United States Department of the Interior

U.S. FISH AND WILDLIFE SERVICE
Southern Alaska Fish and Wildlife Field Office
4700 BLM Road
Anchorage, Alaska 99507

In Reply Refer to:
FWS/R7/FES/SAFWFO

Genevieve Rozhon
Principal Consultant
Environmental Resources Management, Inc.
A980 9th Street, Suite 750
Sacramento, California 95814

Subject: Airraq Network Extension Phase 3 and Kotlik Telecommunications Cable and Fiber-Optic Interconnect, Alaska (Consultation Number 2023-0060288-02)

Dear Genevieve Rozhon:

Thank you for your November 7, 2025, letter requesting informal consultation with the U.S. Fish and Wildlife Service (Service), pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq., as amended; ESA). Unicom, Inc. (Unicom), in cooperation with the National Telecommunications and Information Administration (NTIA), and the U.S. Department of Agriculture (USDA) Rural Development Rural Utilities Service proposes to extend existing broadband service within the Airraq Network from Nunapitchuk to the Villages of Mertarvik, Toksook Bay, Tununak, Emmonak, and Kotlik, with routes selected to avoid passing through the Kuskokwim Delta National Wildlife Refuge (NWR). The NTIA has designated Unicom and Environmental Resources Management, Inc. (ERM) as their non-Federal representatives. You have determined the proposed project may affect but is not likely to adversely affect the federally threatened polar bear (*Ursus maritimus*) and its critical habitat, short-tailed albatross (*Phoebastria albatrus*), spectacled eider (*Somateria fischeri*), and Steller's eider (*Polysticta stelleri*).

Consultation History

Expansion of the broadband network in Alaska has been conducted in phases due to timing of individual funding opportunities and sources. The NTIA and Unicom have worked with the Service and different consulting agencies for ESA pre-planning and consultation. The following is a summary of the ESA consultation history for the Airraq Network:

- June 1, 2023: Unicom and HDR Engineering, Inc. consulted with the Service on the Airraq Phase 1 and Phase 2 (Consultation Number 2023-0060288-01).
- February 18, 2025: A pre-planning meeting was held between the Service, Unicom, and ERM to discuss ESA-listed species and potential routes for the next phases.
- November 7, 2025: The ERM requested consultation on the Airraq Phase 3 and Airraq Kotlik routes (Figure 1).

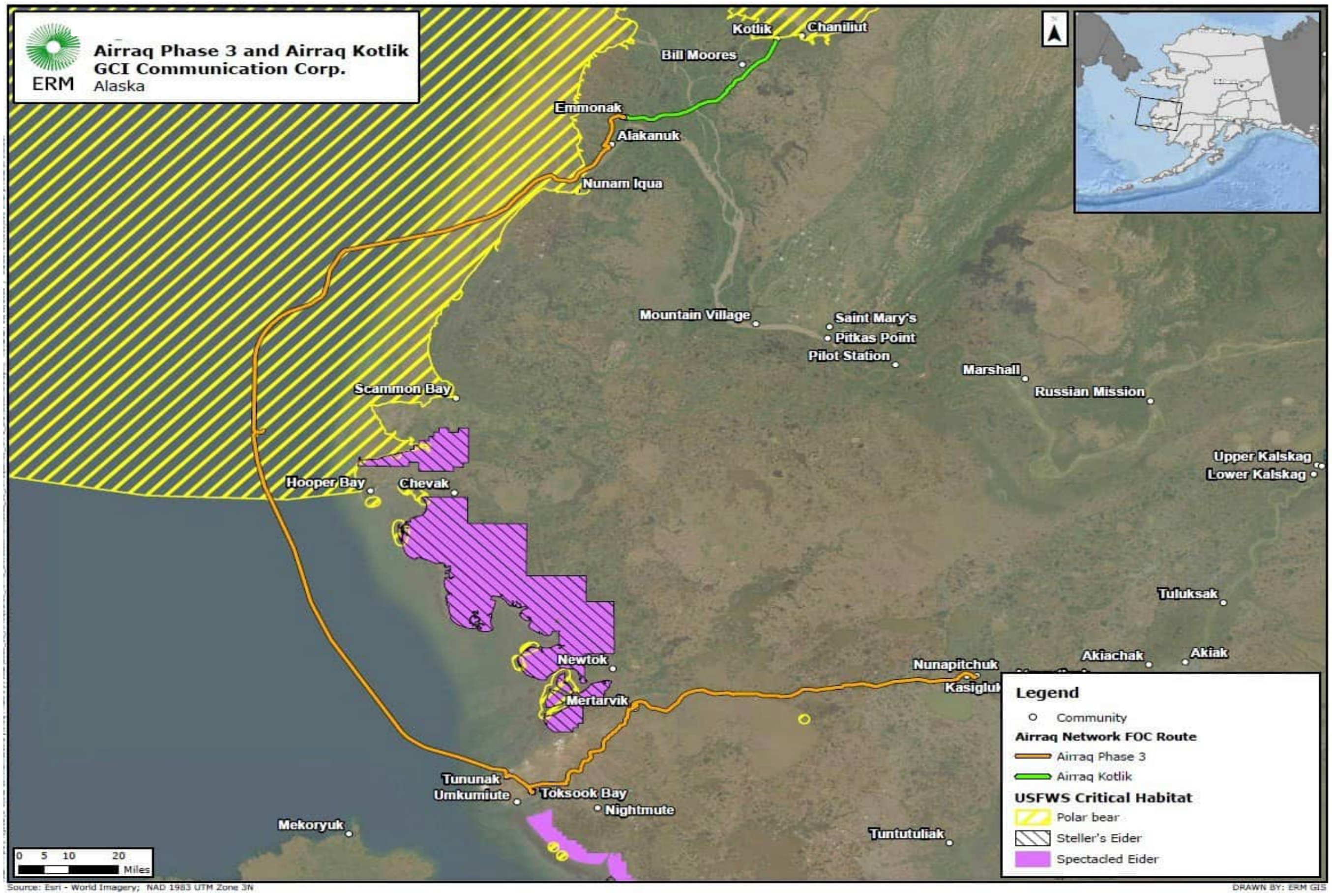

Figure 1. Airraq Phase 3 and Kotlik Routes (Valencia et al. 2025).

Project Description

The Airraq Phase 3 and Kotlik routes would extend broadband to coastal communities. Routes include marine and terrestrial installation of approximately 400 miles (643.7 kilometers [km]) of fiber-optic cable (FOC).

- The Airraq Phase 3 route includes approximately 238.2 miles (383.3 km) of FOC in the marine environment and 116.2 miles (187.0 km) overland.
- The Kotlik route includes 45 miles (72.4 km) of FOC installed overland. Installation activities include laying surface cable (terrestrial and marine), chain trencher burial, cable burial, diver burial, conduit burial, backhoe trenching, and aerial attachment.
- A total of approximately 27 miles (43.5 km) of cable would be installed aerially, using existing utility poles. Where utility poles are not present, the route would be trenched.

Cable installation is scheduled over consecutive years, 2026 through 2028. Sites may be accessed by marine vessel, small boat, and helicopter. Construction vehicles include rubber wheel backhoes, tracked excavators, utility trucks and trailers, and light tracked vehicles. Routes include terrestrial landscapes, including landfall, overland, community shore, and fiber to community lines. Overland segments cross wetlands, lakes, ponds, and streams. Overland routes would be installed during winter; if the ground is not frozen, trenching would not take place in tundra. Marine cable would be installed during summer when ice is not present. Marine vessels would operate at speeds up to 2 knots (3.7 km per hour) during installation and up to 10 knots (18.5 km per hour) during transit.

Mitigation Measures

As detailed in the ERM 2025 Biological Assessment (Valencia et al. 2025), Unicom will implement Service-recommended best management practices (BMPs) for broadband projects to minimize impacts (USFWS 2024a) and recommendations to avoid potential effects on ESA-listed species (USFWS 2024b), with key measures in the following bullets:

- The overland cable routes will be laid or trenched in winter when ESA-listed eiders are not present onshore and to avoid or minimize impacts to vegetation and wildlife.
- The project footprint will be minimized by using already disturbed areas or lower-quality habitats whenever possible. Infrastructure will be collocated in existing disturbed areas such as rights-of-way (e.g., use of road corridors for utilities, placing new antennas on existing towers, and locating new structures near existing ones).
- Project materials such as fill, aggregate, and erosion control materials will be carefully managed to prevent the introduction of invasive plants and seeds. Certified weed-free hay and gravel will be used to further reduce the risk of infestation.
- Artificial lighting will be reduced or shielded so it is not projected skyward to reduce attracting birds.
- The cable-laying vessels will not discharge materials into the ocean that may attract seabirds, including short-tailed albatross.
- Vessels will not allow unused or loose tow lines to remain in the water, thereby reducing the potential for entanglement.
- Deck lighting of vessels will be minimized, and lights will be shielded to direct illumination inboard and downward to the extent possible.
- Project activities will adhere to BMPs for minimizing impacts to polar bears and minimizing human-bear conflicts (USFWS 2024b).
- Precautions will be taken to minimize encounters with polar bears, particularly within 25 miles (40 km) of the coastline and farther inland during the denning period (November to April).
- If a sow and cubs of the year are observed, operations will cease within a 1-mile (1.6-km) exclusion zone, and the Service will be notified.
- Bear deterrence plans will be prepared for implementation in the event that a polar bear approaches. All personnel working in polar bear habitat will receive appropriate bear safety training.
- Personnel will be especially vigilant for swimming polar bears while operating vessels. Vessels will avoid traveling in the same direction as a polar bear, will maintain the

maximum distance possible from polar bears, will reduce speed, and will avoid sudden changes in travel direction when visibility is low.

Unicom will also implement the following measures intended to reduce the potential for spills of hazardous materials and implement spill response plans:

- All fuel and hazardous substances used will be handled and stored on site in compliance with State and Federal regulatory guidance. All fuels and chemicals will be stored in appropriate primary containment areas. Secondary containment areas will be designed in compliance with all applicable permits and regulations.
- Fuels and other products will be transported to the action area using a licensed, commercial transporter following U.S. Department of Transportation regulations for safe transport of materials to minimize spill risk.

ESA-listed Species

Polar Bear

Polar bears use sea ice, marine waters, and terrestrial areas throughout the Arctic. Sea ice is used as a platform for hunting and feeding, seeking mates and breeding, denning, resting, and long-distance movements. Areas near ice edges, leads, or polynyas (open sea areas surrounded by ice) where ocean depth is minimal are productive hunting grounds (Durner et al. 2004). Some polar bears occur seasonally in ice-free environments and use land habitats for varying portions of the year; however, they are more likely to be encountered within 25 miles (40 km) of the coastline, especially along barrier islands July through October. Polar bears, especially females and females with cubs, may be encountered farther inland during the winter denning period (November to April).

Polar Bear Critical Habitat

Polar bear critical habitat was federally designated on December 7, 2010 (75 FR 76086). Three units were identified: Unit 1 - Sea-ice Habitat, used for feeding, breeding, denning, and movements with sea ice; Unit 2 - Terrestrial Denning Habitat, which includes sea ice in proximity of terrestrial denning habitat prior to the onset of denning during the fall; and Unit 3 - Barrier Island Habitat, used for denning, refuge from human disturbance, and movements along the coast to access maternal dens and optimal feeding habitat.

The majority of the action area is located outside the designated polar bear critical habitat. Marine cable laying activities are proposed to occur over spring and summer in water shoreward of pack ice, and therefore, outside the timing and geographical scope of critical habitat Unit 1 and Unit 2. Terrestrial activities are proposed to occur over winter and may occur during shoulder seasons of ice formation and break up. The action area is within the southern portion of Unit 3, which is used for denning, refuge from human disturbance, and includes all barrier islands along the Alaska coast and their associated spits, and the water, ice, and land within 1 mile (1.6 km) of these islands.

Polar bears are particularly sensitive to human disturbance during denning. Den selection and use is related to seasonal timing of pack ice and conditions. Females search for potential den sites, which may be relatively close to the sea-ice edge, in fall when sea ice is at its minimum (75 FR 76086). Polar bears could be exposed to human presence and vessels transiting in waters nearby, possibly reducing the value of the habitat for den selection.

Unicom will incorporate the Service's BMPs for polar bears to ensure precautions are taken to minimize encounters and maintain distance buffers to avoid polar bears. Given the lack of overlap in proximity and timing of activities, and mitigation to avoid polar bears, we expect encounters with polar bears in critical habitat would be unlikely.

In summary, we expect effects on polar bears would be minor (i.e., would not result in injury or death of an individual), temporary (i.e., would not significantly disrupt normal behaviors feeding, breeding, moving, and sheltering), and therefore insignificant and effects on polar bear critical habitat to be discountable.

<u>Short-tailed Albatross</u>

Short-tailed albatrosses spend the majority of their lives over water in the North Pacific. They are surface feeders, soaring along wind currents above the waves, searching along continental shelf breaks and areas of upwelling for prey that churns up on the sea surface. They do not breed in the U.S. but forage extensively and spend considerable time in Alaskan waters along continental shelf breaks and slope regions of the Bering Sea. The largest threat to albatrosses is mortality and injury related to commercial fisheries, especially hook-and-line fisheries when bait is slow to sink, and albatrosses can get hooked and drown. They are also injured by trawl fishery activities, particularly when they are focused on competition for potential food at the water's surface and collide with vessel gear and wires. Other threats include ingestion of plastics, habitat degradation, and contamination by oil and other pollutants.

The short-tailed albatross is unlikely to be encountered. The action area does not overlap concentration areas of the short-tailed albatross, and proposed activities are not expected to attract individual birds. We anticipate effects to the short-tailed albatross to be discountable.

<u>Spectacled and Steller's Eiders</u>

Spectacled eiders are medium-sized sea ducks that remain at open sea or in polynyas (areas of open water in sea ice covered regions), or open leads (more temporary breaks in the sea ice) of the northern Bering Sea from November through March and April. As open water becomes available in spring, breeding pairs move to nesting areas on wet, coastal tundra. Nesting typically occurs between March and August each year. During the breeding season, hens and broods feed in freshwater ponds and wetlands where they eat aquatic insects, crustaceans, and vegetation (Petersen et al. 1991). Migration routes are primarily located offshore. Molting occurs in nearshore waters with flocks gathering to feed in shallow areas along coasts. Although most spectacled eiders are primarily flightless during molting, some flight activity occurs between nests and feeding areas.

The Steller's eider is a small sea duck that spends most of its life in the marine environment, occupying terrestrial habitats only during the nesting season (USFWS 2019). Steller's eiders nest on the Alaska Coastal Plain, near Utqiaġvik. A western subpopulation has historically nested in western Alaska; however, this population is now limited to a small area on the Yukon-Kuskokwim Delta with less than 50 adult individuals (USFWS 2019). After breeding, Steller's eiders migrate from nesting grounds to marine waters where they undergo a complete molt. Migration routes are primarily located offshore. Molting occurs in nearshore waters with flocks gathering to feed in shallow areas along the coast, and individuals remain flightless for about three weeks, from late July until late October (Petersen 1981). Most individuals then disperse further south to wintering grounds throughout the Aleutian Islands, Alaska Peninsula, and western Gulf of Alaska beginning as early as August. Spring migration and staging near nesting grounds generally occurs April to May.

The action area is within the range of spectacled eiders and Steller's eiders. In this area these species have similar use patterns, and project-related activities could disturb staging and nesting eiders if eiders are present during activities. Scheduling terrestrial activities over winter when eiders are not expected to be nesting would help minimize effects to nesting eiders. Marine-based activities are scheduled to occur during spring, summer, and fall; therefore, they could disturb eiders during staging and molting. The risk of eiders colliding with marine vessels increases during fall while eiders are migrating. Scheduling marine activities over summer when eiders are nesting, and down-shielding onshore and vessel lights would minimize this risk. Spills or releases of hazardous materials could injure or kill eiders or degrade foraging habitat. Implementing spill prevention and response measures would minimize the potential for this effect.

Minimization measures, BMPs, and timing are planned so that activities would occur outside of the core spatial and temporal areas of highest use to reduce the likelihood of encounters with listed eiders. We expect effects on spectacled eiders and Steller's eiders would be minor (i.e., not result in injury or death of an individual) and temporary (i.e., not significantly disrupt normal feeding, breeding, moving, and sheltering behaviors), and therefore insignificant.

Conclusion

After reviewing the proposed project and avoidance and mitigation measures, and evaluating the anticipated effects, the Service concurs with your determination that the proposed project is not likely to adversely affect the polar bear and its critical habitat, short-tailed albatross, spectacled eider, and Steller's eider. Based on your request and our response, requirements of section 7 of the ESA have been satisfied. However, if new information reveals that project impacts may affect listed species or critical habitat in a manner or to an extent not previously considered, or if this action is subsequently modified in a manner which was not considered in this assessment, or if a new species is listed or critical habitat designated that may be affected by the proposed action, section 7 consultation should be reinitiated.

This letter relates only to federally listed or proposed species and/or designated or proposed critical habitat under jurisdiction of the Service. It does not address species under the jurisdiction of the National Marine Fisheries Service, or other legislation or responsibilities under the Fish and Wildlife Coordination Act, Migratory Bird Treaty Act, Marine Mammal Protection Act, Clean Water Act, National Environmental Policy Act, or Bald and Golden Eagle Protection Act.

Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat regarding development of information.

- Where overhead wires and guy lines are needed, use bird flight diverters that are durable and visible to reduce collision risk. The type and spacing of diverters will affect the degree to which collision risk is reduced. Diverters with demonstrated utility in extremely cold and windy environments, similar to FireFlyTM, are encouraged.
- Avoid listed eiders and/or their nests by 656 feet (200 meters) between June 1 and July 31 while in eider habitat on the Yukon-Kuskokwim Delta.
- During marine operations avoid listed species on water. Be vigilant for swimming polar bears, low-flying birds, and birds on the water when vessels of any size are underway.
- Where eiders are present, operate vessels at slow speeds (10 knots [18.5 km per hour] or less) and maintain a distance of 0.3 mile (500 meters) or greater, as practicable.
- Never deliberately operate a vessel at any rate of speed heading directly toward a protected species.
    a. Deploy and/or assign wildlife observers on large vessels involved in response when operating in and near polar bear critical habitat and listed eider marine critical habitat. Observers would be expected to notify vessel operators about presence of polar bears and eiders (or groups of unidentified sea ducks on the water), record sightings, and ensure best practices are implemented to minimize impacts.
    b. While operating skiffs in nearshore areas, vigilantly scan the water surface ahead of the skiff. Place someone in the bow to help the skiff operator search.
- In the nearshore environment, minimize activities that would impact areas of eelgrass, including through turbidity and sedimentation during debris removal or construction, or mechanical disturbance related to vessel traffic.
- If operating aircraft (including helicopters, unmanned systems and/or drones):
    a. Avoid landing helicopters or airplanes within 1,969 feet (600 meters) of listed eiders and/or their nests from June 1 to July 31.
    b. Pilots of all aircraft types should fly at the maximum distance possible from polar bears. Under no circumstances, other than an emergency, should aircraft operate at an altitude of lower than 1,500 feet (457 m) within 0.5 mile (805 meters) of polar bears observed on ice or land.

- Document any effects to listed species, their prey, and habitat. Include: location, time of year, response activity and method, species affected, habitat type, and a description of effects including anticipated duration.
- Report any take (e.g., injury, killing of eiders or loss of eggs, nests) to the local U.S. Fish and Wildlife Office of Law Enforcement (https://www.fws.gov/law-enforcement/special-agent-charge-anchorage-alaska) and to ak_fisheries@fws.gov.
- Report all polar bear sightings, encounters, and incidents to the Service, Marine Mammals Management at 907-786-3800 or FW7_MMM_Reports@fws.gov (cc: amy_kirkham@fws.gov). Reports are mandatory if polar bears are harassed or harmed in an incident, and all sighting reports are helpful. Any injury or death of a bear related to human activities must be reported as soon as possible and no later than 48 hours after occurrence
- If desired, Marine Mammals Management is available to assist with developing a polar bear interaction plan and should also be contacted if activities may need authorization for incidental take of polar bears under the Marine Mammal Protection Act, including due to intentional, non-lethal take of polar bears (i.e., through non-lethal deterrence): R7mmmregulatory@fws.gov.

If you have questions or need more information, please contact Fish and Wildlife Biologist, Jennifer Spegon, at jennifer_j_spegon@fws.gov and refer to Consultation Number 2023-0060288-02.

Sincerely,

DOUGLASS COOPER

Digitally signed by DOUGLASS COOPER
Date: 2026.01.14 13:24:09 -09'00'

Douglass M. Cooper
Ecological Services Branch Chief

Literature Cited

Durner, G.M., S.C. Amstrup, R.M. Nielson, and T. McDonald. 2004. Using discrete choice modeling to generate resource selection functions for female polar bears in the Beaufort Sea. Pages 107–120 *in* Resource selection methods and applications: Proceedings of the 1st International Conference on Resource Selection. Available at: https://pubs.usgs.gov/publication/70189285.

Petersen, M.R. 1981. Populations, Feeding Ecology and Molt of Steller's Eiders. The Condor 83:256–262.

Petersen, M.R., D.N. Weir, and M. Dick. 1991. Birds of the Kilbuck and Ahklun Mountain Region, Alaska. North American Fauna 76:159.

USFWS (U.S. Fish and Wildlife Service). 2019. Status assessment of the Alaska breeding population of Steller's eiders. Northern Alaska Fish and Wildlife Field Office, Fairbanks, Alaska.

USFWS. 2024a. Technical Assistance for Broadband Projects. Alaska Region. Accessed: December 15, 2025. Available at: https://www.fws.gov/service/technical-assistancebroadband-.projects.

USFWS. 2024b. Best management practices to minimize impacts to polar bears. USFWS-Alaska Marine Mammals Management Office. Accessed: December 15, 2025. Available at: https://www.fws.gov/sites/default/files/documents/2024-10/usfws-best-managementpractices-to-minimize-impacts-to-polar-bears_2024.pdf.

Valencia, T., G. Rozhon, D. Allen, and J. Leety. 2025. Biological Assessment. Airraq 3 and Kotlik Fiber-Optic Cable Interconnect. ERM prepared for Unicom, Inc. November 7, 2025. pp. 223.

Danna Allen

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Cc:	Thomas Valencia; Leigh Ann Boswell; Danna Allen; Annie Surratt; Jeff Leety; anthony.high@usda.gov; natalie.kovach; Valerie Haragan
Subject:	USFWS Section 7 Consultation - Airraq Telecommunications Cable Project
Attachments:	Airraq3_USFWS_BA_compiledpdf_Optimized.pdf
Categories:	GCI

Good evening,

Attached please find the Biological Assessment we've prepared in support of Section 7 consultation for this project. The USDA Rural Utility Service, the project's federal lead agency, has delegated authority to us to facilitate this consultation.

Here is a brief summary of the project details:

Unicom, Inc., a wholly owned subsidiary of GCI Communications Corporation, proposes to bring high-speed broadband internet service to Alaska's Yukon Kuskokwim Coastal communities as Phase 3 (RUS Project AK1706-C73/Application Number 101001351), and Airraq Kotlik (RUS Project AK1706-E61/Application Number 101001859) of the Airraq Network. The project will extend the existing Airraq Network by installing approximately 400 miles (643.7 kilometers [km]) of fiber-optic cable (FOC) starting in Nunapitchuk and extending to Mertarvik, Tununak, Toksook Bay, Alakanuk, and Emmonak. The route includes both terrestrial and marine components.

We understand that many federal employees are currently furloughed and that you may not be able to review this document immediately. However, our client has requested that we submit it now so it will be available to you upon your return to the office.

Please don't hesitate to reach out if you have any questions once you're back.

Best regards,
Genevieve Rozhon

Sustainability is our business

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U.S. Fish and Wildlife Service Biological Assessment

Airraq 3 and Airraq Kotlik Fiber-Optic Cable Interconnect

PREPARED FOR
Unicom, Inc.

DATE
7 November 2025

REFERENCE
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SIGNATURE PAGE

U.S. Fish and Wildlife Service Biological Assessment

Airraq 3 and Kotlik Fiber-Optic Cable Interconnect

0742901

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ACRONYMS AND ABBREVIATIONS

Acronym	Description
ACP	Arctic Coastal Plain
BA	biological assessment
BMP	best management practice
BU	branching unit
BV	beach vault
CLS	cable landing station
cm	centimeter
CO	central office
CV	connection vault
DA	double armor
dB	decibels
dBA	A-weighted decibels
dB re 1 μPa	decibels referenced to 1 micropascal
dB_{rms}	decibels root mean square
ESA	Endangered Species Act
FE	federally endangered
FOC	fiber-optic cable
FR	Federal Register
ft	foot/feet
FTTx	Fiber to the ‘x’
HTL	high tide line
IPaC	Information for Planning and Consultation
km	kilometer
m	meter
MLW	mean low water
NE	no effect
NEP	nonessential experimental population
NMFS	National Marine Fisheries Service
OHW	ordinary high water
PCE	primary constituent element

Acronym	Description
PLGR	pre-lay grapnel run
Project	Airraq Phase 3 and Airraq Kotlik of the Airraq Network
PSLM	Practical Spreading Loss Model
PTS	permanent threshold shift
RD	Rural Development
RUS	Rural Utilities Service
SB	Scammon Bay
T	Tununak
TB	Tooksook Bay
TBD	to be determined
TTS	temporary threshold shift
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
VOO	Vessel of Opportunity

EXECUTIVE SUMMARY

Unicom, Inc., a wholly owned subsidiary of GCI Communications Corporation, proposes to bring high-speed broadband internet service to Alaska's Yukon Kuskokwim Coastal communities as Airraq Phase 3 (RUS Project AK1706-C73/Application Number 101001351), and Airraq Kotlik (RUS Project AK1706-E61/Application Number 101001859) of the Airraq Network (Project). The Project will extend the existing Airraq Network by installing approximately 400 miles (643.7 kilometers) of fiber-optic cable starting in Nunapitchuk and extending to Mertarvik, Tununak, Toksook Bay, Alakanuk, and Emmonak (Airraq Phase 3); and install approximately 45 miles (72.4 kilometers) of fiber-optic cable from Emmonak to Kotlik (Airraq Kotlik). The U.S. Department of Agriculture (USDA) Rural Development Rural Utilities Service (RUS) has awarded a grant to Unicom for the Project through the RUS ReConnect program, thereby making the Project a federal action.

Under the federal Endangered Species Act (ESA), the USDA-RUS is required to consult with the U.S. Fish and Wildlife Service (USFWS) to determine whether any federally listed endangered, threatened, proposed, or candidate species, or their designated critical habitats could be affected by the proposed Project and whether the effects of the proposed Project could jeopardize any listed or candidate species or result in the destruction or adverse modification of designated critical habitat. This Biological Assessment (BA) has been prepared to facilitate consultation between the USDA-RUS (and Environmental Resources Management, Inc., the USDA-RUS designated federal representative for ESA consultation; see Appendix A) and the USFWS under Section 7 of the ESA.

This BA has been prepared with reference to information retrieved from the USFWS Information for Planning and Consultation website. The probable presence of listed species was further evaluated by reviewing publicly available data from the state of Alaska, stock assessments, other BAs and biological opinions developed for the region, species distribution spatial data, aerial photographs, bathymetric maps, and recent scientific literature. The actual occurrence of a species in the Project vicinity would depend on multiple factors, such as the presence of suitable habitat, the season of the year, and the species' distinct migratory habits. This BA represents the initiation consultation between the USDA-RUS and USFWS.

Federally threatened and endangered species and one nonessential experimental population with the potential to occur in the Project area were analyzed in this BA. Species assessed include two mammals and three birds. The findings of this analysis are summarized in Table ES-1 below, which includes the status of designated critical habitat within the Action Area and the effect determination for each species. Effect determinations consider the Project design, cable installation methods, and the proposed avoidance and minimization measures to be implemented by the Project.

TABLE ES-1 POTENTIALLY AFFECTED SPECIES AND EFFECT DETERMINATIONS

Species	Federal Status	Is action likely to adversely affect species?	Is action likely to destroy or adversely modify critical habitat?
Mammals			
Polar bear (*Ursus maritimus*)	Threatened	No	No
Wood bison (*Bison bison athabascae*)	Nonessential Experimental Population[1]	No	N/A
Birds			
Short-tailed Albatross *(Phoebastria* [=*Diomedea*[2]] *albatrus*)	Endangered	No	N/A
Spectacled Eider (*Somateria fischeri*)	Threatened	No	No
Steller’s Eider (*Polysticta stelleri*)	Threatened	No	No

Notes:
N/A = not applicable (denotes that species do not have areas designated as critical habitat by USFWS)
[1] This designation refers to a reintroduced population of an endangered or threatened species that is considered experimental and is not considered crucial for the species' continued existence.
[2] This is a synonymous genus.

1. INTRODUCTION

Unicom, Inc., a wholly owned subsidiary of GCI Communications Corporation, proposes to bring high-speed broadband internet service to Alaska’s Yukon Kuskokwim Coastal communities as Airraq Phase 3 (RUS Project AK1706-C73/Application Number 101001351) and Airraq Kotlik (RUS Project AK1706-E61/Application Number 101001859) of the Airraq Network (Project).

The Project will extend the existing Airraq Network by installing approximately 400 miles (643.7 kilometers [km]) of fiber-optic cable (FOC) starting in Nunapitchuk and extending to Mertarvik, Tununak, Toksook Bay, Alakanuk, and Emmonak (Appendix B, Figure 1). The route between Nunapitchuk and Mertarvik will be predominately overland (52 miles [83.7 km]), combined with a shorter submerged portion (approximately 24 miles [38.6 km]) through Baird Inlet. From Mertarvik, the Project will be routed overland and terminate at Tununak, with a T-junction on the pole line to Toksook Bay. The route from Tununak to Alakanuk would be entirely marine (215 miles [346 km]). The termination of the submarine cable will be in Alakanuk via coming up Yukon River and coming ashore near Dump Dock Road. From Alakanuk to Emmonak, a cable will be installed on poles on an existing power line to Emmonak. Airraq Phase 3 would also include approximately 9 miles (14.5 km) of the Fiber to the ‘x’ (FTTx) that Unicom would route throughout the community, connecting to local node splitters. The node splitters enable branching into feeder lines that deliver connectivity to the premise locations in Tununak, Toksook Bay, and Emmonak. The Kotlik component of the Project will extend the FOC 45 miles (72.4 km) from Emmonak to Kotlik, using a predominantly overland route through the Kwikpak Pass and heading north adjacent to the Kotlik River before reaching Kotlik. Airraq Kotlik would also include approximately 4 miles (6.4 km) of FTTx throughout the community.

The purpose of this Biological Assessment (BA) is to provide technical information and to review the Project in sufficient detail to determine to what extent federally threatened, endangered, or candidate species and/or their critical habitats may be affected. In addition, the BA is intended to support the USDA-RUS Endangered Species Act (ESA) consultation with the U.S. Fish and Wildlife Service (USFWS). This BA has been prepared in accordance with the legal requirements found in Section 7(a)(2) of the ESA (50 Code of Federal Regulations Part 402; 16 United States Code §1536 [c]).

A detailed Project description is provided in Section 2.2. The Airraq 3 portion of the Project is currently estimated to be completed within an approximately 12-month time period from summer/fall of 2026 through summer/fall of 2027, and the Kotlik component is estimated to take place over a 10 to 12-month period from winter 2027/2028 through the end of 2028. The Airraq 3 construction activities will require both summer and winter work, while Kotlik construction activities will take place in the winter.

1.1 PURPOSE AND NEED

The purpose of the Project is to deliver fast, reliable broadband service to Emmonak, Kotlik, Toksook Bay, and Tununak Alaska Native Village Statistical Areas and socially vulnerable communities in the Bethel and Kusilvak Census Areas, as part of a program that meets grant funding requirements provided by RUS ReConnect. The Proposed Action would aid in providing broadband service in rural areas that do not have sufficient access while facilitating the expansion of broadband services and infrastructure, fueling rural economic development within these communities, benefiting approximately 2,127 people, 33 businesses and five educational facilities.

The FOC network will provide capacity to meet the increased need for the availability of fast and reliable broadband service to residents of rural communities. By extending the existing Airraq Network in Nunapitchuk to Mertarvik, Tununak, Toksook Bay, Alakanuk, Emmonak, and Kotlik, the Project will achieve the following:

- Increase direct data communication links;
- Increase data communications reliability;
- Increase diversity of data communication pathways;
- Increase data transmission capacity and speeds to satisfy burgeoning demands; and
- Respond to increasing demand for connectivity.

1.2 DEFINITIONS

Definitions of key terms used throughout this BA are as follows:

- Project Area: Area of direct Project construction effects within the terrestrial and marine environment (Appendix B, Figure 1).
- Action Area: Area directly or indirectly affected by the Project. A full description of the Action Area is provided in Section 2 (Appendix B, Figure 2).
- Project or Proposed Action: The installation of 400 miles (643.7km) of FOC, extending the existing Airraq telecommunications network (Airraq 1 and 2) from Nunapitchuk to Mertarvik, Toksook Bay, Tununak, Alakanuk, and Emmonak; and 45 miles (72.4 km) of FOC extending the Airraq 3 Network from Emmonak to Kotlik.

1.3 CONSULTATION HISTORY

On February 18, 2025, a pre-application meeting was held between Environmental Resources Management, Inc., Unicom, and USFWS scientists Jennifer Spegon, Douglass Cooper, Kaitlyn Howell, and Sarah Markegard. During this meeting, the proposed Project route map was presented, installation methods were discussed, potential constraints were reviewed, and questions related to the ESA Section 7 consultation were addressed. The USFWS representatives verified that appropriate species and potential effects were being considered, that the proposed timeline for the Project was realistic, and that there were no additional data sources the team was missing.

2. DESCRIPTION OF THE ACTION AREA

The Action Area is defined in 50 Code of Federal Regulations Part 402.02 as “all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action.” For the purposes of this BA, the Action Area was defined by analyzing the potential extent of effects of the proposed Project in the context of existing infrastructure, habitat suitability, and species sensitivity to human-caused disturbance.

Project effects considered in the development of the Action Area include vessel traffic, cable entanglement, artificial light, water quality (including changes in turbidity), substrate disturbance, potential spills of fuel or other hazardous substances, underwater noise, habitat disturbance or loss, effects on habitats of prey of threatened and endangered species, and anthropogenic presence and disturbance. The Action Area for this BA includes the marine and terrestrial Project footprint, which is the 400 miles (643.7 km) of FOC, which will interconnect with the existing Airraq Network in Nunapitchuk and extend it to Mertarvik, Toksook Bay, Tununak, Emmonak, and Kotlik.

On land, the Project footprint includes a 250-foot (ft; 76 meter [m]) buffer off either side of the Project alignment to allow for potential route adjustments and represents the area within which the cable could be placed. The Action Area is delineated by an additional 397 ft (121 meters [m]) buffer off either side of this Project footprint to account for the area within which terrestrial species could be exposed to Project-generated in-air noise (Appendix B, Figure 2).

In the marine environment, the Project footprint includes a 1,312-ft (400-m) buffer off either side of the Project alignment (i.e., the cable could be placed anywhere within this corridor area, allowing for micrositing). The Action Area is delineated by an additional 70.67 ft (21.54 meters) buffer off either side of the Project footprint to account for the area within which marine species could be exposed to level Project-generated underwater noise. (Appendix B, Figure 2).

The terrestrial and marine potions of the Action Area were developed to include the area within which any potential direct or indirect Project effects could occur.

2.1 ACTION AREA BASELINE CONDITIONS AND EXISTING THREATS

2.1.1 TERRESTRIAL ENVIRONMENT

2.1.1.1 CABLE LANDING LOCATIONS - HABITAT

The cable will make landfall in Mertarvik, Tununak, and Alakanuk. The landfall portion of the Action Area is comprised of a variety of habitats such as beaches, tidal mudflats, coastal wetlands, and salt marshes, which provide habitats for many aquatic and terrestrial wildlife species. In Tununak, the cable makes landfall along the beach within the Tununak community in the vicinity of residential development (Appendix B, Figure 3). The Alaska ShoreZone Coastal Inventory and Mapping Project, a database of images, video, and maps of Alaska’s coastline, characterizes the nearshore environment of the Action Area in Tununak as an exposed tidal flat of semi-protected mobile sediment (NOAA Fisheries 2024). The habitat class of semi-protected sediment indicates no epibenthic macro-biota (i.e., species living on or near the substrate’s surface) were observed

(Cook et al. 2017), but the tidal flat likely supports an epibenthic community of microfauna (i.e., microscopic organisms living on or just above the bottom sediments) typical for coastal tidal flats in Alaska. At the northern end of the route near Alakanuk, the cable makes landfall within the Yukon-Kuskokwim Delta where the Yukon River meets the Bering Sea (Appendix B, Figure 4). Habitat at these locations is characterized as mostly salt and brackish marsh and is classified as semi-protected sediment (NOAA Fisheries 2024). These landfall locations are not adjacent to or within communities.

2.1.1.2 OVERLAND CABLE ROUTE – HABITAT

Further inland, the Action Area, located in the Yukon-Kuskokwim Coastal Lowland, features permafrost, organic-rich soils, and a landscape shaped by glacial and volcanic formations (BLM 2020; Wilson et al. 2015). The Yukon and Kuskokwim River Deltas, located in a coastal plain, consist of streams, rivers, lakes, and wetlands. The Action Area intersects a variety of freshwater wetlands, including lacustrine, riverine, and freshwater emergent marshes. This area features diverse freshwater wetlands, including shrub wetlands, dwarf shrub peat lowlands, wet graminoid communities, and emergent marshes around lakes, floodplains, and depressions. These conditions (including wet organic plains, poorly developed soils, and discontinuous permafrost) create unique terrestrial habitats that support diverse ecosystems. The combination of cold climate, organic soil layers, and varying geology creates an environment conducive to specialized habitats for local flora and fauna (BLM 2020).

Vegetation in the Action Area is primarily characterized by low shrub vegetation communities. Dominant species include willows (*Salix* spp.) and alders (*Alnus* spp.), with bog myrtle (*Myrica gale*) as a subdominant species. Dwarf shrubs such as dwarf birch and various ericaceous plants, including Labrador tea (*Ledum* spp.), berries (*Vaccinium* spp.), and crowberries (*Empetrum* spp.), are also common. Herbaceous plants like sedges (*Eriophorum* spp., *Carex aquatilis*), reed grass (*Calamagrostis* spp.), cloudberries (*Rubus chamaemorus*), and Arctic butterbur (*Petasites frigidus*) are found in the area.

2.1.1.3 ANTHROPOGENIC NOISE

The existing noise environment within the terrestrial portion of the Action Area is characterized by natural ambient sounds including environmental sounds (e.g., wind) and animal-produced sounds (e.g., bird calls), as well as noise generated by small, developed communities. In undeveloped areas, natural sounds are expected to vary from 45 to 70 A-weighted decibels (dBA), an expression of the relative loudness of sounds perceived by humans that gives more value to frequencies near the middle of the human range of hearing. Though studies of natural ambient sound within the Yukon-Kuskokwim Delta are not available, a study in Kenai National Wildlife Refuge to the south determined that the terrestrial soundscape averaged 45.1 dBA, while some bird calls can exceed 70 dBA (USEPA 1974; NPS 2000; USFWS 2010a). In contrast, in developed areas, anthropogenic sound in the Action Area may consist of occasional human-made noise from ship engines (70 to 90 decibels [dBs]), snowmachines (60 to 79 dB), all-terrain vehicles (65 to 90 dB), and low-flying aircraft (below 91 dB at 500 ft [152.4 m]) (Kuyek 2015; PAME 2019; Nicholas 2021). Within communities, more frequent anthropogenic noise sources include vehicle idling (58 dB), construction equipment (80 to 120 dB), and diesel generators (USEPA 1971; Przydatek et al. 2023). While noise levels remain relatively low in remote wilderness areas, anthropogenic sounds intermittently disrupt the natural soundscape, with potential implications for wildlife noise exposure.

2.1.1.4 AIR QUALITY

Although there are no air quality monitoring stations in the Action Area, monitoring stations further inland indicate that current air quality conditions are generally good, and that monitored communities meet federal and state air quality standards (ADEC 2025). Since the Action Area is remote, there are few major sources of air pollution, and most emissions would come from local activities such as vehicle travel, fires, and windblown dust. The nearest air quality monitoring station to the Action Area is in Bethel (~145 km east of Mertarvik), which recorded one instance of high particulate matter 2.5 (i.e., $PM_{2.5}$) levels due to wildfire smoke between 2018 and 2020 but no issues with particulate matter 10 (i.e., PM_{10}) (ADEC 2023, 2024). Particulate matter, which comes from sources such as fires, road dust, and combustion, is a common concern in local communities, and the Alaska Department of Environmental Conservation has programs to help reduce emissions in rural areas.

2.1.1.5 FRESHWATER AQUATIC RESOURCES AND WATER QUALITY

Freshwater habitats within the Action Area are comprised of wetlands, lakes, rivers, and streams and include grass sloughs and shrub swamps throughout the Yukon-Kuskokwim Delta. Much of the freshwater habitat within western Alaska, including the Action Area, is comprised of palustrine emergent or palustrine scrub/shrub wetlands (Hall et al. 1994). These wetlands are often underlain by permafrost and will freeze during the fall and winter months when temperatures are low. The Yukon-Kuskokwim River Delta region experiences seasonal flooding due to permafrost thaw and precipitation (FEMA 2023; Hall et al. 1994; USGS 2023). The water quality of the Yukon-Kuskokwim Delta, particularly in the Yukon River Watershed, has historically been considered clean but the rise of pollutants from mining, military development, and global commerce services have increased the potential for contaminant release into the watershed (Duffy et al. 2018).

2.1.2 MARINE ENVIRONMENT

The nearshore marine environment within the Action Area includes the open water habitat of Nushagak Bay, Bristol Bay, and Kuskokwim Bay, all of which open to the Bering Sea. These bays are bordered by over 1,020 acres of marine wetlands. The coastal regions spanning from Dillingham to the Kuskokwim River have a variety of habitats such as beaches, tidal mudflats, coastal wetlands, and salt marshes. In Nushagak Bay, freshwater out-welling maintains cooler temperatures in the spring, while nutrient-rich discharge supports aquatic vegetation such as eelgrass and kelp (NMFS 2013). Kuskokwim Bay, influenced by glaciated drainages, experiences significant tides and is subject to freezing in winter, with temperatures dropping as low as 29 degrees Fahrenheit (USFWS 2012b).

Eroding cliffs and seasonal fish processing contribute to turbidity in Nushagak Bay, further exacerbated by dredging at Dillingham Harbor (Hartwell et al. 2017). Rising sea levels and reduced sea ice are driving coastal erosion, with storm surges and marine water influxes accelerating the process and promoting erosion in coastal wetlands (USEPA 2023; USDA 2023). Flooding in marine areas is influenced by storm-driven flood tides, particularly during the spring breakup and late fall. These storm surges, combined with the low-lying coastal landscape, can lead to significant erosion and disruption of intertidal and estuarine habitats (USGS 2023). The rising water levels can further affect marine wetland ecosystems and local species (FEMA 2023).

2.1.2.1 ANTHROPOGENIC NOISE

The marine acoustic environment in the Action Area changes seasonally. During ice-covered months, sounds from ice cracking, shearing, and fracturing dominate due to large-scale ice motion caused by weather conditions. In ice-free months, natural noise primarily comes from wind and breaking waves, with wind contributions increasing over the past 25 years due to shifts in atmospheric pressure systems. Anthropogenic noise, mainly from fishing and transit vessels, is most prevalent during ice-free months. Marine waters in the Action Area experience varying vessel traffic, with high activity in Nushagak Bay during the commercial salmon fishing season and local communities' reliance on barges for commerce and transportation (USACE 2008, 2009). Vessel noise, typically reaching a maximum of 195 decibels referenced to 1 micropascal (dB re 1 μPa) at 3.3 ft (1 m), is primarily generated by cavitation, a phenomenon where air bubbles collapse due to rapidly moving propeller blades. Within the Action Area, small aircraft are also present and can generate in-air noise, with planes producing 70 to 120 dBA, depending on altitude and engine type (Patenaude et al. 2002; Bhagarathi et al. 2024). Overall, the current soundscape of the marine regions of the Action Area consists of both natural and human-made non-impulsive sounds.

2.1.2.2 AIR AND WATER QUALITY

Small and single-engine offshore vessels used for fishing and transit operate in the Action Area and may contribute to air emissions that include carbon monoxide, nitrogen oxides, particulate matter, volatile organic compounds, and greenhouse gases. While offshore regions generally experience good air quality due to minimal industrial activity, vessel emissions can have localized effects, particularly in nearshore environments and areas with frequent marine traffic. Marine waters in the Action Area are susceptible to localized water turbidity from naturally occurring sediment inputs, combined with seasonal freshwater outflows.

2.1.2.3 VESSEL TRAFFIC

The Bering Sea supports an important intercontinental trade route between Asia and North America (Burns and Poe 2014) and consequently experiences significant vessel traffic. Although much of the shipping traffic occurs in the vicinity of the Aleutians to the south of the Action Area, a significant proportion of it moves into the more northern reaches of the Bering Sea through the Unimak Pass (Schwehr and McGillivary 2007). Vessel traffic in the Bering Sea has exhibited a notable upward trend that is expected to continue as the extent and duration of sea ice has been reduced by climate change, opening up shipping routes that were historically blocked by ice (Ng et al. 2018; Kapsar et al. 2023). In addition to commercial shipping vessels, the Bering Sea has the highest fishing vessel activity of any waterway in the Arctic, with thousands of fishing vessels and stern trawlers operating in the region each year (Silber and Adams 2019). Vessel traffic occurs across over 96 percent of the Bering Sea's surface, with most transits being short duration trips by fishing vessels (over 11,000 annually) and the most common non-fishing vessel traffic being bulk carriers, followed by cellular container ships (Silber and Adams 2019).

2.1.2.4 SEA ICE

Sea ice begins forming in the Bering Sea in the fall (October to November) and generally melts in the spring (March to April), though the timing and extent can vary year to year (Kearney et al. 2021). Ice may extend all the way to the shoreline (i.e., shorefast ice), which provides local communities with access to marine habitats for subsistence fishing and hunting. Historically, the Bering Sea has experienced a maximum winter sea ice cover of 40 to 10 percent (Thoman et al. 2020). This sea ice plays a significant role in regulating climate by insulating marine waters from extremely low atmospheric temperatures (Thoman et al. 2020) and is also critically important for numerous species of marine mammal, including listed ringed seals (Kelly et al. 2010) and bearded seals (Cameron et al. 2010). Ice also serves as a surface for algal growth that plays an important role in initiating biological productivity (Szymanski and Gradinger 2016). In recent years, however, global climate change and associated warming of ocean temperatures have reduced the extent of sea ice in the Bering Sea, leading to a peak ice cover extent in 2018 that was only 47 percent of the mean extent based on historical records (Thoman et al. 2020). Landfast sea ice in the Action Area offshore of the Yukon-Kuskowim Delta has exhibited an average width of approximately 5.5 miles (8.9 km), though this landfast sea ice has notably been exhibiting a trend of forming later in the year and breaking up earlier in the year (Jensen et al. 2020). Multiple studies have shown that Bering Sea ice exhibits greater interannual variability than sea ice in the Chukchi and Beaufort Seas to the north (Frey et al. 2015; Jensen et al. 2020).

2.1.2.5 BENTHIC HABITATS

A bathymetric survey of the marine FOC route plus an approximately 1,312-ft (400-m) buffer to allow for potential route adjustments around sensitive features was performed by Benthic GeoScience, Inc. during the summer of 2024. The survey covered the FOC route starting approximately 11 miles (17.7 km) from shore in the south to approximately 16 miles (25.8 km) from shore in the north (Appendix C; Benthic GeoScience, Inc. 2024). This survey provided data on the benthic environment along the majority (~84 percent) of the offshore portion of the Action Area, covering approximately 136.7 miles (220 km) of the planned 163.7-mile (263.4-km) cable route that runs roughly parallel to the shore between Tununak and Alakanuk.

The survey found that seafloor bathymetry consisted of slopes less than 8 degrees, except in localized areas along the edges of features on the seafloor with relief of approximately 3.3 ft (1 m) over short distances. The depth of the surveyed area varied minimally, ranging from 22.3 to 84.3 ft (6.8 to 25.7 m). The seafloor was comprised primarily of featureless, soft bottom areas interspersed with structures such as boulders and scours caused by bottom currents and/or storm events. Starting from the southern end of the surveyed route, the first 71.5 miles (115 km) of the seabed along the route is characterized by featureless areas interspersed with boulder fields, boulder-cored pits, seabed pits, and sand ribbons. North of this reach, the seabed is characterized by current scours and ice wedge polygons. This scoured seabed continues until 112.5 miles (181 km) from the southern end of the surveyed area, and beyond that point current scours alternate with featureless seafloor for another 9.3 miles (15 km). For the next 6.1 miles (10 km) northward, the seafloor is marked with shallow depressions, followed by 0.6 mile (1 km) of featureless, soft sediment seafloor. For the next 16.2 miles (26 km), the seabed is scoured before changing to featureless, soft bottom substrate for the final 23 miles (37 km) to the northern terminus of the surveyed area (Benthic Geoscience, Inc. 2024).

The substrates along the surveyed portion of the marine route were primarily fine sand; however, the southern half of the route had substrates comprised of fine sand with shell fragments, occasional shell beds, and trace silt. In the northern portion of the surveyed route, the substrates were still comprised primarily of fine sand, but silt and sandy silt were interspersed throughout the seabed due to the proximity of the mouth of the Yukon River. Boulders were most abundant in the southern portion of the surveyed area, with several large boulder fields near the southern terminus and individual or small groups of boulders scattered throughout the rest of the surveyed area (Benthic Geoscience, Inc. 2024).

Although these bathymetric surveys did not provide data on the community of benthic species present in the Action Area, shallow areas along the Bering Sea shelf are known to contain an exceptionally high biomass of benthic fauna, with polychaetes, crustaceans, and sea urchins being the dominant groups in these waters (Lin et al. 2018). Additional nearshore surveys are planned for the seasonal ice-free period in the summer of 2025.

2.2 DETAILED PROJECT DESCRIPTION

2.2.1 PROPOSED ACTION

The Proposed Action will consist of funding Airraq Phase 3 and Airraq Kotlik of the Airraq Network (Appendix B, Figure 1). Airraq Phase 3 of the Airraq Network (RUS Project AK1706-C73/Application Number 101001351) will include installation of approximately 400 miles (643.7 km) of FOC, which will interconnect with the existing Airraq Network in Nunapitchuk, extending it to Mertarvik, Tununak, Toksook Bay, Alakanuk, and Emmonak (Appendix B, Figure 1).

From the point of interconnection with the Airraq Network in Nunapitchuk, the Project route will be extended to Mertarvik. This route would be predominately overland (52 miles [83.7 km]); however approximately 24 miles (38.6 km) of the route would be submerged and installed through Baird Inlet. From Mertarvik, the route would be overland and terminate at Tununak with a T-junction on the pole line to Toksook Bay. The route from Tununak to Alakanuk would be entirely marine (215 miles [346 km]). The termination of the submarine cable will be in Alakanuk via coming up Yukon River and coming ashore near Dump Dock Road. From Alakanuk to Emmonak, a cable will be installed on poles on an existing power line to Emmonak. Alternative routes from the offshore waters to Emmonak must be considered based on marine surveys and the presence of cable(s) installed by others. Airraq Phase 3 would also include approximately 9 miles (14.5 km) of the Fiber to the ‘x’ [FTTx] which would be routed throughout the community, connecting to local nodes where splitters enable branching into feeder lines that deliver connectivity to the premise locations in Tununak, Toksook Bay, and Emmonak. Further, two branching units in the marine waters outside of Scammon Bay and Alakanuk will lay the ground work for potential expansion to be delivered in future builds.

Airraq Kotlik (RUS Project AK1706-E61/Application Number 101001859), will include installation of approximately 45 miles (72.4 km) of FOC which would interconnect with the Airraq Phase 3 in Emmonak and extend to Kotlik (Appendix B, Figure 3). This route would be predominately overland (45 miles [72.4 km]); crossing the Kwikpak Pass and heading north adjacent to the Kotlik River before reaching Kotlik. Airraq Kotlik would also include approximately 4 miles (6.4 km) of FTTx throughout the community.

More details on the marine and overland portions of the Proposed Action for Airraq Phase 3 and Airraq Kotlik and the separate proposed cable routes are provided in Table 2.2-1 and Table 2.2-2 below.

TABLE 2.2-1 SUMMARY OF LENGTHS FOR AIRRAQ PHASE 3, INCLUDING ASSOCIATED FACILITIES

Proposed Route	Airraq Phase 3 Project Route	Airraq Phase 3 Total Length—miles (km)	Estimated Area of Impact (acres)[1]
Overland Route			
Airraq Phase 3	Aerial	17.0 (27.4)	0
Airraq Phase 3	Buried- Backhoe	3.0 (4.8)	3.0
Airraq Phase 3	Buried- Chain Trencher	0.2 (0.3)	0.1
Airraq Phase 3	Surface Lay	87.0 (140.0)	0
Airraq Phase 3 FTTx	Aerial	8.0 (12.9)	0
Airraq Phase 3 FTTx	Buried – Backhoe	1.0 (1.6)	1.0
	Total Overland Route	116.2 (187.0)	4.1
Marine Route (includes Baird Inlet and Offshore)[1]			
Airraq Phase 3	Buried - Chain Trencher	0.0 (0.0)	0
Airraq Phase 3	Buried - Diver Burial	0.1 (0.2)	0.02
Airraq Phase 3	Buried - Sea Plow	151 (243.0)	28
Airraq Phase 3	Surface Lay	63 (101.4)	0
Airraq Phase 3 – Baird Inlet	Buried - Diver Burial	0.1 (38.6)	0.02

Proposed Route	Airraq Phase 3 Project Route	Airraq Phase 3 Total Length—miles (km)	Estimated Area of Impact (acres)[1]
Airraq Phase 3 - Baird Inlet	Surface Lay	24 (38.6)	0
	Total Marine Route	238.2 (383.3)	28.04
	Grand Total	354.4 (570.4)	32.14

Notes:

FTTx = Fiber to the ‘x’; km = kilometers

[1] Estimate based on a maximum estimated terrestrial excavation width of 3 feet (i.e., backhoe excavation) plus a sidecast area of 5 feet for a total impact width of 8 feet, though the use of chain trencher in certain areas would result in a narrower trench width (6 inches) and narrower associated sidecast area. Estimates for marine portions of the route assume a maximum width of 1.5 feet will be disturbed by the jet sled or plow. Therefore, these values are likely an overestimate of area of impact.

[2] The Marine Routes of the Project include all proposed cable routes over water which include marine and freshwater environments and the landfall routes which terminate at BVs.

TABLE 2.2-2 SUMMARY OF LENGTHS FOR AIRRAQ KOTLIK PROJECT ROUTE, INCLUDING ASSOCIATED FACILITIES

Proposed Route	Airraq Kotlik Project Route	Airraq Kotlik Total Length—miles (km)	Estimated Area of Impact (acres)[3]
Overland Route			
Airraq Kotlik	Aerial	2.0 (3.2)	0
Airraq Kotlik	Buried - Backhoe	0.1 (0.2)	0.1
Airraq Kotlik	Surface Lay	38.0 (61.2)	0
Airraq Kotlik FTTx	Buried - Backhoe	4.0 (6.4)	0
Grand Total		44.1 (71.0)	0.1

FTTx = Fiber to the ‘x’; km = kilometers

[3]Estimate based on a maximum estimated terrestrial excavation width of 3 feet (i.e., backhoe excavation) plus a sidecast area of 5 feet for a total impact width of 8 feet, though the use of chain trencher in certain areas would result in a narrower trench width (6 inches) and narrower associated sidecast area. Therefore, these values are likely an overestimate of area of impact.

The following sections describe the construction methods and equipment used for the Landfall Route, Overland Route (which includes Community Connections), FTTx, and Marine Route. These methods are anticipated to follow those that were used in Airraq Phase 1 and Airraq Phase 2. The Proposed Action’s Marine Route will be installed during the summer months when the water is not frozen and when no ice accumulation is present. The Proposed Action’s Overland Route will be installed during the winter months when the substrate is frozen, which would result in less ground disturbances and impacts, and trenching activities in the tundra will not take place if the ground is not frozen. The Overland Route does not pass through the Yukon-Kuskokwim Delta National Wildlife Refuge.

2.2.1.1 LANDFALL ROUTE

The Landfall Route segments are between the mean low water (MLW) mark and each beach vault (BV). There will be one BV per landfall location, and each will be pre-cast measuring 3 ft by 4 ft by 4 ft (0.9 m by 1.22 m by 1.22 m) or 48 ft^3 (1.35 m^3) and will be fully buried above the high tide line (HTL). Excavation dimensions may vary by shoreline, bank contours, and substrate but will not exceed 5 ft by 5 ft by 5 ft (1.52 m by 1.52 m by 1.52 m) or 125 ft^3 (3.54 m^3). Divers may be used to assist in transferring the cable from the installation vessel to the landing site. Once the cable is brought ashore, divers are then used to install armor protection and jet bury the cable within the surf zone out to a depth of approximately 10 ft (3 m) of water. Landfall trenching will be conducted with either a chain trencher or backhoe. Chain trenchers dig a trench typically 6 inches (15.24 centimeters [cm]) wide and 36 inches (91.44 cm) deep, while backhoe trenches are 3 feet wide (0.9 m) and 3 feet (0.9 m) deep. When the situation allows, chain trenchers will replace the backhoe for excavation. Chain trenchers excavate smaller trenches and have less associated sidecast. When deemed necessary, additional protection may be provided to the cable at landfall locations with split pipe articulated armor. Chain trenchers and excavators will be staged on landing craft between the high and low water marks.

Up to two 4-inch (10.16-cm) conduits will be placed in the excavated area no deeper than 36 inches (91.44 cm) to extend from the BV seaward to the beach area above MLW, allowing the cables to be pulled into the BV without further disturbing the shoreline. The installation of the conduit will occur prior to the arrival of the cable ship and best management practices (BMPs) will be utilized to prevent erosion and address stormwater runoff concerns. Conduit installation will be conducted in a controlled manner using BMPs prior to the arrival of the cable ship. A maximum of three conduits will be utilized per CLS or CO site (one conduit per cable). Up to 984 ft (300 m) of split pipe articulated armor may also be used in the four landing sites to provide additional protection for the Project cable.

Excavated material from trench construction and BV or connection vault (CV) excavation will be sidecast temporarily (i.e., less than 1 week). In instances where landfall locations require excavation in soft substrates, such as mudflats or beaches composed primarily of other fine sediments, sidecast material will be underlain with geotextile, ice pads, or similar material to allow for removal of the temporary material to the maximum extent practical. Standard trenching techniques will be used to trench and re-grade trenched areas to pre-existing contours. Trench design and backfill methods have been created with the intention of preventing constructed areas from collecting excess water by acting as a drain.

For the cable trench in intertidal and terrestrial areas, anticipated maximum excavation dimensions will be 3 ft (0.91 m) wide by 3 ft (0.91 m) deep, and the maximum sidecast width will be 5 ft (1.52 m), for an overall disturbance width of 8 ft (2.44 m). Once the conduit and BV or CV are installed, or cable has been laid, the sidecast material will be used to bury the conduits or cable. The BVs will be closed for the life of the Project (i.e., 25 years) unless service or maintenance is required. Cable-trenching work within wetlands and waterbodies under U.S. Army Corps of Engineers (USACE) jurisdiction will be considered a temporary impact, and the placement of BVs and CVs will be considered permanent impact. Minimal excess material will be anticipated after compaction of the trench post-construction. Any excess material still present will be disposed of at an upland location. Although not anticipated, horizontal directional drilling may be utilized for installation of cables onshore and/or from onshore to offshore.

For all intertidal work (between MLW and high tide line), care will be taken to protect shorelines from future erosion, and BMPs will be employed to address stormwater runoff concerns. All construction operations will only occur during low tide. Construction mats will be used in areas without firm coarse sediments, such as cobbles and boulders, to protect the sediment from slumping and erosion. Similar mats were used in Airraq Phases 1 and 2 are anticipated to cause temporary compaction with no permanent impacts. All impacts and alterations of shorelines would be temporary. Section 2.2.5 provides a summary of all BMPs planned to be administered during the Project's landfall construction activities to minimize and reduce impacts.

Equipment to be used during each landfall will likely include, but not limited to, the following:

- Rubber wheel backhoe;
- Tracked excavator or backhoe;
- Utility truck and trailer to deliver materials;
- Chain trencher or cable plow;
- Hand tools such as shovels, rakes, and pry bars;
- Survey equipment;
- Winch or turning sheave;
- Small utility boat to run the pull line to the beach;
- Splicing equipment; and
- Shallow draft landing vessel.

Airraq Phase 3

Airraq Phase 3 will include landfall locations at Mertarvik (Appendix B, Figure 5) on the south side of the Ninglick River, Tununak near Allaq and Cemetery Roads (Appendix B, Figure 3) and Alakanuk (Appendix B, Figure 6). Table 2.2-3 provides the BV locations for Airraq Phase 3.

TABLE 2.2-3 AIRRAQ PHASE 3 BV LOCATIONS

BVs	Location (Coordinates)
Mertarvik BV	60.8217, -164.510554
Tununak BV	60.582577, -165.261992
Alakanuk BV	62.68482, - 164.651168

Notes:
Geographic Coordinate System: WGS84; Appendix B, Figures 3, 5, and 6
BV = beach vault

2.2.1.2 OVERLAND ROUTE

The Overland Route refers to the FOC segments that originate and terminate within a BV or a CV, which will splice the incoming submarine cable with the outgoing terrestrial cable and will be used by communities that do not have a BV. Multiple approaches to fiber installation were considered before choosing the Overland Route proposed herein. In addition to the Overland Route, two submarine paths were considered. The first route where the cable would have been laid far enough offshore that conventional, cable ship-based installation methods could be used for a portion of the route. A second river-based route and an entirely tundra-based route were also considered; however, none of these alternative approaches were found to be practicable.

Overland cable-laying activities will result in minor, temporary tundra habitat disturbance. These activities will take place in winter using vehicles that will not cause surface damage to the tundra (e.g., tracked vehicles). Tracked vehicles will be preferentially used over wheeled vehicles because they distribute weight more evenly and exert lower ground pressure, reducing the potential for surface disturbance even in frozen or sensitive areas. All overland routes that cross wetlands will be installed during the winter months when the substrate is frozen, which would result in less ground disturbances and impacts. Overland construction activities will require artificial lighting and may take place 24 hours a day / 7 days a week. The segments spanning wetlands will use a lightweight submarine cable. Cable will be delivered in either 20-ft (6.1-m) International Organization for Standardization shipping containers or on steel reels. The 20-ft (6.1-m) container can hold approximately 132,000 ft (25 miles [40.23 km]) of lightweight cable, and a steel reel has a capacity of approximately 20,000 ft (3.78 mi [6.08 km]). Cable containers or spools will be towed by light tracked vehicles designed for low impact to the ground. A high-density polyethylene coating will be used with the lightweight submarine cables for added protection, which will measure approximately 0.35 inches (0.89 cm) in diameter. Segments will be joined with each other with a splice joint case that will be 10 inches (25.4 cm) in diameter and 6.5 ft (1.98 m) long. The Project cable will be laid on the substrate with additional slack to allow it to more naturally settle on vegetation and conform to changing surface features and environmental conditions.

The Project's overland sections will either be laid across the ground or trenched. The preferred method for installing the overland cable route is to lay the cable directly on the ground surface, which significantly reduces the Project's impacts, especially through wetlands; however, the cable will need to be buried near trails, streambanks and riverbanks, or areas where the cable will be susceptible to damage. The cable will also need to be buried within 0.25 to 0.6 mile (0.40 to 0.97 km) of each community. If permafrost is present during trenching, the trenching will only occur within the vegetative mat above the permafrost, and the permafrost will be left intact.

Where cable-trenching is required over wetlands, the cable route will first be cleared of all areas with deep snow. A trench will then be excavated, and the cable will be laid directly within the trench, which is similar to other trenching methods. The target trench depth will be approximately 8 inches (20.3 cm) deep but may vary depending on the conditions and terrain. Where the cable route crosses lakes and ponds, the cable will be laid over the ice surface with adequate slack to allow the cable to passively drop into the waterbody once the ice melts in the spring. The weight of the cable should allow it to self-bury into the fine sediments at the bottom of the waterbody. Where crossing rivers (i.e., the Yukon River), a submarine cable will be used which will be spliced with the overland cable and buried into each stream back below ordinary high water (OHW) for added protection. Up to 164 ft (50 m) of split pipe articulated armor may also be used around river and stream crossing for added stabilization and protection. Segments crossing major rivers will use a landing craft to lay lightweight submarine cable across the river. Natural sediment transport will passively bury the cable. Major river crossings will be conducted during ice-free periods.

A post-lay inspection for all the terrestrial components of the Project’s cable will be conducted following the snow and ice melts, and the exact position of the cable will be recorded using survey grade Global Positioning System. During the post-lay inspection, any portion of cable that is suspended will be repositioned and supported accordingly. Duckbill anchors may be used in certain areas to anchor the cable to the ground, if needed. All portions of the cable lying on vegetation will sink into the vegetated mat over time, eventually becoming overgrown and buried. Annual inspections of the cable will be conducted via walkthrough or helicopter to monitor erosion and bank failure.

Equipment to be used to install the Project cable across the overland routes includes, but not limited to, the following:

- Piston Bully or similar snow cat or groomer;
- Large sleds to carry 20-ft (6.1-m) cable containers or cable reels;
- Cable highway and payout equipment;
- Rubber wheel backhoe;
- Tracked excavator or backhoe;
- Small bulldozer or other tracked machines to remove snow;
- Utility truck and trailer to deliver materials;
- Light tracked vehicles;
- Chain trencher;
- Hand tools such as shovels, rakes, chainsaws, and pry bars;
- Survey equipment; and
- Splicing equipment.

Airraq Phase 3

The Airraq Phase 3 overland routes will be composed of 14 different FOC segments from Nunapitchuk west to Toksook Bay and Tununak. Cable will be installed through various construction methods, including surface-lay (terrestrial and marine), chain trencher burial, buried cable, diver burial, conduit burial, backhoe trenching, and aerial attachment. The portion of the route between Mertarvik and CV Tundra to Poleline CV will be the longest overland segment and will cross extensive wetlands, lakes, ponds, and streams.

Four communities will have one CV in each community. Table 2.2-4 provides the CV locations for Airraq Phase 3, and Table 2.2-1 above provides the Overland Route cable distances for Airraq Phase 3. Appendix B, Figure 7 shows the Overland Route between Nunapitchuk to Tunanak, and Appendix B, Figure 4 shows the Overland Route near Alakanuk and Emmonak.

TABLE 2.2-4 AIRRAQ PHASE 3 CV LOCATIONS

CVs	Location (Coordinates)
Nunapitchuk CV	60.892691, -162.466307
Mertarvik CV	60.813948, -164.501123
Tununak Poleline CV	60.559827, -164.907474

Notes:
Geographic Coordinate System: WGS84
CV = connection vault

2.2.1.3 AIRRAQ KOTLIK

The Airraq Kotlik overland routes will be composed of three different FOC segments (see Table 2.2-2). Cable will be routed from Emmonak to Emmonak CV on existing utility poles. The portion of the route between Emmonak CV and Kotlik will be the longest overland segment and will be surface-laid across open ground, wetlands, lakes, ponds, rivers, and streams. The segment from Emmonak will be buried from Kotlik CV into Kotlik and then change to an aerial route through Kotlik.

Two communities will have one CV in each community. Table 2.2-5 provides CV locations for Airraq Kotlik, and Table 2.2-2 above provides the Overland Route cable distances for Airraq Kotlik. Appendix B, Figure 8 shows the Overland Route between Emmonak and Kotlik.

TABLE 2.2-5 AIRRAQ KOTLIK CV LOCATIONS

CVs	Location (Coordinates)
Emmonak CV	62°46'25.24"N, 164°29'44.65"W
Kotlik CV	63° 1'24.55"N, 163°33'42.61"W

Notes:
Geographic Coordinate System: WGS84
CV = connection vault

2.2.1.4 COMMUNITY CONNECTIONS

The Project’s community connections include FOC sections between each community’s BV or CV and a cable landing station (CLS) or a central office (CO). This section of cable is referred to as the shore route cable. It is attempted to have the most direct route for the shore route cables. The shore route cable can be part of the FTTx portion of the Project and use standard outside plant construction methods for either aerial or underground installations. A new prefabricated 12 ft by 20 ft (3.6 m by 6.1 m) CLS facility will be constructed within Tununak. Emmonak and

Toksook Bay have existing CO facilities to house the new equipment needed to connect them to the Airraq Network. A new prefabricated CLS facility will also be constructed in Kotlik within a new lease area. In all cases, the splice point between submarine fiber cable and standard land fiber cable will be housed in a watertight splice enclosure within the BV or CV.

A CLS constructed on pilings and a gravel pad can measure up to 50 ft by 60 ft (15.2 m by 18.3 m). Each CLS will be equipped with fully redundant heating, ventilation, and air conditioning, as well as direct current power systems with an 8-hour battery backup. The redundant power generators and transfer switching capability will provide additional resiliency and the quick provision of long-term backup power in the event of a community power grid failure. All facilities will be designed for full-capacity power consumption at commissioning and will not require upgrades as the network carries more traffic. Cable segments within community shore routes will be trenched or attached to existing utility poles and located adjacent to existing Unicom facilities when possible.

The equipment to be used to install the community shore routes includes, but is not limited to, the following:

- Rubber wheel backhoe;
- Tracked excavator or backhoe;
- Utility truck and trailer to deliver materials;
- Light tracked vehicles;
- Chain trencher;
- Hand tools such as shovels, rakes, and pry bars;
- Survey equipment; and
- Splicing equipment.

Airraq Phase 3

Each Airraq Phase 3 community will have one collocated CLS or CO. Each CLS or CO may require an additional generator on a pile platform (see Appendix B, Figure 4). Table 2.2-6 provides the CLS and CO locations for Airraq Phase 3, and Table 2.2-7 provides the community shore route cable distances by community for Airraq Phase 3.

TABLE 2.2-6 AIRRAQ PHASE 3 CLS FACILITY LOCATIONS

CLS	Location (Coordinates)
Tununak CLS	60.585237, -165.251018
Toksook Bay CO (existing)	60.532394, -165.106.875
Emmonak CO (existing)	62.777941, -164.535828

Notes:
Geographic Coordinate System: WGS84
CLS = cable landing station

TABLE 2.2-7 AIRRAQ PHASE 3 COMMUNITY SHORE ROUTE CABLE DISTANCES

Community	Cable Trenched—miles (km)	Cable Attached to Existing Aerials—miles (km)	Total Distance—miles (km)
Tununak BV to CLS	0.06 (0.10)	0.52 (0.84)	0.58 (0.93)

Notes:
BV = beach vault; CLS = cable landing station; km = kilometers

2.2.1.5 AIRRAQ KOTLIK

A new CLS facility for Airraq Kotlik will be located within a new lease area near the existing Earth Station located near coordinates 63.035519, -163.532244.

2.2.2 FIBER TO THE ‘X’

FTTx will begin at the CLS, which houses the FTTx local access distribution equipment. FTTx will then be routed throughout the community, connecting to local nodes where splitters will be installed to enable branching into feeder lines that deliver connectivity to the premise locations.

FTTx will be distributed throughout communities by trenching or attaching the cable to existing utility poles. If possible, no new utility poles will be constructed for the Proposed Action; instead, existing utility poles will be used where present. Where utility poles are not present, the FTTx route will be trenched.

The equipment that will be used to install FTTx includes, but is not limited to, the following:

- Rubber wheel backhoe;
- Tracked excavator or backhoe;
- Utility truck and trailer to deliver materials;
- Light tracked vehicles;
- Chain trencher;
- Hand tools such as shovels, rakes, and pry bars;
- Survey equipment; and
- Splicing equipment.

2.2.2.1 AIRRAQ PHASE 3

FTTx installation will occur in Toksook Bay, Tununak, and Emmonak. Table 2.2-8 provides FTTx cable distances for Airraq Phase 3.

TABLE 2.2-8 AIRRAQ PHASE 3 FTTX CABLE DISTANCES

Community	Trenched FTTx—miles (km)	Aerial Hanging FTTx—miles (km)	Total FTTx—miles (km)
Toksook Bay	0.3 (0.48)	3.3 (5.31)	3.5 (5.63)
Tununak	0.00	1.2 (1.93)	1.2 (1.93)

Community	Trenched FTTx—miles (km)	Aerial Hanging FTTx—miles (km)	Total FTTx—miles (km)
Emmonak	0.4 (0.64)	3.4 (5.47)	3.9 (6.27)

Notes:
FTTx = Fiber to the ‘x’; km = kilometer

2.2.2.2 AIRRAQ KOTLIK

FTTx installation will occur in Kotlik. Table 2.2-9 provides FTTx cable distances for Kotlik.

TABLE 2.2-9 AIRRAQ KOTLIK FTTX CABLE DISTANCES

Community	Cable Trenched—miles (km)	Cable Attached to Existing Aerials—miles (km)	Total Distance—miles (km)
Kotlik	4.00 (6.44)	0.00 (0.00)	4.00 (6.44)

Notes:
km = kilometers

2.2.3 MARINE ROUTE—AIRRAQ PHASE 3 ONLY

The Airraq Phase 3 Marine Route is defined as components taking place below MLW. The Proposed Action Alternative will consist of two marine components: the route between Nunapitchuk and Mertarvik, in which a portion of the route will be installed through Baird Inlet; and the route between Tununak and Alakanuk, which will consist of two branching units that will be installed in the Bering Sea. The path chosen for the Marine Route was identified through desktop studies and a marine route benthic survey (IT Telecom 2024,; Benthic GeoScience, Inc. 2024). These engineering and field studies assist in selecting routes that provide consideration for environmental and anthropogenic forms of disturbance on the cable system that may lead to the cable fault. Fishing activities have been identified by the International Cable Protection Committee as the primary cause for submarine faults and repairs (ICPC 2025). As such, the proposed route identified through desktop and benthic surveys avoids high-impact fishing grounds where possible, and the Project’s cable will be buried where ground fishing areas could not be avoided. The identified cable route also utilizes nearshore areas and landfalls that have relatively low energy (wave and tidal energy), have low rates of erosion, are not developed, and are not defined anchorage areas for vessels. Geophysical reviews were also conducted for the route, and considerations were made to avoid areas prone to sediment slumping, fast currents, and other geological hazards. External aggression from the effects of seasonal ice has been identified as the highest risk to the cable in this region and both desktop study and marine survey will allow the route to avoid any areas identified with high ice scaring. If unavoidable, then the cable will require additional protection through higher armoring and cable burial. Historical Automatic Identification System data and the discussions of local mariners are used to avoid anchoring and barge landing areas, which can be a concern for cable safety.

2.2.3.1 PRE-LAY GRAPNEL RUN

Prior to cable burial, a PLGR will be carried out to identify and remove any debris within the proposed cable route to allow an easier installation process. PLGR is conducted by pulling a grapnel along the route over the seabed (Appendix B, Figure 9). Any debris identified by the PLGR will be collected and discharged onshore in accordance with local regulations. If the debris cannot be recovered, then the proposed route will be adjusted to avoid the debris. All industry standards for deploying towed grapnels will be adhered to during the PLGR operation, and the exact type and size of grapnel will be determined based on the specific characteristics of the seabed, but it is likely a flatfish grapnel (~39.8 inches wide by 25.6 inches long) will be utilized.

2.2.3.2 MARINE CABLE ROUTE INSTALLATION

Installing the cable along the Marine Route will rely on up to four vessels in different phases of construction and navigation. Cable installation vessels may use ports in Unalaska, Homer, Seward, or other ports, depending on the contractors used. The cable-laying method for the cable in the Marine Route will be dependent on water depth and location. Most of the offshore Marine Route (in water greater than approximately 30 ft [9.1 m]) will be installed using a full-size cable ship (C.S. IT Intrepid or IT Infinity) (Appendix B, Figure 10) that will rely on dynamic positioning. The nearshore segments of the Project’s cable route (less than 340 ft [103.6 m]), such as within Baird Inlet and approaching Alakanuk and Tununak, will be installed using either a tug and barge, a small landing craft stored on the cable ship, or a separate operation using an Alaska Vessel of Opportunity (VOO). The VOO will have a shallow draft and the ability to be grounded on mud flats, but an ideal vessel will be a larger landing craft such as the M/V Polar Bear or M/V Unalaq. These vessels have a shallow draft and large carrying capacity, making shallow waters and landings more accessible with the ability to lay longer lengths of cable at one time.

In the Project’s offshore Marine Route in water depths greater than 30 ft (9.1 m), the cable will be installed by either laying it on the seafloor or burying it by inserting it into the sediment using a cable sea plow. Laying the cable on the seafloor will be carried out within areas that have low risk of cable disturbance or where the geological conditions of the seafloor do not allow for plow burial (e.g., steep grades or bedrock). When laying the cable on the seafloor, a cable ship will be used with engineered slack to ensure the cable conforms to contours of the seafloor.

In areas where the risk of outside aggression to the cable is present (i.e., popular fishing or anchoring locations) or areas of ice scaring, a cable plow will be used to install the cable below the seafloor. The cable plow will be pulled along the seafloor by a tow wire connected to the cable ship. The cable will be fed through the plow’s share blade, penetrating the seafloor sediments under the plow up to 5 ft (1.5 m) deep through a plow share approximately 1 ft (0.3 m) wide. The cable will exit the lower aft end of the share blade, and the sediments will immediately collapse on top of the cable behind the plow. It is currently estimated that up to 115 miles (185.1 km) of cable will be buried using this method, and the remainder will be surface-laid.

In waters with depths less than 30 ft (9.1 m), the Project’s cable will either be surface laid where there is a low risk of disturbance or be buried through areas where additional protection from environmental conditions such as surf action and ice scour are needed. Where burial is required, a water jet sled operated from a landing craft or barge system may be used to install the cable below the seafloor. Pressurized water will be used to liquefy substrate on the seafloor and turn the fine sediments into a slurry, and the cable will then sink into the trench. The jet sled will be a self-propelled system, and the pressurized water will be supplied from the surface through pressurized hoses, allowing for the jetting pressure and flow rates to be controlled based on benthic conditions. Divers will accompany the jet sled to monitor the trenching performance and assist in operations. Appendix B, Figure 11 shows a typical jet sled. For marine cable-laying, the use of a plow or jet sled to trench and re-cover the cable up to 1.5 ft (0.5 m) deep in soft sediments means that no sidecast will be generated.

In waters along the Project's cable routes that are very shallow (3 m / 10 ft or less) or constrained, a smaller shallow draft vessel will be deployed to install the cable. In these shallow areas, the cable will either be surface-laid in areas with low risk of disturbance or buried using divers and hand jetting tools near villages or areas of known vessel anchoring activities. Divers will be used to facilitate cable shore landing at landfall sites. The Project's marine cable will measure approximately 1 inch (2.5 cm) in diameter, will be constructed from benign materials, and will not carry an electrical current. Landfall construction activities will take place in July and August.

2.2.4 CONSTRUCTION SCHEDULE

Unicom anticipates initiating construction for Airraq Phase 3 during the summer/fall of 2026 and completing by the end of 2027. Unicom anticipates initiating construction for Airraq Kotlik during the winter of 2027/2028; the FTTx construction is to be determined with final design. It is anticipated Airraq Kotlik construction will be completed by the end of 2028. Construction activities will take place primarily during daylight hours for the marine components and primarily during nighttime hours for the overland components in the winter months. Additional details involving the construction activities scheduled are provided in Table 2.2-10 below.

TABLE 2.2-10 AIRRAQ PHASE 3 AND AIRRAQ KOTLIK PROPOSED CONSTRUCTION SCHEDULE

Project Phase	Component	Season
Airraq Phase 3	CLS Work	Summer/Fall 2026
Airraq Phase 3	FTTx Tununak	Summer/Fall 2026
Airraq Phase 3	Marine Installation—Baird Inlet	Late Summer/Fall 2026
Airraq Phase 3	Overland, Tundra Lay	Winter 2026/2027
Airraq Phase 3	Marine Installation Tununak to Alakanak	Summer 2027
Airraq Phase 3	FTTx—Toksook Bay and Emmonak	Summer/Fall 2026 or 2027
Airraq Kotlik	Emmonak to Kotlik	Winter 2027/2028
Airraq Kotlik	FTTx Kotlik	Summer/Fall 2027 or 2028

Notes:
CLS = cable landing station; FTTx= Fiber to the 'x'

2.2.5 CONSERVATION MEASURES

Unicom, Inc. will implement BMPs and measures to avoid or minimize the effects of the Proposed Action on ESA-listed species and their habitats. These include the 2024 USFWS BMPs for broadband projects (included as Appendix E and key measures reprinted below), as well as additional BMPs suggested below.

2.2.5.1 ONSHORE/LANDFALL MEASURES

General BMPs

Spill Contingency and Hazardous Substances

- All fuel and hazardous substances used by the Project will be handled and stored on-site in compliance with state and federal regulatory guidance. All fuels and chemicals will be stored in appropriate primary containment areas. Secondary containment areas will be designed in compliance with all applicable permits and regulations.
- Fuels and other products will be transported to the Action Area using a licensed, commercial transporter following U.S. Department of Transportation regulations for safe transport of materials to minimize spill risk.
- To fulfill Federal and State reporting requirements, all onshore spills of oil, petroleum, or other hazardous substances, of any size, should be reported to the National Response Center (1-800-424-8802) and the Alaska Department of Environmental Conservation Spill Reporting Hotline (1-800-478-9300).

Equipment Use and Site Restoration

- Equipment access will be limited to the immediate Action Area. Tracked vehicles are preferred over wheeled vehicles to avoid soil compaction.
- Temporary fills will be removed in their entirety, and the affected areas will be returned to pre-construction elevations.
- The overland route will be inspected after breakup to ensure the cable is not suspended within water crossings but instead conforms to waterbody contours and terrestrial segments.

Aquatic Resource Protections

Construction and Excavation Requirements

- Excavated material will be stored and contained in uplands when practical. Stockpiled materials must be placed on construction cloth rather than directly on bare marsh surfaces, eelgrass, macroalgae, or other submerged aquatic vegetation.
- Heavy equipment working within wetlands or mudflats must be placed on mats or other measures taken to minimize soil disturbance.
- Temporarily impacted wetlands will be restored to pre-existing conditions (e.g., hydrology, grade, and vegetation).

Shoreline and Wetland Protection

- Disturbed shoreline and streambank areas affected by this Action will be restored to pre-construction contours and stabilized to prevent erosion and sedimentation.
- Existing rights-of-way will be used whenever possible to reduce wetland encroachment and disturbance.
- Natural drainage patterns will be maintained using appropriate methods. Excessive ponding or drying adjacent to fill areas will indicate non-compliance with this condition.

Waterbody Protection and Compliance

- All exposed soil and fills, as well as any work below OHW, will be permanently stabilized at the earliest practicable date.
- Structures or materials will not be placed in streams to facilitate crossings.
- Winter crossings will only occur if ice thickness is sufficient to support the equipment. Open water crossings with equipment and vehicles during winter will not occur.
- Equipment will not be fueled or serviced below OHW of permitted waterbodies. Fuel storage is also prohibited below OHW. Any vehicles leaking fuel, hydraulic fluids, or other pollutants will not be operated below OHW.

Terrestrial Broadband BMPs

Construction Timing and Techniques

- The overland cable routes will be laid or trenched in winter when ESA-listed bird species are not present onshore, and to avoid or minimize impacts to vegetation and wildlife.
- Winter landfall and overland construction will occur to limit ground disturbance and protect vegetation from heavy equipment and temporary sidecast.

Vegetation and Habitat Protection

- The Project footprint will be minimized by using already disturbed areas or lower-quality habitats whenever possible. For example, in some areas, infrastructure will be collocated in existing disturbed areas such as rights-of-way (e.g., using road corridors for utilities, placing new antennas on existing towers, and locating new structures near existing ones).

Soil and Water Protection

- Construction will avoid sensitive soils, including highly erosive soils and thaw-unstable permafrost, to prevent degradation and subsidence.
- Trenching in thaw-sensitive soils (e.g., continuous/discontinuous permafrost) will be avoided due to the risk of permafrost degradation and water quality impacts.
- Stream and riparian buffers will be preserved to maintain water quality, stabilize streambanks, support fish and wildlife habitat, and provide flood protection.

Invasive Species

- Equipment will arrive and leave the Action Area clean without visible soil clumps, plant, or animal material. A pressure washer will be used, with special attention given to wheel wells, areas behind the bumper, trailers, and other areas that are likely to catch vegetation or seeds.
- Equipment washing will occur at the same location during Project operations, surveyed regularly, and treated as necessary.
- Equipment will be cleaned away from waterways to prevent the spread of invasive plant species downstream.
- Project operations will occur in uninfested areas first to ensure that invasive species do not contaminate equipment and get moved to new areas.
- Invasive plant contamination of Project materials will be prevented by ensuring stockpile areas are free of invasive species. Gravel and construction materials will be covered to prevent the accidental introduction of plant parts such as seeds, roots, and propagules. Any plant parts will be removed from materials before they are deployed into the field.
- Certified weed-free gravel and hay will be used for the Project. Gravel will meet the standards outlined at plants.alaska.gov/invasives/weed-free-gravel.htm, and hay used in straw wattles will comply with plants.alaska.gov/invasives/weed-free-forage.htm.
- Soil disturbance, including contouring, grubbing, logging, moving, removing, excavating, and cutting, will be managed to minimize its impacts.
- Project materials such as fill, aggregate, and erosion control materials will be carefully managed to prevent the introduction of invasive plant seeds. Certified weed-free hay and gravel, as referenced above, will be used to further reduce the risk of infestation.
- Workers will wear clothing, boots, and gear that minimize soil and plant retention when possible. Before entering and leaving the worksite, they will clean off soil, mud, seeds, and plant material using appropriate tools. Coworkers will be informed about potential seed or propagule transfer on their gear.
- Vertebrate invasive species can stow away in cargo, grain, straw, and hay during transport. Rats and mice will be eradicated if detected on equipment to prevent their spread. Attractants such as shelter, food, and refuse will be eliminated, and trash will be stored in rodent-proof containers. Live rats and mice will never be released into the wild or thrown overboard, as they can swim to shore. Prevention and control measures will follow the Alaska Department of Fish and Game's State Invasive Rodent Plan (adfg.alaska.gov/static/species/nonnative/invasive/pdfs/invasive_rodent_plan.pdf).

Direct Cable Lay on Tundra

- Above ground cable sections will be kept in a straight line to prevent wildlife entanglement and will not be allowed to curl up.
- When slack is needed for temperature expansion, contraction, or settling, it will be laid in a waving line rather than twisted in circles to minimize the risk of entanglement for wildlife.

- Extra effort will be made to place cables on the ground, even in areas with thick shrubs, to further reduce entanglement risks. This will occur post thaw.

Offshore Measures General BMPs

- Unicom will inform USFWS of impending in-water activities a minimum of 1 week prior to the onset of those activities.
- If construction activities will occur outside the time window specified during consultation, the applicant will notify USFWS of the situation at least 60 days prior to the end of the specified time window to allow for re-initiation of consultation.
- In-water work in the intertidal zone will be conducted at the lowest points of the tidal cycle when feasible.
- Consistent with Alaska Statute 46.06.080, trash will be disposed of in accordance with state law. Trash comprised of closed loops (e.g., packing straps, rings, bands, etc.) will be cut prior to disposal. In addition, the Project proponent will secure all ropes, nets, and other marine mammal entanglement hazards so they cannot enter marine waters.
- Proposed Action-associated staff will cut all materials that form closed loops (e.g., plastic packing bands, rubber bands, all other loops) prior to proper disposal in a closed and secured trash bin. Trash bins will be properly secured with locked or secured lids that cannot blow open, preventing trash from entering the environment, thus reducing the risk of marine mammal entanglement should waste enter marine waters.
- To the extent it is practicable and safe, vessel operators will operate their vessel thrusters (both main drive and dynamic positioning) at the minimum power necessary to accomplish the work.
- Marine cable-laying activities will occur in summer months when long daylight occurs, which should make bird strikes with vessels unlikely.
- Cable routing has been selected to avoid concentration areas where eiders occur to reduce potential behavioral or disturbance effects.
- Cable will be deployed with engineered slack to allow cable to conform to seafloor and to settle into sediments..
- Take all precautions necessary to minimize the risk of spilling fuels or other materials in the marine environment.
- Minimize the use of external lighting at night, and angle lights downward toward the surface of the water to reduce potential for collisions with vessels and gear.
- The cable-laying vessels will not discharge materials into the ocean that may attract seabirds, including short-tailed albatross.
- Vessels will not allow unused or loose tow lines to remain in the water, thereby reducing the potential for entanglement.

Spill Contingency and Hazardous Substances

- All fuel and hazardous substances used by the Project will be handled and stored on-site in compliance with state and federal regulatory guidance. All fuels and chemicals will be stored in appropriate primary containment areas. Secondary containment areas will be designed in compliance with all applicable permits and regulations.
- Fuels and other products will be transported to the action area using a licensed, commercial transporter following U.S. Department of Transportation regulations for safe transport of materials to minimize spill risk.

Invasive Species

- Alaska relies on the U.S. Coast Guard to enforce national standards for ballast water and biofouling.
- Commercial ships use ballast water, typically loading ballast when offloading cargo and discharging ballast when onloading cargo; however, when loading ballast, small organisms are often also brought onboard with the water. If unmanaged, water can then be transferred to areas and discharged with viable organisms in the effluent. Organisms that are then deposited can cause harm to native flora and fauna in the new area they inhabit.
    - Empty/refill exchange: pump the ballast tank or tanks and refill the tank with mid-ocean waters at least 200 nautical miles from any coast.
    - Flow through exchange: pump in mid-ocean water, at least 200 nautical miles from any coast, at the bottom of the tank and continuously overflow the tank from the top until three full volumes of the ballast water tank capacity have been changed.
    - Onboard treatment: Use a properly functioning treatment system approved by the U.S. Coast Guard that is designed to kill all living organisms in the ballast water.
    - Freshwater: Use ballast water from a municipal water supply from the United States or Canada.
    - Sealed tanks: Use ballast water in sealed tanks incapable of discharging ballast water.
- Biofouling accumulation on a submerged vessel can begin within minutes. The process begins with bacteria and algae recruiting onto the vessel, progressing into a slime layer (biofilm) within days. Then further advancing into a macrofouling community in weeks. Macrofouling happens especially in the niche areas (i.e., propeller shafts, rudder, sea chest intake, bow thruster gratings, etc.), which act as protective spaces for biofouling organisms. Applying the proper antifouling hull paint and maintaining the coating to the manufacturer's specifications may substantially reduce vessel operating costs and minimize environmental impacts. Following BMPs for managing biofouling "early and often" at the slime layer level will cut biofouling management and fuel costs, thereby reducing vessel carbon emissions in addition to reducing biosecurity risks ports.
- Vertebrate invasive species can be transported in cargo planes and ships where they stowaway in grain, straw, and hay. Eradicate free-roaming rats and mice whenever they are detected on or in equipment to ensure they are not inadvertently relocated elsewhere.

Eliminate rat attractants including shelter, edible refuse, and food. Keep trash and foodstuffs in metal or other rodent-proof containers.

- Never release live rats or mice into the wild and never throw captured rats overboard; they are excellent swimmers and may reach land. Additional prevention and control measures are available in the Alaska Department of Fish and Game's State Invasive Rodent Plan (adfg.alaska.gov/static/species/nonnative/invasive/pdfs/invasive_rodent_plan.pdf).

2.2.5.2 SPECIES SPECIFIC MEASURES

Migratory Birds

- All artificial lighting will be minimized in native habitats during to reduce potential for bird disruption.
- Construction will be limited to daylight hours whenever possible to prevent unnecessary habitat illumination.
- Down-shielded or directional lighting (e.g., Cobra-style lights) will be used to prevent light trespass into bird habitats.
- Low-intensity, energy-efficient lighting (e.g., low-pressure sodium lamps) will be employed to reduce attraction and disturbance to birds.
- No high-intensity and steady-burning lights (e.g., sodium vapor, quartz, halogen, or fluorescent spotlights) will be used.
- Motion-activated or heat-sensing lights instead of constant illumination to minimize unnecessary light exposure.
- Open pipes and small dark spaces will be capped and sealed to prevent birds from becoming trapped.
- Avoid ground-disturbing activities during the bird nesting season when possible.

Polar Bears

- Project activities will adhere to BMPs for minimizing impacts to polar bears and minimizing human-bear conflicts (USFWS 2024a).
- Precautions will be taken to minimize encounters with polar bears, particularly within 25 miles of the coastline and farther inland during the denning period (November to April).
- If a sow and cubs of the year are observed, operations will cease within a 1-mile (1.6-km) exclusion zone, and the USFWS will be notified.
- Attractants will be managed to minimize odor and prevent access by bears.
- As part of the Project's Letter of Authorization, specific protocols will be established to minimize risk of encounters and maximize human and animal safety, including regular on-site safety discussions, traveling in groups, establishment of a notification system, and designating safe areas to gather in the event of bear approach.

- Personnel will be observant of bears during all work. If personnel cannot perform work and be observant of bears, then dedicated bear guards will be used. If possible, personnel will allow all polar bears to continue travel when observed.
- If a polar bear was recently observed at or near the Project site, a dedicated bear guard should be posted during Project activities.
- Bear deterrence plans will be prepared for implementation in the event that a polar bear approaches.
- All personnel working in polar bear habitat will receive appropriate bear safety training.
- Personnel will be especially vigilant for swimming polar bears while operating vessels. Protected species observers are proposed (detailed in the National Marine Fisheries Service [NMFS] BA) and will monitor for all marine mammals during marine work.
- Vessels will avoid traveling in the same direction as a polar bear, will maintain maximum distance possible from polar bears, will reduce speed, and will avoid sudden changes in travel direction when visibility is low.
- Personnel will adhere to polar bear encounter guidelines to minimize human-bear conflicts.

Spectacled and Steller's Eiders

- Concern for eider-vessel collision risk is particularly high between August and November, during which time Spectacled and Steller's Eiders frequently fly in large groups between nesting, molting, and wintering areas. This timing coincides with decreasing hours of daylight and a high potential for inclement weather, both of which may impair their visibility to human observers and increase the likelihood that birds may become disoriented by ship lighting, in turn, reducing their ability to avoid colliding with structures.
- Deck lighting of vessels will be minimized and lights will be shielded to direct illumination inboard and downward to the extent possible while still maintaining compliance with navigation rules.

3. EFFECTS OF THE ACTION

The following describes general effects of the proposed Project. Section 4 evaluates these effects in relation to individual listed species with potential to occur in the Action Area.

3.1 HABITAT DISTURBANCE OR LOSS

3.1.1 TERRESTRIAL

3.1.1.1 WINTER INSTALLATION OF OVERLAND CABLE ROUTE

Project activities within the Action Area would result in temporary and minor disturbance to terrestrial habitat during cable-laying or trenching. The overland cable route will be installed during the winter months when substrate is frozen, reducing the potential for damage to habitat. This portion of the route will cross wetlands, lakes, ponds, rivers and streams (as discussed further in Section 3.1.1), as well as boreal forest habitat. Where possible, the Project cable will be laid directly on the ground surface on the substrate with additional slack to allow it to more naturally settle on vegetation and conform to changing surface features and environmental conditions. Additionally, some portions of the Project cable will be collocated with existing utility poles. Any portion of cable that is attached to existing utility poles will be installed aboveground and therefore have no effect on terrestrial habitat. Project effects on terrestrial habitat would be minimized with implementation of conservation measures outlined in Section 2.2.5.

3.1.1.2 SUMMER CABLE LANDFALL

Project activities within the Action Area would result in minor, temporary disturbance to coastal habitat where cables will make landfall. Excavation and trenching will occur associated with burial of BVs and cable conduits. Chain trenchers and excavators will be staged on landing craft between the high and low water mark. Standard trenching techniques will be used to trench and re-grade trenched areas to pre-existing contours at landfall sites. Excavated material will be sidecast temporarily and will be used to backfill trenched areas. In instances where landfall locations require excavation in soft substrates, such as mudflats or beaches composed primarily of other fine sediments, sidecast material will be underlain with geotextile, ice pads, or similar material to allow for removal of the temporary material to the maximum extent practical. Minimal excess material is anticipated after the completion of the trenches, and any excess material will be disposed of at an upland location.

Trenching in intertidal areas or near shorelines could result in erosion and stormwater runoff; however, effects and alterations of shorelines would be temporary. Construction activities will only occur during low tide, and construction mats will be used in areas without firm coarse sediments such as cobbles and boulders to protect the sediment from slumping and erosion. Effects on coastal habitat would be minimized with the implementation of conservation measures outlined in Section 2.2.5.

3.1.1.3 UPLAND CABLE LAY

Portions of the cable laid on vegetation are expected to sink into the vegetated mat over time and eventually become overgrown and buried. During the post-lay inspection in summer, any portion of cable laid that is found to remain suspended after the snow and ice melts will be repositioned and supported accordingly, and the cable will be hand buried where needed for protection.

In areas where trenching is required, standard trenching techniques will be used to trench and re-grade trenched areas to pre-existing contours in areas of previously disturbed ground or adjacent to villages. The cable will also need to be trenched within 0.6 miles (0.97 km) of each community Excavated material will be sidecast temporarily and will be used to backfill trenched areas. Minimal excess material is anticipated after the completion of the trenches, and any excess material will be disposed of at an upland location. Trenching will be required near trails, streambanks and riverbanks, or areas where the cable would be susceptible to damage. These areas will be hand trenched using hand tools including handheld trenchers and chainsaws. This work will be done in the summer and sites will be accessed via small boat or helicopter. If permafrost is present during trenching, the trenching will only occur within the vegetative mat above the permafrost, and the permafrost will be left intact. Project effects on terrestrial habitat would be minimized with implementation of conservation measures outlined in Section 2.2.5.

3.1.2 FRESHWATER

Project activities within the Action Area would result in minor, temporary disturbance to freshwater aquatic resources. The Project cable route will cross freshwater wetlands, lakes, ponds, and rivers. All overland routes that cross aquatic resources will be installed during the winter months when the substrate is frozen. The cable will be surface-laid in most locations and self-bury during thaw, which would minimize disturbances to aquatic resources. The cable will be laid over the ice surface with adequate slack to allow the cable to passively drop into the waterbody once the ice melts in the spring. The weight of the cable should allow it to self-bury into the fine sediments at the bottom of the waterbody. Where crossing rivers, a submarine cable will be used that will be spliced with the overland cable and buried into each streambank below OHW for added protection.

Segments of the cable route through wetlands will use a lightweight submarine cable. In areas where the cable and burial is required (i.e., near trails, streambanks, riverbanks, or areas where the cable could be susceptible to damage), the cable route will first be cleared of all areas with deep snow. A narrow trench will then be excavated, and the cable will be laid directly within the trench, similar to other trenching methods in the intertidal. The target trench depth will be approximately 8 inches (20.3 cm) deep but may vary depending on the conditions and terrain. Trenches will be backfilled with native soils. Effects on freshwater aquatic resources would be minimized with the implementation of conservation measures outlined in Section 2.2.5.

3.1.3 MARINE

Project activities within the marine portions of the Action Area could cause temporary disturbance to listed species benthic foraging habitat. The use of the cable plow, water jet sled, and hand jets, as well as the PLGR, would affect the benthic environment by temporarily reducing the area of benthic habitat and disturbing benthic species. Benthic habitat could also be temporarily disturbed by trenching and cable-laying activities due to increased amounts of suspended sediments.

Benthic organisms and communities include invertebrates such as worms, clams, and crustaceans, as well as fish and marine mammals that utilize benthic areas and communities for foraging. The effects of the Project on these organisms are expected to be limited to the areas directly beneath and adjacent to the cable placement where cable-laying and burial will occur. Motile invertebrates, fish, and other wildlife in the vicinity are anticipated to avoid the cable installation and areas of human activity and expected to recolonize the area after the cable has been installed. Non-motile invertebrates directly affected by the cable could experience mortality as a result of crushing, smothering, or scouring, though levels are not anticipated to result in population-level effects given the narrow diameter and associated spatially restricted effects of the cable.

The suspension of sediments during the Project could disrupt filter-feeding mechanisms and interfere with ingestion and respiration of sedentary invertebrates, as well as smother fish and invertebrate eggs in the vicinity and reduce photosynthesis of vegetation (Berry et al. 2003). Additionally, habitat degradation could interfere with ecological interactions (i.e., predator-prey relationships and competition) (Kayode-Edwards 2024); however, any suspended sediments occurring as a result of Project activity are anticipated to be localized and would therefore not result in a significant change from existing conditions. Further, it is expected that the sediment would naturally settle out and dissipate from the effects of vessel traffic, current, and wave action over a short duration (i.e., hours).

Increased turbidity in the water column could also result in physical impairment of fish species, causing potential turbidity-induced clogged gills (i.e., suffocation or abrasion of sensitive epithelial tissue) and alteration of foraging behavior for visual predators. Fish typically avoid areas of increased suspended sediment (Wenger et al. 2017). Due to turbidity and other potential effects such as underwater sound and human activity, it is anticipated that mobile species such as fishes would likely avoid areas of cable-laying during the activity, moving to surrounding areas of similar habitat and then returning once the activity is complete and the sediment plume has dissipated. Mobile species such as fishes, clams, and shrimps are anticipated to recolonize the cable lay area quickly. It is anticipated that recolonization of the cable route would occur following completion of Project activities. Benthic communities tend to be resilient to direct disturbances, and studies show that benthic communities recover from direct physical disturbance at various rates, with some recovering as quickly as 100 days (Germano et al. 1994; Dernie and Warwick 2003). The potential effects of the Project activities on benthic habitat and species foraging/prey relationships resulting from sediment deposition and turbidity are anticipated to be minor, short-term, and localized to the area of the cable-laying route. Effects on benthic resources would be minimized with the implementation of conservation measures outlined in Section 2.2.5.

3.2 VESSEL STRIKES AND VEHICLE COLLISIONS

3.2.1 VESSEL STRIKES

Project vessel use within the offshore portion of Action Area would occur along the marine route offshore of the Yukon Delta National Wildlife Refuge, the Baird Inlet, and the Yukon River. The

Project will use several different types of vessels, including a full-size cable ship (e.g., the C.S. IT Intrepid or IT Infinity) and a tug and barge, a small landing craft stored on the cable ship, or an Alaska VOO with shallow draft capabilities (e.g., the M/V Polar Bear or M/V Unalaq). Existing vessel traffic in this region includes fishing vessels, cargo ships, cruise ships, and research vessels.

The effects of increased vessel traffic on seabirds such as eiders are poorly understood, especially in offshore waters (Schwemmer et al. 2011); however, in Alaska, avian species at the highest risk for collisions with vessels include eiders due to their high-speed flight travel, relatively low flight altitude over water, and attraction to bright lights on vessels at night (Day et al. 2004, 2005; Johnson and Richardson 1982). Vessels traveling during fall and spring bird migration or near bird concentration areas have a higher risk of collisions with eiders. Flock size may influence flushing behaviors related to approaching vessels, with larger flock sizes generally flushing earlier and at further distances. Flushing may result in a lost foraging time and increased energy expenditure (Schwemmer et al. 2011). Most (but not all) direct collisions reported in recent years (2019 and 2020) with eiders happened at night with large, lighted fishing vessels in foggy, low-visibility conditions (USFWS 2021a).

Vessel speed has been correlated with other marine species injury or mortality, where strikes are associated with a mean vessel speed of 18.1 knots (Jensen and Silber 2003; Hazel et al. 2007); however, vessel strikes are unlikely during cable installation, as Project vessels will operate at low speeds (installation speeds up to 2 knots [1 m/s] and transit speeds up to 10 knots [5.1 m/s]) and proceed along a predictable path. The slow movement of the vessel could be detectible to marine wildlife, giving them the opportunity to avoid Project vessels, even if the vessel's noise limits the species ability to determine the vessel's approach angle (Terhune and Verboom 1999; Allen et al. 2012; Leaper 2019;
Williams et al. 2021); however, the possibility remains that listed marine species that are physically compromised due to illness, injury, or inability to perceive environmental stimuli could be struck. Strikes could also occur during resting times or in association with curiosity (species could approach the cable and support vessels). The increase in the number of Project-related vessels in the Action Area would be small, temporary, and localized and would be consistent with existing vessel traffic from fishing and transit vessels during the ice-free summer months when activities in the marine portion of the Action Area are proposed. Protected species observers will also be present during in-water work to alert crews to the presence of protected species and employ BMPs to avoid strikes (see Section 2.2.5).

3.2.2 VEHICLE COLLISIONS

Onshore water crossing will occur when waterbodies are frozen using light tracked vehicles. The Project will use a variety of vehicles for construction in the terrestrial portion of the Action Area. Vehicles used in Project construction may include rubber wheel backhoes, tracked excavators, utility trucks and trailers, and light tracked vehicles, all of which may pose some risk of collision with wildlife. Vehicle collisions are identified as leading cause of bird mortality (Loss et al. 2014), as well as mortality of medium to large mammals (Collins and Kays 2011) in the United States. However, the slow speeds at which these Project vehicles will operate, combined with the open nature of the terrestrial Action Area, suggests that the risk of collision is low. The potential for vehicle collisions with listed species would be minimized with the implementation of conservation measures outlined in Section 2.2.5.

3.3 ENTANGLEMENT

3.3.1.1 MARINE

Historically, certain types of subsea cables have posed some risk to marine wildlife (Heezen 1957). For example, there are documented occurrences of marine mammal entanglements with submarine telegraph cables at depths up to 3,720 ft (1,134 m) (Heezen 1957); however, these telegraphic cables possessed very different physical characteristics than modern FOC, and historical installation methods differed from modern approaches. Modern FOC installations provide minimal risk of cable exposures or suspensions that could entangle marine species. Modern FOC systems and installation techniques have improved torsional and flexion characteristics in subsea cables as compared to historical cables, virtually eliminating the potential for exposed cable to entangle marine species (Wood and Carter 2009).

Fishing gear snagged and sacrificed on exposed cable is another potential source of entanglement for marine species. The majority of fishing gear that becomes snagged and subsequently abandoned or sacrificed by fishermen is caught on marine debris (Laist 1997; Watters et al. 2010), not necessarily on active and maintained cables. Snagged nets or fishing gear may incidentally entangle marine wildlife until the gear is removed or recovered.

The Project as proposed would include measures to reduce the likelihood of exposed cable and sacrificed fishing gear, specifically, proposed cable burial in high-risk areas and avoidance of high-impact fishing grounds where possible. The Project's proposed routing and installation will include state-of-the-art cable route planning and installation techniques designed to increase burial success. The proposed route for the Airraq 3 cable was developed based on desktop and seafloor surveys that mapped substrate types along the cable route. In waters greater than 39 ft (12 m) deep, the offshore cable will be surface-laid or buried into soft sediment using a sea plow. A cable plow will be used to install the cable to a depth of up to 5 ft (1.5 m) deep in areas where risk of outside aggression to the cable is present, such as popular fishing or anchoring locations. In nearshore waters at depths of less than 30 ft (9 m) the cable will be trenched to provide additional protection from environmental conditions such as surf action and to reduce the potential for disturbance by fishing gear or wildlife. In areas of hard bottom or where geological conditions of the seafloor do not allow for plow burial, the cable will be surface-laid with only enough slack to allow the cable to conform to the seabed. In nearshore waters, the cable will also be articulated to reduce movement and the potential for entanglement.

3.3.1.2 TERRESTRIAL

Although there is no evidence of terrestrial wildlife entanglements due to surface-laid FOC, wildlife such as polar bear, caribou, and birds may still become entangled in sections of cable that are loose or may become twisted in circles (Nicholson et al. 2022; USFWS 2024b). Terrestrial entanglement from cable devices or loose power lines have been known to cause injuries such as abrasions, cuts, bruises, and constriction of blood flow to the wildlife entangled and may result in the death of the animal if it is unable to escape (USDA 2019). In areas of the overland route where cable is laid directly on the vegetative mat, the cable will be laid with only enough slack to allow the cable to more naturally settle on vegetation and conform to changing surface features and environmental conditions. Additionally, any portion of cable that is found suspended during the post-lay inspection will be repositioned and supported accordingly, and duckbill anchors may be used in certain areas to anchor the cable to the ground if needed. As discussed in Section 2.2.5, the implementation of conservation measures would minimize the potential for entanglement to affect any listed species in the Action Area.

3.4 ARTIFICIAL LIGHT

Project-related offshore and onshore lighting has the potential to affect marine and terrestrial species. Offshore construction activities will occur 24 hours per day and will require nighttime lighting. Project vessels will use artificial lighting to comply with U.S. Coast Guard regulations for navigation and safety. Artificial lighting can act as an attractant for marine species, particularly birds (Gauthreaux and Belser 2006). Several bird species, including species that spend the majority of life at sea, are attracted to bright lights on ships at night and are at increased risk of disorientation and colliding with ships (Adams et al. 2021; Chernetsov 2016). Poor weather conditions such as rain, fog, and low cloud cover can further disorient birds and increase their attraction to artificial lights, leading to collisions. Risk increases during bird migrations (Ronconi et al. 2015). Nocturnal bird fatalities are more prevalent in areas where illuminated objects intrude upon their flight paths. Additionally, some birds have succumbed to starvation as a result of incessantly circling around platforms and flares (Wiese et al. 2001). Project vessels will not require excessive lighting and will transit through the Action Area over a brief period. Additionally, offshore installation activities will align with the ice-free summer season when daylight lasts 18 to 21 hours, minimizing the periods when artificial lighting would be required.

Artificial lighting at terrestrial construction areas may affect birds in the Action Area. New sources of light could attract species and disrupt foraging and breeding behaviors of species on land or in nearshore waters (Gauthreaux and Belser 2006). Additionally, the circadian rhythms, dispersal movement and corridor use, and foraging behavior of terrestrial mammals may also be disrupted by increases in the amount of artificial light (Beier 2006). Overland cable installation activities are expected to take place during the winter months, which average approximately 5 to 8 hours of daylight per day, and construction activities may involve the use of artificial lighting 24 hours per day. However, the effects of lighting during terrestrial construction would be temporary and localized to the Project Area.

Project activities in the marine portion of the Action Area will take place in the summer months when eiders may be encountered migrating between breeding, molting, and overwintering sites but during periods of continuous daylight. Project activities in the terrestrial portion of the Action Area will take place in the winter months after eiders have returned to their offshore overwintering areas (Petersen et al. 1999; USFWS 2019). This being the case, eiders are unlikely to be exposed to sources of Project light. Polar bears, whose movements are tied to sea ice presence, are not expected within the Action Area during the summer months when sea ice melts and the species migrates further north; however, polar bears have the potential to be present in the Action Area during the fall and winter months in areas of shallow waters along the continental shelf or in areas where sea ice is extended below the Bering Strait and therefore could be exposed to artificial lighting (Durner and Amstrup 1996). As discussed in Section 2.2.5, the implementation of conservation measures would minimize the potential for artificial lighting to affect any listed species in the Action Area.

3.5 WATER QUALITY

3.5.1 TURBIDITY

Project activities have the potential to result in the temporary, localized suspension of sediments during the PLGR and cable installation. The PLGR will be conducted prior to trenching in order to clear any debris within the proposed cable route. During cable installation, surface-lay, cable sea plow burial, water jet sled burial, diver burial with hand jets, and trenched excavations for landfall could also result in turbidity. The use of a cable plow is anticipated to penetrate the seafloor sediments to a depth of up to 5 ft (1.5 m) and form a trench approximately 1 ft (0.3 m) in width. Water jet sled and diver burial will take place in areas less than 30 ft (9.1 m) in depth and will rely on pressurized water to turn sediments into a slurry. Project-generated turbidity is anticipated to be minimal due to the small size of the cable (approximately 1.5 inches [3.8 cm] in diameter), necessitating the disturbance of only a narrow area along the full length of the cable burial route. It is anticipated that the cable will be buried along 115 miles (185 km) of the marine route, and an assumed mean trenching width of 1 ft suggests a total area of approximately 13.9 acres (5.6 hectares) will be directly affected by trenching. Cable burial in shallow areas of freshwater habitats or constrained areas will be surface-laid or buried by divers with hand jetting tools. Sediments and turbidity are expected to return to baseline levels within minutes (with the use of the plow or surface-lay) to hours (with the use of the water jet sled, hand jets, and trenched excavation) and are expected to be localized to the cable route.

Notably, marine mammals often occupy turbid waters and therefore significant negative effects from localized, temporary increases in turbidity arising from suspension of sediment associated with activities disturbing the seafloor are considered improbable (Todd et al. 2014). Eiders occupying freshwater habitats would not be exposed to in-water turbidity as overland Project activities will take place during the winter months when substrate is frozen and when eiders are at overwintering grounds outside of the Action Area (Smith et al. 2017). As discussed in Section 2.2.5, implementation of conservation measures would minimize the potential for increased turbidity to affect any listed species in the Action Area.

3.5.2 FUEL OR HAZARDOUS SUBSTANCE SPILLS

Project vessels and equipment that have the potential to release fuel, oil, or lubricants into the marine environment. Petrochemical releases into the marine environment have the potential to directly and/or indirectly affect all trophic levels and taxa of wildlife to some degree, depending on the quantity released. Accidental releases have the potential to expose marine species to oil or hazardous materials, leading to direct consequences such as contamination or illness, as well as indirect impacts through the destruction or degradation of habitats and food sources. Additionally, solid waste releases, such as garbage or food waste from vessels, can have negative effects on marine species, through ingestion or entanglement. Effects can be fatal, depending on the released solid materials.

Vessels operate under strict regulatory requirements that include measures to prevent and respond to unforeseen accidents. Requirements include federal and state oil spill prevention and response requirements. The measures identified in Section 2.2.5 are recommended to avoid and minimize effects on marine wildlife resulting from fuel or hazardous substance spills.

3.6 NOISE

3.6.1 DETERMINING NOISE EFFECT CRITERIA

Acoustic exposure thresholds are used to assess the potential effects of sound on wildlife. These thresholds define the levels at which sound may cause temporary or permanent hearing changes in animals, taking into account different sound sources such as impulsive (e.g., explosions) and non-impulsive (e.g., machinery noise). Loud or prolonged noise exposure can lead to temporary or permanent hearing loss in wildlife, which are defined as temporary threshold shifts (TTSs) or permanent threshold shifts (PTSs) (NMFS 2018). In addition to physical effects, sound can alter wildlife behavior, affecting movement, feeding, and communication. Responses vary based on sound type, duration, and context, making it challenging to define strict behavioral thresholds.

The effects of in-air and underwater noise on wildlife vary significantly across species groups, with differences in sensitivity and response distances. To accurately assess potential effects, noise measurements are adjusted using weighting functions that reflect an animal's ability to detect specific frequencies. This ensures that assessments focus on biologically relevant sounds that may affect communication, predator detection, or other essential behaviors (Houser et al. 2017). Listed species considered herein (see Section 4) were assessed for potential auditory effects from Project noise.

Currently, research does not specifically denote each species' in-air and underwater thresholds for injury and behavioral response (see Table 3.6-1 and Table 3.6.2); however, the best available proxies were identified. Wood bison were grouped with ungulates (Maier et al. 1998; Shannon et al. 2016), while Short-tailed Albatross, Spectacled Eider, and Steller's Eider were categorized under wading and diving birds to estimate their response to in-air noise exposure (USFWS 2012a; Crowell et al. 2015). Underwater noise effects on seabirds were considered using USFWS guidance for Marbled Murrelets (2012a), the only known regulatory guidance specifying underwater noise injury and behavioral change thresholds for a seabird species. Polar bear in-air and underwater noise thresholds (TTS and PTS) were grouped within the marine carnivores category, as outlined in Southall et al. (2019). There are no formally defined behavioral thresholds for in-air or underwater noise impacts specific to polar bears; however, based on current literature and recent communication with the USFWS (Stephanie Burgess 2025, pers. comm.), a conservative underwater noise threshold of 160 dBrms is generally applied when assessing potential behavioral disturbance to polar bears.

TABLE 3.6-1 IN-AIR NOISE THRESHOLDS (dB) FOR FEDERALLY LISTED WILDLIFE

In-Air Noise Thresholds			
Species Group	Behavior	TTS	PTS
Carnivorous mammals (polar bear)[a]	N/A	157	177
Wading and diving birds[b]	80	N/A	N/A
Ungulates (wood bison)[c]	98	N/A	N/A

Sources: [a] Southall et al. 2019; [b] Crowell et al. 2015; [c] Shannon et al. 2016

Notes:
N/A = not applicable; PTS = permanent threshold shift; TTS = temporary threshold shift

TABLE 3.6-2 UNDERWATER NOISE THRESHOLDS (dB_{rms}) FOR FEDERALLY LISTED WILDLIFE

Underwater Noise Thresholds			
Species Group	Behavior	TTS	PTS
Carnivorous mammals[a, b]	160	199	219
Diving birds[c]	N/A	202	208

Sources: [a] Southall et al. 2019; [b] Burgess 2025; [c] USFWS 2012a

Notes:
N/A = not applicable; PTS = permanent threshold shift; TTS = temporary threshold shift

3.6.2 NOISE SOURCES

Construction equipment on this Project will generate non-impulsive noise, meaning the sound is continuous or intermittent rather than sudden and intense. On land, construction and industrial machinery, such as trucks, excavators, and diesel generators, produce steady noise at varying levels, typically around 76 to 98 dB at a distance of 50 ft (15.2 m). Underwater, marine operations like cable-laying ships and tugboats generate consistent sound, reaching approximately 160 to 180 dB re 1 µPa at 3.28 ft (1 m) (Hale 2018). These sound sources contribute to overall environmental noise levels and may influence wildlife behavior, depending on their intensity and duration. Table 3.6-3 below provides information regarding the noise levels from expected Project sound sources in the Action Area.

TABLE 3.6-3 NOISE LEVELS (dB) FROM EXPECTED SOUND SOURCES IN THE ACTION AREA

Sound Source[a,b]	Decibels (dB)	Distance From Source (ft)
Trucks	78.9	50
Backhoes	78	50

Sound Source[a,b]	Decibels (dB)	Distance From Source (ft)
Excavators	81	50
Chain trenchers	98	50
Other heavy equipment	82.1	50
Diesel-powered generators	81	50
Cable-laying ships (underwater noise)[c]	180 dB_{rms}	3.28

Sources: [a] FHWA 2006; [b] DOC NTIA 2024; [c] Hale 2018
Notes:
dB = decibels; dB_{rms} = decibels root mean square; ft = feet

3.6.3 NOISE MODELLING

The Practical Spreading Loss Model (PSLM), recommended by NMFS (2012) for spherical-spreading noise, was used to calculate the distance at which in-air and underwater noise would reach TTS, PTS, and attenuate to the behavioral acoustic thresholds for all species groups. The PSLM is presented in NMFS (2012) as:

$$TL = 15\log(\frac{R_2}{R_1})$$

- TL is transmission loss.
- R_1 is the distance of a known or measured sound level.
- R_2 is the estimated distance required for the sound to attenuate to a predetermined acoustic threshold.
- The number 20 serves as the TL constant on land (this is substituted for a value of 15 in water) (NMFS 2012; WSDOT 2020).
- The equation may be rearranged to solve for R_2 for underwater noise as follows:

$$R_2 = R_1 * 10^{\left(\frac{(dB\ at\ R_1 - dB\ acoustic\ threshold)}{15}\right)}$$

- The equation may be rearranged to solve for R_2 for in-air noise as follows:

$$R_2 = R_1 * 10^{\left(\frac{(dB\ at\ R_1 - dB\ acoustic\ threshold)}{20}\right)}$$

The PSLM calculations indicate that polar bears, wading and diving birds, and wood bison have varying sensitivities to in-air noise from different sources. As noted in Table 3.6-3, chain trenchers are potentially the loudest in-air, Project-related terrestrial sound source, and that value (i.e., 98 dB) was used to calculate potential Project in-air auditory effects on polar bear, diving birds, and ungulates (wood bison). The cable-laying ship may produce underwater noise up to 180 dB_{rms}, and that value was used to assess the potential underwater noise effects on polar bears and birds. All noise calculations can be found in Appendix D.

3.6.3.1 IN-AIR NOISE EFFECTS

Calculations indicate that polar bears would not experience hearing injury associated with terrestrial Project noise, with TTS and PTS distances at 0 ft (0 m). In contrast, birds could be sensitive to loud sources like chain trenchers, which could elicit behavioral responses at 397 ft (121 m). Wood bison fall between the two groups in terms of sensitivity. Their calculated behavioral response distance to chain trenchers was 50 ft (15.2 m). Overall, chain trenchers will serve as the noisiest and most disruptive Project equipment on land. Detailed descriptions of in-air noise calculations and applicable thresholds for assessing potential impacts to wildlife can be found in Appendix D.

3.6.3.2 UNDERWATER NOISE EFFECTS

Underwater noise from cable-laying ships is expected to have negligible effects on polar bears and birds (see Table 3.6-4 below). The underwater noise from cable-laying operations is not expected to be above 180 dB_{rms} and would be below the TTS threshold (199 dB) and the PTS threshold (219 dB) for polar bears. Polar bears within 70.67 ft (21.54 m) and underwater during cable-laying operations could experience behavioral disturbance; however polar bears are not expected to be present in the water during summer cable-laying operations. Therefore, the risk of exposure to Project underwater noise is unlikely.

Similarly, birds immediately next to ships (0 ft [0 m]) and underwater may experience injury TTS and PTS; however, it is unlikely birds would remain this close to cable lay operations and would likely move to more suitable in-water habitat. Detailed descriptions of underwater noise calculations and applicable thresholds for assessing potential impacts to wildlife can be found in Appendix D.

TABLE 3.6-4 DISTANCES TO THRESHOLDS FOR VARIOUS SPECIES GROUPS FROM TERRESTRIAL AND MARINE SOUND SOURCES IN THE ACTION AREA

Terrestrial Sound Sources (In-Air)			
Hearing Group	TTS Distance in ft (m)	PTS Distance in ft (m)	Behavior Distance in ft (m)
Other Marine Carnivores (Polar Bears)	0.009 ft (0.003 m)	0.001 ft (0.0003 m)	N/A
Wading and Diving Birds	N/A	N/A	397.16 ft (121.05 m)
Ungulates (Wood Bison)	N/A	N/A	50
Marine Sound Sources (Underwater)			
Hearing Group	TTS Distance in ft (m)	PTS Distance in ft (m)	Behavior Distance in ft (m)
Other Marine Carnivores (Polar Bears)	0.177 ft (0.054 m)	0.008 ft (0.0024 m)	70.67 ft (21.54 m)
Wading and Diving Birds	0.11 ft (0.03 m)	0.045 ft (0.014 m)	N/A

Notes:
ft = feet; m = meters; N/A = not applicable; PTS = permanent threshold shift; TTS = temporary threshold shift

3.7 ANTHOROPOGENIC PRESENCE AND DISTURBANCE

Terrestrial and marine species could be affected by increased human presence in the Action Area during Project activities. Wildlife species may be displaced from terrestrial and aquatic habitat due to increased vehicle and vessel traffic as well as increased exposure to construction noise; however, the disturbance would be temporary, transitory, and of short duration. Vehicle use will be limited to roads, equipment staging areas, and areas immediately along the overland cable route. Light tracked vehicles designed for low impact to the ground will be used during cable installation activities, reducing the Project's effects on overland habitat. Anthropogenic presence in marine portions of the Action Area would be limited to offshore and nearshore cable installation and support vessels, as well as divers in nearshore waters along the cable route.

Project activities in the terrestrial portion of the Action Area will take place in the winter months after eiders have returned to their offshore overwintering areas (Petersen et al. 1999; USFWS 2019); therefore, potential exposure to increased anthropogenic presences is unlikely. Project activities within the marine portion of the Action Area will take place in the summer months when eiders are breeding along the Yukon-Kuskokwim Delta; however, migrating eiders have the potential to be encountered in the marine portion of the Action Area during this time (Petersen et al. 1999; USFWS 2019). Polar bears, whose movements are tied to sea ice presence, are not expected within the Action Area during the summer months when sea ice melts and the species migrates further north; however, polar bears have the potential to be present in the Action Area during the spring and winter months in areas of shallow waters along the continental shelf or areas where sea ice is extended below the Bering Strait and therefore may be exposed to increased anthropogenic presence (Durner and Amstrup 1996). Implementation of conservation measures, as discussed in Section 2.2.5, would minimize the potential for anthropogenic disturbance to affect listed species in the Action Area.

4. ESA-LISTED SPECIES AND CRITICAL HABITAT CONSIDERED

Federally listed threatened and endangered, proposed, and candidate species under USFWS jurisdiction that may occur within the Project vicinity were identified from the following databases:

- USFWS Information for Planning and Consultation Tool ([IPaC] USFWS 2025a; Appendix F);
- USFWS map of Threatened and Endangered Species with Critical Habitat designation across the United States online mapping tool (USFWS 2025d);
- U.S. Geological Survey North Pacific Pelagic Seabird Database Visualization Tool (USGS 2025); and
- Cornell Lab of Ornithology (eBird 2025).

Table 4.1-1 below lists all species evaluated in this review.

4.1 ESA-LISTED SPECIES CONSIDERED

Table 4.1-1 shows five federally listed species identified during literature and desktop review that have the potential to occur in the vicinity of the Action Area and are under USFWS jurisdiction. Critical habitat for polar bear overlaps the Action Area (Appendix B, Figure 12). Based on existing scientific literature and technical reports, several species and critical habitat were eliminated from further consideration due to lack of habitat and/or the fact that the Action Area is outside of the species' known range. Rationale for exclusion is noted for each species.

TABLE 4.1-1 SPECIES AND DESIGNATED CRITICAL HABITAT DETERMINATIONS

Common Name	Scientific Name	Status[1]	Determination/Species Potential to Occur in Action Area	Determination/Critical Habitat Presence Within the Action Area
Mammals				
Polar bear	*Ursus maritimus*	FT	May Affect, But Not Likely To Adversely Affect. Alaska supports two polar bear subpopulations: the Southern Beaufort Sea population and the Chukchi-Bering Seas population. The range of the Chukchi-Bering Seas population overlaps the Action Area (USFWS 2010b). Based on their reliance upon sea ice, polar bears could be present in the Action Area when sea ice extends below the Bering Strait in winter until the pack ice retreats in summer. At that point, polar bears would move north to the Chukchi and Beaufort Seas and would not be present in the Action Area. Therefore, polar bear encounters (if any) are anticipated during winter terrestrial cable lay activities. The Action has potential to affect the species via vehicle collisions, noise, habitat disturbance, effects of habitat disturbance on polar bear prey species, and anthropogenic presence and disturbance. Effects will be minimized with implementation of conservation measures (Section 2.2.5).	May Affect, But Not Likely To Adversely Modify. USFWS-designated critical habitat for this species in 2010 (75 FR 76086). The designated critical habitat overlaps the offshore cable route between Hooper Bay and the mouth of the Yukon River near the cable connection in Alakanuk. Although the Project occurs within designated critical habitat, no Project activities would modify critical habitat Primary Constituent Elements (PCEs), including sea ice, terrestrial denning habitat, or barrier island habitat. With implementation of BMPs and conservation measures (Section 2.2.5), the Project may affect but is not likely to adversely modify critical habitat.
Wood bison	*Bison bison athabascae*	NEP	No Effect. This species was reintroduced to the Lower Innoko-Yukon River area near Shageluk in 2015 (USFWS 2020). This species inhabits sedge meadows, boreal mixed forest, and alpine plateaus (NatureServe 2025). The majority of the Lower Yukon/Innoko Rivers herd ranges from within 50 miles of the release site in Shageluk; however, approximately 2% of the population has been known to disperse hundreds of miles to other regions, including the mouth of the Kuskokwim River (USFWS 2020). Although	No Effect. No critical habitat has been designated for this species at this time.

Common Name	Scientific Name	Status[1]	Determination/Species Potential to Occur in Action Area	Determination/Critical Habitat Presence Within the Action Area
			suitable habitat may be present along the overland portions of the cable installation route, the Action Area is outside of the known dispersal range of wood bison. In addition, the population is experimental. The Action would have no effect on this species.	
Birds				
Short-tailed Albatross	*Phoebastria* (=*Diomedea*) *albatrus*	FE	No Effect. Although the published range for Short-tailed Albatross potentially overlaps portions of the marine Action Area and the species was identified in the USFWS IPaC official species list, the likelihood of this species occurring in the Action Area is extremely low. Short-tailed Albatross nest well outside the Action Area (in Japan and Taiwan), and foraging habitat occurs along the eastern Bering Sea continental shelf in water depths much deeper than the Action Area (USFWS 2008b).	No Effect. No critical habitat has been designated for this species.
Spectacled Eider	*Somateria fischeri*	FT	May Affect, But Not Likely To Adversely Affect. Spectacled Eiders occur in Alaska's Beaufort Coastal Plain Subregion and in western Alaska. Breeding is generally within 12 miles of the coast in a variety of tundra habitat types (USFWS 2010c) in the Yukon-Kuskokwim Delta; molting occurs in Ledyard Bay and Norton Sound (Petersen et al. 1999). Almost the entire global population winters in polynyas and leads in the Bering Sea south of St. Lawrence Island. Spring migration generally occurs from mid-April to mid-June, molting migration occurs from mid-June to mid-September, and fall migration occurs from early October to mid-November (Smith et al. 2017). Spectacled Eiders could be encountered primarily during migration between breeding, molting, and wintering areas within the offshore Action Area during summer cable-laying activities. The Action	No Effect. Critical habitat for this species was designated in 2001 and includes the Yukon-Kuskokwim Delta; Norton Sound and Ledyard Bay; and south of St. Lawrence Island, Alaska (66 FR 9146). Designated critical habitat does not overlap with Action Area (58 FR 27474).

Common Name	Scientific Name	Status[1]	Determination/Species Potential to Occur in Action Area	Determination/Critical Habitat Presence Within the Action Area
			would have the potential to affect the species via vessel or vehicle collisions, entanglement, hazardous spills, noise, lighting, temporary habitat loss or displacement, and anthropogenic disturbance. Effects will be minimized with implementation of conservation measures (Section 2.2.5).	
Steller's Eider	*Polysticta stelleri*	FT	May Affect, But Not Likely To Adversely Affect. Steller's Eiders have breeding grounds on the Arctic Coastal Plain and historically the Yukon-Kuskokwim Delta in Alaska but migrate along the coast to southwest Alaska to molt and mix with the larger Russian-Pacific breeding population (USFWS 2019; USFWS 2025b). Wintering grounds are found throughout the Aleutian Islands, Alaska Peninsula, and western Gulf of Alaska, including Kodiak Island and lower Cook Inlet (USFWS 2019). Spring migration generally occurs from mid-April to early July, molting migration occurs from late June to mid-October, and fall migration occurs from late July to December (Smith et al. 2017). Steller's Eiders could be encountered primarily during migration between breeding, molting, and wintering areas within the offshore Action Area during summer cable-laying activities. The Action would have the potential to affect the species via vessel or vehicle collisions, entanglement, hazardous spills, noise, lighting, temporary habitat loss or displacement, and anthropogenic disturbance. Effects will be minimized with implementation of conservation measures (Section 2.2.5).	No Effect. Critical Habitat for this species was designated in 2001 (66 FR 8850 8884). Critical habitat includes the habitat on the Yukon-Kuskokwim Delta and marine waters in southwest of Alaska. Designated critical habitat does not overlap the Action Area.

Notes:

FR = Federal Register; IPaC = Information for Planning and Consultation; PCE = primary constituent element; USFWS = U.S. Fish and Wildlife Service

[1]Status: FT = federally threatened; FE = federally endangered; NEP = nonessential experimental population; ESA determinations: NE = no effect

4.2 NO EFFECT

The BA concluded that the proposed Project would have no effect on wood bison or Short-tailed Albatross and no effect on the designated critical habitat for Spectacled Eider and Steller's Eider. These species and critical habitats are not considered further herein.

4.2.1 MAY AFFECT, NOT LIKELY TO ADVERSELY AFFECT

The BA concluded that the Project may affect but is not likely to adversely affect the following species: polar bear (including critical habitat), Spectacled Eider, and Steller's Eider. Conclusions are discussed in detail for each species below.

4.2.2 POLAR BEAR

4.2.2.1 REGULATORY HISTORY AND STATUS

The Center for Biological Diversity (and later the Natural Resources Defense Council and Greenpeace) petitioned the USFWS to list the polar bear under the ESA in 2005. The Center for Biological Diversity argued that anthropogenic factors such as climate change, oil and gas development, contaminants, hunting, and poaching threatened the species' survival. In 2006, the USFWS determined that the petition may be warranted and initiated a species status review (71 Federal Register [FR] 6745). Following this review, the USFWS moved forward with listing the species as threatened under the ESA (76086a).

Critical habitat was designated in 2010 and includes an area of 187,157 square miles (484,734 km^2) encompassing sea ice habitat (over the continental shelf, and including water approximately 984 ft [300 m] or less in depth); terrestrial denning habitat (within approximately 20 miles [32 km] of the northern coast of Alaska between the Canadian border and the Kavik River and within 5 miles [8 km] of the northern coast of Alaska between the Kavik River and Utqiaġvik); and barrier island habitat along northern and northwestern Alaska and extending well offshore (75 FR 76086). This species also received a 4(d) rule in 2013 (78 FR 11766).

4.2.2.2 LIFE HISTORY

Polar bears are the largest species of bear worldwide (DeMaster and Stirling 1981) and serve as top predator in their marine ecosystem. Polar bears are inextricably tied to sea ice, using it as a platform to hunt and feed on seals, find mates, travel to terrestrial denning habitats, and engage in long-distance movements. Pack ice serves as the primary summer habitat for polar bears (USFWS 2016). Polar bears exhibit preferences for certain types of sea ice over others, favoring floe ice edge, stable shorefast ice with drifts (used by seal prey for pupping), and moving ice (Stirling et al. 1993). Polar bear movements are tied to sea ice, with bears retreating north during the summer melt and returning south during the autumn freeze. Sea ice conditions during the autumn and early winter allow for the best conditions for foraging in shallow waters over the continental shelf, which is the time at which the bears obtain their peak weights (Durner and Amstrup 1996). They primarily feed on ringed seals (*Phoca hispida*) but also prey on bearded seals (*Erignathus barbatus*) and other species opportunistically (USFWS 2016).

Due to the dynamic nature of the marine landscape, male polar bears do not defend territories, which allows them to travel extensively in search of mates during the breeding season (Schliebe et al. 2006). The breeding season spans from March through June, although implantation is delayed until autumn (Derocher and Stirling 1992; Eberhardt 2002). Females first breed when around 4 or 5 years in age. Pregnant females excavate dens in snowdrifts on land near the coast in the autumn and early winter (Ramsay and Stirling 1990; Amstrup and Gardner 1994) or in snowdrifts on pack and shorefast ice (USFWS 2016). Snowdrifts that are at least 4.9 ft (1.5 m) deep may be required to support a maternity den throughout the denning season (Liston et al. 2015). Polar bear dens in Alaska are found on coastal bluffs and riverbanks, on barrier islands, or on drifting pack ice (USFWS 2016) in areas of flat topography (Durner et al. 2003). Areas potentially suitable for denning have been mapped on the North Slope (Durner et al. 2001, 2006, 2013; Blank 2013; Durner and Atwood 2021). Litter sizes range from two to three cubs, and females produce litters approximately every 3 years (Amstrup 2003). Females and cubs emerge from dens in the spring, and cubs remain with their mother until they are weaned at approximately 2.5 years of age (USFWS 2016).

Polar bears are considered to be a k-selected species, defined by long life spans, late sexual maturity, low reproductive rate, and considerable investment in the raising of young (USFWS 2016). Survivorship varies based on age, with cubs having the lowest survival rate. Based on population modeling, adult female survival rates of 90 percent are required to sustain populations (Amstrup and Durner 1995). Key indicators associated with population viability have shown a downward trend in Southern Beaufort Sea subpopulation in recent years, including body size, body condition, and recruitment (Rode et al. 2010, 2014), and population projections indicate that significant future population declines are likely (Hunter et al. 2010).

4.2.2.3 THREATS

The decline of sea ice habitat due to climate change is considered to be the primary threat to the continued existence of polar bears (USFWS 2008a), a threat further compounded by the lack of existing regulatory mechanisms to adequately address climate change (USFWS 2016). The USFWS polar bear recovery plan (2016) also cites human-bear conflicts and defense-of-life removals, subsistence harvest, loss of denning habitat, and contamination from spills as primary management concerns.

4.2.2.4 POTENTIAL PRESENCE IN THE ACTION AREA

The state of Alaska encompasses two polar bear subpopulations: the Southern Beaufort Sea population and the Chukchi-Bering Seas population. The range of the Chukchi-Bering Seas population overlaps the Action Area (USFWS 2010b). Reliable population estimates for the Chukchi-Bering Seas subpopulation are not available, although attempts to roughly quantify the population put the number of bears at around 2,000 (Aars et al. 2006). Historically, polar bears have ranged as far south as St. Matthew Island (Hanna 1920) and the Pribilof Islands (Ray 1971) in the Bering Sea. The Chukchi-Bering Seas population currently extends into the Bering Sea, and the southern boundary is approximate and determined by the annual extent of pack ice (Garner et al. 1990, 1994; Amstrup et al. 2004). Sea ice may extend 248 miles (400 km) south of the Bering Strait in winter, and polar bears will extend their range to this southernmost extent

(USFWS 2010b). Shorefast ice connected to broken and drifting ice, usually occurring in a narrow band along the coast, is also an important sea ice habitat type that can be present along the coast of the Yukon-Kuskokwim Delta into May (Dau and Kistchinski 1977).

Polar bears may be present in the Action Area during the winter months when sea ice extends below the Bering Strait, specifically adult males, subadults, and non-pregnant adult females. However, their presence is expected to be occasional and temporary, as they are more commonly found farther north of the Project (USFWS 2010b). Pregnant females, which enter maternity dens between September and December, are not expected to occur in the Action Area. These females typically den much farther north, predominately in stable sea ice or coastal areas along the Beaufort and Chukchi Seas (Kurtén 1964; Amstrup 2003) and remain in dens to give birth and nurse their cubs, emerging in March–April (Laidre et al. 2008). When the ice pack retreats in the spring and summer, all polar bears move north to the Chukchi and Beaufort Seas to forage and mate and are not expected to be present in the Action Area. There are no known denning areas in the vicinity of the Action Area, and encounters with denning females or cubs during the winter is not expected.

4.2.2.5 CRITICAL HABITAT OVERLAPPING THE ACTION AREA

The USFWS critical habitat designation for polar bear (75 FR 76086) defines critical habitat based on the presence of at least one of three primary constituent elements (PCEs). These PCEs are characteristics that support the essential life history functions of the species, and they include the following:

> 1) *Sea ice habitat used for feeding, breeding, denning, and movements, which is sea ice over waters 300 m (984.2 ft) or less in depth that occurs over the continental shelf with adequate prey resources (primarily ringed and bearded seals) to support polar bears.*
>
> 2) *Terrestrial denning habitat, which includes topographic features, such as coastal bluffs and river banks, with suitable macrohabitat characteristics. Suitable macrohabitat characteristics are:*
>
> > a. *Steep, stable slopes (range 15.5– 50.0°), with heights ranging from 1.3 to 34 m (4.3 to 111.6 ft), and with water or relatively level ground below the slope and relatively flat terrain above the slope;*
> >
> > b. *unobstructed, undisturbed access between den sites and the coast;*
> >
> > c. *sea ice in proximity of terrestrial denning habitat prior to the onset of denning during the fall to provide access to terrestrial den sites; and*
> >
> > d. *the absence of disturbance from humans and human activities that might attract other polar bears.*
>
> 3) *Barrier island habitat used for denning, refuge from human disturbance, and movements along the coast to access maternal den and optimal feeding habitat. This includes all barrier islands along the Alaska coast and their associated spits, within*

the range of the polar bear in the United States, and the water, ice, and terrestrial habitat within 1.6 km (1 mi) of these islands (no-disturbance zone).

Further, these three PCEs are defined as being distributed in an appropriate quantity and arrangement to provide the essential physical and biological features for polar bears to complete their life history. These physical and biological features are noted to include the following:

1) *Space for individual and population growth and for normal behavior;*
2) *Food, water, air, light, minerals, or other nutritional or physiological requirements;*
3) *Cover or shelter;*
4) *Sites for breeding, reproduction, or rearing (or development) of offspring; and*
5) *Habitats that are protected from disturbance or are representative of the historic, geographical, and ecological distributions of a species.*

Based on the presence of these PCEs and physical and biological features, USFWS defined three units of critical habitat for polar bear: sea ice habitat (Unit 1), terrestrial denning habitat (Unit 2), and barrier island habitat (Unit 3). Of these three units, the Action Area only overlaps with Unit 1 (sea ice). Specifically, this sea ice critical habitat unit overlaps the offshore cable route between Hooper Bay and the mouth of the Yukon River near the cable connection in Alakanuk (USFWS 2010b); however, it is important to note that marine Project activities will only occur during the summer when the sea ice PCE is absent. The Action Area does not overlap with Unit 2 terrestrial denning critical habitat, nor does it overlap with Unit 3 barrier island critical habitat.

4.2.3 POTENTIAL EFFECTS ON POLAR BEAR

Critical Habitat

As noted above, designated polar bear critical habitat includes three primary physical and biological features essential to the conservation of the species and includes the following:

1. Sea ice used for feeding, hunting, travel, and resting;
2. Terrestrial denning habitat used for reproduction and maternal care; and
3. Terrestrial coastal features, such as barrier islands used for resting, travel, and protection from disturbance (USFWS 2010, 75 FR 76086).

The designated critical habitat overlaps the offshore Action Area between Hooper Bay and the mouth of the Yukon River near the cable connection in Alakanuk as well as a portion of the onshore Action Area in Kotlik.

Potential effects on polar bear critical habitat are evaluated based on the seasonal presence or absence of its PCEs within the Action Area. The marine components of the Project will occur during the summer months when sea ice is not present in the Action Area. As a result, Project activities would not adversely modify sea ice critical habitat. There are no known terrestrial denning areas within or near the Action Area, and the Project does not overlap any areas designated as core denning habitat for polar bears. Denning occurs much farther north, particularly along the Beaufort and Chukchi Seas. Because denning habitat is not present, the Project have no effect on terrestrial denning habitat. The Project Area does not include barrier islands or similar terrestrial coastal features that polar bears use for travel, temporary refuge, or resting during the open water season. Since these habitats are absent from the Action Area, the Project would have no effect on barrier island habitat.

Effects of Habitat Disturbance on Prey

As detailed in Section 3.1, disturbances to habitat resulting from Project activities could affect the prey of the listed species. Ringed seals are the primary prey of polar bears. Project activities in the marine portion of the Action Area will only take place during navigable periods in the summer months and therefore would not disturb the sea ice and snowdrifts that ringed seals rely on for pupping and nursing in the spring (Reimer et al. 2019). Further, ringed seals mostly occur north of Utqiaġvik in the Beaufort and Chukchi Seas during the summer (Von Duyke et al. 2020) and therefore are unlikely to be present in the Action Area during Project activities. Given the likely absence of ringed seals within the Action Area during planned periods of Project activity and the temporary and short-term nature of any effect on seal habitat, effects to polar bear prey resources would be insignificant and minimized with the implementation of conservation measures (Section 2.2.5).

Vessel Strikes and Vehicle Collisions

Polar bears are unlikely to be impacted by vessel strikes during Project activities, as construction will take place in the summer months when sea ice is absent from the Action Area. During this time, adult males, subadults, and non-pregnant females are typically dispersed farther north, reducing the likelihood of encounters with vessels. In ice-free conditions, polar bears tend to spend less time resting or traveling on sea ice in marine corridors and are more likely to be on land or in coastal areas with limited overlap with Project vessel routes. Additionally, the Project vessels will operate at low speeds (installation speeds up to 2 knots [1 m/s] and transit speeds up to 10 knots [5.1 m/s]) along a predictable, linear path, reducing the likelihood of collisions to any marine wildlife. These slow speeds provide marine wildlife, including any polar bears that may be swimming in the area during the summer (although highly unlikely), with ample time to detect and avoid vessels. The overall number of vessels used would also be small and temporary, adding minimal new traffic compared to existing fishing and transit vessels in the region. Further, protected species observers will be on board to monitor wildlife and implement avoidance measures, further minimizing the risk of vessel strikes.

As discussed in Section 3.2, collisions with vehicles used during terrestrial Project activities have the potential to affect polar bears. The Project could increase the potential for vehicle collisions with polar bears, particularly where construction and operation activities overlap with the seasonal movements of adult males, subadults, and non-pregnant adult females during the winter months when sea ice extends below the Bering Strait. However, their presence is expected to be occasional and temporary, as they are more commonly found farther north of the Action Area. Increased traffic, including heavy equipment and transport vehicles, may pose a risk to bears traveling through the area, especially during low-visibility conditions such as winter storms or darkness. Over time, polar bears may become accustomed to human activity, which could further increase the likelihood of encounters with vehicles. However, given that the Project will occur at almost the furthest southern point of the polar bear range, and activities will occur during times when and in areas where polar bears are not expected to be present, the potential for polar bears to be exposed to and affected by Project vehicles is insignificant. Effects would be minimized with implementation of conservation measures (Section 2.2.5).

Entanglement

Polar bears have been found entangled in debris in some instances (James and Große 2023); however, in one of these cases, the debris was located within the bear's mouth, which may suggest an attempt at ingestion or exploratory behavior rather than typical entanglement. While there are no widely documented cases of polar bears becoming entangled in terrestrial or marine debris, materials like fishing nets and ropes do pose risks to wildlife species (Letcher et al. 2010). Polar bears generally do not interact with debris in ways that lead to entanglement. Although they may encounter debris such as plastics or fishing gear during foraging or swimming, the primary risks to polar bears are indirect (e.g., the ingestion of harmful materials rather than physical entanglement) (James and Große 2023). Polar bears are unlikely to become entangled in the FOC due to the Project's careful planning and modern installation techniques (see Section 3.3). Unlike historical cables, the flexible and low-torsion characteristics of the FOCs minimize the risk of exposure or suspension. The cable will be buried in high-risk areas, such as fishing grounds, and surface-laid with minimal slack where burial is not possible. In nearshore areas, the cable will be trenched to reduce disturbance from environmental conditions and wildlife. Additionally, post-lay inspections will ensure cables are properly secured, further reducing the risk of entanglement. Conservation measures discussed in Section 2.2.5 would further minimize any potential impact on polar bears.

Artificial Light

Polar bears, like other bear species, typically avoid human settlements (Gibeau et al. 2002; Elfström et al. 2014); however, artificial lighting has the potential to attract polar bears to human settlements, disrupting their natural behaviors and potentially leading to habituation. Over time, repeated exposure to lit areas can increase the likelihood of polar bears associating these environments with food or safety, further encouraging their presence near human developments (Peine 2001). While polar bears are generally not expected to be present in the Action Area during the summer months, when sea ice has melted and the species migrates north, they may be found in the region during the fall and winter months. This would typically involve adult males or subadult polar bears that may be in areas with shallow waters along the continental shelf or where sea ice extends below the Bering Strait; however, it is unlikely that these bears would be significantly impacted by artificial lighting. Polar bears are known to be highly mobile and typically avoid developed areas, especially those with significant human activity. The effects, if any, would be insignificant. Additionally, the conservation measures outlined in Section 2.2.5 will minimize the potential effects of artificial lighting on any polar bears that might be present.

Water Quality

Turbidity and fuel or hazardous substance spills can have various impacts on polar bears, primarily through the potential disruption of their food sources and the contamination of their habitat.

Increased turbidity can affect prey species such as seals by hindering their ability to detect prey, which, in turn, could impact polar bears' foraging success. Fuel or hazardous substance spills pose a risk of direct contamination to polar bear habitat and prey, with the potential for ingestion or absorption of harmful chemicals through the skin or by the consumption of contaminated prey. These pollutants can lead to long-term health issues for polar bears, including reproductive and immune system disruptions, as well as chronic toxic effects (Peacock et al. 2010; Routti et al. 2019).

Project-specific activities, such as the PLGR and cable installation, are unlikely to cause impacts on polar bears due to the temporary and localized nature of the disturbances. Although sediment suspension from trenching and other seafloor disturbances could result in short-term increases in turbidity, this effect is expected to be minimal and localized along the cable route. The turbidity would return to baseline levels within minutes to hours, limiting any disruption to polar bears' access to prey or their habitat. Further, any fuel or hazardous substance spills are anticipated to be minimized through the implementation of BMPs for spill containment and cleanup. In addition, marine work will occur during the summer, when polar bears are expected to be absent from the Action Area. The effects, if any, would be insignificant. Additionally, the conservation measures outlined in Section 2.2.5 will minimize the potential effects of turbidity or contaminant spills on any polar bears that might be present.

Noise

Complete noise analysis calculation results using the NMFS Technical Guidance and airborne noise guidance are included in Section 3.6 (Appendix D). Polar bears are unlikely to be affected by in-air Project noise. Polar bears within 70.67 ft (21.54 m) and in/underwater during cable-laying operations may experience behavioral disturbance. However, activity in the marine portion of the Action Area will take place in ice-free summer months far offshore when polar bears are absent from the Action Area; therefore, the potential for polar bears to be exposed to and affected by in-air or underwater Project noise is insignificant. Effects will be minimized with implementation of conservation measures (Section 2.2.5).

Anthropogenic Presence and Disturbance

Section 3.7 describes the potential effects of anthropogenic presence on listed species in the Action Area. Project construction over multiple years could increase the potential for polar bear-human interactions and changes in polar bear behavior or habitat use. However, exposure to human presence is unlikely during the marine summer cable lay activities, as polar bears will have retreated with the sea ice further north. Similarly, exposure to human presence during terrestrial cable lay is unlikely during winter months as the Action Area represents the furthest southern portion of the polar bear range. However, as a precaution, an intentional harassment permit will be obtained, and conservation measures outlined in Section 2.2.5 will be implemented. These measures include waste management strategies to reduce attractants and protocols for minimizing human-bear encounters. Given these precautions, no significant effects on polar bears are anticipated.

4.2.3.2 CONCLUSION

The Project may affect but is not likely to adversely affect polar bears. Marine Project activities are planned to take place during navigable periods in summer when sea ice and polar bears are not present. Polar bears may be present in the terrestrial portions of the Action Area during winter Project activities (although the potential for presence is low) and would have the potential to be exposed to the following effects in the Project's Action Area: vehicle collisions, noise, habitat disturbance, effects of habitat disturbance on polar bear prey species, and anthropogenic presence and disturbance. None of these are expected to have significant negative effects on polar bears. Any effects will be further minimized with the implementation of conservation measures included in Section 2.2.5.

The Project may affect but is not likely to adversely modify polar bear critical habitat. Project activities would not affect sea ice, as offshore activities will only take place during ice-free periods in the summer and early fall. Additionally, no denning habitat or barrier islands are present within the Action Area.

4.2.4 SPECTACLED EIDER

4.2.4.1 REGULATORY HISTORY AND STATUS

The Spectacled Eider was listed as threatened under the ESA in 1993 (USFWS 1993) as a result of population declines in western Alaska and loss of up to 98 percent of breeding pairs in their primary breeding range in the Yukon-Kuskokwim Delta between the 1970s and 1990s (Stehn et al. 1993). The causes of precipitous population declines remains unknown; however, the species faces numerous threats.

Subsequent to the species listing, new information became available regarding Spectacled Eiders' molting, wintering habitat, and breeding habitat (USFWS 2001b), which resulted in the USFWS designating over 100,000 km^2 as final critical habitat in 2001. These areas include nesting habitat on the Yukon-Kuskokwim Delta, molting habitat in Norton Sound and Ledyard Bay, and wintering habitat south of St. Lawrence Island (USFWS 2001b; Appendix B, Figure 12).

4.2.4.2 LIFE HISTORY

Spectacled Eiders are large sea ducks, ranging from 20 to 22 inches (50.8 to 55.9 cm) long. They spend most of their life in marine waters feeding primarily on benthic prey (mostly clams), as well as amphipods, crustaceans, insects, mollusks, and vegetation by diving and dabbling on the surface (USFWS 2021a). Spectacled Eiders begin breeding at 2 to 3 years of age. Nesting occurs on tundra lake islands and peninsula habitats on Alaska's Beaufort Coastal Plain Subregion and in western Alaska, generally within 12 miles (19.3 km) of the coast. They arrive at breeding grounds as pairs in late May or June (USFWS 2010c). Nests are generally located near shallow ponds or lakes within 10 ft (3 m) of water (Petersen 2000). Broods are reared near freshwater, where they feed on invertebrates along pond edges (USFWS 2010c). Females lay one egg per day and have an average clutch size of three to nine oval, olive green eggs (USFWS 2010c). Eggs are incubated for 24 to 28 days and young fledge in late August (Rothe and Arthur 2000).

After breeding, Spectacled Eiders migrate to molt in shallow coastal waters with sandy, gravelly bottoms, usually less than 59 ft (18 m) deep in coastal areas of the Chukchi and Bering Seas (USFWS 2021a). Males move to nearshore marine waters in late June, undergoing a complete molt of their flight feathers in the eastern Siberian Sea. Nesting females remain on the coastal tundra until late August to early September and then congregate to molt. Female Spectacled Eiders breeding in Arctic Alaska primarily molt in Ledyard Bay and breeding females from the Yukon-Kuskokwim Delta molt primarily in Norton Sound (Petersen et al. 1999). Non-breeding females or those with failed nests arrive in molting areas in late July, while successfully breeding females arrive in late August and stay through October.

After molting, Spectacled Eiders travel to their wintering areas in October or November. Almost the entire global population winters in polynyas (areas of persistent open water in sea ice) and leads (a linear area of open water within the sea ice) in the Bering Sea south of St. Lawrence Island at water depths of less than 262.5 ft (80 m) from November to March (Petersen et al. 1999, 2000; USFWS 2001b).

4.2.4.3 THREATS

Spectacled Eider population threats include ingestion of lead ammunition; harvest and shooting; exposure to contaminants (other than lead); collisions with onshore/offshore structures and vessels; habitat loss in terrestrial and marine environments; disease, parasites, and biotoxins; predation; reduced prey availability; and climate change. Spectacled Eider species are particularly vulnerable to oil spills (Smith et al. 2017; USFWS 2010c, 2021b). Chronic oil contamination is a serious problem for Spectacled Eiders in areas near shipping lanes, such as the Aleutian Islands, the Bering Sea, the Bering Strait, and increasingly in the Chukchi and Beaufort Seas (Smith et al. 2017). Increases in ocean warming may cause shifts in the availability and composition of benthic invertebrate prey species and affect the length of time Spectacled Eiders can spend foraging, as the species often rest on sea ice to conserve energy when not foraging (USFWS 2010c). Additionally, the melting of sea ice can cause increased competition with and and predation by species (i.e., Pacific walrus) forced to haul out onto Spectacled Eider molting or wintering areas instead of sea ice (USFWS 2010c). Of the many threats facing this species, lead exposure, oil contamination, and climate change are of the highest concern for Spectacled Eider population viability (USFWS 2021b).

4.2.4.4 POTENTIAL PRESENCE IN THE ACTION AREA

Spectacled Eiders exhibit strong migratory connectivity and site fidelity to several spatially important areas, as identified in the USFWS Species Status Assessment for the Spectacled Eider (2021). Areas identified as important to population viability within the vicinity of the Action Area include the eastern and southern Norton Sound in the northeastern Bering Sea within approximately 37.3 miles (60 km) of Shaktoolik Bay and the Yukon River Delta; specifically, the Yukon-Kuskokwim Delta and adjacent marine areas within approximately 12.4 miles (20 km) of the coast of western Alaska between Scammon Bay and Nelson Island, and the northern Bering Sea within approximately 124.3 miles (200 km) of the southern coast of St. Lawrence Island (Sexson et al. 2014; Appendix B, Figure 12).

Based on annual aerial and ground-based surveys conducted by the USFWS between 1985 and 2014, Spectacled Eider nesting on the western Alaska coast in the Yukon-Kuskokwim Delta coastal plain may occur south of the Bering Strait from Norton Sound south to Anogok from coastal areas to approximately 24.9 miles (40 km) inland (Fischer et al. 2018). The core nesting area within this larger survey area was identified along the central coastal zone encompassing an area 276.5 square miles (716 km^2) surrounding Hazen Bay (Fischer et al. 2018). This core nesting area is located approximately 12.4 miles (20 km) west of the Baird Inlet cable segment where it terminates in Metarvik and approximately 12.4 miles (20 km) northwest of the Airr 3.2.1 Metarvik to Poleline segment; therefore, the closest Spectacled Eider nesting area is well outside of the Action Area. The 1996 species' recovery plan notes that low-density breeding may still occur outside of confirmed breeding locations (USFWS 1996); however, nesting within the Action Area would not be expected.

Although nesting is not expected within the Action Area, Spectacled Eiders could be encountered in the marine environment during summer cable-laying activities. This may occur during migration from the Yukon-Kuskokwim Delta breeding area to molting areas in the eastern Siberian Sea or Norton Sound (Petersen et al. 1999) typically between the months of June to late August. When moving between nesting and molting areas, Spectacled Eiders travel along the coast up to 37 miles (59.6 km) offshore (Petersen et al. 1999). The offshore cable will be laid approximately 20 to 30 miles (32 to 48 km) off the coast of the Yukon-Kuskokwim Delta and therefore could be encountered by eiders when migrating to molting areas. Molting flocks gather in relatively shallow coastal water, usually less than 118.1 ft (36 m) deep (Petersen et al. 1999). Spectacled Eiders may also be encountered in the Action Area along the offshore cable route when wintering birds migrate from south of St. Lawrence Island or from the southern Norton Sound to the Yukon-Kuskokwim Delta for breeding (Petersen et al. 1999; Sexson et al. 2014 (Petersen et al. 2000).

4.2.4.5 CRITICAL HABITAT OVERLAPPING THE ACTION AREA

Spectacled Eider critical habitat units in the vicinity of the Action Area include the Yukon-Kuskokwim Delta breeding population, occurring from approximately Kokechik Bay in the north to the coastline situated west of Chefornak and up to approximately 12 miles (19.3 km) inland. The PCEs for critical habitat units in the Yukon-Kuskokwim Delta, which includes the Central and South Yukon-Kuskokwim Delta Units, consist of the vegetated intertidal zone and associated plant communities and all open water inclusions within that zone (USFWS 2001b). Plant communities that occur within that zone include, but are not limited to, low wet sedge tundra, grass marsh, dwarf shrub/graminoid meadow (consisting of grasses and sedges), high and intermediate graminoid meadow, and mixed high graminoid meadow/dwarf shrub uplands (USFWS 2001b). The Action Area is not located within any Spectacled Eider critical habitat units (Appendix B, Figure 12).

4.2.5 STELLER'S EIDER

4.2.5.1 REGULATORY HISTORY AND STATUS

The Alaska-breeding population of Steller's Eider was listed as threatened under the ESA in 1997 (62 FR 31748) due to concerns over apparent declines inferred from a reduction in nesting range in western Alaska. These declines included the disappearance of the species from the Yukon-Kuskokwim Delta, which was historically the most populated breeding ground for this species. Because this species breeds in low numbers, spends winter months in remote areas, and most historical information on population size is anecdotal, the specific causes of population decline remain unclear. However, it is estimated that the total population of Steller’s Eiders may have declined by up to 50 percent from the 1960s through the 1980s (USFWS 1997, 2019). As of 2010, less than 600 Steller’s Eiders were present on breeding grounds in Alaska, with most individuals near Barrow (USFWS 1997).

Critical habitat for the Steller’s Eider was designated in 2001 (66 FR 8850) and included breeding habitat in the Yukon-Kuskokwim Delta. The Yukon-Kuskokwim Delta Nesting Unit (Unit 1) includes 1,202.3 square miles (3,114 km^2) of the outer coastal zone of the central Delta. Marine units include Kuskokwim Shoals (Unit 2), the Seal Islands (Unit 3), Nelson Lagoon (Unit 4), and Izembek Lagoon (Unit 5) (66 FR 8850). None of these designated areas of critical habitat overlap with the Action Area (Appendix B, Figure 12).

4.2.5.2 LIFE HISTORY

Steller’s Eiders spend the majority of their lives in the marine environment, occupying terrestrial habitats only during the nesting season (USFWS 2019). Steller’s Eiders have similar behavior and physical traits as dabbling duck species. Steller’s Eiders are relatively small sea ducks. They typically measure about 17 to 19 inches (43.2 to 48.3 cm) in length and have a wingspan of approximately 28 to 29 inches (71.1 to 73.7 cm). Males are slightly larger than females, but both sexes are similar in size overall. During the non-breeding season, they forage in eelgrass beds, seaweed, and tidal flats, feeding on a variety of marine prey such as mollusks, crustaceans, and marine worms (Fredrickson 2001).

Steller’s Eiders typically begin breeding around 2 to 3 years of age. Breeding occurs in the Arctic regions of Russia and Alaska, with the majority of the global population nesting in Russia from early June to early September. In Alaska, they are found on the Arctic Coastal Plain (ACP) and historically on the Yukon-Kuskokwim Delta (USFWS 2025b). Birds typically arrive at their breeding grounds already paired. Nesting takes place in tundra regions near ponds and lakes (Quakenbush et al. 2004). Nests are usually located on the rims of low-centered polygonal tundra wetland habitat near ponds with emergent vegetation (USFWS 2019). The average clutch size is about 5.4 eggs, and the incubation period lasts approximately 24 days (Quakenbush et al. 2004). After hatching, the ducklings usually remain within approximately 2.1 miles (3.5 km) of the nest and forage in areas with abundant ponds and emergent vegetation (Quakenbush et al. 2004; USFWS 2019).

After nesting, Alaska-breeding Steller’s Eiders migrate along the coast to southwest Alaska, where they undergo a flightless molt and mix with the larger Russian-Pacific breeding population. Molting typically occurs between late June to mid-October (Smith et al. 2017). During the molt, they primarily occupy shallow marine areas with extensive eelgrass beds and/or intertidal mud and sand flats. After molting, Pacific-wintering Steller’s Eiders disperse throughout the Aleutian Islands, Alaska Peninsula, and western Gulf of Alaska, including Kodiak Island and lower Cook Inlet between late July and December. Migration back to the nesting areas occurs in spring between mid-April and early July (Smith et al. 2017; USFWS 2019). Steller's Eiders can migrate up to 2,983 miles (4,800 km) between breeding and wintering grounds and often fly only a few feet above the water during migration (ADFG n.d.; USFWS 2019).

4.2.5.3 THREATS

Steller's Eider population threats include ingestion of lead ammunition, collisions with powerlines and other structures, harvest and shooting, human disturbance, predation, exposure to contaminants (other than lead), habitat loss in terrestrial and marine environments, harsh winter weather, disease, reduced prey availability, and climate change. Eiders are particularly vulnerable to oil spills due to large flock sizes and therefore high probability of multiple individuals being oiled at one time (Smith et al. 2017; USFWS 2019). Chronic oil contamination is a serious problem for Steller's Eiders in areas near shipping lanes, such as the Aleutian Islands, the Bering Sea, the Bering Strait, and increasingly in the Chukchi and Beaufort Seas (Smith et al. 2017). Increases in ocean warming may cause shifts in the availability and composition of benthic invertebrate prey species (USFWS 2019). Additionally, increases in anthropogenic disturbance and predation from species, such as eagles and foxes, also threaten the resilience of Steller's Eider populations. Of the many threats facing this species, lead exposure, oil contamination, and climate change are of the highest concern for Steller's Eider population viability (USFWS 2019).

4.2.5.4 POTENTIAL PRESENCE IN THE ACTION AREA

Areas identified as important to population viability within the vicinity of the Action Area include the Yukon-Kuskokwim Delta and adjacent marine areas, nearshore waters throughout Nunivak Island, and the coastline along the southeastern Bering Sea, including the south side of Nunivak Island (MMS 2006). The current known range of Steller's Eiders overlaps with the Action Area (USFWS 2025b).

Based on ground and aerial surveys conducted by USFWS, the Yukon-Kuskokwim Delta was once the most populated nesting ground for Alaska-breeding Steller's Eiders but use has since declined (Kertell 1991; Larned 2012; Stehn et al. 2013; USFWS 2019). Although nesting is not expected within the Action Area, Steller's Eiders could be encountered in the marine environment during summer cable-laying activities. This may occur during migration of the Alaska-breeding population from the ACP and Yukon-Kuskokwim Delta breeding area to molting areas in coastal southwest Alaska and wintering areas in the Aleutian Islands, Alaska Peninsula, and western Gulf of Alaska, including Kodiak Island and lower Cook Inlet (USFWS 2019). Molting migration typically occurs from late June to mid-October, and fall migration occurs from late July to December. Steller's Eiders may also be encountered in the marine Action Area during spring migrations when wintering birds migrate along the southwestern coastline back to the Yukon-Kuskokwim Delta and the ACP for breeding in late April to early July (Smith et al. 2017; USFWS 2019.

4.2.5.5 CRITICAL HABITAT OVERLAPPING THE ACTION AREA

The USFWS-designated critical habitat units for the Alaska-breeding population of Steller's Eider include the habitat on the Yukon-Kuskokwim Delta and four units in marine waters southwest of 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 (USFWS 2001a). The PCEs for the Yukon-Kuskokwim Delta include all land within the vegetated intertidal zone, along with all open water inclusions within that zone. For the other marine units, PCEs include waters up to 30 ft (9 m) deep, the associated invertebrate fauna in the water column, the underlying marine benthic community, and eelgrass beds and associated flora and fauna, where present (USFWS 2001a). The Action Area is not located within any Steller's Eider critical habitat units (Appendix B, Figure 12).

4.2.6 POTENTIAL EFFECTS ON EIDERS

Critical Habitat

The Action Area does not occur within the USFWS-designated critical habitat for Spectacled Eider or Steller's Eider, and the Project would have no effect on critical habitat for these species.

Habitat Disturbance or Loss

As discussed in Section 3.1, Project activities within the Action Area would result in temporary and minor disturbance to terrestrial, freshwater, and marine habitats. Nearshore and terrestrial installation areas would experience temporary habitat disturbance (e.g., displacement of sediments during trenching, suspended sediments, etc.); however, the Project alignment has been designed to avoid high quality Spectacled Eider and Steller's Eider habitat and known areas of occupancy in critical habitat units. Additionally, installation of terrestrial cable segments will occur in the winter months when Steller's Eiders are wintering in offshore waters and Spectacled Eiders are wintering off the southern coast of St. Lawrence Island (neither species would be present during terrestrial cable-laying); therefore, habitat disturbance or loss to Steller's Eider and Spectacled Eider habitat would be insignificant. Any effects will be further minimized with the implementation of conservation measures (Section 2.2.5).

Effects of Habitat Disturbance on Prey

As discussed in Section 3.1, Project activities would cause temporary disturbance to benthic communities and benthic fauna (i.e., mollusks, crustaceans, and marine worms) that Steller's Eiders and Spectacled Eiders are known to feed upon in nearshore areas (Madge and Burn 1988; Sexson et al. 2014). Benthic fauna effects could include prey mortality and temporary changes in prey species composition as a result of Project activities; however, motile fauna are expected to leave or avoid areas being disturbed during active installation activities. In addition, based on the small cable footprint, effects to sessile fauna communities would be insignificant. Any effects will be further minimized with the implementation of conservation measures (Section 2.2.5).

Vessel Strike

As described in Section 3.2.1, Spectacled and Steller's Eiders could be at risk from Project-related vessel strikes. Eiders are highly susceptible to collisions with vessels due to their high-speed flight travel, relatively low flight altitude over water, and attraction to bright lights at night (Day et al. 2004, 2005; Johnson and Richardson 1982). Vessels traveling during bird migration or near bird concentration areas have a higher chance of striking birds. USFWS estimates this risk is highest during August through November when Steller's Eiders frequently fly in large groups between nesting, molting, and wintering areas (USFWS 2025b). Most (but not all) direct collisions reported in recent years (2019 and 2020) happen at night with large, lighted fishing vessels (NOAA Fisheries 2020; USFWS 2021a) in foggy, low-visibility conditions in nearshore areas and up to 12.4 miles (20 km) offshore. The Project marine route would be installed during the ice-free summer months when Spectacled and Steller's Eiders could be present during migration between breeding, molting, and overwintering sites (Smith et al. 2017). . Any effects will be further minimized with the implementation of conservation measures (Section 2.2.5).

Entanglement

Risks to listed species arising from potential entanglement are discussed in Section 3.3. The relative susceptibility of Spectacled Eiders and Steller's Eiders to entanglement is largely unknown. Reports on closely related common eiders indicate that entanglement in fishing gear and marine aquaculture nets can occur (Hoopes 1992; Schick et al. 2022). Other species of diving bird are also known to be at risk of entanglement, but assessments of Steller's and Spectacled Eiders have noted that entanglements of these species in commercial fishing gear have never been reported (Funk 2008; Stehn et al. 1993). Further, there is no recorded incidence of eiders or any sea duck species being entangled in FOC or similar communication cables. Modern FOC and installation techniques have improved torsional and flexion characteristics in subsea cables, virtually eliminating the potential for exposed cable to entangle marine species (Wood and Carter 2009). Further, the risk of abandoned fishing gear becoming snagged on the FOC and creating an increased risk of entanglement will be mitigated by burying of the cable in high-impact fishing areas. Given these factors, the risk of the Project causing negative effects to Steller's Eiders and Spectacled Eiders from entanglement is insignificant. Any effects will be further minimized with the implementation of conservation measures (Section 2.2.5).

Light

As discussed above in Section 3.3, artificial lighting can alter bird behavior. During migration and periods of low-visibility conditions, Spectacled and Steller's Eiders may be attracted or disoriented by vessel lighting and may even attempt to land on vessels to seek refuge from bad weather such as high winds and rain (USFWS 2025c). New sources of light could attract birds and disrupt foraging behaviors of Spectacled and Steller's Eiders in terrestrial and nearshore waters (Gauthreaux and Belser 2006). However, Project vessels will not require excessive lighting and will transit through the Action Area over a brief period. Additionally, offshore installation activities will align with the ice-free summer season when daylight lasts 18 to 21 hours, minimizing the periods when artificial lighting will be required. Any effects will be further minimized with the implementation of conservation measures (Section 2.2.5).

Water Quality

Project activities have the potential to result in the temporary and localized suspension of marine sediments in both soft bottom and hard bottom areas, as discussed in Section 3.5.1; however, the predominant seabed sediment type for the cable route consists of fine sand (Benthic GeoScience, Inc. 2024), thus generated turbidity in the Action Area would be expected to settle quickly. Effects from temporary, short-term, and minimal areas of elevated turbidity on eiders would be insignificant. Any effects will be further minimized with the implementation of conservation measures (Section 2.2.5).

Fuel or Hazardous Substance Spills

As discussed in Section 3.5.2, Project activities also have the potential to affect water quality through fuel or hazardous substance spills. Vessels and equipment that will be used for Project activities have the potential to release fuel, oil, or lubricants into the marine environment. Spectacled and Steller's Eiders could be directly affected by vessel and equipment-related fluid spills during Project activities through ingestion, contact with plumage, or inhalation. Eiders could also be indirectly affected by effects on prey or habitats. Threats to birds increase when spills occur near or within areas of high bird concentrations, such as nesting or molting congregations (ADFG 2018). Additionally, solid waste releases, such as garbage or food waste from vessels, can have negative effects on marine species; however, vessels operate under strict regulatory requirements that include measures to prevent and respond to unforeseen accidents. Requirements include federal and state oil spill prevention and response requirements. With the implementation of conservation measures (Section 2.2.5), the effects of hazardous material spills on Spectacled and Steller's Eiders would be insignificant.

Noise

The effects of noise on avian species is discussed in Section 3.6. Air-transmitted noise and underwater noise above environmental background levels will be generated by Project activities in the Action Area by vessels, mechanized equipment, construction activities, and human voices. Noise could affect Spectacled Eiders and Steller's Eiders present in terrestrial, freshwater, or marine habitats, depending on noise levels and the distance of noise attenuation in each environment.

Underwater noise associated with Project activities could disturb Spectacled Eiders and Steller's Eiders because they spend time underwater while foraging and diving for prey in water depths up to 33 ft (10 m) (Madge and Burn 1988; Smith et al. 2017) and 230 feet (70 m), respectively (Lovvorn et al. 2003); however, the effects of underwater noise on eiders has not been well-studied. Studies of other bird species have demonstrated that both acute and chronic air-transmitted noise may cause nest abandonment and failure, reduced juvenile growth and survival, and malnutrition or starvation of the young (Francis et al. 2009); however, modeled Project underwater noise effects are well below levels that could cause hearing damage or mortality and would be considered temporary and minor.

Additionally, based on the timing of Project activities and distances from nesting, molting, and wintering areas, the potential for eider exposure to terrestrial Project noise is low. Individuals would be expected to leave active construction areas well before this point; however, eiders within 397 ft (121 m) of chain trenching activities could exhibit behavioral disturbance. Chain trenching would not occur near any known areas of eider congregation (e.g., molting, nesting, staging); therefore, the effects of any Project-generated noise on eiders would be insignificant and further minimized with the implementation of conservation measures (Section2.2.5).

Anthropogenic Presence and Disturbance

Spectacled Eiders and Steller's Eiders could be affected by increased anthropogenic presence in the Action Area, as discussed in Section 3.7. However, because the Project alignment has been designed to avoid Spectacled Eider and Steller's Eider terrestrial congregating areas and installation of terrestrial cable segments will occur in the winter months when Spectacled Eiders and Steller's Eiders are wintering elsewhere, exposure to anthropogenic presence in the terrestrial environment would be unlikely. Similarly, eiders could encounter project personnel in the marine environment during summer cable lay, but anthropogenic presence would be in line with baseline levels for the area. Therefore, the effects of anthropogenic disturbance would be insignificant and further minimized with the implementation of conservation measures (Section 2.2.5).

4.2.6.2 CONCLUSION

The Project may affect but is not likely to adversely affect Spectacled Eiders and Steller's Eiders. Terrestrial Project activities will take place in the winter months when both species are in offshore overwintering habitats. Spectacled and Steller's Eiders may be present in the marine environment during Project activities in the summer, but the marine portion of the Project Action Area is well outside of the intertidal zone that eiders typically utilize during the summer months. Though their presence is unlikely during periods of Project activity, any Spectacled Eiders or Steller's Eiders that may occur have the potential to be affected by vessel strike, entanglement, artificial light, water quality, fuel or hazardous substance spills, anthropogenic noise, habitat disturbance or loss, effects of habitat disturbance on prey, or anthropogenic presence and disturbance. None of these factors are expected to have significant negative effects on Spectacled Eiders or Steller's Eiders.

5. CONCLUSIONS

This BA forms the basis for the conclusions on the effects of the proposed Project on the following federally listed species: polar bear, wood bison, Short-tailed Albatross, Spectacled Eider, and Steller's Eider.

It was determined that the Project would have no effect on wood bison or Short-tailed Albatross. It was also determined that the Project would have no effect on critical habitats for Spectacled Eider or Steller's Eider.

The Project may affect but is not likely to adversely affect polar bear, Spectacled Eider, and Steller's Eider, and the Project may affect but is not likely to adversely modify polar bear critical habitat.

6. REFERENCES

Aars, J., N.J. Lunn, and A.E. Derocher (Eds.). 2006. *Polar bears: Proceedings of the 14th working meeting of the IUCN/SSC Polar Bear Specialist Group, 20–24 June, Seattle, 23*. Washington, USA. IUCN, Gland, Switzerland. 189 pp.

Adams, C.A., E. Fernández-Juricic, E.M. Bayne, and C.C. St. Clair. 2021. "Effects of artificial light on bird movement and distribution: a systematic map." *Environmental Evidence*, Vol. 10, No. 37. DOI: https://doi.org/10.1186/s13750-021-00246-8

ADEC (Alaska Department of Environmental Conservation). 2023. *Air pollution in Alaska communities*. Accessed: February 25, 2025. Retrieved from: https://dec.alaska.gov/air/anpms/communities/

ADEC. 2024. "Annual Air Quality Monitoring Network Plan." Accessed: March 6, 2025. Retrieved from: https://dec.alaska.gov/air/air-monitoring/guidance/monitoring-plans

ADEC. 2025. "Air Quality Index." Accessed: May 16, 2025. Retrieved from: https://experience.arcgis.com/experience/8655256b056a48f6a19788d43cdab30f

ADFG (Alaska Department of Fish and Game). 2018. *State of Alaska Special Status Species*. Accessed: March 10, 2025. Retrieved from: http://www.adfg.alaska.gov/index.cfm?adfg=specialstatus.main

ADFG. n.d.. *Steller's Eider (Polysticta stelleri) Species Profile*. Accessed: March 10, 2025. Retrieved from: https://newsrelease.adfg.alaska.gov/index.cfm?adfg=spectacledeider.main

Allen, J.K, M.L. Peterson, G.V. Sharrard, D.L. Wright, and S.K. Todd. 2012. "Radiated noise from commercial ships in the Gulf of Maine: Implications for whale/vessel collisions." *The Journal of the Acoustical Society of America*, Vol. 132, No. 3: EL229–EL235.

Amstrup, S.C. 2003. "Polar Bear (*Ursus maritimus*)." In G.A. Feldhamer, B.C. Thompson, and J.A. Chapman, editors. *Wild Mammals of North America- Biology, Management, and Conservation*. John Hopkins University Press. Baltimore, Maryland, USA. 587–610 pp.

Amstrup, S.C., and G.M. Durner. 1995. "Survival rates of radio-collared adult polar bears and their dependent young." *Canadian Journal of Zoology* 73:1312-1322.

Amstrup, S.C., and C. Gardner. 1994. "Polar bear maternity denning in the Beaufort Sea." *Journal of Wildlife Management*, Vol. 58: 1–10.

Amstrup, S.C., T.L. McDonald, and G.M. Durner. 2004. "Using satellite radiotelemetry data to delineate and manage wildlife populations." *Wildlife Society Bulletin*, Vol. 32: 661–679.

Beier, P. 2006. "Effects of artificial night lighting on terrestrial mammals." In *Ecological Consequences of Artificial Night Lighting*, by C. Rich and T. Longcore (eds.). Washington, D.C.: Island Press. 19–42 pp.

Benthic GeoScience, Inc. 2024. *Marine Geophysical & Geotechnical Route Selection Survey Interim Report*. Prepared for Airraq Network, Bethel Native Corporation, and GCI.

Bhagarathi, L.K., P.N. DaSilva, G. Maharaj, R. Balkarran, and A. Baksh. 2024. "The impact of anthropogenic sound on marine mammals: A review." *International Journal of Life Science Research Archive*, Vol. 7, No. 2.

Blank, J.J. 2013. "Remote identification of maternal polar bear (Ursus maritimus) denning habitat on the Colville River Delta, Alaska." ProQuest Dissertations And Theses; Thesis (M.S.)—University of Alaska Anchorage. Publication Number: AAT 1542712; ISBN: 9781303281792; Source: *Masters Abstracts International*, Vol. 52, No. 1: 76 pp.

Bureau of Land Management (BLM). 2020. *Bering Sea-Western Interior Proposed Resource Management Plan and Environmental Impact Statement*. U.S. Department of the Interior.

Burgess, S. 2025. Personal communication—USFWS. March 17, 2025.

Burns, D., and A. Poe. 2014. "Marine Vessel Traffic in the Aleutians." Aleutian Islands Working Group. Accessed: April 30, 2025. Retrieved from: https://aleutianislandsworkinggroup.wordpress.com/2014/09/09/marine-vessel-traffic-in-the-aleutians/

Cameron, M.F., J.L. Bengtson, P.L. Boveng, J.K. Jansen, B.P. Kelly, S.P. Dahle, E.A. Logerwell, J.E. Overland, C.L. Sabine, G. T. Waring, and J.M. Wilder. 2010. *Status review of the bearded seal (Erignathus barbatus).* U.S. Department of Commerce, NOAA Technical Memorandum. NMFS-AFSC-211: 246 pp.

Chernetsov, N.S. 2016. "Orientation and navigation of migrating birds." *Biology Bulletin*, Vol. 43, No. 8:788–803. DOI: 10.1134/S1062359016080069

Collins, C. and R. Kays. 2011. "Causes of mortality in North American populations of large and medium-sized mammals." *Animal Conservation*, Vol. 14, No. 5:474–483. DOI: https://doi.org/10.1111/j.1469-1795.2011.00458.x

Cook, S., S. Daley, K. Morrow, and S. Ward. 2017. *ShoreZone coastal imaging and habitat mapping protocol.* Prepared for NOAA, National Marine Fisheries Service, Alaska Region, Habitat Conservation Division, Juneau, AK, USA by Coastal and Ocean Resources.

Crowell, S.E., A.M. Wells-Berlin, C.E. Carr, G.H. Olsen, R.E. Therrien, S.E. Yannuzzi, and D.R. Ketten. 2015. "A comparison of auditory brainstem responses across diving bird species." *Journal of Comparative Physiology*, Vol. 201: 803–815.

Dau, C. and S. Kistchinski. 1977. "Seasonal movements and distribution of the Spectacled Eider." *Wildfowl Journal*, Vol. 28: 65–75.

Day, R.H., A.K. Prichard, and J.R. Rose. 2005. *Migration and Collision Avoidance of Eiders and Other Birds at Northstar Island, Alaska, 2001–2004: Final Report*. Prepared for BP Exploration (Alaska) Inc. by ABR, Inc. – Environmental Research & Services, Fairbanks, Alaska.

Day, R.H., J.R. Rose, A.K. Prichard, R.J. Blaha, and B.A. Cooper. 2004. "Environmental Effects on the Fall Migration of Eiders at Barrow, Alaska." *Marine Ornithology*, Vol. 32:13–24.

DeMaster, D.P., and I. Stirling. 1981. "*Ursus maritimus*. Polar bear." *Mammalian Species*, 145: 1–7.

Dernie, K.M., M.J. Kaiser, and R.M. Warwick. 2003. "Recovery rates of benthic communities following physical disturbance." *Journal of Animal Ecology*, Vol. 72, No. 6: 1043–1056. DOI: 10.1046/j.1365-2656.2003.00775.x

Derocher, A.E., and I. Stirling. 1992. "The population dynamics of polar bears in western Hudson Bay." In D.R. McCullough and R.H. Barrett, editors. *Wildlife 2001: Populations*. Elsevier Applied Science, London, United Kingdom and New York, USA. 1150–1159 pp.

Duffy, L., L. De Wilde, K. Spellman, K. Dunlap, B. Dainowski, S. McCullough, B. Luick, and M. van Muelken. 2018. "Resilience and Adaptation: Yukon River Watershed Contaminant Risk Indicators." *Scientifica*, 2018 (8421513): 12.

Durner, G.M., and S.C. Amstrup. 1996. "Mass and body-dimension relationship of polar bears in northern Alaska." *Wildlife Society Bulletin*, Vol. 24: 480–484.

Durner, G.M., and T.C. Atwood. 2021. *Mapping data of polar bear (Ursus maritimus) maternal den habitat, Arctic Coastal Plain, Alaska (ver. 2.0, November 2011): U.S. Geological Survey data release*. Accessed: February 23, 2024. Retrieved from: https://alaska.usgs.gov/products/data.php?dataid=436

Durner, G.M., D.C. Douglas, R.M. Nielson, and S.C. Amstrup. 2006. *Model for Autumn Pelagic Distribution of Adult Female Polar Bears in the Chukchi Seas, 1987–1994*. USGS Alaska Science Center, Anchorage, Final Report to USFWS. U.S. Geological Survey, Anchorage, Alaska, USA.

Durner, G.M., K. Simac, and S.C. Amstrup. 2013. "Mapping polar bear maternal denning habitat in the National Petroleum Reserve-Alaska within an IFSAR digital terrain model." *Arctic*, Vol. 66: 197–206.

Durner, G.M., S.C. Amstrup, and A.S. Fischbach. 2003. "Habitat characteristics of polar bear terrestrial maternal den sites in northern Alaska." *Arctic*, Vol. 56: 55–62.

Durner, G.M., S.C. Amstrup, and K.J. Ambrosius. 2001. "Remote identification of polar bear maternal den habitat in northern Alaska." *Arctic*, Vol. 54: 115–121.

Eberhardt, L.L. 2002. "A paradigm for population analysis of long-lived vertebrates." *Ecology*, Vol. 83: 2841–2854.

eBird. 2025. eBird: An online database of bird distribution and abundance. Cornell Lab of Ornithology, Ithaca, New York. Accessed: March 4, 2025. Retrieved from: http://www.ebird.org

Elfström, M, A. Zedrosser, O-G. Støen, and J.E. Swenson. 2014. "Ultimate and proximate mechanisms underlying the occurrence of bears close to human settlements: review and management implications." *Mammal Review*, Vol. 44: 5–18.

Federal Emergency Management Agency (FEMA). 2023. *FEMA Flood Map Service Center*. Accessed: March 10, 2025. Retrieved from: https://msc.fema.gov/portal/search?AddressQuery=city%20of%20bethel

FHWA (U.S. Federal Highway Administration). 2006. *Construction noise handbook: Chapter 9*. Accessed on 5 March 2025. Retrieved from: https://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm

Fischer, J. B., R.A. Stehn, T.D. Bowman, R.M. Platte, W.D. Eldridge, J.I. Hodges, and W.I. Butler Jr. 2018. “Coordinated aerial and ground surveys document long-term recovery of geese and eiders on the Yukon–Kuskokwim Delta, Alaska, 1985–2014.” In *Trends and traditions: Avifaunal change in western North America* (W. D. Shuford, R. E. Gill Jr., and C. M. Handel, eds.), pp. 148–160. Studies of Western Birds 3. Western Field Ornithologists, Camarillo, CA. DOI: 10.21199/SWB3.7

Francis, C.D., C.P. Ortega, and A. Cruz. 2009. “Noise Pollution Changes on Avian Communities and Species Interactions.” *Current Biology*, Vol. 19: 1415–1419.

Fredrickson, L.H. 2001. “Steller's Eider (*Polysticta stelleri*), version 2.0.” In *The Birds of North America* (P. G. Rodewald, editor). Cornell Lab of Ornithology, Ithaca, New York, USA.

Frey, K.E., G.W.K. Moore, L.W. Cooper, and J.M. Grebmeier. 2015. “Divergent patterns of recent sea ice cover across the Bering, Chukchi, and Beaufort seas of the Pacific Arctic Region”. *Progress in Oceanography*, Vol. 136:32–49.

Funk, F. 2008. *Potential interactions between commercial fishing vessels and Steller's and Spectacled Eiders in Alaska*. Final Report, Federal Aid Project E-5. Alaska Department of Fish and Game, Division of Commercial Fisheries. Juneau, AK.

Garner, G.W., S.E. Belikov, M.S. Stishov, V.G. Barnes, and S.A. Arthur. 1994. “Dispersal patterns of maternal polar bears from the denning concentration on Wrangel Island.” *International Conference on Bear Research and Management*, Vol. 9, No. 1: 401–410.

Garner, G.W., S.T. Knick, and D.C. Douglas. 1990. “Seasonal movements of adult female polar bears in the Bering and Chukchi Seas.” *International Conference on Bear Research and Management*, Vol. 8: 219–226.

Gauthreaux Jr., S.A., and C.G. Belser. 2006. “Effects of Artificial Night Lighting on Migrating Birds.” In *Ecological Consequences of Artificial Night Lighting*, edited by C. Rich and T. Longcore, pp. 67-93. Washington, D.C.: Island Press. Accessed: February 19, 2025. Retrieved from: https://sj-admin.s3-us-west-2.amazonaws.com/2006_0000_Gauthreaux_EffectsOfArtificialNightLighting.pdf

Germano, J.D., J.H. Parker, and J. Charles. 1994. *Monitoring cruise at the Massachusetts Bay Disposal Site, August 1990*. Waltham, MA: U.S. Army Corps of Engineers, New England Division. DOI: https://archive.org/details/monitoringcruise01germ

Gibeau, M.L., A.P. Clevenger, S. Herrero, and J. Wierzchowski. 2002. “Grizzly bear response to human development and activities in the Bow River Watershed, Alberta, Canada.” *Biological Conservation*, Vol. 103: 227–236.

Hale, R. 2018. “Sounds from Submarine Cable and Pipeline Operations.” UN ICP on Oceans and the Law of the Sea. Presented 22 Oct 2018. Accessed March 7, 2025. Retrieved from: https://www.un.org/depts/los/consultative_process/icp19_presentations/2.Richard%20Hale.pdf

Hall, J.V., W.E. Frayer, and B.O. Wilen. 1994. *Status of Alaska Wetlands*. U.S. Fish and Wildlife Service, Alaska Region. Anchorage, Alaska. 36 pp.

Hanna, G.D. 1920. “Mammals of the St. Matthew Islands, Bering Sea.” *Journal of Mammalogy*, Vol. 1: 118–122.

Hartwell, I.S., D.A. Apeti, A.S. Pair, T. Radenbaugh, and R. Britton. 2017. *Alaska: Characterization of soft bottom benthic habitats, fish body burdens and sediment contaminant baseline assessment.* NOAA. Anchorage, Alaska. DOI: 10.7289/V5/TM-NOS-NCCOS-227

Hazel, J., I.R. Lawler, H. Marsh, and S. Robson. 2007. “Vessel speed increases collision risk for the green turtle *Chelonia mydas*.” *Endangered Species Research*, Vol. 3: 105–113.

Heezen, B.C. 1957. “Whales entangled in deep sea cables.” *Deep Sea Research*, Vol. 4: 105–115.

Hoopes, E.M. 1992. "Entanglement of Common Eiders in Clam Culture Nets." *Bird Observer*, Vol. 20, No. 5. DOI: https://digitalcommons.usf.edu/bird_observer/vol20/iss5/7

Houser, D.S., W. Yost, R. Burkard, J.J. Finneran, C. Reichmuth, and J. Mulsow. 2017. “A review of the history, development and application of auditory weighting functions in humans and marine mammals.” *The Journal of the Acoustical Society of America*, Vol. 141, No. 3: 1371–1413.

Hunter, C.M., H. Caswell, M.C. Runge, E.V. Regehr, S.C. Amstrup, and I. Stirling. 2010. “Climate change threatens polar bear populations: a stochastic demographic analysis.” *Ecology*, Vol. 91, No. 10: 2883–2897.

ICPC (International Cable Protection Committee). 2025. *Damage to Submarine Cables from Dragged Anchors* Accessed: March 5, 2025. Retrieved from: https://www.iscpc.org/publications/icpc-viewpoints/damage-to-submarine-cables-from-dragged-anchors.”

IT International Telecom, Inc. (IT Telecom). 2024. *Phase 3 – Tununak to Emmonak Desktop Study Report.* IT Doc No. 1144C—DTS-120-002, rev.00, 28 June 2024.

James, N.A. and A. Große. 2023. “Marine Mammals and Interactions with Debris in the Northeastern Atlantic Region: Synthesis and Recommendations for Monitoring and Research.” In *Marine Plastics: Innovative Solutions to Tackling Waste*. Cham: Springer Nature Switzerland. 3-25 pp.

Jensen, A.S., and G.K. Silber. 2003. *Large Whale Ship Strike Database*. U.S. Department of Commerce, NOAA Technical Memorandum. NMFS-OPR.

Jensen, D., A. Mahoney, and L. Resler. 2020. "The annual cycle of landfast ice in the eastern Bering Sea." *Cold Regions Science and Technology*, Vol. 174, No. 103059.

Johnson, R., and W. Richardson. 1982. "Waterbird Migration near the Yukon and Alaska Coast of the Beaufort Sea: II. Molt Migration of Seaducks in Summer." *Arctic*, Vol. 35: 291–301.

Kapsar, K., G. Gunn, L. Brigham, and J. Liu. 2023. "Mapping vessel traffic patterns in the ice-covered waters of the Pacific Arctic." *Climatic Change*, Vol. 176, No. 7: 94.

Kayode-Edwards, I.I. and P.O. Isibor. 2024. "Arctic Benthic Habitat Alterations." In *Arctic Marine Ecotoxicology*. Springer 353–379. DOI: 10.1007/978-3-031-73584-4_17

Kelly, B.P., J.L. Bengtson, P.L. Boveng, M.F. Cameron, S.P. Dahle, J.K. Jansen, E.A. Logerwell, J.E. Overland, C.L. Sabine, G.T. Waring, and J.M. Wilder. 2010. *Status review of the ringed seal (Phoca hispida).* U.S. Department of Commerce, NOAA Technical Memorandum. NMFS-AFSC-212: 250 pp.

Kertell, K. 1991. "Disappearance of the Steller's Eider from the Yukon-Kuskokwim Delta, Alaska." *Arctic*, Vol. 44: 177–184.

Kurtén, B. 1964. "The evolution of the polar bear, *Ursus Maritimus Phipps*." *Acta Zoologica Fennica*, Vol. 108: 1–30.

Kuyek, D. 2015. *Sound Level Measurements of an Electric Snowmobile and an Internal Combustion Engine Snowmobile on Various Snow Surfaces* (Master's thesis, McGill University [Canada]).

Laidre, K.L., I. Stirling, L.F. Lowry, Ø Wiig, M.-P. Heide-Jørgensen, and S.H. Ferguson. 2008. "Quantifying the sensitivity of arctic marine mammals to climate-induced habitat change." *Ecological Applications*, Vol. 18: S97–S125.

Laist, D.W. 1997. "Impacts of marine debris: entanglement of marine life in marine debris including a comprehensive list of species with entanglement and ingestion records." In: J.M. Coe and D.B. Rogers (Eds.) *Marine Debris – Sources, Impacts and Solutions*. Springer-Verlag. New York, NY: 99–139 pp.

Larned, W.W. 2012. *Steller's Eider Spring Migration Surveys, Southwest Alaska 2012*. U.S. Fish and Wildlife Service, Waterfowl Management, Soldotna, Alaska. Accessed: March 11, 2025. Retrieved from: https://iris.fws.gov/APPS/ServCat/DownloadFile/53666?Reference=53159

Leaper, R. 2019. "The role of slower vessel speeds in reducing greenhouse gas emissions, underwater noise and collision risk to whales." *Frontiers in Marine Science*, Vol. 6: 505.

Letcher R.J., J.O. Bustnes, R. Dietz, B.M. Jenssen, E.H. Jørgensen, C. Sonne, J. Verreault, M.M. Vijayan, and G.W. Gabrielsen. 2010. "Exposure and effects assessment of persistent organohalogen contaminants in arctic wildlife and fish." *Science of the Total Environment*, Vol. 408, No. 15: 2995–3043. DOI: 10.1016/j.scitotenv.2009.10.038.

Lin, H., K. Liu, J. Wang, Y. Huang, Z. Li, J. Lin, X., He, S. Zhang, J. Mou, Y. Wang, and B. Xing. 2018. "Spatial pattern of macrobenthic communities along a shelf-slope-basin transect across the Bering Sea." *Acta Oceanologica Sinica*, Vol. 37: 72–81. DOI: https://doi.org/10.1007/s13131-018-11

Liston, G.E., C.J. Perham, R.T. Shideler, and A.N. Cheuvront. 2015. "Modeling snowdrift habitat for polar bear dens." *Ecological Modelling*, Vol. 320: 114–134. DOI: 10.1016/j.ecolmodel.2015.09.010

Loss S.R., T. Will, and P.P. Marra. 2014. "Estimation of bird-vehicle collision mortality on U.S. roads." *The Journal of Wildlife Management*, Vol. 78, No. 5: 763–771. DOI: https://doi.org/10.1002/jwmg.721

Lovvorn, J.R., S.E. Richman, J.M. Grebmeier, and L.W. Cooper. 2003. "Diet and Body Condition of Spectacled Eiders Wintering in Pack Ice of the Bering Sea." *Polar Biology*, Vol. 26: 259–267.

Madge, S. and H. Burn. 1988. *Wildfowl*. Christopher Helm, London.

Maier, J.A., S.M. Murphy, R.G. White, and M.D. Smith. 1998. "Responses of caribou to overflights by low-altitude jet aircraft." *The Journal of Wildlife Management*, Vol. 62: 752–766.

MMS (Minerals Management Service). 2006. *Biological Evaluation of Steller 's Eider (Polysticta stelleri), Spectacled Eider (Somateria jischeri), and Kittlitz's Murrelet (Brachyramphus brevirostris) for Seismic Surveys in the Northeast Chukchi Sea and western Beaufort Sea Planning Areas*. Accessed: March 10, 2025. Retrieved from: https://www.boem.gov/sites/default/files/uploadedFiles/BOEM/About_BOEM/BOEM_Regions/Alaska_Region/Environment/Environmental_Analysis/final_be_birds.pdf

National Park Service (NPS). 2000. *Merced Wild and Scenic River Comprehensive Management Plan and Final Environmental Impact Statement*. San Francisco (CA): U.S. Department of the Interior, National Park Service, Yosemite National Park.

NatureServe. 2025. *Bison bison athabascae - Wood Bison*. NatureServe Explorer. Accessed: March 3, 2025. Retrieved from: https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.100513/Bison_bison_athabascae

Ng, A.K.Y, J. Andrews, D. Babb, Y. Lin, and A. Becker. 2018. "Implications of climate change for shipping: Opening the Arctic seas." *Wiley Interdisciplinary Reviews: Climate Change*, Vol. 9, No. 2: e507. DOI: https://doi.org/10.1002/wcc.507.

Nicholson, S.K., L. Leeuwner, G. Tate, and C. Hoogstad. 2022. "Power lines and wildlife." In: Martín Martín, J., Garrido López, J.R., Clavero Sousa, H. and Barrios, V. (eds.). *Wildlife and power lines. Guidelines for preventing and mitigating wildlife mortality associated with electricity distribution networks*. Gland, Switzerland: IUCN.

NMFS (National Marine Fisheries Service). 2012. *Guidance Document: Sound Propagation Modeling to Characterize Pile Driving Sounds Relevant to Marine Mammals*. NMFS Northwest Region and Northwest Fisheries Science Center, NOAA. Memorandum: 6 pp.

NMFS (National Marine Fisheries Service). 2013. *Biological Characterization: An Overview of Bristol, Nushagak, and Kvichak Bays; Essential Fish Habitat, Processes, and Species Assemblages*. NMFS, Alaska Region.

NMFS. 2018. *2018 Revision to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts.* U.S. Department of Commerce. NOAA Technical Memorandum NMFS-OPR-59: 167 pp.

NOAA (National Oceanic and Atmospheric Administration) Fisheries. 2020. *IB 20-32: NMFS Reports a Vessel-Strike Mortality of an Alaska-Breeding Population Steller's Eider in the BSAI*. Accessed: March 10, 2025. Retrieved from: https://www.fisheries.noaa.gov/bulletin/ib-20-32-nmfs-reports-vessel-strike-mortality-alaska-breeding-population-stellers

NOAA Fisheries. 2024. “Alaska ShoreZone Mapping.” Accessed: March 3, 2025. Retrieved from: alaskafisheries.noaa.gov/mapping/sz/

NOAA. 2024. *Acoustics in the ocean*. NOAA Ocean Exploration. Accessed: March 4, 2025. Retrieved from: https://oceanexplorer.noaa.gov/explorations/sound01/background/acoustics/acoustics.html#:~:text=Because%20of%20these%20differences%20in,noise%20level%20referenced%20in%20water

PAME (Protection for the Arctic Marine Environment). 2019. *Underwater noise in the Arctic: A state of knowledge report.* Secretariat, Akureyri. Accessed: March 5, 2025. Retrieved from: https://pame.is/document-library/pame-reports-new/pame-ministerial-deliverables/2019-11th-arctic-council-ministerial-meeting-rovaniemi-finland/421-underwater-noise-report/file

Patenaude, N.J., W.J. Richardson, M.A. Smultea, W.R. Koski, G.W. Miller, B. Würsig, and C.R. Greene Jr. 2002. “Aircraft sound and disturbance to bowhead and beluga whales during spring migration in the Alaskan Beaufort Sea.” *Marine Mammal Science*, Vol. 18, No. 2: 309–335.

Peacock, E, A. Derocher, N. Lunn, and M. Obbard. 2010. “Polar bear ecology and management in Hudson Bay in the face of climate change.” In: Ferguson, S.H., Loseto, L.L., Mallory, M.L. (eds) *A Little Less Arctic*. Springer, Dordrecht: 93–116 pp.

Peine, J.D. 2001. “Nuisance bears in communities: strategies to reduce conflict.” *Hum Dim Wild*, Vol. 6: 223–237.

Petersen, M.R., J.B. Grand, and C. Dau. 2000. “Spectacled Eider (*Somateria fischeri*).” In *The Birds of North America, No. 547* (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Petersen, M.R., W.W. Larned, and D.C. Douglas. 1999. “At-Sea Distribution of Spectacled Eiders: A 120-year-old Mystery Resolved.” *The Auk*, Vol. 116: 1009–1020.

Przydatek, G., A. Ryniewicz, O. Irimia, C. Tomozei, E. Mosnegutu, and M. Bodziony. 2023. “Analysis of noise levels in typical passenger cars.” *Sustainability*, Vol. 15, No. 10: 7910. DOI: 10.3390/su15107910

Quakenbush, L., R. Sudyam, T. Obritschkewitsch, and M. Deering. 2004. “Breeding Biology of Steller’s Eiders (*Polysticta stelleri*) near Barrow, Alaska, 1991–99.” *Arctic*, Vol. 57, No. 2: 166–182.

Ramsay, M.A. and I. Stirling. 1990. “Fidelity of female polar bears to winter-den sites.” *Journal of Mammalogy*, Vol. 71: 233–36.

Ray, C.E. 1971. “Polar bear and mammoth on the Pribilof Islands.” *Arctic*, Vol. 24: 9–19.

Reimer, J.R., H. Caswell, A.E. Derocher, and M.A. Lewis. 2019. “Ringed seal demography in a changing climate.” *Ecological Applications*, Vol. 29, No.3: e01855.

Rode, K.D., E.V. Regehr, D.C. Douglas, G. Durner, A.E. Derocher, G.W. Thiemann, and S.M. Budge. 2014. “Variation in the response of an Arctic top predator experiencing habitat loss: feeding and reproductive ecology of two polar bear populations.” *Global Change Biology*, Vol. 20, No. 1: 76–88. DOI: 10.1111/gcb.12339

Rode, K.D., S.C. Amstrup, and E.V. Regehr. 2010. “Reduced body size and cub recruitment in polar bears associated with sea ice decline.” *Ecological Applications*, Vol 20: 768–782.

Ronconi, R.A., K.A. Allard, and P.D. Taylor. 2015. “Bird interactions with offshore oil and gas platforms: review of impacts and monitoring techniques.” *Journal of Environmental Management*, Vol. 147: 34–45. DOI: 10.1016/j.jenvman.2014.07.031

Rothe, T., and S. Arthur. 2000. *Eiders*. Alaska Department of Fish and Game. Accessed: May 15, 2025. Retrieved from: https://www.adfg.alaska.gov/static/education/wns/eiders.pdf

Routti, H., T.C. Atwood, T. Bechshoft, A. Boltunov, T.M. Ciesielski, J.P. Desforges, R. Dietz, G.W. Gabrielsen, B.M. Jenssen, R.J. Letcher, and M.A. McKinney. 2019. “State of knowledge on current exposure, fate and potential health effects of contaminants in polar bears from the circumpolar Arctic.” *Science of the Total Environment*, Vol. 664: 1063–1083.

Schick, L.A., P. Wohlsein, S. Rautenschlein, A. Jung, J. Ometere Boyi, G. Glemarec, A. Kroner, S.A. Barth, and U. Siebert. 2022. “Health Status of Bycaught Common Eiders (*Somateria mollissima*) from the Western Baltic Sea.” *Animals*, Vol. 12, No. 15. DOI: https://doi.org/10.3390/ani12152002

Schliebe, S., T. Evans, K. Johnson, M. Roy, S. Miller, C. Hamilton, R. Meehan, and S. Jahrsdoerfer. 2006. *Range-wide status review of the polar bear (Ursus maritimus).* U.S. Fish and Wildlife Service, Anchorage, Alaska, USA.

Schwehr, K.D., and P.A. McGillivary. 2007. “Marine Ship Automatic Identification System (AIS) for Enhanced Coastal Security Capabilities: An Oil Spill Tracking Application.” *Oceans*, 2007. Vancouver, BC: IEEE.

Schwemmer, P., B. Mendel, N. Sonntag, V. Dierschke, and S. Garthe. 2011. “Effects of ship traffic on seabirds in offshore waters: implications for marine conservation and spatial planning.” *Ecological Applications*, Vol. 21: 1851–1860.

Sexson, M.G., J.M. Pearce, and M.R. Petersen. 2014. *Spatiotemporal distribution and migratory patterns of Spectacled Eiders. BOEM 2014-665.* Bureau of Ocean Energy Management, Alaska Outer Continental Shelf Region, Anchorage, Alaska.

Shannon, G., M.F. McKenna, L.M. Angeloni, K.R. Crooks, K.M. Fristrup, E. Brown, K.A. Warner, M.D. Nelson, C. White, J. Briggs, and S. McFarland. 2016. “A synthesis of two decades of research documenting the effects of noise on wildlife.” *Biological Reviews*, Vol. 91, No. 4: 982–1005.

Silber, G.K., and J.D. Adams. 2019. “Vessel operations in the Arctic, 2015–2017.” *Frontiers in Marine Science*, Vol. 6: 573.

Smith, M.A, M.S. Goldman, E.J. Knight, and J.J. Warrenchuk. 2017. *Ecological Atlas of the Bering, Chukchi, and Beaufort Seas*. 2nd edition. Audubon Alaska, Anchorage, Alaska.

Southall, B.L., J.J. Finneran, C.J. Reichmuth, P.E. Nachtigall, D.R. Ketten, A.E. Bowles, W.T. Ellison, D.P. Nowacek, and P.L. Tyack. 2019. “Marine mammal noise exposure criteria: Updated scientific recommendations for residual hearing effects.” *Aquatic Mammals*, Vol. 45, No. 2: 125–232. DOI: 10.1578/AM.45.2.2019.125

Stehn, R.A., C.P. Dau, B. Conant, and W.I. Butler. 1993. “Decline of Spectacled Eiders Nesting in Western Alaska.” *Arctic*, Vol. 46, No. 3: 264–277.

Stehn, R.A., W.W. Larned, and R.M. Platte. 2013. *Analysis of Aerial Survey Indices Monitoring Waterbird Populations of the Arctic Coastal Plain*, Alaska, 1986–2012.

Stirling, I., D. Andriashek, and W. Calvert. 1993. “Habitat preferences of polar bears in the western Canadian Arctic in late winter and spring.” *Polar Record*, Vol. 29: 13–24.

Szymanski, A., and R. Gradinger. 2016. “The diversity, abundance and fate of ice algae and phytoplankton in the Bering Sea.” *Polar Biology*, Vol. 39, No. 2: 309–325.

Terhune, J., and W. Verboom. 1999. “Right Whales and Ship Noises.” *Marine Mammal Science*, Vol. 15: 256–258. DOI: 10.1111/j.1748-7692.1999.tb00799.x

Thoman, R.L., U.S. Bhatt, P.A. Bieniek, B.R. Brettschneider, M. Brubaker, S.L. Danielson, Z. Labe, R. Lader, W.N. Meir, G. Sheffield, and J.E. Walsh. 2020. “The record low Bering Sea ice extent in 2018: Context, impacts, and an assessment of the role of anthropogenic climate change.” *Bulletin of the American Meteorological Society*, Vol. 101, No. 1: S53–S58. DOI: https://doi.org/10.1175/BAMS-D-19-0175.1

Todd, V. L., I.B. Todd, J.C. Gardiner, E.C. Morrin, N.A. MacPherson, N.A. DiMarzio, and F. Thomsen. 2014. “A review of impacts of marine dredging activities on marine mammals.” *ICES Journal of Marine Science*, Vol. 72, No. 2: 328–340.

USACE (U.S. Army Corps of Engineers). 2008. *Section 905(b) analysis Alaska regional ports*. USACE, Alaska District.

USACE. 2009. *Alaska Barge Landing System Design Data Gathering Study and Preliminary Design Planning - Various Locations, Statewide, Alaska Phase 1*. Prepared by URS Corporation. Accessed: March 6, 2025. Retrieved from: https://www.poa.usace.army.mil/portals/34/docs/civilworks/archive/alaskabargelandingsystemdesignstatewidephase1.pdf

USDA (U.S. Department of Agriculture). 2019. *Chapter III: The use of cable devices in wildlife damage management. Human Health and Ecological Risk Assessment for the Use of Wildlife Damage Management Methods*. United States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services.

USDA. 2023. *Alaska and a changing climate.* Accessed: March 15, 2025. Retrieved from: https://www.climatehubs.usda.gov/hubs/northwest/topic/alaska-and-changing-climate

USEPA (U.S. Environmental Protection Agency). 1971. *Transportation noise and noise from equipment powered by internal combustion engines, NTID300.13.* U.S. Environmental Protection Agency.

USEPA. 1974. *Information on levels of environmental noise requisite to protect public health and welfare with an adequate margin of safety.* Washington (D.C.): United States Environmental Protection Agency. Report. EPA/ONAC 550/9-72-004.

USEPA. 2023. *Drinking water maps.* Accessed: March 25, 2025. Retrieved from: https://geopub.epa.gov/DWWidgetApp/

USFWS (U.S. Fish and Wildlife Service). 1993. “Endangered and Threatened Wildlife and Plants; Final Rule to List Spectacled Eider as Threatened.” 58 Federal Register 27474 (May 10, 1993). Accessed: March 11, 2025. Retrieved from: https://www.govinfo.gov/content/pkg/FR-2001-02-06/pdf/01-1342.pdf

USFWS (U.S. Fish and Wildlife Service). 1996. *Spectacled Eider (Somateria fischeri) Recovery Plan*. Region 7 US Fish and Wildlife Service. Anchorage, Alaska.

USFWS. 1997. “Endangered and Threatened Wildlife and Plants; Threatened Status for the Alaska Breeding Population of the Steller’s Eider.” 62 Federal Register 31748 (June 11, 1997). Accessed: March 20, 2025. Retrieved from: https://www.govinfo.gov/content/pkg/FR-1997-06-11/pdf/97-15244.pdf

USFWS. 2001a. “Endangered and Threatened Wildlife and Plants; Final Determination of Critical Habitat for the Alaska-Breeding Population of Steller’s Eider; Final Rule.” 66 Federal Register 8850 (February 2, 2001). Accessed: March 20, 2025. Retrieved from: https://www.fws.gov/sites/default/files/federal_register_document/01-1334.pdf

USFWS. 2001b. “Endangered and Threatened Wildlife and Plants; Final Determination of Critical Habitat for the Spectacled Eider.” 66 Federal Register 9146 (February 6, 2001). Accessed: March 11, 2025. Retrieved from: https://www.govinfo.gov/content/pkg/FR-2001-02-06/pdf/01-1342.pdf

USFWS. 2006. “Endangered and Threatened Wildlife and Plants; Petition to List the Polar Bear as Threatened.” 71 Federal Register 6745 (February 9, 2006). Accessed: March 11, 2025. Retrieved from: https://www.govinfo.gov/content/pkg/FR-2006-02-09/pdf/06-1226.pdf

USFWS. 2008a. “Endangered and Threatened Wildlife and Plants: Determination of Threatened Status for the Polar Bear (*Ursus maritimus*) Throughout Its Range.” 73 Federal Register 28212 (May 15, 2008). Accessed: March 20, 2025. Retrieved from: https://www.govinfo.gov/content/pkg/FR-2008-05-15/pdf/E8-11105.pdf

USFWS. 2008b. *Short-tailed Albatross Recovery Plan*. Anchorage, AK: 105 pp.

USFWS. 2010a. *Comprehensive Conservation Plan: Kenai National Wildlife Refuge*. Soldotna, Alaska: Kenai National Wildlife Refuge.

USFWS. 2010b. “Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Polar Bear (*Ursus maritimus*) in the United States.” 75 Federal Register 76086 (December 7, 2010). Accessed: March 20, 2025. Retrieved from: https://www.govinfo.gov/content/pkg/FR-2010-12-07/pdf/2010-29925.pdf

USFWS. 2010c. *Spectacled Eider (Somateria fischeri) 5-Year Review: Summary and Evaluation*. Fairbanks Fish and Wildlife Field Office. Fairbanks, Alaska.

USFWS. 2012a. *Agreement for criteria for injury to marbled murrelet from noise*. Memorandum from the Federal Highway Administration, U.S. Fish and Wildlife Service, and Washington State Department of Transportation.

USFWS. 2012b. *Whitefish Biology, Distribution, and Fisheries in the Yukon and Kuskokwim River Drainages in Alaska: A Synthesis of Available Information.* Alaska Fisheries Data Series Number 2012-4. U.S. Fish and Wildlife Service, Fairbanks, Alaska.

USFWS. 2013. “Endangered and Threatened Wildlife and Plants; Special Rule for the Polar Bear Under Section 4(d) of the Endangered Species Act.” 78 Federal Register 11766 (February 20, 2013). Accessed: March 20, 2025. Retrieved from: https://www.govinfo.gov/content/pkg/FR-2013-02-20/pdf/2013-03136.pdf

USFWS. 2016. *Polar Bear (Ursus maritimus) Conservation Management Plan, Final*. U.S. Fish and Wildlife, Region 7, Anchorage, Alaska: 104 pp.

USFWS. 2019. *Status Assessment of the Alaska-breeding Population of Steller’s Eiders. Version 1*. U.S. Fish and Wildlife Field Office. Fairbanks, Alaska.

USFWS. 2020. *Wood Bison (Bison bison athabascae) 5-Year Review 2020*. Anchorage Fish and Wildlife Conservation Office. Anchorage, AK. Accessed: March 20, 2025. Retrieved from: https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/3377.pdf

USFWS. 2021a. *5-Year Review: Species Status Assessment for the Spectacled Eider (Somateria fischeri).* Fairbanks Fish and Wildlife Field Office. Fairbanks, Alaska.

USFWS. 2021b. *Noise levels for aircraft on Alaska's North Slope for polar bear and walrus impact analysis*. U.S. Fish and Wildlife Service, Anchorage, Alaska. Accessed: March 10, 2025. Retrieved from: https://rosap.ntl.bts.gov/view/dot/63309

USFWS. 2024a. *Best management practices to minimize impacts to polar bears.* USFWS Marine Mammals Management. Accessed: April 30, 2025. Retrieved from: https://www.fws.gov/sites/default/files/documents/2024-10/usfws-best-management-practices-to-minimize-impacts-to-polar-bears_2024.pdf

USFWS. 2024b. *Technical Assistance for Broadband Projects.* USFWS Alaska Region. Accessed: April 30, 2025. Retrieved from: https://www.fws.gov/service/technical-assistance-broadband-projects

USFWS. 2025a. *Information for Planning and Consultation Tool*. Accessed: March 3, 2025. Retrieved from: https://ipac.ecosphere.fws.gov/

USFWS. 2025b. *Steller's Eider (Polysticta stelleri) Alaska-Breeding Population Range Information*. Accessed: March 10, 2015. Retrieved from: https://ecos.fws.gov/ecp/species/1475#rangeInfo

USFWS. 2025c. *Technical Assistance to Prevent Bird-Vessel Strike in the Alaska Marine Environment*. USFWS. Accessed: March 3, 2025. Retrieved from: https://www.fws.gov/service/technical-assistance-prevent-bird-vessel-strike-alaska-marine-environment

USFWS. 2025d. *Threatened and Endangered Species with Critical Habitat designation across the United States online mapping tool.* Accessed: March 4, 2025. Retrieved from: https://www.arcgis.com/apps/mapviewer/index.html?url=https://services.arcgis.com/QVENGdaPbd4LUkLV/ArcGIS/rest/services/USFWS_Critical_Habitat/FeatureServer&source=sd

USGS (U.S. Geological Survey). 2023. *National Water Information System: Mapper*. Accessed: March 3, 2025. Retrieved from: https://maps.waterdata.usgs.gov/mapper/index.html

USGS. 2024. *National Water Information System: Surface Water Data for Alaska*. U.S. Department of the Interior. Accessed: March 4, 2025. Retrieved from: https://waterdata.usgs.gov/ak/nwis/sw

USGS. 2025. *North Pacific Pelagic Seabird Database Visualization Tool*. Accessed: March 3, 2025. Retrieved from: https://rconnect.usgs.gov/nppsd_viz/

Von Duyke, A.L., D.C. Douglas, J.K. Herreman, and J.A. Crawford. 2020. "Ringed seal (*Pusa hispida*) seasonal movements, diving, and haul-out behavior in the Beaufort, Chukchi, and Bering Seas (2011–2017)." *Ecology and Evolution*, Vol. 10, No. 12: 5595–5616.

Watters, D.L., M.M. Yoklavich, M.S. Love, and D.M. Schroeder. 2010. "Assessing marine debris in deep seafloor habitats off California." *Marine Pollution Bulletin*, Vol. 60: 131–138.

Wenger, A.S., E. Harvey, S. Wilson, C. Rawson, S.J. Newman, D. Clarke, B.J. Saunders, N. Browne, M.J. Travers, J.L. Mcilwain, P.L.A. Erftemeijer, J.A. Hobbs, M. Depczynski, and

R.D. Evans. 2017. “A critical analysis of the direct effects of dredging on fish.” *Fish and Fisheries*, Vol. 18, No. 5: 967–985. DOI: 10.1111/faf.12218

Wiese, F.K., W.A. Montevecchi, G.K. Davoren, F. Huettmann, A.W. Diamond, and J. Linke. 2001. “Seabirds at Risk around Offshore Oil Platforms in the North-west Atlantic.” *Marine Pollution Bulletin*, Vol. 42, No. 12: 1285–1290.

Williams, R., E. Ashe, L. Yruretagoyena, N. Mastick, M. Siple, J. Wood, R. Joy, R. Langrock, S. Mews, and E. Finne. 2021. “Reducing vessel noise increases foraging in endangered killer whales.” *Marine Pollution Bulletin*, Vol. 173: 112976.

Wilson, F.H., C.P. Hults, C.G. Mull, and S.M. Karl. 2015. *Geologic map of Alaska: U.S. Geological Survey Scientific Investigations Map 3340, 197 p., 2 sheets, scale 1:584,000*. Accessed: March 8, 2025. Retrieved from: https://alaska.usgs.gov/science/geology/state_map/interactive_map/AKgeologic_map.html

Wood, M.P., and L. Carter. 2009. “Whale entanglements with submarine telecommunication cables.” *IEEE Journal of Oceanic Engineering*, Vol. 33, No. 4: 445–450. DOI: 10.1109/JOE.2008.2001638

WSDOT (Washington State Department of Transportation). 2020*. Biological Assessment Preparation Manual, Chapter 7 Construction Noise Impact Assessment*. Accessed: March 22, 2025. Retrieved from: https://wsdot.wa.gov/sites/default/files/2021-10/Env-FW-BA_ManualCH07.pdf

APPENDIX A USDA-RUS DESIGNATION OF ERM AS FEDERAL REPRESENTATIVE FOR ESA CONSULTATION

United States Department of Agriculture

Rural Development

Rural Utilities Service

1400 Independence Ave, SW
Room 4121, Stop 1590
Washington, DC 20250

Voice: (202) 690-4673

September 24, 2024

U.S. Fish and Wildlife Service (FWS)
Anchorage Fish & Wildlife Field Office
4700 BLM Road
Anchorage, AK 99507-2546

National Oceanic and Atmospheric Administration
National Marine Fisheries Service (NMFS)
Alaska Region, Protected Resources Division
P.O. Box 21668
Juneau, AK 99802-1668

Re: USDA Rural Utilities Service R4 ReConnect Project AK 1706-C73 Unicom, Incorporated – Designation of Non-Federal Representative

Dear FWS/NMFS Staff,

Unicom, Incorporated (Unicom) is seeking financial assistance from the Rural Utilities Service (RUS) under its Telecommunications ReConnect Program for construction of a fiber-to-the-premise (FTTP) network to provide high-speed broadband services to underserved rural communities located in the Yukon-Kuskokwim (Y-K) Delta region for the communities of Nunapitchuk, Mertarvik, Tununak, and Toksook Bay. This project may affect Endangered Species Act (ESA) listed or proposed species and/or designated or proposed critical habitat and possibly result in harassments of species protected under the ESA and Marine Mammal Protection Act (MMPA).

To facilitate Section 7 ESA and MMPA consultation, RUS is designating Unicom and their consultant, ERM, as our non-federal representative for the purpose of initiating informal consultation with the FWS and NMFS. The role of the non-federal representative includes conducting studies, attending meetings, participating in telephone and email contact, developing draft biological assessments, etc., in support of our eventual ESA determination. The authority for making Endangered Species Act determinations remains with USDA, RUS. As the USDA, RUS environmental point of contact for this project I can be reached at Anthony.High@usda.gov or (202) 690-4673, also please include Natalie Kovach, General Field Representative (GFR) at Natalie.Kovach@usda.gov on any correspondence.

Sincerely,

Anthony High

Digitally signed by Anthony High
Date: 2024.09.24 02:09:22 -04'00'

ANTHONY W. HIGH
Environmental Protection Specialist
Policy & Outreach Division Engineering Branch
Telecommunications Program
Rural Utilities Service

cc: Genevieve Rozhon, Principal Consultant, Genevieve.Rozhon@erm.com
Danna Allen, Principal Consultant, danna.allen@erm.com

Application #: 101001351

APPENDIX B FIGURES

Figure 1 – Project Location

Figure 2 – Action Area

Figure 3 – Mertarvik Landfall

Figure 4 – Tununak Landfall

Figure 5 – Emmonak Landfall

Figure 6 – Nunapitchuk to Tunanak

Figure 7 – Alakanuk to Emmonak

Figure 8 – Emmonak to Kotlik

Figure 9 – Critical Habitat

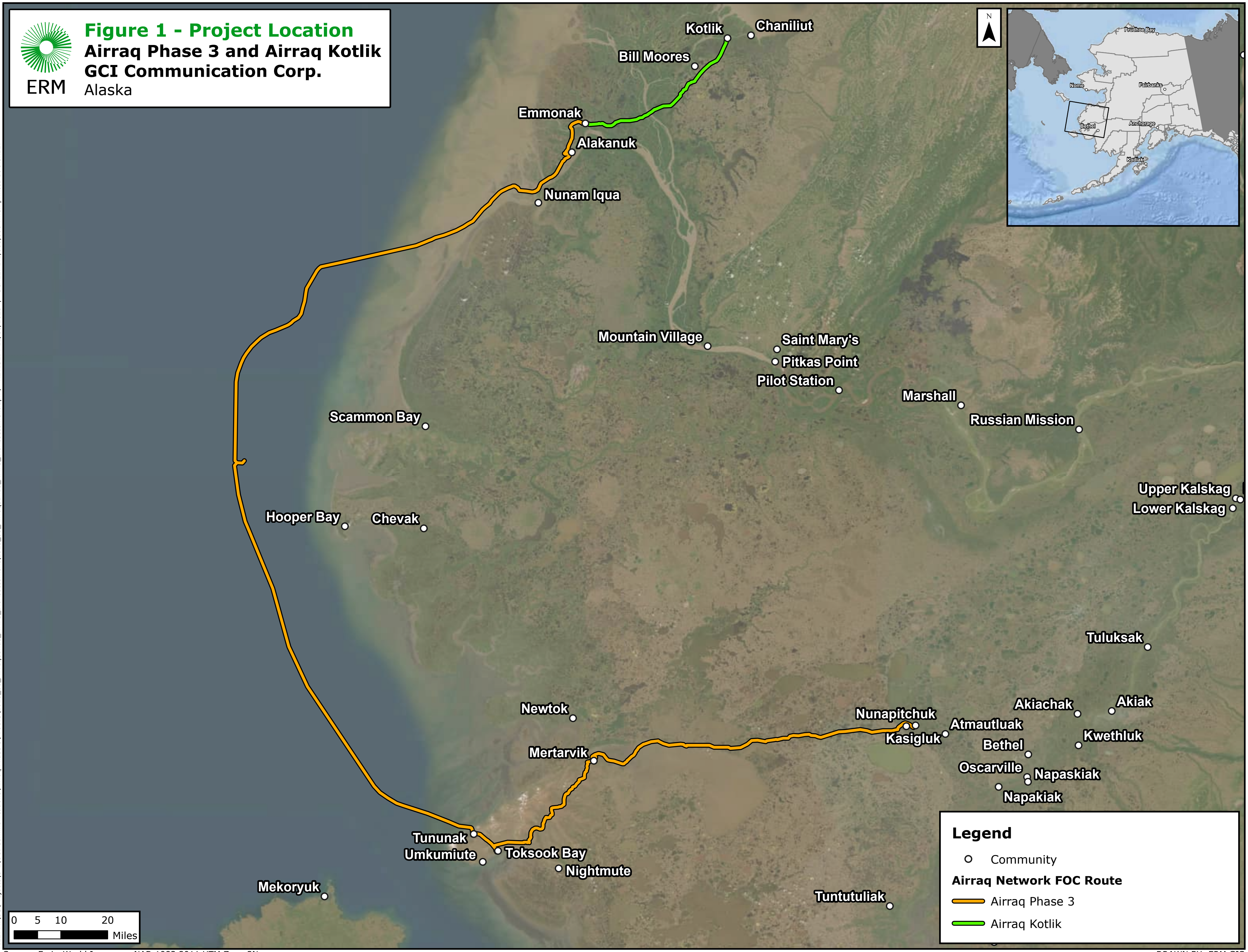

Figure 1 - Project Location

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Figure 2 - Action Area
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GCI Communication Corp.
Alaska

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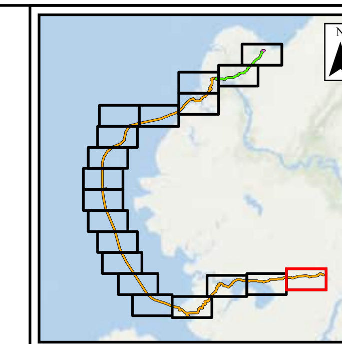
- Airraq Phase 3
- Overland Installation Corridor
- Overland Action Area



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- Marine Installation Corridor
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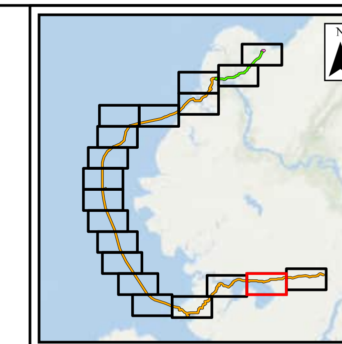

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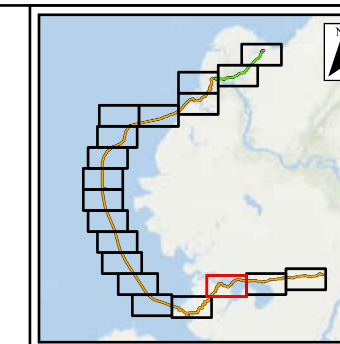
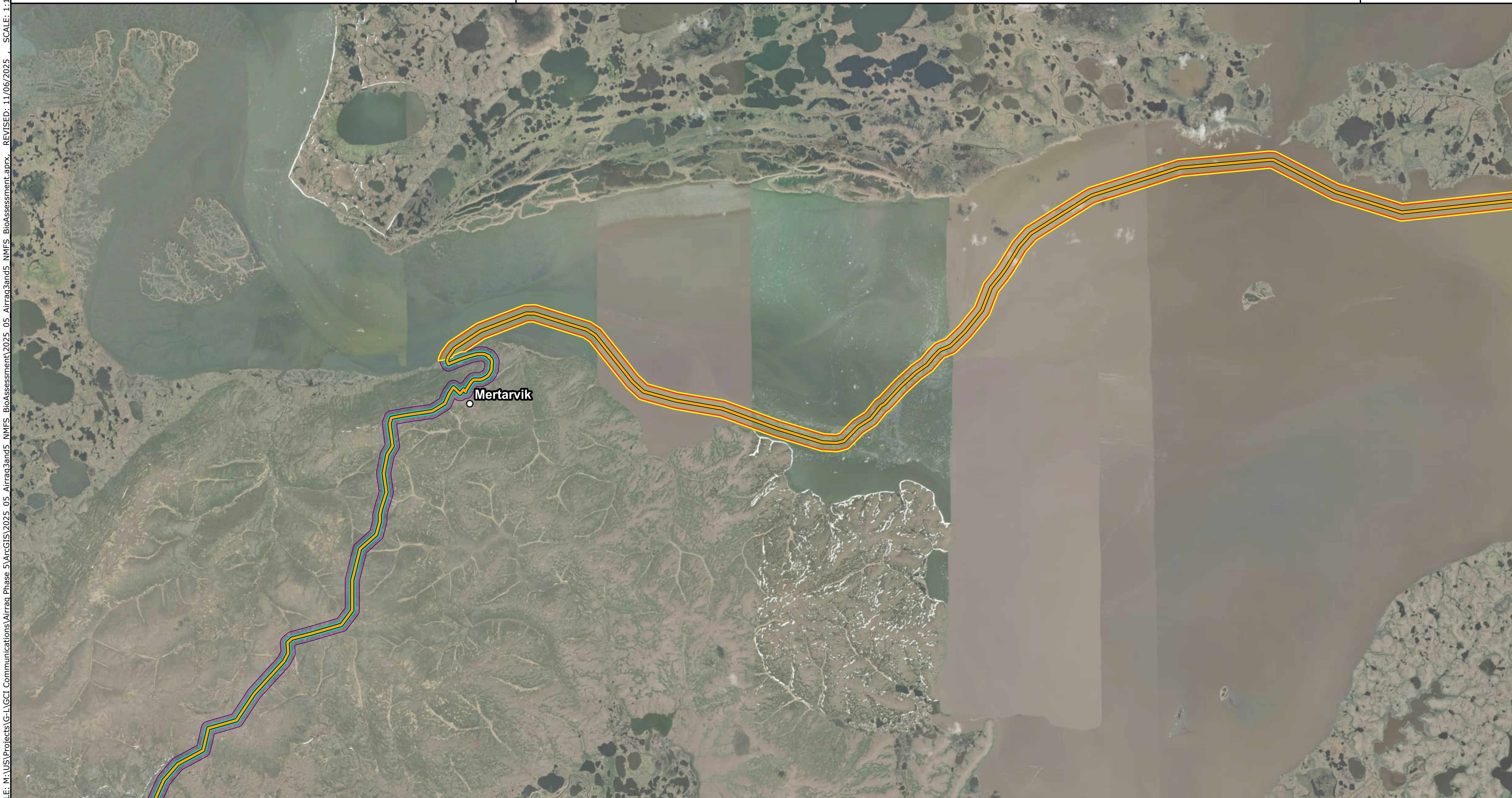
- Marine Installation Corridor
- Marine Action Area





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Airraq Phase 3 and Airraq Kotlik

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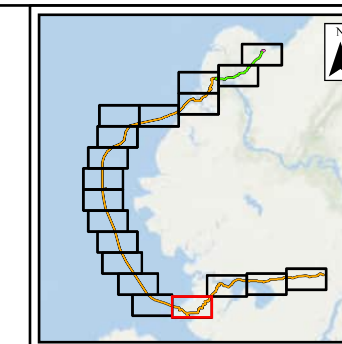

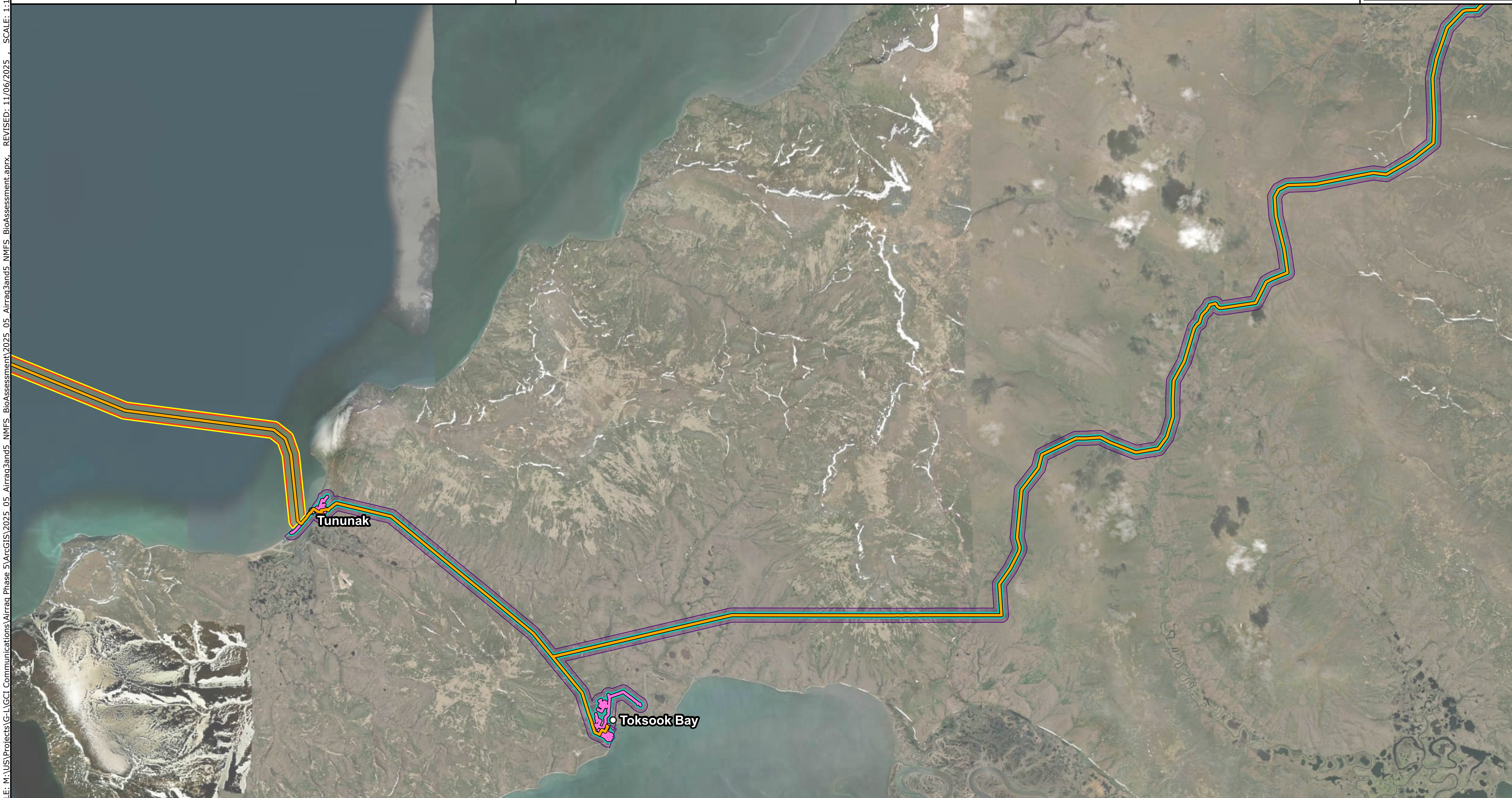

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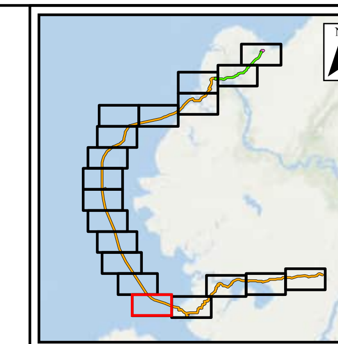

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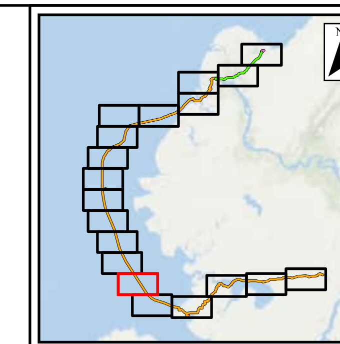

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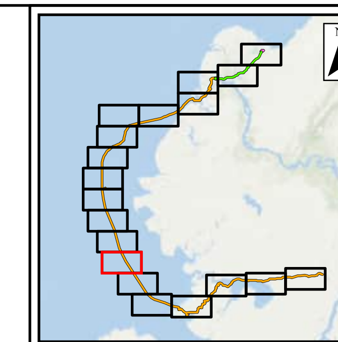
- Marine Installation Corridor
- Marine Action Area



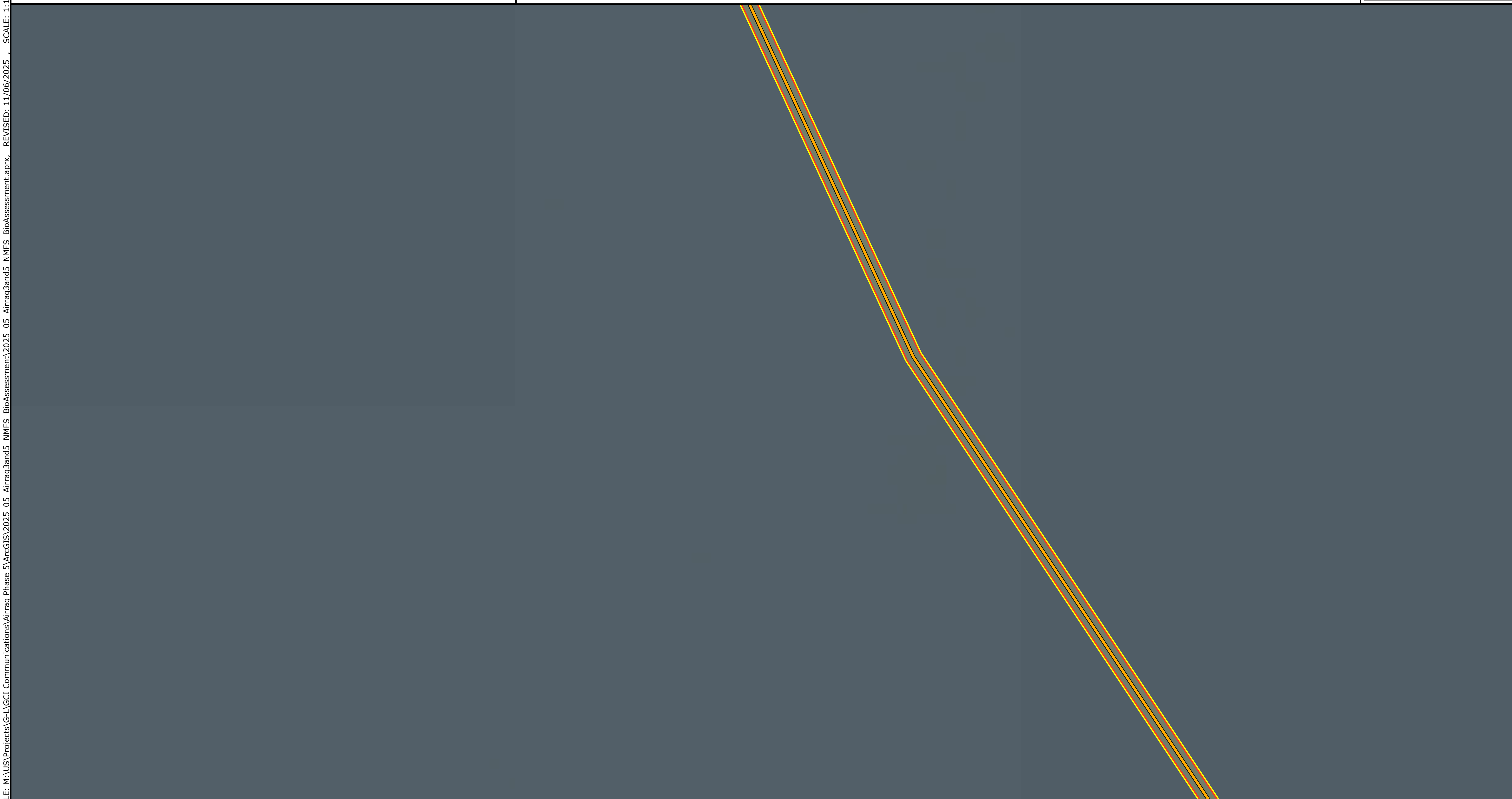


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Figure 2 - Action Area

Airraq Phase 3 and Airraq Kotlik
GCI Communication Corp.
Alaska

ERM

N

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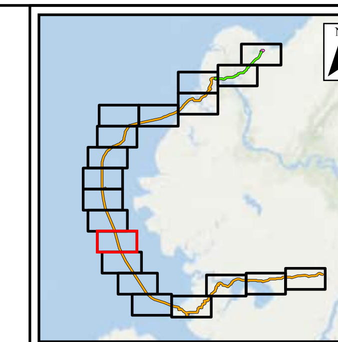
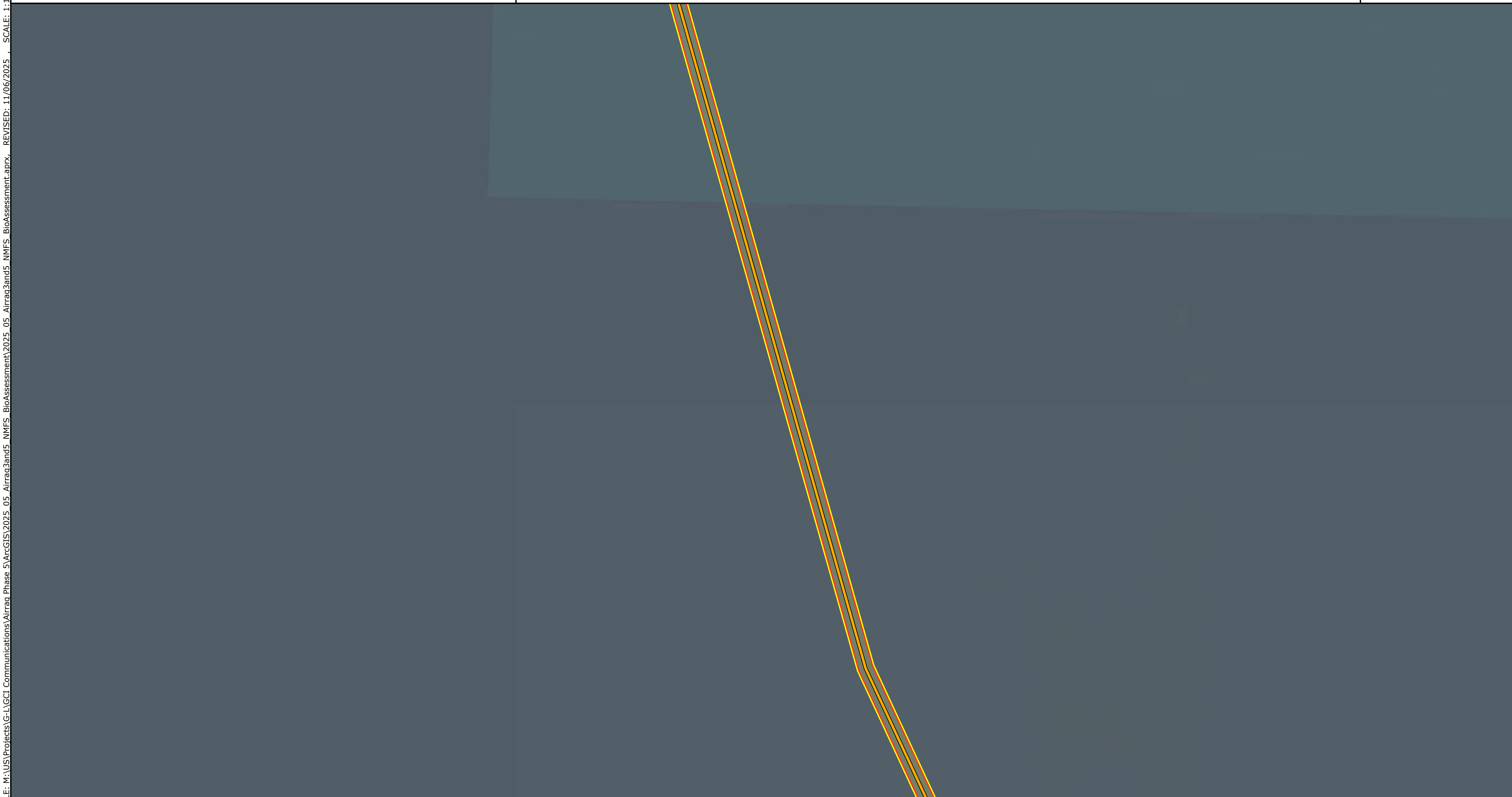
Miles
1:100,000 when printed at 11"x17"

Legend

- Airraq Phase 3
- Marine Installation Corridor
- Marine Action Area





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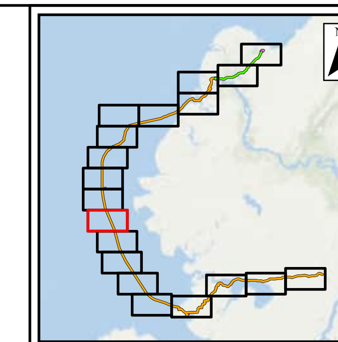

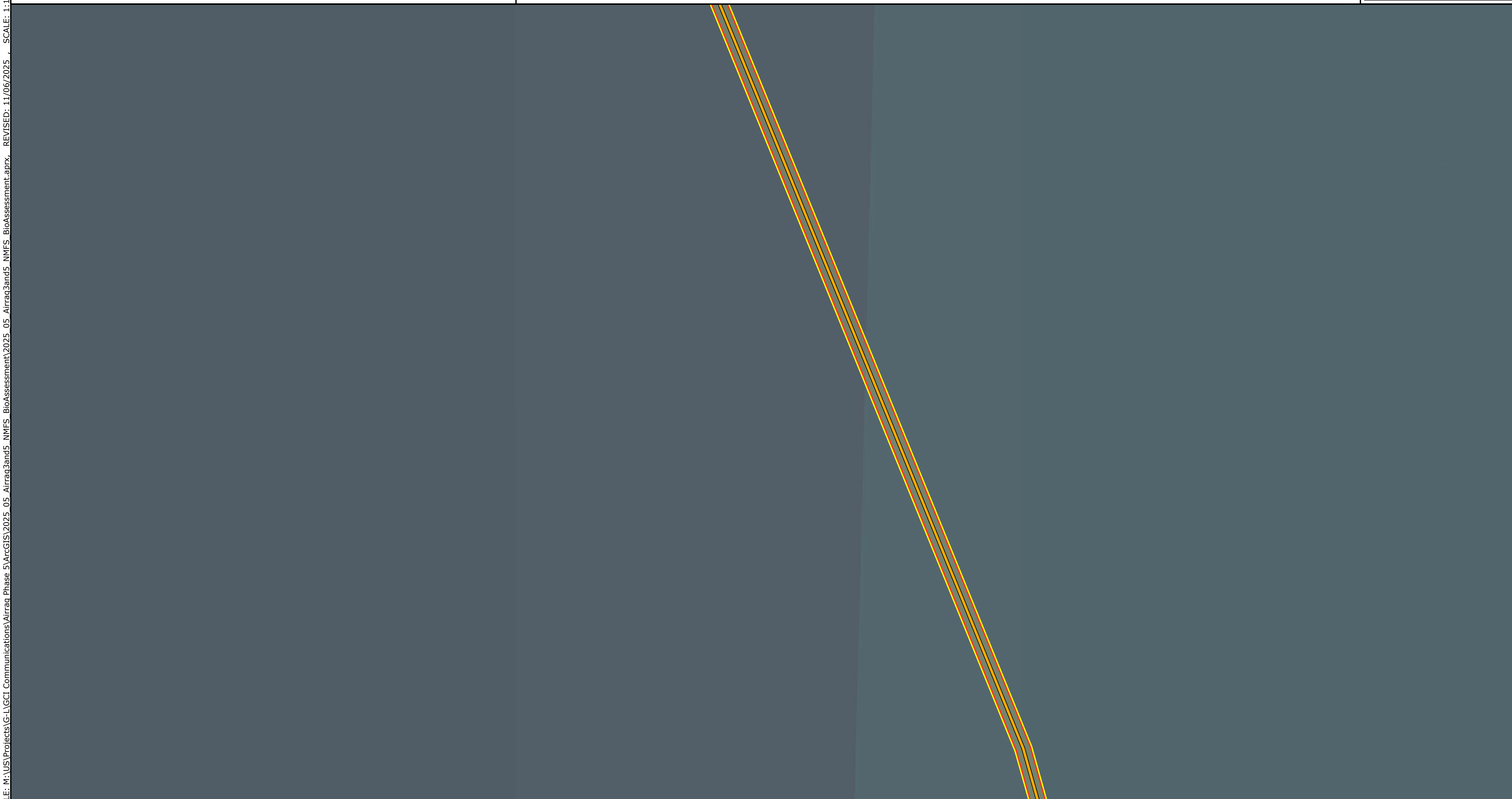

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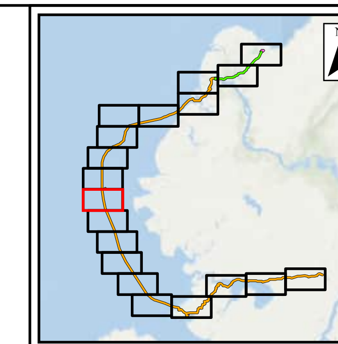

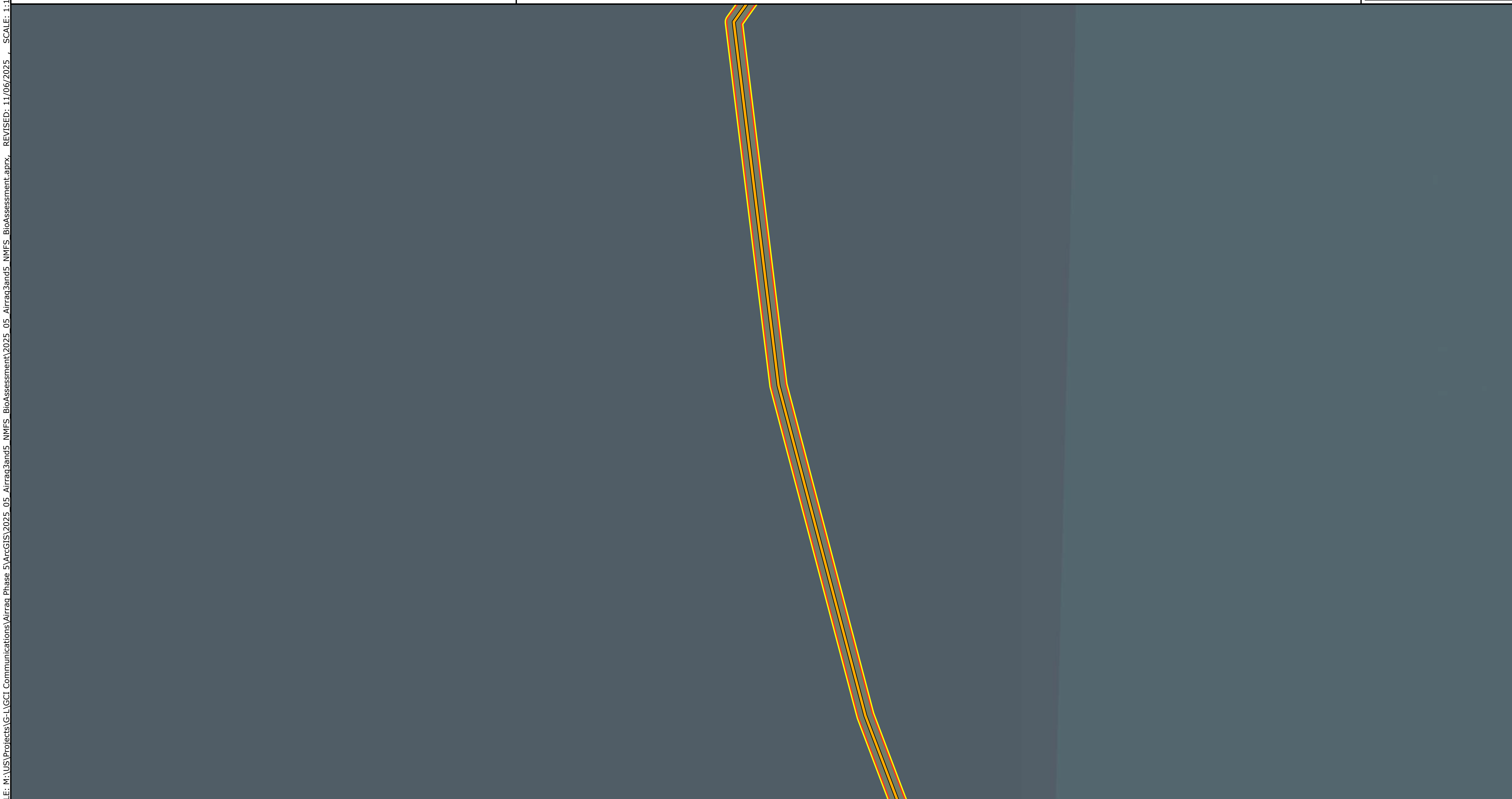

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Legend
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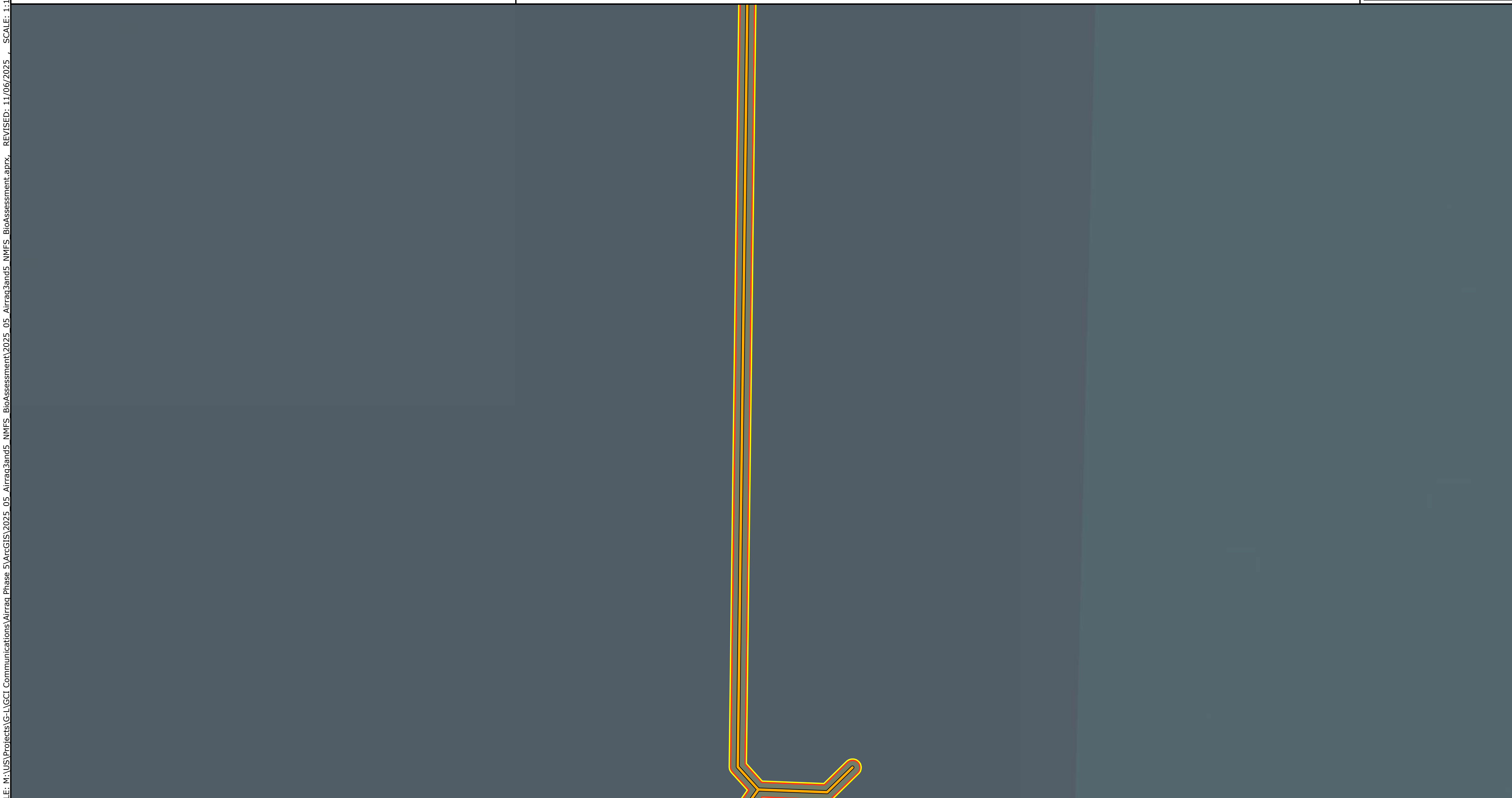
- Marine Action Area



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GCI Communication Corp.
Alaska

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Legend
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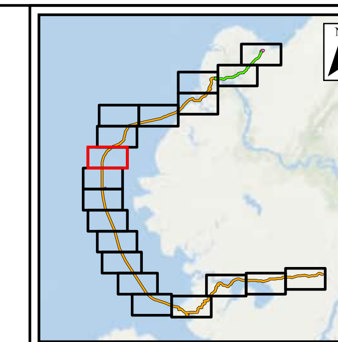

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Airraq Phase 3 and Airraq Kotlik
GCI Communication Corp.
Alaska

ERM

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Miles
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Legend

- Airraq Phase 3
- Marine Installation Corridor
- Marine Action Area

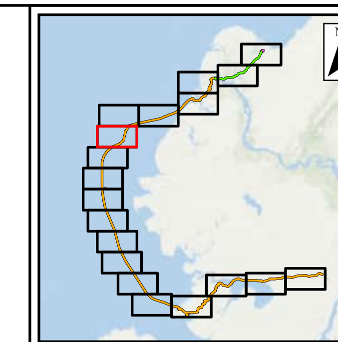

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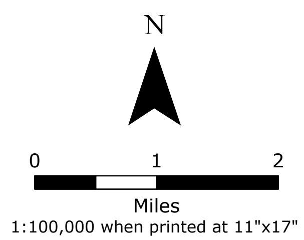
Figure 2 - Action Area

Airraq Phase 3 and Airraq Kotlik
GCI Communication Corp.
Alaska



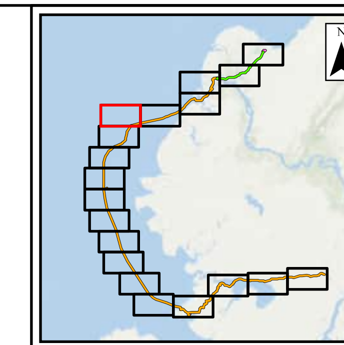


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Figure 2 - Action Area

Airraq Phase 3 and Airraq Kotlik
GCI Communication Corp.
Alaska

N

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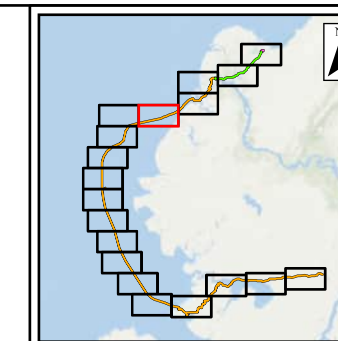
Miles
1:100,000 when printed at 11"x17"

Legend
- Airraq Phase 3
- Marine Installation Corridor
- Marine Action Area



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Source: Esri World Imagery ; ADNR ; Alaska BLM ; NAD 1983 2011 UTM Zone 3N

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Figure 2 - Action Area

Airraq Phase 3 and Airraq Kotlik
GCI Communication Corp.
Alaska

ERM

N

0 1 2
Miles
1:100,000 when printed at 11"x17"

Legend
- Community
- Airraq Phase 3
- Marine Installation Corridor
- Marine Action Area

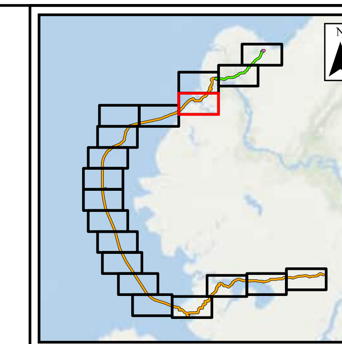

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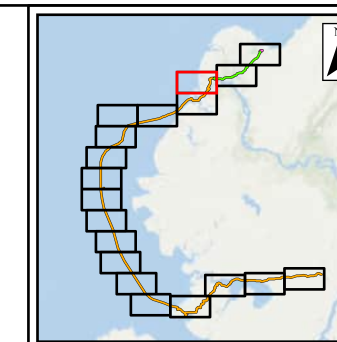
Figure 2 - Action Area
Airraq Phase 3 and Airraq Kotlik
GCI Communication Corp.
Alaska

N

0 1 2
Miles
1:100,000 when printed at 11"x17"

Legend
- Community
- Airraq Phase 3
- Airraq Kotlik
- FTTx
- Overland Installation Corridor
- Overland Action Area



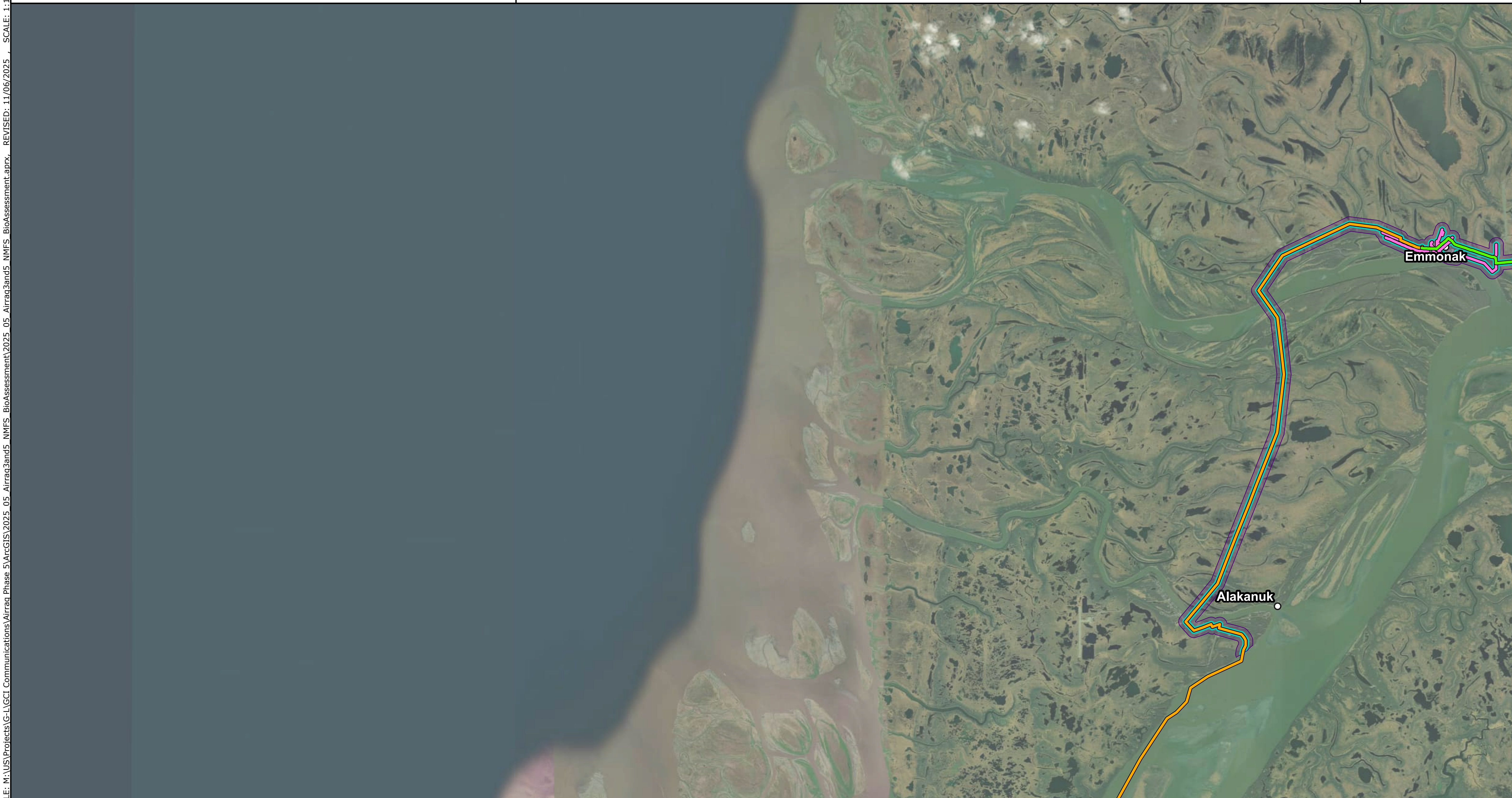


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Figure 2 - Action Area

Airraq Phase 3 and Airraq Kotlik

GCI Communication Corp.

Alaska

ERM

N

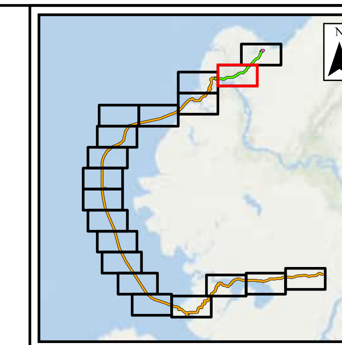
0 1 2

Miles

1:100,000 when printed at 11"x17"

Legend

- Airraq Kotlik
- Overland Installation Corridor
- Overland Action Area



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Source: Esri World Imagery ; ADNR ; Alaska BLM ; NAD 1983 2011 UTM Zone 3N

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Figure 2 - Action Area
Airraq Phase 3 and Airraq Kotlik
GCI Communication Corp.
Alaska

ERM

Legend
- Community
- Airraq Kotlik
- FTTx
- Overland Installation Corridor
- Overland Action Area

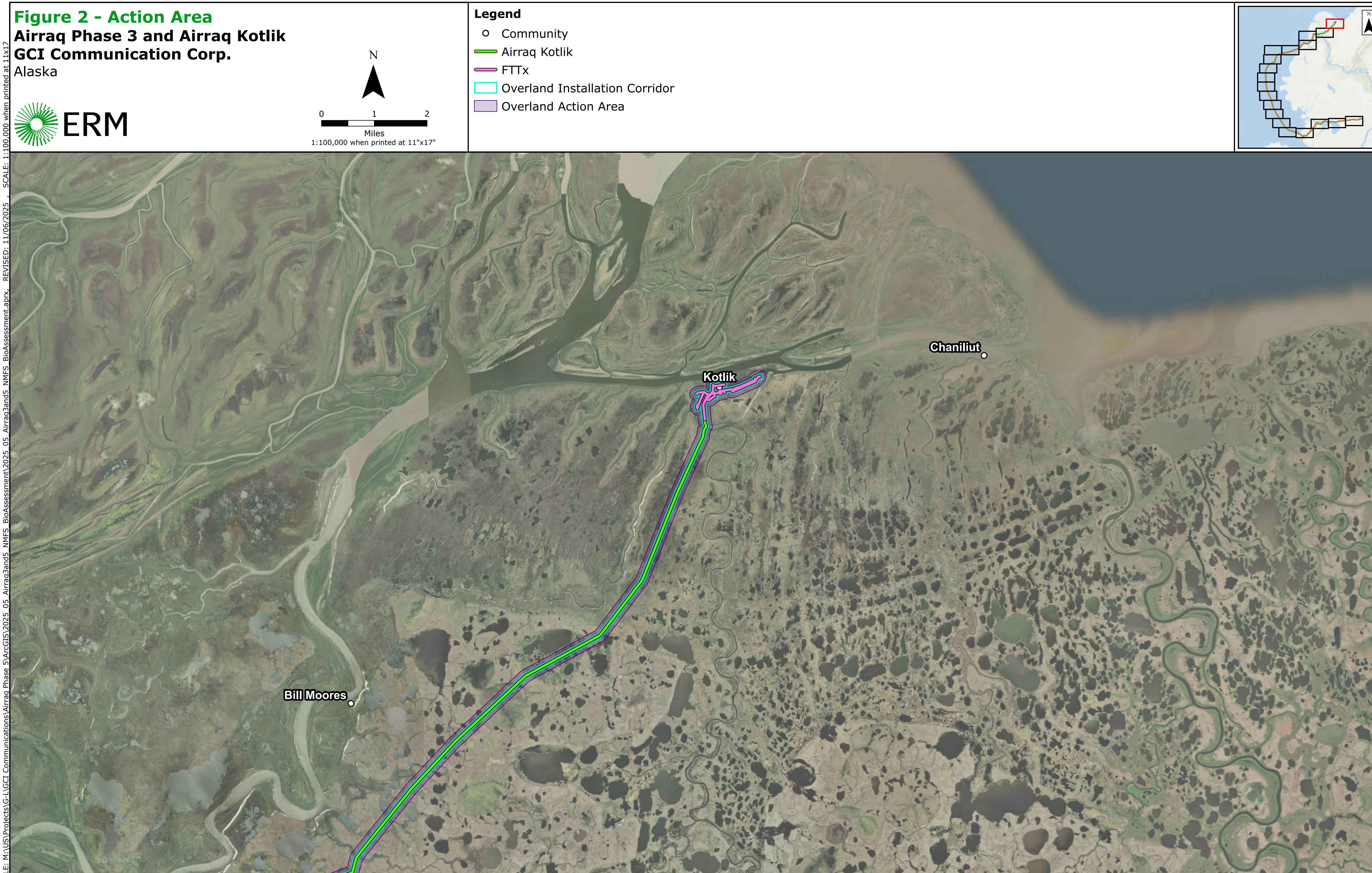

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Figure 3 - Mertarvik Landfall

Airraq Phase 3 and Airraq Kotlik
GCI Communication Corp.
Alaska

ERM

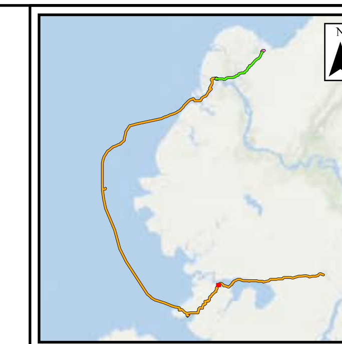
N

0 0.1 0.2
Miles
1:12,000 when printed at 11"x17"

Legend

Project Activities

- Beach Vault
- Airraq Phase 3



Source: Esri World Imagery ; ADNR ; Alaska BLM ; WGS 1984 Web Mercator Auxiliary Sphere

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Figure 4 - Tununak Landfall

Airraq Phase 3 and Airraq Kotlik
GCI Communication Corp.
Alaska

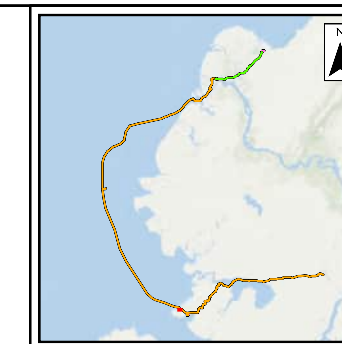
ERM

N

0 0.1 0.2
Miles
1:12,000 when printed at 11"x17"

Legend
- Community

Project Activities
- Cable Landing Station
- Beach Vault
- Airraq Phase 3
- FTTx



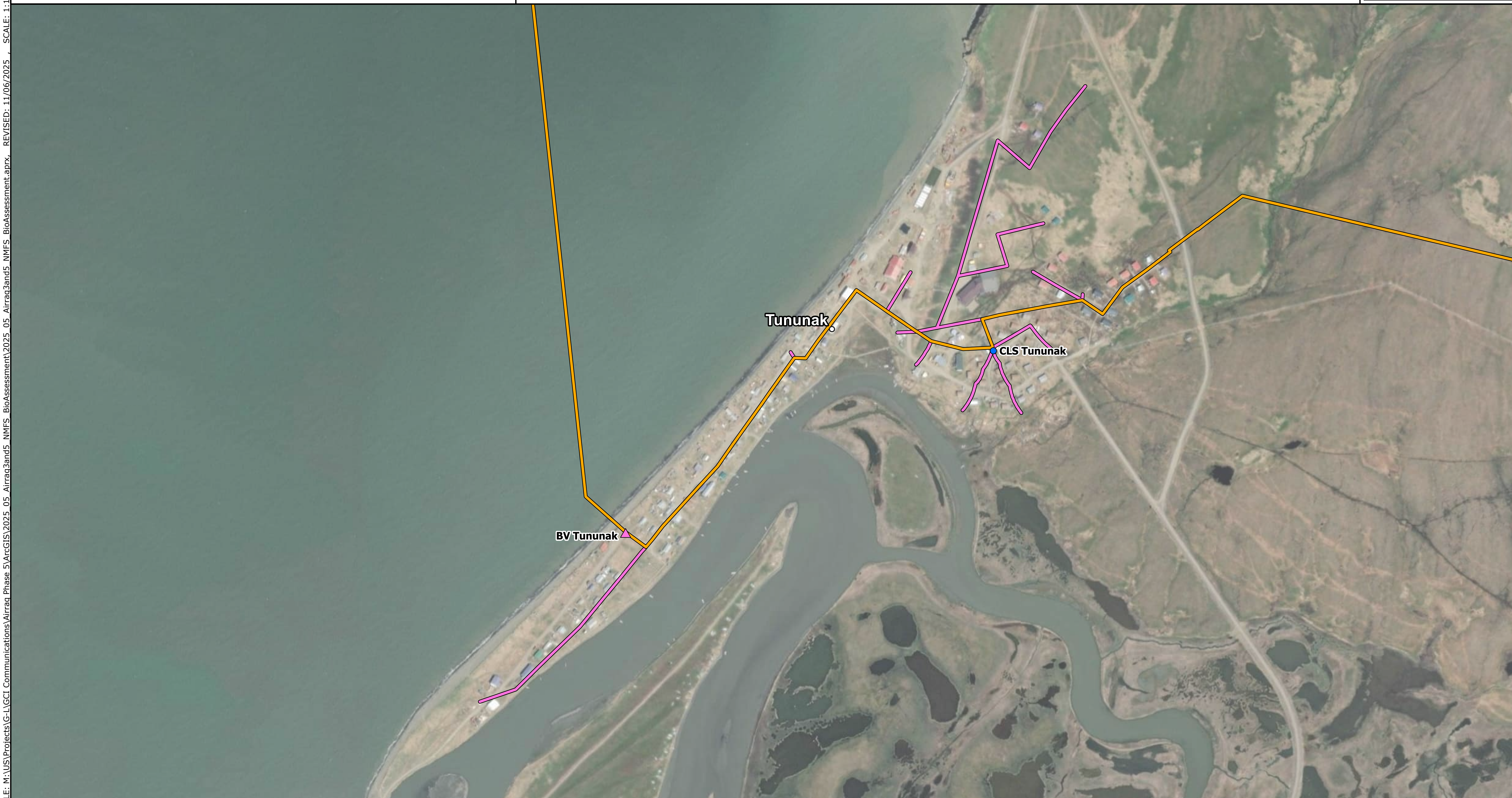


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Figure 5 - Emmonak Landfall

Airraq Phase 3 and Airraq Kotlik
GCI Communication Corp.
Alaska

ERM

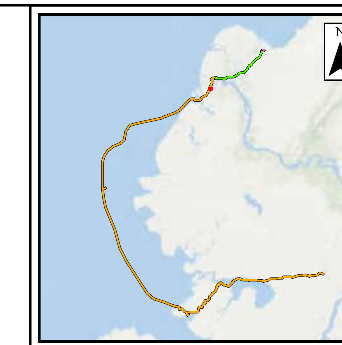
N

0 0.1 0.2
Miles
1:12,000 when printed at 11"x17"

Legend

Project Activities

- Central Office
- Beach Vault
- Airraq Phase 3



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Source: Esri World Imagery ; ADNR ; Alaska BLM ; WGS 1984 Web Mercator Auxiliary Sphere

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Figure 6 - Nunapitchuk to Tunanak

Airraq Phase 3 and Airraq Kotlik

GCI Communication Corp.

Alaska

ERM

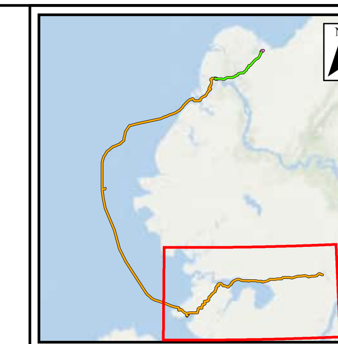

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Figure 7 - Alakanuk to Emmonak
Airraq Phase 3 and Airraq Kotlik
GCI Communication Corp.
Alaska

ERM

Legend
- Community

Project Activities
- Cable Landing Station
- Central Office
- Connection Vault
- Beach Vault
- Airraq Phase 3
- Airraq Kotlik
- FTTx

N

0 1 2
Miles
1:150,000 when printed at 11"x17"

Source: Esri World Imagery ; ADNR ; Alaska BLM ; WGS 1984 Web Mercator Auxiliary Sphere

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Figure 8 - Emmonak to Kotlik

Airraq Phase 3 and Airraq Kotlik
GCI Communication Corp.
Alaska

ERM

N

0 3 6
Miles
1:350,000 when printed at 11"x17"

Legend
Community
Project Activities
Cable Landing Station
Connection Vault
Airraq Phase 3
Airraq Kotlik
FTTx

FILE: M:\US\Projects\G-L\GCI Communications\Airraq Phase 5\ArcGIS\2025_05_Airraq3and5_NMFS_BioAssessment\2025_05_Airraq3and5_NMFS_BioAssessment.aprx, REVISED: 11/06/2025, SCALE: 1:350,000 when printed at 11x17

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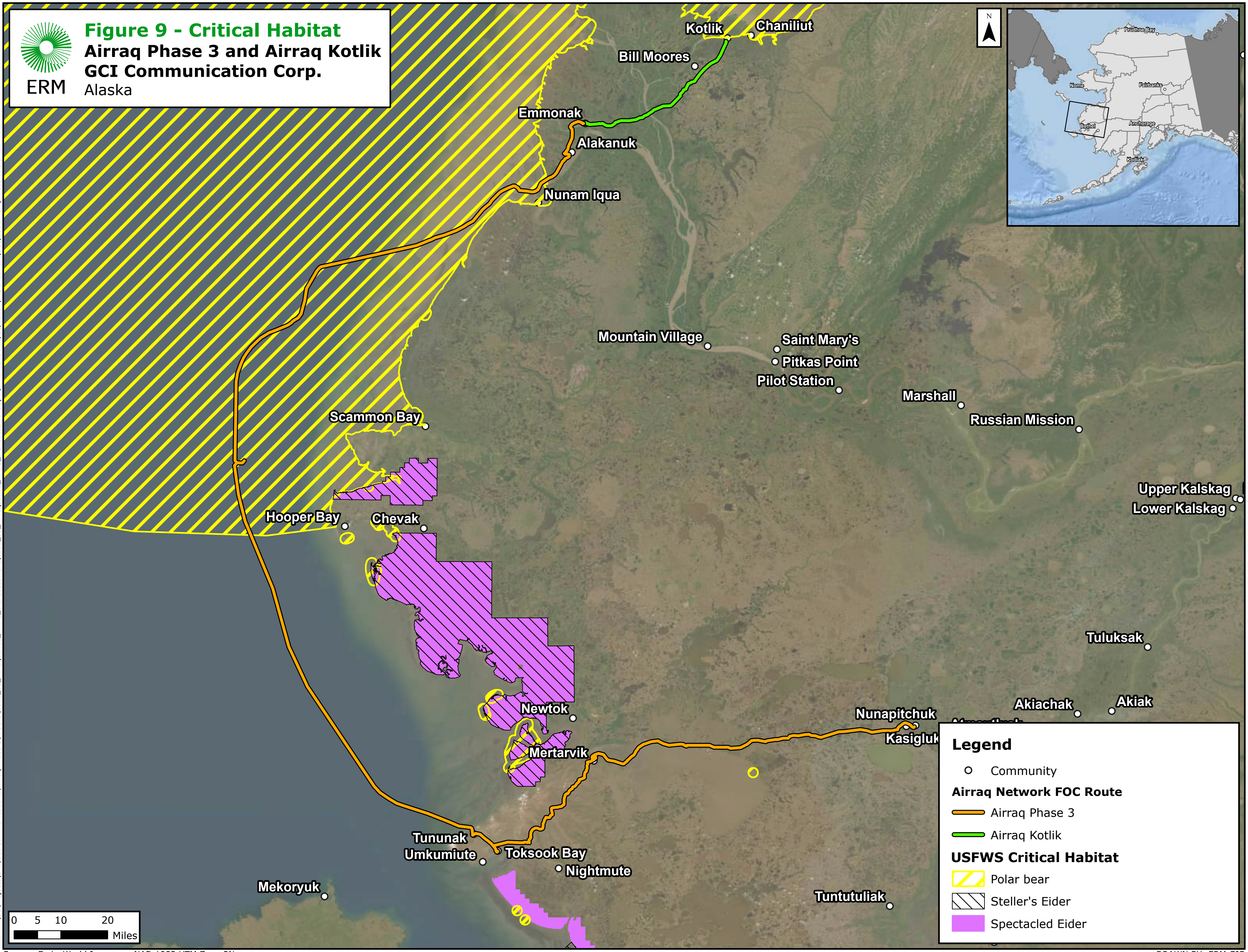

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Source: Esri - World Imagery; NAD 1983 UTM Zone 3N

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APPENDIX C MARINE GEOPHYSICAL & GEOTECHNICAL ROUTE SELECTION SURVEY (BENTHIC GEOSCIENCE, INC. 2024)

Airraq Fiber Network

Marine Geophysical & Geotechnical Route Selection Survey

Interim Report

4 December 2024

Prepared for:

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EXECUTIVE SUMMARY

Airraq Fiber Network (Airraq 3)
Marine Geophysical & Geotechnical Route Selection Survey (RSS)

Survey Dates	24 June – 07 August
Equipment	Multibeam Echo Sounder (MBE), Side Scan Sonar (SSS), Innomar Sub-bottom Profiler (SBP), Cone Penetrometer Test (CPT), Piston Core (PC), and Sea Floor Sampler (SFS)
Horizontal Coordinate System	Universal Transverse Mercator (UTM) Zone 3N, meters

DESCRIPTION OF ROUTE

During the summer of 2024, Segment 3.4.2 of the Airraq Fiber Network from Nunapitchuk to Emmonak, Alaska was surveyed, with a total route distance of 278 km. More than 3700 km of geophysical survey lines were acquired including centerline, wing lines, infills, branching units and route development. For logistical purposes the segment was divided into multiple Blocks, primarily based on water depth, to ensure comprehensive and full coverage.

BATHYMETRY & SEAFLOOR MORPHOLOGY

Water Depths

Water depths range from 6.8 m below MLLW at the start of the route corridor to 25.7 in a broad trough approximately 100 km from the northern end of the route.

Slopes

Slopes are less than 8° except for localized steep slopes at the edge of seabed features with approximately 1 m elevation difference over a short distance.

Seabed Morphology

Beginning in the south, the seabed crosses a boulder field followed by featureless seabed and another boulder field. Seabed with occasional boulder-cored pits and featureless seafloor then alternate for 60 km. Bedforms in the form of sand ribbons cross the route, still alternating with intermittent seabed pits and featureless areas. Current-scoured seabed begins roughly 115 km from the southern end of the survey area. Ice wedge polygons are found amongst scoured seabed adjacent to the mid-route Branching Unit areas. Scoured seabed persists until 181 km from the southern end of the route, then alternates with featureless seabed for 15 km. Shallow, circular depressions dot the landscape for 10 km, followed by 1 km of smooth seafloor. Scoured seabed is dominant for 26 km, after which featureless and scoured seabed alternate for the remaining 37 km of the survey area.

SURFICIAL GEOLOGY

The surficial geology along the route corridor is dominated by fine SAND. The seabed of the southern half of the survey area consists of fine SAND with trace silt with shell fragments and occasional shell beds. SILT and sandy SILT are intermittently present at the seabed in the northern half of the survey area as the route approaches the mouth of the Yukon River, though the predominant seabed sediment type remains fine SAND.

SEAFLOOR FEATURES AND CONTACTS

A total of 1111 boulders were picked from SSS imagery. 1024 hazards for construction were identified, including 966 individual boulders with heights >0.25 m and 56 boulder fields. A majority of the boulders and hazards for construction are located in the southern portion of the survey corridor.

2 possible anthropogenic seabed features were identified. One is a linear slight depression, and the other is a linear feature with no discernable vertical expression.

GEOLOGY

Segment 05

H1	H1 is the base of Unit 1 and is mapped intermittently throughout the survey area except where currents have precluded deposition or scoured away recent sediments. H1 defines the base of surficial sediments and is generally 0-2 m below the seabed. Unit 1 sediments are typically fine sand with trace silt and shells in the southern half of the survey area. Unit 1 is occasionally absent through the central portion of the route but is consistently present in the northern corridor where it is siltier than in the south. Full CPT penetration was consistently achieved in Unit 1 sediments.
H2	H2 is an erosional unconformity at the base of a sand and silt unit generally less than 10 m thick. These sediments are thought to be more consolidated than the overlying Unit 1, though full CPT penetration is achieved in nearly all cases (Stations 43 and 57 met CPT refusal within Unit 2). Like Unit 1, Unit 2 is more sandy to the south and generally siltier as it approaches the mouth of the Yukon River in the north. This unit is interpreted to be fluvial and deltaic deposits.
H3	H3 is the erosional base of a deformed, layered silty unit. The top of this unit is generally deeper than 10 m and rarely comes within 2 m of the seabed in the northern and southern sections. The unit is intermittently exposed in the central section of the route, where ice wedge structures indicate that it was subaerially exposed. Full CPT penetration was achieved in nearly all locations where Unit 3 was encountered (Stations 34 and 35 met refusal within Unit 3).

SEABED AND SUB-SEABED HAZARDS

Cable	No cables were documented or detected during the survey.
Coarse Sediments/Gravel Layers	Shells and shell hash are intermittently present in sandy areas throughout the corridor. No other course sediments were identified.
Boulders	Boulders are most abundant in the southern portion of the survey area. Several large boulder fields are present near the southern end of the route. Numerous individual boulders and small groups of boulders are scattered throughout the remainder of the corridor
Mobile seabed sediments	Mobile sediments in the form of sand ribbons are present in the southern half of the corridor. Three small patches of ripples were identified in the northern part of the survey area.
Pipeline	No pipelines were documented or detected during the survey.
Seabed gradients	Seabed slopes are >8° for a vast majority of the route. Localized slopes >15° are associated with seabed pitting, ice wedge structures, and isolated areas of scoured seabed. These steep slopes are typically no taller than 1 meter.
Shallow gas	Shallow gas is indicated by elevated amplitudes and blanking in SBP records. Gas occurs at the southern end of the route, along two areas in the middle of the route, and intermittently along the northern third of the survey area.
Faulting	No evidence of faulting was identified along the route.
Wreck	No wrecks were documented or detected during the survey.
Ice Gouging	No indication of ice interaction with the seabed was found in the survey area.
Trawling/Anchoring	No evidence of trawling or anchoring were identified along the route.

1 OVERVIEW

This report outlines the operations for the Nearshore Geophysical Survey of the Airraq Network Marine Geophysical & Geotechnical Route Selection Survey conducted by Benthic GeoScience Inc. (Benthic) for the Airraq 3 Project.

The Airraq Network is an initiative by the US Federal Government, driven by a collaboration between Bethel Native Corporation (BNC) and General Communication Inc. (GCI). The project aims to provide fiber-optic connectivity to thirteen communities within the Yukon-Kuskokwim Delta region, enhancing digital infrastructure and connectivity in these remote areas.

The survey was conducted in late spring and early summer of 2024 with the goal of establishing a viable marine cable route for the telecommunications infrastructure, ensuring its longevity and resilience against environmental factors. A summary of project details is presented in Table 1.1.

Project details	
Client:	Bethel Native Corporation (BNC) and General Communication Inc. (GCI)
Project Name:	Airraq Network project (Airraq 3)
Benthic's Project No.:	2403
Survey Type:	Geophysical, and Geotechnical Survey for Submarine Cable Route Selection
Area:	Bering Sea, Northeastern Part, adjacent to Yukon-Kuskokwim Delta
Survey Period:	24 June – 07 August
Survey Vessel	Research Vessel (RV) Woldstad

Table 1-1 Project details

1.1 Survey Goals

The primary goal of the survey is to initiate the identification of the safest and most continuous burial route for installing the submarine cable. This objective was achieved by continuously processing and interpreting data on board, which also helps guarantee the quality and quantity of the data acquired. Preliminary surface interpretations of the route help for early and accurate decision-making regarding route development or route changes during survey. These preliminary products were later refined and the geotechnical results were integrated into the interpretation at Benthic's Processing Center in Palmer, AK following completion of the geotechnical survey.

This report exclusively encompasses operations within the Nearshore zone, defined as any areas of the survey corridor with water depths greater than 15 m.

The main objectives of the survey were:

- Acquire and interpret high quality seabed and sub-seabed data for project planning and execution. This includes bathymetry, seabed sediment distribution, seabed features, obstructions, wrecks, archaeological sites, crossing cables and pipelines, and evaluation of possible mobile sediments.
- Conduct sub-bottom profiling surveys along the survey lines to map shallow geological units (horizons).
- Perform seabed sampling and testing to provide in-situ geological data, supporting the interpretation of the shallow geophysical survey data.
- Provide accurate and detailed information to select the best sites to perform seabed sampling during the geotechnical operations.

The main goal and those objectives were achieved in three different phases.

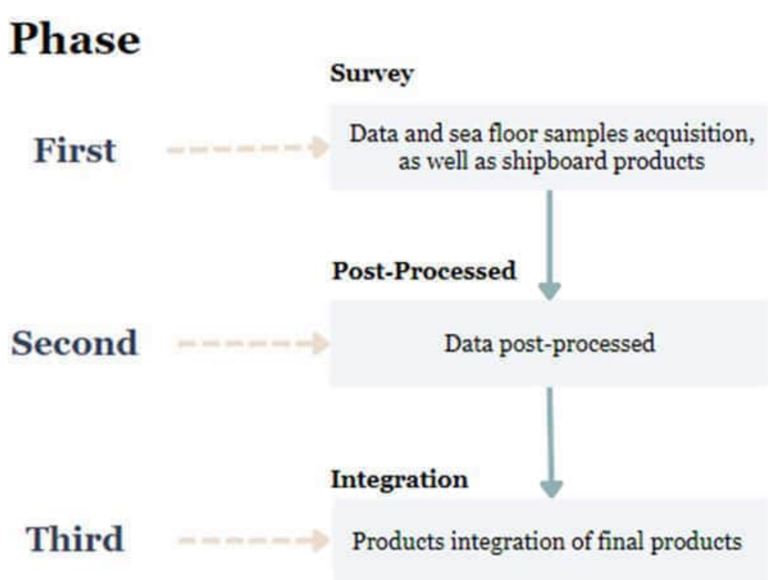


Figure 1-1 Three phases of deliverables production

In the first phase, Benthic conducted a comprehensive and continuous survey using Multibeam Echo Sounder (MBE), Side Scan Sonar (SSS), and Sub-Bottom Profiler (SBP) from 24 June to 22 July. This data enabled the creation of an onboard geological interpretation which was used to pick appropriate locations for the geotechnical campaign, which took place between August 2-7.

During the second phase, all acquired data were post-processed at Benthic's Palmer, AK facility.

Finally, in the third phase, all products were integrated, and the geological interpretation was updated and correlated using the results from the August geotechnical survey.

1.2 Project Site Localization and Description

The worksite for the current project spans ~573.6 km from Nunapitchuk to Emmonak, Alaska. However, this report focuses exclusively on the portion of the Airraq 3 route surveyed in 2024.

Survey Segment Summary				
Segment	**From**	**To**	**Route Distance (Km)**	**Comment**
3.4.2	Tununak	Emmonak	289.0	Starting at -15 m MLLW

Table 1-2 2024 Marine Route Survey Segment Summary

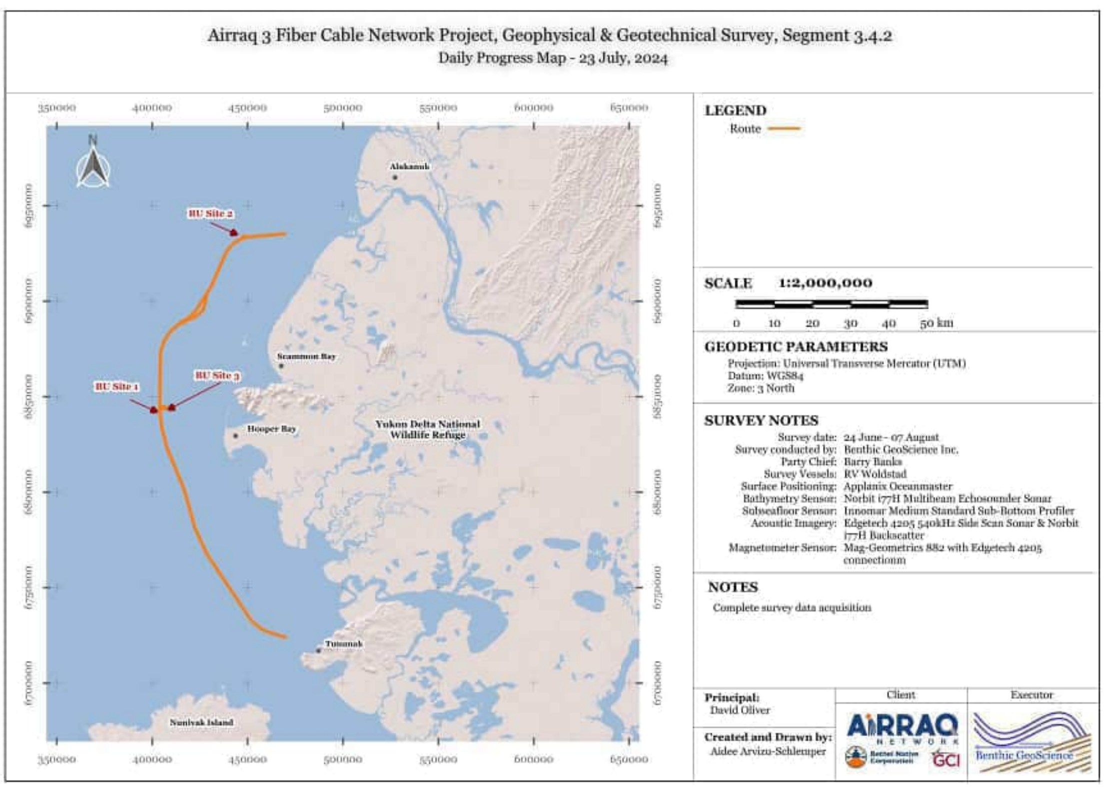


Figure 1-2 Overview of Nearshore Survey Route 2024

1.3 Survey Blocks and Line Plan

To facilitate survey data management and planning, Segment 3.4.2 was divided into six blocks (see Table 5-1 & Figure 5-1) primarily based on water depth to ensure complete coverage.

Multibeam Echo Sounder (MBE), Back Scatter (BS), Side Scan Sonar (SSS), and Sub-bottom Profiler (SBP) data were acquired simultaneously on all geophysical main lines.

1.4 Deviations to Scope of Work

During the geophysical survey, several deviations from the original scope of work were encountered, please see table1.3.

Deviations from the original scope of work during survey

Description	Acquisition Date	Cause
Line plan updated	27 June	Alternative route removed from the scope
Line plan updated	29 June	New route for Block 34204 to find deeper water
BU site 1 added	12 July	Branching Unit (BU) site 1 in Block 34203 added
BU site 3 added	18 July	Branching Unit (BU) site 3 in Block 34203 added
BU site 2 added	22 July	Branching Unit (BU) site 2 in Block 34205 added

Table 1-3 Deviations from the original scope of work during survey

2 SURVEY VESSEL

The effectiveness of any survey operation greatly depends on the selection of an appropriate platform. Specifically, vessel selection should be tailored to meet the operational requirements and environments.

Benthic arranged for the charter of the research vessel Woldstad from Support Vessels of Alaska (SVA) to accommodate the science crew during the geophysical and geotechnical surveys. This vessel was built for the Bering Sea and is a good fit for this environment.

2.1 RV Woldstad

The RV Woldstad was the live-aboard research vessel for this expedition, well-suited for the challenging conditions of the Bering Sea and Aleutian Islands. Originally commissioned by the State of Alaska for patrolling icy waters, this 121-foot steel vessel has been extensively overhauled for large-scale projects. The schematics could be reviewed at the following link.

https://www.supportvesselsofalaska.com/wp-content/uploads/2016/11/Woldstad-Schematic-Final-2.1.pdf

Figure 2-1 RV Woldstad

To perform the data acquisition required for this project the vessel was fitted with two retractable pole arms for mounting MBE, USBL, and SBP systems, along with a towed SSS managed by a stern winch.

3 PROJECT GEODESY

3.1 Geodetic Datum and Grid Coordinate System

The geodetic datum used for survey equipment during acquisition is presented in Table 2-1.

Horizontal datum			
Geodetic Datum	WGS 84	EPSG Datum code	32603
Spheroid	WGS 84 / UTM zone 3N	Prime meridian	Greenwich 0,00,00.0000 E
Semi-major axis (a)	6378137.00000 m	Semi-minor axis (b)	6356752.314245 m
Flattening (f)	0.003352810664747	Inverse flattening (1/f)	298.257223563000
First eccentricity (e)	0.081819190842621	Second eccentricity (e')	0.082094437949696

Table 3-1 Geodetic parameters used during acquisition

3.2 Tidal Datum

Multibeam echo sounder data were shifted during processing from ellipsoidal heights (ITRF2020) to Mean Lower Low Water (MLLW) tidal datum using a separation model specifically created for the survey area.

3.3 Time Datum

The time datum used for the survey was Coordinated Universal Time (UTC). All data acquisition and logging activities were synchronized to UTC to ensure consistency and accuracy across different survey components. Utilizing UTC allows for seamless integration of various datasets and ensures precise correlation between time-stamped data points.

Events in Daily Progress Reports (DPR), however, were recorded in local Alaska Daylight Time (AKDT) for convenience and ease of understanding.

4 EQUIPMENT AND SOFTWARE

4.1 Geophysical and Geotechnical Equipment

Various equipment and sensors were utilized for this project. A brief description of these sensors is provided in the following tables. The first table corresponds to geophysical equipment, while the second table pertains to geotechnical equipment. Following the tables, figures showing the layout of the equipment on each vessel are presented.

Sensor	Manufacturer	Series	Serial Number	Description
Inertial Navigation System (INS)	Applanix	Oceanmaster	N/A	It uses sensors to accurately track a vessel's position, speed, and heading, enhancing navigation and data collection in challenging conditions.
Multibeam Echo Sounder (MBE)	Norbit	i77H winghead	232507	Provided detailed bathymetric data, mapping the seafloor's topography with high resolution and accuracy.
Back Scatter (BS)	Norbit	i77H winghead	232507	Used to measure the intensity of sound waves reflected off the seabed, offering valuable information about the composition and texture of the seafloor.
Ultrashort Baseline (USBL)	iXblue	Gaps M7	7351	
USBL Beacons	iXblue	BCN-1119	2423046 2423047	Navigation data for monitoring SSS.
Side Scan Sonar (SSS)	EdgeTech	4205 dual frequencies	59652	Used to image the seafloor surface, identifying features, sediment types, and potential obstructions or hazards.
Sub-Bottom Profiler (SBP)	Innomar	Standard 100	E3111-4	Penetrated beneath the seafloor to map subsurface geological units and detect variations in sediment layers and geological structures.

Magnetometer (MAG)	Geometrics	G-882	883911	Not used, but onboard vessel and ready to deploy if needed to identify infrastructure crossings or large metallic debris.
Sound Velocity Profiler (SVP)	Valeport	RapidPro SVT Swift SVP Swift SVP RapiPro CTD RapiPro CTD	78721 60311 69850 81072 75844	Provide detailed measurements of the water column for speed of sound, salinity, and temperature to calibrate data from other sensors on board
Profiling winch controller	Revelare System	Underway Profiler	N/A	

Table 4-1 Equipment for geophysical operations

A brief description of the main equipment used during the geotechnical operations are described in the following table:

Item	Manufacturer	Series	Serial Number
Inertial Navigation System (INS)	Applanix	Oceanmaster	N/A
Winch	Okeanus	220 HLWR	50595
CPT	Datem	Neptune 3000	59
Piston Core			
Ultrashort Baseline (USBL)	IXBlue	GAPs M7	7351
Van Veen			N/A

Table 4-2 Equipment for geotechnical operations

The Norbit Multibeam Echo Sounder (MBE) was mounted on the port side, along with the USBL, while the SBP was mounted on the starboard side. The SSS was towed from the stern port side using a winch (Okeanus). The length of cable used for towing was determined primarily by the water depth, vessel speed, and environmental conditions.

The SVP sensor was deployed while underway from the stern starboard side with the assistance of a small winch (Revelare).

Below is a graphical representation of the geophysical sensor layout on the RV Woldstad:

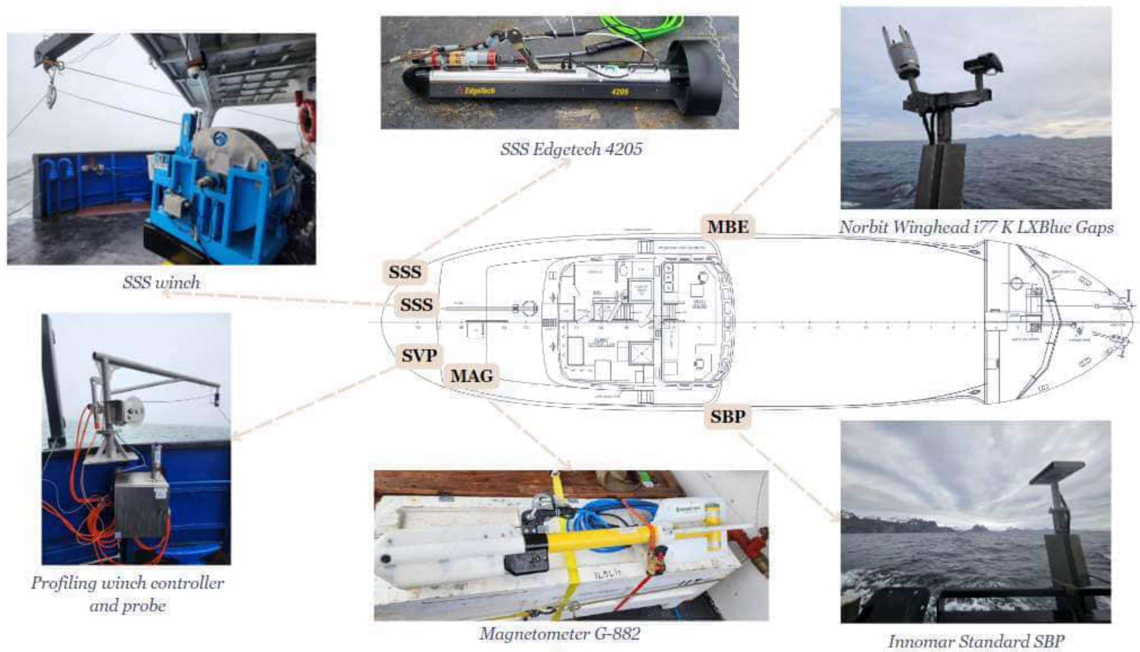


Figure 4-1 Geophysical Survey instrumentation layout for RV Woldstad

During the geotechnical survey phase, the RV Woldstad underwent a reconfiguration of its equipment layout to accommodate the specific needs of the survey operations. The Okeanus winch was relocated from the stern to the deck on the port side to facilitate better handling and access. The Cone Penetration Test (CPT) unit was positioned on the starboard side of the vessel to optimize its deployment and operation with the help of a crane.

Additionally, a temporary geological lab was established in the middle of the deck. This lab was used for the classification and analysis of the samples collected during the survey. The central location of the lab ensured efficient processing and handling of the samples from CPT and PC, contributing to the smooth execution of the geotechnical operations.

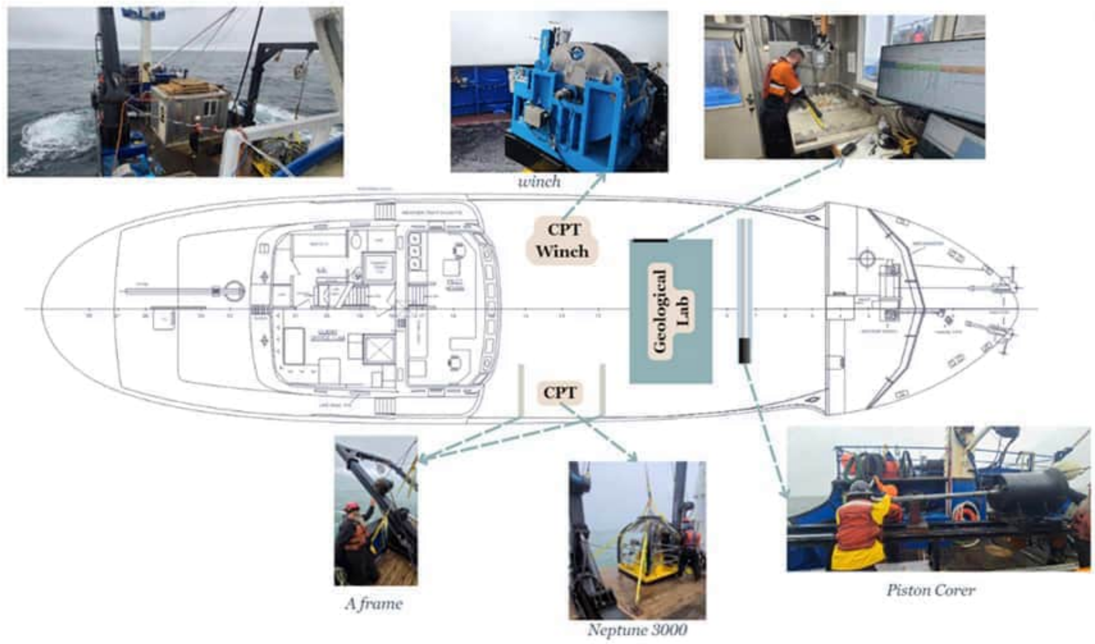


Figure 4-2 Geotechnical Survey instrumentation layout for RV Woldstad

4.2 Software

Several common software packages were employed during the geophysical and geotechnical phases of the survey. These programs were used during nearshore survey operations for shipboard processing, facilitating real-time decision-making for route adjustments or development. The following table presents a summary of installed software.

Software for Geophysical Operations			
Provider	Software	Description	Survey Phase
Blue Marble Geographics	Global Mapper	Geographic information system	All
Chesapeake Technology	SonarWiz	Designed for processing and analyzing sonar data, with tools for visualizing, interpreting, and managing data collected from different types of sonar systems, including side scan, sub-bottom, and bathymetric sonars.	Geophysical

GeoLogismiki	CPeT-IT	Process and interpretation of Cone Penetration Test (CPTu) data.	Geotechnical
Golden Software	Strater	Geotechnical and geological visualization.	Geotechnical
QPS	QINSy	Precise data collection, processing, and visualization for various hydrographic and geophysical surveys.	All
QPS	Qimera	Designed for the acquisition, processing, and visualization of multibeam and LiDAR data in hydrographic surveying and underwater mapping applications.	Geophysical
QPS	FMGT	Package for the visualization, analysis, and interpretation of geospatial data in marine and terrestrial environments.	Geophysical
RadExPro	RadExPro	SBP processing software	Geophysical
Seequent	Oasis Montaj	Visualize, analysis and integration of geoscience data	Geophysical
S&P Global	Kingdom	SBP interpretation	Geophysical
Trimble	Applanix & POSPac	Post-processing of GNSS and inertial data collected during land, marine, and airborne survey missions.	Geophysical

Table 4-3 RV Woldstad installed software

5 ACQUISITION PLAN

Several collection techniques were employed during the geophysical survey, including Multibeam Echo Sounder (MBE), Backscatter (BS), Side Scan Sonar (SSS), and Sub-Bottom Profiler (SBP). A magnetometer was mobilized on the vessel for use in identifying any subsea infrastructure or large debris but was not needed.

The geotechnical survey was conducted using cone penetration testing (CPT) and piston core (PC) techniques, with a Van Veen grab sampler available if piston core samples met refusal.

Both geophysical and geotechnical surveys were conducted on a 24-hour basis using two crews with shift changes every 12 hours.

5.1 Corridor and Coverage

Survey lines for geophysical data were run to ensure a minimum corridor width of 400 meters, with a minimum side scan sonar overlap of 100% and a bathymetry (MBE) overlap of 20% throughout the entire corridor, as well as 100% bathymetry coverage, meaning the entire seabed within the corridor was scanned without any gaps.

5.2 Line Planning

Since the swath width was dependent on factors such as depth and terrain slope, preplanning the survey lines was complex for the entire route. To determine the number of wind lines for geophysical data required for the segment, Benthic decided to begin data acquisition on the centerline. This approach facilitated the initial reconnaissance of the segment and assisted in planning the survey line route. The following maps and table presented the number of blocks and wing lines planned for each segment:

Line plan					
Segment	Block	No. of wing lines	Segment	Block	No. of wing lines
3.4.2	01	10	3.4.2	02	12
3.4.2	03	10	3.4.2	04	14
3.4.2	05	12	3.4.2	06	14
3.4.2	BU1	N/A	3.4.2	BU2	N/A
3.4.2	BU3	N/A	3.4.2	04 old route	N/A

Table 5-1 Line Plan

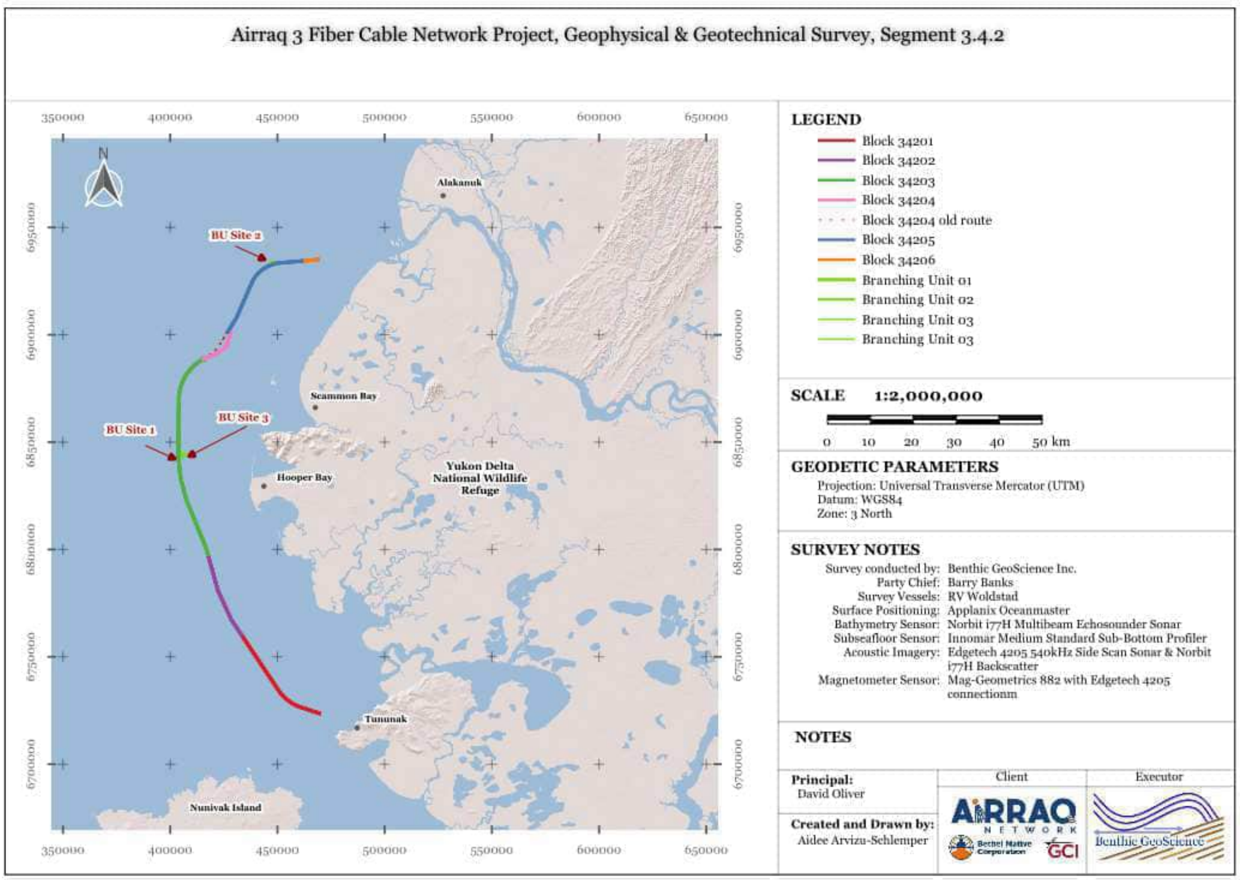


Figure 5-1 Blocks for Segment 3.4.2

5.3 Geotechnical Sites

A total of 60 sites were collected during the geotechnical survey campaign. To determine the best locations for each site, the MBE, SSS, and SBP datasets were used to determine the best possible locations based on seabed, subsurface conditions and seismic anomalies. Some locations deviated both perpendicularly and parallel within survey corridor due to a need to understand the soil properties of certain features.

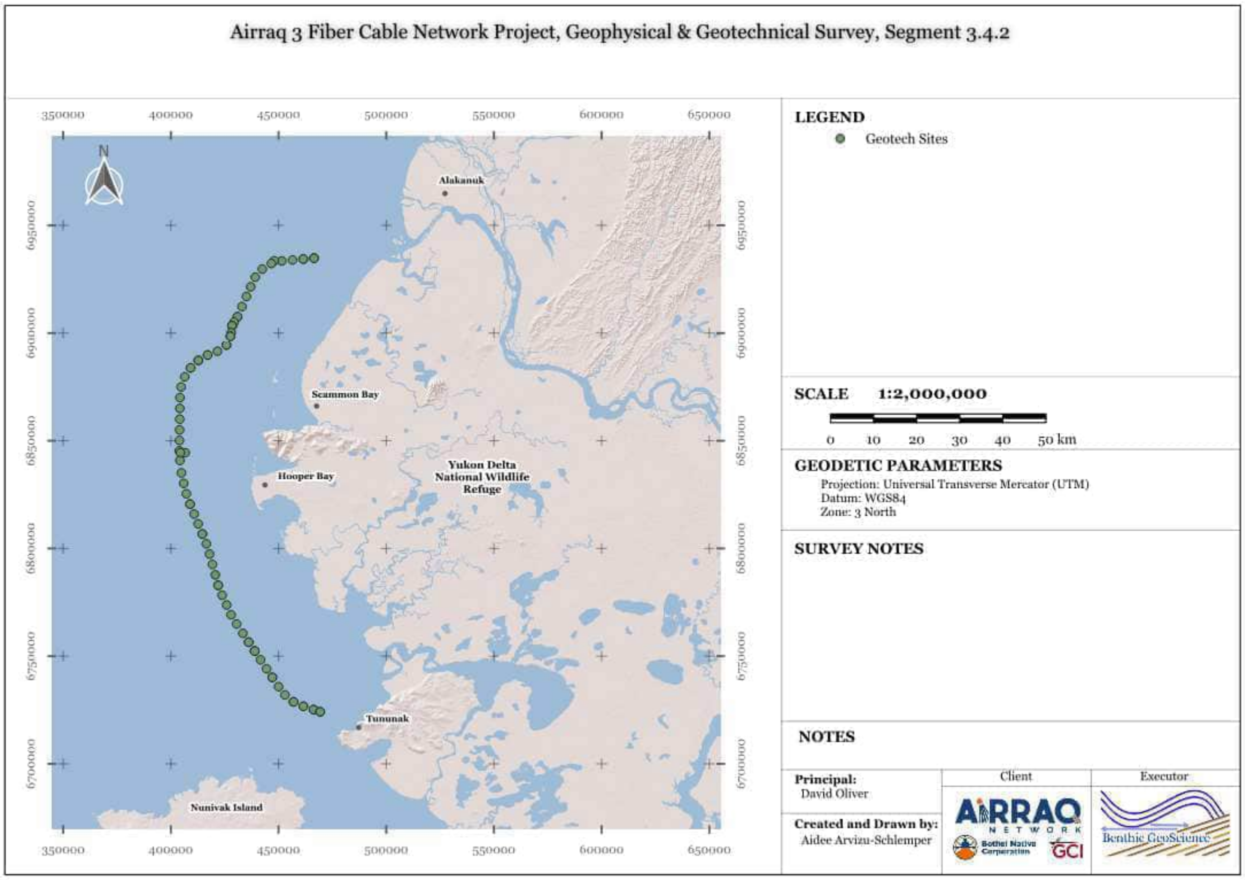


Figure 5-2 Geotech sites Segment 3.4.2

6 QUALITY CONTROL

Infield processing was performed sufficiently to assess coverage, data quality, and assess geohazards and inclement conditions necessitating route development. Further post processing was performed onshore at Benthic's Processing Center in Palmer, AK.

6.1 Equipment Calibration

The primary geophysical survey equipment was calibrated prior to the survey during the sea trials executed on 14 May 2024 in Kachemak Bay, including a multibeam patch test in Halibut Cove. Each sensor underwent calibration to ensure accuracy, precision, alignment, timing error, uncertainty value, and residual biases in roll, pitch, heading, and navigation. Comprehensive testing was conducted to verify that all systems were functioning correctly and were ready for survey operational use. At sea portions of the equipment calibrations were concluded on 15 May 2024. The crew finished processing the calibration data on 16 May.

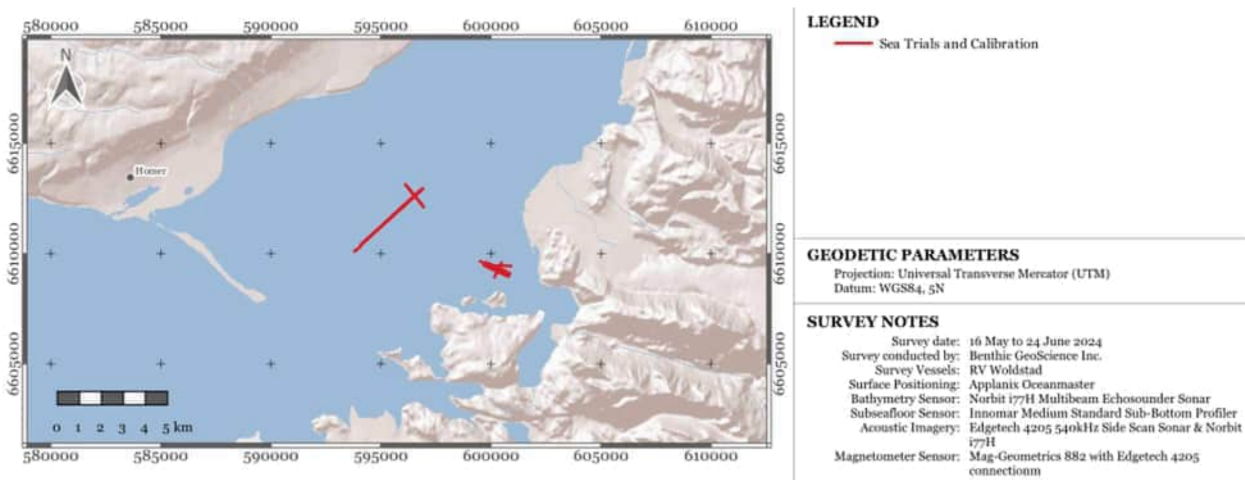


Figure 6-1 Geophysical Calibration Site

To verify the USBL system onboard, a check was conducted by comparing the USBL range with a measurable distance above water. Verification of the depth ranging of the sonar was done by dropping a lead line from the deck of the vessel to the seafloor under the sonar and comparing that to sonar depth.

The MBE calibration was completed by conducting a patch test. To verify the accuracy of the SSS different lines were run in reciprocal directions and imported into processing software. Based on this data, the functionality and positional accuracy of the SSS was determined to be satisfactory for survey operations. It's important to mention that during the Sea Trials the lines running southeast show more accurate, this could be related to environmental factors like underwater currents.

Several SBP profiles were recorded for calibration purposes, and after processing the seismic images, areas of distinct seabed topography were identified and compared with the MBE surface. Magnetometer calibrations were executed in much the same way as SBP, where bedrock outcrops identified in MBE and SSS were compared with the position of magnetic anomalies.

Calibration was not necessary for the Gaps M7 USBL system because it contains an INS inside of the USBL head. The calibration is done during the manufacturing process, making Gaps M7 a precalibrated system. A position verification of USBL-tracked SSS towfish was done, as stated earlier. Similarly, the SVP probes used in this project were calibrated at the factory and did not require on-site calibration.

Immediately after the geophysical demobilization took place, geotechnical mobilization and testing occurred. Test deployments of the CPT and the PC were performed close to the port of Nome shortly after personnel arrived at the Woldstad on 30 July. The crew performed seven tests for piston cores and calibrated the trigger weight and length to ensure accurate and reliable sampling.

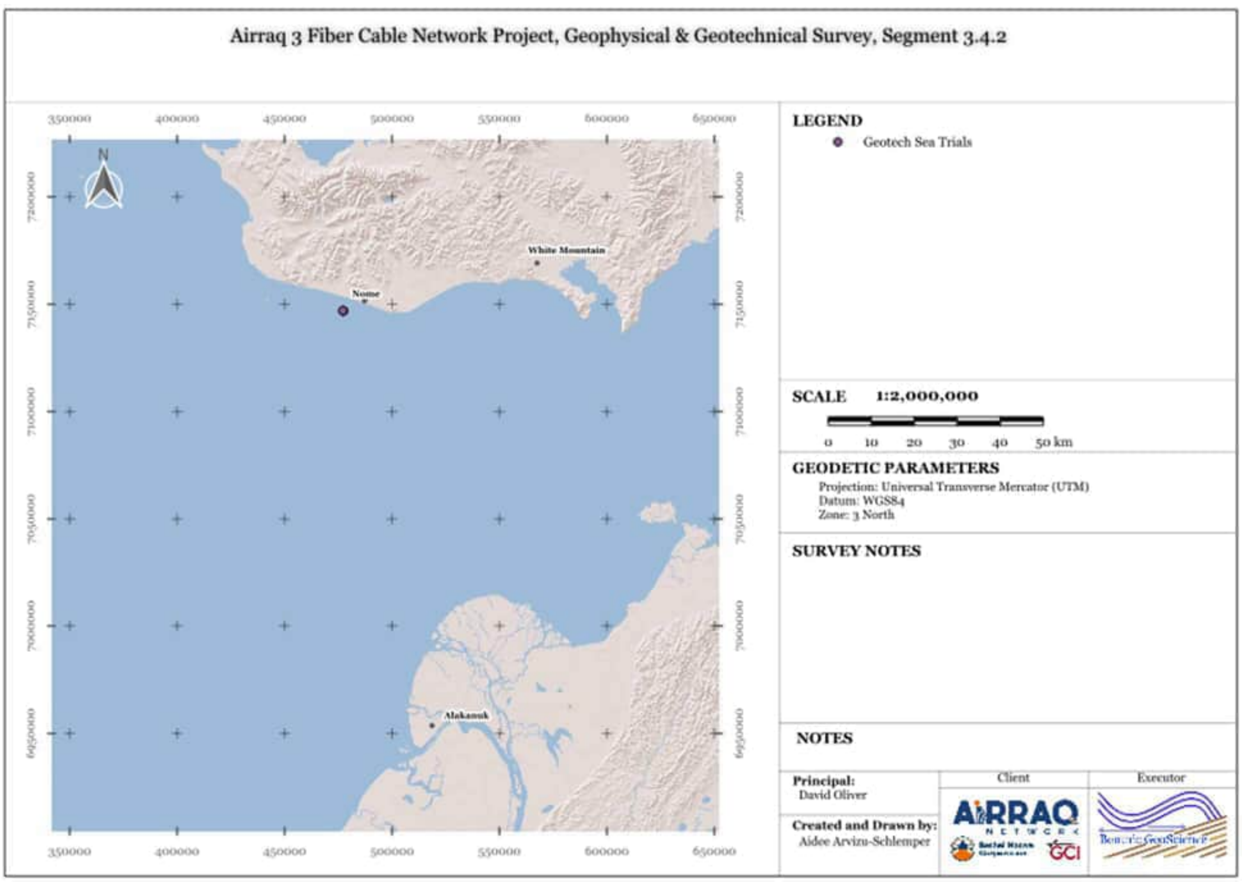


Figure 6-2 Geotechnical Calibration Site

6.2 Data Collection

MBE data was collected using Norbit software and fed into QINSy Navigation software, while SSS data was collected using Discover, SBP data was collected automatically by SESWin with ping triggering and file naming provided by QINSy. The multibeam operated at an automatic ping rate to optimize the coverage of the seafloor in variable water depths.

CPT data records and piston core samples were collected in accordance with the geotechnical plan established during the geophysical survey. During data acquisition, the vessel was halted to deploy the piston core and collect soil samples for analysis (Color, Plasticity, Dilatancy, Soil Strength) by the onboard geologists. Simultaneously, other crew members deployed the CPT equipment to test pore pressure, sleeve friction, and cone resistance at each site.

The file naming convention was inherent to QINSy and Discover to ensure that individual survey lines had unique names based on time of collection. In case of line break due to file size or other conditions, the original file name was kept but appended with an underscore and additional file number. All raw data files contained positional and attitude information and were stored on the acquisition computer's hard drive for the duration of the survey.

Chronological logs containing information specific to each line were maintained as an independent reference to aid in data integration and error tracking. Acquisition logs included the line name, start and end times in UTC and AK time, speed over ground, Vessel Heading, as well as additional comments and events deemed significant by the operator.

6.3 Initial File Handling

Shipboard data handling proceeded as follows: All raw files were organized by Julian day in UTC time, saved locally, copied onto the onboard networked-attached storage (NAS) using GoodSync software for synchronization, and uploaded to a dedicated and secured cloud storage site. As an additional safety measure, all data stored on the vessel NAS was backed up to a second NAS daily at midnight.

6.4 Field Data Processing

Preliminary processing of MBE, BS, SSS, and SBP data was conducted aboard the survey vessel during offshore operations. The data was reviewed daily by the party chief, geophysical interpreter, and geophysical interpreter-reporter for quality control. The data products were reviewed for initial surficial geology interpretation and analysis of bedforms and sediment thickness, which facilitated informed decisions for route development or route modifications. All shipboard products were later post-processed and integrated with the geotechnical survey results at Benthic's processing center in Palmer.

During the geotechnical survey, the geology team analyzed each sample and recorded the data in field logs while simultaneously reviewing the quality of the CPT records to ensure accuracy.

7 GEOPHYSICAL OPERATIONS

This section provides an overview of the geophysical operations and personnel involved in the geophysical survey, including the navigation/acquisition center, shipboard data processing center, and geophysical deck layout.

7.1 Mobilization Summary

The mobilization of geophysical and geotechnical equipment for the nearshore operations began on 24 April 2024, at Benthic's Palmer facility. Key project personnel inspected equipment for completeness and damage upon arrival and all were generally found to be in order. Equipment was loaded into a project box truck for transport to Homer, AK and mobilization on RV Woldstad. The mobilization crew arrived at RV Woldstad on 06 May 2024 to begin mobilization. Table 6-1 outlines the project personnel directly involved in the mobilization operations for the project.

Role	Name
Principal and Technical Lead	David Oliver
Party Chief	Brent Johnston
Sr. Equipment Mobilizer	Thomas Lamoure
Jr. Equipment Mobilizer	James Thomas
Jr. Equipment Mobilizer	Emerson Kropp
Vessel Mobilization Specialist	Erick Kusnir
Vessel Mobilization Specialist	Bill Langolf
Vessel Mobilization Specialist	Tara Levy
Vessel Mobilization Specialist	Eduardo Niño

Table 7-1 Personnel for Mobilization

Figure 7-1 Mobilization

Starting on 06 May, all necessary equipment for operations was manually loaded onto the vessel, and heavy parts were loaded by crane. By 1 PM on the same day, all equipment was onboard. The crew began by inspecting the equipment and installing the pole arms that would be used to deploy various underwater sensors (MBE, SSS, and USBL).

During the following days the crew mounted and installed chafing gear for the MBE and USBL. Initial tests for MBE, USBL, SSS, deck cameras were successful, though minor USBL tracking issues had to be troubleshot and quickly resolved. Over the following days the processing and navigation room were set up with computer equipment and screens. At the same time another part of the crew fabricated hydraulic hoses for the winch and installed the towing sheave on the aft crane, which was tested on the foredeck to confirm operational status.

After completing configuration of the navigation room, all equipment and software were tested to ensure that they were functioning properly.

For more detailed information, please refer to Daily Progress Reports in Appendix A.

7.2 Navigation/Acquisition Center

The Navigation/Acquisition (NAVACQ) center on the RV Woldstad was in the second deck starboard office space. NAVACQ and interpretation stations were established in this room, along with a workstation utilized by the Party Chief. The bridge was apportioned with a helmsman display and a bridge observation desk.

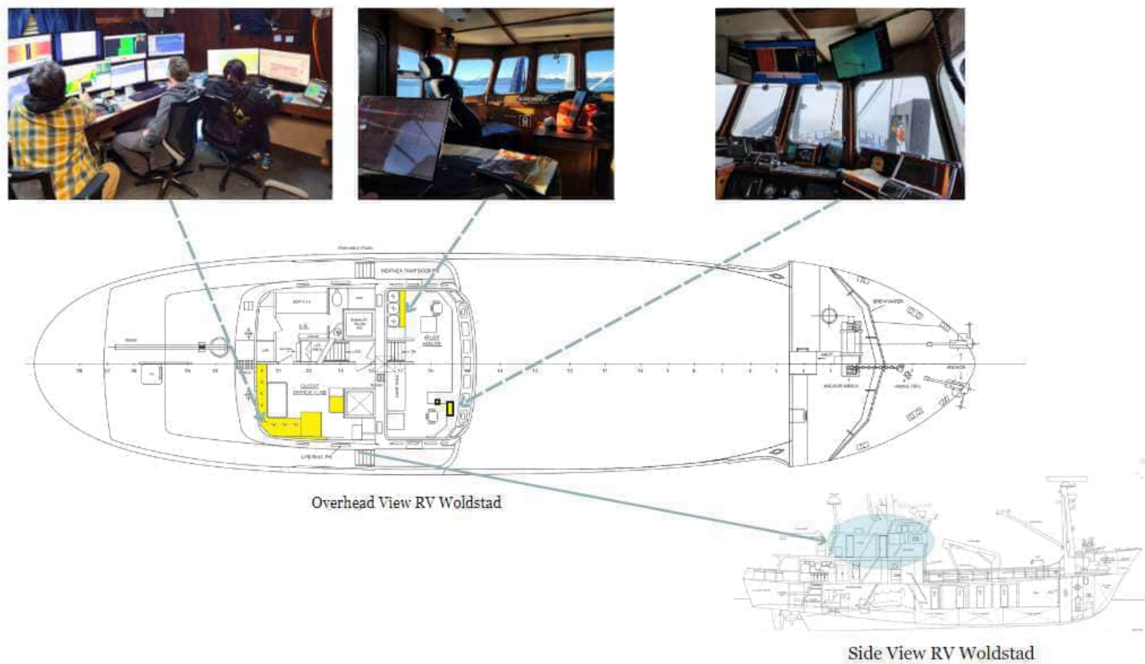


Figure 7-2 Geophysical NAVACQ Layout Plan

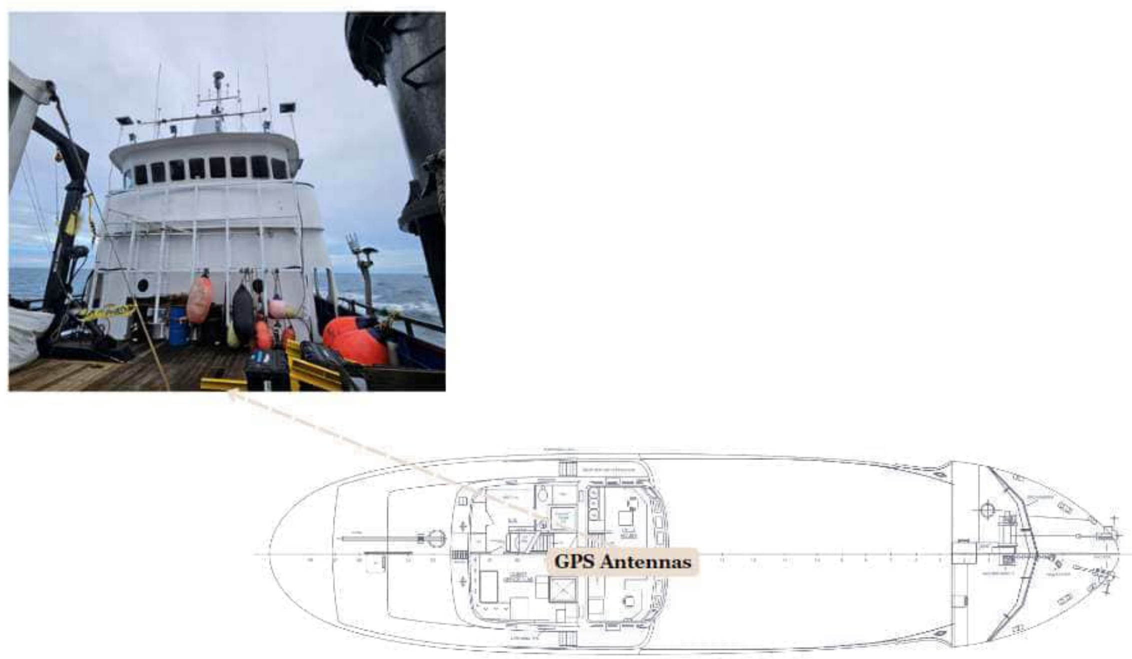


Figure 7-3 Navigation Antennas

The navigation system utilized during the survey was designed to provide high-precision positioning and navigation data. This system includes:

- **Differential Global Positioning System (DGPS):** Utilized for real-time positioning with sub-meter accuracy. A dual antenna Hemisphere 330 was used to provide navigation to the helmsman. This positioning utilized WAAS SBAS corrections to provide better positioning to the QINSy Navigation Software. Heading was provided by the same instrument.

- **Inertial Navigation System (INS):** Used in tandem with the DGPS to enhance accuracy and reliability, especially in areas with limited satellite visibility. Benthic employed an Applanix Oceanmaster INS to provide precise real-time positioning and orientation data essential for accurate data collection and mapping. This integrates inertial technology with GNSS (Global Navigation Satellite System) to deliver reliable and high-accuracy navigation solutions tailored for marine survey applications. Provided continuous real-time tracking of the vessel's position, heading, roll, pitch, and heave.
- **Ultra-Short Baseline (USBL):** The iXblue Gaps M7 USBL system was used for precise subsea positioning of equipment, ensuring accurate data acquisition at various depths. This is a bi-directional acoustic positioning system, which communicates between ship (antenna) and one or more transponders (beacons).

The estimated accuracy of the navigation system for the surveyed area is as follows:

- **Horizontal Positioning Accuracy:** Achieved sub-meter accuracy (typically within ±0.5 meters) due to the combination of DGPS and INS.
- **Vertical Positioning Accuracy:** Achieved accuracy within ±1 meter, essential for precise bathymetric and subsurface data collection.

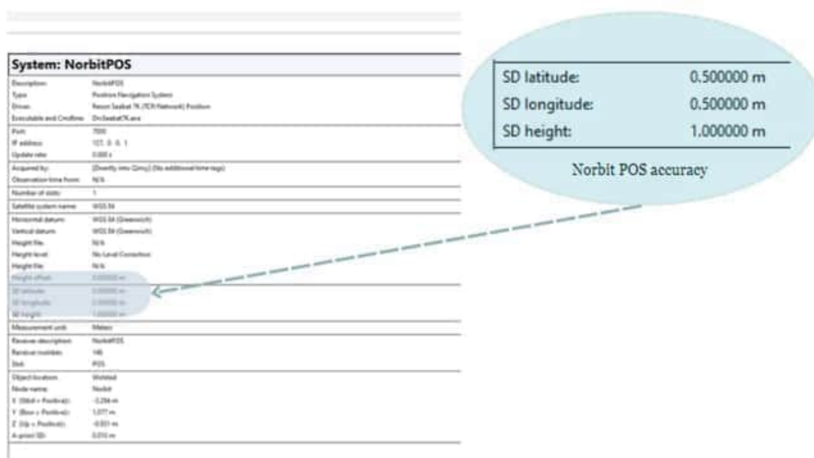


Figure 7-4 Navigation accuracy for POS

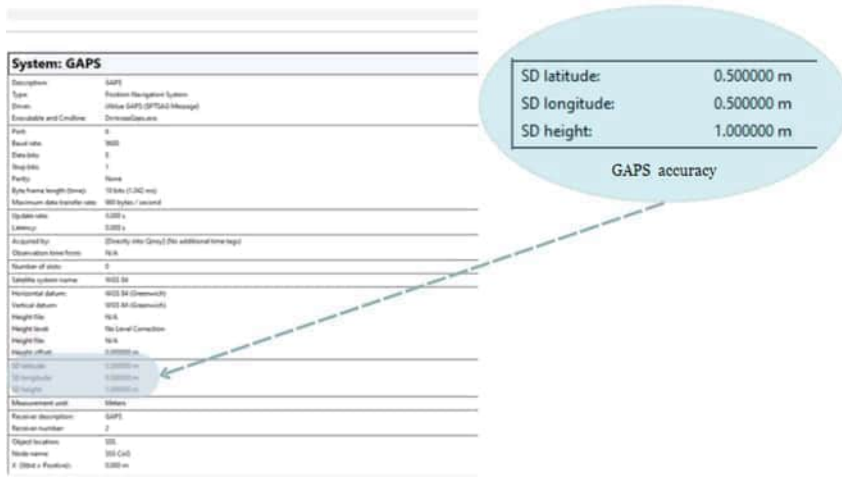


Figure 7-5 Navigation accuracy for USBL

7.3 Navigation

Below are the screenshots of the navigation system corresponding to the X, Y, and Z offsets of the sensor locations, as well as settings.

System: Norbit

Description:	Norbit
Type:	Multibeam Echosounder
Driver:	Reson Seabat 7K (TCP/Network)
Executable and Cmdline:	DrvSeabat7K.exe
Driver specific settings:	MANUAL=FALSE;MAX_SNIP_WINDOW=0;MIN_SNIP_WINDOW=0;PROCESSING_TOOL=FM Geocoder Toolbox (FMGT);PROCESSING_TOOL_OPTION=Normalized snippets;RAW_BATHY=7027;RAW_SNIP=7058;RAW_WCD=0;SYNC_RECORDING=FALSE;SYSTEM=Norbit;
Port:	7000
IP address:	127. 0. 0. 1
Update rate:	0.000 s
Acquired by:	[Directly into Qinsy] (No additional time tags)
Observation time from:	N/A
Number of slots:	0
Manufacturer:	Unknown
Model:	Unknown
Object location:	Winlad
Node name:	Norbit
X (Stbd = Positive):	-3.294 m
Y (Bow = Positive):	1.077 m
Z (Up = Positive):	-0.931 m
A-priori SD:	0.010 m
Roll offset:	0.230
Pitch offset:	-0.060
Heading offset:	1.400
Unit is roll stabilized:	No
Unit is pitch stabilized:	No
Unit is heave compensated:	No
Beam steering (flat transducer):	No
Beam angle width along:	1.500 m
Beam angle width across:	1.500 m
Maximum number of beams per ping:	1024
Use sound velocity from unit:	Yes
Slot:	1
SD type:	Pulse, Frequency
SD pulse length:	0.150 ms
SD sampling frequency:	14.050 kHz
SD roll offset:	0.050 °
SD pitch offset:	0.050 °
SD heading offset:	0.500 °
SD roll stabilization:	0.000 °
SD pitch stabilization:	0.000 °
SD heave compensation:	0.000 m
SD sound velocity:	0.050 m/s

Figure 7-6 Norbit system

System: Norbit [Pitch Roll Heave Sensor]

Description:	Norbit [Pitch Roll Heave Sensor]
Type:	Pitch Roll Heave Sensor
Driver:	Reson Seabat 7K (TCP/Network) R-P-H
Executable and Cmdline:	DrvSeabat7K.exe
Port:	7000
IP address:	127. 0. 0. 1
Update rate:	0.000 s
Acquired by:	[Directly into Qinsy] (No additional time tags)
Observation time from:	N/A
Number of slots:	0
Object:	Wolstad
PRH sensor reference number:	2
Rotation convention pitch:	Positive bow up
Rotation convention roll:	Positive heeling to starboard
Angular variable measured:	HPR (roll first)
Angular measurement units:	Degrees
Sign convention heave:	Positive upwards
Measurement unit heave:	Meters
Conversion factor to degrees decimal:	N/A
Conversion factor to metres:	N/A
Quality indicator type pitch and roll:	No quality info recorded
Quality indicator type heave:	No quality info recorded
Description of quality indicator type:	N/A
Object location:	Wolstad
Node name:	Norbit
X (Stbd = Positive)::	-3.294 m
Y (Bow = Positive)::	1.077 m
Z (Up = Positive)::	-0.931 m
A-priori SD:	0.010 m
(C-O) roll offset:	0.000 °
(C-O) pitch offset:	0.000 °
(C-O) heave offset:	0.000 m

Heave time delay:	0.000 s
Heave filter length:	20.000 s
SD roll and pitch:	0.050 °
SD heave (fixed):	0.050 m
SD heave (variable):	5.000 %
SD roll offset:	0.050 °
SD pitch offset:	0.050 °
SD heave offset:	0.050 m

Figure 7-7 Norbit system pitch, roll and heave

System: NorbitPOS

Description:	NorbitPOS
Type:	Position Navigation System
Driver:	Reson Seabat 7K (TCP/Network) Position
Executable and Cmdline:	DrvSeabat7K.exe
Port:	7000
IP address:	127. 0. 0. 1
Update rate:	0.000 s
Acquired by:	[Directly into Qinsy] (No additional time tags)
Observation time from:	N/A
Number of slots:	1
Satellite system name:	WGS 84
Horizontal datum:	WGS 84 (Greenwich)
Vertical datum:	WGS 84 (Greenwich)
Height file:	N/A
Height level:	No Level Correction
Height file:	N/A
Height offset:	0.000000 m
SD latitude:	0.500000 m
SD longitude:	0.500000 m
SD height:	1.000000 m
Measurement unit:	Meters
Receiver description:	NorbitPOS
Receiver number:	146
Slot:	POS
Object location:	Wolstad
Node name:	Norbit
X (Stbd = Positive)::	-3.294 m
Y (Bow = Positive)::	1.077 m
Z (Up = Positive)::	-0.931 m
A-priori SD:	0.010 m

Figure 7-8 Norbit-integrated POS system

Node: ANT1

Object location:	Wolstad
Node name:	ANT1
X (Stbd = Positive)::	-2.325 m
Y (Bow = Positive)::	0.845 m
Z (Up = Positive)::	10.291 m
A-priori SD:	0.010 m

Node: ANT2

Object location:	Wolstad
Node name:	ANT2
X (Stbd = Positive)::	2.316 m
Y (Bow = Positive)::	0.942 m
Z (Up = Positive)::	10.580 m
A-priori SD:	0.010 m

Figure 7-9 Antenna offsets

Node: GAPS

Object location:	Wolstad
Node name:	GAPS
X (Stbd = Positive)::	-3.294 m
Y (Bow = Positive)::	0.247 m
Z (Up = Positive)::	-1.061 m
A-priori SD:	0.010 m

Node: Norbit

Object location:	Wolstad
Node name:	Norbit
X (Stbd = Positive)::	-3.294 m
Y (Bow = Positive)::	1.077 m
Z (Up = Positive)::	-0.931 m
A-priori SD:	0.010 m

Node: SBP

Object location:	Wolstad
Node name:	SBP
X (Stbd = Positive)::	4.406 m
Y (Bow = Positive)::	0.677 m
Z (Up = Positive)::	-1.191 m
A-priori SD:	0.010 m

Figure 7-10 Gaps, Norbit, and SBP offsets

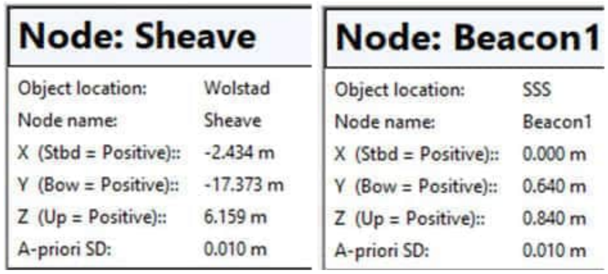


Figure 7-11 Sheave and Beacon offsets

The vessel navigated along the route at an average speed of 6.5 knots, reaching a maximum of 7 knots and a minimum of 3.5 knots on a few occasions. Speed was determined to optimize data quality based on prevailing weather conditions. During acquisition, several days had weather conditions unfavorable for survey operations, accounting for 10% down time. The Daily Progress Report (DPR) provides detailed information on weather and sea state conditions for the whole project (see Appendix A and Appendix B).

7.4 Survey instrumentation

Sensor	Description	Configuration
MBE	Provides detailed bathymetric data, mapping the depth and characteristics of the seafloor with high resolution and accuracy.	Mounted on the port side.
SSS	Images the seafloor surface, identifying features, sediment types, and potential obstructions or hazards.	Towed from the port side aft.
SBP	Penetrates beneath the seafloor to map subsurface geological units and detect variations in sediment layers and geological structures.	Mounted on the starboard side.
MAG	Detects magnetic fields, anomalies in which can be useful in locating ferromagnetic objects and the identification of infrastructure crossings and large metallic debris.	Stowed unless needed – can be quickly mobilized and towed from port side aft.
SVP	Measures the speed at which sound travels through water. This information is crucial for accurate underwater mapping and navigation, as it helps in correcting the paths of sonar signals.	The SVP winch is mounted on the starboard side aft.

Table 7-2 RV Woldstad equipment for Geophysical operations

For this project, various sensors were utilized for the acquisition of geophysical data. These sensors are described in **Error! Reference source not found.**.

7.5 Geophysical Calibrations

Sea trials for all geophysical systems took place from 14-16 May in Kachemak Bay. All systems were operational and within positional accuracy and data quality specifications. See Section 6.1 for more information.

7.6 Geophysical Operations

After receiving and integrating updated route information from GCI client representative Bruce Rein, survey work commenced at 22:54 (AKDT) on 23 June by transiting to the southern portion of the route corridor.

On June 24 at 09:37 hrs. (AKDT), the vessel arrived on site and began deploying geophysical sensors for a reconnaissance survey (recon line) to determine depths along the initial part of the route. At 12:03 hrs. on the same day, the RV Woldstad commenced survey acquisition on the Segment 3.4.2 centerline, continuing data collection for over two days until 11:43 hrs. on June 26. Immediately afterward, survey data acquisition began on the centerline of an alternative route, continuing until 16:37 hrs. the same day. Following the completion of this acquisition, the vessel transited to the Port of Nome for a crew change, refueling, and provisioning. During the transit, MBE data from the alternative route was processed and sent to Palmer headquarters for discussion with the GCI representative. It was subsequently decided not to use the alternative route for cable deployment.

On June 27 at 09:40 hrs., the new crew arrived, underwent vessel inductions, and completed handovers. By 19:00 hrs., the vessel departed the dock to continue the survey. The next day, on June 28 at 10:54 hrs., the vessel resumed data collection, focusing on the wing lines of block 34206 and filling in gaps. The acquisition for the entire block was completed by 22:42 hrs. of the same day. Later that night, at 23:31 hrs., survey acquisition commenced for Block 34205.

Given the shallow waters in Block 34204, the GCI representative suggested acquiring an additional reconnaissance line perpendicular to the route, extending 11.19 km. This reconnaissance allowed the Benthic and GCI team to decide on surveying 8 additional recon lines perpendicular and east of the original route to identify a better route for cable lay.

On June 1, a new centerline for Block 34204 was chosen, and data acquisition began the next day. Unfortunately, unfavorable weather conditions hindered data collection, leading to the decision to recover the equipment and navigate south of the segment to seek calmer waters and continue data acquisition for Block 34201.

During June 3 and 4, unfavorable weather conditions persisted, preventing consistent data collection as the data quality could have been compromised. It was decided to halt continuous data acquisition and take advantage of small windows of favorable weather. On June 5, the weather improved significantly, allowing for continuous work. This marked the completion of the acquisition for Block 34201, including infill lines, and the beginning of data acquisition for Block 34202.

Geophysical data collection continued generally uninterrupted until 22 July, when the final infills for Block 34205 and lines for the BU 3 site were collected and transit to Nome began. During the 24-hour transit to Nome, geophysical equipment was demobilized and packaged for offloading and shipment. A significant portion of the crew was exchanged in Nome between July 25 and 27, followed by a transition to the geotechnical phase of the survey. See Section 9.3 for a summary of geotechnical operations.

7.7 Geophysical Challenges

One of the biggest challenges for Segment 3.4.2 was the unreliable charted water depths, which caused route changes during the survey, as in Block 34204, which had to be completely altered to seek deeper water. Line plans for the geophysical acquisition were initially based on water depths from NOAA charts. Unfortunately, these depths proved unreliable for the area. To resolve this, the team decided to run the centerline of the remainder of the route and base line spacing on observed depths.

It is important to mention that a large portion of the route presented shallow depths. Therefore, the team consulted with the GCI representative about expectations regarding SSS data. The representative recommended that for depths less than 20 meters, acquiring SSS data was unnecessary unless BS data was insufficient or of low quality for the project's objectives. Thanks to this recommendation, the best logistical decision was made to ensure data quality and acquisition timelines were not impacted. The goal was to acquire as much SSS data as possible due to its high reliability in detecting bedforms and boulders on the seafloor.

As anticipated, weather sometimes impacted data collection. With the MBE and USBL heads collocated and mounted well beneath the water line, both were relatively weather tolerant. However, during extreme weather conditions between July 3-4 and 15-16, the data quality was compromised due to blowouts where the seabed is temporarily obscured by air bubbles beneath the sonar head. This lead to a pause in data acquisition until the weather improved. This significant weather event degraded the data quality across all sensors, ultimately initiating a weather standby due to poor MBE data quality. Meanwhile, SSS data, although relatively weather tolerant, was susceptible to heavy cable snatch when the RV Woldstad was bucking into the weather, resulting in heavy striping of the final imagery. The SBP was the most susceptible to weather, especially when significant sea state roll caused a plunging cavitation action that wiped out traces. During the geophysical phase of the project, weather standby was called on 3 separate occasions, totaling 70 hours and 40 minutes (10% of the total time offshore).

8 GEOPHYSICAL DATA PROCESSING

The processing of geophysical data for this project followed a consistent methodology across all segments and portions. While there were minor variations to address specific needs of different data types and conditions, the overall approach remained uniform.

Initial processing of all data was conducted shipboard to ensure coverage and quality. This was followed by detailed post-processing at Benthic's Headquarters in Palmer, AK, where the data underwent further refinement to produce the final deliverables.

The following table presents the personnel involved in the data acquisition and processing activities offshore:

Role	Name
Principal and Technical Lead	David Oliver
Party Chief	Brent Johnston / Barry Banks
Geoscientist interpreter	Jane Hawken / Eric Lavering
Geophysical interpreter and Reporter	Aidee Arvizu-Schlemper
SBP Processor	Erick Kusnir
MBE Processor.	Eli Deshaies
MBE Processor.	Gabby Bejarano / Agno Rubim De Assis
SSS Processor	Tara Levy
SSS Processor	Makenna Andersen / Ronald Lipscomb
Navigator	Bill Langolf / David Lewis
Navigator	Kitrina Godding
SSS Tech.	Byron Thompson
SSS Tech.	Eduardo Niño

Table 8-1 Geophysical shipboard operations/processing personnel

The following table presents the personnel involved in the onshore post-processing, data integration, and creation of final deliverables:

Role	Name
Principal and Technical Lead	David Oliver
Geoscientist interpreter	Eric Lavering
Geophysical interpreter and Reporter	Aidee Arvizu-Schlemper
SBP Processor	Erick Kusnir
MBE Processor	Eli Deshaies
MBE Processor	Agno Rubim De Assis
SSS Processor	Makenna Andersen

Table 8-2 Onshore geophysical processing personnel

The following sections provide detailed descriptions of the various geophysical data processing and analysis steps undertaken:

8.1 Sound Velocity Profiles (SVP)

For the Nearshore operations, Benthic brought on board five probes (one in use and four spares) to perform sound velocity profiles. The probe was deployed using a Revelare winch mounted on the stern starboard side. The length of cable used for casting depended primarily on the water depth, vessel speed, and environmental conditions.

Sound speed varies with temperature, salinity, and depth; ocean temperature and salinity vary with season and location. The navigation crew, in consultation with onboard multibeam processors, ensured that sufficient casts were taken during data acquisition. During the Airraq 3 project, an SVP cast was acquired at least every hour during the survey, totaling 555 SVP casts for the entire route.

For each SVP cast, the navigator processed the raw profiles using HydrOffice Sound Speed Manager V2024.0.3. These profiles were imported and reviewed to ensure correct geolocation and timestamps. Erroneous points were manually removed from the profiles as needed. Sound velocity profiles were exported in CARIS.SVP format for subsequent multibeam processing and were also manually input into Norbit.

8.2 Multibeam Echo Sounding (MBE) Processing

Multibeam bathymetry was processed using QPS Qimera V2.6.2. Raw S7K files were imported and corrected with sound velocity profiles and processed SBET navigation files. Soundings were vertically shifted from ITRF2020 ellipsoid heights to a Mean Lower Low Water (MLLW) datum using a separation model specifically created for the survey area. The workflow diagram for MBE processing is shown in Figure 8-2.

Corrected soundings were reviewed, with erroneous soundings being rejected. TU Delft sound velocity corrections were applied to the data as needed. Soundings across the entire survey area were gridded at a 1 m resolution using the average CUBE method in Qimera.

During post-process Qimera's advanced cleaning tools were utilized to remove noise and erroneous soundings that created artefacts, with both automated and manual cleaning techniques employed to enhance data quality (Figure 8-1). 1 m resolution GeoTIFF and XYZ files were then exported from the final surface.

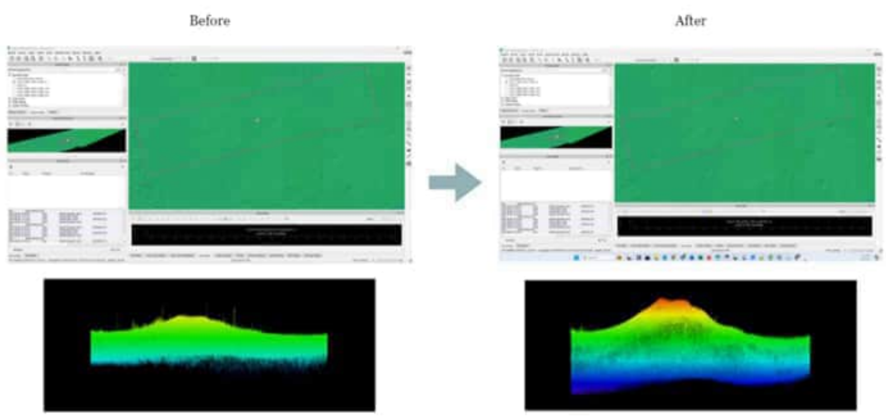


Figure 8-1 Removal of noise and erroneous soundings

The MBE slope grid was calculated in Global Mapper by down sampling the grid to a 2 m resolution and exporting it in FLT format in units of degrees. The FLT grid was then reimported into Global Mapper and exported as a GMG file. All MBE products were utilized by the interpretation team for reporting seabed conditions relevant to the marine route survey.

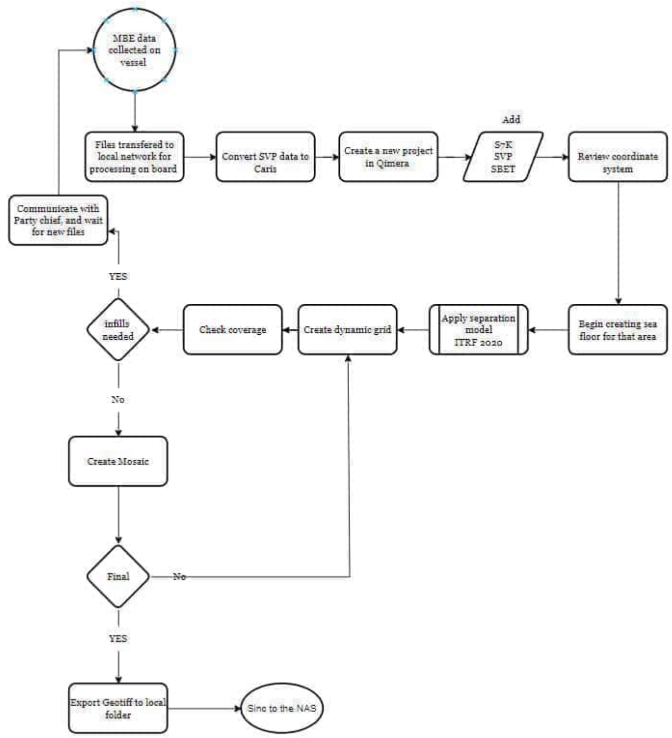


Figure 8-2 MBE basic workflow

8.3 Backscatter

Multibeam backscatter was processed using QPS Fledermaus Geocoder Toolbox (FMGT) V 7.10.3. The backscatter snippets data were exported from the S7k files into GSF format. The XYZ bathymetry data were used as a reference grid to correct angle dependency.

Geometric and radiometric corrections were performed in FMGT to ensure accurate backscatter representation. One of the most challenging aspects was determining an optimal grayscale for the visualization of anomalies, which required careful adjustment and iteration. Finally, backscatter geotiff mosaics were exported at a 0.50 m resolution, providing detailed and accurate imagery of the seabed.

8.4 Side Scan Sonar

Side scan Sonar files were recorded as Edgetech JSF files, processing and interpretation was conducted within Chesapeake SonarWiz software. Prior to importing raw SSS JSF files the water sound velocity at towing depth was confirmed and updated within the SonarWiz import settings. They were imported into SonarWiz and converted for the internal project into CSF files. The workflow diagram for SSS processing is shown in Figure 8-3.

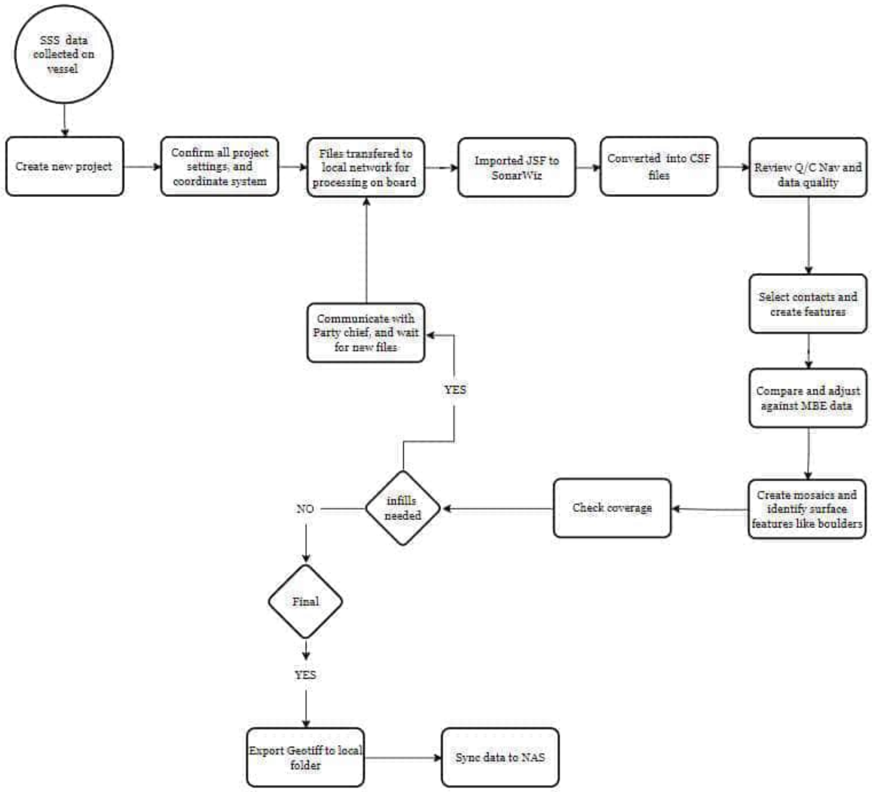


Figure 8-3 SSS basic workflow

The low frequency channel (540 kHz) was processed and used to create the mosaics and pick contacts. Additionally, the imported resolution was set at maximum (8192 samples per channel; Figure 8-4).

Lines were imported into SonarWiz as they were acquired. Once imported, the files were bottom tracked (first automatically by the threshold method and then fixed manually where needed) and navigation was smoothed or slightly corrected. Navigation was set to Course Made Good with 100 samples of smoothing as a basis for all lines. Additional smoothing was performed on a line-by-line basis in Z-edit, where navigation required it. For much of the project, the USBL system was operational and had generally good positioning with only minor dropouts. Sonar files were positioned using layback in isolated cases where USBL dropouts caused distorted imagery

An Empirical Gain Normalization (EGN) table was created at the beginning of the project was used throughout acquisition to balance gain values and create visually appealing imagery. A final EGN table was created in post-processing to capture the entirety of the intensity values and create the desired smoothed color surface.

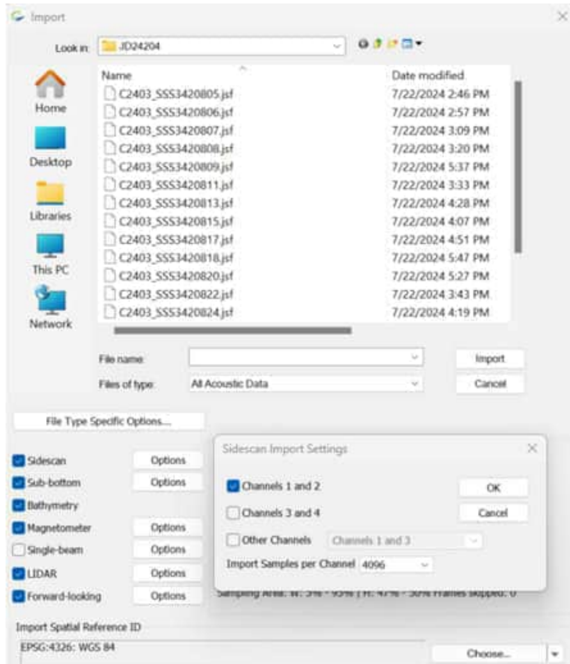


Figure 8-4 Resolution Import settings for SSS

Combined imagery mosaics were routinely provided to the onboard interpreter. Every file was compared with the multibeam bathymetry surface to identify surface features (i.e., boulders, sand waves, seabed scars, outcrops, shadows, and compositional drastic changes). The SSS data lines were adjusted as needed to precisely align with the MBE data (Figure 8-5).

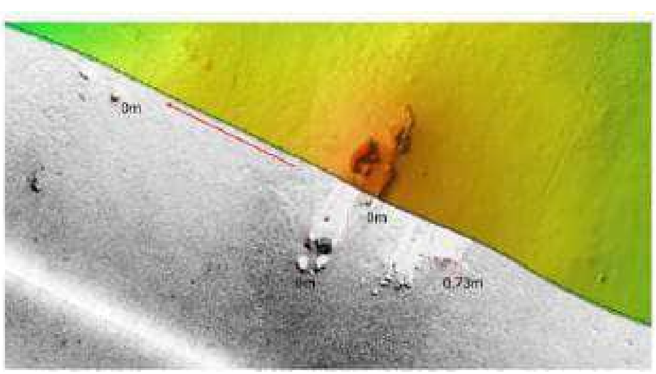


Figure 8-5 SSS vs MBE data

Once data was positionally correct and with the proper amplitude intensity, mosaics were created for each segment of the route, and for the project as a whole. Mosaic resolution was set to 0.25m per pixel onboard (final processing in the office was 0.15 m per pixel). Final tiles after post-processing were set to be 2km long by 2km wide and the resulting Geotiff was set to 32-bit.

8.5 Sub-Bottom Profiler

Seismic lines acquired by the Innomar were recorded in 24-bit digital resolution, SES3 format, and then converted to the seismic standard format of SEGY using Innomar's conversion software SESConvert. The coordinates sent from QINSy to the Innomar recording software were in WGS84 Latitude and Longitude. Coordinate transformation to the project CRS, in this case WGS84 UTM Zone 4N and 5N, occurred upon import to Innomar SESConvert.

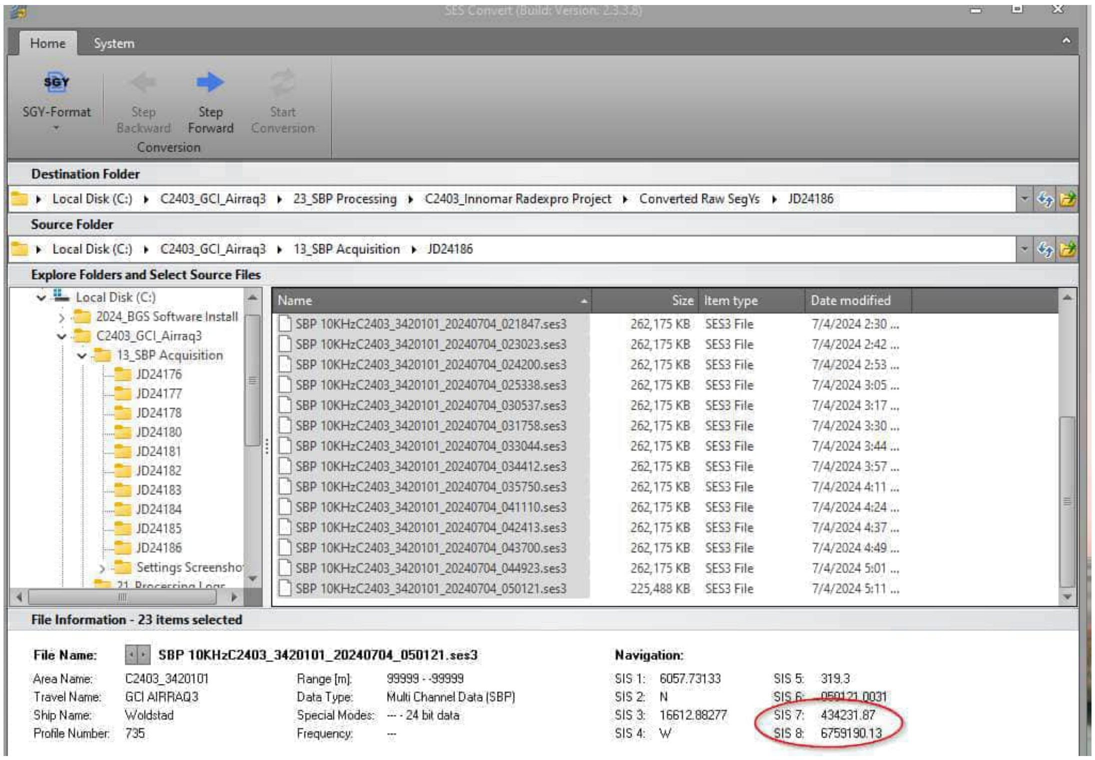


Figure 8-6 Innomar SESConvert software, showing X and Y coordinates in meters

Total RadExPro processing steps are shown in the following figure.

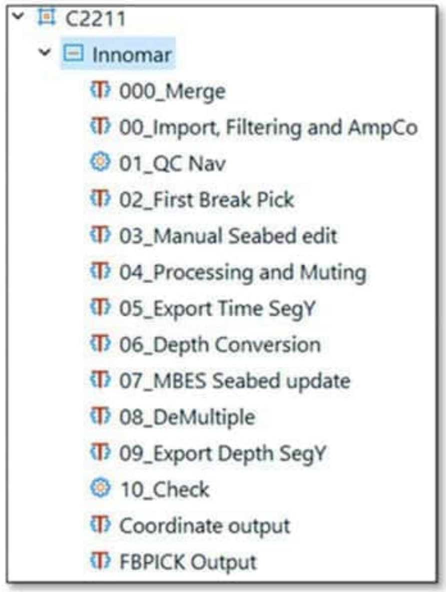


Figure 8-7 SBP processing steps using RadExPro

RadExPro has a series of modules/menus with parameters carefully filled with logical starting values and tested during calibration. Once data was collected in survey conditions, the data was further optimized and finally set for the whole project. The following figure provides an example of the modules within a typical RadExPro processing flow.

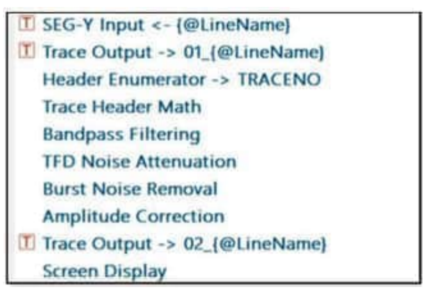


Figure 8-8 RadExPro modules

Navigation was then checked in RadExPro as shown below, plotting the coordinates as a crossplot:

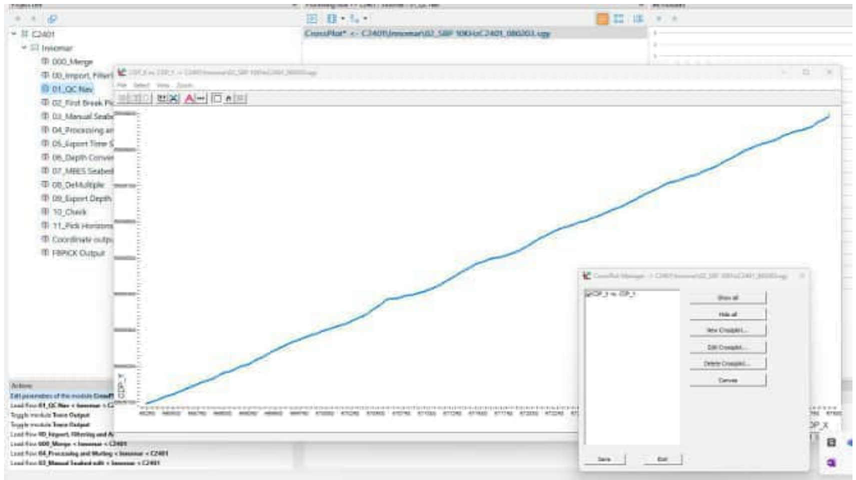


Figure 8-9 Example of RadExPro navigation plot

Generating the seafloor in RadExPro utilizes the first break peak wave. Using parameters optimized for thisproject, first an auto-picking method was used, then manually edited. This picked seabed is necessary for the later steps.

The SBP data was de-ghosted, compressing multiple arrivals of the same layers, especially layers that havestrong seismic impedance contrast (e.g. water and seabed interface).

In shallow water, the removal of the seabed multiple was necessary for reducing interference with interpretation. In deeper water, the seabed multiple was deeper than the interpretation required, and removing the multiple was not necessary.

The SBP data was then shifted vertically using the multibeam surface (i.e., MLLW), which eliminates any residual motion from the sea state during acquisition. While motion artifacts are corrected within both the Innomar software and from POSMV directly, some residual motion may remain during times of increased sea state. Thus, matching the seismic seafloor with the multibeam surface eliminated any motion artifacts. This was performed using a 2-velocity model for the water and substrate, using 1500 m/s and 1640 m/s, respectively. Finally, the SBP data was shifted to the final MBE surface on a trace-by-trace basis (Figure 8-10). This was necessary for the interpretation team to integrate the geophysical and geotechnical datasets.

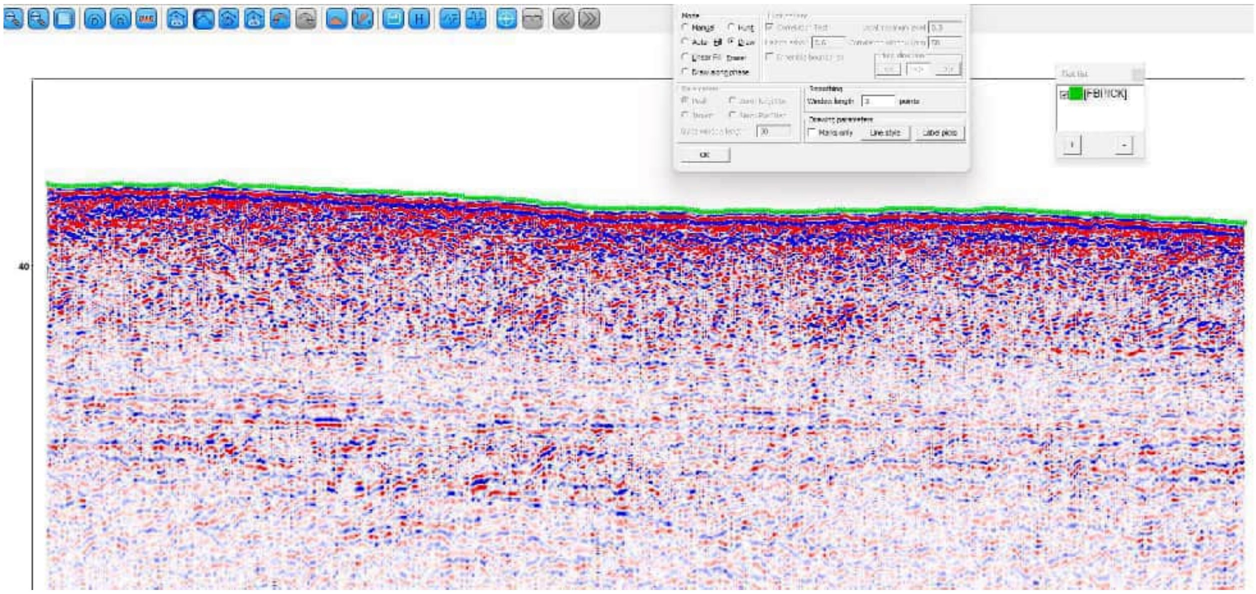


Figure 8-10 Example of depth converted SBP data

8.6 Sub-Bottom Profiler Interpretation

The SBP time data was first imported into the Kingdom software. At the beginning of the survey, a few filters were tested, but they did not increase the resolution of the data. Therefore, dynamic amplitude gains (overall gain) were applied where necessary to enhance reflectors. The dynamic amplitude was not applied to all files globally but rather adjusted on a file-by-file basis for interpretation purposes only. The seismic envelope was also calculated for each line to aid in visualizing subsurface reflectors. During periods when the motion of the vessel was evident due to weather conditions, the data was temporarily flattened to the seabed to aid in the digitizing of reflectors. All reflectors along the centerline of the surveyed route were digitized.

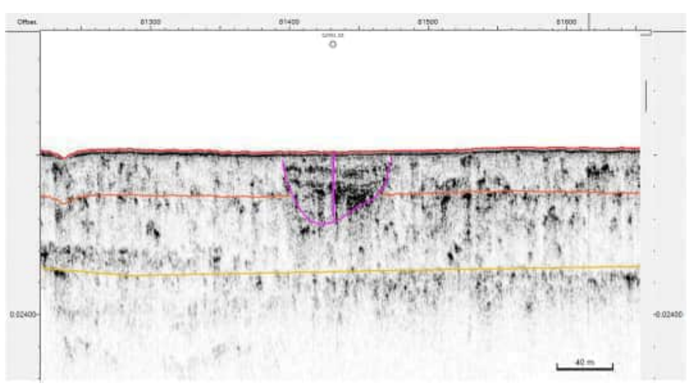


Figure 8-11 Example SBP data visualized as seismic envelope in Kingdom Software

After generating MBE products with MLLW corrections, seismograms in the depth domain were generated and imported into Kingdom. The distance from the seabed to the digitized reflectors was calculated using a sound velocity of 1640 m/s.

The subsurface interpretation generated onboard was correlated with MBE and SSS mosaics. The onboard interpretation was further refined by integrating the results of the geotechnical samples after that campaign concluded in late August.

8.7 Shipboard Analysis and Integration of Survey Products

In-field processing was performed sufficiently to assess coverage, data quality, and evaluate geohazards and inclement conditions necessitating route development. This approach ensured continuous assessment and allowed for immediate adjustments as needed.

The initial analysis of surficial geology and bedforms was conducted using the Side Scan Sonar (SSS) and backscatter (BS) imagery in Global Mapper software. BS and SSS mosaics were exported as GeoTIFF files and imported into Global Mapper for digitization and feature extraction. These mosaics were then correlated with Sub-Bottom Profiler (SBP) data to map linear and polygonal surface features.

To achieve an integrated interpretation, the bedforms and surficial geology interpreted from the SSS data were cross-referenced with Multibeam Echo Sounder (MBE) grid data. This comprehensive analysis ensured that all available data were considered for a cohesive interpretation of the survey area.

The interpretation of SSS contacts was performed using SonarWiz software. In digitizing mode, SSS data was examined, and contacts were selected based on predefined criteria. These interpreted contacts were then integrated into the Global Mapper project.

Sediment thickness data was also incorporated into the Global Mapper project. This data was derived from horizons identified using Kingdom software from the SBP data, providing an additional layer of detail for sediment characterization.

After the geotechnical survey, the classifications of surficial geology and seabed sediments were reconciled with the geotechnical results to validate and refine the sediment classifications. This reconciliation process was conducted onshore at the Palmer office during the post-processing phase, ensuring accurate and detailed sediment classification.

9 GEOTECHNICAL OPERATIONS

This section provides an overview of the geotechnical operations and personnel involved during the survey and post-processing phases.

A total of 60 sites were collected during the geotechnical survey campaign. Field MBE, SSS, and SBP datasets were used to determine the best possible geotechnical locations based on seabed and subsurface conditions. Some locations deviated both perpendicularly and parallel within survey corridor due to a need to understand the soil properties of certain features.

Infield processing was performed sufficiently to assess data quality and determine soil properties. Further post-processing will be performed onshore at Benthic's Processing Center in Palmer, AK.

The following table presents the personnel involved in the data acquisition and processing activities offshore:

Role	Name
Principal and Technical Lead	David Oliver
Party Chief	Brent Johnston
Geologic Interpreter	Dimitri Tzekakis
Geologic Interpreter	Nick Hatsios
Sr CPT	Trevor Hoskins
Jr CPT	Damion Montisino
CPT Processor	Erick Kusnir
Sr Piston Corer	Ryan Kennedy
JR Piston Corer	Gregorio Cruz
Back Deck Support	Grace Smythe
Back Deck Support	James Thomas
Back Deck Support	Josh Moraches

Back Deck Support	John Parks
Back Deck Support	Emerson Kropp
Geologic Interpreter	Aidee Arvisu-Schlemper
Back Deck Support	Colby Gottschalk

Table 9-1 Geotechnical shipboard operations/processing personnel

After the geotechnical survey, the classifications of surficial geology and seabed sediments derived from geophysical datasets were reconciled with the geotechnical results to validate and refine the sediment classifications. This reconciliation process was conducted onshore at the Palmer office during the post-processing phase, ensuring accurate and detailed sediment classification.

The following table presents the personnel involved in the onshore post-processing, data integration, and creation of final deliverables:

Role	Name
Principal and Technical Lead	David Oliver
Interpreter and Reporter	Aidee Arvizu-Schlemper
Processor	Erick Kusnir

Table 9-2 Onshore geophysical processing personnel

9.1 Mobilization Summary

Mobilization of a significant portion of the geotechnical equipment took place during the initial mobilization in Homer, AK. The Mooring Systems Inc. PC-300 Piston Core (PC) and supporting accessories including three-meter barrels and core liners were delivered to Nome on 24 July (Figure 9-1).

Figure 9-1 Mooring Systems Inc. PC-300 Piston Corer on SVA's custom piston core launch and recovery system

The Datem Neptune 3000 Cone Penetrometer Test (CPT) and winch was delivered to the Woldstad on 27 July and tested during the 3 following days (Figure 9-2).

Figure 9-2 Datem Neptune 3000 Cone Penetrometer Test (CPT) system

9.2 Geotechnical Sea Trial

Sea trials for the CPT and piston coring equipment took place on 30 June at a location just south of Nome, AK. All systems were shown to be operational. See section 6.1 for more information.

9.3 Geotechnical Operations

The Woldstad began transit to the project site at 18:35 hrs. on the 31 July, arriving 21 hours later. Upon arrival, production was briefly delayed due to adverse weather conditions. The following day, coring, seafloor sampling, and CPT operations were conducted for over 15 hours, but were eventually suspended due to building weather, which made it difficult for the vessel to maintain station. Operations resumed on 5 August at 09:01 hrs, and all 60 sites were completed by 16:32 hrs. on 7 August. The vessel then commenced transit to another project.

During acquisition, several days had weather conditions that were unfavorable for survey operations, accounting for 26% weather down time. The Daily Progress Report (DPR) provides detailed information on weather and sea state conditions for the whole project (see Appendix A and Appendix B).

9.4 Geotechnical Challenges

One of the biggest challenges was operation in shallow water depths. This increased difficulty for vessel operators to hold station as acceptable horizontal movement of the vessel is reduced for safe CPT operations.

High currents especially combined with wind and elevated sea states proved to be the most significant challenge faced by the geotechnical crew. At times wind speed was above 20.0 kts, and currents greater than 2.0 kts on the sea surface made vessel positioning and station keeping very difficult and time consuming. On some sites positioning of the vessel took over an hour.

One final note is that the penetration value recorded for piston cores was often inaccurate. Penetration was measured by a garter that was placed on the outside of the core barrel and was supposed to slide up the barrel as the corer penetrated the seabed. This garter was too tight and did not slide freely on the barrel, leading to perceived penetration values that were often smaller than the recovered sample.

10 GEOTECHNICAL DATA PROCESSING

10.1 CPT Processing

The CPT data were processed using CPeT-IT software at Benthic's office in Palmer. The raw CPT data was recorded as ASCII text files and included tip resistance (qc - MPa), the sleeve friction (fs - kPa), pore pressure (u2 - kPa), and inclination (degrees). Additionally, the header in the text file included the area cone size (mm). Each CPT was imported, adding the site acquisition date and UTM coordinates.

The tip resistance data was de-spiked of clear outliers which were not to be included in the processing calculations. These values are called "Hand Auger" values and are set to -9999. For final CPT interpretation, these -9999 values were set to "Null" and not included in the final core logs.

CPT Data QA/QC was performed by checking the cross correlation between the tip resistance and sleeve friction for each CPT. This correlation should be zero.

When they were not, the fs column was shifted by applying a filter that calculates the samples needed to be shifted. An image of the cross-correlation plot, the curves, and the data columns is shown in **Error! Reference source not found.**. Additionally, the inclination value was loaded in the software and used to correct for depth for each CPT. Pore pressure was loaded as u2, thus it was unnecessary to convert from u1. No other filters were applied.

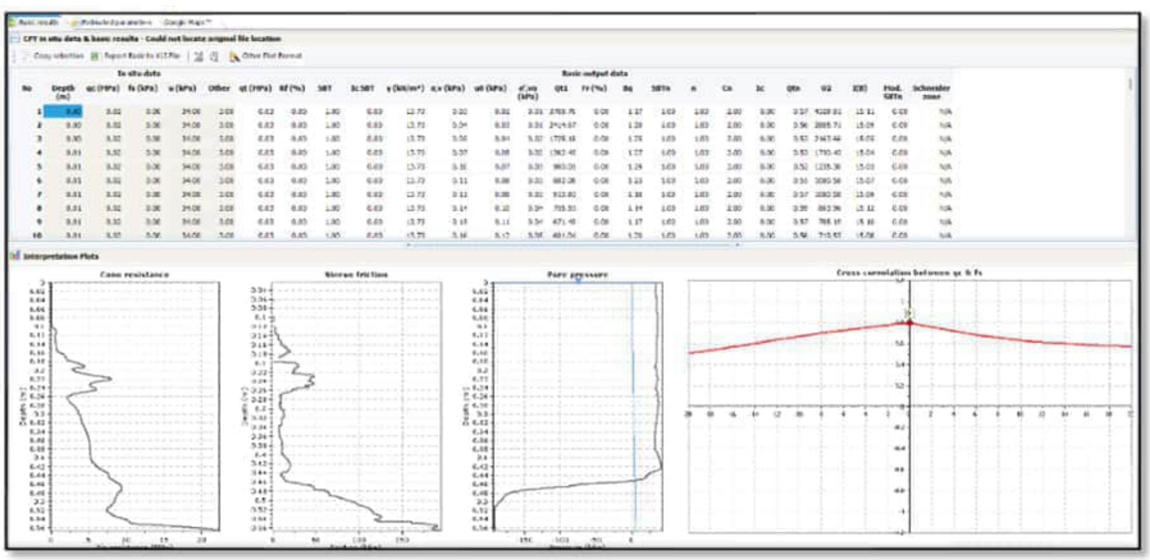


Figure 10-1 Example cross correlation plot between qc and fs

Many of the parameters were left as default in the CPeT-IT software. A few were changed and described below.

The probe radius was updated after review of the CPT headers. The cone area ratio was left at 0.8 (Robertson et.al., 2016). Figure 10-2 shows the general parameters utilized for processing. OCR (Over-consolidation ratio) and Nkt (undrained shear strength cone factor for clays) were checked to be calculated by the software and not set for a manually set value. A value of 2 was used for the Cn cutoff, a normalization factor for N-variable needed to normalize the cone resistance to the effective stress. Ns (constant used for soil sensitivity) was set to 7.1 as described in Robertson et al. (2016). Figure 10-3 shows the calculation parameters used for processing. ASCII tables with the most relevant parameters were exported for each CPT for the interpretation team, namely tip resistance (qc), sleeve friction (fs), pore pressure (u2), and relative density (Dr).

Several additional parameters were calculated and exported (Figure 10-4). “Mod. SBTN” is the 2016 (latest) Soil classification that corrects for effective stress and is modified to incorporate the possible presence of internal layering structures withing each zone or lithology. “Ic” is the Index used by Robertson to create the SBTn classifications. The “Schneider zone” is an additional soil classification method. “Ksbt” is the permeability in cm/sec, “Es” the Young Modulus, and “Go” is the shear modulus.

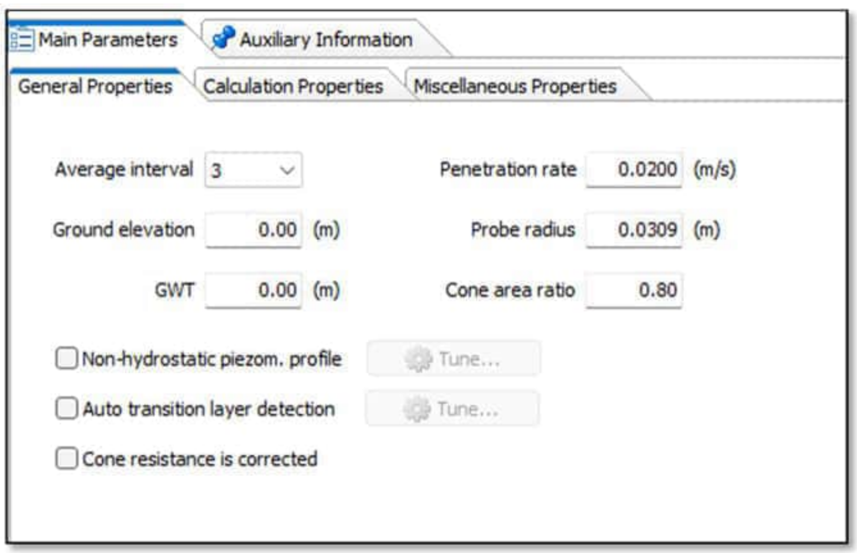


Figure 10-2 General parameters used for CPT processing

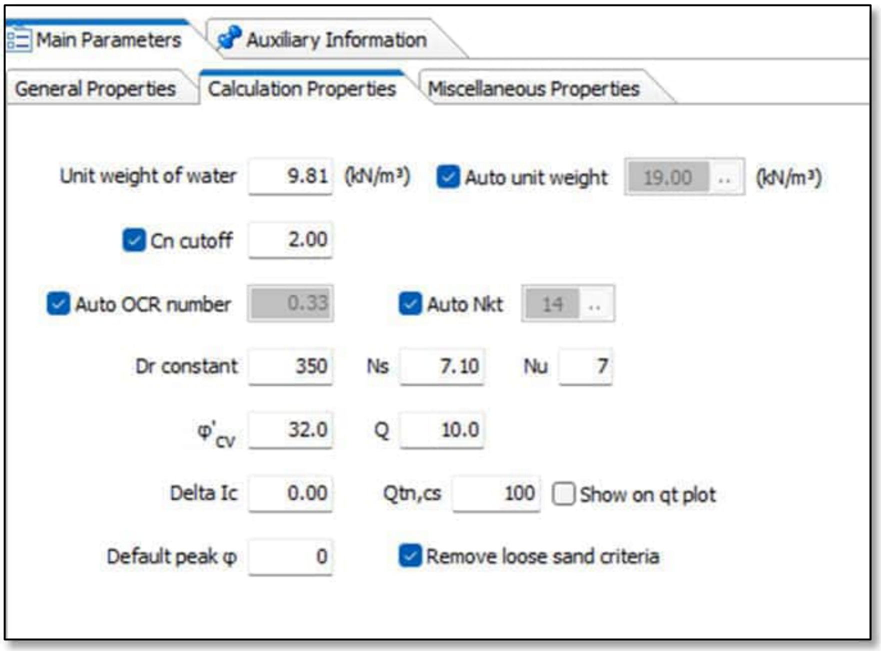


Figure 10-3 Calculation parameters for CPT processing

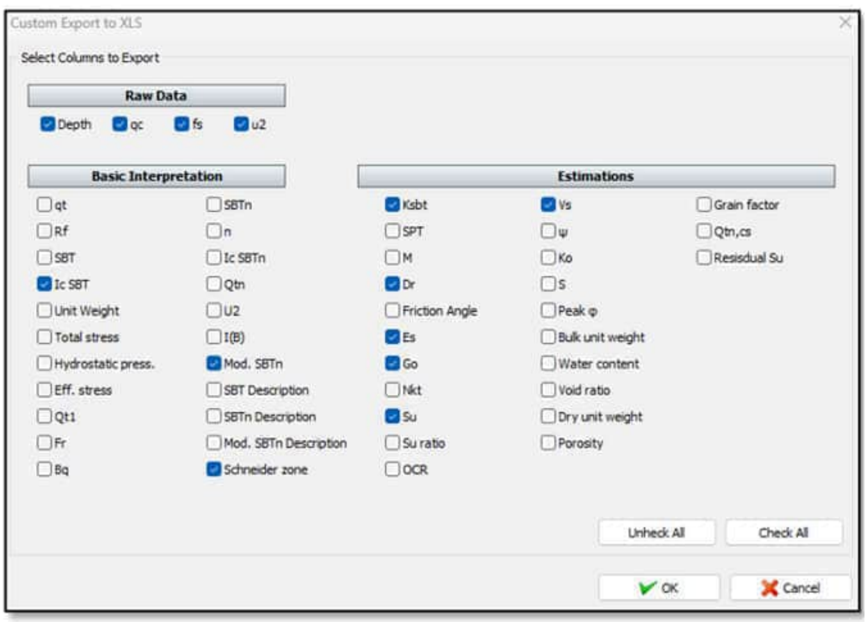


Figure 10-4 Calculation exports from CPT processing

Two Modified SBTn were utilized during processing: Robertson 2016 and Schneider 2008. The Modified SBTn (Soil Behavior Type, normalized) is a soil classification method for CPT data, heavily relied upon in the industry which tends to agree with core samples. Cases in which is best to apply to is to clean lithology of each type, while mixtures are harder to correlate to core data. Internal structuring also creates divergence from the SBTn results to coring data. For each CPT, two additional SBTn from Robertson 1986 and

2010 were also calculated. Examples of both SBTn (Robertson 2016 and Schneider 2008) of CPT logs for this survey are shown in **Error! Reference source not found.** and **Error! Reference source not found.**.

Full reports for each CPT log were generated and are included in the deliverables package.

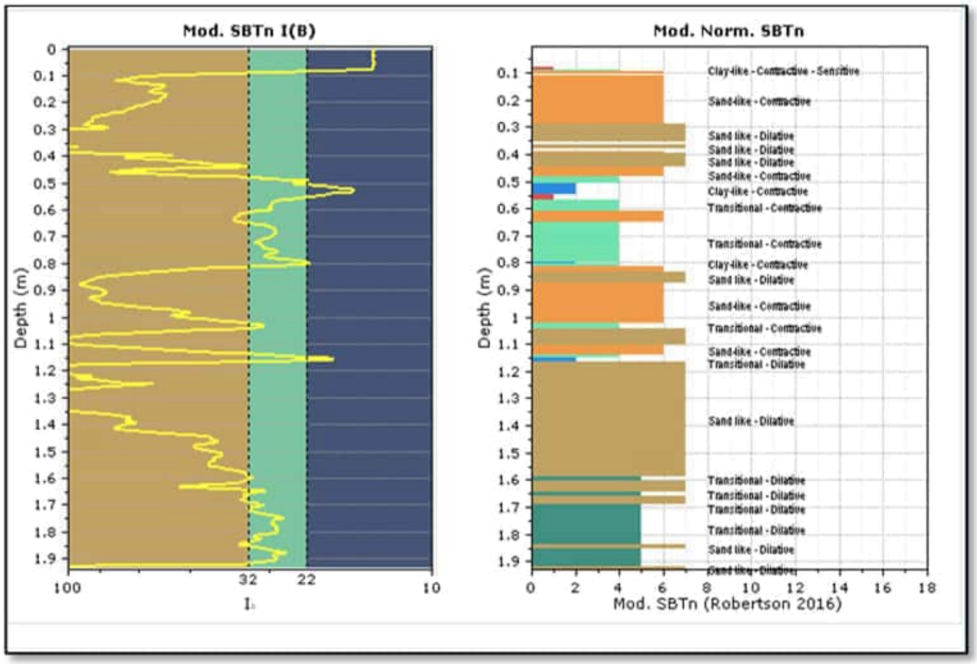


Figure 10-5 SBTn soil classification plots

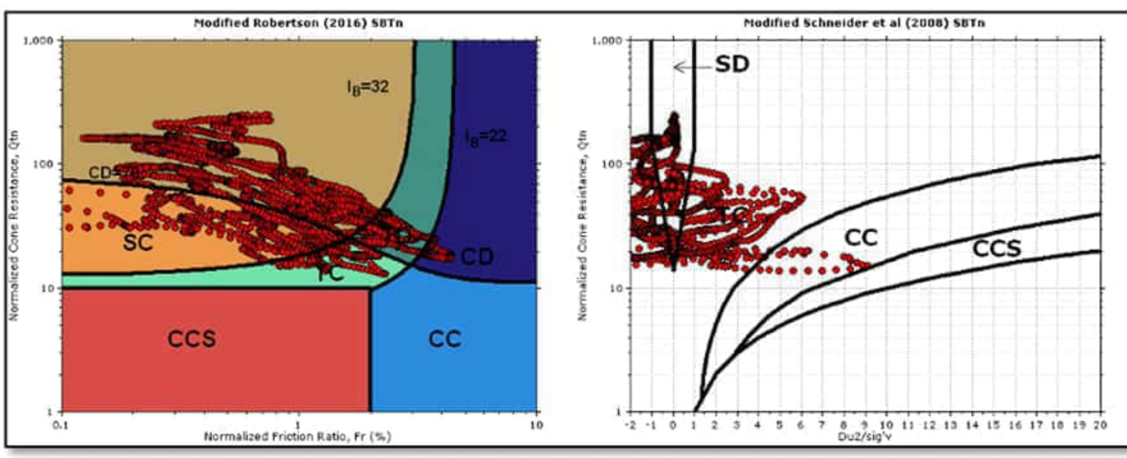


Figure 10-6 SBTn soil classification plots by Robertson 2016 (left) and Schneider 2006 (right)

10.2 Piston Core Processing

Infield piston core data processing and logging was performed sufficiently to assess sediment types and discrete geotechnical parameters per the Scope of Work established by Benthic.

Lithology was evaluated using Manual/Visual Geologic Classification methodology. Core logging was guided by the Unified Soil Classification System, Munsell Color Charts, and Torvane/Penetrometer user manuals, in addition to geologic and industry best practices.

Geologic Core Logs included:

- Length of core recovered
- Classification of major/minor soil units (and inclusion lithologies)
- Depth of each soil unit
- Palm Roll Test
- Torvane shear test
- Hand (pocket) penetrometer measurements

Each core was also photographed, segmented into approximately 0.5 m lengths of core in each photo. Core names and depth profile were annotated in each photo. Field logs were recorded on waterproof paper by the on-shift geologist upon recovery of each core and digitized in Excel at the end of each geologist's watch. Cores were not retained after logging and photographing.

Further data processing was performed onshore which included incorporation of core logs, core photos, and CPT data into Golden Software Strater for final PDFs of geotechnical sampling site reports.

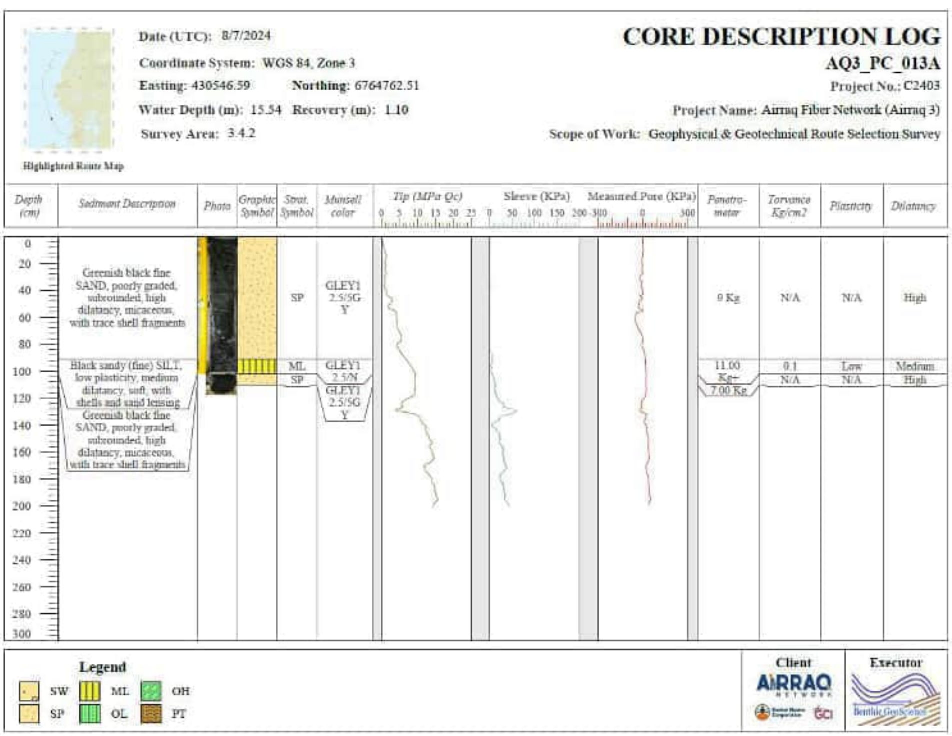


Figure 10-7 Example of Geotechnical Evaluation Record

11 INTEGRATION AND INTERPRETATION

Initial interpretation of each geophysical dataset was accomplished in near real time as part of the processing and quality control procedure. These various datasets were later compiled, integrated, and refined by the lead geologist to produce a comprehensive and holistic interpretation of the data collected. This preliminary interpretation was carried out onboard the RV Woldstad.

Following the conclusion of the geotechnical campaign, the piston core, seafloor sample, and CPT results were used to verify and improve the existing geomodel. The preliminary results were largely supported by the new information, but by integrating the geotechnical "ground truthing", Benthic can offer the following interpretations with a high level of confidence in their accuracy.

The descriptions of the survey corridor in this section reference geotechnical sampling stations to discuss the locations of features. There are 60 geotechnical stations spaced nominally at 5 km, beginning in the south of the survey corridor and ending in the north (Figure 11-1).

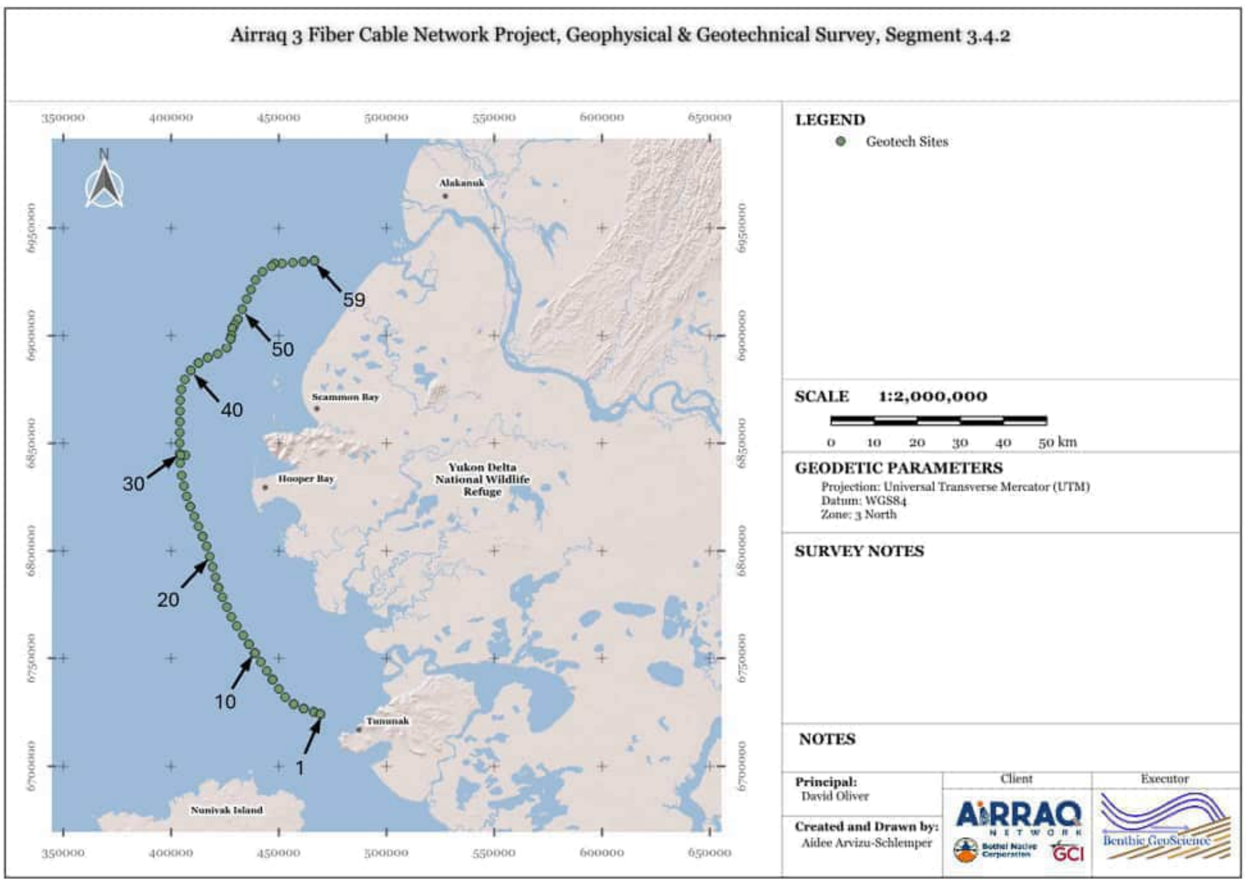


Figure 11-1 Geotechnical sites with every 10th station labeled

11.1 Geologic Background

Surficial bedrock units of the lower Yukon River basin and eastern Bering Sea shelf date back at least to Lower Cretaceous time (145 to 100.5 Ma; Hults et al., 2015). Rock outcrops are sparse and bedrock is deeply buried by late Cenozoic sediments through much of the region, making recent geologic history more pertinent to the scope of this project.

The Yukon River has the 18th largest suspended sediment load in world and has emptied into the eastern Bering Sea since at least Early Pliocene time (5.3 to 3.6 Ma; Dupré, 1980; Duk-Rodkin et al., 2001). The entire route corridor lies on the combined Yukon-Kuskokwin Delta and has accumulated sediments from those two rivers for millions of years. Numerous glaciations during the Pleistocene Epoch (2.6 to 0.01 Ma) lowered global sea levels and caused repeated subaerial exposure of the survey area. Tundra, permafrost, and fluvial deposits covered the region during lowstands, while marine deposits of terrigenous silt and sand dominated during highstands. The survey area has been inundated through much of Holocene time, and sedimentation rates for the eastern Bering Sea shelf during this period are on the order of 8-70 cm per thousand years (Knebel et al., 1974).

11.2 Bathymetry

Multibeam echosounder data revealed a maximum elevation of -6.8 m at the southern terminus of the surveyed area and a minimum elevation of -25.7 m near Station 38. Additional high points occur between Station 17 and 20 and beyond Station 57 (Figure 11-1 & Figure 11-13: Dangers to Navigation).

11.2.1 Bathymetric profiles

Bathymetric profiles along the route highlight the generally mild terrain throughout the surveyed area. Water depth varies by only around 17 m over the nearly 275 km of surveyed corridor. Extreme vertical exaggeration was required to highlight the bathymetric features seen in Figure 11-2.

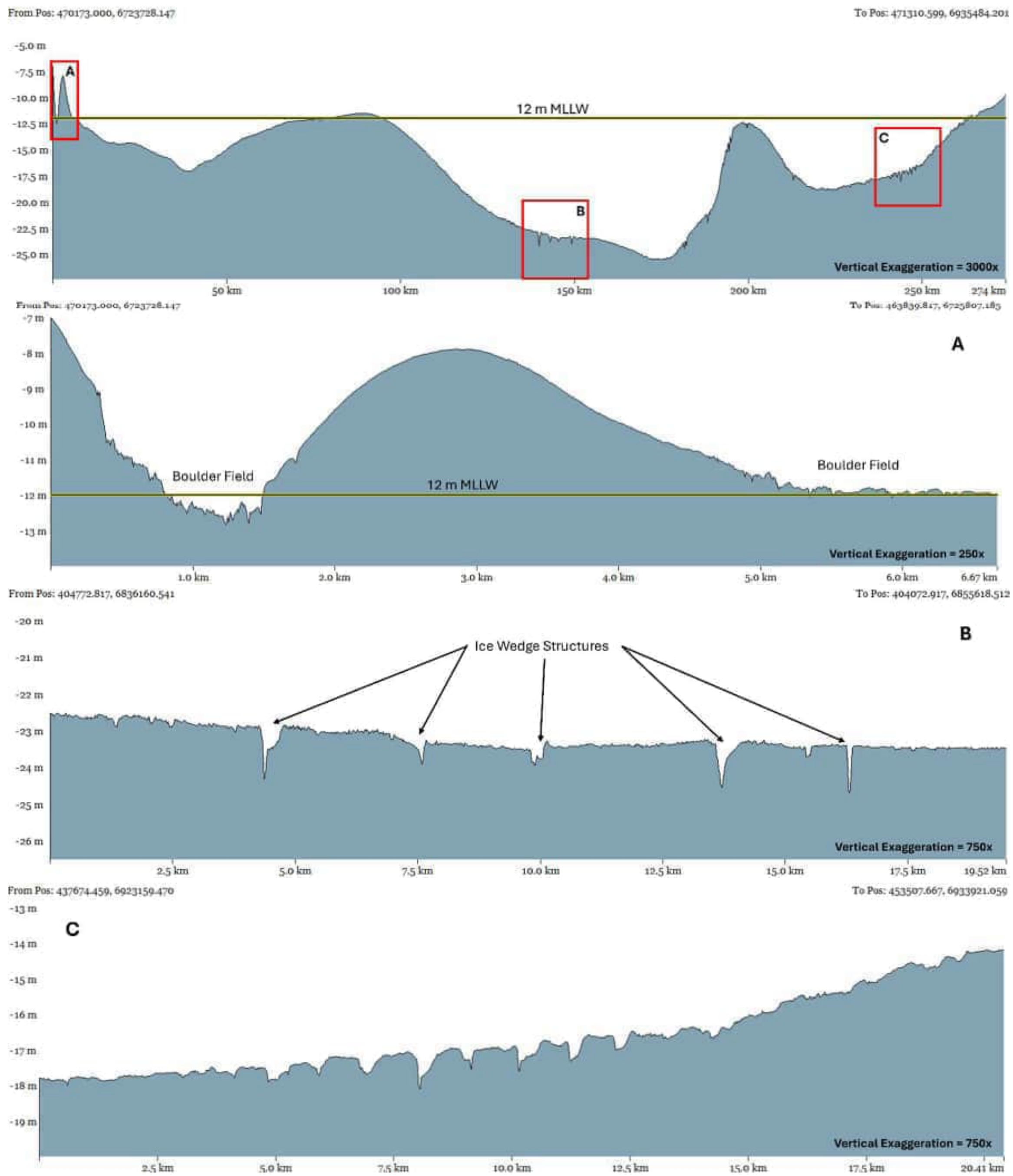


Figure 11-2 Bathymetric profiles. Top: profile of entire surveyed centerline with insets for profiles A, B, and C. 12 m isobath that is the threshold for "Dangers to Navigation" is marked (see §11.6.4). Inset A: Shoalest portion of the route at the southern terminus with 12 m isobath highlighted. Inset B: Prominent depressions where ice wedge polygons are exposed. Inset C: Linear scoured depressions near the northern end of corridor. Note the extreme vertical exaggeration in the lower right of each image that was necessary to highlight small elevation changes.

11.2.2 Slopes

Slopes along the route corridor are generally very mild. There are no regional slopes greater than 8°, and the few localized slopes exceeding 8° represent small elevation changes of around 1 m or less over a short distance. These localized abrupt steps occur intermittently throughout the survey area. In the southern portion of the route, they are found on the edges of boulder-cored scour pits several meters across. Between geotechnical stations 29 and 34, small, steep slopes are located along the edge of ice wedge polygons that are concentrated in groupings of rugose seabed several hundred meters wide (Figure 11-3, insets B and C). In the north-central and northern section of the corridor beyond Station 39, steep slopes are located along small escarpments caused by scouring (Figure 11-3, inset D). These escarpments are located between Stations 39 and 41, then again from Station 51 to 55.

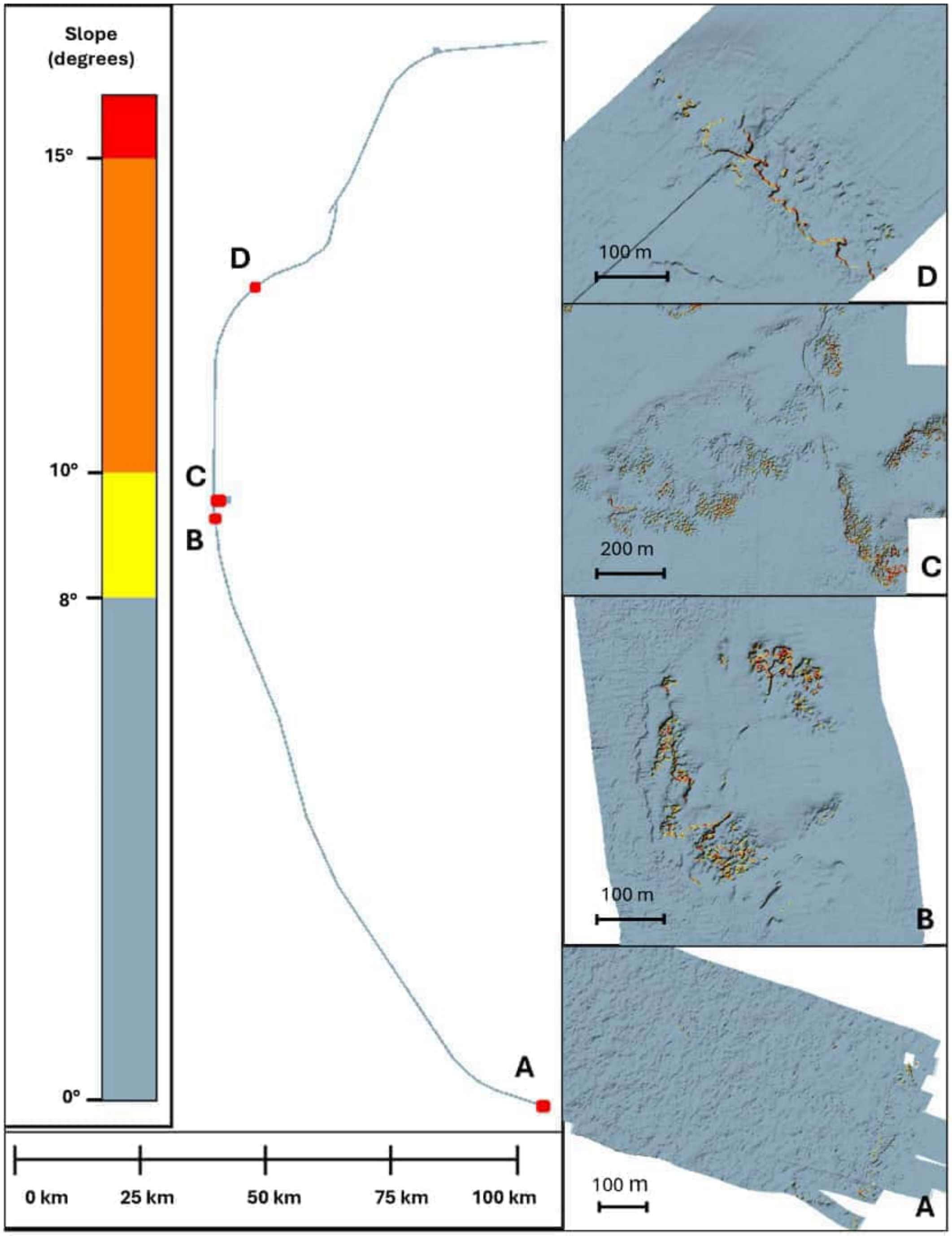
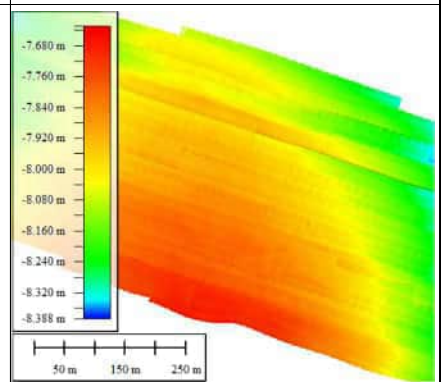
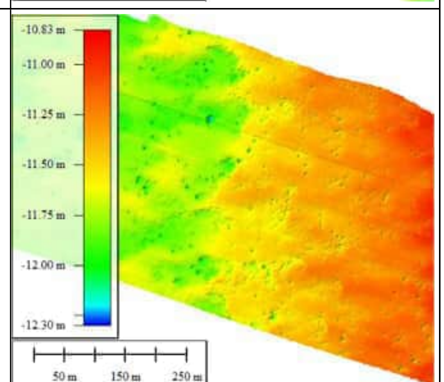
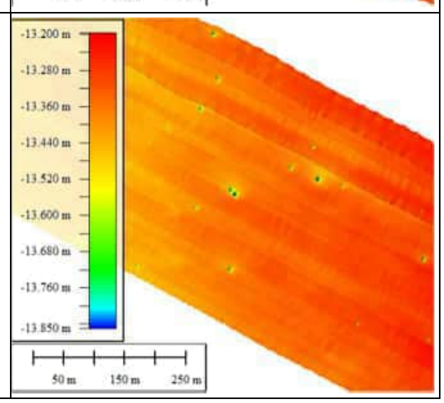
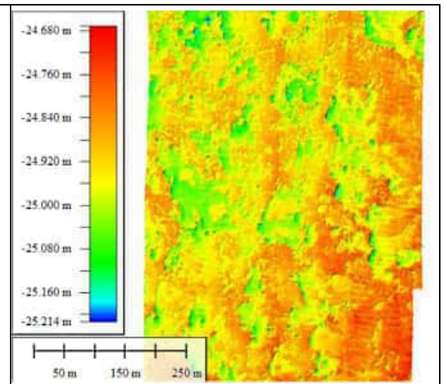
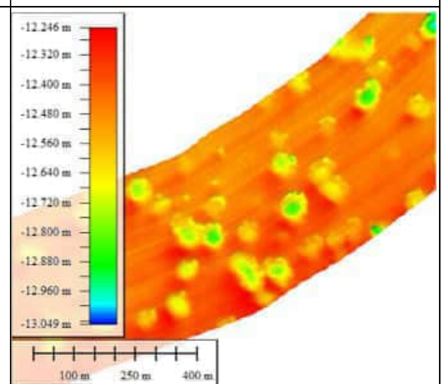
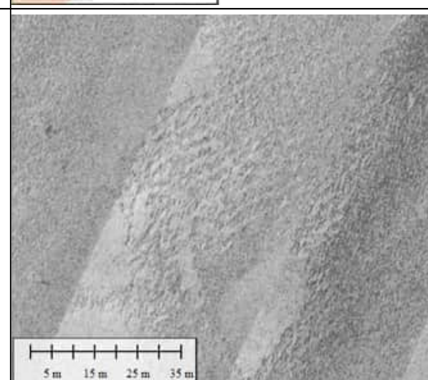
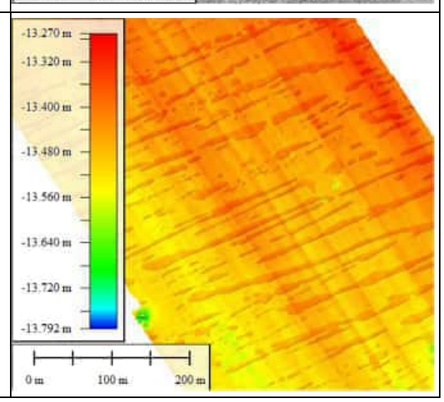


Figure 11-3 Slopes along route corridor. Inset A: slopes at southern terminus of survey area are mostly <8°. Insets B and C: examples of localized steep slopes along the edge of ice wedge polygons in the central portion of the survey area. Inset C is located at Branching Unit 1. Inset D: example of one of the small escarpments that crosses the northern portion of the survey area. Elevation change is approximately 0.8 m over 1.5 m distance.

11.3 Seabed Morphology

The seabed along the survey corridor was classified based on the morphological character as determined from multibeam bathymetry. A summary of the classes used for this report are included below in **Error! Reference source not found.**.

Seabed Morphological Class	Description	Example Image
Featureless Seabed	Characterized by a relatively smooth, undisturbed seabed. Isolated boulders and low-relief mounds or depressions are possible.	
Boulder Field	Numerous boulders, typically with associated scour pits. This occurs near the southern end of the survey corridor.	
Pitted Seabed	Areas of seabed where bottom currents have eroded pits, usually cored by a boulder or group of boulders. Density of pits is variable. This occurs near the southern portion of the corridor.	

<table>
<tr><td>Scoured Seabed</td><td>Areas of rough, low-relief seabed that has been scoured and eroded by bottom currents and/or storm events. Scoured seabed textures are variable and extensive in the northern 2/3 of the survey corridor.</td><td>
</td></tr>
<tr><td>Seabed depressions</td><td>Seabed with regular circular shallow depressions, found in a small area of the north-central portion of the corridor</td><td>
</td></tr>
<tr><td>Ripples</td><td>Ripples (wavelength <5 m, height <0.1 m) are present in several isolated patches at the northern end of the corridor. They are faintly seen in SSS data but are too small to be identified in MBE data.</td><td>
</td></tr>
<tr><td>Sand Ribbons</td><td>Elongate, low-relief bedforms that form parallel to prevailing current and cross parts of the southern portion of the corridor.</td><td>
</td></tr>
</table>

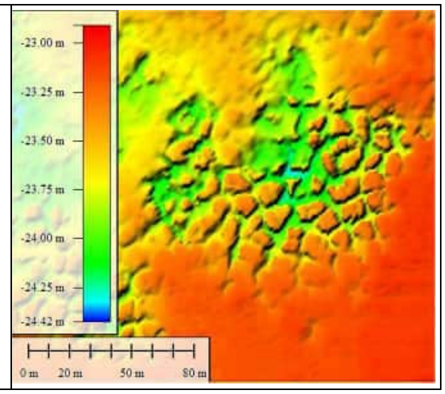
Ice Wedge Structures	Fissured seabed with a polygonal texture found in the central portion of the route corridor.	

Table 11-1 Descriptions of seabed morphological classes

Seabed morphology at the southern end of the route corridor consists of boulder fields and alternating pitted and featureless seabed (Figure 11-4, inset A). Boulder density and associated pitting decreases to the north, and by geotechnical Station 6 the corridor has transitioned to a stretch of featureless seabed approximately 15 km long. Sections of pitted seabed resume from Station 9 through Station 14, then are absent for the remainder of the route corridor.

Sand ribbons appear beginning near Station 8 and are seen intermittently for the next 80 km until beyond Station 24 (Figure 11-4, inset B). These are characterized by long, narrow, low-relief stringers of sand, the most well-formed of which are <10 cm high, approximately 10 m across, and hundreds of meters long (Table 11-1). These bedforms are thought to be formed by tidal currents or wave action and indicate bottom currents of around 1 m/s (2 kts) oriented parallel to the long axis of the ribbon, in this case roughly E-W across the route corridor (Reynaud & Dalrymple, 2012; Stride, 2012; Hunter et al., 1981).

A low-relief, rugose seabed morphology suggestive of scouring first appears between Stations 24 and 25. This scoured seabed covers a majority of the route corridor to the north of here and is characterized by irregular depressions that are generally 5-10 cm below the surrounding seabed but up to 50 cm deep in some areas. These surface irregularities occasionally show a slight N-S orientation, indicating that they are formed by regional shore-parallel currents. The cause of scouring in areas without a preferred orientation may be either longshore currents or other means such as tides or storm wave scouring.

Ice wedge structures are intermittently observed at the seabed between Stations 29 and 34 and within the Branching Unit sites to the east of the main corridor (Figure 11-4, inset C). This morphology presents as a lattice of fissures approximately 1 meter deep, giving the seafloor a distinctive polygonal texture. This texture is typical of ice wedge polygons that form in subaerially-exposed, fine-grained permafrost soils (Morse & Burn, 2013). The sediments recovered by piston cores here were organic rich silts, suggesting that these features are analogous to the tundra permafrost ice wedge polygons seen on land in many polar locations today.

Featureless seabed alternates with scoured seabed from approximately Station 39 to Station 42. Small escarpments roughly 1 m high are part of the scoured seabed morphology on this stretch between Stations 39 and 41.

Shallow circular depressions dot an otherwise featureless seabed starting at 419908 E, 6890554 N (See Table 11-1 & Figure 11-4, inset D). The largest depressions are <0.5 m deep and approximately 50 m across. The genesis of the depressions is unknown, though fluid expulsion (i.e. pockmarks) is unlikely as SBP records show little evidence of gas in this area. Seabed depressions are seen discontinuously until 427185 E, 6896824 N, where 1 km of featureless seabed is followed by 26 km of scoured seabed until Station 52.

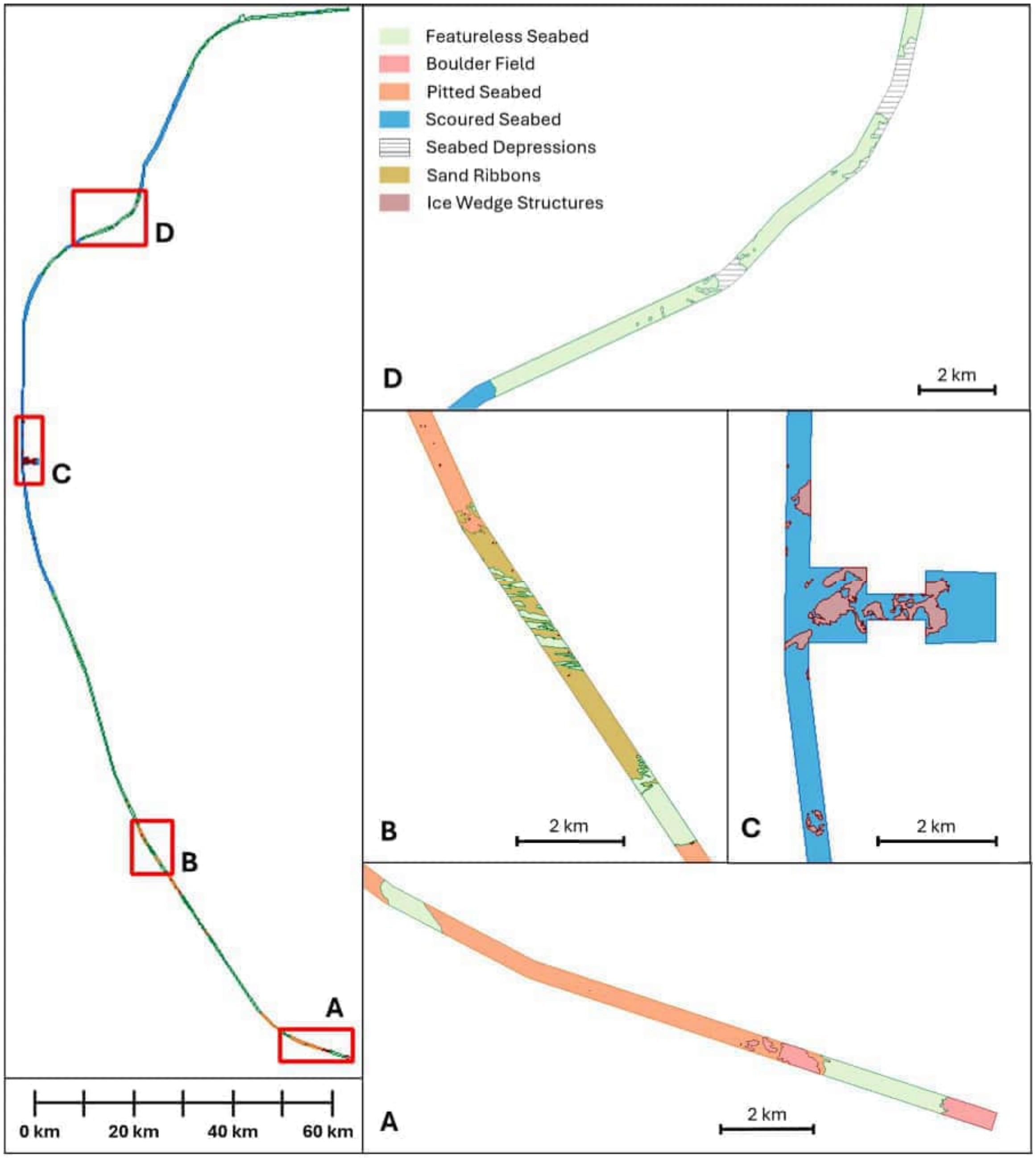


Figure 11-4 Seabed morphology

A small patch of ripples occurs at 434216 E, 6915683 N, followed by two more patches adjacent to Station 55 (Table 11-1). These ripples are small enough to have no measurable height in MBE data and are barely discernible in SSS sonograms.

Featureless seabed resumes as the main morphology beginning at 437344 E, 6922467 N. Alternating bands of scoured seabed cross the corridor at approximately 1 km intervals until Station 55. Featureless seabed with less frequent and irregular sections of scoured seabed fills the survey corridor from Station 55 until the northern end of the route.

11.4 Seabed Sediment Classification

Seabed sediments were classified based on acoustic response in both sidescan sonar and multibeam backscatter datasets. Determination of sediment type was further refined by analyzing geotechnical results. In general, sand covers most of the survey area, with silt and sandy silt patches scattered across the northern half. Several very small areas of gravel are located near the northern end of the route.

Sand comprises the seafloor of the southern 134 km of route corridor. Geotechnical samples in this area consistently contain fine sand with trace silt and occasional shells. Patches of silt are exposed at the seabed within shallow depressions beginning at Station 28 (Figure 11-5 inset A). Most of these silty depressions correspond to the ice wedge polygons described in §11.3.

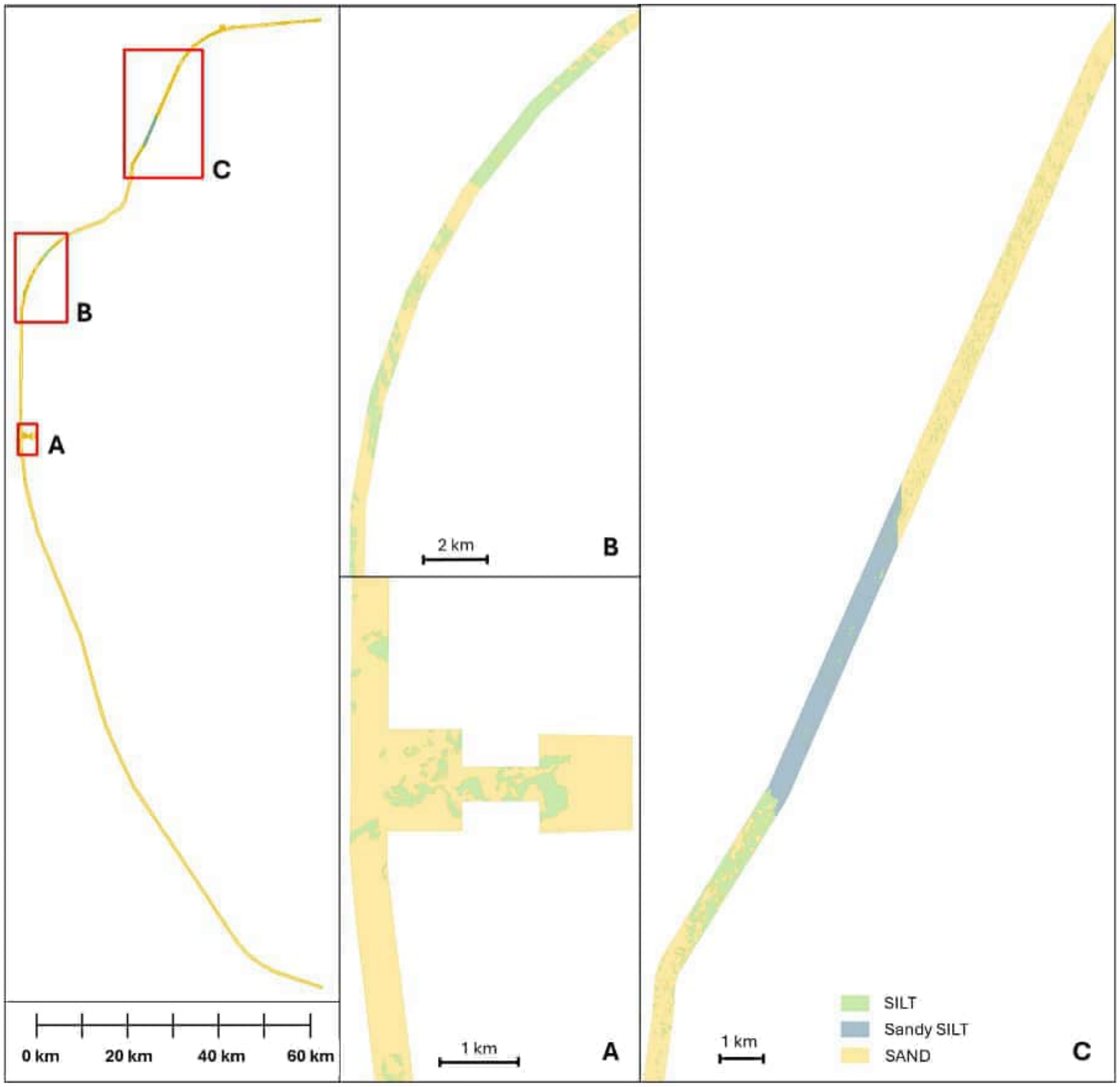


Figure 11-5 *Sediment classification*

Silt is intermittently found at the seabed until Station 33, after which there is a 20 km stretch of sand until Station 37. The piston core at Station 36 recorded 8 cm of sandy silt at the seabed, but as this veneer of silt was not visible in SSS or backscatter imagery, the seabed sediment type here was mapped as sand.

Silt and sand alternate from Station 37 to Station 41, followed by 22 km of sand (Figure 11-5, inset B). Beginning at Station 46, small patches of silt are interspersed amongst predominant sand. Silt is the main surface sediment type from Station 48 to 49, followed by 7 km of sandy silt (Figure 11-5, inset C). This section of sandy silt has higher amplitude returns than the preceding silt in geophysical datasets. Geotechnical samples, however, record predominantly silt with fine sand. The sediment grain size change in this area is gradational between the silt at Station 49 and the sand at Station 51. After Station 51, the remainder of the route corridor is sand with scattered silt patches.

11.5 Subsurface Interpretation

Interpretation of sub-bottom profiler data was accomplished using Kingdom software. 4 main horizons were interpreted, representing the base of their respective units.

H1: Base of surficial unit, generally 0-2 m thick, thought to be mobile sand and silt either recently deposited by the Yukon river or reworked from the underlying units. Shells are common in sediment samples.

H2: Base of more consolidated silt and sand unit that is generally less than 10 m thick. Horizon H2 appears to be an erosional unconformity. Unit 2 is more sandy in the south and becomes siltier toward the northern end of corridor and the mouth of the Yukon River. Unit 2 is interpreted as Holocene fluvial and deltaic deposits.

H3: Base of deformed unit of layered silt and sand. Unit 3 is generally deeper than 10 m and rarely comes within 2 m of the seabed. Unit 3 has ice wedge structures that indicate subaerial exposure during Pleistocene lowstands.

Channels: Base of paleochannels

Additionally, internal reflectors and shallow gas have been interpreted where appropriate and are included with digital deliverables.

Figure 11-6 Location of SBP figures

From the southern end of the survey area, the route corridor crosses immediately into a boulder field where the fine sand of Unit 3 is exposed at the surface (Figure 11-6). Coral fragments were sampled at geotechnical Station 1, suggesting that the cause of poor SBP penetration in this area may be partially biologic in origin.

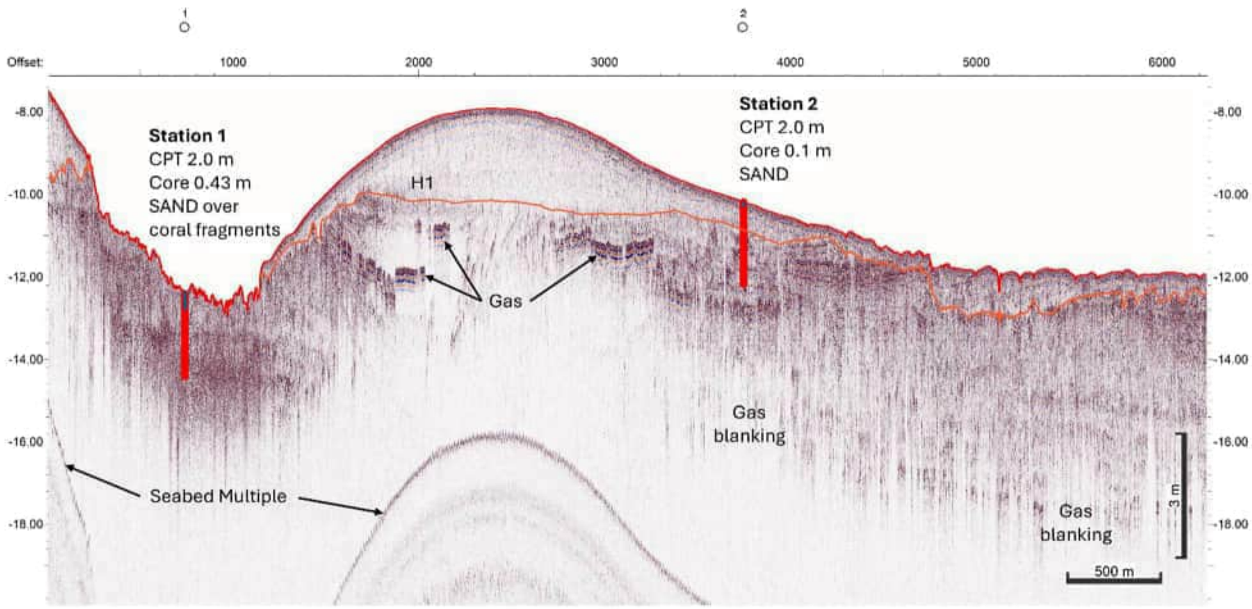


Figure 11-7 Station 1-2 SBP section showing current-scoured boulder fields on either side of an acoustically transparent sand package. Note gas blanking and gas enhancement below H1. Unit 3 lies directly beneath H1 in this area and is exposed at geotechnical Station 1.

A 0-2 m thick drifted package of recent, acoustically transparent fine sand covers the route corridor until beyond Station 2, after which Unit 1 settles into a thickness of around 1 m that persists for much of the remainder of the survey area. Gas enhancement as shown by high-amplitude reflectors are visible within Unit 3 beneath the drifted sand package. Gas blanking is widespread for the first 40 km of route corridor until beyond Station 8 (Figure 11-7).

By Station 5, Unit 2 can be seen between the deformed sediments of Unit 3 and the thin surficial layer of Unit 1. Unit 2 is within 2 m of the seabed at Station 7, where it is flanked in SBP records by two broad channels capped by prominent internal reflectors (Figure 11-8). Smaller paleochannels cut into the top of Unit 2 and are infilled by recent sediments. Shell beds along H1 can be seen as high-amplitude streaks in SBP records.

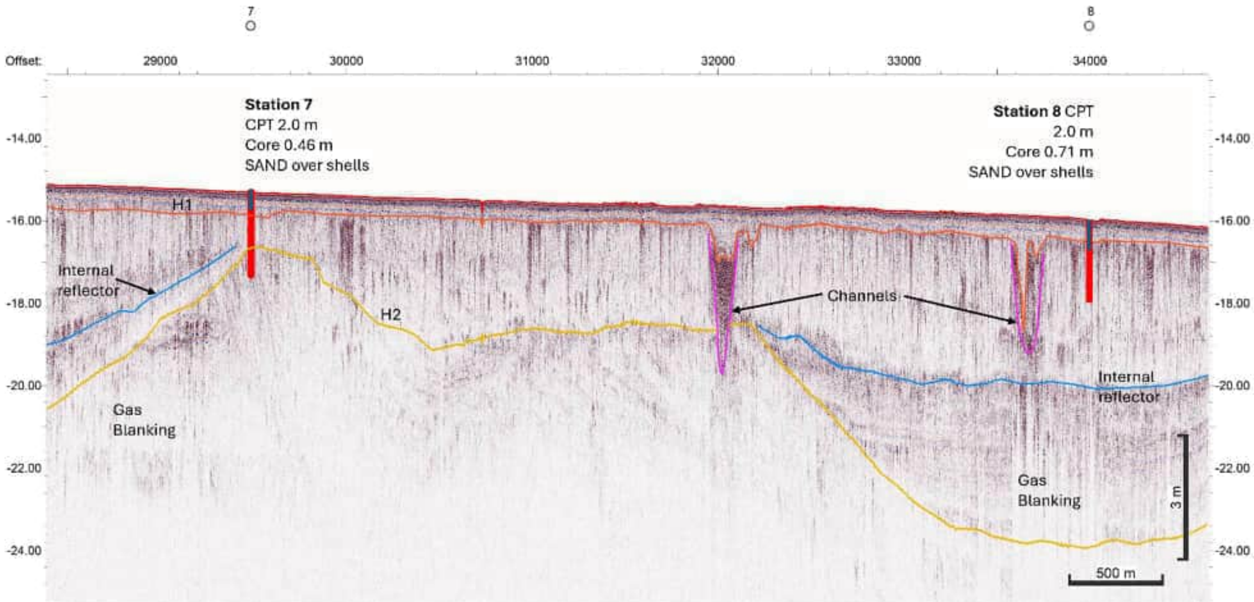


Figure 11-8 Station 7-8 SBP section. Shell beds at the base of Unit 1 show up as high amplitude returns. Small paleochannels (magenta) cut into Unit 2, while very broad channels can be seen deeper in Unit 2 beneath a prominent internal reflector.

Unit 1 varies in thickness from several decimeters up to 4 m between Station 8 and Station 33 but is present at the seabed nearly everywhere. Paleochannels intermittently cut into the sediments directly beneath H1 (Figure 11-9). H2 is visible for much of this stretch but is deep enough to be obscured in some areas. Both H1 and H2 are sometimes obscured due to the shell hash that was recorded in piston core samples. By Station 33, Unit 2 has pinched out against H1, leaving Unit 3 near the seabed. Unit 3 is exposed in several areas, revealing the ice wedge polygons described in §11.3 (Figure 11-9).

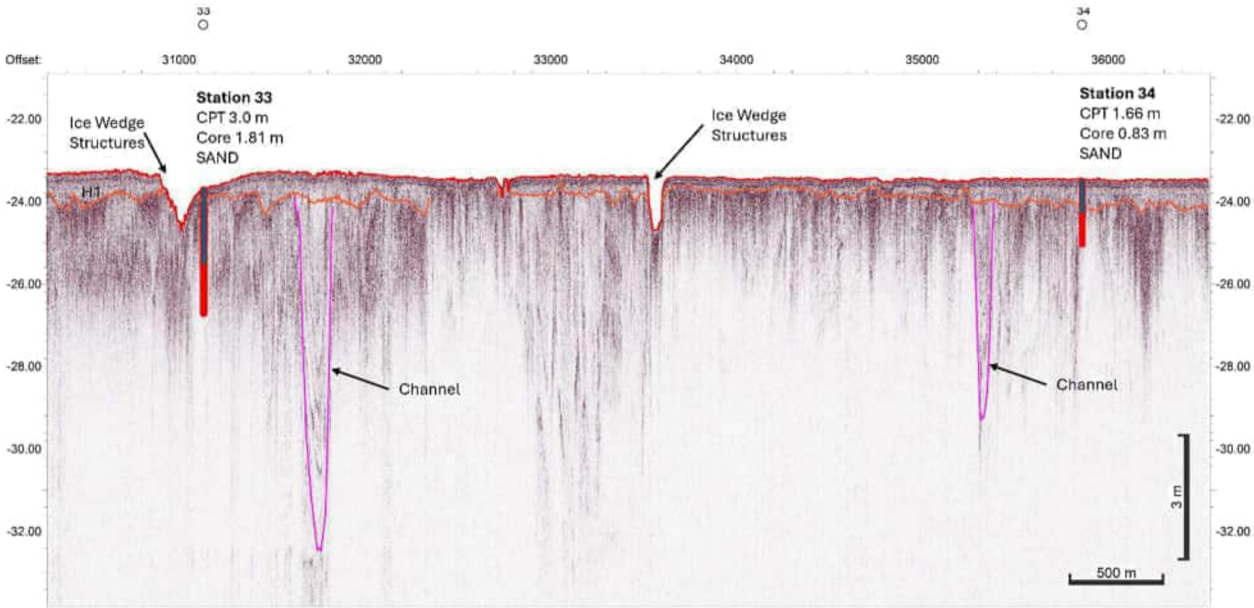


Figure 11-9 Station 33-34 SBP section. Unit 3 underlies H1 in this area. Ice wedge polygons are intermittently exposed where Unit 1 is not present.

Unit 2 is again present beginning shortly after Station 34. It remains between Units 1 and 3 for most of the next 55 km until it pinches out just before Station 45 (Figure 11-10). Shallow scoured depressions on the seabed cut through Unit 1 in this area, exposing small windows of Unit 3 at the seabed. Gas blanking can be seen intermittently from Station 45 until the end of the route corridor.

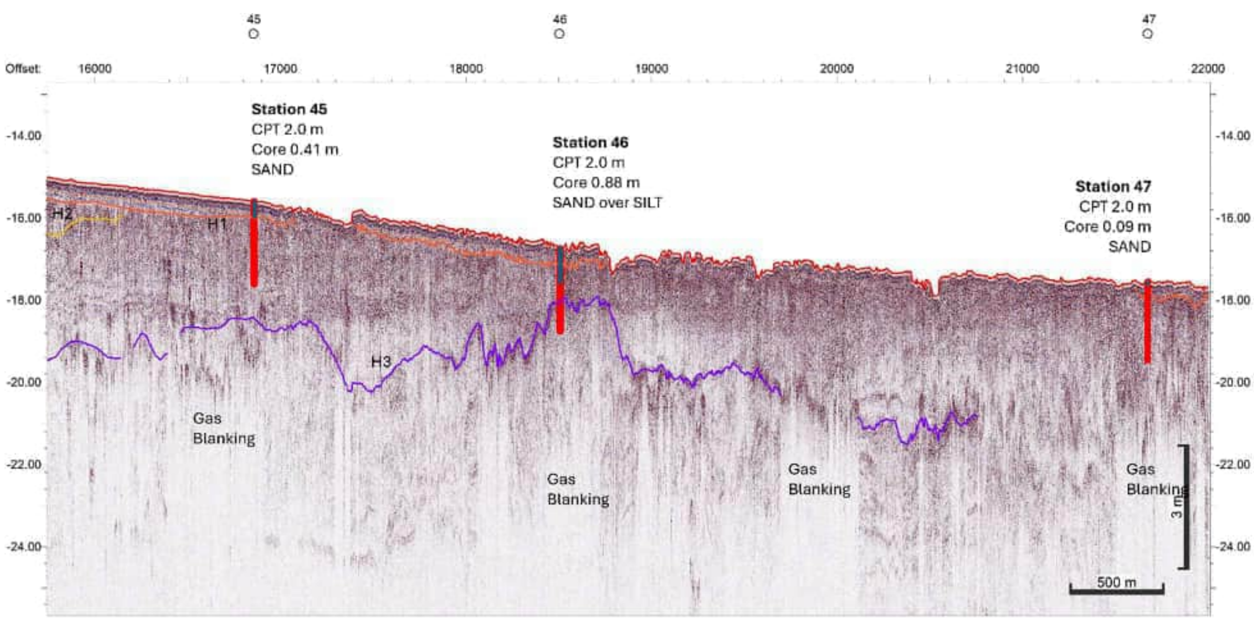


Figure 11-10 Station 45-47 SBP section. Unit 2 pinches out on the left (south) side of this image

Units 1 and 2 become siltier (though still predominantly sand in many places) in the northern section of the route corridor as it approaches the mouth of the Yukon River (Figure 11-11). Shell beds are still intermittently present, giving SBP records a mottled appearance. The depth of H2 is more consistent than in the south, staying 3-4 m below the seabed. Intermittent gas blanking and gas enhancement is common throughout the northern portion of the survey area.

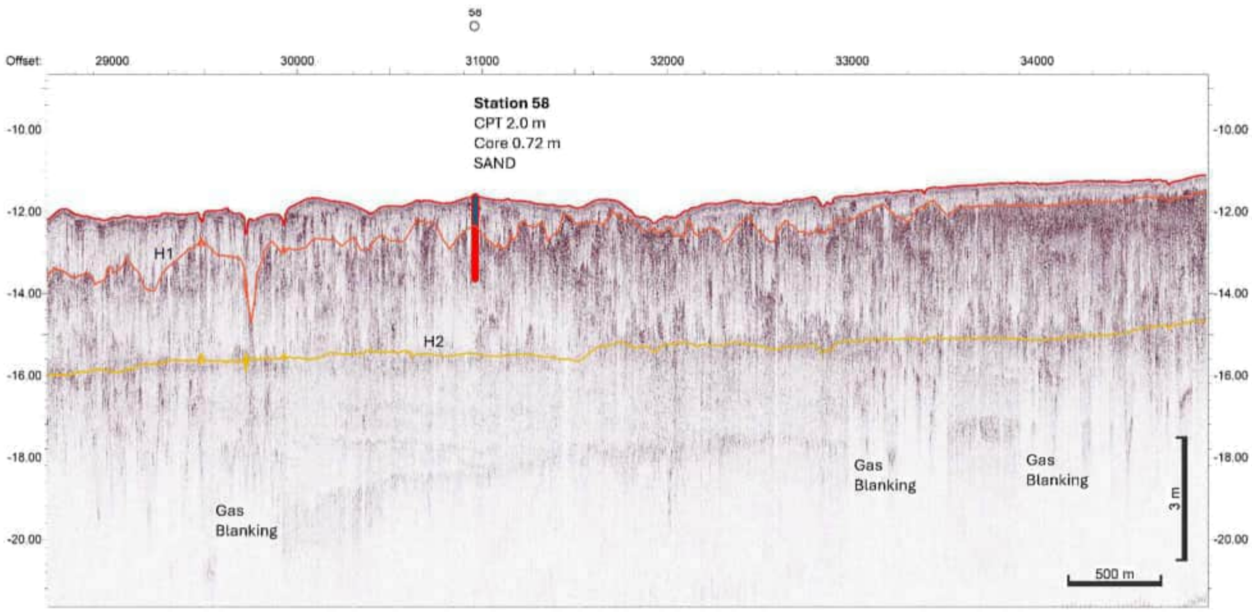


Figure 11-11 Station 58 SBP section, nearing the Yukon River mouth.

11.6 Seabed Features

11.6.1 Anthropogenic features

Only two possible anthropogenic features were identified. Both are linear features within 1 km of geotechnical Station 49. The southern feature is a 0.07 m deep by 125 m long seabed scar and is located at 430602 E, 6907480 N. The northern feature is barely visible in SSS imagery. It is approximately 150 m long, has no discernable vertical expression, and is located at 431273 E, 6908630 N.

11.6.2 Boulders

A total of 1111 boulders were picked from SSS imagery (not including boulders defined as “hazards for construction”; see §11.6.3 below). The highest concentration is in the southern portion of the survey area, with 739 boulders mapped south of geotechnical Station 15 (Figure 11-12).

11.6.3 Hazards for Construction

Hazards for construction are defined as any object protruding more than 0.25 m from the seabed. There were a total of 1024 hazards for construction identified, including 966 individual boulders and 56 boulder fields (Figure 11-12, red dots and red solid areas, respectively). All but 4 of these boulder fields are small groupings of boulders from a few meters to several tens of meters across. The highest concentration is in the southern portion of the survey area, with 743 hazards for construction identified south of geotechnical Station 15.

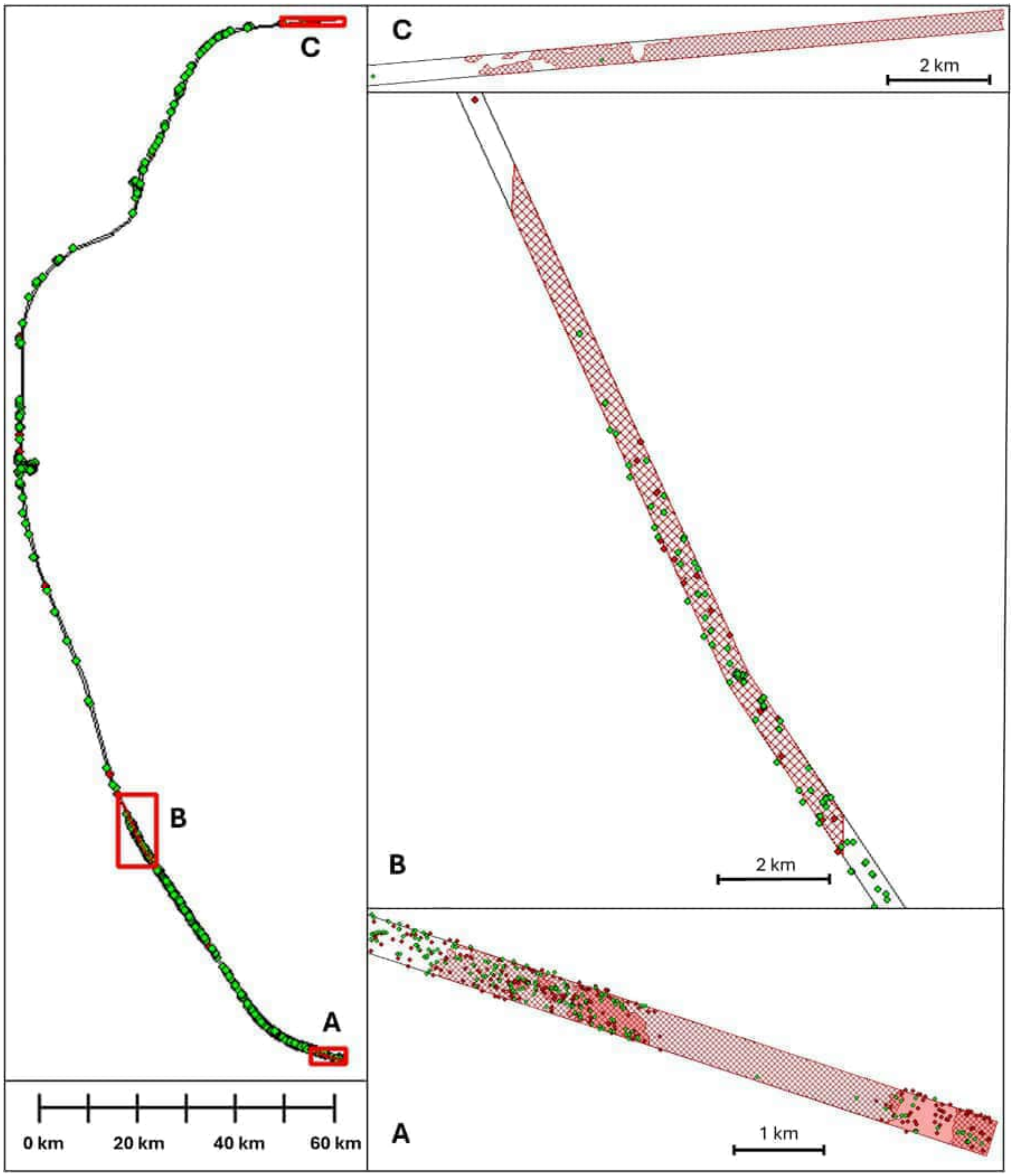


Figure 11-12 Seabed Features. Hazards to Navigation (areas with depth <12 m) in red hatch pattern; boulder fields in solid red; individual boulders are green dots; hazards for construction are red dots

11.6.4 Dangers to Navigation

Dangers to navigation are defined for this project as any area of seabed shoaler than 12 m MLLW. These depths are found at the very northern and southern ends of survey area and also from geotechnical Station 17 to Station 20 (Figure 11-12). All three of these shallow areas occur as part of gently inclined regional slopes and are not abrupt bathymetric features that could catch vessels by surprise.

11.6.5 Absent Seabed Features

Throughout the course of the survey, Benthic personnel were watchful for seabed features that could indicate hazardous conditions such as ice gouging, bottom trawling, or vessel anchoring. No signs of these hazards were identified within the survey corridor. This lack of seabed scarring could indicate that ice and vessel activity are not a threat to infrastructure in this area. Alternately, evidence of ice or human activity may have been infilled due to soft, mobile sediments and bottom currents. Further investigation in the form of a desktop study is recommended to determine the risk of ice gouging and human activities to the proposed cable.

11.7 Summary of Hazards

Figure 11-13 below summarizes the potential hazards as outlined in previous sections.

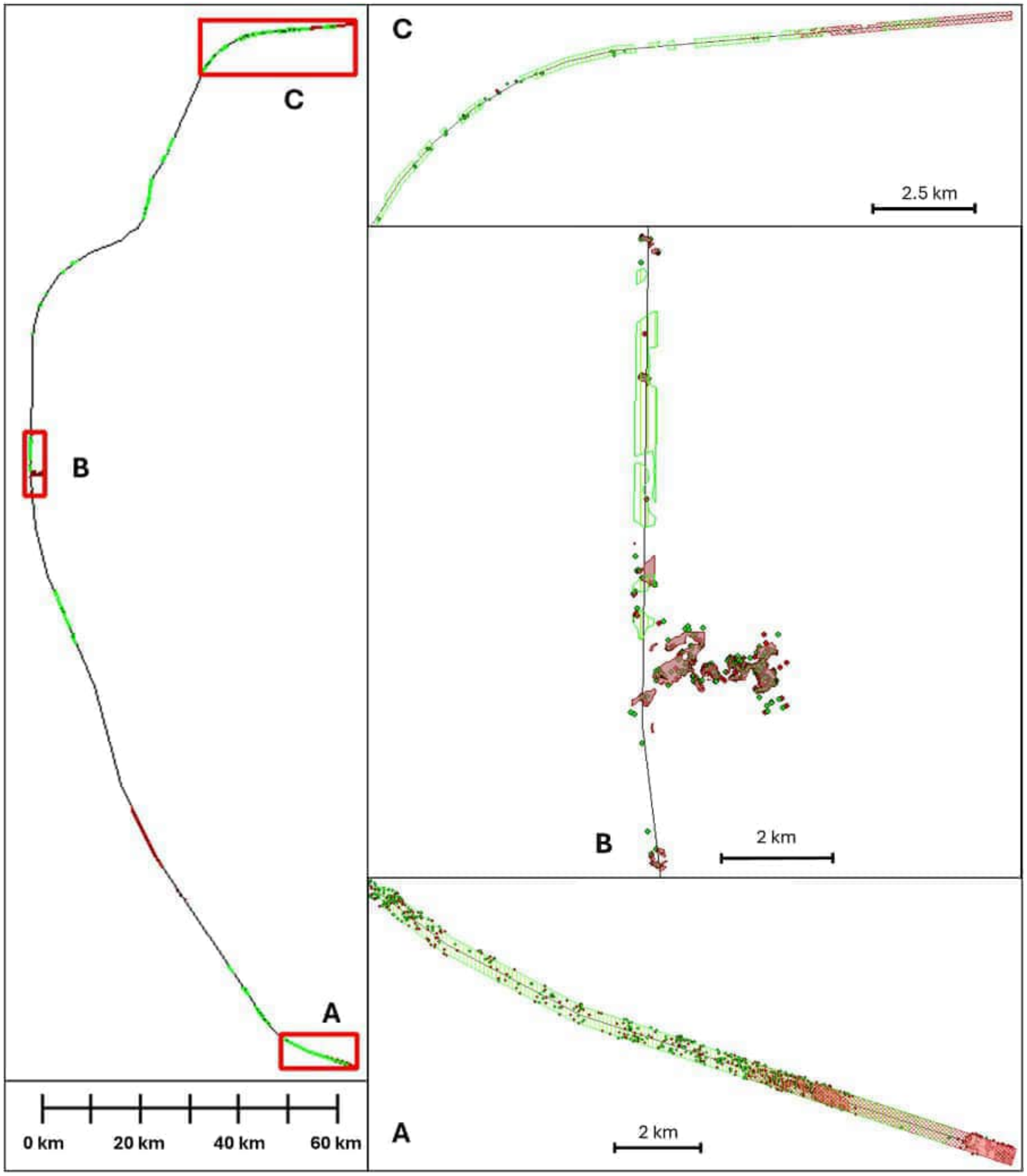


Figure 11-13 Summary of hazards. Danger to Navigation in red cross hatch. Boulder fields in solid light red (Inset A). Areas of shallow gas in green hatch. Ice wedge polygons in dark red are included due to steep but brief slopes along the edges of polygons (Inset B). Green dots are individual boulders, and red dots are individual hazards for construction.

12 REFERENCES

Duk-Rodkin, A., Barendregt, R. W., White, J. M., & Singhroy, V. H. (2001). Geologic evolution of the Yukon River: implications for placer gold. *Quaternary International*, *82*(1), 5-31.

Dupré, W. R. (1980). *Yukon Delta coastal processes study*. Houston, TX, USA: Department of Geology, University of Houston.

Hults, C. P., Mull, C. G., & Karl, S. M. (2015). Geologic map of Alaska. Alaska: US Department of the Interior, US Geological Survey.

Hunter, R. E., Thor, D. R., & Swisher, M. L. (1981). Depositional and erosional features of the inner shelf, northeastern Bering Sea. Geologie en Mijnbouw, 61(1), 49-62.

Knebel, H. J., Creager, J. S., & Echols, R. J. (1974). *Holocene sedimentary framework, east-central Bering Sea continental shelf* (pp. 157-172). Springer Berlin Heidelberg.

Morse, P. D., & Burn, C. R. (2013). Field observations of syngenetic ice wedge polygons, outer Mackenzie Delta, western Arctic coast, Canada. *Journal of Geophysical Research: Earth Surface*, *118*(3), 1320-1332.

Reynaud, J. Y., & Dalrymple, R. W. (2012). Shallow-marine tidal deposits. Principles of tidal sedimentology, 335-369.

Smith, K. R., & McConnaughey, R. A. (1999). *Surficial sediments of the eastern Bering Sea continental shelf: EBSSED database documentation*. US Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center.

Stide, A. H. (2012). Offshore tidal sands: processes and deposits. Springer Science & Business Media.

13 APPENDICES

Appendix A – Daily Progress Reports (DPR) – Geophysical Expedition

Appendix B – Daily Progress Reports (DPR) – Geotechnical Expedition

Appendix C – Geotechnical Interpretation Logs

Appendix D – CPT Processing Results

Appendix E – Digital Survey Deliverables

APPENDIX A - Daily Progress Reports (DPR) – Geophysical Expedition

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ERM

APPENDIX D NOISE CALCULATIONS

In-Air

General Project Information

Project Title	Airraq 3 and Kotlik Fiber Optic Cable Interconnect
Project/ Source Information	Unicom, Inc. Airraq 3 and Kotlik Fiber Optic Cable Interconnect
Project Contact	Unicom, Inc.

The PSLM is presented in NMFS (2012) as:

$$TL = 15 \log (R2/R1)$$

•TL is transmission loss
•R1 is the distance of a known or measured sound level.
•R2 is the estimated distance required for the sound to attenuate to a predetermined acoustic threshold.
The number 20 serves as the TL constant on land (this is substituted for a value of 15 in water; NMFS (2012))

The equation may be rearranged to solve for R2 for in air noise as:

$$R_2=R_1*10^\wedge((\text{dB at R1-dB acoustic threshold})/20))$$

Potential project-related in-air mechanized construction equipment used for cable installation may generate noise levels of up to approximately 98 dB at a distance of 50 feet, with the highest levels associated with the operation of a chain trencher, based on its typical operational characteristics. Other heavy equipment that may be used may generate noise levels of around 82.1 dB at a distance of 50 feet. 82.1 dB is the level used to calculate in-air disturbance thresholds to polar bears.

	Hearing Group		
	Carnivorous mammals (polar bear)	**Wading and diving birds**	**Ungulates**
Thresholds			
Behavior	N/A	80	98
TTS	157	N/A	N/A
PTS	177	N/A	N/A
Calculations			
Behavior	N/A	50*10^((98-80)/20)	50*10^((98-98)/20)
TTS	50*10^((82.1-157)/20	N/A	N/A
PTS	50*10^((82.1-177)/20	N/A	N/A
Distance to Thresholds			
Behavior Isopleth (feet)	N/A	397.16	50
TTS Isopleth (feet)	0.009	N/A	N/A
PTS Isopleth (feet)	0.001	N/A	N/A

References

Polar Bear (TTS and PTS)

Southall, E. B. L., J. J. Finneran, C. Reichmuth, P. E. Nachtigall, D. R. Ketten, A. E. Bowles, W. T. Ellison, D. P. Nowacek, and P. L. Tyack. 2019. Marine mammal noise exposure criteria: Updated scientific recommendations for residual hearing effects. Aquatic Mammals 45:125-232.

NMFS. 2012 Guidance Document: Sound Propagation Modeling to Characterize Pile Driving Sounds Relevant to Marine Mammals. U.S. Department of Commer., NOAA. NOAA Technical Memorandum, 6 p.

Wading and Diving Birds (Behavior)

Crowell, S.E., Wells-Berlin, A.M., Carr, C.E., Olsen, G.H., Therrien, R.E., Yannuzzi, S.E. and Ketten, D.R., 2015. A comparison of auditory brainstem responses across diving bird species. Journal of Comparative Physiology A, 201, pp.803-815.

Ungulates (Behavior)

Maier, J. A., Murphy, S. M., White, R. G. & Smith, M. D. (1998). Responses of caribou to overflights by low-altitude jet aircraft. The Journal of Wildlife Management 62, 752–766.

Underwater

General Project Information

Project Title	Airraq 3 and Kotlik Fiber Optic Cable Interconnect
Project/ Source Information	Unicom, Inc. Airraq 3 and Kotlik Fiber Optic Cable Interconnect
Project Contact	Unicom, Inc.

The PSLM is presented in NMFS (2012) as:

TL = 15 log (R2/R1)

•TL is transmission loss
•R1 is the distance of a known or measured sound level.
•R2 is the estimated distance required for the sound to attenuate to a predetermined acoustic threshold.

The equation may be rearranged to solve for R2 as:

$$R_2=R_1*10\text{^}((\text{dB at R1-dB acoustic threshold})/15))$$

Potential project-related underwater noise from vessels used for cable installation may generate noise levels of up to approximately 180 dBA at a distance of 3.28 feet (1 meter), with the highest levels associated with the operation of a chain trencher, based on its typical operational characteristics.

7	Hearing Group		
	Carnivorous mammals (polar bear)	**Wading and diving birds**	**Ungulates**
Thresholds			
Behavior	160	N/A	N/A
TTS	199	202	N/A
PTS	219	208	N/A
Calculations			
Behavior	3.28*10^((180-160)/15)	N/A	N/A
TTS	3.28*10^((180-199)/15)	3.28*10^((180-202)/15)	N/A
PTS	3.28*10^((180-219)/15)	3.28*10^((180-208)/15)	N/A
Distance to Thresholds			
Behavior Isopleth (feet)	70.67	N/A	N/A
TTS Isopleth (feet)	0.177	0.11	N/A
PTS Isopleth (feet)	0.008	0.045	N/A

References

Polar Bear (Behavior, TTS and PTS)	Behavior:U.S. Fish and Wildlife Service. (2016, August 5). Marine mammals; Incidental take during specified activities (Docket No. FWS-R7-ES-2016-0060; RIN 1018-BA99). 50 CFR Part 18. Department of the Interior. https://www.federalregister.gov/documents/2016/08/05/2016-18583/marine-mammals-incidental-take-during-specified-activities TTS and PTS: Southall, E. B. L., J. J. Finneran, C. Reichmuth, P. E. Nachtigall, D. R. Ketten, A. E. Bowles, W. T. Ellison, D. P. Nowacek, and P. L. Tyack. 2019. Marine mammal noise exposure criteria: Updated scientific recommendations for residual hearing effects. Aquatic Mammals 45:125-232
Wading and Diving Birds (TTS and PTS)	USFWS (U.S. Fish and Wildlife Service). 2012. Agreement for criteria for injury to marbled murrelet from noise. Memorandum from the Federal Highway Administration (FHA), U.S. Fish and Wildlife Service (USFWS), and Washington State Department of Transportation.
Ungulates (Behavior)	N/A

APPENDIX E BEST MANAGEMENT PRACTICES FOR BROADBAND PROJECTS, U.S. FISH AND WILDLIFE SERVICE, ALASKA REGION

Best Management Practices for Broadband Projects
US Fish & Wildlife Service
Alaska Region

In anticipation of substantial expansion of broadband capability in Alaska, the Alaska Region of the US Fish and Wildlife Service (Service) has compiled Best Management Practices (BMPs) for project proponents to consider early in the planning and project development process to avoid and minimize impacts to wildlife populations and habitats. Although these BMPs are designed to be broadly applicable across projects, each individual project will likely have unique environmental and wildlife considerations, and we encourage project proponents to reach out directly to either the Northern Alaska Fish and Wildlife Field Office or Southern Alaska Fish and Wildlife Field Office, depending on the location of the project.

To determine if your proposed project is on land managed by the Service (i.e., National Wildlife Refuges) or has Service trust resources (e.g., Threatened and Endangered species, eagles, migratory birds, marine mammals, wetlands, etc.) in the vicinity of or within the project footprint, see the Service's Information Planning and Consultation (IPaC) tool (ipac.ecosphere.fws.gov/). To use IPaC, click on 'Get Started', and select the project area by manually drawing project boundaries or uploading a shapefile.

In addition to universal BMPs that will be broadly applicable across all activity types, activity specific BMPs are organized based on the type of broadband deployment method being used (i.e., terrestrial, riverine, and marine cable lay as well as broadband towers). Additional sections on species-specific BMPs and regulatory BMPs are provided and should be considered when additional species or resources are identified within or adjacent to the project area in IPaC. Contact the relevant Field Office (listed on the IPaC Resource List printout) with any questions and for additional guidance on avoiding and minimizing impacts to resources.

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Universal Best Management Practices

Migratory birds

- The Service has developed a timing guidelines table for migratory birds in Alaska to help avoid the take of nesting birds based on location, habitat, and bird species. Visit fws.gov/alaska-bird-nesting-season to view the table online and download a PDF version.
- Prevent increase in lighting of native habitats during the bird breeding season.
- To the maximum extent practicable, limit construction activities to the time between dawn and dusk to avoid the illumination of adjacent habitat areas.
- If construction activity time restrictions are not possible, use down shielding or directional lighting to avoid light trespass into bird habitat (i.e., use a 'Cobra' style light rather than an omnidirectional light system to direct light down to the roadbed). To the maximum extent practicable, while allowing for public safety, low intensity energy saving lighting (e.g., low pressure sodium lamps) should be used.
- Minimize use of high-intensity lighting, steady-burning, or bright lights such as sodium vapor, quartz, halogen, fluorescent, or other bright spotlights.
- Minimize illumination of lighting on associated construction or operation structures by using motion sensors or heat sensors. Use switches to keep lights off when not required.
- Avoid installing lights offshore or within 0.5 miles of the coast.
- Cap pipes and cover and seal all small dark spaces where birds may enter and become trapped.
- Install anti-perching devices on facilities and equipment where birds may commonly nest or perch.
- Cover or enclose all potential nesting surfaces on the structure with mesh netting, chicken wire fencing, or other suitable exclusion material prior to the nesting season to prevent birds from establishing new nests. The netting, fencing, or other material should have no opening or mesh size greater than 19 millimeters and should be maintained until the structure is removed.

Oil spills

- To fulfill Federal and State reporting requirements, all spills of oil, petroleum, or other hazardous substances, of any size, should be reported to the National Response Center (1-800-424-8802) and the Alaska Department of Environmental Conservation Spill Reporting Hotline (1-800-478-9300).

Method-specific Best Management Practices

Terrestrial broadband

- Reduce the project footprint to the maximum extent practicable, and locate proposed projects and their associated activities in already disturbed areas or lower functioning or lower quality habitat.
- Collocate infrastructure whenever possible in permanently disturbed areas such as rights-of-way (e.g., place utilities in existing road corridors, use existing pipeline or transportation corridors for new infrastructure construction, place new antenna on existing towers or place new structures near existing structures whenever possible).
- Avoid placement of infrastructure and fill materials in wetlands whenever possible. Effects to wetlands are usually proportional to the size of the impact. Therefore, if avoidance is not possible, minimization should be employed by choosing broadband options with smaller footprints (i.e., single tower vs. miles of overhead cable poles with cleared right-of-way) that do not obstruct hydrologic flow across the landscape.
- If impacts to wetlands are unavoidable, make them temporary impacts by restoring the site to pre-existing conditions (e.g., hydrology, grade, vegetation). Permanent impacts (e.g., placement of fill, alteration of hydrology) should be offset with the purchase of compensatory mitigation within the same or a nearby watershed. This will reduce subsidence, scarring, and habitat alteration.
- Avoid sensitive soils such as highly erosive soils, thaw-stable, and thaw-unstable permafrost.
- Avoid ground-disturbing activities during the bird nesting season when possible.
- Preserve stream and riparian buffers to protect water quality, maintain stream channel and bank stability, maintain fish and wildlife habitat, and provide flood water protection. See fws.gov/node/378411 for more information on riparian buffers.
- Trenching should be avoided in terrestrial areas of thaw-sensitive soils (i.e., continuous and discontinuous permafrost). The activity of trenching, even during freezing temperatures where a stable, frozen platform is available for digging and backfill, creates linear density differences within the trench, allowing groundwater to collect and pass more easily than the surrounding non-disturbed soils. The higher permeability of backfilled trenches usually causes a French-drain effect, aggregating surface flows and groundwater, which then melts surrounding permafrost and causes water flow, further exacerbating the permafrost degradation. Subsequent water quality and habitat degradation causes numerous negative effects. Alternatives for trenching include direct cable lay, overhead cable with poles, or use of non-cable broadband such as 4G and 5G networks via network towers.

Invasive species

- Equipment must arrive and leave the project clean without visible soil clumps, plant, or animal material. Use a pressure washer, paying special attention to wheel wells, areas behind the bumper, trailers, and other areas that are likely to catch vegetation or seeds. Equipment washing should occur at the same location during project operations; this site should then be surveyed regularly and treated as necessary. Do not clean equipment in or near waterways as it may promote the spread of invasive plant species downstream. Conduct project operations in uninfested areas first to ensure that invasive species do not contaminate equipment and get moved to new areas.

- Prevent invasive plant contamination of project materials when stockpiling materials. Ensure the area is free of invasive species, and cover gravel and construction materials to prevent accidental introduction of plant parts such as seeds, roots, and propagules (i.e., reproductive vegetative parts). Remove any plant parts from materials before deploying them into the field.
- Use certified weed free gravel (plants.alaska.gov/invasives/weed-free-gravel.htm)
- Use certified weed free hay in straw wattles (plants.alaska.gov/invasives/weed-free-forage.htm)
- Soil disturbance includes contouring, grubbing, logging, moving, removing, excavating, and cutting. Soil disturbance destabilizes and exposes soil, which can impact water and air movement, biological activity, root growth, and seedling emergence. Disturbed soil provides an opportunity for invasive plants to establish and spread, to compete with native species, and to colonize new areas. Disturbed soil should be stabilized and covered as soon as possible to prevent the germination and growth of invasive plants. If a worksite is infested with invasive plants, schedule treatment of these plants prior to ground disturbance to minimize spread of invasive plants into other uninfested areas. Project materials such as fill, aggregate, and erosion control materials can also carry invasive plant seeds, which further increase the risk for infestation after soil disturbance. Refer to the weed free hay and gravel above.
- When possible, wear clothing, boots, and gear that do not retain soil and plant material. Clean clothing, boots, and gear before entering and leaving worksite. Remove soil, mud, seeds, and any plant material from clothing, boots, and gear with appropriate equipment. This may include wire brushes, small screwdrivers, boot brushes, extra rinse water, and bags for plant material. Inform coworkers about possible seeds or other propagules carried on their clothing, footwear, and gear.
- Vertebrate invasive species can be transported in cargo planes and ships where they stowaway in grain, straw, and hay. Eradicate free-roaming rats and mice whenever they are detected on or in equipment to ensure they are not inadvertently relocated elsewhere. Eliminate rat attractants including shelter, edible refuse, and food. Keep trash and foodstuffs in metal or other rodent-proof containers.
- Never release live rats or mice into the wild, and never throw captured rats overboard; they are excellent swimmers and may reach land. Other tips for rat prevention and control are available in the Alaska Department of Fish and Game's State Invasive Rodent Plan (adfg.alaska.gov/static/species/nonnative/invasive/pdfs/invasive_rodent_plan.pdf).

Direct cable lay on tundra

- Depending on the type of tundra, some sections of the cable may never subside when directly laid on the ground. Ensure above ground cable sections remain in a line and do not curl up to avoid entanglement by wildlife (e.g., birds, caribou, etc.).
- When necessary, cable slack on the ground to prevent impacts of temperature expansion, contraction, and cable settling may be necessary. However, the cable slack should be laid on the ground in a waving line instead of twisted in circles to prevent entanglement of birds, caribou, and other wildlife.
- The extra effort to place the cable on the ground, regardless of the thickness or height of shrubs, will prevent potential entanglement of birds.

- Be aware that wildlife (e.g., grizzly bears, polar bears, foxes, rodents, etc.) may attempt to chew on cables. This could also occur for cables that are trenched shallowly.

Overhead between poles

- To reduce bird collisions, place transmission lines associated with the development underground to the extent possible unless burial of the lines is prohibitively expensive (i.e., where shallow bedrock exists) or where greater impacts to biological resources would result.
- Overhead lines may be acceptable if they are sited away from areas used by high numbers of birds crossing between roosting and feeding areas or between lakes, rivers, and nesting areas.
- Use bird flight diverters (i.e., flappers) or related deterrent devices that are durable and visible to reduce collision risk. Studies suggest that most bird collisions occur with the shield wire – the smallest diameter and highest wire on a transmission line. The observed reduction in collision rates can range from about 10 percent to as much as 80 percent (Barrientos et al. 2011[1]) and appears to vary with location, habitat, wire, pole configurations, and other factors. The type and spacing of diverters will also affect the degree to which collision risk is reduced.
- Above water crossings of the cables may still impact birds, regardless of the bird diverters. This primarily may happen with thick fog during fall migration or during breeding when birds are flying in circles, etc. to impress a potential mate. Placing the cable under water, and perhaps under the bottom of streams or rivers, likely will be the best solution to avoid avian impacts.
- On the North Slope of Alaska, where ravens depend on manmade structures for perching and nesting, install deterrent features on poles to reduce their availability as artificial perching and nesting platforms.

Riverine broadband

- Adhere to permit construction timing windows to avoid sensitive fish life stages such as spawning, incubation, and migration.
- Preserve stream and riparian buffers to protect water quality, maintain stream channel and bank stability, maintain fish and wildlife habitat, and provide flood water protection. See fws.gov/node/378411 for more information on riparian buffers.
- Use screened intake for water withdrawals. The Alaska Department of Fish and Game Habitat Division Technical Report No. 97-8 (adfg.alaska.gov/static/license/uselicense/pdfs/97_08.pdf) contains additional information on screening criteria for various species and life stages of fish as well as methods for design and fabrication of cylindrical water intakes. Appropriate screening prevents suction entrapment and entrainment injury to small and juvenile fish present in the area of the withdrawal.

[1] Barrientos, R., J.C. Alonso, C. Ponce, and C. Palacín. 2011. Meta-analysis of the effectiveness of marked wire in reducing avian collisions with power lines. *Conservation Biology* 25:893-903.

- For riverine fiber-optic and traditional cable overhead wire crossing, horizontal directional drilling (HDD) is highly recommended as a crossing method. This is especially true for Navigable Waters regulated under Section 10 of the Rivers and Harbors Act and rivers that are navigable in fact. HDD should be used over the 100-year floodplain extent to maintain lateral movement of the river without obstructions from protective broadband infrastructure. This ensures protection of wildlife from the infrastructure obstructions and entanglements, decreases regulatory oversight from potential obstructions to navigation, and increases infrastructure lifespan by avoidance of damage from flooding.
- The use of plastic fiber erosion control fabrics is not acceptable to mitigate streambank erosion or maintain erosion control on steep slopes in or near flowing waterbodies. Instead, use bioengineering techniques and materials that will not pose hazards to wildlife if escapement occurs. For examples, see the Alaska Department of Fish and Game Streambank Revegetation and Protection: A Guide for Alaska (adfg.alaska.gov/index.cfm?adfg=streambankprotection.main).

Spill mitigation

- Maintain a minimum 200-foot setback from waterways when storing hazardous or toxic material.
- Ensure that secondary containment is provided for the storage of fuel or hazardous substances and sized as appropriate to container type and according to governing regulatory requirements in 18 AAC 75 and 40 CFR 112.
- Containers with an aggregate storage capacity of greater than 55 gallons that contain fuel or hazardous substances should not be stored within 100 feet of a waterbody or within 1,500 feet of a current surface drinking water source.
- During equipment storage or maintenance, ensure that the site is protected from leaking or dripping fuel and hazardous substances by the placement of drip pans or other surface liners designed to catch and hold fluids under the equipment or by creating an area for storage or maintenance by using an impermeable liner or other suitable containment mechanism.
- During fuel or hazardous substance transfer, ensure that a secondary containment or a surface liner is placed under all container or vehicle fuel tank inlet and outlet points, hose connections, and hose ends. Appropriate spill response equipment, sufficient to respond to a spill of up to five gallons, should be on hand during any transfer or handling of fuel or hazardous substances.

Sedimentation and pollutants

- Isolate wetlands and waterbodies from project-generated sediment and pollutants (i.e., soil sediments, fuels, grease, and oil) with project specific measures to avoid and minimize water quality degradation to protect respiratory gill function of fish. Measures may include maintaining riparian zone setbacks and bank stabilization or restoration practices. During the construction phase, properly installed silt fencing, silt curtains, etc. should be used interim to proper bank stabilization with vegetation. Long-term use of silt fencing must be avoided due to level of maintenance necessary to maintain and the likelihood of plastics escapement to the environment.

Invasive species

- Aquatic Best Management Practices follow the principles of Clean, Drain, Dry:
  - Clean – Inspect and clean off plants, animals, and mud from clothing, vehicles (i.e., float planes and boats), and equipment including waders, footwear, ropes, anchors, and field gear before leaving water access. Use the local water source initially to help remove heavy deposits. Remove plant fragments, and scrub off any visible material with a stiff brush.
  - Drain – all water from watercraft, motor, bilge, bladder tanks, live well, and portable bait containers before leaving water access.
  - Dry – equipment, vehicles, and gear before moving between waterbodies. Dispose of unwanted materials in the trash; do not dump them in the water or on land.
- Refer to the Alaska Region's Guidelines for Preventing the Spread of Aquatic Invasive Species (fws.gov/media/aquatic-invasive-species-prevention-guidelines-pdf) for more information.

Marine broadband

- Select cable routing to avoid listed eider and short-tailed albatross concentration areas to reduce potential behavioral and disturbance effects.
- Depending on the project area, Protected Species Observers may be necessary to avoid potential take of Endangered Species Act-listed species and marine mammals protected by the Marine Mammal Protection Act.
- Keep cable lines tight to decrease entanglement risk.
- Take all precautions necessary to minimize the risk of spilling fuels or other materials in the marine environment.
- Avoid project activities, particularly those that disturb subsurface vegetation, in areas of eelgrass and kelp growth. Eelgrass and kelp provide rearing and refugia habitat for a wide variety of small and juvenile marine fish and invertebrate species that provide food for listed eiders. Northern sea otters are also associated with kelp forests, which they use to escape from marine predators.
- Minimize the use of external lighting at night, and angle lights downward toward the surface of the water to reduce potential for collisions with vessels and gear. The use of bright lights at night, especially during inclement weather, increases risk of collision and mortality events. Bright lights on vessels at night can serve as an attractant or can cause temporary visual impairment, which increases the risk of birds colliding with vessel gear or rigging that is difficult to see at night. Weather patterns can further reduce visibility and the lower cloud ceiling enhances light where birds tend to fly at lower altitudes. Further information on vessel strikes in the marine environment is available at fws.gov/service/technical-assistance-prevent-bird-vessel-strike-alaska-marine-environment

- Vessels should not discharge materials (i.e., trash or other debris) into the ocean that may attract seabirds, including short-tailed albatross.
- Vessels will not allow tow lines to remain in the water, thereby reducing the potential for entanglement.

Invasive species

- Alaska relies on the US Coast Guard to enforce national standards for ballast water and biofouling.
- Commercial ships use ballast water, typically loading ballast when offloading cargo and discharging ballast when onloading cargo. However, when loading ballast, small organisms are often also brought onboard with the water. If unmanaged, water can then be transferred to areas and discharged with viable organisms in the effluent. Organisms that are then deposited can cause harm to native flora and fauna in the new area they inhabit.
    - Empty/Refill Exchange: pump the ballast tank or tanks and refill the tank with mid-ocean waters at least 200 nautical miles from any coast.
    - Flow through exchange: pump in mid-ocean water, at least 200 nautical miles from any coast, at the bottom of the tank and continuously overflow the tank from the top until three full volumes of the ballast water tank capacity have been changed.
    - Onboard Treatment: Use a properly functioning treatment system approved by the US Coast Guard that is designed to kill all living organisms in the ballast water.
    - Freshwater: Use ballast water from a municipal water supply from the US or Canada.
    - Sealed tanks: Use ballast water in sealed tanks incapable of discharging ballast water.
- Biofouling accumulation on a submerged vessel can begin within minutes. The process begins with bacteria and algae recruiting onto the vessel, progressing into a slime layer (biofilm) within days. Then further advancing into a macrofouling community in weeks. Macrofouling happens especially in the niche areas (i.e., propeller shafts, rudder, sea chest intake, bow thruster gratings, etc.), which act as protective spaces for biofouling organisms. Applying the proper antifouling hull paint and maintaining the coating to the manufacturer's specifications may substantially reduce vessel operating costs and minimize environmental impacts. Following best management practices for managing biofouling "early and often" at the slime layer level will cut biofouling management and fuel costs, thereby reducing vessel carbon emissions in addition to reducing biosecurity risks ports.
- Vertebrate invasive species can be transported in cargo planes and ships where they stowaway in grain, straw, and hay. Eradicate free-roaming rats and mice whenever they are detected on or in equipment to ensure they are not inadvertently relocated elsewhere. Eliminate rat attractants including shelter, edible refuse, and food. Keep trash and foodstuffs in metal or other rodent-proof containers.
- Never release live rats or mice into the wild, and never throw captured rats overboard; they are excellent swimmers and may reach land. Other tips for rat prevention and control

are available in the Alaska Department of Fish and Game's State Invasive Rodent Plan (adfg.alaska.gov/static/species/nonnative/invasive/pdfs/invasive_rodent_plan.pdf).

Broadband towers

- Guy wires and tower lighting should be avoided when possible. Use self-supporting towers when applicable. If guy wires are necessary, bird flight diverters or high visibility marking devices should be used. When guy wires are necessary, each wire should be marked for its full-length using markers colored to contrast with the wire and surrounding environment during daylight hours. The Service can provide information as needed on types that have proven durable as not all markers have withstood use in Alaska. Markers should be checked and maintained periodically to ensure continued functionality for the life of the project.
- Use visual contrasting colors on towers to improve visibility.
- Use motion detectors and down-shield lights to reduce collisions and light loss when lighting facilities.
- Towers and associated facilities should be designed, sited, and constructed to avoid or minimize habitat loss within and adjacent to the tower "footprint" (including guy wire circumference). Several shorter, un-guyed towers may be preferable to a single, tall, guyed and lit tower.
- If a tower is in the path of a potential bird migration corridor, the Service recommends mortality monitoring. Representatives from the Service or other experienced biological monitors (i.e., from other agencies, biological consulting companies, etc.) should be allowed access to the site to evaluate bird use; conduct dead-bird searches; place above ground net catchments below the towers; and to perform studies using radar, infrared, thermal imagery, and acoustical monitoring, as necessary.
- Use monopole structures when possible, rather than lattice structures to discourage perching and nesting by ravens, raptors, and other birds of prey unless a monopole structure would require additional guywires on an otherwise un-guyed tower. Nesting by ravens and raptors can result in increased rates of predation. In these cases, the applicant should work with the Service to incorporate anti-perching and anti-nesting devices into project design.
- Powerlines should be buried in roadbeds or placed in electrical trays strung on Voltage Sensing Modules when possible.
- Locate towers to avoid placement of fill in or disturbance to wetlands, which are prime breeding and forage areas for migratory birds and other trust species.
- Towers should not be sited on ridgelines or other known bird concentration areas (e.g., State or Federal refuges, staging areas, rookeries, and Important Bird Areas) or in known migratory bird movement routes, daily movement flyways, areas of breeding concentration, or in habitat of Threatened or endangered species.
- Avoid installing towers offshore or within 0.5 miles of the coast.
- It is recommended that new towers should not be more than 199 feet above ground level. This height increases the mean free airspace between the top of the tower and the height at which birds generally migrate, reducing collision risk.

- Lights are a primary source of bird aggregation around towers, thus minimizing all light is recommended. Eliminating tower lighting is the preferred option if allowed by FAA regulations and lighting standards (Patterson 2012[2]). See (faa.gov/documentlibrary/media/advisory_circular/ac_70_7460-1l_.pdf) for more detailed information about FAA guidelines. To meet FAA requirements for visibility lighting of towers the Service recommends (in order of least to most likely to affect birds): red strobe, dual red and white strobe, strobe-like, or flashing and not steady state lights. Pilot warning lights should fire synchronously.
- Security lighting for on-ground facilities, equipment, and infrastructure should be motion or heat-sensitive, down-shielded, and of a minimum intensity to reduce nighttime bird attraction and eliminate constant nighttime illumination while still allowing safe nighttime access to the site.
- On the North Slope of Alaska, where ravens depend on manmade structures for perching and nesting, design towers to reduce their suitability as artificial perching and nesting platforms.

Species-specific Best Management Practices

Northern sea otter

- For all vessel-based activities within the sea otter range, take precaution to avoid harassment or harm of sea otters. Vessel strikes are a cause of injury and death for sea otters and the probability of death or serious injury to a marine mammal increases as vessel speed increases. Use established navigation channels or commonly recognized vessel traffic corridors and avoid alongshore travel in shallow water (<20 m) whenever practicable. Follow the Service's sea otter vessel guidelines for Alaska (fws.gov/sea-otters-boater-guidance).
- Vessels should avoid approaching within 100 meters (328 feet) of areas with kelp at the surface when operationally possible. If vessels must approach kelp canopy areas more closely, apply extra vigilance to look for sea otters (e.g., assign an additional spotter), and maintain an appropriate distance from sea otter individuals or groups.
- Sea otters may be disturbed or harmed by loud in-water noise, and the Service considers sea otter to be harassed when exposed to in-water sound levels exceeding 160 dB re 1 μPa SPL_{RMS}. If activities involve in-water noise production in sea otter habitat above this level, contact the Service's Marine Mammals Management office (FW7_AK_Marine_Mammals@fws.gov; 800-362-5148).
- Coordinate with Tribal organizations to ensure activities do not disrupt sea otter subsistence harvest. The Service's Marine Mammals Management office may be able to assist with coordination.
- Depending on the project area, Protected Species Observers may be necessary to avoid potential take of sea otters.

[2] Patterson, J.W. 2012. Evaluation of new obstruction lighting techniques to reduce avian fatalities. Technical Note: DOT/FAA/TC-TN12/9.

- Areas have been designated as critical habitat for northern sea otters. These areas represent locations that are of particular importance to the species. The Service asks that project proponents are cognizant of the importance of these locations to sea otters and limit actions within these areas when possible.

Pacific walrus

- Walruses are sensitive to disturbance from noise, sights, and smells associated with human activities. Take caution to avoid disturbing walruses that are in the water or are hauled out on ice or land. Follow the Service's guidelines for avoiding disturbance, including from marine vessels and aircraft: fws.gov/walrus-approach-viewing-guidelines
- When planning work in the Bering or Chukchi Seas, consult the Pacific Walrus Coastal Haulout Database 1852-2016 (alaska.usgs.gov/products/data.php?dataid=74) for information regarding location and use patterns of known terrestrial walrus haulouts in Alaska. Note there are five regularly used walrus haulouts in Bristol Bay, located at Round Island and Hagemeister Islands and Capes Peirce, Newenham, and Seniavin. During the months of May through December, walruses may be encountered in the water and resting on land in these areas. In the Chukchi Sea, there are especially large, sensitive haulouts at Point Lay and Cape Lisburne. The sea ice edge is also a sensitive congregation and migration area. When walruses are present, haulouts should be avoided by the stand-off distances from the Service's marine vessel guidelines, reiterated here:
    - Vessels less than 50 feet in length should remain at least 0.5 nautical miles away from a walrus haulout.
    - Vessels 50 feet or more but less than 100 feet in length should remain at least 1 nautical mile away from a walrus haulout.
    - Vessels 100 feet or more in length should remain at least 3 nautical miles away from a walrus haulout.
    - All vessels should refrain from anchoring or conducting tendering operations within 3 nautical miles of a walrus haulout.
- If aircraft are being used, it is very important to follow the aircraft measures included in the guidelines linked above.
- For more information on a specific haulout, reach out to the contact noted in the Pacific Walrus Coastal Haulout Database or the Service's Marine Mammals Management office (FW7_AK_Marine_Mammals@fws.gov; 800-362-5148). If activities must occur within 3 nautical miles of a haulout, near the sea ice edge, or are within the Bering Strait, reach out to the Service.
- Walruses may be disturbed or harmed by loud in-water noise, and the Service considers walruses to be harassed when exposed to in-water sound levels exceeding 160 dB re 1 μPa SPL_{RMS}. If activities involve in-water noise production in walrus habitat above this level, contact the Service.
- Coordinate with Tribal organizations to ensure activities do not disrupt walrus subsistence harvest. The Service's Marine Mammals Management office may be able to assist with coordination. Specifically, activities near communities in the Bering Strait and near Saint Lawrence Island between April and June would likely overlap with subsistence walrus hunting activities.

- Depending on the project area, Protected Species Observers may be necessary to avoid potential take of walruses.

Polar bear

- Polar bears use sea ice, marine waters, and terrestrial areas in northern and northwestern Alaska for resting, feeding, denning, and seasonal movements. They are most likely to be encountered within 25 miles of the coastline, especially along barrier islands during July–October. Polar bears may also be encountered farther inland, especially females during the denning period (November–April). Be aware that polar bears also occur within human settlements such as villages, camps, and work areas. If any work in polar bear habitat may occur, see the Service's best management practices for minimizing impacts to polar bears in Appendix A of the Species Status Assessment for the Polar Bear (ecos.fws.gov/ServCat/DownloadFile/238581#page=125), which also includes polar bear encounter guidelines and reporting procedures. Following as many relevant measures as possible through the development and implementation of a polar bear avoidance and encounter plan will help protect both human and bear safety.
- Denning is a critical, sensitive period in polar bear life history. Human disturbance of maternal dens at any stage, including after emergence, could result in the taking (harassment or harm) of polar bears. This may include the possibility of lethally taking cubs. Projects with operations between November and April and within 25 miles of the Bering, Chukchi, or Beaufort coasts (outside of communities) may impact denning, and planners should contact the Service's Marine Mammals Management office (FW7_AK_Marine_Mammals@fws.gov; 800-362-5148) as early as possible to discuss activities.
- For any project with operations on sea ice or within five miles of the Alaska Arctic coast from the Canadian border to Point Hope, within one mile of the western coast from Point Hope to Nome, or along the coast of St. Lawrence Island, contact the Service Marine Mammals Management office to discuss activities.

Short-tailed albatross

- Short-tailed albatross spend most of their lives in marine environments and are known to forage primarily on continental shelf breaks in Alaskan waters but may also be found near shore when upwelling creates prey-rich concentrations. They can be attracted to vessel debris, such as bait used in the hook-and-line commercial fishery in Alaska, and therefore can be vulnerable to entrapment, entanglement, or bycatch. Specifics for preventing bird-vessel strike can be found at: fws.gov/service/technical-assistance-prevent-bird-vessel-strike-alaska-marine-environment. Also refer to the 'Marine Broadband' section above for more guidance.

Spectacled eider / Steller's eider

- Listed eiders are at risk of colliding with moving or stationary marine vessels around Alaska. Impaired visibility and vessel lighting may increase the likelihood of bird strikes.

Generally, the Service recommends keeping deck lighting to a minimum and shielding lights to direct illumination inboard and downward to the extent possible while still maintaining compliance with navigation rules. Concern for eider-vessel collision risk is particularly high between August and November, during which time Steller's and spectacled eiders frequently fly in large groups between nesting, molting, and wintering areas. This timing coincides with decreasing hours of daylight and a high potential for inclement weather, both of which may impair eider visibility to human observers and increase the likelihood that birds may become disoriented by ship lighting, in turn, reducing their ability to avoid colliding with structures. More specifics for preventing bird-vessel strike can be found at: fws.gov/service/technical-assistance-prevent-bird-vessel-strike-alaska-marine-environment. Also refer to the 'Marine Broadband' section above for more guidance.

- Steller's eiders and spectacled eiders are migratory birds. Refer to the 'Migratory Bird' section for more BMPs.
- Listed eiders are at risk of injury or death due to collision with communication towers and wires. Refer to the 'Broadband Towers' section above for appropriate mitigation measures to reduce eider collisions.
- Areas have been designated as critical habitat for both spectacled and Steller's eiders (review if your project occurs within critical habitat at ipac.ecosphere.fws.gov/). These areas represent locations that are of particular importance to each species or locations at which birds are particularly vulnerable to disturbance. We ask that project proponents are cognizant of the importance of these locations to each species and limit actions within these areas. For projects with marine components, we ask that vessels limit their transit and actions within these areas and be extra cautious about vessel lighting. Furthermore, we ask that mariners do not disturb congregations of eiders within these areas as they may be flightless and unable to move away from vessels.
- Depending on the project area, Protected Species Observers may be necessary to avoid potential take of listed eiders.

Regulatory Best Management Practices

Bald and Golden Eagle Protection Act

- For any project that may result in take or disturbance of eagles or their nests, the USFWS recommends a survey by a qualified raptor biologist prior to conducting activities to document locations of nests and help inform avoidance and minimization measures and the need for a permit. Surveys should be conducted within the project footprint and extending 0.5 miles beyond the project footprint, including cliffs of tributary streams, to determine if and where eagles may be nesting.
- The Alaska Bald Eagle Nest Atlas (eagle.abrinc.com/) is a useful first step to identify potential bald eagle nest locations in and around project areas. However, the Atlas should not be used as a replacement for recommended, location-specific surveys to verify the presence of nests identified in the Atlas and document additional nests.

- The Service's National Bald Eagle Management Guidelines (fws.gov/media/national-bald-eagle-management-guidelines) provide activity-specific buffers to help avoid disturbance to nesting bald eagles.
- The Service in Alaska has provided additional information and guidance on bald eagle nesting windows and sensitivity to disturbance (fws.gov/Alaska-eagle-nesting).
- In general, golden eagles are more sensitive than bald eagles, and, in Alaska, the Service recommends a 0.5-mile buffer for most, but not all activities. For more information on historical golden eagle nests in the project area or for additional questions or guidance on eagles, please contact the local Field Office.
- The Service's National Eagle Management webpage (fws.gov/program/eagle-management/eagle-permits) provides an overview of the types of eagle take permits.
- If needed, permit applications are submitted through the Service's ePermits portal (fwsepermits.servicenowservices.com/fws/). Please note that permits can take up to 90 days to process once a completed application is submitted.

Clean Water Act

- Wetlands and waters of the US are regulated by the US Army Corps of Engineers under the Clean Water Act and the US Environmental Protection Agency.
- These habitats are often considered important habitat for aquatic life, migration and movement, migratory bird staging, forage and reproduction, and resident wildlife populations. Therefore, the Service regulates activities within the same footprint under different statutory authorities. However, consultation with the Service is often necessary pursuant to project permitting under the Clean Water Act due to the nexus of high-value habitat provided by wetlands and waters.

Endangered Species Act

- The purpose of the Endangered Species Act (ESA) is to provide a means to conserve the ecosystems upon which Endangered and Threatened species depend and provide a program for the conservation of such species. The ESA directs all federal agencies to participate in conserving these species. Specifically, section 7(a)(1) of the ESA charges federal agencies to aid in the conservation of listed species, and section 7(a)(2) requires the agencies to ensure their activities are not likely to jeopardize the continued existence of federally listed species or destroy or adversely modify designated critical habitat.
- Additionally, the ESA prohibits, with certain exceptions, the take of listed species. Take means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."
- IPaC (ipac.ecosphere.fws.gov/) will generate a letter including a list of Threatened and Endangered species, designated critical habitat, and other sensitive resources in your project area. If consultation or further assistance is needed, contact the appropriate Service Field Office named in the letter.

Executive Orders

- Executive Order (EO) 13751, Safeguarding the Nation from the Impacts of Invasive Species (federalregister.gov/documents/2016/12/08/2016-29519/safeguarding-the-nation-from-the-impacts-of-invasive-species) was issued December 5, 2016, and Amends EO 13112. This EO aims to prevent the introduction of invasive species and provide for their control, and to minimize the economic, plant, animal, ecological, and human health impacts that invasive species cause.

Fish and Wildlife Conservation Act

- Under the Fish and Wildlife Conservation Act, the Service is directed and authorized to evaluate Federal actions that affect any stream or other body of water and provide recommendations to minimize impacts on fish and wildlife resources.
- Proponents with projects involving rivers or other water bodies should reach out to the Service during project planning to coordinate on minimizing impacts.

Marine Mammal Protection Act

- The Marine Mammal Protection Act (MMPA) prohibits, with certain exceptions, the take of all marine mammal species in US waters. Take is defined as "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill". Harassment includes behavioral disturbance.
- In Alaska, the Service implements the MMPA for walruses, sea otters, and polar bears. The National Marine Fisheries Service has jurisdiction over pinnipeds and cetaceans.
- When certain requirements are met, the Service may authorize incidental take of small numbers of Pacific walruses, polar bears, or northern sea otters through an incidental take authorization under Section 101(a)(5) of the MMPA (see fws.gov/ITA-general-info and fws.gov/ITA-applicant-instructions). Note that issuance of an incidental take authorization can take over a year, and early coordination with the Service's Marine Mammals Management (MMM) Regulatory Program is very important. Contact the MMM Regulatory program with any questions on incidental take authorizations (R7mmmregulatory@fws.gov).

Migratory Bird Treaty Act

- Intentional take of migratory birds may be permitted in limited situations (fws.gov/program/migratory-bird-permit).
- Incidental take (i.e., unintentional take from an otherwise lawful activity) of migratory birds cannot be permitted. The best way to avoid incidental take and comply with the Migratory Bird Treaty Act is to avoid vegetation clearing, ground disturbance, and other site construction activities during the nesting season. Visit fws.gov/alaska-bird-nesting-season to view nesting season dates for migratory birds based on location, habitat, and bird species.

Rivers and Harbors Act

- For rivers listed as Navigable Waters of the US, overhead structures or structures or cables laid in-stream on the riverbed are often considered potential impediments to navigation and to aquatic life migration and movement. Therefore, the Service may engage in consultation under this statute.

APPENDIX F

U.S. FISH AND WILDLIFE SERVICE INFORMATION FOR PLANNING AND CONSULTATION (IPaC) TOOL RESULTS

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Anchorage Fish & Wildlife Field Office
4700 Blm Road
Anchorage, AK 99507
Phone: (907) 271-2888 Fax: (907) 271-2786

In Reply Refer To: 02/11/2025 01:47:19 UTC
Project Code: 2025-0054455
Project Name: Airraq 3 Fiber Optic Cable Interconnect

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, and proposed species, designated critical habitat, and some candidate species that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). Please note that candidate species are not included on this list. We encourage you to visit the following website to learn more about candidate species in your area: https://www.fws.gov/library/collections/candidate-conservation

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

Endangered Species: The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see https://www.fws.gov/program/migratory-bird-permit/what-we-do.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a Federal nexus) or a Bird/Eagle Conservation Plan (when there is no Federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures see https://www.fws.gov/library/collections/threats-birds.

In addition to MBTA and BGEPA, Executive Order 13186: Responsibilities of Federal Agencies to Protect Migratory Birds, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle

Protection Act (16 U.S.C. 668 et seq.), and projects affecting these species may require development of an eagle conservation plan (https://www.fws.gov/program/eagle-management/working-around-eagles). Additionally, wind energy projects should follow the wind energy guidelines (https://www.fws.gov/node/266177) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at:

https://www.fws.gov/media/recommended-best-practices-communication-tower-design-siting-construction-operation
http://www.towerkill.com

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Bald & Golden Eagles
- Migratory Birds
- Marine Mammals

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Anchorage Fish & Wildlife Field Office
4700 Blm Road
Anchorage, AK 99507
(907) 271-2888

PROJECT SUMMARY

Project Code: 2025-0054455
Project Name: Airraq 3 Fiber Optic Cable Interconnect
Project Type: New Constr - Below Ground
Project Description: Onshore and offshore telecommunications installation.
Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@60.852150699999996,-163.95777255765017,14z

Counties: Bethel and Kusilvak counties, Alaska

ENDANGERED SPECIES ACT SPECIES

There is a total of 5 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Polar Bear *Ursus maritimus* There is **final** critical habitat for this species. Your location overlaps the critical habitat. ***This species is also protected by the Marine Mammal Protection Act, and may have additional consultation requirements.*** Species profile: https://ecos.fws.gov/ecp/species/4958	Threatened
Wood Bison *Bison bison athabascae* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8362	Threatened

BIRDS

NAME	STATUS
Short-tailed Albatross *Phoebastria (=Diomedea) albatrus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/433	Endangered
Spectacled Eider *Somateria fischeri* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/762	Threatened
Steller's Eider *Polysticta stelleri* Population: AK breeding pop. There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1475	Threatened

CRITICAL HABITATS

There is 1 critical habitat wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
Polar Bear *Ursus maritimus* https://ecos.fws.gov/ecp/species/4958#crithab	Final

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

REFUGE INFORMATION WAS NOT AVAILABLE WHEN THIS SPECIES LIST WAS GENERATED. PLEASE CONTACT THE FIELD OFFICE FOR FURTHER INFORMATION.

BALD & GOLDEN EAGLES

Bald and Golden Eagles are protected under the Bald and Golden Eagle Protection Act [2] and the Migratory Bird Treaty Act (MBTA) [1]. Any person or organization who plans or conducts activities that may result in impacts to Bald or Golden Eagles, or their habitats, should follow appropriate regulations and consider implementing appropriate avoidance and minimization measures, as described in the various links on this page.

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1. The Bald and Golden Eagle Protection Act of 1940.
2. The Migratory Birds Treaty Act of 1918.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

MIGRATORY BIRDS

The Migratory Bird Treaty Act (MBTA) [1] prohibits the take (including killing, capturing, selling, trading, and transport) of protected migratory bird species without prior authorization by the Department of Interior U.S. Fish and Wildlife Service (Service). The incidental take of migratory birds is the injury or death of birds that results from, but is not the purpose, of an activity. The Service interprets the MBTA to prohibit incidental take.

There are migratory birds in your project area. Please refer to Alaska's Bird Nesting Season for recommendations to minimize impacts to migratory birds, including eagles.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the "Probability of Presence Summary" below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Black-legged Kittiwake *Rissa tridactyla* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/10459	Breeds elsewhere
Common Loon *gavia immer* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/4464	Breeds Apr 15 to Oct 31

NAME	BREEDING SEASON
Northern Alaska Dunlin *Calidris alpina arcticola* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9573	Breeds May 20 to Jul 20
Pomarine Jaeger *Stercorarius pomarinus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/10458	Breeds elsewhere
Red-necked Phalarope *Phalaropus lobatus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/10467	Breeds elsewhere

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (■)

Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

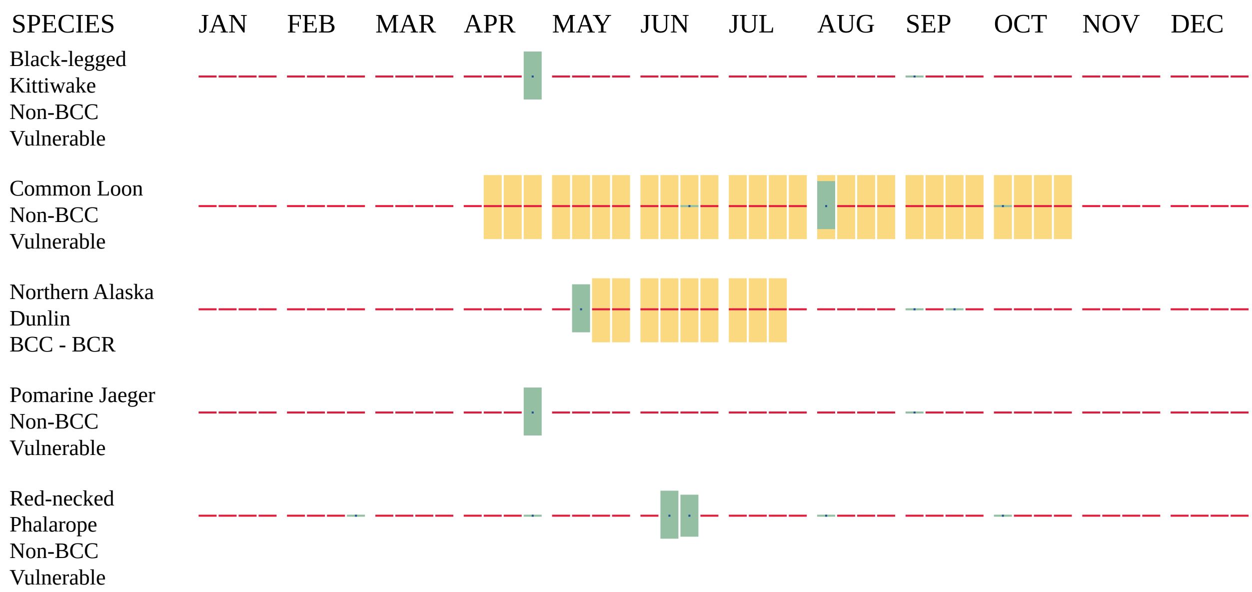
Survey Effort (|)

Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)

A week is marked as having no data if there were no survey events for that week.

■ probability of presence ■ breeding season | survey effort – no data



Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide avoidance and minimization measures for birds
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

MARINE MAMMALS

Marine mammals are protected under the Marine Mammal Protection Act. Some are also protected under the Endangered Species Act[1] and the Convention on International Trade in Endangered Species of Wild Fauna and Flora[2].

The responsibilities for the protection, conservation, and management of marine mammals are shared by the U.S. Fish and Wildlife Service [responsible for otters, walruses, polar bears, manatees, and dugongs] and NOAA Fisheries[3] [responsible for seals, sea lions, whales, dolphins, and porpoises]. Marine mammals under the responsibility of NOAA Fisheries are **not** shown on this list; for additional information on those species please visit the Marine Mammals page of the NOAA Fisheries website.

The Marine Mammal Protection Act prohibits the take of marine mammals and further coordination may be necessary for project evaluation. Please contact the U.S. Fish and Wildlife Service Field Office shown.

1. The Endangered Species Act (ESA) of 1973.
2. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is a treaty to ensure that international trade in plants and animals does not threaten their survival in the wild.
3. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

NAME

Pacific Walrus *Odobenus rosmarus ssp. divergens*
Species profile: https://ecos.fws.gov/ecp/species/8791

Polar Bear *Ursus maritimus*
Species profile: https://ecos.fws.gov/ecp/species/4958

IPAC USER CONTACT INFORMATION

Agency:	Private Entity
Name:	Genevieve Rozhon
Address:	980 9th Street, Suite 750
City:	Sacramento
State:	CA
Zip:	95814
Email	gcrozhon@gmail.com
Phone:	6507739881

United States Department of Agriculture

Rural Development

Rural Utilities Service

1400 Independence Ave, SW
Room 4121, Stop 1590
Washington, DC 20250

Voice: (202) 690-4673

September 24, 2024

U.S. Fish and Wildlife Service (FWS)
Anchorage Fish & Wildlife Field Office
4700 BLM Road
Anchorage, AK 99507-2546

National Oceanic and Atmospheric Administration
National Marine Fisheries Service (NMFS)
Alaska Region, Protected Resources Division
P.O. Box 21668
Juneau, AK 99802-1668

Re: USDA Rural Utilities Service R4 ReConnect Project AK 1706-C73 Unicom, Incorporated – Designation of Non-Federal Representative

Dear FWS/NMFS Staff,

Unicom, Incorporated (Unicom) is seeking financial assistance from the Rural Utilities Service (RUS) under its Telecommunications ReConnect Program for construction of a fiber-to-the-premise (FTTP) network to provide high-speed broadband services to underserved rural communities located in the Yukon-Kuskokwim (Y-K) Delta region for the communities of Nunapitchuk, Mertarvik, Tununak, and Toksook Bay. This project may affect Endangered Species Act (ESA) listed or proposed species and/or designated or proposed critical habitat and possibly result in harassments of species protected under the ESA and Marine Mammal Protection Act (MMPA).

To facilitate Section 7 ESA and MMPA consultation, RUS is designating Unicom and their consultant, ERM, as our non-federal representative for the purpose of initiating informal consultation with the FWS and NMFS. The role of the non-federal representative includes conducting studies, attending meetings, participating in telephone and email contact, developing draft biological assessments, etc., in support of our eventual ESA determination. The authority for making Endangered Species Act determinations remains with USDA, RUS. As the USDA, RUS environmental point of contact for this project I can be reached at Anthony.High@usda.gov or (202) 690-4673, also please include Natalie Kovach, General Field Representative (GFR) at Natalie.Kovach@usda.gov on any correspondence.

Sincerely,

Anthony High

Digitally signed by Anthony High
Date: 2024.09.24 02:09:22 -04'00'

ANTHONY W. HIGH
Environmental Protection Specialist
Policy & Outreach Division Engineering Branch
Telecommunications Program
Rural Utilities Service

cc: Genevieve Rozhon, Principal Consultant, Genevieve.Rozhon@erm.com
Danna Allen, Principal Consultant, danna.allen@erm.com

Application #: 101001351