario		Implementation of Alternative C.1 Submarine Cable System	
Input				
Total CapEx	$95.9M		$113.9M ($35M Subsea, $78.9M Remainder)	
Total OpEx	$34,8M		$33.7M ($5.7M Subsea, $27.9M Remainder)	
Total Revenue	$102M		$102M	
Required Capital	$92.1M ($4M RUS Grant, $44M RUS Loan, $4.1M Commercial Loan)		$109.9M ($4M RUS Grant, $44M RUS Loan, $21.9M Commercial Loan)	
Results		**Criteria Met**		**Criteria Met**
IRR	6.51%	No	0.65%	No
NPV	-$4.1M	No	-$17.0M	No
Payback Period	9 Years	Yes	11 Years	Yes

Table 4: Business Case Evaluation Results

Neither the Baseline Case nor the Submarine Cable System implementation cases meet all of the financial criteria defined earlier.

Figure 10 below shows the results of the TIER calculation for both the Baseline Microwave-only and Submarine Cable System implementation case. The Baseline Microwave-only case meets the RUS criteria for TIER of TIER > 1.5 through 2018, and > 1.0 thereafter, while the Submarine Cable System case does not. Note: The significant drop in the Submarine Cable System TIER in year 2020 reflects a presumed cable repair that year.

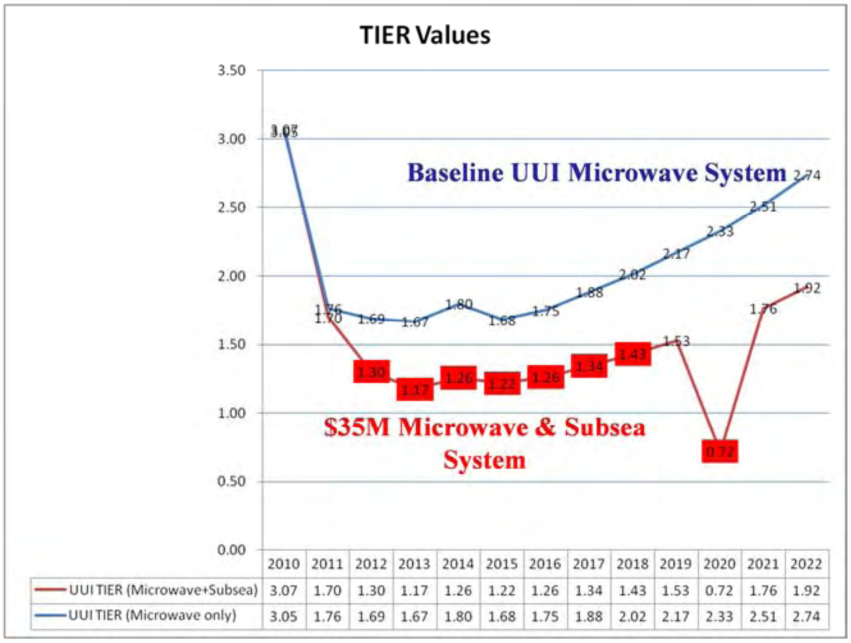


Figure 10: TIER Value Results for Baseline Microwave Case and Submarine Cable System Implementation Cases

In addition to the results provided above, other business case scenarios were executed to determine the level of Revenue increase to meet the three financial criteria and RUS TIER requirements. The results of these sensitivity studies are shown in Table 5 and Figure 11 below.

Link Type (Dillingham to Quinhagak)	Link Cost ($M)	Revenue Tail Constant Growth Rate (%)	OpEx ($M)	IRR (%)	Payback (Yrs)	NPV ($M)	Comment
Microwave	$16.4	2%	$34.8	6.5%	9	($4.1M)	Baseline UUI TERRA-SW Project
Submarine Link	$35.0	5%	$33.7	3.4%	10	($12.5M)	Replace MW Link with Subcable
Submarine Link	$35.0	7%	$33.7	5.5%	9	($8.2M)	Replace MW Link with Subcable
Submarine Link	$35.0	9%	$33.7	7.6%	9	($3.5M)	Replace MW Link with Subcable
Submarine Link	$35.0	11%	$33.7	9.6%	8	$1.7M	Replace MW Link with Subcable
Submarine Link	$35.0	S Curve	$33.7	9.1%	8	$0.3M	Replace MW Link with Subcable

Table 5: Revenue Sensitivity Study Results

(Case highlighted in YELLOW is the Baseline Microwave Case. Cases highlighted in Green meet the Financial Criteria.

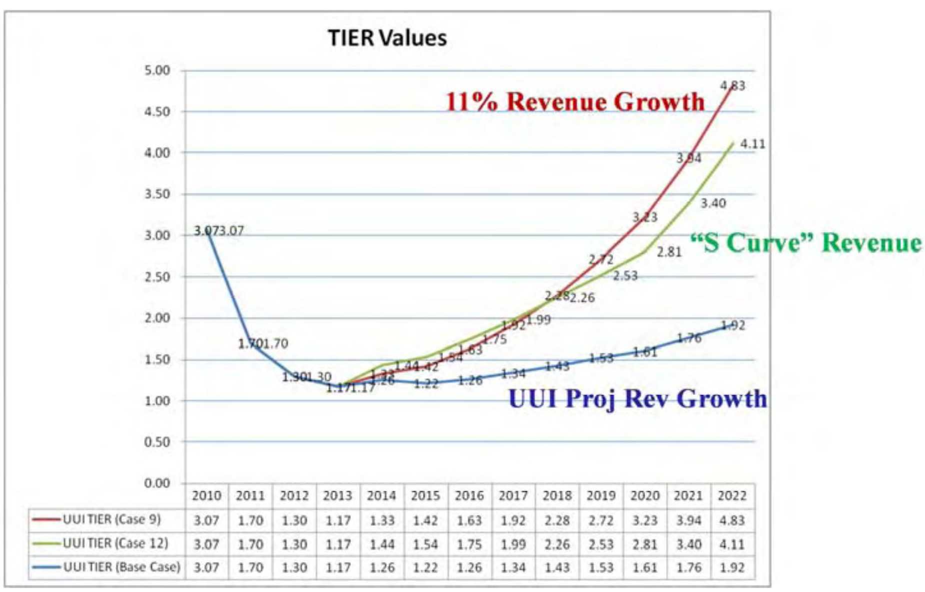


Figure 11: TIER Projections for Baseline Revenue, 11% Revenue Growth, and "S Curve" Revenue Growth

Implementation of the minimum priced C.1 Alternative Submarine Cable System as an alternative to the microwave link between Dillingham, AK and Quinhagak, AK would require a significant increase in Projected Revenues to meet the financial criteria defined above and the RUS TIER requirements.

COMPARISON WITH EVALUATION CRITERIA

Data gathered and results generated from the development of the submarine cable system alternatives as well as the financial analysis were in a comparison with a set of 12 agreed upon Evaluation Criteria. That comparison is provided below.

				Submarine System Alternative				Explanation
#	Criterion	Parameter of Measure	Quantitative	B.1	B.2	C.1	C.2	
5	Critical Backup Service	Can Critical Backup Services be implemented within 4 hours	Yes / No	Yes	Yes	Yes	Yes	In all all alternatives, there are redundant transmission equipment that provide transmission protection in the event of a card failure. In addition, it is well within the ability of local staff to reach the site and replace any defective card within 4 hours (local sparing was included in the pricing). For wet plant faults, In the case of B.1 and B.2, all critical restoration services are provided by Satellite Backup, and can be achieved within 4 hours. In the case of C.1, critical restoration services are provided by means of the ring architecture approach of the implementation, which is resilient to a single fault scenario, and consequenty, critical services can be restored within 4 hours. For C.2, the primary trunk of C.2 is redundant and resilient to a single fault. Cable Landing spurs into Togiak and Platinum are not redundant, but restoration of services to these local communities is via satellite.
6	Cost of Critical Backup Services	CapEx & OpEx $/bit for restoration	Present Value $	N/A	N/A	$0.00	N/A	Not relevant since submarine cable repair can not be accomplished in 48 hours, therefore restoral bandwidth must be reserved on the satellites.
7	Restoral Backup Service	Can Restoral Backup Services be implemented within 48 hours	Yes / No	Yes	Yes	Yes	Yes	Same rationale for Critical Backup Services applies to complete restoral services.

				Submarine System Alternative				Explanation
#	**Criterion**	**Parameter of Measure**	**Quantitative**	**B.1**	**B.2**	**C.1**	**C.2**	
7a	Restoral Backup Service	MTTR	Yes / No	No	No	Yes	No*	Only System Alternative C.1 can be assured to meet a full service restoration in 15 days, because it can tolerate a wet plant fault without loss functionality. Systems B.1, B.2, and C.2 require a cable repair to return to full service. Given ship availability, good weather, and depending on ship berth location and wet plant spares location, a cable repair could be achieved between 12 and 15 days. If however,a fault occurred immediately before the operation weather window closed, repairs could be delayed by 6 months. In addition, if the repair was required in shallow water, a barge would need to be mobilized and provisioned with splicing equipment to make the repair, and this could reasonable take 8 weeks. C.1, because of its redundant design and resiliency to a cable fault is the only alternative that can "wait" for a cable repair to an impacted segment. Consequently, it is also a good candidate for "Spot Market" repair scenario.
8	Cost of Restoral Backup Services	CapEx & OpEx for restoration	Present Value $	$50.4M	$50.4M	$0	$6.03M	NPV of Satellite Restoration Costs over 25 year life.

				Submarine System Alternative				Explanation
#	**Criterion**	**Parameter of Measure**	**Quantitative**	**B.1**	**B.2**	**C.1**	**C.2**	
9	Total Availability	Calculate System Availability compared to desired values: 99.98% for Alternative B 99.98% for Alternative C	Calculated Value	99.99726	99.99728	99.98597	99.98651	Availability based on 3 Month MTTR
10	Wet Plant Faults	Number of Faults and Outage Time	Calculated Value	0.700	0.658	0.904	0.891	Probability of 1 fault over 25 years. MTTR of 3 months.

				Submarine System Alternative				Explanation	
#	**Criterion**	**Parameter of Measure**	**Quantitative**	**B.1**	**B.2**	**C.1**	**C.2**		
11	System Cost	Total CapEx and Total OpEx $s	Present Value $M	39.0 48.4 87.4	37.4 48.4 85.8	35.9 3.5 39.4	37.3 8.1 45.4	CapEx OpEx Total	System costs using Mixed vendor solution

RISK ANALYSIS

Technical Risk

There is little technical risk regarding the implementation and performance of any alternative submarine cable system, and specifically C.1.

Third-party suppliers have demonstrated the ability to provide the required non-repeatered transmission capacity on the system (and much greater) over the longest DLS for C.1, and in fact is the best candidate as a supplier of the SLTE equipment.

While there can never be a guarantee that external aggression events have been entirely avoided, the analysis of the region indicates that the two of the three primary external aggression causes – anchoring and fishing do not pose significant threat, and ice scouring threat has been mitigated by near shore Split Pipe (500m) and 1 meter burial and use of Double Armor cable to the 10 meter water depth mark.

In addition, the Ring Architecture of the C.1 Alternative results in a very resilient cable system, capable of withstanding a fault while providing the required service.

Schedule Risk

There are three primary risks associated with the implementation schedule for any alternative submarine cable system. These are primarily driven by the RUS Ready for Service date of May 31, 2013 and the limited opportunities for marine services based on the available weather windows (April – September).

As result of these constraints, the following steps need to be executed:

1) A Project Decision needs to be made prior to the completion of 1st Quarter 2011.
2) Project Contract and Negotiations need to be completed by the end of 2nd quarter 2011 with focus and sequencing based on required task dates and durations,
3) Permitting, which is dependent on various federal, state, and local agencies, could take as long as 12 months and is required for installation, and should be initiated as early as possible.

4) Marine Survey (~60 days of marine time) needs to be completed in the available 2011 weather window to support the final cable configurations and permitting process,
5) Installation of the Submarine Cable System requires execution and completion in the 2012 weather window.

Financial Risk

The Financial Analysis presented indicates that the implementation of Alternative C.1, the best alternative submarine cable system, would range in cost from ~$35.7M for the minimum Mixed Supply Implementation to ~$45.3M for Turnkey Implementation.

DRG believes that a Mixed Supply Implementation is the best alternative for the system, primarily due to the availability of an excellent product suite for the SLTE equipment.

HOWEVER, based on UUI Revenue Projections and Business Case Constraints (Loan vs Grant funds usage, commercial paper terms, etc.), even the lowest cost submarine cable system price makes the business case problematic.

CONCLUSIONS

All four of the alternatives evaluated as part of this feasibility study would serve as a satisfactory substitute for the proposed microwave system from a technical standpoint. The four alternatives have a system design life of 25 years, initial capacity of 10Gbps per fiber pair upgradeable to a minimum of 200 Gbps per fiber pair, a SONET interface to the local network, and greater than 99.98% availability.

Three of the alternatives require satellite backup from two or more of the cable stations in the event of a cable fault to meet the availability requirement. Alternative C.1 does not require any satellite backup since it is a ring configuration that is fully redundant. The undersea portion of Alternative C.1 is more expensive than that of the other three configurations. With the significant capital and operating costs of the associated necessary satellite backup factored in for the other three configurations, overall Alternative C.1 is the most cost effective alternative to the proposed microwave system. Alternatives B.1 and B.2 are more than twice as expensive as Alternative C.1 and Alternative C.2 is about 12% more expensive.

Alternative B.1	$87.4M
Alternative B.2	$85.7M
Alternative C.1	$39.4M
Alternative C.2	$45.4M

Table 6: NPV of CapExs and OpEx for Alternatives - General Contractor Approach

Alternative C.1 is the most attractive of the alternatives that were investigated. As can be seen from Table 7 below, the capital expense of Alternative C.1 is more than that of the proposed microwave system and the operating expense is less. The end result is that the overall NPV of Alternative C.1 is more than that of the proposed microwave system, resulting in Alternative C.1 being less attractive than the microwave system from a financial perspective.

	CapEx	OpEx
Alternative C.1	S113.9M	$33.7M
Microwave System	$95.9M	$34.8M

Table 7: CapEx and OpEx Comparison between Alternative C.1 and the Baseline Microwave System

Table 8 below compares Alternative C.1 with the microwave system with respect to IRR, NPV, Payback Period, and TIER Values, assuming the revenue projections provided by UUI.

Financial Criteria	Baseline Case Microwave Only Scenario	Implementation of Alternative C.1 Submarine Cable System
IRR	6.51%	0.65%
NPV	-$4.1M	-$17.0M
Payback Period	9 Years	11 Years
TIER >1.5 thru 2018	Yes	No

Table 8: Business Case Results Comparison between Microwave-only and C.1 Submarine Cable Implementations

As can be seen in the table, Alternative C.1 does not meet any of the three financial criteria, nor does it meet the RUS Tier Value requirements.

In summary, although Alternative C.1 is technically viable and the most financially attractive of the four alternatives to the proposed microwave system, it is not an economically feasible and prudent alternative due to its inability to meet all of the financial evaluation criteria requirements and as a consequence:

None of the Submarine Cable System Alternatives are Economically Feasible or Prudent.

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7. DRG_UUI20110126-01, UUI Questions on DRAFT Study Report, 20 and 26 Jan 2011, and Study Report Responses", 29Jan2011.

Appendices

1. Appendix 1.0, DRG_UUI20110113-01, "TERRA-SW Alternatives Feasibility Study Project Report", February, 2011.

    a. Appendix A – Request for Quotes

    b. Appendix B – Supplier Responses

    c. Appendix C - Information Sources

    d. Appendix D – Fugro Marine Feasibility Study

    e. Appendix E – Satellite Restoration Development

    f. Appendix F – O&M, Wet Plant Storage and Repair Development

    g. Appendix G – Reliability and Availability Development

h. Appendix H – Pricing Schedules

i. Appendix I –Financial Analysis

j. Appendix J – Applicable Standards

k. Appendix K – RFP, Proposal, and SOW

2. Appendix 2.0, UUI Comments

   a. DRG_UUI20110126-01, Rev A, UUI Questions on Draft Report, 20 and 26Jan2011, and DRG Responses, 26Jan2011.

   b. UUI Comments to Interim Final Report Conclusion, 3Feb2011

   c. UUI Comments to Interim Final Report, 3Feb2011

3. Appendix 3.0 U.S. Fish & Wildlife Services Comments

APPENDIX F

Wilderness Characteristics Inventory – BLM-Managed Lands

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Wilderness Characteristics Inventory – BLM Managed Lands

Introduction

The BLM Manual 6303 provides direction and guidance for considering Lands with Wilderness Characteristics (LWC) in project-level decisions for areas not analyzed in accordance with BLM Manual 6302. The first step in the LWC process is to inventory the lands to determine which areas have wilderness characteristics. This narrative outlines the methods used and the results of an inventory for the proposed TERRA Southwest Broadband Telecommunications Project for the Cone Mountain area. The following are only relevant to inventory of public lands to assess their wilderness characteristics and should not be confused with managing of lands with wilderness characteristics.

Methodology

All public lands, including State- and Native-selected lands, in the immediate area of the proposed action were inventoried for wilderness characteristics. The inventory evaluated wilderness characteristics as discussed in Section 2(c) of the Wilderness Act of 1964 (16 U.S.C. 1131) and incorporated into the Federal Land Policy and Management Act (43 U.S.C. 1701 *et seq*.).

The criteria for determining wilderness characteristics are established by the BLM Manual

6300-1 Wilderness Inventory. To be identified during the inventory process as having wilderness characteristics, lands must:

- Be a roadless area of sufficient size as to make practicable its preservation and use in an unimpaired condition;
- Generally appear to have been affected primarily by the forces of nature and;
- Have outstanding opportunities for solitude, or a primitive and unconfined type of recreation.

Within this inventory, lands were not buffered. Land with wilderness characteristic may immediately abut land whose own character precludes wilderness characteristics. For example, land immediately adjacent to a road may be classified during inventory as possessing wilderness characteristics. The fact that the sight or sound of the road may detract from the wilderness experience on adjacent lands does not, in and of itself, render those lands as not possessing wilderness characteristics.

As long as the wilderness characteristics criteria listed above are met, the following facilities,activities and uses consistent with the Alaska National Interest Lands Conservation Act (ANILCA) may occur on lands having wilderness characteristics: public use cabins; administrative sites and visitor facilities; temporary facilities and equipment for hunting, fishing, and camping; airplane use and landings; and motorboat, snowmobile, and all-terrain motor vehicle use.

The critical question to consider is not whether these facilities, activities or uses exist in the relevant tract, but whether they singly or in combination with other factors have altered the character of the land from one that “generally appears to have been affected primarily by the forces of nature” and precludes the land from having “outstanding opportunities for solitude and/or a primitive and unconfined type of recreation.” In general, substantial active or remnant evidence of mining or oil and gas extraction facilities, above-ground pipelines or power lines, intensive recreational developments, and similar intrusions on the land may render such lands as inappropriate for identification in the inventory stage as having wilderness characteristics. The inventory process utilized in-house expertise from staff specialists as well as recent land use planning information (Bay RMP, 2008) to assess whether or not specific lands possess wilderness characteristics.

Form 2. Current Conditions: Presence or Absence of Wilderness Characteristics

Area Name: Cone Mountain area

BLM Inventory Acreage: 143,437

1) Is the area of sufficient size? Yes

Description: The area is more than 5,000 contiguous acres of BLM land. The Cone Mountain area is mostly bounded on the east by State owned land, to the north by the Togiak National Wildlife Refuge and Wilderness Area, to the west by Carter Bay and Carter Spit Area of Critical Environmental Concern (ACEC), and the Kigsugtag Mountain to the south. The Cone Mountain area consist of 143,437 acres of which 3,785 acres are under primary selection by either the State of Alaska or the local village and/or regional corporation, 103,432 acres are currently withdrawn under Public Land Order 5181 and are top filed for selection by the State of Alaska, and 36,220 acres are BLM managed lands designated as the Carter Spit ACEC. There is no private property (Native Allotments) or federal mining claims within the area. Even if all selected lands were to be conveyed, the remaining BLM lands, in total, will exceed 5,000 acres. There are no BLM-managed wilderness areas or wilderness study areas within the Goodnews Bay block (BLM, 2008).

2) Does the area appear natural? Yes

Description: The Cone Mountain area is a contiguous/un-fragmented parcel of BLM land. The area is generally natural in appearance, having been primarily affected by the forces of nature, and contains generally minimal evidence of people's work. Two existing trails bisect the area. One of the trails is located east of Cone Mountain and is a winter use route. It measures approximately 30 miles and runs north and south between the Arolik River and Goodnews Bay. The second trail is a year round route which also travels north and south and is located within the western end of the Carter Spit ACEC boundary. Overall, the Cone Mountain area retains its primitive character.

3) Does the area have outstanding opportunities for solitude? Yes

Description: Although two trails bisect the area, the amount of trail use on both is relatively low due to the area's remoteness. Other roads and trails are absent within and adjacent to the area. The nearest airstrip is located 3.7 miles southeast of the Cone Mountain area boundary, near the Good News River and the nearest town or village is 14 miles to the south (Good News Bay). There are no other known man-made developments within the area.

4) Does the area have outstanding opportunities for primitive and unconfined recreation? Yes

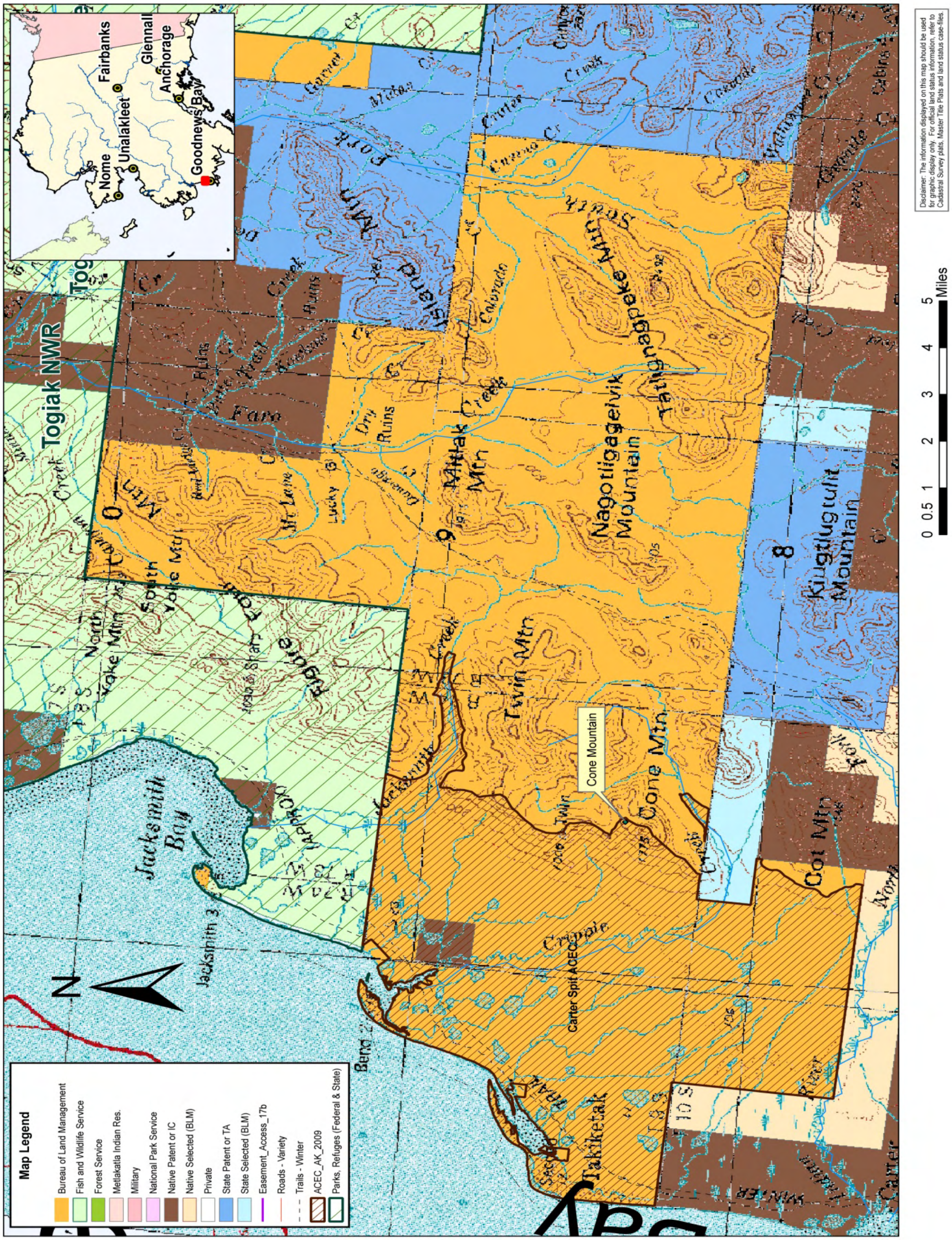
Description: The overall size, remoteness and lack of developments in the area provide users with outstanding opportunities for primitive and unconfined recreation, including the following activities: camping, bird watching, hiking, snow machining, big game hunting, subsistence, wildlife viewing, and photography.

5) Does the area have known supplemental values (ecological, geological, or other features of scientific, educational, scenic or historical value)? Yes

Description: The western portion of the unit consists of the Carter Spit ACEC, which has been formally designated with the objective of protecting the coastal area associated with molting and staging habitat for Steller eiders, a threatened species under the Endangered Species Act. The Carter Spit ACEC is managed for Visual Resource Management (VRM) Class III, and all other BLM-managed within the Cone Mountain area is are being managed as VRM Class IV.

CONCLUSION: The area has wilderness characteristics and is identified as Land with Wilderness Characteristics (LWC).

Map 1 - Cone Mountain Area



APPENDIX G

Background Information for the Analysis of Noise

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Background Information for the Analysis of Noise

Fundamentals of Acoustics

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air, and are sensed by the human ear. Sound is generally characterized by several variables, including frequency and amplitude. Frequency describes the sound's pitch (tone) and is measured in cycles per second (Hertz [Hz]), while amplitude describes the sound's pressure (loudness). Because the range of sound pressures that occur in the environment is extremely large, it is convenient to express these pressures on a logarithmic scale that compresses the wide range of pressures into a more useful range of numbers. The standard unit of sound measurement is the decibel (dB).

Hz is a measure of how many times each second the crest of a sound pressure wave passes a fixed point. For example, when a drummer beats a drum, the skin of the drum vibrates a number of times per second. When the drum skin vibrates 100 times per second it generates a sound pressure wave that is oscillating at 100 Hz, and this pressure oscillation is perceived by the ear/brain as a tonal pitch of 100 Hz. Sound frequencies between 20 and 20,000 Hz are within the range of sensitivity of the healthy human ear.

As mentioned above, sound level is expressed by reference to a specified national/international standard. The Sound Pressure Level (SPL) is used to describe sound at a specified distance or specific receptor location. In expressing sound pressure level on a logarithmic scale, sound pressure is compared to a reference value of 20 micropascals (μPa). SPL depends not only on the power of the source, but also on the distance from the source and on the acoustical characteristics of the space surrounding the source (absorption, reflection, etc.).

Outdoor sound levels decrease logarithmically as the distance from the source increases. This is due to wave divergence, atmospheric absorption, and ground attenuation. Sound radiating from a source in a homogeneous and undisturbed manner travels in spherical waves. As the sound waves travel away from the source, the sound energy is dispersed over a greater area decreasing the sound pressure of the wave. Spherical spreading of the sound wave from a point source reduces the noise level at a rate of 6 dB per doubling of distance.

Atmospheric absorption also influences the sound levels received by an observer. The greater the distance traveled, the greater the influence of the atmosphere and the resultant fluctuations. Atmospheric absorption becomes important at distances greater than 1,000 feet. The degree of absorption varies depending on the frequency of the sound as well as the humidity and temperature of the air. For example, atmospheric absorption is lowest (i.e., sound carries further) at high humidity and high temperatures and lower frequencies are less readily absorbed (i.e., sound carries further) than higher frequencies. Over long distances, lower frequencies become dominant as the higher frequencies are more rapidly attenuated. Turbulence, gradients of wind and other atmospheric phenomena also play a significant role in determining the degree of attenuation. For example, certain conditions, such as temperature inversions can channel or focus the sound waves resulting in higher noise levels than would result from simple spherical spreading.

Sound from a tuning fork contains a single frequency (a pure tone), but most sounds one hears in the environment do not consist of a single frequency but rather a broad band of many frequencies differing in sound level. Because of the broad range of audible frequencies, methods have been developed to quantify these values into a single number. The most common method used to quantify environmental sounds consists of evaluating all frequencies of a sound according to a weighting system that is reflective of human hearing characteristics. Human hearing is less sensitive at low frequencies and extremely high frequencies than at the mid-range frequencies. This process is termed “A weighting”, and the resulting dB level is termed the “A weighted” decibel (dBA). “A weighting" is widely used in local noise ordinances and state and federal guidelines. In practice, the level of a noise source is conveniently measured using a sound level meter that includes a filter corresponding to the dBA curve. Unless specifically noted, the use of A-weighting is always assumed with respect to environmental sound and community noise even if the notation does not show the “A”. Sound levels underwater are not weighted and measure the entire frequency range of interest.

In terms of human perception, a sound level of 0 dBA is approximately the threshold of human hearing and is barely audible by a healthy ear under extremely quiet listening conditions. This threshold is the reference level against which the amplitude of other sounds is compared. Normal speech has a sound level of approximately 60 dBA. Sound levels above about 120 dBA begin to be felt inside the human ear as discomfort progressing to pain at still higher levels. Humans are much better at discerning relative sound levels than absolute sound levels. The minimum change in the sound level of individual events that an average human ear can detect is about 1 to 3 dBA. A 3 to 5 dBA change is readily perceived. An increase (or decrease) in sound level of about 10 dBA is usually perceived by the average person as a doubling (or halving) of the sound’s loudness.

Because of the logarithmic nature of the dB unit, sound levels cannot be added or subtracted directly and are somewhat cumbersome to handle mathematically. However, some simple rules are useful in dealing with sound levels. First, if a sound’s intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. Thus, for example: 60 dB + 60 dB = 63 dB, and 80 dB + 80 dB = 83 dB. Remember however, that it requires about a 10 dB increase to double the perceived intensity of a sound and it is interesting to note that a doubling of the acoustical energy (a 3 dB increase) is at the lower limit of readily perceived change.

Although dBA may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Most ambient environmental noise includes a mixture of noise from nearby and distant sources that creates an ebb and flow of sound including some identifiable sources plus a relatively steady background noise in which no particular source is identifiable. A single descriptor called the equivalent sound level (L_{eq}) is used to describe sound that is constant or changing in level. L_{eq} is the energy-mean dBA during a measured time interval. It is the “equivalent” constant sound level that would have to be produced by a given constant source to equal the acoustic energy contained in the fluctuating sound level measured during the interval. In addition to the energy-average level, it is often desirable to know the acoustic range of the noise source being measured. This is accomplished through the maximum L_{eq} (L_{max}) and minimum L_{eq} (L_{min}) indicators that represent the root-mean-square (RMS) maximum and minimum noise levels measured during the monitoring interval. The L_{min} value obtained for a particular monitoring location is often called the acoustic floor for that location.

To describe the time-varying character of environmental noise, the statistical or percentile noise descriptors L_{10}, L_{50}, and L_{90} may be used. These are the noise levels equaled or exceeded during 10 percent, 50 percent, and 90 percent of the measured time interval. Sound levels associated with L_{10} typically describe transient or short-term events, L_{50} represents the median sound level during the measurement interval, while L_{90} levels are typically used to describe background noise conditions.

The Day-Night Average Sound Level (L_{dn} or DNL) represents the average sound level for a 24-hour day and is calculated by adding a 10 dB penalty only to sound levels during the night period (10:00 p.m. to 7:00 a.m.). The L_{dn} is the descriptor of choice used by nearly all federal, state, and local agencies throughout the United States to define acceptable land use compatibility with respect to noise. Because of the time-of-day penalties associated with the L_{dn} descriptor, the L_{dn} dBA value for a continuously operating sound source during a 24-hour period will be numerically greater than the dBA value of the 24-hour L_{eq}. Thus, for a continuously operating noise source producing a constant noise level operating for periods of 24 hours or more, the L_{dn} will be 6 dB higher than the 24-hour L_{eq} value. To provide a frame of reference, common sound levels, in terms of L_{eq}, are presented in Figure1, “Sound Levels of Typical Noise Sources and Noise Environments”.

Figure 1. Sound Levels of Typical Noise Sources and Noise Environments

Source: URS Corporation, 2008

Applicable Laws, Ordinances, Regulations, and Standards (LORS)

The following discussion addresses relevant LORS regarding noise emissions and exposure. The purpose of this section is to provide the reader with a greater understanding of the regulatory environment relating to environmental noise. Although the proposed project is not directly subject to these LORS, many activities that influence the existing noise environment are subject to various components of these LORS. Because of this influence, these LORS help to define the existing noise environment.

There are a number of laws and guidelines at the federal level that direct the consideration of a broad range of noise issues. Because the project does not fall within the purview of the Federal Energy Regulatory Commission, the proposed project is not directly subject to federal noise regulations other than the Occupational Safety and Health Administration (OSHA). For perspective, several of the more significant noise-related federal regulations and guidelines are provided below:

- Noise Control Act of 1972 (42 U.S.C 4910)

  This Act establishes a national policy to promote an environment for all Americans free from noise that jeopardizes their health and welfare. To accomplish this, the Act establishes a means for the coordination of Federal research and activities in noise control, authorizes the establishment of Federal noise emissions standards for products distributed in commerce, and provides information to the public respecting the noise emission and noise reduction characteristics of such products.

- Environmental Protection Agency (EPA) recommendations in "Information on Levels of Environmental Noise Requisite to Protect Health and Welfare with an Adequate Margin of Safety", NTIS 550\9-74-004, USEPA, Washington, D.C., March 1974.

  In response to a federal mandate, the U.S. EPA provided guidance in this document, commonly referenced as the, "Levels Document," that establishes an Ldn of 55 dBA as the requisite level, with an adequate margin of safety, for areas of outdoor uses including residences and recreation areas. This document does not constitute U.S. EPA regulations or standards, but identifies safe levels of environmental noise exposure without consideration for achieving these levels or other potentially relevant considerations. It is intended to "provide State and Local governments as well as the Federal Government and the private sector with an informational point of departure for the purpose of decision making." The agency is careful to stress that the recommendations contain a factor of safety and do not consider technical or economic feasibility issues, and therefore should not be construed as standards or regulations.

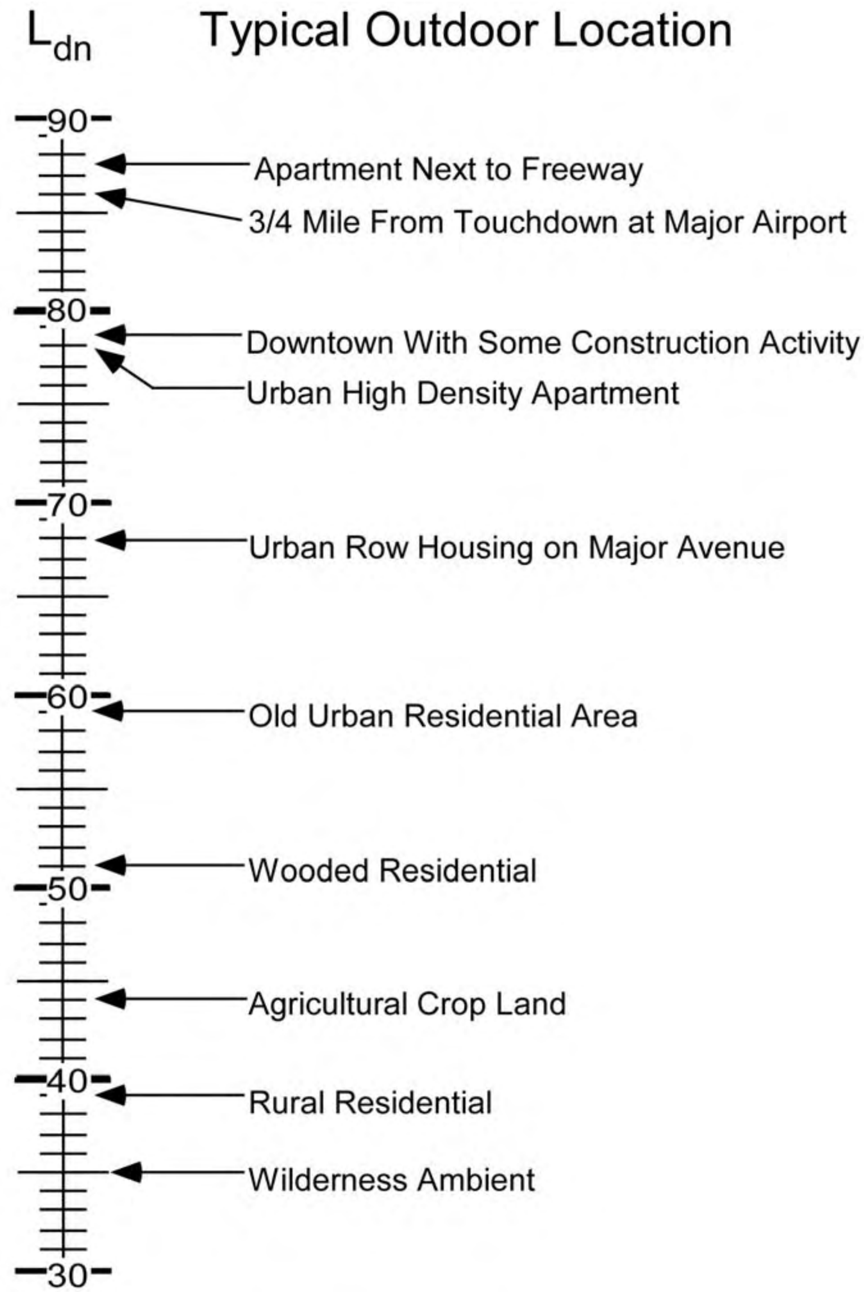
- Occupational Safety and Health Administration (OSHA) Occupational Noise Exposure; Hearing Conservation Amendment (FR 48 (46), 9738 – 9785 (1983).

  The standard stipulates that protection against the effects of noise exposure shall be provided for employees when sound levels exceed 90 dBA over an 8-hour exposure period. Protection shall consist of feasible administrative or engineering controls. If such controls fail to reduce sound levels to within acceptable levels, personal protective equipment shall be provided and used to reduce exposure of the employee. Additionally, a Hearing Conservation Program must be instituted by the employers whenever employee noise exposure equals or exceeds the Action Level of an 8-hour time-weighted average (TWA) sound level of 85 dBA. The Hearing Conservation Program requirements consist of periodic area and personal noise monitoring, performance and evaluation of audiograms, provision of hearing protection, annual employee training, and record keeping.

The State of Alaska does not have statewide noise regulations. Boroughs, counties and cities may adopt a general plan or noise ordinance that establishes noise standards. The proposed project sites will be Kulukak Mountain, Caribou Ridge and Cone Mountain. The staging areas for these three sites would be located in Kulukak Bay, the City of Togiak and Carter Bay, respectively. None of the local jurisdictions potentially impacted by the proposed project have adopted noise regulations applicable to the project.

In the absence of state or local guidelines, the most relevant guidelines are federal guidelines provided by the U.S. Environmental Protection Agency (EPA) in "Information of Levels on Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety." (EPA 550/9-74-004). Although this document does not constitute EPA regulations or standards, it does identify safe levels of environmental noise exposure. These levels are provided without consideration for the technical or economic feasibility issues that may be associated with achieving these levels. In these guidelines, an L_{dn} of 55 dBA is recommended in order to maintain an "adequate margin of safety for areas of outdoor uses including residences and recreation areas" (EPA 1974). 55 dBA L_{dn} is equivalent to a constant, steady-state L_{eq} of 49 dBA. Typical community noise levels, in terms of L_{dn}, are presented in Figure 2, Typical Outdoor Noise Levels in Terms of L_{dn}. As shown in this figure, typical outdoor noise levels vary by human activity and population density.

Figure 2. Typical Outdoor Noise Levels in Terms of L_{dn}



Source: Adapted from "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare With an Adequate Margin of Safety", EPA, 1974

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APPENDIX H

Visual Contrast Rating Report

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Visual Contrast Rating Report

Introduction

This report discusses the analysis completed to identify potential impacts to visual resources that may result from construction and operation of the proposed TERRA-SW Project. The proposed project includes one microwave tower located on Bureau of Land Management administered lands known as the Goodnews Block (Cone Mountain) and two microwave towers located within the Togiak National Wildlife Refuge (Caribou Ridge and Kulukak Mountain).

Analysis Methods

The analysis area included areas located within 10 miles of the project that contain views of project features, referred to as the "Seen Area." The Seen Area was calculated using a Geographic Information System viewshed analysis tool using an assumed tower height of 60 feet (18.2 meters). The impact analysis was restricted to within 10 miles of the project area based on the assumption that the visual contrast between project features (i.e., towers and associated project components) and natural landscape declined beyond this distance. The Seen Area included public lands administered by the BLM and the Togiak National Wildlife Refuge (Togiak Refuge). The analysis focused on ground-level views from the foreground-middleground distance zone (3-5 miles), as well as views from the air at representative altitudes of 2,000 and 4,000 feet. The foreground-middleground zone was selected as it is assumed that this vantage point represents the most common views of the project, as seen by recreational visitors or individuals engaged in subsistence. The analysis area is shown in (Figure 1).

Indicators

The indicator used to measure potential impacts to visual resources that may result from the project included:

- Impacts to visual resources, measured by the level of visual contrast created by the project, and
- Consistency with goals and objectives contained in relevant land resource management plans.

Additional qualitative indicators included the expected level of change to the existing landscape aesthetic, such as movement, activity (measured in terms of change in vehicular traffic and amount of people), noise, or naturalness.

Contrast Rating Procedure

The BLM Contrast Rating procedure was used to determine visual contrast that may result from the construction and operation of the project (BLM, 1984). This method assumes that the extent to which the project results in adverse effects to visual resources is a function of the visual contrast between the project and the existing landscape character. Impact determinations are based on the identified level of contrast, and are not a measure of the overall attractiveness of the project.

The contrast rating was conducted at locations within the Seen Area of the three viewshed areas. The viewshed areas differ by geographic location, land ownership and associated management, and proximity to the designated Togiak Wilderness. The contrast rating procedure was implemented at a Key Observation Points (KOP) established within the Seen Area of each viewshed (Figures 2, 4, and 6). Three KOPs, located within the foreground-middleground distance zone of each proposed tower location, were selected for used in the contrast rating. The selected photographs of the proposed Cone Mountain and Caribou Ridge sites were obtained from the air. The selected photo of the Kulukak Mountain site, in contrast, was obtained from ground level, adjacent to the Kulukak River (Figure 6).

At each KOP, existing landforms, vegetation, and structures were described using the basic components of form, line, color, and texture. A simulation of the proposed project components was developed at the three locations:

- KOP #2 approximately 8.1 miles from the proposed project and an elevation of approximately 2,000 ft (Figure 3 – Cone Mountain Visual Simulation
- KOP #11 approximately 3.4 miles from the proposed project and an elevation of approximately 2,000 ft (Figure 5; Caribou Ridge Visual Simulation) and
- KOP #3 located approximately 5.7 miles from the Kulukak Mountain Repeater at an elevation of approximately 2,000 ft (Figure 7 – Kulukak Mountain Visual Simulation).

This simulation was used to demonstrate the appearance of project features within the context of the existing landscape character, and derive the level of perceived contrast from other KOPs. The levels of contrast are defined as follows:

None: The element contrast is not visible or perceived.

Weak: The element contrast can be seen but does not attract attention.

Moderate: The element contrast begins to attract attention and begins to dominate the characteristic landscape

Strong: The element contrast demands attention, would not be overlooked, and is dominant in the landscape

Contrast Rating Forms completed at each KOP are included in this appendix. Although no formal contrast rating was completed for construction or decommissioning related actions, the expected level of contrast was estimated based on knowledge of anticipated actions and equipment.

Consistency with Land Management Plans

Visual resources within the Refuge are managed by the Refuge's Comprehensive Conservation Plan (CCP) (FWS, 2009), which addresses Section 304(g) of the Alaska National Interest Lands Conservation Act of 1980 (ANILCA). Section 304(g) of ANILCA requires the FWS to identify and describe special values of the Refuge. The stated goal of the CCP is to "*minimize the visual impacts of refuge development and use. All activities and facilities on the Refuge will be designed to blend into the landscape to the extent practical*" (FWS, 2009). It was assumed that a weak to moderate contrast rating would be consistent with these objectives.

Visual resources on BLM-managed lands are managed according to Visual Resource Management (VRM) System (BLM, 1984). A VRM Class IV designation provides for "*management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high but every attempt should be made to minimize the impact of activities" (BLM 2008).*

A determination of conformance with VRM Objectives was made based on the results of the contrast rating. The following method for conformance was used:

Table 1. Relationship of Visual Contrast to VRM Conformance.

Level of Contrast	Conforming VRM Class
None	I
Weak	II
Moderate	III
Strong	IV

Results

Although the viewshed areas are similar in terms of the dominant use and likelihood of being viewed from the air, each repeater site was analyzed independently due to the geographic distances between them. Project features that can be seen are expected to vary based on the specific location of the viewer (distance and vantage point), with the greatest contrast perceived from areas located within the immediate foreground distance zone (less than 3 miles). Contrast Ratings were completed at KOPs located within the foreground-middleground distance zone because this vantage point represented typical viewing distance within the area. The contrast rating completed for each proposed tower, and the associated Seen Area is described below:

The Cone Mountain Microwave Repeater

Potential impacts that may result from construction and operation of the Cone Mountain repeater were analyzed within the Goodnews Block Viewshed (Figure 2). This viewshed includes portions of the Ahklun Mountains located between the Goodnews River to the east, and the Kuskokwim Bay to the west. The area is primarily administered by BLM (BLM, 2008). The proposed project is located on lands managed according to VRM Class IV, which

> Provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high but every attempt should be made to minimize the impact of activities (BLM, 1986).

The area is characterized by the dramatic visual relief of the of the Ahklun Mountains as they rise from the extensive coastal plain of the Kuskokwim Bay to the west, and the broad river plain of the Goodnews River to the east. The mountainous terrain to the east creates extensive topographic shielding of that limits views of the project site from an established north-west trail through the Ahklun Mountains, and other areas of dispersed recreation and subsistence use in the area. Views to the west, in contrast, are largely unobstructed due to the flat topography of the coastal plain. Individuals engaged in dispersed recreation or subsistence, or traveling along the winter trail paralleling the Bering Sea would be located within the Seen Area of the Cone Mountain Tower. Such viewers would be primarily located within the foreground-middleground distance zone. Boaters located on the Kuskokwim or Carter Bay would also be situated in the Seen Area; however views would be from within the background distance zone (5-15 miles). Individuals flying in aircraft may also view the proposed project from varying distances and viewer angles.

The proposed Cone Mountain repeater is expected to result in weak visual contrast when viewed from the foreground-middleground or background distance zones. Perceived visual contrast is expected to result primarily from the introduction of a vertical line from the microwave tower and auxiliary structures. A weak contrast is acceptable in areas managed by VRM Class IV objectives.

The Caribou Ridge Microwave Repeater

Potential impacts that may result from construction and operation of the Caribou Ridge repeater were analyzed within the Caribou Ridge Viewshed (Figure 4). The viewshed is located on the eastern edge of the Ahklun Mountains, northwest of Togiak Bay. The viewshed includes Refuge lands and a small portion of the Togiak Wilderness (FWS, 2009). Predominant landforms within the Seen Area include the southern portion of the Gechiak Mountains, and upland areas surrounding the Matogak and Quigmy Rivers. Predominant views of the project area are situated to the east and west of the project site, with views to the north and south limited by topographic shielding. Dispersed recreational visitors and individuals engaged in subsistence activities in the area, on rivers noted above, and traveling along the established east-west trail between Goodnews Bay and Togiak Bay would be located within the foreground-middleground zone of the 'seen area" of the caribou Ridge Repeater.

The proposed Caribou Ridge repeater is expected to result in weak visual contrast when viewed from the foreground-middleground or background distance zones. Perceived visual contrast is expected to result primarily from the introduction of a vertical line from the microwave tower and auxiliary structures. A weak contrast is consistent with the visual resource management goals of the Togiak National Wildlife Refuge. Individuals flying in aircraft may also view the proposed project from varying distances and viewer angles.

The Kulukak Repeater

Potential impacts that may result from construction and operation of the Kulukak repeater were analyzed within the Kulukak River Viewshed (Figure 6). The viewshed is located within Togiak Refuge lands situated east of Togiak Bay, in the southern portion of the Wood River Mountain Range. Predominant landforms include the Wood River Range, the Kulukak River valley to the west, and Ualik Lake to the east. Numerous smaller drainages intersect the viewshed in a predominantly north-south trending orientation. Views of the project from portions of the Wood River Mountains to the north are limited due to topographic shielding. To the west of the project site the Seen Area includes portions of the Kulukak River basin and the east-southeast slopes of Buchia Ridge and Eddie Mountain. The Seen Area to the east-southeast includes Ualik Lake and portions of Kulukak Bay. Individuals engaged in recreation or subsistence within on the Kulukak River or Ualik Lake could potentially view the project from background distance zones. Although viewers located in the Kulukak River would be located within the foreground-middleground distance zone, those located on Ualik Lake east-southeast slopes of Buchia Ridge and Eddie Mountain would be situated in the background distance zone. Individuals flying in aircraft may also view the proposed project from varying distances and viewer angles.

The proposed Kulukak repeater is expected to result in weak visual contrast when viewed from the foreground-middleground or background distance zones (Figure 7). Perceived visual contrast is expected to result primarily from the introduction of a vertical line from the microwave tower and auxiliary structures. A weak contrast is consistent with the visual resource management goals of the Togiak National Wildlife Refuge.

Mitigation

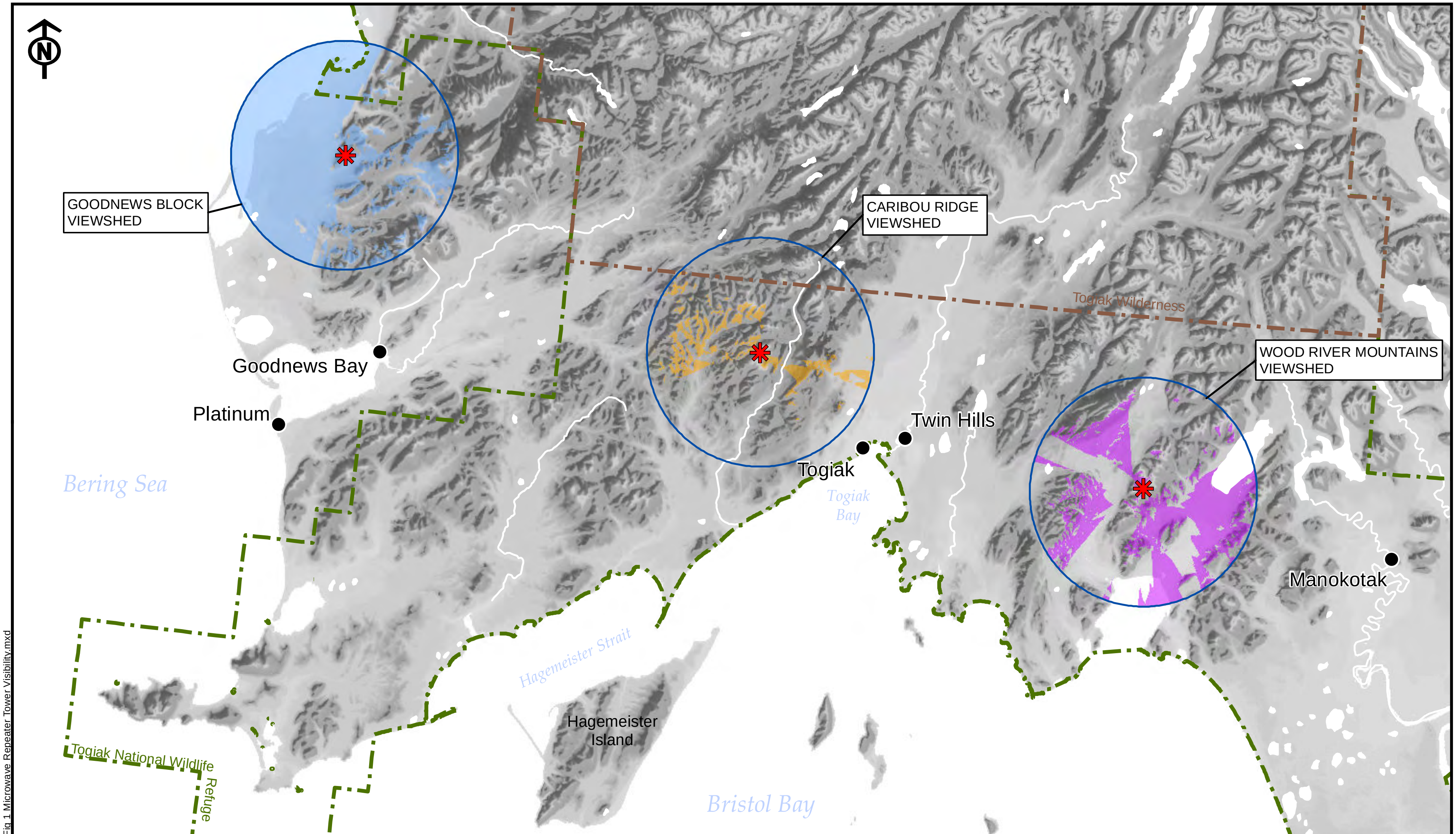
Recommended mitigation to reduce visual contrast includes painting the structure a color that blends with the surrounding landscape. Consider painting towers Shadow Grey (Standard Environmental Color Chart CC-001: June 2008, BLM/WY/ST-08/015+8450).

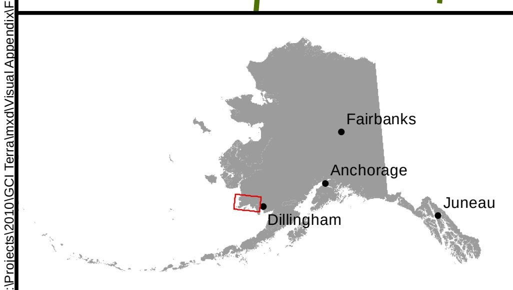
References

Bureau of Land Management, U.S. Department of the Interior (BLM). 1984. Visual Resource Management System, 8431 Manual Series.

BLM. 2008. Bay Resource Management Plan/Final Environmental Impact Statement. Bureau of Land Management Office, Anchorage District.

U.S. Fish and Wildlife Service, U.S. Department of the Interior (FWS). 2009. [Revised] Comprehensive Conservation Plan for Togiak National Wildlife Refuge. Prepared by U.S. Fish and Wildlife Service, Region 7, Anchorage Alaska. Accessed January 13, 2011. Available at http://alaska.fws.gov/nwr/planning/pdf/togiak/1_Cover.pdf





Proposed Repeater Location
10-Mile Viewshed Boundary
Togiak NWR Wilderness Boundary
Togiak NWR Boundary
Cone Mountain Tower Visibility
Caribou Ridge Tower Visibility
Kulukak Mountain Tower Visibility

0 5 10 15 20 Miles

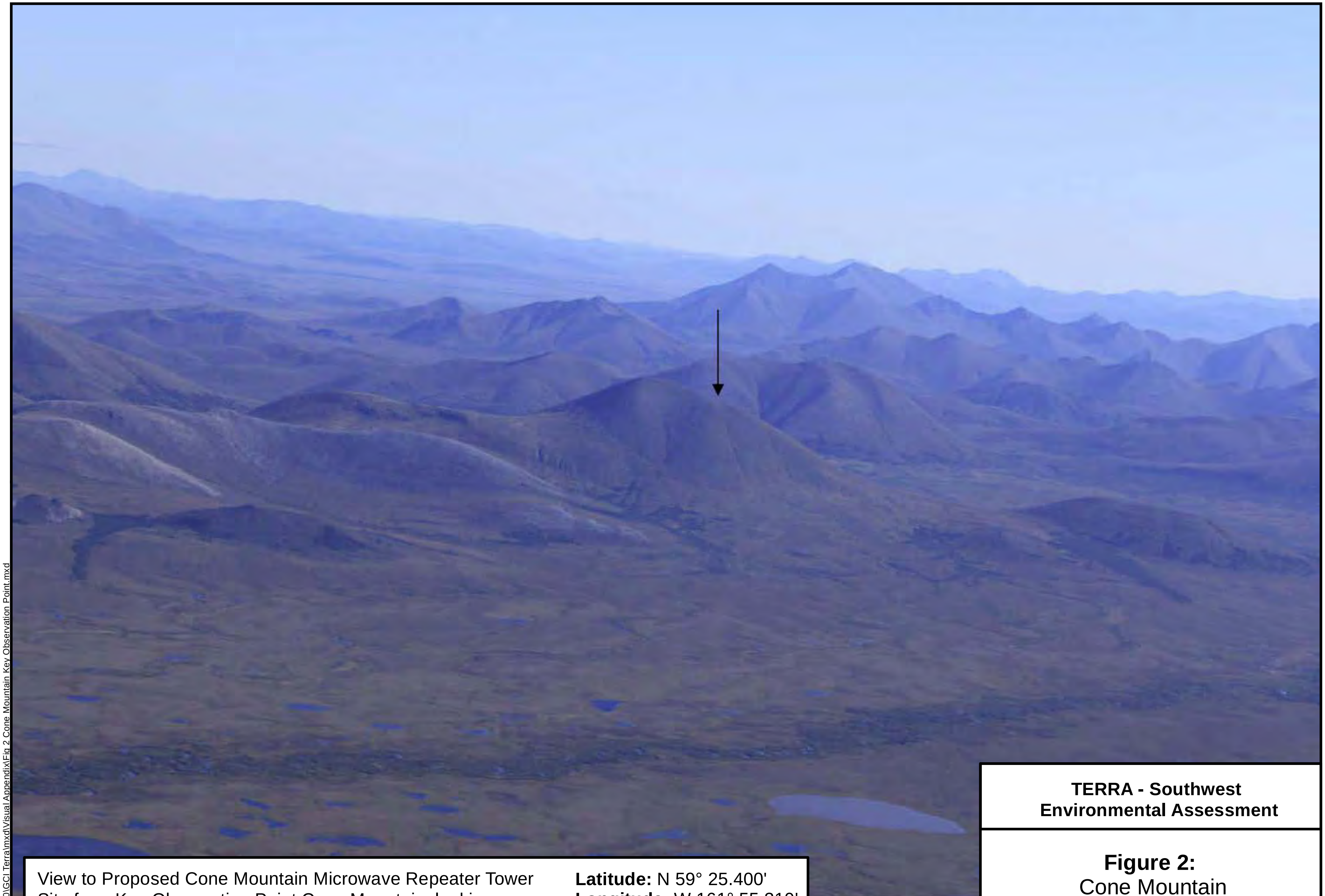
Source: USGS; USFWS; GCI; ADNR; BLM; URS

TERRA - Southwest
Environmental Assessment

Figure 1:
Microwave Repeater
Tower Visibility

April 2011

M:\Projects\2010\GCI Terra\mxd\Visual Appendix\Fig 1 Microwave Repeater Tower Visibility.mxd



View to Proposed Cone Mountain Microwave Repeater Tower Site from Key Observation Point Cone Mountain, looking southeast. Arrow indicates approximate tower location.

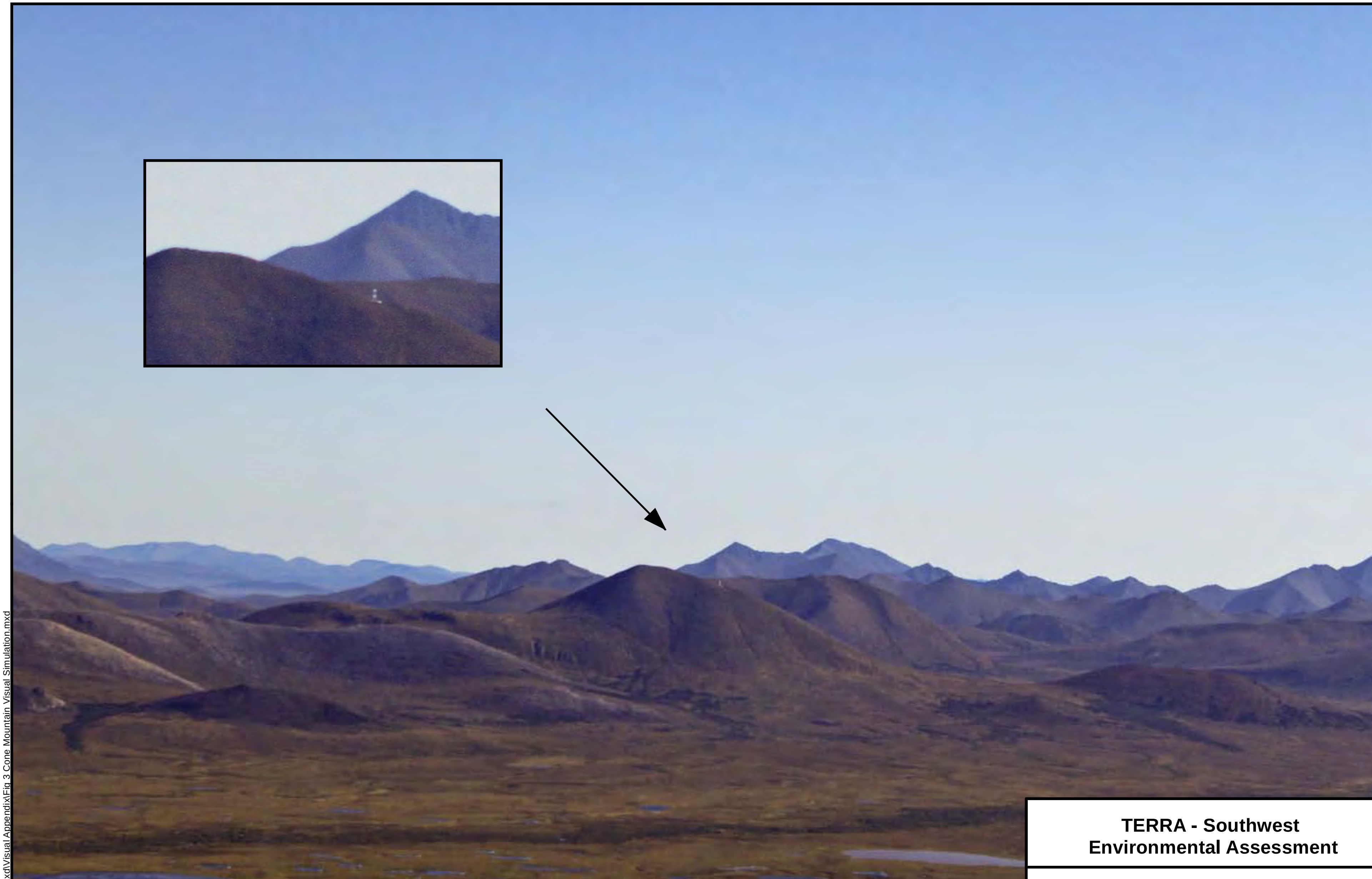
Latitude: N 59° 25.400'
Longitude: W 161° 55.310'
Elevation: 4.099'

TERRA - Southwest Environmental Assessment

Figure 2:
Cone Mountain
Key Observation Point

April 2011

M:\Projects\2010\GCI Terra\mxd\Visual Appendix\Fig 2 Cone Mountain Key Observation Point.mxd



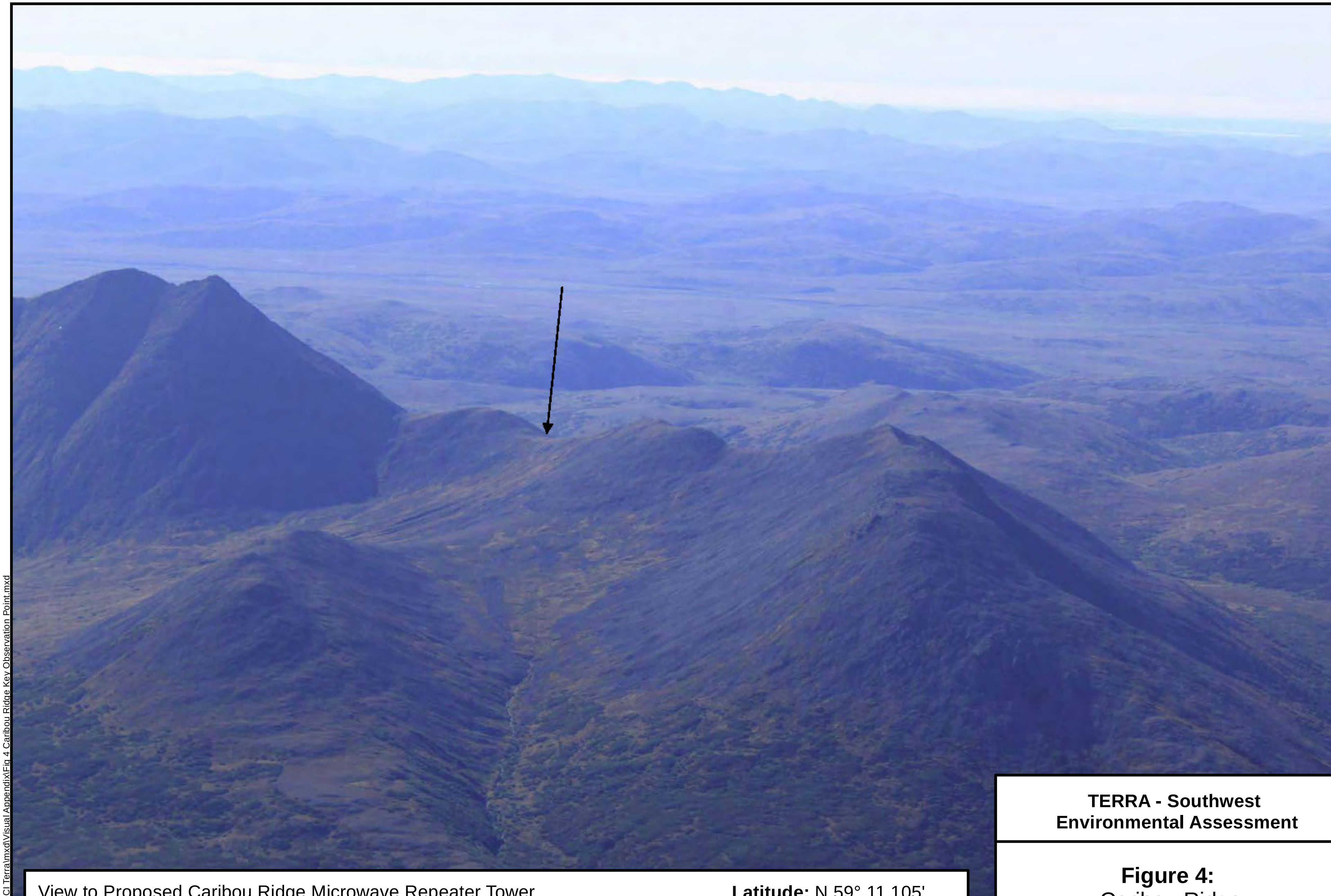
TERRA - Southwest
Environmental Assessment

Figure 3:
Cone Mountain
Visual Simulation

April 2011

Simulated view to Proposed Cone Mountain Microwave Repeater Tower from KOP Cone Mountain, looking southeast from approximately 8.1 miles.

Latitude: N 59° 25.480'
Longitude: W 161° 55.320'
Elevation: 2,084'



View to Proposed Caribou Ridge Microwave Repeater Tower Site from Key Observation Point #11, looking west-southwest. Arrow indicates approximate tower location.

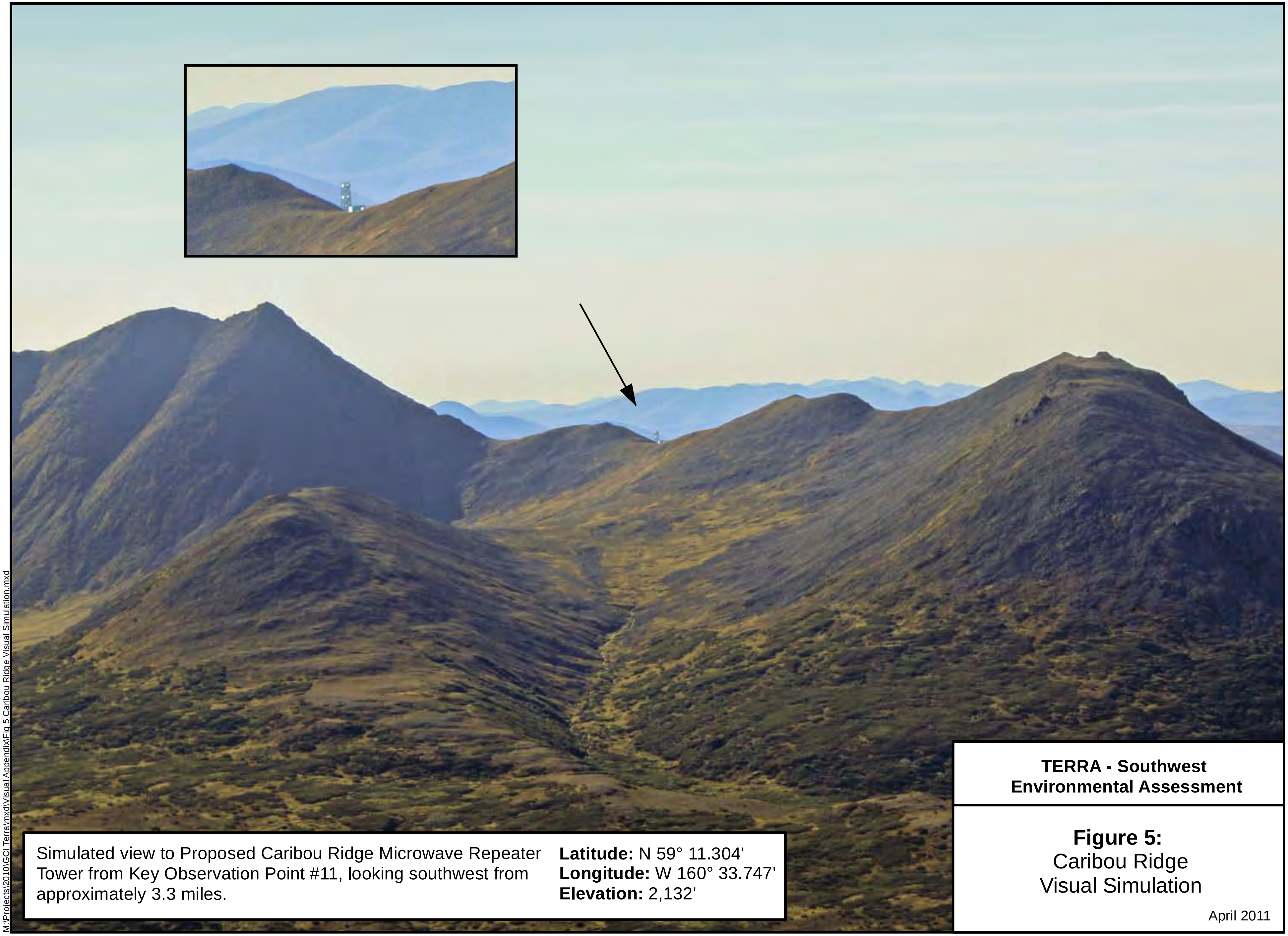
Latitude: N 59° 11.105'
Longitude: W 160° 33.792'
Elevation: 4,166'

TERRA - Southwest Environmental Assessment

Figure 4:
Caribou Ridge
Key Observation Point

April 2011

M:\Projects\2010\GCI Terra\mxd\Visual Appendix\Fig 4 Caribou Ridge Key Observation Point.mxd



Simulated view to Proposed Caribou Ridge Microwave Repeater Tower from Key Observation Point #11, looking southwest from approximately 3.3 miles.

Latitude: N 59° 11.304'
Longitude: W 160° 33.747'
Elevation: 2,132'

TERRA - Southwest Environmental Assessment

Figure 5:
Caribou Ridge
Visual Simulation

April 2011

M:\Projects\2010\GCI Terra\mxd\Visual Appendix\Fig 5 Caribou Ridge Visual Simulation.mxd

View to Proposed Kulukak Mountain Microwave Repeater Tower Site from Key Observation Point #4 (Kulukak River), looking northeast. Arrow indicates approximate tower location. Photo taken 50' above river level on cut bank bluff.

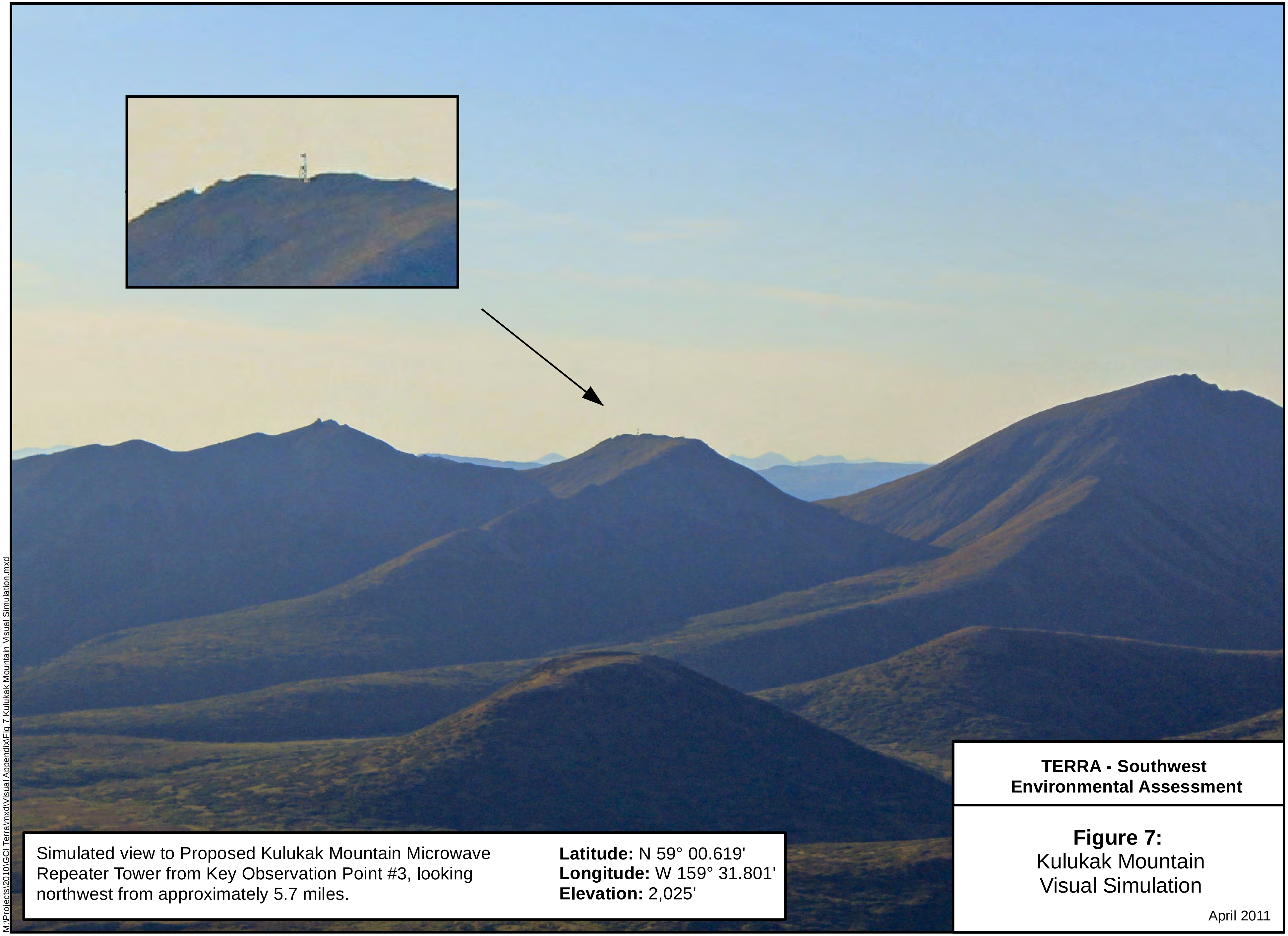
Latitude: N 59° 06.254'
Longitude: W 159° 45.346'
Elevation: 251'

TERRA - Southwest
Environmental Assessment

Figure 6:
Kulukak Mountain
Key Observation Point

April 2011

M:\Projects\2010\GCI Terra\mxd\Visual Appendix\Fig 6 Kulukak Mountain Key Observation Point.mxd



Simulated view to Proposed Kulukak Mountain Microwave Repeater Tower from Key Observation Point #3, looking northwest from approximately 5.7 miles.

Latitude: N 59° 00.619'
Longitude: W 159° 31.801'
Elevation: 2,025'

TERRA - Southwest Environmental Assessment

Figure 7:
Kulukak Mountain Visual Simulation

April 2011

M:\Projects\2010\GCI Terra\mxd\Visual Appendix\Fig 7 Kulukak Mountain Visual Simulation.mxd

Form 8400-4

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date: 13 January, 2011

Togiak National Wildlife Refuge

SECTION A. PROJECT INFORMATION

1. Project Name
Terra SW

2. Key Observation Point
Caribou Mountain Repeater

3. VRM Class
N/A

5. Location Sketch

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Rugged mountains; triangular, often parallel Drainages appear linear and curving	Amorphous and Patchy	None
LINE	Bold, diagonal and jagged. Appear contiguous along ridgelines	Smooth and irregular; curvilinear	Not Applicable
COLOR	Grey/brown; saturated	Harmonious combination of yellows, brown s and greens	Not Applicable
TEX-TURE	Coarse and granular	Smooth; clumped	Not Applicable

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES (Assumed, not Simulated)
FORM	Identical to that described in Section B	Identical to that described in Section B	Isolated; indistinct
LINE	Identical to that described in Section B	Identical to that described in Section B	Vertical tower; horizontal and vertical auxiliary structures.
COLOR	Identical to that described in Section B	Identical to that described in Section B	Grey, white
TEX-TURE	Identical to that described in Section B	Identical to that described in Section B	smooth

SECTION D. CONTRAST RATING __SHORT TERM X LONG TERM

1. DEGREE OF CONTRAST		FEATURES: LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM				X				X			X	
	LINE				X				X			X	
	COLOR				X				X			X	
	TEXTURE				X				X			X	

1. VRM Class: Not Applicable

2. Does project design meet visual resource management objectives? _X _Yes ___No
(Explain on reverses side)

3. Additional mitigating measures recommended
_X__Yes ___No (Explain on reverses side)

Evaluator’s Names Date

SECTION D. (Continued)

Comments from item 2.

Visual resources within the Refuge are managed by the Refuge's Comprehensive Conservation Plan (CCP) (USFWS, 2009), which addresses Section 304(g) of the Alaska National Interest Lands Conservation Act of 1980 (ANILCA). Section 304(g) of ANILCA requires the USFWS to identify and describe special values of the Refuge. The stated goal of the CCP is to "*minimize the visual impacts of refuge development and use. All activities and facilities on the Refuge will be designed to blend into the landscape to the extent practical*"

The project should consider mitigation described below.

Additional Mitigating Measures (See item 3)

- Consider painting towers Shadow Grey (Standard Environmental Color Chart CC-001:June 2008, BLM/WY/ST-08/015+8450)
- Consider an FAA-approved Audio Visual Warning System (AVWS) to eliminate need for tower lighting when painted a non-white color.

Form 8400-4

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date: 13 January, 2011

BLM Goodnews Block

SECTION A. PROJECT INFORMATION

1. Project Name Terra SW	5. Location Sketch
2. Key Observation Point Cone Mountain Repeater	
3. VRM Class IV	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Rugged mountains; triangular, often parallel Drainages appear linear and curving	Smooth and flattened	None
LINE	Bold, diagonal; jagged to rolling. Appear contiguous along ridgelines Horizontal lines where mountains meet lowland river valley Oval to elliptical waterbodies	Bold and curving at edge of elevation distribution	Not Applicable
COLOR	Grey/brown; saturated	Yellow/brown	Not Applicable
TEX-TURE	Coarse and granular	Smooth; contiguous	Not Applicable

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES (Assumed, not Simulated)
FORM	Identical to that described in Section B	Identical to that described in Section B	Isolated; indistinct
LINE	Identical to that described in Section B	Identical to that described in Section B	Vertical tower; horizontal and vertical auxiliary structures.
COLOR	Identical to that described in Section B	Identical to that described in Section B	Grey, white
TEX-TURE	Identical to that described in Section B	Identical to that described in Section B	smooth

SECTION D. CONTRAST RATING __SHORT TERM X LONG TERM

1. DEGREE OF CONTRAST		FEATURES											
		LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM								X			X	
	LINE								X		X		
	COLOR								X			X	
	TEXTURE								X			X	

1. VRM Class: IV

2. Does project design meet visual resource management objectives? _X_Yes ___No
(Explain on reverses side)

3. Additional mitigating measures recommended
_X__Yes ___No (Explain on reverses side)

Evaluator’s Names Date

SECTION D. (Continued)

Comments from item 2.

The goal of VRM Class IV Objectives is to "*Provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high but every attempt should be made to minimize the impact of activities*"

A weak contrast is acceptable in areas managed by VRM Class IV objectives.

The project should consider mitigation described below.

Additional Mitigating Measures (See item 3)

- Consider painting towers Shadow Grey (Standard Environmental Color Chart CC-001:June 2008, BLM/WY/ST-08/015+8450)
- Consider an FAA-approved Audio Visual Warning System (AVWS) to eliminate need for tower lighting when painted a non-white color.

Form 8400-4

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date: 13 January, 2011

SECTION A. PROJECT INFORMATION

1. Project Name Terra SW	5. Location Sketch
2. Key Observation Point Kulukak Repeater	
3. VRM Class N/A	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Rugged mountains; triangular Flattened river valley	Smooth and flattened Trees on river valley appear linear and symmetrical	None
LINE	Bold, diagonal; jagged; Appears contiguous along ridgelines Bold horizontal lines where mountains meet lowland river valley	Bold, irregular edge at upper elevation distribution Vertical lines from trees; flowing and clumped distribution in lowlands	Not Applicable
COLOR	Grey/brown; saturated	Green; Yellow/Orange; Grey (trunks)	Not Applicable
TEX-TURE	Coarse and granular	Smooth; contiguous Trees appear course	Not Applicable

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES (Assumed, not Simulated)
FORM	Identical to that described in Section B	Identical to that described in Section B	Isolated; indistinct
LINE	Identical to that described in Section B	Identical to that described in Section B	Vertical tower; horizontal and vertical auxiliary structures.
COLOR	Identical to that described in Section B	Identical to that described in Section B	Grey, white
TEX-TURE	Identical to that described in Section B	Identical to that described in Section B	smooth

SECTION D. CONTRAST RATING __SHORT TERM X LONG TERM

1. DEGREE OF CONTRAST		FEATURES											
		LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM				X				X				X
	LINE				X				X			X	
	COLOR				X				X				X
	TEXTURE				X				X				X

1. VRM Class: IV

2. Does project design meet visual resource management objectives? _X_Yes ___No
(Explain on reverses side)

3. Additional mitigating measures recommended
_X__Yes ___No (Explain on reverses side)

Evaluator's Names Date

SECTION D. (Continued)

Comments from item 2.

The goal of VRM Class IV Objectives is to "*Provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high but every attempt should be made to minimize the impact of activities*"

A weak contrast is acceptable in areas managed by VRM Class IV objectives.

The project should consider mitigation described below.

Additional Mitigating Measures (See item 3)

- Consider painting towers Shadow Grey (Standard Environmental Color Chart CC-001:June 2008, BLM/WY/ST-08/015+8450)

- Consider an FAA-approved Audio Visual Warning System (AVWS) to eliminate need for tower lighting when painted a non-white color.

Form 8400-4

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date: 13 January, 2011

SECTION A. PROJECT INFORMATION

1. Project Name Terra SW	5. Location Sketch
2. Key Observation Point Kulukak Repeater-2 (5.7 miles from project site)	
3. VRM Class N/A	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Rugged mountains; triangular	Smooth and flattened	None
LINE	Bold, diagonal, horizontal; jagged silhouette, appearing contiguous along ridgelines	Irregular; patchy	Not Applicable
COLOR	Grey/brown; saturated	Green; Yellow/Orange	Not Applicable
TEX-TURE	Coarse and granular	soft	Not Applicable

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES (Assumed, not Simulated)
FORM	Identical to that described in Section B	Identical to that described in Section B	Isolated; indistinct
LINE	Identical to that described in Section B	Identical to that described in Section B	Vertical tower; horizontal and vertical auxiliary structures.
COLOR	Identical to that described in Section B	Identical to that described in Section B	Grey, white
TEX-TURE	Identical to that described in Section B	Identical to that described in Section B	smooth

SECTION D. CONTRAST RATING __SHORT TERM X LONG TERM

1. DEGREE OF CONTRAST	FEATURES: LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS: FORM				X				X			X	
LINE				X				X			X	
COLOR				X				X			X	
TEXTURE				X				X			X	

1. VRM Class: IV

2. Does project design meet visual resource management objectives? _X _Yes ___No (Explain on reverses side)

3. Additional mitigating measures recommended _X__Yes ___No (Explain on reverses side)

Evaluator’s Names Date

SECTION D. (Continued)

Comments from item 2.

The goal of VRM Class IV Objectives is to “*Provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high but every attempt should be made to minimize the impact of activities*”

A weak contrast is acceptable in areas managed by VRM Class IV objectives.

The project should consider mitigation described below.

Additional Mitigating Measures (See item 3)

- Consider painting towers Shadow Grey (Standard Environmental Color Chart CC-001:June 2008, BLM/WY/ST-08/015+8450)
- Consider an FAA-approved Audio Visual Warning System (AVWS) to eliminate need for tower lighting when painted a non-white color.

APPENDIX I

Determination of Impairment
Lake Clark National Park and Preserve

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Determination of Impairment
Lake Clark National Park and Preserve

The Terra-SW Project and Activities Associated with Installation of a Lake-bed Fiber Optic Cable in Lake Clark National Park and Preserve

A determination of impairment is made for each of the resource impact topics carried forward and analyzed for effects in Lake Clark National Park and Preserve in the environmental assessment for the preferred alternative. Only significant resource purposes and values of the park are analyzed in this impairment determination. Such determinations are *not* necessary for visitor experience, socioeconomics, public health and safety, environmental justice, land use, and park operations, etc., because impairment findings relate back to park resources and values. Significant park resources and values are derived from ANILCA Section 201(7) and the October 2009 Foundation Statement for the Park. Key elements for this determination are:

- to protect the watershed necessary to perpetuate a healthy population of red salmon in the headwaters of the Bristol Bay salmon fishery;
- to protect the habitat for and populations of fish and wildlife including but not limited to brown/grizzly bears, bald eagles, and peregrine falcons;
- to maintain the scenic beauty and quality of portions of the Alaska Range and Aleutian Range, including wild rivers and lakes in their natural state;
- to provide opportunities for subsistence uses by local rural residents where such uses are traditional; and
- to protect a tapestry of cultural places woven from 10,000 years of human occupancy that is vital to the cultural and spiritual continuance of the Dena'ina culture and commemorates historical trends beginning with Russian and Euro-American exploration in the late 18th century.

NATURAL RESOURCE TOPICS

Water Quality

Under preferred Alternative 2, increases in turbidity near shore would increase within the Nondalton to Port Alsworth lake-bed cable corridor and the egress point at Port Alsworth during mobilization of the barge in shallow areas, but would likely be of very short duration. Supplies would be offloaded from barges using methods to prevent fuel spills. Impacts to water resources and water quality may occur at Port Alsworth along the shores of Lake Clark. During construction activities impacts to water quality would occur near shore at both the Port Alsworth and Nondalton egress points, and would be highest during construction activities and minor following installation. Direct impacts on water resources and water quality would be of high intensity to a localized area and would include increased turbidity, and potential release of fuel and lubricant compounds near shore of the ingress and egress points. During operations no impacts would be expected to water resources and water quality as a result of operations. Impacts to water quality from decommission activities would be similar to construction.

The potential release of fuel and/or lubricants would exist during construction activities at the ingress and egress points at Lake Clark. Safety management, spill prevention, and spill response practices can reduce risk and impact. If the spill were to occur in wetland or a water body, the impact would likely be longer term (exceeding two years), and larger in extent, and high in intensity. Given the limited temporal and fuel volume risks, the summary impact of a fuel spill would be considered minor.

In summary the effects to water quality would be temporary, localized impacts that would be short term in duration (during construction activities), high in intensity but affecting resources common in context. The summary impact would be considered minor. Because of these minor potential effects to water quality in Lake Clark, the preferred alternative would not result in impairment.

Fisheries

The park provides habitat for many species of fish. A total of 19 resident and anadromous fish species are present in Lake Clark including sockeye salmon, Arctic grayling, lake trout, northern pike, burbot, round whitefish, Chinook salmon, Dolly Varden, and other species as documented in the EA section 3.3.2.2. The dominant fish species in terms of sheer numbers, commercial value, ecological importance, and human use is sockeye salmon.

Fuel spills into Lake Clark from vessels used to lay underwater fiber optic cable would be possible. If such a spill were to occur it could potentially be harmful to fish and fish habitats. Vessels used for this component of the project would be relatively small in size with limited capacity to store fuel onboard, and spill prevention and response procedures would be required. The likelihood of a fuel spill large enough to cause measurable harm to fish or fish habitats would be considered low.

Installation of the fiber optic cable would cause brief disturbance to the Lake Clark cable landfall in Port Alsworth. Sedimentation would be likely to occur due to trenching and underwater hand jetting necessary to secure the cable. These impacts would be expected to be short in duration as disturbed sediments quickly settle. The setting in which these impacts would be expected to occur is at a glacially turbid portion of Lake Clark. In areas where sediment accumulates, cables are often rapidly buried by natural processes or simply settle into soft substrates. Most sockeye salmon spawning areas are at or adjoining the northern end of Lake Clark away from the proposed cable route and away from potential impacts that may be caused by its placement on the lake bed. The action of installing the cable to the lakebed of Lake Clark is not expected to hinder or impede the migration or movement of fish into or within the lakes.

To best avoid impacts, the cable installation activities at the Port Alsworth land fall would avoid the peak period of sockeye salmon spawning which is estimated to occur between September 15 and October 15. Based on hydrographs and water table measures, the mid-August may be the best month for the barge to install the lake-bed cable. While project activities during August would have the potential of conflicting with local subsistence activities, but the estimated rate of progress for the cable installation would result in very short duration (i.e. less than one day) overlaps with subsistence uses at specific locations. Though it may not be logistically feasible to completely avoid overlapping either or both sockeye salmon peak spawning and the peak of subsistence activities, clear communications with the subsistence communities and careful project planning are essential to minimize any potential conflicts. Installation and maintenance of the fiber optic cable would be subject to a special use permit issued by the Superintendent to minimize such adverse effects.

Under Alternative 2 the risk of fuel spills exists but can be managed and mitigated. Barring a fuel spill scenario, the effects of Alternative 2 would be expected to be of minor intensity, localized in extent, short in duration and effecting fish resources that are common. Thus, Alternative 2 would be expected to have minor or negligible impacts to fish and fish habitat. Because of these minor to negligible potential effects to fish resources in Lake Clark, the preferred alternative would not result in impairment.

Wildlife

Installation of the lake-bed optical fiber cable at Lake Clark would occur between August 15, 2011 and September 15, 2011. Installation would primarily occur on a barge, utilizing a tugboat as necessary for positioning, and the cable would be laid on the lakebed. The two onshore segments would require burial with a backhoe to the water line and possibly hand-jetting by divers underwater. Cranes, miscellaneous water transport, pick-up trucks, and ORVs would also be used as supporting equipment. The construction/installation time period would be outside of the bird breeding and nesting season, although molting or staging waterfowl may be present. Other wildlife may be present, as well, using the lake for watering or feeding. Construction activities would be limited to a discrete location, within a large amount of common habitat. Wildlife may be temporarily displaced during construction, but affects would be temporary and low intensity.

Barring a fuel spill scenario, the effects of Alternative 2 would be expected to be of minor intensity, localized in extent, short in duration and effecting only seasonal wildlife using the Lake Clark and its shores. Alternative 2 would be expected to have negligible impacts to wildlife and its habitat. Because of these negligible potential effects to wildlife resources in the Lake Clark area, the preferred alternative would not result in impairment.

Scenic Integrity

For the preferred alternative 2, visual resource effects would be very short term during construction when the barge is on Lake Clark, and the fiber optic cable would be out of sight on the lake bed surface or buried where it egresses and ingresses lake shores. Effects to the scenic integrity of Lake Clark and the surrounding mountain scenery would be negligible. Because of these negligible potential effects to scenery in Lake Clark, the preferred alternative would not result in impairment.

Subsistence

For the proposed project area from Nondalton to Port Alsworth, the sockeye salmon run is an especially important subsistence resource. Section 4.3.2.2 of the EA concluded that direct impacts to the sockeye salmon resource are unlikely, provided that effective measures are taken to avoid fuel spills. Installation of the fiber option cable at the landfall sites in Nondalton and Port Alsworth would cause brief disturbances in sedimentation, due to trenching and underwater hand jetting necessary to secure the cable. However, these impacts would be short in duration, and would likely occur in a glacially turbid portion of Lake Clark. Moreover, most sockeye salmon spawning areas are at or adjoining the northern end of Lake Clark, away from the proposed cable route. With effective consultation with local communities, the cable-laying activity in Lake Clark can be managed with no expected displacement of sockeye salmon subsistence harvests. Once installed, the lake-bed cable in Lake Clark would not limit access or activities involved in subsistence fishing. The scale of the proposed project is such that a small workforce, including local hires as possible, would be expected to complete construction during a few days. The project would not bring a new permanent workforce to the region. For these reasons, the proposed project would not be expected to increase competition for subsistence resources in the project area.

Alternative 2 would have effects on subsistence uses of high intensity and short-duration, but in a very small area and affecting resources that are common in context. The summary impact of Alternative 2 on subsistence would be considered negligible. Because of the negligible potential effects to subsistence uses in Lake Clark, the preferred alternative would not result in impairment.

Cultural Resources

Bathymetric survey data of Lake Clark indicated that the area that would be disturbed during installation of the fiber optic cable through trenching is unlikely to contain archaeological sites. As a result, there would be no direct or indirect impacts to submerged cultural resources along the proposed cable route.

There were seven terrestrial cultural resources identified within one mile of the cable landing site in Port Alsworth. Given the information gathered about these cultural resource sites during field surveys in 2010, there was no additional cultural resource work recommended associated with the development of Alternative 2. As known sites, construction activities would be conducted in a manner to avoid any impact to these cultural resources. There are no impacts to cultural resources associated with the construction, operation, or decommissioning of Alternative 2.

Taking into account construction methods that avoid known cultural resources sites, implementation of Alternative 2 would have no impacts to cultural resources. There would be no adverse effects to cultural resources in the Lake Clark area, and the preferred alternative would not result in impairment.

SUMMARY

As described above, adverse impacts anticipated as a result of the preferred alternative on a resource or value whose conservation is necessary to fulfill specific park purposes identified in ANILCA, which are key to the natural or cultural integrity of the park and opportunities for enjoyment of the park, or identified as significant in the park’s general management plan or foundation statement, would not rise to levels that would constitute impairment.