U.S. Department of the Interior
Bureau of Land Management

Willow Master Development Plan

Supplemental Environmental Impact Statement

DRAFT

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Prepared by:
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In Cooperation with:
U.S. Army Corps of Engineers
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
Native Village of Nuiqsut
Iñupiat Community of the Arctic Slope
City of Nuiqsut
North Slope Borough
State of Alaska



Estimated Total Costs Associated with Developing and Producing this SEIS: $1,318,200

Willow Master Development Plan

Appendix F
Cultural Resources Findings: Process and Analysis

June 2022

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List of Acronyms

AHRS	Alaska Heritage Resources Survey
BLM	Bureau of Land Management
BMP	best management practice
DEW	Distant Early Warning
EIS	Environmental Impact Statement
IAP	Integrated Activity Plan
LS	lease stipulation
MDP	Master Development Plan
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPR-A	National Petroleum Reserve in Alaska
NSB	North Slope Borough
OHA	Office of History and Archaeology
Project	Willow Master Development Plan Project
RFFAs	reasonably foreseeable future actions
ROD	Record of Decision
ROP	required operating procedure
TLUI	Traditional Land Use Inventory

Note to Readers

To assist readers in identifying new information in this Supplemental EIS, new or substantially revised text is highlighted in light yellow (as shown in this paragraph). Substantial revisions include changes to the text or underlying data that have changed the analysis or analysis conclusion. All sections that are new or include significant or substantial revisions include an asterisk ("*") at the end of the section header; all new or substantially revised tables and figures also include an asterisk at the end of the table or figure caption.

1.0 CULTURAL RESOURCES FINDINGS: PROCESS AND ANALYSIS

The cultural history of northern Alaska is described in detail in Bureau of Land Management's (BLM's) National Petroleum Reserve in Alaska (NPR-A) Final Integrated Activity Plan/Environmental Impact Statement (IAP/EIS) (BLM 2020b). Cultural resources found on the North Slope broadly represent a long prehistory of land use, followed by more recent historic land use by Iñupiat and influences from Euro-Americans beginning in the nineteenth century. Cultural resources on the North Slope can represent a broad variety of types, ranging from distinctly human-made objects and changes to the landscape, to places with less definitive expressions of use by people in the past, albeit with great significance to North Slope communities. Such resources include but are not limited to the following:

- Prehistoric and historic archaeological sites, features, and artifacts, such as those associated with camps and villages, buildings and structures, dwellings (e.g., sod houses, semi-subterranean houses, and tent rings), production and use of objects (e.g., discarded tools and tool-making debris), subsistence activities (e.g., discarded animal bone accumulations, reindeer herding fences, ice cellars, and caches), and transportation (e.g., boat and sled remains).
- Places significant to Iñupiat heritage and traditional land use (e.g., burial places and hunting, fishing, and trapping and camping areas).
- Cultural landscapes and areas important for reasons of cultural identity or religious significance.
- For purposes of the Willow Master Development Plan Project (Project) Supplemental Environmental Impact Statement (EIS), paleontological resources are also considered.

A variety of federal, state, and local regulations govern how cultural resources are described and analyzed. Although compliance requirements for these regulations are similar, the types of cultural resources considered, as well as the implementation of cultural resources review, differ. The National Environmental Protection Act (NEPA) requires disclosure and consideration of impacts to the human environment, of which cultural resources are considered a subcategory (40 CFR 1508.14). Section 106 of the National Historic Preservation Act (NHPA) (54 USC 306108) and its implementing regulations (36 CFR 800) require federal agencies to consider the effects of their undertakings on historic properties (prehistoric or historic districts, sites, buildings, structures, or objects listed in or eligible for the National Register of Historic Places). Both NEPA and Section 106 of the NHPA require consultation with agencies and key stakeholders (including tribal and municipal governments and members of the public) and afford a reasonable opportunity for consulting parties to comment on the potential for impacts to cultural resources or to alert the lead agency to the presence of potentially impacted cultural resources. Other regulatory statutes that protect cultural resources include the Antiquities Act (16 USC 431–433), the Historic Sites Act (16 USC 461–467), the Archaeological and Historic Preservation Act (16 USC 469–469c), the American Indian Religious Freedom Act (42 USC 1996), the Archaeological Resources Protection Act (16 USC 470aa–470ll), the Abandoned Shipwreck Act (43 USC 2101–2106), the Native American Graves Protection and Repatriation Act (25 USC 3001 et seq.), EO 13007: Indian Sacred Sites, and the Alaska Historic Preservation Act (AS 41.35). The Project would also require a Certificate of Traditional Land Use Inventory (TLUI) Clearance from the North Slope Borough (NSB), certifying that no TLUI sites would be negatively impacted.

1.1 Supplemental Analysis*

Initial analysis of potential Project impacts was completed as part of the Final EIS for the Willow Master Development Plan (MDP). Additional analysis has been conducted for this Supplemental EIS, developed in response to the 2021 Alaska District Court decision requiring BLM to address NEPA deficiencies found by the court.[1]

The Office of History and Archaeology's (OHA's) Alaska Heritage Resources Survey (OHA 2020, 2022), which contains an inventory of all documented archaeological sites in the state of Alaska, is the primary source of information for archaeological resources in the Project area. A subset of the NSB's TLUI within the Project vicinity was acquired from the NSB Department of Iñupiat History, Language and Culture (NSB 2019, 2020); the TLUI is the primary source of information regarding Iñupiat traditional use areas, although BLM pursued additional information through consultation with local and regional tribal and municipal governments and Alaska Native corporations, and the public. Academic literature, agency documents, and cultural resources survey reports from other studies conducted within the Project area provided more robust information about sites documented in the area. Recent cultural resources surveys conducted in support of the Project (Reanier 2017, 2018, 2019b, 2019c, 2020, 2022b) provided the most current archaeological site location and condition information for the area.

1.2 Potential Impacts

Direct impacts are those that are caused by, and occur during, the Project (36 CFR 800.5; 40 CFR 1508.8) and are primarily limited to the Project footprint. Ground-disturbing activities (e.g., drilling, gravel mining, construction and use of grounded ice bridge, etc.) pose the greatest threat of direct impacts to cultural resources, especially archaeological sites, by destabilizing, damaging, or destroying subsurface and aboveground cultural resources and contexts. Support activities (including the transport and staging of materials, heavy equipment, and personnel) and manufacture and use of the grounded ice roads and pads could also directly affect surficial and shallowly buried cultural resources through inadvertent ground disturbance, vibration, and compaction.

Indirect impacts are those that occur beyond the Project footprint or after the Project's completion and are reasonably foreseeable. The greatest indirect threats to cultural resources include altering the setting of historic properties and increasing access to otherwise remote and difficult-to-access locations, followed by increased foot or vehicle traffic, resulting in sensitive areas being eroded, vandalized, or looted.

Cumulative impacts include those resulting from past, present, and reasonably foreseeable future actions (RFFAs) or effects relating to the Project and can extend beyond the 2.5-mile indirect effects analysis area. Regarding cultural and paleontological resources, the most significant cumulative effects involve the Project's association with increased future development projects and changes to environmental dynamics resulting from climate change (particularly permafrost degradation and erosion).

1.3 Previously Identified Cultural Resources and Surveys*

The Alaska Heritage Resources Survey (AHRS) (OHA 2020, 2022) lists 93 cultural sites documented within or overlapping the BLM-recommended 2.5-mile analysis area, none of which fall within the Project footprint. A total of 31 sites in the analysis area have been evaluated for eligibility for inclusion on the National Register of Historic Places (NRHP); 23 were determined eligible and eight were determined ineligible for NRHP inclusion.

Twenty-two (22) of the sites listed in the AHRS (19 cultural and three paleontological) have been destroyed through excavation, removal, or erosion. This includes 12 documented Distant Early Warning (DEW) Line Station sites removed from Point Lonely during environmental remediation activities

[1] Refer to the August 18, 2021, Alaska District Court decision (*Sovereign Iñupiat for a Living Arctic et al. v. BLM* [Case No. 3:20-cv-00290-SLG] and *Center for Biological Diversity et al. v. BLM* [3:20-cv-00308-SLG], United States District Court, D. Alaska) remanding the Willow MDP to BLM for the purpose of addressing NEPA deficiencies found by the court.

undertaken by the U.S. Air Force (K. Leeper, Archaeologist, personal communication to L. O'Quinn [DOWL], March 18, 2019; report pending to OHA).

Of the remaining 71 sites, 12 are paleontological, 10 are prehistoric, 30 are historic or modern Iñupiaq, and 19 are historic or modern Euroamerican. Of the 23 sites in the analysis area evaluated for NRHP eligibility, 17 NRHP-eligible sites remain. There are six documented grave sites within the analysis area. Two (TES-00120) fall within other larger site areas at TES-00028 and TES-00045, and four others (TES-00121) are located roughly one mile south of Qalluvik (TES-00028), with which they are associated. The NSB TLUI lists 45 traditional land use sites documented within or overlapping the analysis area (NSB 2020). Ten TLUI sites are co-located with AHRS-documented sites, two of which have been determined eligible for NRHP listing, while three others have been destroyed (Table F.1.1).

Table F.1.1. List of Cultural and Paleontological Sites in the Analysis Area According to the Alaska Heritage Resource Survey and the Traditional Land Use Inventory Data*

AHRS No.	TLUI No.	Site Name/Description	Site Type	Determination of NRHP Eligibility	Condition
HAR-00002	–	HAR-00002	Prehistoric	Not Eligible	Destroyed
HAR-00005	–	Sod House and Boat on Fish Creek	Historic (Iñupiaq)	No Determination	Intact
HAR-00010	–	Kikkaq	Historic (Iñupiaq)	No Determination	Intact
HAR-00011	TLUIHAR011	Sikulik	Historic, Modern (Iñupiaq)	No Determination	Intact
HAR-00014	–	HAR-00014 Reindeer Corral	Historic (Iñupiaq)	Eligible	Partially Destroyed
HAR-00018	–	Ahsogeak Site	Historic (Iñupiaq)	Eligible	Excavated
HAR-00021	–	Niglivik 1	Historic (Iñupiaq)	No Determination	Intact
HAR-00025	TLUIHAR060	Tikigaqmiut/Tikibaq	Historic (Iñupiaq)	No Determination	Unconfirmed
HAR-00026	TLUIHAR091	Atigaru Point/Atibruk	Historic (Iñupiaq)	No Determination	Destroyed
HAR-00027	TLUIHAR038	Kanigluq/Kangiqluk	Historic (Iñupiaq)	Eligible	Threatened
HAR-00029	TLUIHAR089	Ikkalipik	Historic (Iñupiaq)	No Determination	Destroyed
HAR-00045	–	Old Campsite	Historic (Iñupiaq)	No Determination	Partially Destroyed
HAR-00046	–	Leavitt Family Campsite	Historic (Iñupiaq)	No Determination	Partially Destroyed
HAR-00048	–	HAR-00048	Historic (Iñupiaq)	No Determination	Intact
HAR-00049	–	HAR-00049	Historic (Iñupiaq)	No Determination	Intact
HAR-00055	–	Caribou Bone	Modern (Faunal)	No Determination	Destroyed
HAR-00073	–	HAR-00073	Prehistoric (Denbigh, ASTt)	No Determination	Intact
HAR-00080	TLUIHAR030	Niglivik/Niblivik	Historic (Iñupiaq)	No Determination	Intact
HAR-00081	–	Reindeer Corral, Uqalium Kanigana, Uqalik Corral	Historic (Iñupiaq)	No Determination	Intact
HAR-00089	TLUIHAR081	Nappaun (Napaun)	Historic (Iñupiaq)	No Determination	Destroyed
HAR-00090	–	Niglivigauraq Creek 1	Historic (Iñupiaq)	No Determination	Intact
HAR-00091	–	Niglivigauraq Creek 2	Historic (Iñupiaq)	No Determination	Intact
HAR-00098	–	SRBA 2012 C3	Prehistoric	No Determination	Intact
HAR-00100	–	HAR-00100	Prehistoric	No Determination	Intact
HAR-00101	–	HAR-00101	Prehistoric	No Determination	Intact
HAR-00105	–	Drained Lake Blowout	Prehistoric	No Determination	Could not be relocated (2018)
HAR-00106	–	HAR-00106	Prehistoric	No Determination	Intact
HAR-00107	–	HAR-00107	Prehistoric	No Determination	Intact
HAR-00108	–	HAR-00108	Historic, Modern (Iñupiaq)	No Determination	Intact
HAR-00109	–	Sod Feature	Prehistoric	No Determination	Intact
HAR-00110	–	Navy Seismic Camp	Historic (Euroamerican)	No Determination	Intact
HAR-00111	–	Navy Seismic Camp	Historic (Euroamerican)	No Determination	Intact
HAR-00112	–	Akulik	Historic (Iñupiaq)	No Determination	Intact

AHRS No.	TLUI No.	Site Name/Description	Site Type	Determination of NRHP Eligibility	Condition
HAR-00119	–	HAR-00119	Historic (Iñupiaq)	No Determination	Intact
HAR-00120	–	HAR-00120	Historic (Iñupiaq)	No Determination	Intact
HAR-00121	–	Navy Debris	Historic (Euroamerican)	No Determination	Intact
HAR-00151	–	HAR-00151	Historic (Euroamerican)	No Determination	Intact
HAR-00154	–	Katairuaq Grave	Historic (Iñupiaq)	No Determination	Intact
HAR-00156	TLUIHAR082	Nanuq	Historic (Iñupiaq)	No Determination	Intact
HAR-00157	–	Niglivik 2	Historic (Iñupiaq)	No Determination	Intact
HAR-00158	–	Putu	Historic (Iñupiaq)	No Determination	Disturbed
HAR-00167	–	Kayuqtusilik	Historic (Iñupiaq)	No Determination	Intact
HAR-00168	–	Aqsiataaq Inaat	Historic (Iñupiaq)	No Determination	Intact
HAR-00172	–	HAR-00172	Prehistoric	No Determination	Intact
HAR-00173	–	Colville #1 Peat Road	Historic (Euroamerican)	Eligible	Intact
TES-00028	TLUITES222	Kolovik/Qalluvik	Historic (Iñupiaq)	Eligible	Threatened
TES-00032	–	Building 1, Dew Operations Lonely LRRS Dew Line Facilities	Historic (Euroamerican)	Eligible	Destroyed
TES-00033	–	Building 2, Maintenance Shop Lonely LRRS Dew Line Facilities	Historic (Euroamerican)	Eligible	Destroyed
TES-00034	–	Building 12, Supply and Equipment Warehouse Lonely LRRS Dew Line Facilities	Historic (Euroamerican)	Eligible	Destroyed
TES-00035	–	Building 13, Pump Station Lonely LRRS Dew Line Facilities	Historic (Euroamerican)	Eligible	Destroyed
TES-00036	–	Building 15, Pump Station Lonely LRRS Dew Line Facilities	Modern (Euroamerican)	Not Eligible	Destroyed
TES-00037	–	Building 17, Pump Station Lonely LRRS Dew Line Facilities	Modern (Euroamerican)	Not Eligible	Destroyed
TES-00038	–	Building 18, Aircraft Shelter Lonely LRRS Dew Line Facilities	Modern (Euroamerican)	Not Eligible	Destroyed
TES-00039	–	Building 19, Air Freight and Passenger Terminal Lonely LRRS Dew Line Facilities	Modern (Euroamerican)	Not Eligible	Destroyed
TES-00040	–	Building 20, Warehouse Supply and Equipment Building Lonely LRRS Dew Line Facilities	Modern (Euroamerican)	Not Eligible	Destroyed
TES-00041	–	Building 100, Radome Tower Building Lonely LRRS Dew Line Facilities	Modern (Euroamerican)	Not Eligible	Destroyed
TES-00042	–	Building 101, Electric Power Station Lonely LRRS Dew Line Facilities	Modern (Euroamerican)	Not Eligible	Destroyed
TES-00043	–	Gravel Structures Lonely SRRS Road System	Historic (Euroamerican)	Eligible	Partially Destroyed
TES-00044	–	Gravel Structures Lonely SRRS Airfield	Historic (Euroamerican)	Eligible	Intact
TES-00045	–	Gravel Structures Lonely SRRS Gravel Pad System	Historic (Euroamerican)	Eligible	Partially Destroyed
TES-00048	–	POW-1	Historic (Euroamerican)	Eligible	Destroyed
TES-00120	–	Point Lonely Graves	Historic (Iñupiaq)	No Determination	Intact
TES-00121	–	TES-00121	Historic (Iñupiaq)	No Determination	Intact
XBP-00002	–	Oliktok Point	Historic (Euroamerican)	No Determination	Intact
XBP-00033	–	Kuparuk Pingo	Prehistoric (Northern Archaic)	No Determination	Excavated
XBP-00036	TLUIXBP016	Ugrugnavik River	Historic (Iñupiaq)	No Determination	Unconfirmed/ Destroyed

AHRS No.	TLUI No.	Site Name/Description	Site Type	Determination of NRHP Eligibility	Condition
XBP-00037	–	Thetis Pingo	Prehistoric, Historic (Iñupiaq, Euroamerican)	No Determination	Disturbed
XBP-00039	–	Pow-2	Historic (Euroamerican)	Eligible	Intact
XBP-00050	–	Building 1, Civilian Camp Oliktok Dew Line Facilities	Historic (Euroamerican)	Eligible	Intact
XBP-00051	–	Building 2, Vehicle Maintenance Shop Oliktok Dew Line Facilities	Historic (Euroamerican)	Eligible	Intact
XBP-00052	–	Building 3, Aircraft Shelter Oliktok Dew Line Facilities	Historic (Euroamerican)	Eligible	Intact
XBP-00053	–	Building 8, Supply and Equipment Warehouse Oliktok Dew Line Facilities	Historic, Modern (Euroamerican)	Eligible	Intact
XBP-00054	–	Building 17, Fuel Pump Station Oliktok Dew Line Facilities	Historic (Euroamerican)	Eligible	Intact
XBP-00055	–	Building 18, Weather Building Oliktok Dew Line Facilities	Historic (Euroamerican)	Eligible	Intact
XBP-00057	–	Gravel Structures Oliktok LRRS Road System	Historic (Euroamerican)	Eligible	Intact
XBP-00058	–	Gravel Structures Oliktok LRRS Airfield	Historic (Euroamerican)	Eligible	Intact
XBP-00059	–	Gravel Structures Oliktok LRRS Gravel Pad System	Historic (Euroamerican)	Eligible	Intact
XBP-00119	–	Ugnuravik Pingo	Historic (Iñupiaq)	No Determination	Intact
–	TLUIHAR006	Inibruat	Historic (Iñupiaq)	NA	Intact
–	TLUIHAR007	Narvabauraq	Historic (Iñupiaq)	NA	Intact
–	TLUIHAR012	Sikulik Lake	Historic (Iñupiaq)	NA	Intact
–	TLUIHAR015	Savikpaligauram Leitublia	Historic (Iñupiaq)	NA	Intact
–	TLUIHAR017	Ayuvieam Ixuvia	Historic (Iñupiaq)	NA	Intact
–	TLUIHAR023	Ayuviea	Historic (Iñupiaq)	NA	Intact
–	TLUIHAR027	Qitiq	Historic (Iñupiaq)	NA	Intact
–	TLUIHAR031	Niblivigauram Narvafi	Historic (Iñupiaq)	NA	Intact
–	TLUIHAR032	Itivliqpak	Historic (Iñupiaq)	NA	Intact
–	TLUIHAR033	Niblivigauram Narvafa	Historic (Iñupiaq)	NA	Intact
–	TLUIHAR035	Tifmiaqpalik	Historic (Iñupiaq)	NA	Intact
–	TLUIHAR059	Apkugaruk	Historic (Iñupiaq)	NA	Intact
–	TLUIHAR065	Sabviavik	Historic (Iñupiaq)	NA	Intact
–	TLUIHAR066	Anagguvik	Historic (Iñupiaq)	NA	Intact
–	TLUIHAR068	Tiglak	Historic (Iñupiaq)	NA	Intact
–	TLUIHAR069	Putu	Historic (Iñupiaq)	NA	Intact
–	TLUIHAR079	Kayuqtusilik	Historic (Iñupiaq)	NA	Intact
–	TLUIHAR103	Sigiaruk	Historic (Iñupiaq)	NA	Intact
–	TLUITES104	Abnaqsraq	Historic (Iñupiaq)	NA	Intact
–	TLUITES216	Ayagutaq	Historic (Iñupiaq)	NA	Intact
–	TLUITES217	Nalluabruum Paafa	Historic (Iñupiaq)	NA	Intact
–	TLUITES218	Sisamalik	Historic (Iñupiaq)	NA	Intact
–	TLUITES220	Tasibaabruk	Historic (Iñupiaq)	NA	Intact
–	TLUITES221	Afupqan Ieitublia	Historic (Iñupiaq)	NA	Intact
–	TLUITES225	Natibnauraq	Historic (Iñupiaq)	NA	Intact
–	TLUITES226	Kifiefuq	Historic (Iñupiaq)	NA	Intact
–	TLUITES227	Qiruktabiaq	Historic (Iñupiaq)	NA	Intact
–	TLUITES229	Igluqabvialuk	Historic (Iñupiaq)	NA	Intact
–	TLUITES230	Tigutaam Paafa	Historic (Iñupiaq)	NA	Intact
–	TLUITES233	Kuvrabliq	Historic (Iñupiaq)	NA	Intact
–	TLUITES238	Tigutaam Kuufa	Historic (Iñupiaq)	NA	Intact
–	TLUITES244	Tigutaaq	Historic (Iñupiaq)	NA	Intact
–	TLUIXBP013	Sannifaruaq	Historic (Iñupiaq)	NA	Intact
–	TLUIXBP014	Uuliktuq	Historic (Iñupiaq)	No Determination	Partially Destroyed

AHRS No.	TLUI No.	Site Name/Description	Site Type	Determination of NRHP Eligibility	Condition
–	TLUIXBP015	Ufurabvik	Historic (Iñupiaq)	NA	Intact
HAR-00032	–	Pa, D306t	Paleontological	NA	Intact
HAR-00033	–	Pa, 34571 Observation Point (Blm Ak-83-V)	Paleontological	NA	Intact
HAR-00034	–	Pa, Ocean Point	Paleontological	NA	Intact
HAR-00035	–	Pa, Ocean Point	Paleontological	NA	Intact
HAR-00036	–	Pa, D306, Loc. 1	Paleontological	NA	Intact
HAR-00038	–	PA, Carter Et Al. 1978 Site A	Paleontological	NA	Intact
HAR-00040	–	Pa, 7	Paleontological	NA	Intact
HAR-00057	–	Pa, Mammoth Femur Sticking Vertically from Ground	Paleontological	NA	Excavated
HAR-00060	–	Pa, Old Bone Beach	Paleontological	NA	Intact
HAR-00061	–	Pa, Liscomb Bed	Paleontological	NA	Intact
HAR-00067	–	HAR-00067	Paleontological	NA	Excavated
HAR-00075	–	Metatarsal Bar	Paleontological	NA	Disturbed
HAR-00170	–	Mammoth Bone	Paleontological	NA	Destroyed
TES-00029	–	Pa, 2	Paleontological	NA	Intact
TES-00030	–	Pa, 6	Paleontological	NA	Intact

Note: – (no data); AHRS (Alaska Heritage Resources Survey); NA (not applicable); NRHP (National Registry of Historic Places); TLUI (Traditional Land Use Inventory).

The AHRS sites nearest to any Project components occur near Module Delivery Options 2 and 3. Module Delivery Option 2 would use the existing gravel infrastructure at Point Lonely to stage modules prior to transport via ice road to the Project area. The gravel infrastructure at Point Lonely consists of three intact, or largely intact, sites (TES-00043, TES-00044, and TES-00045) all of which were determined eligible for NRHP listing prior to remediation activities at the site. Impacts to these gravel pads from staging and transport of the Project modules is unlikely as these activities would occur in winter and primarily over land-based ice road. The gravel pads will not be modified and their proposed use (for staging and transport purposes) is consistent with their historical function. Additionally, one AHRS site (TES-00120) is located on the tundra within the larger Dew Line site area (TES-00048) but outside of the existing gravel infrastructure areas. Should Module Delivery Option 2 be selected, this site would be avoided.

The nearest site to Module Delivery Option 3 gravel road components is the Kuparuk Pingo site (XBP-00033), which was excavated by Lobdell (Lobdell 1986) and revisited by Reanier (Reanier 2013). Any road improvements undertaken for module transport will not impact this site as it is separated from the road by a lake. The nearest AHRS site to the Option 3 ice road route is HAR-00073, a Denbigh Flint Complex site roughly 750 feet south of the proposed ice road route (Reanier 2020). The proposed location for the Option 3 ice bridge across the Colville River is roughly 0.5 miles downriver (south and east) of the last outcrops of the Prince Creek Formation, a well-documented site that still produces paleontological materials (Druckenmiller 2009, 2010; P. Druckenmiller, Paleontologist (UAF), personal communication to C. Kennedy (DOWL), January 31, 2020). All other known sites are distant from proposed Project infrastructure.

The Proponent conducted surveys to identify cultural resources in the Project area in 2018, 2019, and 2021 (Reanier 2018, 2019b, 2019c, 2020, 2022a). To date, the Proponent has surveyed 100% of proposed terrestrial gravel infrastructure and approximately 90% of proposed ice road alignments. In addition, the cultural resources analysis area has been examined repeatedly for cultural resources due to nearby oil and gas development projects and academic studies since 1980 (Hemmeter, Teese et al. 2019; Lobdell 1981, 1982, 1985, 1988, 1991, 1993, 1996, 1998a, 1998b, 1999; Lobdell and Lobdell 1999; Mobley & Associates 2016; Reanier 2003, 2004, 2008, 2013, 2014, 2019a; SRB&A 2018).[2] Collectively, the Proponent's and others' surveys have covered 100% of the direct Project footprint, including proposed ice road alignments. Figure F.1.1 depicts aerial and/or ground surveys conducted within the analysis area.

[2] This list is not exhaustive.

1.4 Findings*

The Project would not likely result in direct or indirect impacts to historic properties or paleontological resources. BLM permit requirements ensure that a cultural resources survey would be undertaken, and cultural resources avoided; NSB requires TLUI clearance before issuance of permits; and the Proponent's voluntary avoidance measures and operating procedures (provided in Appendix I.1, *Avoidance, Minimization, and Mitigation*) are also intended to protect cultural resources. The coverage and results of Project surveys and previous surveys indicate that previously undocumented cultural resources are unlikely to exist in the analysis area (Figure F.1.1).

Table F.1.2 summarizes the applicable NPR-A IAP lease stipulations (LS) and required operating procedures (ROPs) that would apply to Project actions on BLM-managed lands and are intended to mitigate impacts to cultural resources from development activity (BLM 2022). The LS and ROPs would reduce impacts to cultural resources associated with the construction, drilling, and operation of oil and gas facilities. In 2021, BLM was directed to re-evaluate the 2020 NPR-A IAP (BLM 2020a). The NPR-A IAP re-evaluation resulted in the issuance of a new NPR-A IAP Record of Decision (ROD) (BLM 2022). Full text of the requirements is provided in BLM (2022).

Table F.1.2. Summary of Applicable Lease Stipulations and Required Operating Procedures Intended to Mitigate Impacts to Cultural Resources*

LS or ROP	Description or Objective	Requirement/Standard
ROP C-2	Protect stream banks, minimize compaction of soils, and minimize the breakage, abrasion, compaction, or displacement of vegetation.	a. Ground operations shall be allowed only when frost and snow cover are sufficient to protect the tundra. Ground operations shall cease when the spring snowmelt begins (approximately May 15); the exact dates will be determined by the AO. b. Low-ground-pressure vehicles shall be used for on-the-ground activities off ice roads or pads. c. Bulldozing of tundra mat and vegetation, trails, or seismic lines is prohibited. d. To reduce the possibility of ruts, vehicles shall avoid using the same trails for multiple trips unless necessitated by serious safety or superseding environmental concern. e. The location of ice roads shall be designed and located to minimize compaction of soils and the breakage, abrasion, compaction, or displacement of vegetation. Offsets may be required to avoid using the same route or track in the subsequent year. f. Motorized ground-vehicle use within the Colville River Special Area associated with overland moves, seismic work, and any similar use of heavy equipment shall be minimized within an area that extends 1 mile west or northwest of the bluffs of the Colville River.
ROP E-13	Protect cultural and paleontological resources.	Lessees shall conduct a cultural and paleontological resources survey prior to any ground-disturbing activity. Upon finding any potential cultural or paleontological resource, the lessee shall notify the AO and suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the AO.

LS or ROP	Description or Objective	Requirement/Standard
ROP I-1	Minimize cultural and resource conflicts.	All personnel shall be provided information concerning applicable stipulations, ROPs, standards, and specific types of environmental, social, traditional, and cultural concerns that relate to the region. All personnel involved in permitted activities shall attend an orientation program at least once a year and the orientation program should: a. Provide sufficient detail to notify personnel of applicable stipulations and ROPs, as well as specific types of environmental, social, and traditional and cultural concerns that relate to the region. b. Address the importance of not disturbing archaeological and biological resources and habitats, and provide guidance on how to avoid disturbance. c. Include guidance on the preparation, production, and distribution of information cards on endangered and/or threatened species. d. Be designed to increase sensitivity and understanding of local community values, customs, and lifestyles. e. Include information concerning avoidance of conflicts with subsistence, commercial fishing activities, and pertinent mitigation. f. Include information for aircraft personnel concerning subsistence activities and areas/seasons that are particularly sensitive to disturbance by low-flying aircraft. g. Provide that individual training is transferable from one facility to another except for elements of the training specific to a particular site. h. Include on-site records of all personnel who attend the program for so long as the site is active. i. Include a module discussing bear interaction plans to minimize conflicts between bears and humans. j. Provide a copy of 43 CFR 3163 regarding Non-Compliance Assessment and Penalties to on-site personnel. k. Include training designed to ensure strict compliance with local and corporate drug and alcohol policies. l. Include training developed to train employees on how to prevent transmission of communicable diseases, including sexually transmitted diseases, to the local communities.
LS K-1	*River Setbacks* Minimize the disruption of natural flow patterns and changes to water quality; the disruption of natural functions resulting from the loss or change to vegetative and physical characteristics of floodplain and riparian areas; the loss of spawning, rearing or over-wintering habitat for fish; the loss of cultural and paleontological resources; the loss of raptor habitat; impacts to subsistence cabin and campsites; the disruption of subsistence activities; and impacts to scenic and other resource values.	*River Setbacks* Permanent oil and gas facilities, including gravel pads, roads, and pipelines, are prohibited in the streambed and adjacent to the rivers listed below. On a case-by case basis, essential pipeline and road crossings will be permitted through setback areas. a. Colville River: A 2-mile setback from the boundary of NPR-A where the river determines the boundary along the Colville where BLM-manages both sides of the river up through T5S, R30W, U.M. Above that point to the juncture of Thunder and Storm creeks, the setback is 0.5 mile. b. Fish (Uvlutuuq) Creek: A 3-mile setback from the creek downstream from the eastern edge of section 31, T11N, R1E., U.M. and a 0.5-mile setback farther upstream. c. Judy (Kayyaaq) Creek: A 0.5-mile setback. d. Ublutuoch (Tiŋmiaqsiuġvik) River: a 0.5-mile setback.

Source: BLM 2022
Note: AO (authorized officer); BLM (Bureau of Land Management); LS (lease stipulation); NPR-A (National Petroleum Reserve in Alaska); ROP (required operating procedure).

All action alternatives would require deviations from existing LS K-1 because they would include road and pipeline crossings of one or more of the waterbodies protected in the LS. These deviations would not result in adverse impacts to cultural resources.

Areas of traditional subsistence land use are a critical cultural element in the Project area and are addressed in Section 3.16, *Subsistence and Sociocultural Systems*, of this Supplemental EIS. TLUI clearance is required by NSB to ensure avoidance of sensitive Alaska Native cultural sites before issuing a Development Permit or Administrative Approval, and the Proponent must seek TLUI clearance before receiving a permit from NSB. Potentially undocumented places that are significant to North Slope heritage but lack definitive expressions of land use are best identified and assessed through consultation with local and regional tribal and municipal governments and Alaska Native corporations, as well as other community members. BLM's efforts thus far to consult with these entities within Nuiqsut and the NSB under NEPA and Section 106 have not resulted in expressed concerns for impacts to specific cultural resources within the Project area.

No cultural resources have been identified within the Project footprint. The Proponent would opt to route all Project components at least 500 feet from all recorded cultural sites and would avoid the Prince Creek Formation when constructing the ice road crossing of the Colville River near Ocean Point. To ensure appropriate treatment of inadvertent discoveries, the Proponent would maintain a Fossil and Artifact Finds Standard Operating Procedure.

Cultural resources and paleontological resources outside the Project footprint would also be unlikely to be impacted by the proposed undertaking. Of the 13 cultural sites located within 2.5 miles of permanent Willow Project infrastructure (HAR-00005, HAR-00048, HAR-00049, HAR-00105, HAR-00109, HAR-00110, HAR-00112, HAR-00119, HAR-00120, HAR-00121, HAR-00151, TES-00120, and TES-00121), only one is located within one mile (TES-00120). This site is located amidst the disturbed former Dew Line site (TES-00048) and will be avoided, should Module delivery Option 2 be selected for the Project in BLM's ROD. While it is possible that the proposed permanent Project infrastructure may result in some perceptible visual, audible, or olfactory change within any of these 13 sites' settings for the life of the Project, such changes are expected to be minimal and negligible considering the following

1. The distances separating these sites from proposed permanent infrastructure
2. The narrow fields of view in which infrastructure could be visible from each site
3. The nature of the site themselves, which are limited to collapsed structures and debris scatters

Any visual, audible, or olfactory changes would be minimal and would unlikely affect the character of how and why these properties are situated in relation to their surrounding environments. Therefore, it is unlikely that the Project would substantially alter these settings in ways that would alter their NRHP eligibility or result in adverse effects.

Access to Project infrastructure would be controlled and would not be accessible to members of the public, and ConocoPhillips Alaska, Inc. staff would undergo cultural awareness training before deployment; this training would inform personnel on how to identify archaeological materials, thereby reducing the risk of inadvertent disturbance of culturally significant sites. Although increased access to cultural resources has been documented to correlate strongly with increased instances of vandalism and looting of cultural resources sites (Hedquist, Ellison et al. 2014; Spangler, Arnold et al. 2006), these impacts would be improbable due to conditions specific to the Project area and timeline. Ice roads and pads would only be used during winter construction seasons. Therefore, unsurveyed portions of the area of potential effect situated within 2.5 miles of the proposed ice road routes (as shown in Figure F.1.1) would be unlikely to be affected due the timing of ice road construction and use. Access to cultural resources areas in the summer months, while possible, is complicated by the surrounding terrain. Off-road travel in the Project area during summer months is suboptimal by foot or vehicle, given that the tundra during this season is uneven, frequently inundated, and spongy.

1.4.1 Cumulative Effects

Section 3.19, *Cumulative Effects*, of this Supplemental EIS addresses the potential for Project impacts to accumulate with those associated with past, present, and RFFAs, and what those effects might be. While increasing oil and gas and transportation projects relating to the Project can potentially adversely affect historic properties, the majority of lands or coastal regions on or along the North Slope are managed or owned by either Federal agencies or the State of Alaska. Future activities connected to the Project within Federally managed areas or on State of Alaska lands would be subject to Section 106 of the NHPA or the Alaska Historic Preservation Act, respectively. Similarly, any future actions connected to the Project that occur outside state of Federal lands, but with a federal nexus (including rights-of-way) would be subject to Section 106 of the NHPA. Therefore, RFFAs resulting from the Project are not expected to result in cumulative effects to historic properties, cultural resources, or paleontological sites.

Climate change associated with the cumulative effects of past, present, and future oil and gas development could adversely affect cultural and paleontological resources. However, the potential climate change impacts are not expected to be universal or predictable across the analysis area as a myriad of factors influence the degree to which climate change can affect a specific location, region, habitat, or ecosystem. Some locales may be substantially affected, while others may not be affected at all (BLM 2012). According to the Willow MDP Supplemental EIS evaluation of cumulative impacts to soils and permafrost (Section 3.19.6, *Cumulative Impacts to Soils, Permafrost, and Gravel Resources*), the Project would have effects on soils and permafrost like those of past and present actions and would contribute to the cumulative effects of past, present, and RFFAs. However, given the scope of the Project considered in context of past, present, and RFFAs, the Project would not change the cumulative impacts on soils or permafrost in the analysis area. Therefore, while the Project is expected to contribute to cumulative effects to soils and permafrost overall, it is not currently possible to predict where impacts from the Project would occur, to what extent they would occur, or if those effects would adversely affect historic properties.

Module Transfer Island
Point Lonely
Option 2 Multi-Season Ice Pad
Harrison Bay
Teshekpuk Lake
Module Transfer Island
Atigaru Point
Option 1 Multi-Season Ice Pad
Option 2 Multi-Season Ice Pad
Option 1 Multi-Season Ice Pad
Oliktok Dock
Oliktok Point
Mine Site E
CD3
KUPARUK
ALPINE
CD2
CD1
CD5
CD4N
Colville River
Mine Site F
CPF2
Mine Site C
Alt B, C, D BT4
Kalikpik River
Tiŋmiaqsiuġvik Boat Ramp Alt B, C, D, and E
Alt E BT2
Fish Creek Boat Ramp Alt B and E
Alt B, C, D BT2
GMT-1
Gravel Mine Site
NUIQSUT
Horizontal Directional Drilling Pads
Fish (Uvluttuq) Creek
Options 1 and 2 Multi-Season Ice Pad
BT1
GMT-2
Judy (Kayyaaq) Creek
Fish Creek Boat Ramp Alt B and E
Judy (Iqalliaq) Creek
BT3
Ocean Point
DS2P
Alt E BT5
Alt B, C, D BT5
Uplutuoch (Tiŋmiaqsiuġvik) River
0 5 10 Miles

Cultural Survey
- Analysis Area
- CulturalSurveyAreas 2020-21
- CPAI Survey 2004 - 2019
- Other Survey 2012 - 2019
- AHRS Survey **

Willow Proposed Development Features
- Drill Site (Not to Scale)
- Ice Road
- New Pipeline Existing VSM
- New Pipeline New VSM
- Option 3 Existing Road
- Gravel Footprint

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation
- National Petroleum Reserve in Alaska

Note:
**Specific geographic information system (GIS) data not available for these surveys.

Data Sources:
Document Repository, AHRS

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.



Figure F.1.1

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Willow Master Development Plan

Appendix G
Alaska National Interest Lands Conservation Act Section 810 Analysis

June 2022

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List of Acronyms and Abbreviations

ANILCA	Alaska National Interest Lands Conservation Act
ATV	all-terrain vehicle
BLM	Bureau of Land Management
BOEM	Bureau of Ocean Energy Management
BT1	Bear Tooth drill site 1
BT2	Bear Tooth drill site 2
BT3	Bear Tooth drill site 3
BT4	Bear Tooth drill site 4
BT5	Bear Tooth drill site 5
BTU	Bear Tooth Unit
CAA	Conflict Avoidance Agreement
CAH	Central Arctic Caribou Herd
CPAI	ConocoPhillips Alaska, Inc.
CRD	Colville River Delta
DS2P	Kuparuk drill site 2P
EIS	Environmental Impact Statement
FLPMA	Federal Land Policy and Management Act
GMT	Greater Mooses Tooth
GMT-1	Greater Mooses Tooth 1
GMT-2	Greater Mooses Tooth 2
GMU	Game Management Unit
IAP/EIS	Integrated Activity Plan/Environmental Impact Statement
Kuukpik	Kuukpik Corporation
MTI	module transfer island
NEPA	National Environmental Policy Act
NPR-A	National Petroleum Reserve in Alaska
NPRPA	Naval Petroleum Reserves Production Act
Project	Willow MDP Project
ROD	Record of Decision

ROP	required operating procedures
SDEIS	Supplement to the Draft EIS
TCH	Teshekpuk Caribou Herd
WAH	Western Arctic Herd
Willow MDP	Willow Master Development Plan
WOC	Willow Operations Center
WPF	Willow Processing Facility

Note to Readers

To assist readers in identifying new information in this Supplemental EIS, new or substantially revised text is highlighted in light yellow (as shown in this paragraph). Substantial revisions include changes to the text or underlying data that have changed the analysis or analysis conclusion. All sections that are new or include significant or substantial revisions include an asterisk ("*") at the end of the section header; all new or substantially revised tables and figures also include an asterisk at the end of the table or figure caption.

ALASKA NATIONAL INTEREST LANDS CONSERVATION ACT SECTION 810 ANALYSIS OF SUBSISTENCE IMPACTS*

This analysis of subsistence impacts is for the Willow Master Development Plan (Willow MDP) Supplemental Environmental Impact Statement (EIS). ConocoPhillips Alaska, Inc. (CPAI) is seeking approval to develop and produce oil from leases in the Bear Tooth Unit (BTU) of the National Petroleum Reserve in Alaska (NPR-A) via four or five drill sites and pipelines that would connect to the Greater Mooses Tooth 2 (GMT-2) development and existing Alpine development facilities in the Colville River Delta (CRD). The Project would include its own processing facility, an operations center, ice and gravel roads, and either one or two airstrips depending on the selected alternative. The Project would be located on the North Slope of Alaska in the northeast section of the NPR-A, west of the Colville River, CRD, and the community of Nuiqsut; however, module delivery facilities and related ice roads would also be located to the east and south of Nuiqsut, including a crossing of the Colville River. The original Willow MDP EIS was finalized in August 2020. This Supplemental EIS was prepared in response to the United States District Court of Alaska's 2021 decision remanding the Willow MDP EIS to the Bureau of Land Management (BLM) for the purpose of addressing National Environmental Policy Act (NEPA) deficiencies. A key revision of the Supplemental EIS was the addition of a fourth action alternative (Alternative E), which reduces infrastructure within the Teshekpuk Lake Special Area (TLSA) relative to the previously analyzed action alternatives.

The proposed Project drill sites and the majority of operational infrastructure would be located on federal lands in the NPR-A managed by the BLM. Some supporting infrastructure (e.g., portions of the gravel access road, temporary ice roads, and pipelines) would be located on lands owned by the Kuukpik Corporation (Kuukpik) and the State of Alaska. Conveyed and selected Native (Kuukpik) lands would include portions of Project pipelines, roads, and Colville River pipeline crossing pads. State of Alaska lands would include portions of Project pipelines. Three of the four Willow MDP Supplemental EIS alternatives analyzed include a gravel road connection from the GMT-2 drill site to the Project area. All of the action alternatives include a pipeline that would connect Project drill sites to existing pipeline infrastructure to the east.

The Willow MDP Supplemental EIS considers four alternatives and three module delivery options, in addition to a No Action Alternative (Alternative A). While the Willow MDP Supplemental EIS analysis provides an evaluation for the four Willow MDP EIS action alternatives and three module delivery options separately, any final subsistence determinations should consider the implementation of alternatives in combination with each of the module delivery options because one of the three options would occur under any action alternative. The four Willow MDP action alternatives include the Proponent's Project (Alternative B), which includes a gravel access road connecting the Project to the existing GMT-2 and Alpine developments; Disconnected Infield Roads (Alternative C), which reduces the gravel footprint but maintains a year-round gravel road connection to the existing GMT-2 and Alpine developments; Disconnected Access (Alternative D), which does not include a year-round gravel access road connection to the existing GMT-2 and Alpine developments; and Three-Pad Alternative (Alternative E), which eliminates drill site BT4 and moves drill site BT2 north. The three module delivery option alternatives include the Atigaru Point Module Transfer Island (MTI) (Option 1); the Point Lonely Module Transfer Island (Option 2); and the Colville River Crossing (Option 3). Each of these options would construct ice road connections to the Project area, and two of the options (Options 1 and 2) would construct a man-made island to support gravel hauling and module transport. Either MTI would be located in State of Alaska waters, while other associated infrastructure (e.g., ice roads, ice pads) would be located on federal lands in the NPR-A.

Chapter 3.0, *Affected Environment and Environmental Consequences*, of the Willow MDP Supplemental EIS describes the current environmental status of the Project area and potential effects of the alternative development scenarios to the physical, biological, and social environment. In particular, Section 3.16, *Subsistence and Sociocultural Systems*, addresses the affected environment and environmental

consequences for subsistence, traditional use, and sociocultural systems. Other relevant sections include Section 3.10, *Fish*; Section 3.11, *Birds*; Section 3.12, *Terrestrial Mammals*; Section 3.13, *Marine Mammals*; and Section 3.18, *Public Health*. This analysis uses that information to evaluate potential impacts to subsistence uses and needs pursuant to Section 810(a) of the Alaska National Interest Lands Conservation Act (ANILCA). This analysis is organized to inform BLM's findings of significance based on the factors listed below (Section A). While the Willow MDP Supplemental EIS provides both a description of the affected environment and an analysis of the environmental consequences of the Project, this document provides an evaluation of the potential impacts of the Project on subsistence uses and needs, followed by BLM's findings of significance for each Project alternative and the cumulative case.

A. SUBSISTENCE EVALUATION FACTORS*

Section 810(a) of ANILCA, 16 USC 3120(a), requires that an evaluation of subsistence uses and needs must be completed for any federal determination to "withdraw, reserve, lease, or otherwise permit the use, occupancy or disposition of public lands." All of the Project's proposed drill sites, Willow Processing Facility (WPF), Willow Operations Center (WOC), gravel roads, air strip(s), and sections of associated pipelines and ice roads would be located on BLM-managed public lands under all action alternatives. Thus, an evaluation of potential impacts to subsistence under ANILCA Section 810(a) must be completed for the Willow MDP EIS. All impacts to subsistence uses and needs are evaluated herein regardless of land status.

ANILCA requires that this evaluation include findings on three specific issues:

1. The effect of use, occupancy, or disposition on subsistence uses and needs.
2. The availability of other lands for the purposes sought to be achieved.
3. Other alternatives that would reduce or eliminate the use, occupancy, or disposition of public lands needed for subsistence purposes (16 USC Section 3120(a)).

In this analysis, four factors are considered when determining if a significant restriction of subsistence uses and needs may result from the proposed action and alternatives, or in the cumulative case:

1. A reduction in the abundance of harvestable resources.
2. A reduction in the availability of resources used for subsistence purposes caused by alteration in their distribution, migration, or location.
3. A limitation on the access of subsistence users to harvestable resources.
4. An increase in competition from non-federally qualified users, resulting in a disruption to the continuation of subsistence uses.

Willow MDP Supplemental EIS Section 3.16.1, *Affected Environment*, and Appendix E.16, *Subsistence and Sociocultural Systems Technical Appendix*, provide information on areas and resources important for subsistence use, and the degree of dependence of Nuiqsut and Utqiaġvik (Barrow) on different subsistence populations. The Willow MDP Supplemental EIS Section 3.16.2, *Environmental Consequences*, provides data on subsistence resource availability and limitations that each action alternative would place on access and is used to determine whether the action alternatives may cause a significant restriction to subsistence uses.

A finding that the proposed action may significantly restrict subsistence uses imposes requirements to notify the State of Alaska and appropriate regional and local subsistence committees, hold hearings in affected communities, and make the following determinations before BLM can authorize the use of public lands:

- Such a significant restriction of subsistence uses is necessary and consistent with sound management principles for the use of the public lands.
- The proposed activity would involve the minimal amount of public lands necessary to accomplish the purposes of the use, occupancy, or other disposition.
- Reasonable steps would be taken to minimize adverse effects upon subsistence uses and resources resulting from such actions (16 USC 3120(a)).

A proposed action or alternative would be considered to significantly restrict subsistence uses if, after consideration of stipulations or protection measures (e.g., lease stipulations and required operating procedures [ROPs]) included as a part of each alternative, it can be expected to result in a substantial reduction in the opportunity to continue subsistence uses of renewable resources. Substantial reductions in the opportunity to continue subsistence uses generally are caused by large reductions in resource abundance, a major redistribution of resources, extensive interference with access, or major increases in the use of those resources by non-subsistence users.

When analyzing the effects of Project alternatives, particular attention is paid to Nuiqsut, the community that has the potential to be most directly impacted by the Project. Nuiqsut is located on the Niġliq Channel of the Colville River, and the Project area lies within a substantial portion of the community's subsistence use area (Willow MDP Supplemental EIS Section 3.16, *Subsistence and Sociocultural Systems*, Figure 3.16.1). Additionally, the analysis considers potential effects to Utqiaġvik because the Project would be in the eastern portion of the community's subsistence use area and some components would be close to Teshekpuk Lake, a key traditional use area for the community. The cumulative analysis expands the evaluation of potential impacts to consider areas beyond the Project area in which past activities have impacted North Slope subsistence uses, in which current activities are impacting North Slope subsistence uses, or in which future activities could occur that could impact Nuiqsut, Utqiaġvik, or other North Slope communities' subsistence uses or the subsistence resources that rely upon the habitats affected.

In addition to ANILCA, Environmental Justice, as defined in Executive Order 12898, also calls for an analysis of the effects of federal actions on minority populations with regard to subsistence. Specifically, Environmental Justice is:

> *The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including a racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies.*

Section 4-4 of the Executive Order on Environmental Justice, regarding the Subsistence Consumption of Fish and Wildlife, requires federal agencies to collect, maintain, and analyze information on the consumption patterns of populations who principally rely on fish or wildlife for subsistence, and to communicate to the public any risks associated with those consumption patterns. To this end, the action alternatives subsistence analyses, located in Section 3.16 of the Willow MDP Supplemental EIS, have been reviewed and found to comply with Executive Order 12898.

B. ANILCA SECTION 810(A) EVALUATIONS AND FINDINGS FOR ALL ALTERNATIVES AND THE CUMULATIVE CASE

Evaluations and findings for Alternatives A, B, C, D, and E, module delivery Options 1, 2, and 3, and the cumulative case are presented individually in the following sections. ROPs established by the 2022 NPR-A Integrated Activity Plan/Environmental Impact Statement (IAP/EIS) Record of Decision (ROD) (BLM 2022) would apply to all Project alternatives. CPAI's leases in the BTU are subject to lease stipulations established in the 2008 Northeast NPR-A Supplemental IAP ROD (BLM 2008). The mitigating effects of these ROPs and lease stipulations are accounted for in the following evaluations and findings.

1. Evaluation and Finding for Alternative A (No Action)

The No Action Alternative of the Willow MDP EIS precludes the currently proposed development in the BTU, and no oil from the BTU field would be produced. Under this alternative, no new roads, airstrips, pipelines, or other oil and gas facilities would be constructed pursuant to CPAI's proposal for development in the BTU.

Activities that are currently allowed pursuant to the 2022 NPR-A IAP/EIS ROD would continue. These activities include seismic exploration, exploratory drilling of test wells, and the construction of ice roads and pads to support these operations.

a. Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs

No additional impacts to subsistence uses and needs would be expected under the No Action Alternative. Impacts in the Project area would be expected from those actions associated with scientific research during the summer and oil and gas exploration during the winter. Numerous studies are conducted on a year-round basis on the North Slope. Aerial surveys are conducted by fixed-wing aircraft or helicopter, and ground surveys are conducted on foot, snow machine, or by all-terrain vehicle (ATV); these activities have the potential to disturb wildlife. However, the effects of these activities on species used by subsistence users are expected to be local and short-term and would have no regional population effects.

b. Evaluation of the Availability of Other Lands for the Purpose Sought to be Achieved

The evaluation for Willow MDP EIS Alternative A (No Action) regarding the availability of other lands is not applicable because Alternative A does not propose the disposition or use of public lands.

c. Evaluation of Other Alternatives that would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

Alternative A (No Action) would not eliminate the use of public lands needed for subsistence purposes. However, Alternative A does not meet the purpose of the proposed action to produce oil discovered on CPAI's BTU leases. The Willow MDP Supplemental EIS Appendix D.1, *Alternatives Development*, Section 3.5.3 (*Alternative Components Considered but Eliminated from Further Analysis*) discusses other alternatives that were considered but eliminated from detailed analysis due to economic or technological feasibility or practicability, or because they did not meet the purpose of the proposed action. Alternative A is included in the analysis for baseline comparison, but BLM does not have the authority to select this alternative because CPAI's leases are valid and provide the right to develop the oil and gas resources therein.

d. Findings

The effects of the No Action Alternative fall below the level of possibly significantly restricting subsistence uses and needs. The impacts to subsistence resources and access discussed above would be minimal. This finding applies to the entire Project study area.

2. Evaluation and Finding for Alternative B (Proponent's Project)

Development of oil reserves in the BTU would occur under Alternative B, the Proponent's Project. Infrastructure would include five drill sites (BT1, BT2, BT3, BT4, and BT5), WPF, WOC, an all-season gravel road connection extending from the GMT-2 drill site southwest to the WPF, an airstrip, infield and export pipelines, gravel roads (including eight turnouts with subsistence/tundra access ramps and seven associated bridges) connecting the five drill sites to the WPF, and a water source access road near BT5. Gravel roads would cross both the Judy (Iqalliqpik and Kayyaaq) and Fish (Uvlutuuq) creeks.

The Proponent would also construct up to three boat ramps for subsistence uses. One of the boat ramps, common to all action alternatives, would provide access to the Ublutuoch (Tiŋmiaqsiuġvik) River along the existing gravel road between Alpine CD5 and Greater Mooses Tooth 1 (GMT-1). Up to two additional boat ramps would be constructed along Judy (Iqalliqpik) Creek and/or Fish (Uvlutuuq) Creek pending further community input (and the selected alternative). All three boat ramps would be accessed via short roads connected to Project roads near Project bridges. During construction, the Project would also develop the Tiŋmiaqsiuġvik gravel mine site (with two distinct mine pits), a module delivery option (see Sections B.5, *Evaluation and Findings for Module Delivery Option 1: Atigaru Point Module Transfer Island;* B.6, *Evaluation and Findings for Module Delivery Option 2: Point Lonely Module Transfer Island; and Option 3: Colville River Crossing*), and associated ice roads for gravel haul and/or module transport. All action alternatives would use Oliktok Dock for the delivery of Project materials.

In the Willow MDP Supplemental EIS, BLM analyzed potential direct impacts on subsistence based on a 2.5-mile buffer of permanent and temporary (e.g., ice roads) infrastructure associated with Alternatives B, C, D, and E, in addition to the gravel mine site, ice roads, and Oliktok Dock (Figure 1). Because the 2.5-mile buffer of the first three action alternatives is nearly identical, it was not necessary to provide a separate analysis area for each action alternative. The Alternative E 2.5-mile buffer yielded slightly different results in the subsistence analysis for one subsistence resource, and those results were provided separately. Thus, while the footprint of development infrastructure and activity is similar under all action alternatives, differences in infrastructure design, infrastructure placement, and operational details determine how and to what level subsistence uses would be affected. These differences are discussed qualitatively. The alternatives analysis area includes both permanent infrastructure and temporary infrastructure (e.g., ice roads, ice pads) that would only be present during the construction phase. The difference in impacts between the construction and operations phases are discussed qualitatively. In addition, the alternatives analysis area does not include upgrades to infrastructure or new infrastructure that would occur within the footprint of existing development areas (e.g., new pipelines that would colocate with existing pipelines and roads east of GMT-2), nor does it include all areas where development-related activity, such as air traffic, would occur. These indirect effects are discussed where applicable. While each action alternative would also include a module delivery option and associated ice roads because there is more than one module delivery option, the three options and associated ice infrastructure are analyzed separately using a separate 2.5-mile buffer (Sections B.5, B.6, and B.7).

The alternatives analysis area allows for more detailed analysis of the area where subsistence users are most likely to experience direct impacts from the Project. Additional direct and indirect impacts that would occur outside the alternatives analysis area are also addressed. In addition to the alternatives analysis area, a direct effects analysis area, which is defined as a 2.5-mile buffer around all action alternatives and module delivery options, is used in the Willow MDP Supplemental EIS Subsistence Appendix (Appendix E.16) to characterize the nature of subsistence uses, including timing and transportation methods, within the area of potential direct effects.

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Atigaru Point
Harrison Bay
Oliktok Dock
CD3
ALPINE
CD2
CD1
CD5
CD4N
Alt B, C, D BT4
Alt E BT2
BT2
Kalikpik River
Fish (Uvlutuuq) Creek
Lake M0233
Fish (Uvlutuuq) Creek
BT1
Lake L9911
GMT-1
GMT-2
Ubluuoch (Tiŋmiaqsiuġvik) River
Tiŋmiaqsiuġvik Gravel Mine
NUIQSUT
ASRC Gravel Mine Site
Colville River
Lake M0015
Lake R0064
Judy (Iqalliqpik) Creek
BT3
Alt E BT5
Alt B, C, D BT5
Ocean Point
DS2P
0
5
10 Miles

Willow Proposed Development Features
- Alternatives Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation
- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

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Figure 1

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a. Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs

The Willow MDP alternatives analysis area (Figure 1) lies within areas heavily used by Nuiqsut residents for subsistence (Figure 2), particularly for harvesting of caribou and furbearers (wolf and wolverine) with some goose hunting and limited moose and eider hunting also occurring within the alternatives analysis area. The Oliktok Dock portion of the alternatives analysis area overlaps with Nuiqsut offshore seal and eider use areas in addition to coastal caribou hunting areas. The alternatives analysis area lies within the eastern periphery of Utqiaġvik subsistence use areas for wolf, wolverine, and caribou (Figure 3). During interviews with Nuiqsut active harvesters for the 1995 through 2006 time period, 91% of harvesters reported using the alternatives analysis area for Alternatives B through D, with wolf, wolverine, and caribou being the primary targeted resources (Table 3.16.5 in the Willow MDP Supplemental EIS Section 3.16.2.3, *Alternative B: Proponent's Project*). Based on annual data for the Nuiqsut Caribou Subsistence Monitoring Project for the 2008 through 2019 time period, use of the alternatives analysis area for caribou hunting on an annual basis appears somewhat lower (between 35% and 72% of harvesters during individual study years, Table 3.16.6 in the Willow MDP Supplemental EIS Section 3.16.2.3). The percent of total caribou harvests occurring within the alternatives analysis area throughout 12 years of the Nuiqsut Caribou Subsistence Monitoring Project has ranged from 6% to 21%, with the last two study years (2018 and 2019) being on the high end at 21% and 17%, respectively. The area just east of the alternatives analysis area (defined as the area "West of Nuiqsut" in the Nuiqsut Subsistence Caribou Monitoring Project) shows even greater harvests, ranging from 14% to 65%. Recent years show an increase in harvests coming from this area (SRB&A 2021). Twelve percent of Utqiaġvik harvesters reported using the alternatives analysis area, primarily for wolf and wolverine, during the 1997 through 2006 time period.

For Nuiqsut, caribou is a resource of major importance, both culturally and as a food source, and the alternatives analysis area includes lands that are highly used for caribou hunting or lands that are directly west of areas highly used for caribou hunting (Figures 4 through 7). While furbearers generally are not a food source for the community, furbearer hunting and trapping has cultural value as it is a specialized activity, among highly active harvesters, which contributes to the local economy and provides materials for Native crafts and clothing. The alternatives analysis area is heavily used by furbearer hunters in Nuiqsut (Figures 8 and 9).

Thus, impacts to both caribou and furbearer resources are considered in this ANILCA Section 810 evaluation, in addition to indirect and cumulative impacts to other harvesting activities, such as fishing and waterfowl hunting, where applicable. Nuiqsut lies on the eastern periphery of the Teshekpuk Caribou Herd (TCH) range and the western periphery of the Central Arctic Caribou Herd (CAH) range. Estimates based on the timing and location of harvests indicate that a majority of Nuiqsut's caribou harvest is from the TCH, which is the primary herd that occurs within the alternatives analysis area (Braem, Kaleak et al. 2011). The CAH also contributes to the community's overall harvest, and caribou from this herd may cross to the west of the CRD on occasion. However, the CAH generally occurs east of the alternatives analysis area and impacts to harvests to this herd resulting from Alternative B would likely be minimal.

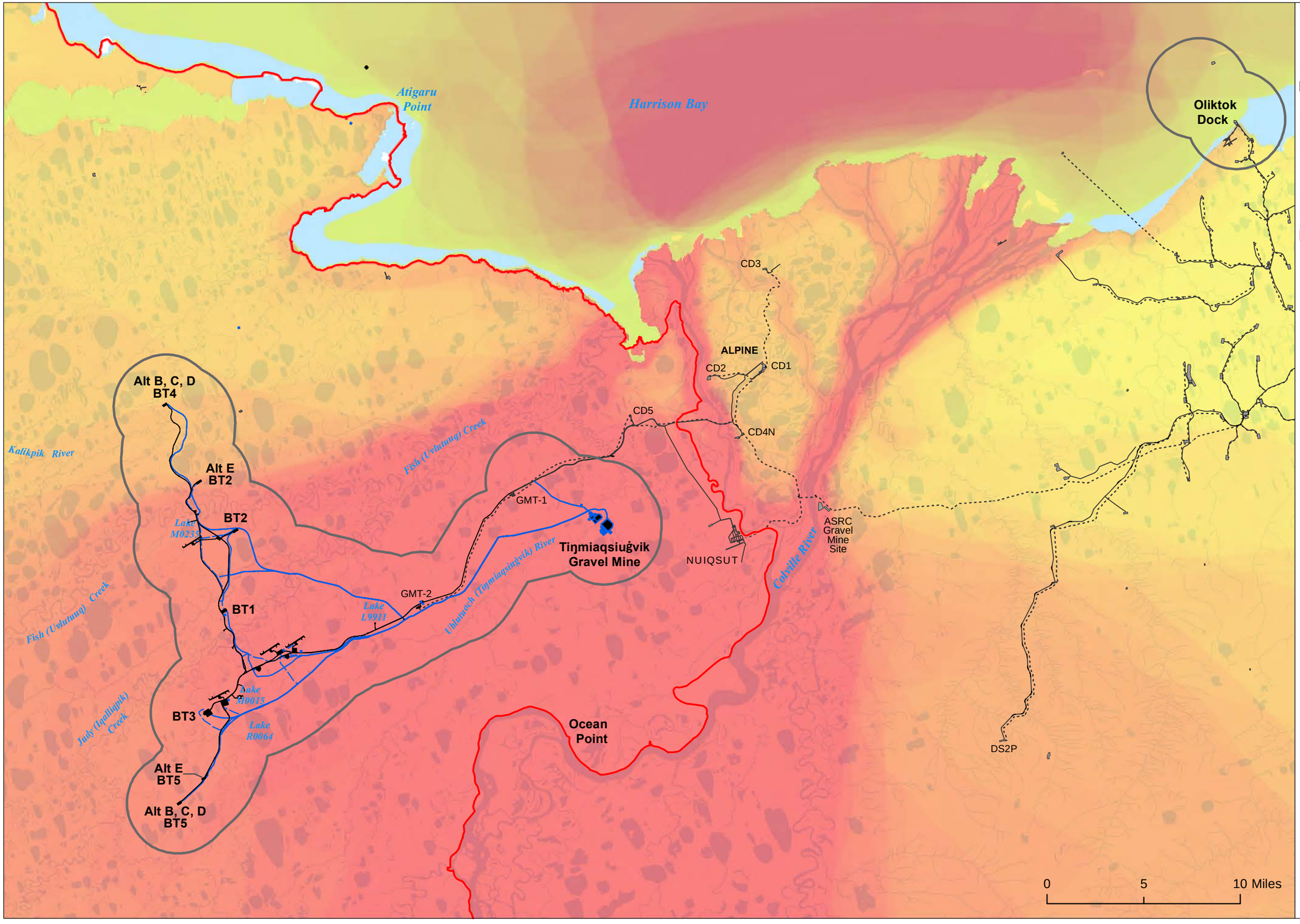
The alternatives analysis area is on the periphery of Utqiaġvik subsistence use areas but is directly east of the Teshekpuk Lake area, which is a key traditional use area for many Utqiaġvik residents (Figure 3). The alternatives analysis area is used during some years for hunting of wolf and wolverine and may be particularly important during years when these resources are less available elsewhere (Figures 10 and 11). Caribou may also be harvested during these furbearer hunting trips, but the alternatives analysis area is generally not used specifically for Utqiaġvik caribou hunting (SRB&A 2010b). Thus, the ANILCA Section 810 evaluation focuses on potential impacts to furbearer harvesting for Utqiaġvik, in addition to indirect or cumulative impacts to other resource harvesting activities. Like Nuiqsut, furbearer hunting is practiced by a relatively small proportion of households, but it is a culturally important and specialized activity in Utqiaġvik.

Subsistence Resource Abundance

As noted above, the TCH is the primary herd that occurs in the alternatives analysis area, with seasonal migrations occurring through the area during the spring and fall, and large numbers of caribou sometimes occurring in the area during the oestrid fly season (July through August), a peak hunting time for Nuiqsut (Willow MDP Supplemental EIS Section 3.12.1, *Affected Environment*). The alternatives analysis area occurs in areas of relatively low caribou calving density. Impacts to caribou populations could occur through direct mortality (e.g., vehicle strikes) or through decreased calf survival resulting from impacts to calving grounds or to the behavior of maternal caribou. Injuries and mortality resulting from vehicle collisions may occur but are not expected to have population-level effects (Willow MDP Supplemental EIS Section 3.12.2.3.3, *Injury or Mortality*). In addition, while the Project may result in displacement of some calving caribou because the alternatives analysis area is located in low density calving areas for the TCH, displacement would likely not have population-level effects (Willow MDP Supplemental EIS Section 3.12.2.3.2, *Disturbance or Displacement*). Thus, the abundance of caribou available for subsistence use would not be impacted under Alternative B.

The alternatives analysis area does not have a high density of wolves or wolverines, although the area is heavily used by Nuiqsut furbearer hunters who generally cover large areas in pursuit of these resources. While wolf and wolverine would likely be displaced by infrastructure and human activity and some individual mortalities of wolverine may occur, overall population levels are not expected to be affected by the Project (Willow MDP Supplemental EIS Appendix E.12, *Terrestrial Mammals Technical Appendix*). Thus, the abundance of wolf and wolverine available for subsistence use would not be impacted under Alternative B.

While generally not harvested within the alternatives analysis area, other subsistence resources that could experience direct or indirect impacts from the Project include waterfowl and fish. Waterfowl hunting occurs to the north and east of the alternatives analysis area, while fishing of broad whitefish and other fish species occurs downriver from the alternatives analysis area in Fish (Uvlutuuq) Creek. Habitat loss and degradation could displace or cause individual mortalities of these resources, but the Project is not expected to cause population-level effects (Willow MDP Supplemental EIS Section 3.10, *Fish*). A large oil spill could have population-level effects but is not expected to occur (Willow MDP Supplemental EIS Sections 3.10, *Fish*, and 3.11, *Birds*).



Subsistence Data

High / Low — Overlapping Subsistence Use Areas All Resources, 1995-2006 [a]

Willow Proposed Development Features

- Alternatives Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

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Figure 2



Subsistence Data

High / Low — Overlapping Subsistence Use Areas All Resources, 1997-2006 [a]

Willow Proposed Development Features

- Alternatives Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

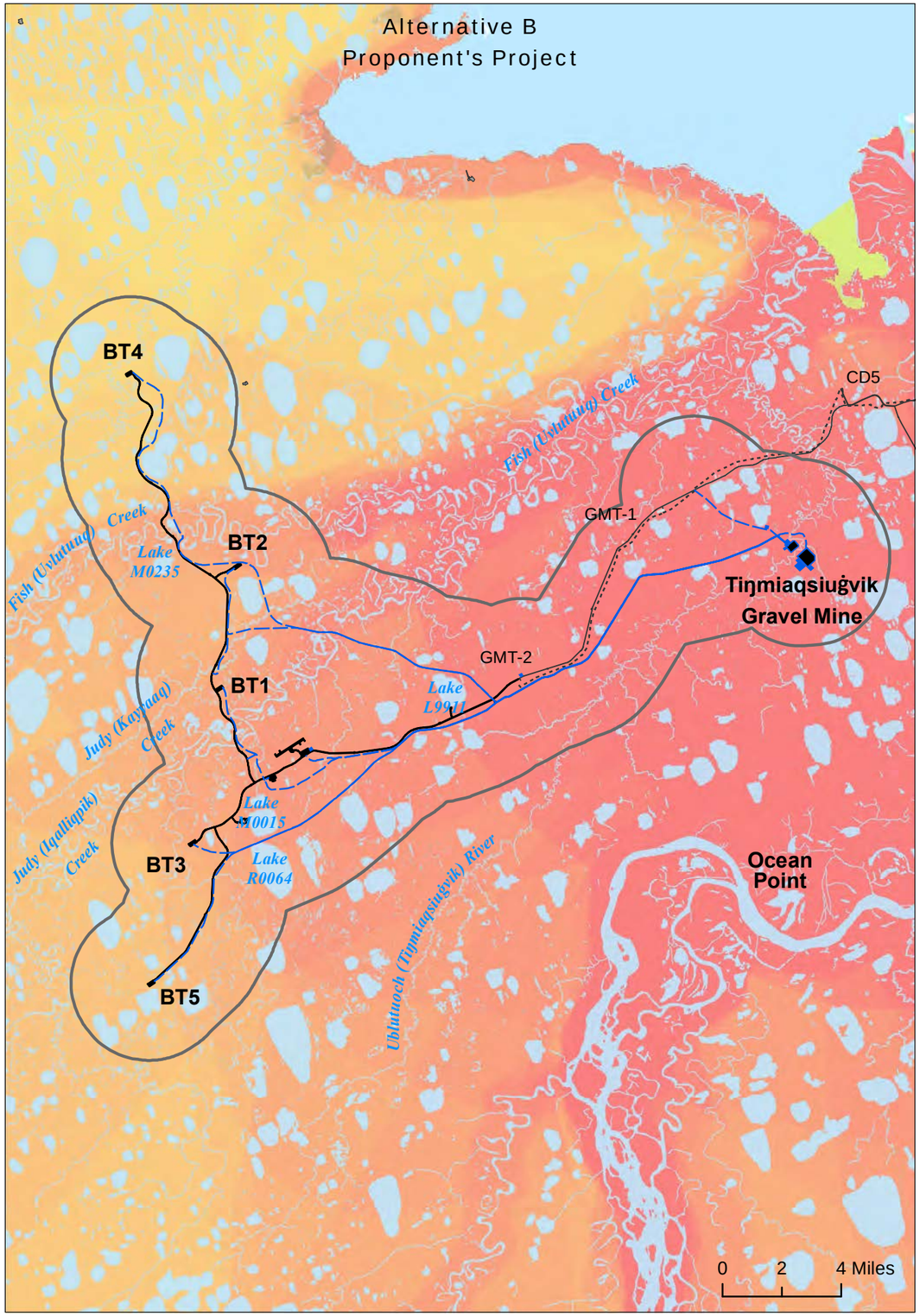
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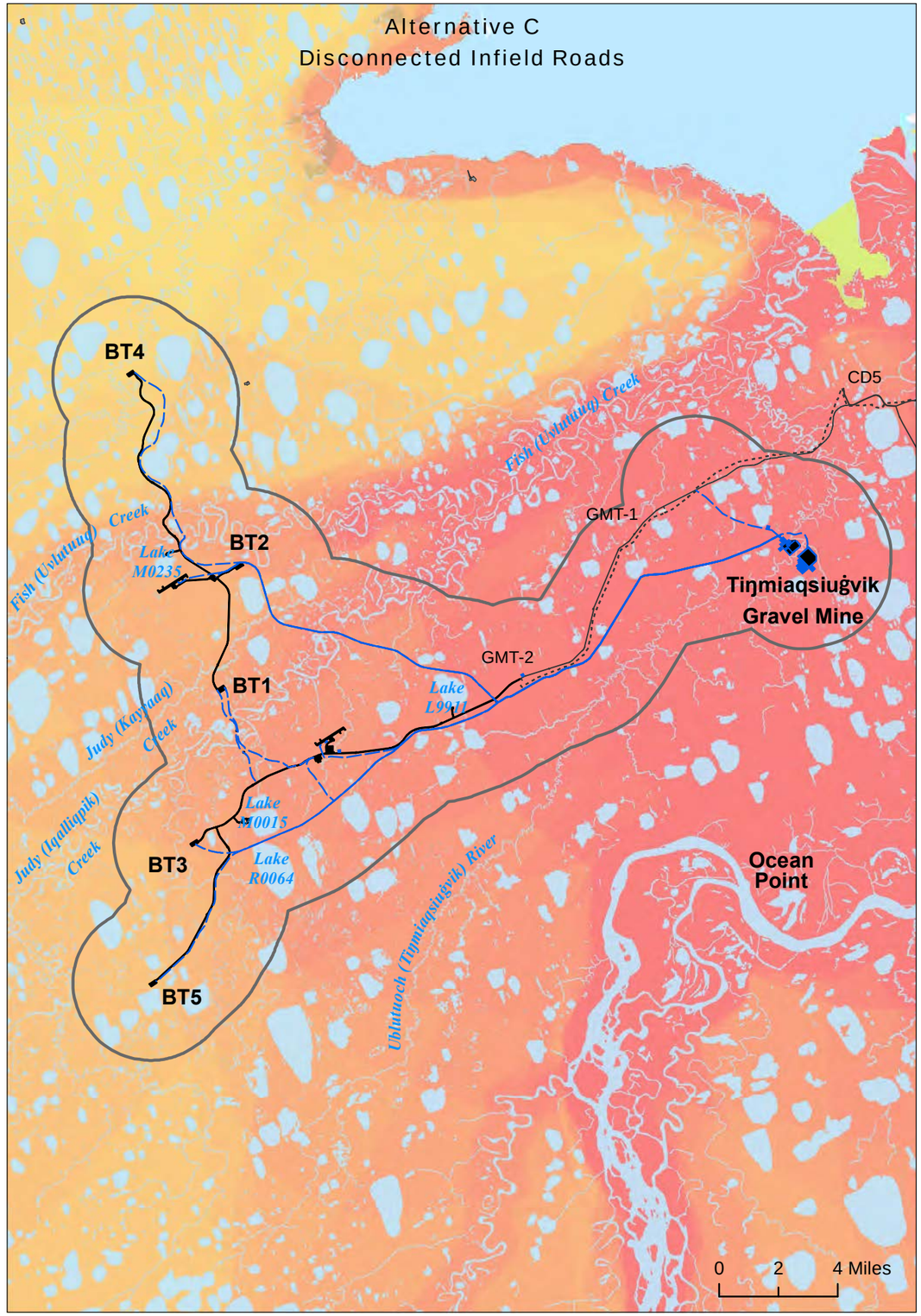
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Figure 3





Subsistence Data

High / Low — Overlapping Subsistence Use Areas Caribou, 1995-2006 [a]

Willow Proposed Development Features

- Alternative Analysis Area *
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

* The alternatives analysis area also includes Oliktok Dock (see Figures 1 through 3)

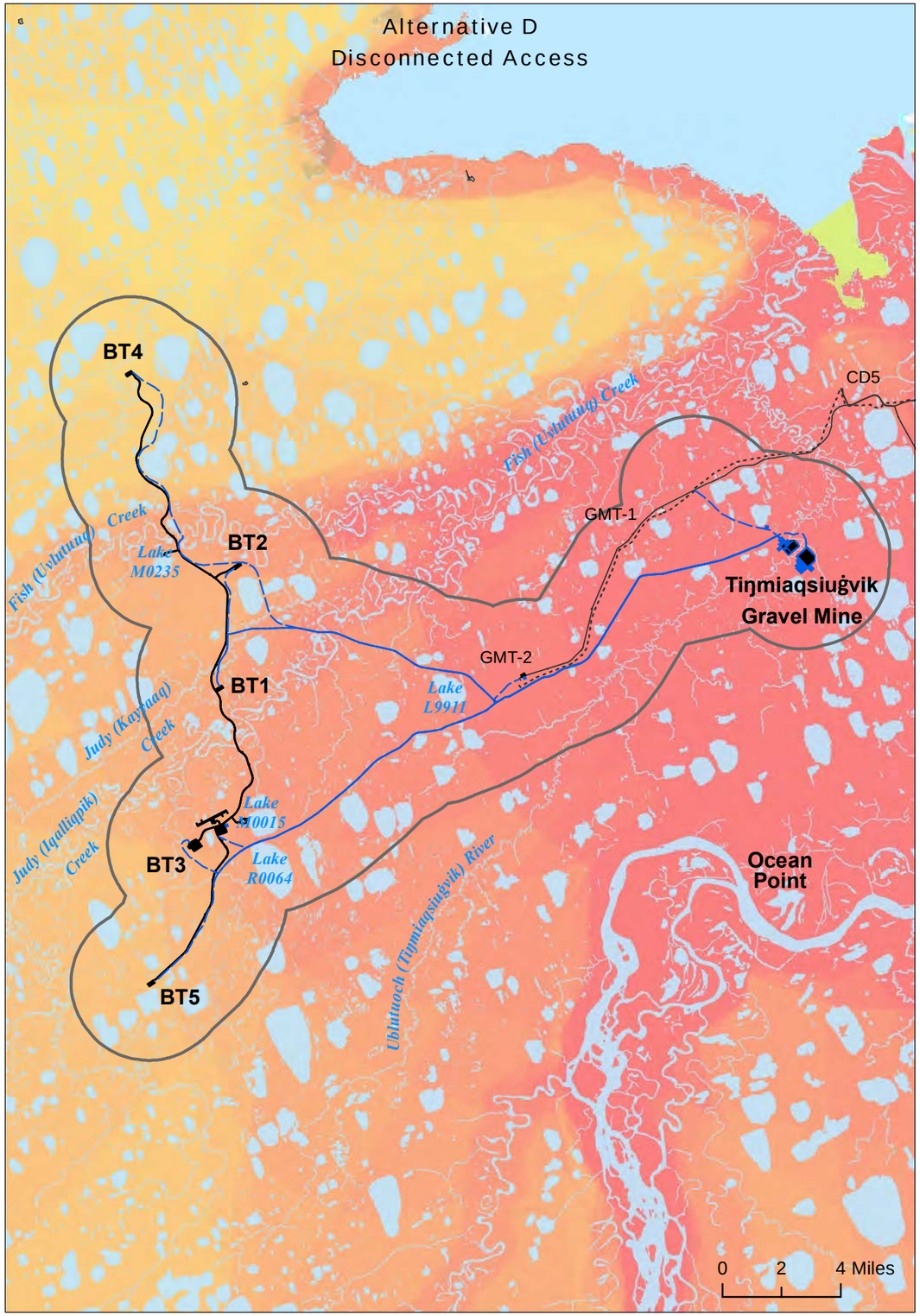
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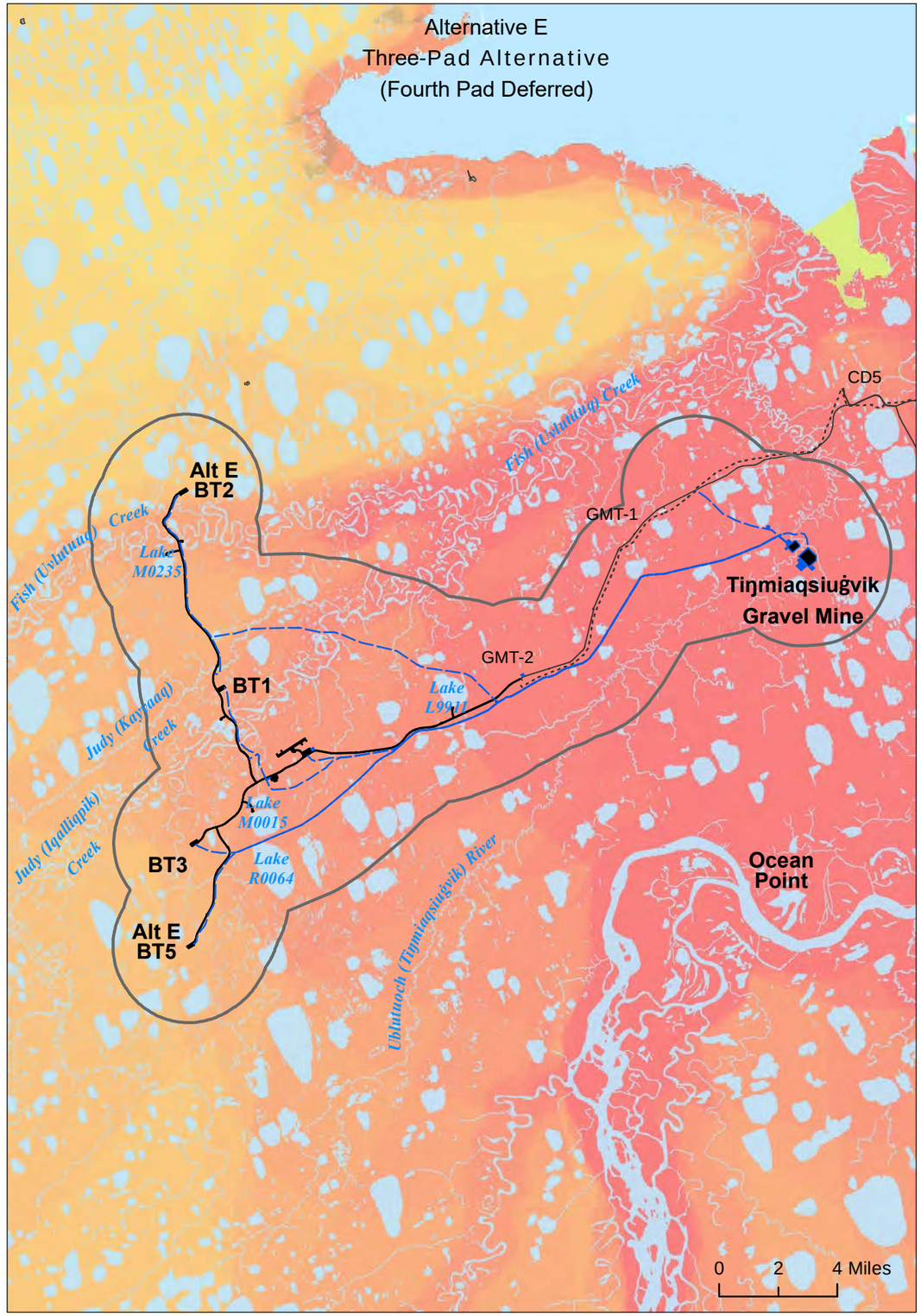
Source
a. SRB&A 2010a

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Figure 4





Subsistence Data

- High / Low — Overlapping Subsistence Use Areas Caribou, 1995-2006 [a]

Willow Proposed Development Features

- Alternative Analysis Area *
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

* The alternatives analysis area also includes Oliktok Dock (see Figures 1 through 3)

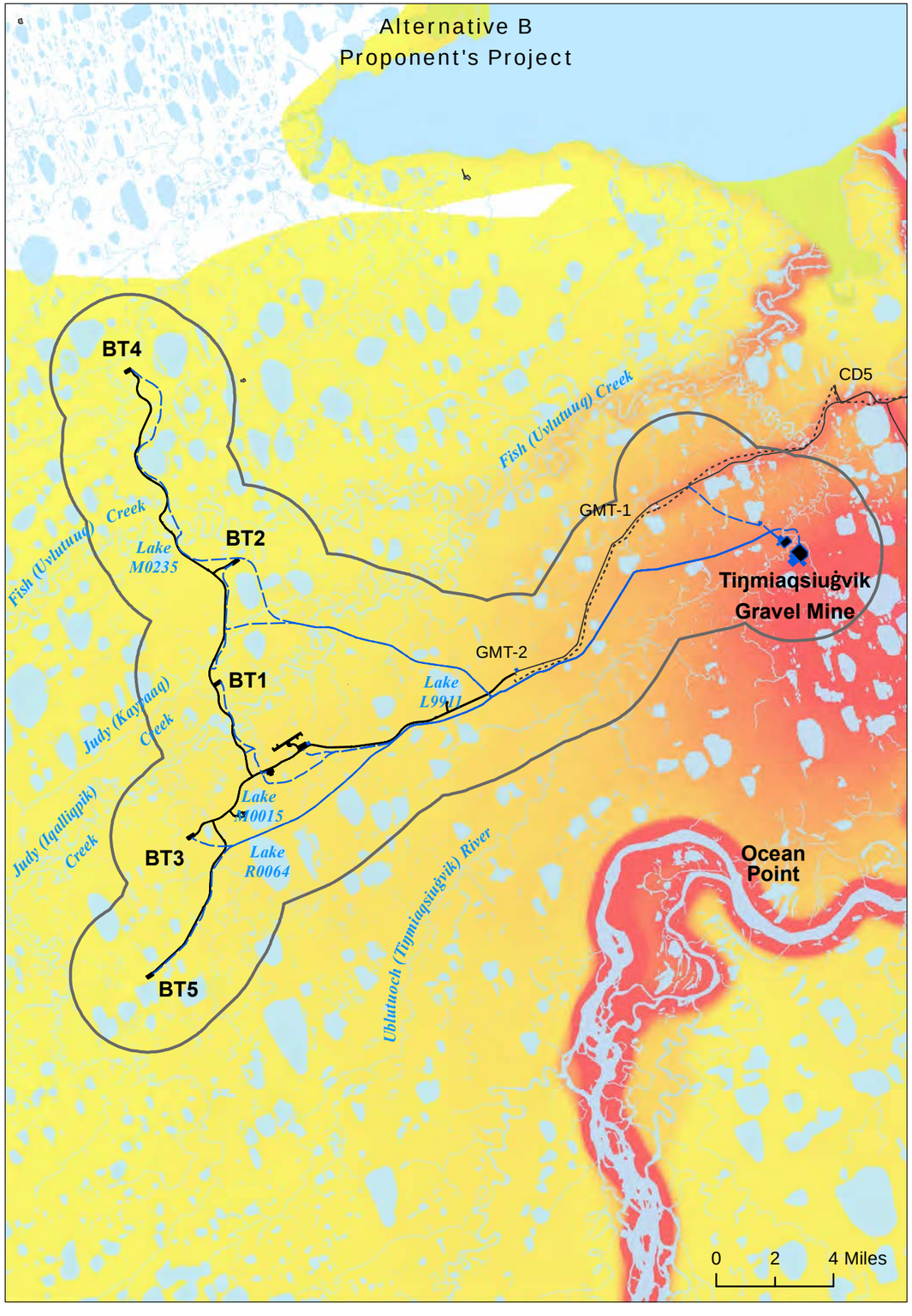
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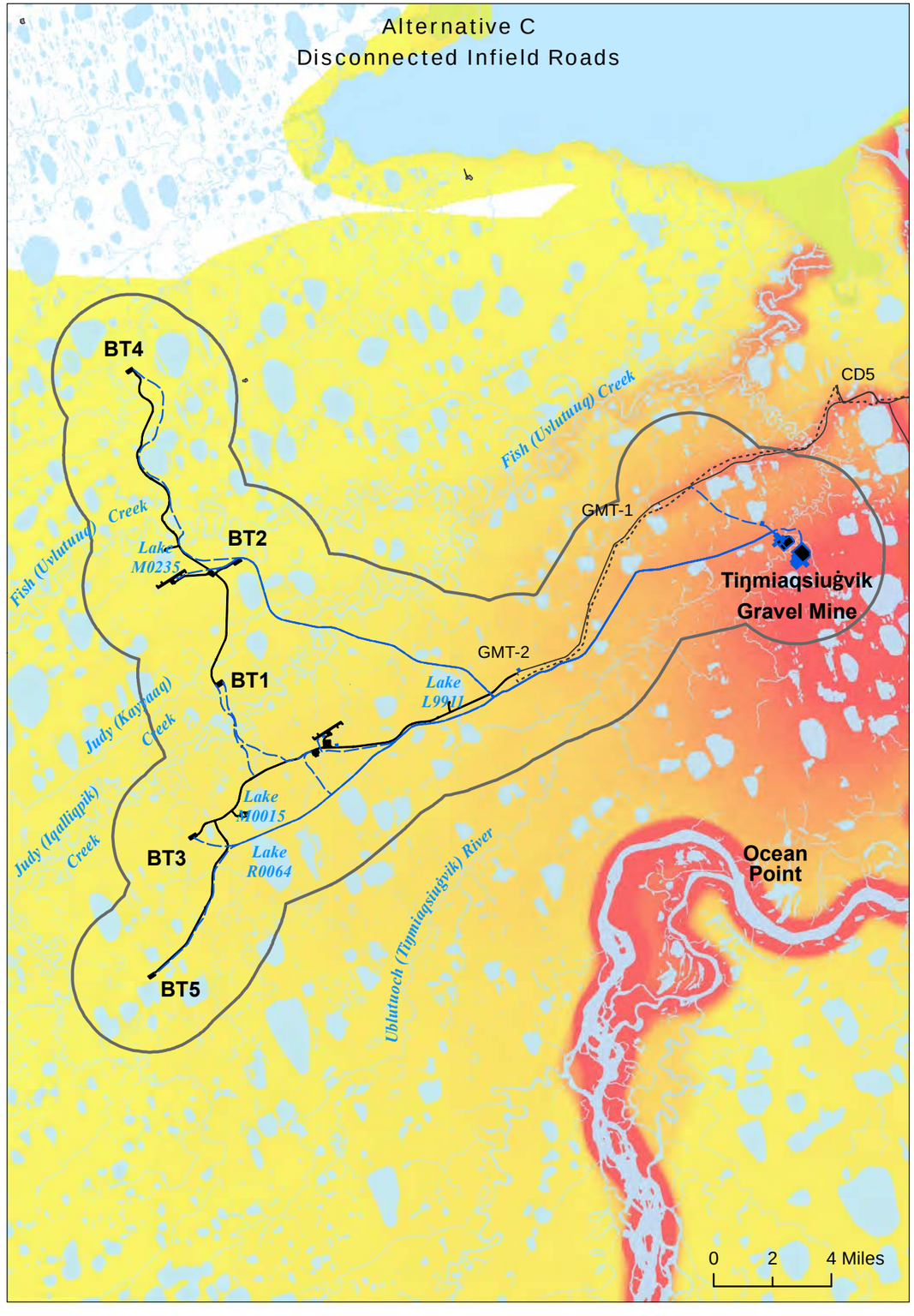
Source
a. SRB&A 2010a

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Figure 5





Subsistence Data

High / Low — Overlapping Subsistence Use Areas Caribou, January 2008 through December 2019 [a]

Willow Proposed Development Features

- Alternative Analysis Area *
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

* The alternatives analysis area also includes Oliktok Dock (see Figures 1 through 3)

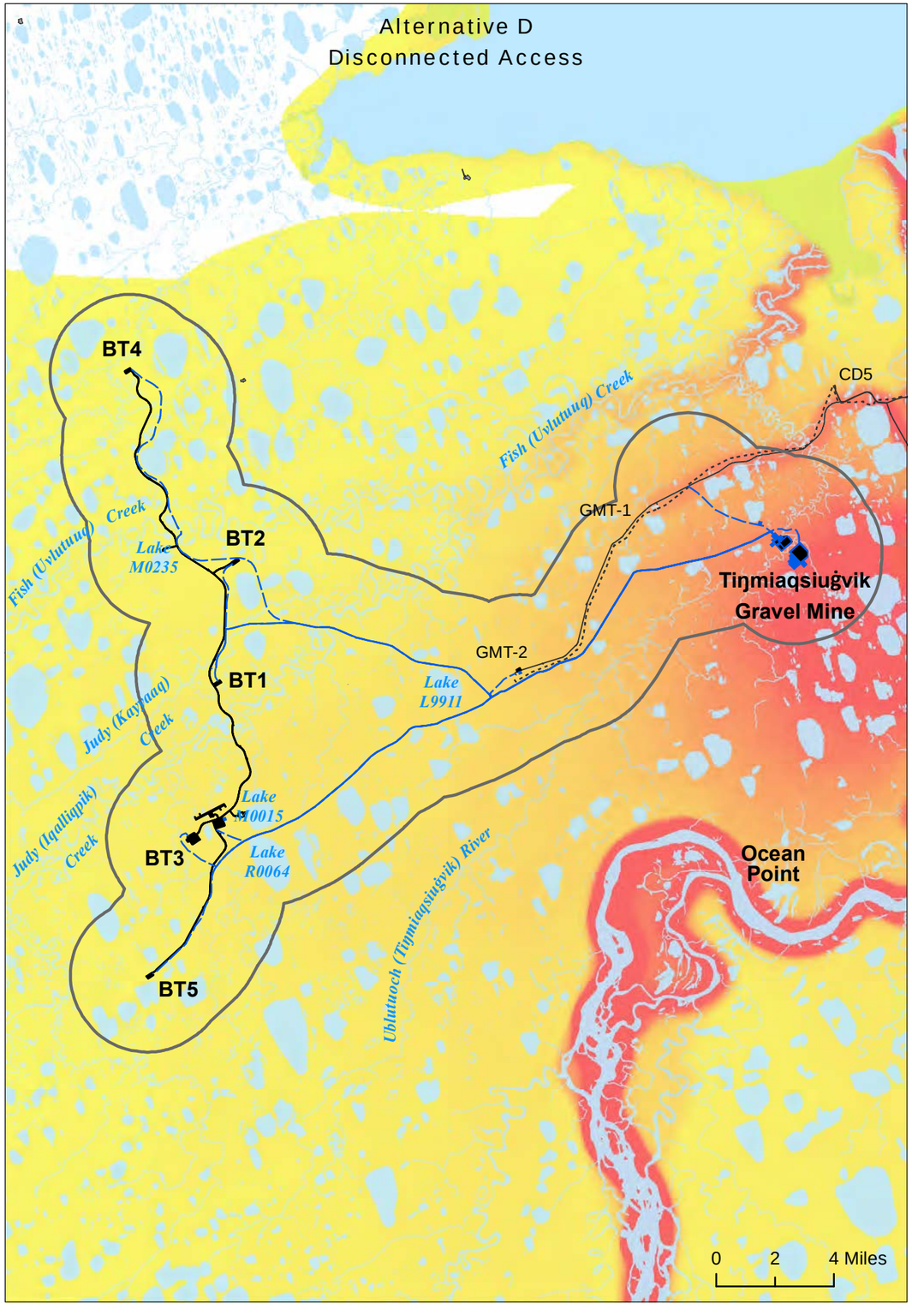
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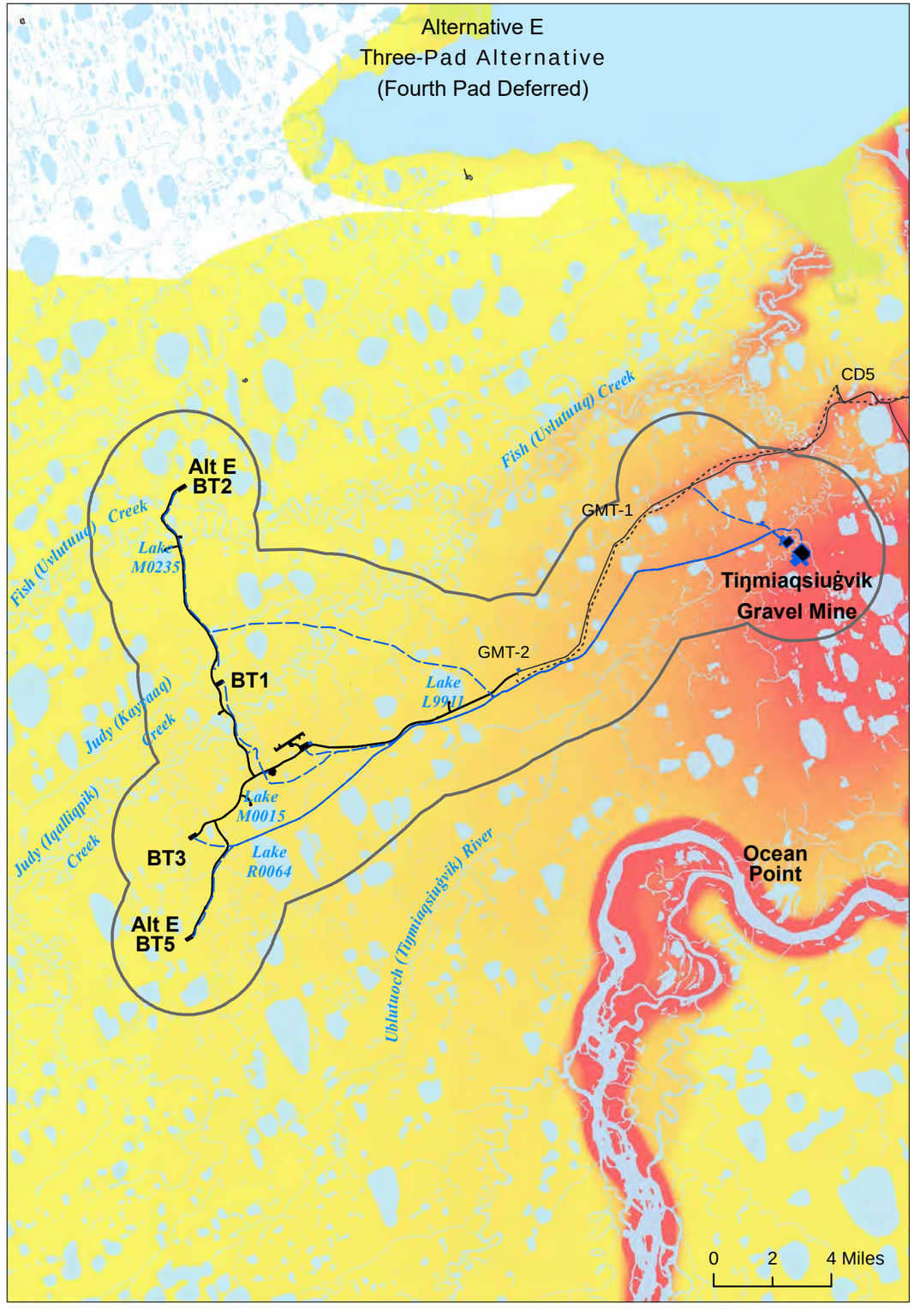
Source
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Figure 6





Subsistence Data

High / Low — Overlapping Subsistence Use Areas Caribou, January 2008 through December 2019 [a]

Willow Proposed Development Features

- Alternative Analysis Area *
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

* The alternatives analysis area also includes Oliktok Dock (see Figures 1 through 3)

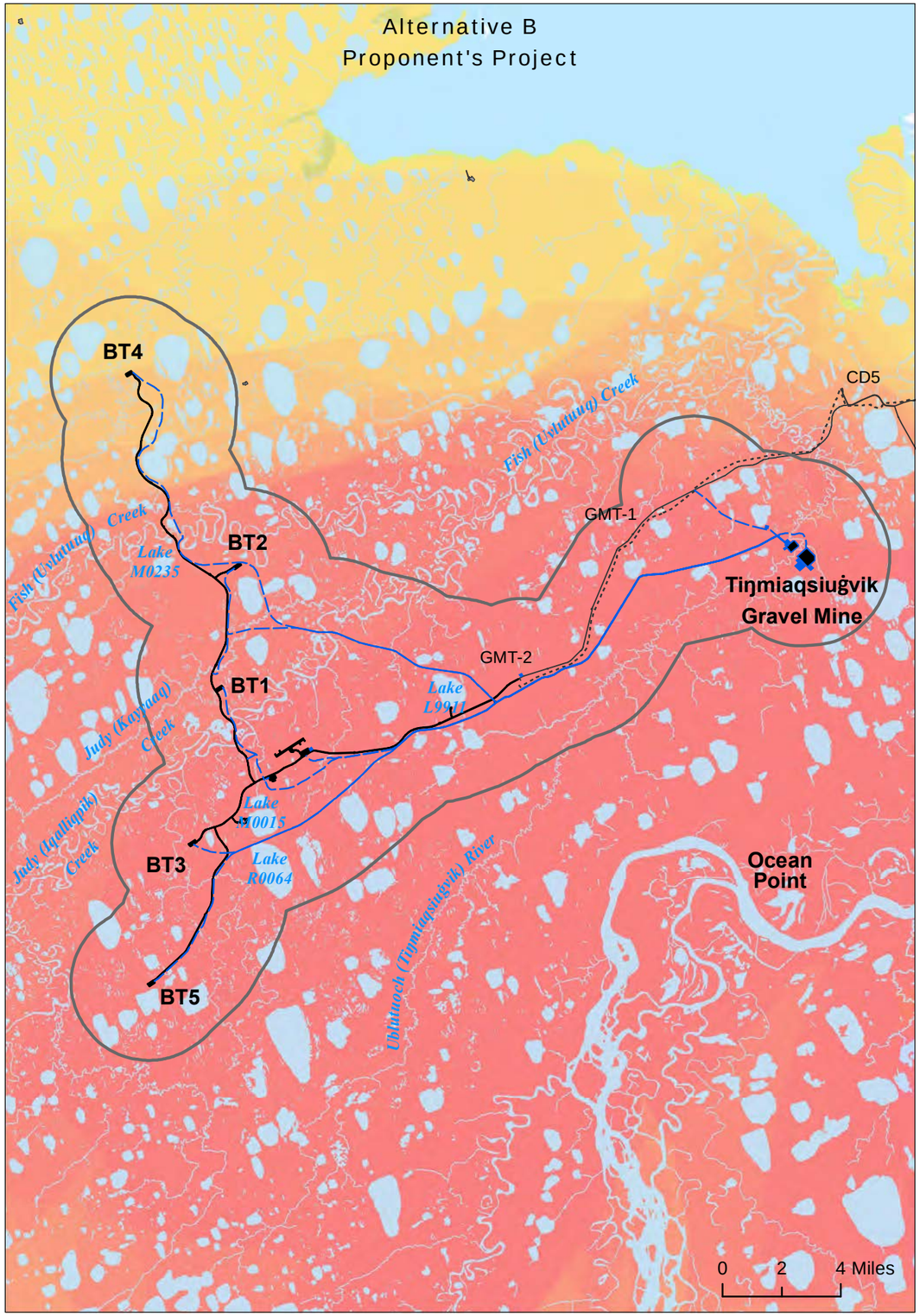
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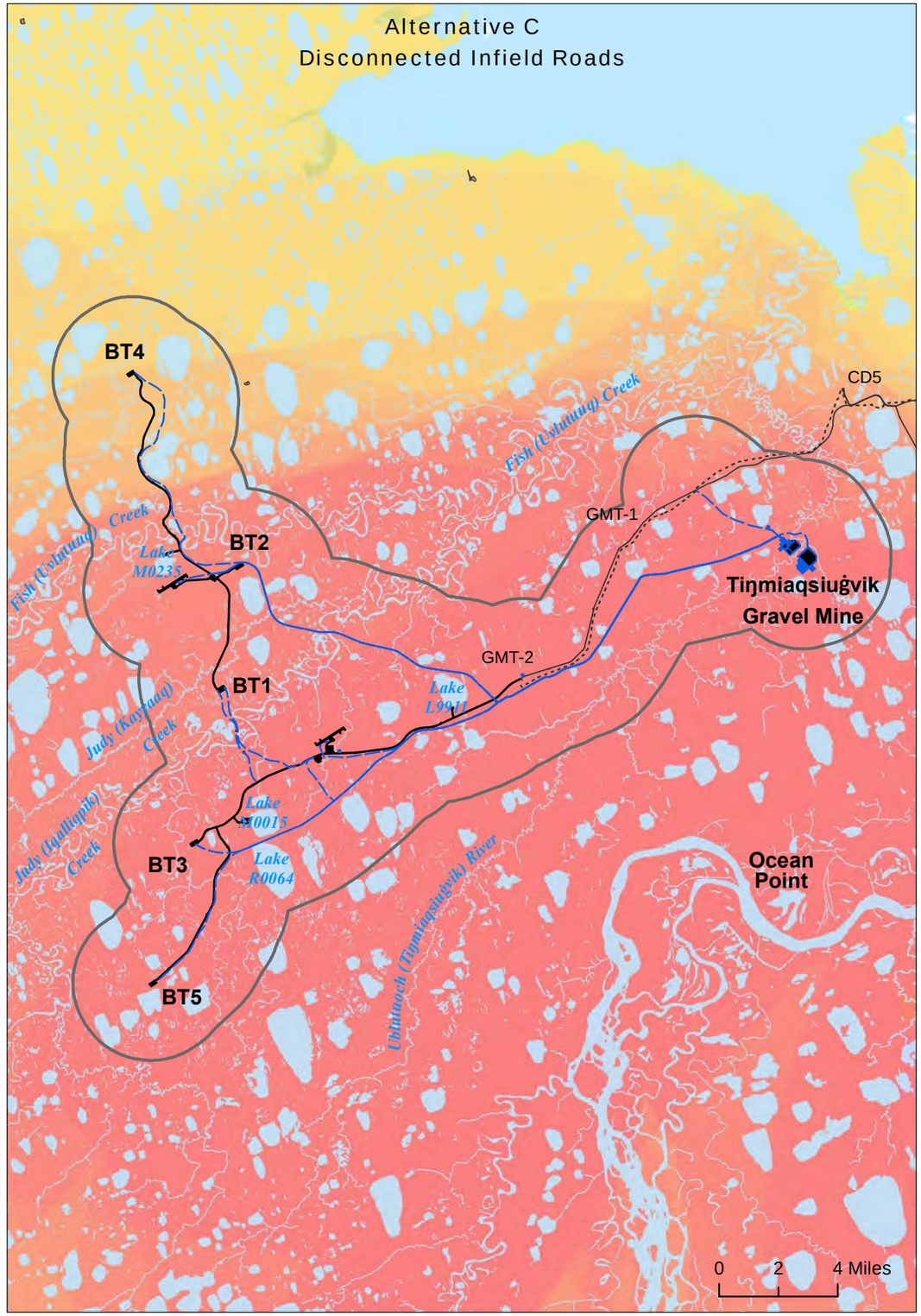
Source
a. SRB&A 2021

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Figure 7





Subsistence Data

High / Low — Overlapping Subsistence Use Areas Wolf and Wolverine, 1995-2006 [a]

Willow Proposed Development Features

- Alternative Analysis Area *
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

* The alternatives analysis area also includes Oliktok Dock (see Figures 1 through 3)

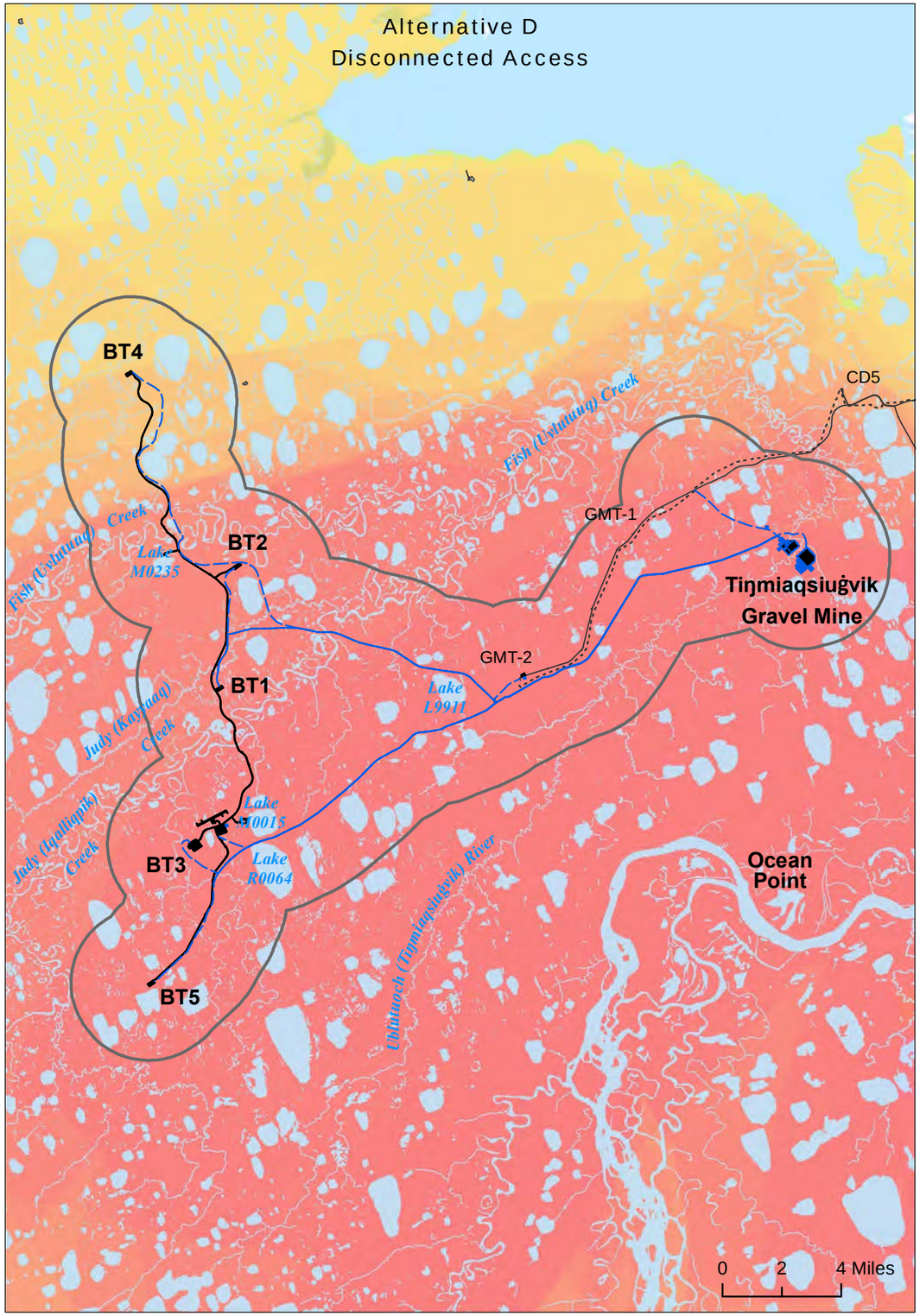
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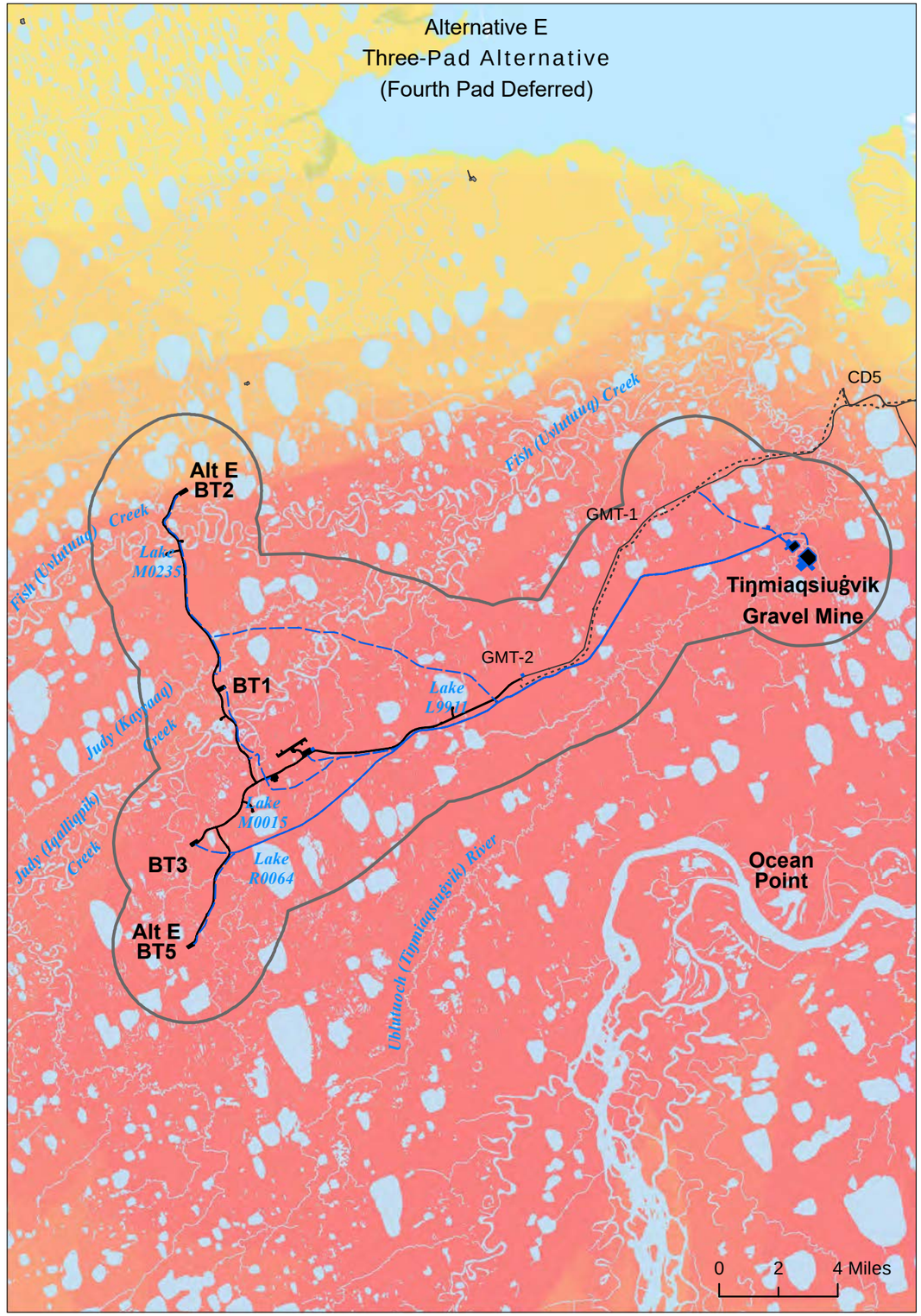
Source
a. SRB&A 2010a

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Figure 8





Subsistence Data

High / Low — Overlapping Subsistence Use Areas Wolf and Wolverine, 1995-2006 [a]

Willow Proposed Development Features

- Alternative Analysis Area *
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

* The alternatives analysis area also includes Oliktok Dock (see Figures 1 through 3)

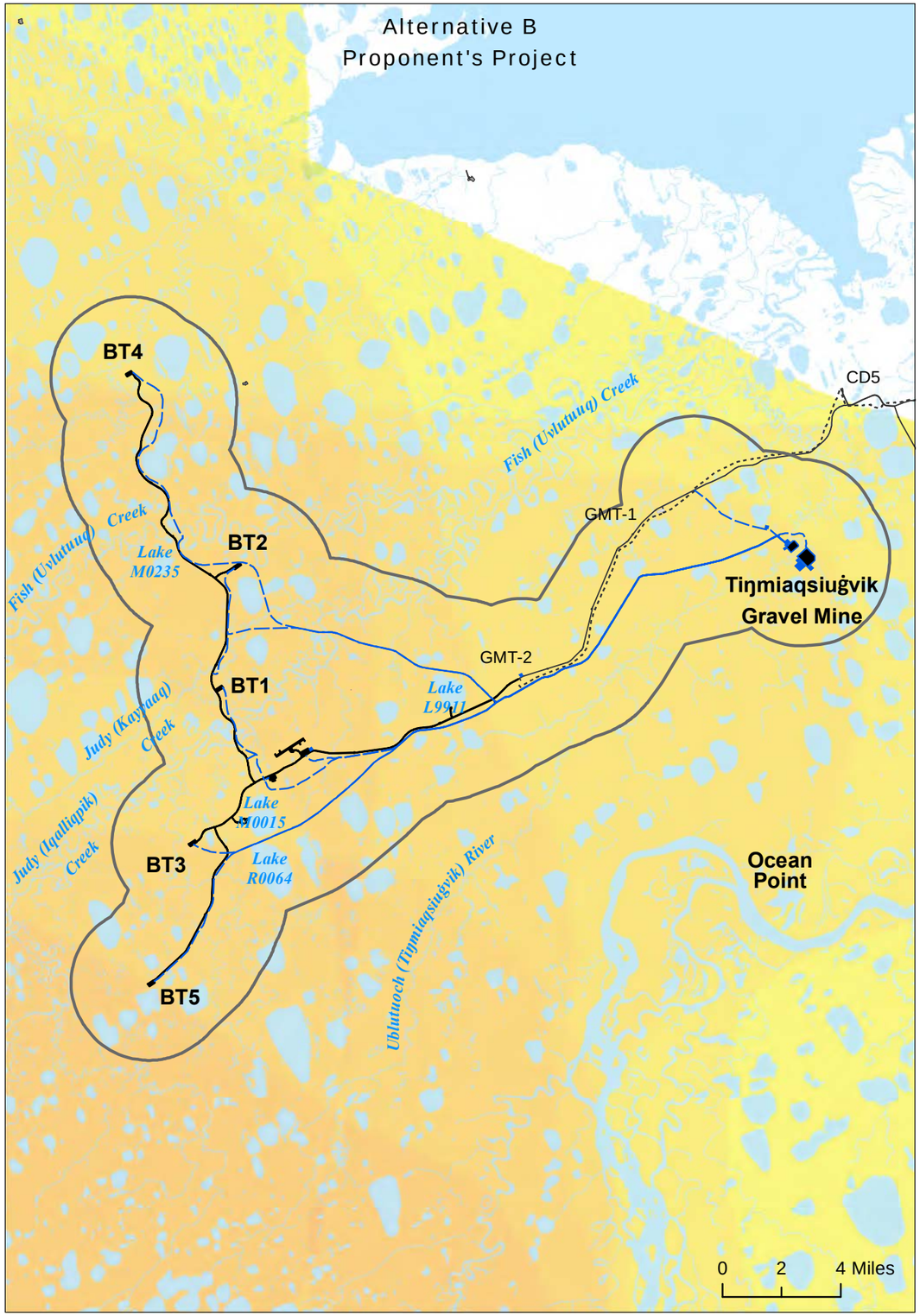
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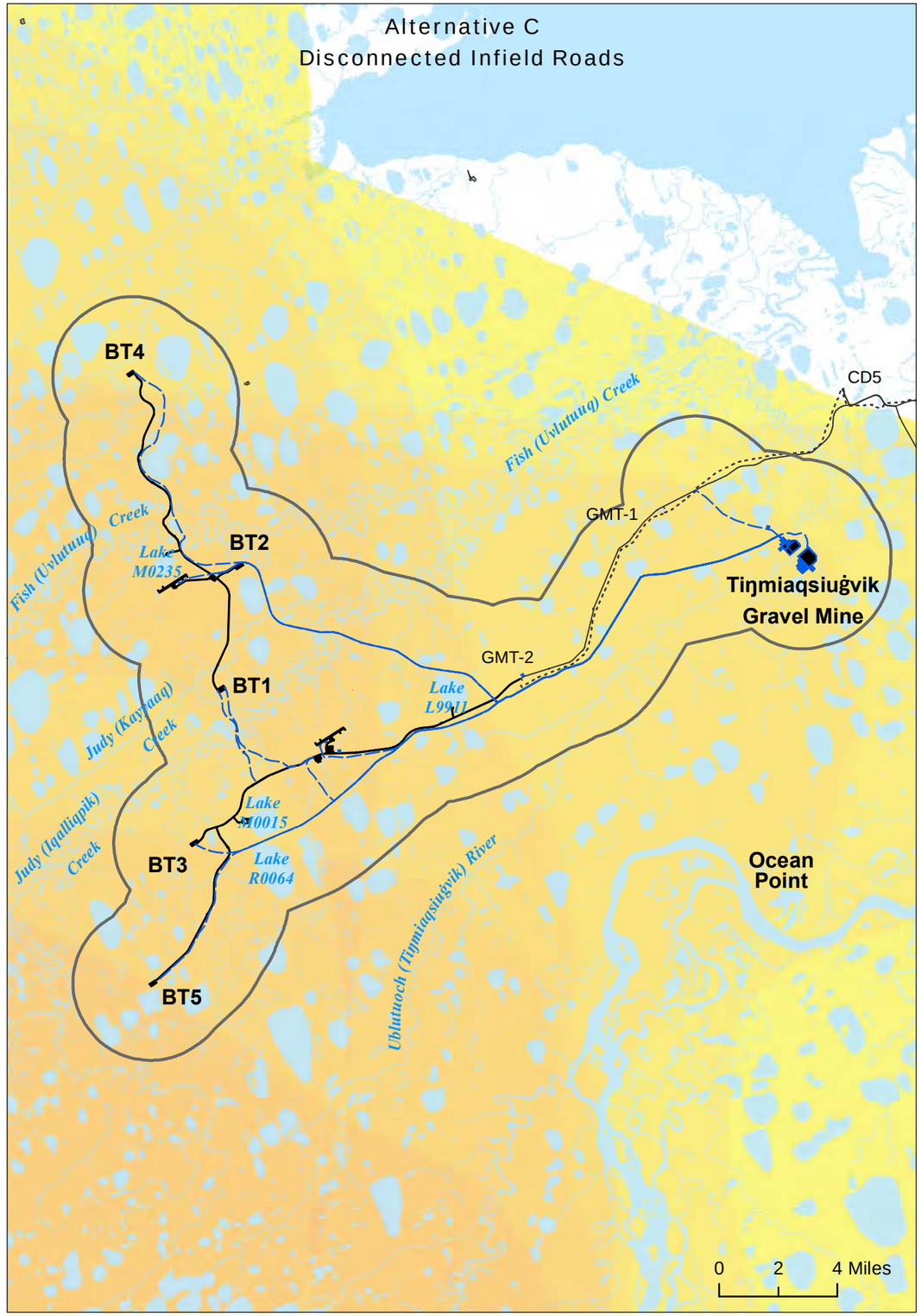
Source
a. SRB&A 2010a

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Figure 9





Subsistence Data

- Overlapping Subsistence Use Areas Wolf and Wolverine, 1997-2006[a] (High / Low)

Willow Proposed Development Features

- Alternative Analysis Area *
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

* The alternatives analysis area also includes Oliktok Dock (see Figures 1 through 3)

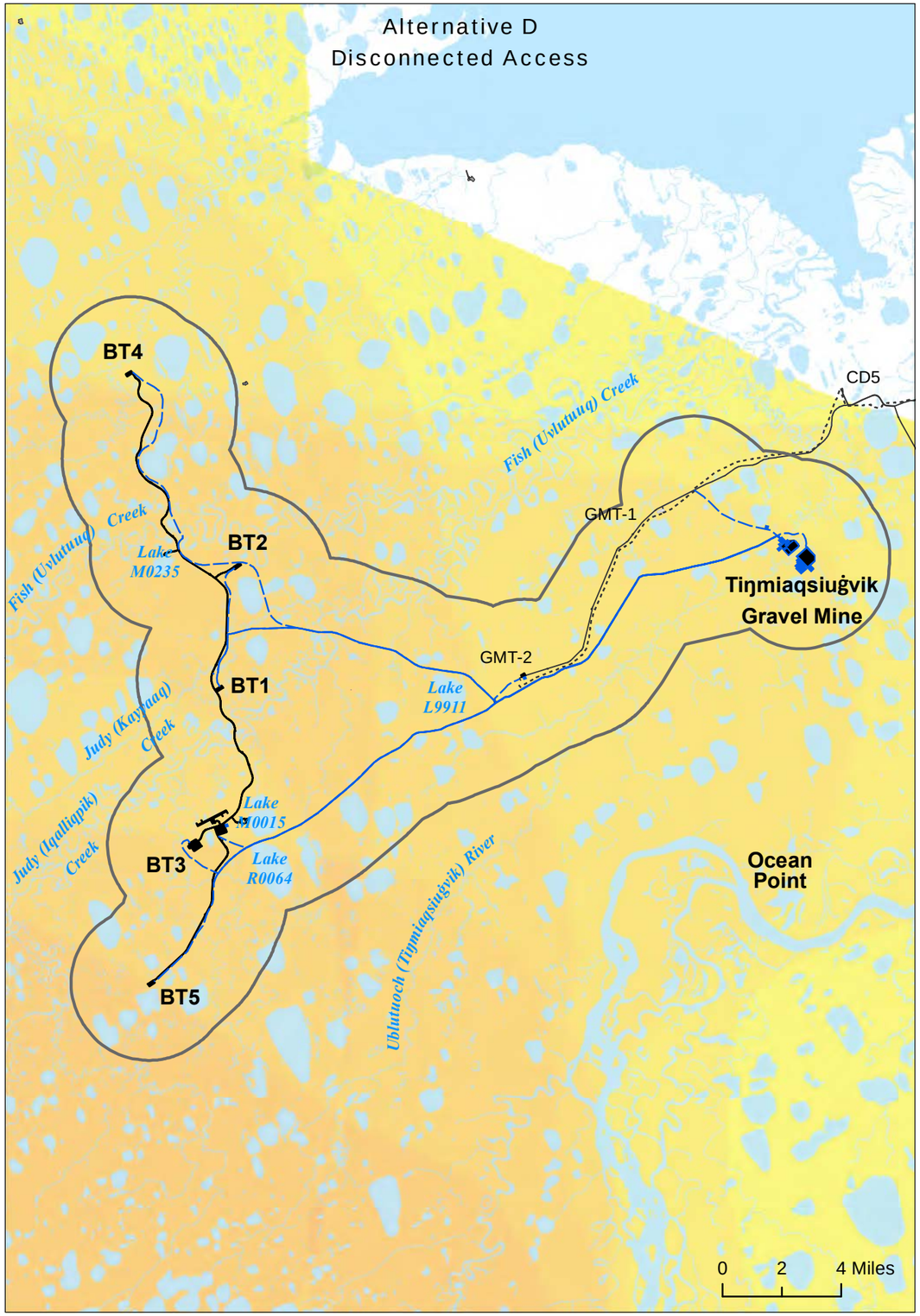
Map prepared by
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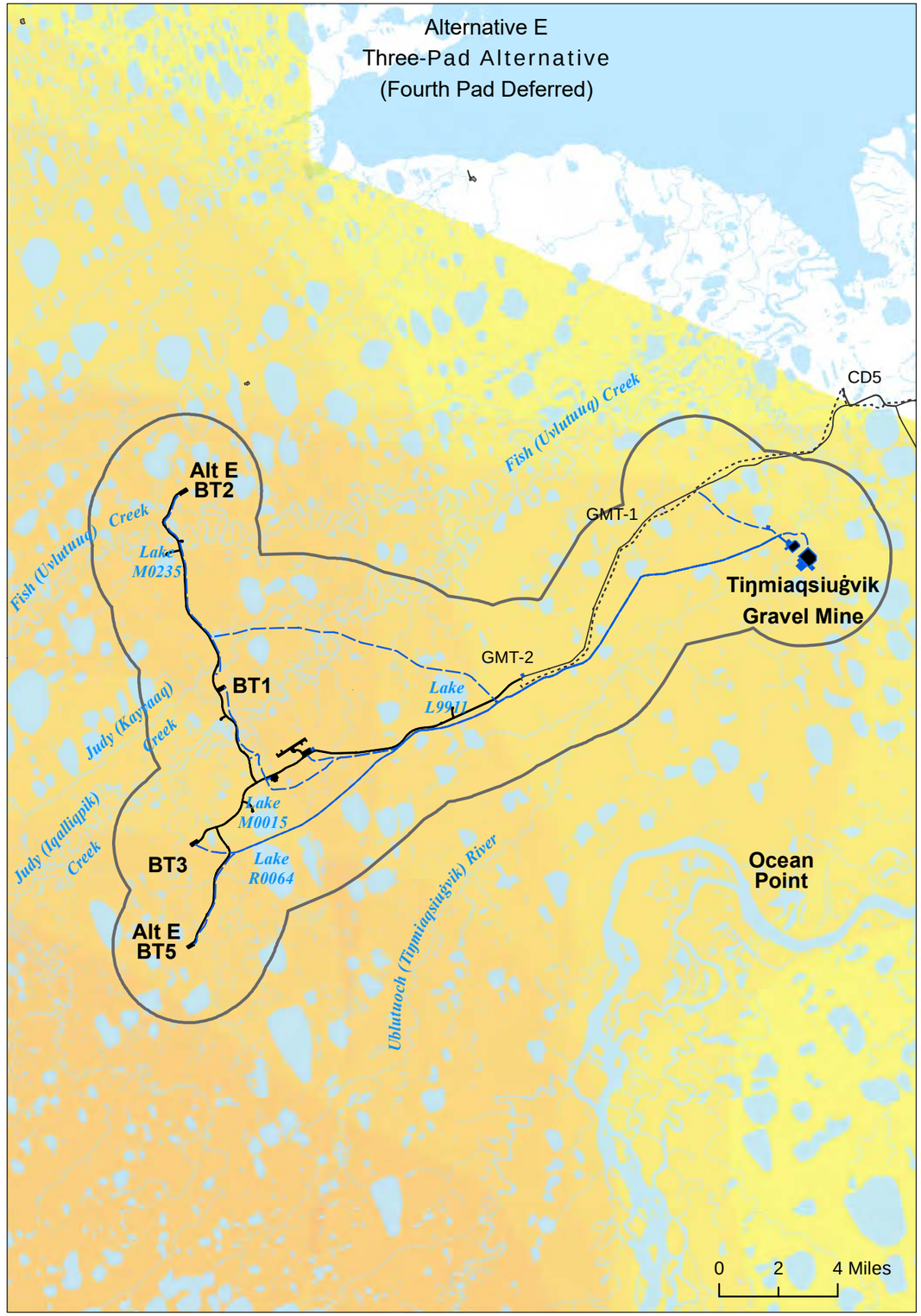
Source
a. SRB&A 2010a

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Figure 10





Subsistence Data

- High / Low — Overlapping Subsistence Use Areas Wolf and Wolverine, 1995-2006 [a]

Willow Proposed Development Features

- Alternative Analysis Area *
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

* The alternatives analysis area also includes Oliktok Dock (see Figures 1 through 3)

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

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Figure 11

Subsistence Resource Availability

A description of subsistence uses for Nuiqsut and Utqiaġvik is provided in Willow MDP Supplemental EIS Section 3.16.1, *Affected Environment*, and in Willow MDP Supplemental EIS Appendix E.16, *Subsistence and Sociocultural Systems Technical Appendix*. Nuiqsut caribou hunting primarily occurs along the Colville River drainage, including the Niġliq and East channels, as well as in overland areas to the west, southwest, and northwest of the community. While boat is the primary method of travel to caribou hunting areas along the Colville River, overland areas west of the community are primarily accessed by ATV, snow machine, and, since construction of the Kuukpik Spur, CD5, GMT-1, and GMT-2 roads, by automobile. Use of the area west of Nuiqsut for caribou hunting has increased somewhat in recent years, partially due to increased access from recently constructed gravel roads. The increase in subsistence use to the west of the community correlates with decreased use of other areas including Niġliq Channel, East Channel, and the Fish (Uvlutuuq) Creek drainage, which have been commonly reported as places of avoidance by local hunters due to development, environmental, and personal factors (SRB&A 2019a). Nuiqsut caribou hunting activities in the direct effects analysis area peak from July through September, as does hunting directly east and south of the alternatives analysis area (Willow MDP Supplemental EIS Appendix E.16). The majority of the use of the alternatives analysis area for caribou hunting occurs in the eastern portion of the area surrounding the proposed gravel mine and access road. Recent data from the Nuiqsut Caribou Subsistence Monitoring Project (2017–2019) have shown increasing overlapping use to the west along the GMT-1 and GMT-2 roads (SRB&A 2021). Data for the 1995 through 2006 time period shows greater use of the alternatives analysis area; recent years have seen a decrease in use of snow machines and increased use of ATVs, which may partly explain the relatively smaller overland use areas shown on Figures 6 and 7 compared to Figures 4 and 5 (SRB&A 2021). During years with adequate snow cover, use of the area may be higher. Nuiqsut caribou hunters often target caribou in the area west of the community while caribou are most available in the area during the oestrid fly season (July and August) and fall migration (August and September). During these time periods, caribou may cross through the Project and alternatives analysis area before being hunted to the west of the community. In recent years, residents have reported using roads to access caribou during these times because the caribou tend to stay near the road system rather than migrating farther south and east as they have in the past. Such deflection near the road was documented by Welch, Prichard et al. (2021) during the 2020 summer and fall migration.

Nuiqsut wolf and wolverine hunting is a winter subsistence activity that occurs in large overland areas to the west, south, and southeast of the community. For the 1995 through 2006 time period, 88% of wolverine harvesters and 87% of wolf harvesters reported using the alternatives analysis area. The majority of the alternatives analysis area is used heavily for wolf and wolverine hunting by Nuiqsut harvesters. Wolf and wolverine hunting in the area peaks from November through March and occurs by snow machine (Willow MDP Supplemental EIS Appendix E.16, *Subsistence and Sociocultural Systems Technical Appendix*).

Potential impacts to the abundance of subsistence resources are discussed above. The primary sources of potential impacts to resource availability of caribou, wolf, and wolverine to subsistence users include:

1. Displacement resulting from habitat loss (roads, pipelines, and/or other oil and gas facilities).
2. Displacement resulting from road disturbance.
3. Displacement from air traffic.
4. Displacement from other infrastructure and sources of disturbance.

These impacts are discussed in further detail below.

Displacement of Caribou Due to Habitat Loss

Impacts on caribou related to habitat loss are discussed in Willow MDP Supplemental EIS Section 3.12, *Terrestrial Mammals*. The Project area is to the east and south of the TCH primary calving grounds which, in recent years, occur with the greatest density to the southeast of Teshekpuk Lake. Alternative B would remove 616.1 acres of terrestrial mammal habitat due to gravel mining and construction of gravel infrastructure. Additional habitat loss or alteration would result from gravel spray and dust deposition.

The habitats that would be affected by Alternative B are not unique, and similar habitats would be available nearby. Thus, habitat loss and alteration associated with the Project would likely cause caribou to move to similar habitats nearby and would not have overall impacts on subsistence resource availability for Nuiqsut harvesters.

Displacement of Caribou Due to Road Disturbance*

Impacts on caribou and caribou hunting resulting from road-related disturbance are discussed in Willow MDP Supplemental EIS Sections 3.16.2.3.2.1, *Resource Availability–Caribou*, and 3.12.2.3.2, *Disturbance or Displacement*. The increasing presence of roads near Nuiqsut has resulted in increased reports of impacts to hunting from roads and road traffic (SRB&A 2016, 2017a, 2018a, 2019a; SRB&A 2020a, 2021). As noted above, the Project area would be in the northeastern portion of the range of the TCH. In the spring (May and June), some TCH caribou migrate through the Project area on their way to calving grounds, with males arriving in mid- to late-June when Nuiqsut residents begin traveling by boat to hunt caribou. In the summer oestrid fly season (July and August), caribou sometimes occur in the area of proposed infrastructure in large numbers, and in the fall, large numbers of caribou may move through the Project area as they migrate south to their wintering grounds (Prichard, Macander et al. 2018).

The Alternative B Project access road would bisect a portion of the fall migration corridor and would occur in areas heavily used by TCH caribou in some years (during both the summer and winter months). Residents hunt to the west, northwest, and southwest of the community of Nuiqsut during the summer and fall by ATV, and they hunt to the north and west of the community by automobile. In addition, residents hunt caribou by boat along the Colville River to the east and southeast of the proposed road corridor in the months of July, August, and September (Willow MDP Supplemental EIS Appendix E.16). While the majority of this hunting occurs in the eastern portion of the alternatives analysis area near the proposed mine site and directly east of the proposed road, some residents also travel as far as the proposed gravel road, particularly when using the existing road system to access hunting areas. This has become increasingly common in recent years with construction of the GMT-1 and GMT-2 roads (SRB&A 2021). The most heavily used hunting areas are directly east and northeast of the proposed access road. Some caribou may remain in the Project area throughout the winter and are hunted by individuals on snow machine or, in recent years, along the road. While the number of caribou that occur within the alternatives analysis area may represent a small portion of the overall herd, they represent an important source of caribou available to the community of Nuiqsut, and harvests within the area may be increasing (Willow MDP Supplemental EIS Section 3.16.2.3.2.1). Thus, roads associated with the Project have a high potential for disturbance of caribou and Nuiqsut caribou hunting activities. While some Utqiaġvik hunters may venture into the western portion of the alternatives analysis area in some years during winter, the area is not a primary hunting area for caribou for that community. Thus, this discussion focuses on potential impacts to Nuiqsut hunters resulting from road disturbance.

Roads and road traffic are believed to cause behavioral and migratory changes in caribou that can affect hunting success. Deflections or delays of caribou movement from roads and associated ground traffic and human activity have been documented both by active harvesters (SRB&A 2010a, 2011, 2012, 2013a, 2014, 2015, 2016, 2017a, 2018a; SRB&A 2019b, 2020b, 2021) and during behavioral studies on caribou (Welch, Prichard et al. 2021; Wilson, Parrett et al. 2016). During the Nuiqsut Caribou Subsistence Monitoring Program, reports of road-related impacts on caribou hunting have steadily increased since road construction began. Year 9 (2016) of the study was the first year where impacts related to man-made structures (e.g., roads, pipelines) were as common as impacts related to helicopter traffic (SRB&A 2018a). In Year 10 (2017) and Year 11 (2018), when constructed roads included the Spur, CD5, and GMT-1 roads, impacts from human-made structures were the most commonly reported impacts (SRB&A 2019a). In 2019, reports of direct impacts related to human-made structures decreased somewhat, although residents continue to discuss indirect impacts associated with resource availability. Residents indicate that the roads pose both a physical and visual barrier to the caribou and have observed changes in caribou distribution and behavior around roads, including decreased availability of caribou closer to the community (SRB&A 2019a). Residents also note that safety considerations around roads reduce the availability of individual caribou as residents are careful not to shoot toward infrastructure.

Avoidance of roads is particularly common for maternal caribou (displacement of between 0.6 and 3.1 miles [1 and 5 kilometers] from roads) (Willow MDP Supplemental EIS Section 3.12, *Terrestrial Mammals*). Displacement of calving caribou would likely not have direct effects on hunter success, as hunting during the spring calving season is low and the hunting that does occur focuses on males. During the mosquito and oestrid fly seasons, caribou are highly mobile due to insect harassment and regularly approach and cross pipelines; however, deflected movements and delays become common where roads and pipelines are close to one another or where traffic rates exceed 15 vehicles per hour (Willow MDP Supplemental EIS Section 3.12). Deflections or delays of several hours could have substantial impacts to harvesting success for residents hunting to the east of the road corridor, particularly hunters waiting along river corridors with no means of approaching delayed herds. Traffic rates of over 15 vehicles per hour would be more common during construction, and therefore decreased hunting success resulting from delayed caribou crossings would be more frequent during the construction period. It is likely that caribou deflections would continue during operations but at a lower intensity and frequency than during Project construction. In addition to increased road traffic along Project roads, development of the Project would also increase road traffic along existing roads connecting the Project area to Greater Mooses Tooth (GMT) and Alpine developments. Thus, impacts related to roads would extend beyond the alternatives analysis area.

Caribou tend to follow linear infrastructure when they are placed parallel to the herd's primary movement (Willow MDP Supplemental EIS Section 3.12), though perpendicular roads can also intercept caribou and cause delayed crossing (BLM 2018; CPAI 2018). The Alternative B access road, where it intersects with infield roads near the WPF, WOC, and airstrip, could create a "pinch point" and deflect caribou away from the road during the fall migration. During the 2020 summer/fall caribou migration, caribou were delayed crossing the GMT-1 and GMT-2 roads and instead traveled parallel to the road system until they had passed all infrastructure (Welch, Prichard et al. 2021). Under Alternative B, these caribou would have had to cross over one or more roads in order to continue their migration east and south and therefore delays may have been longer, possibly resulting in the herd not migrating into the area west of Nuiqsut, where residents frequently hunt them during the fall months. An overall deflection of migration could have substantial impacts to residents hunting caribou in overland areas during the fall. While residents hunting along roads would likely experience greater hunting success in these circumstances, some hunters will likely continue to prefer hunting in traditional overland areas rather than accessing them by road. In addition, if roads cause deflection rather than simply delaying caribou movement, there could be an overall reduction in success among road and overland caribou hunters. Temporary changes in distribution have not been shown to alter overall migration patterns or herd distribution (Willow MDP Supplemental EIS Section 3.12); however, small changes in caribou distribution and movement from a biological perspective can have large impacts on hunter success as residents are generally limited in how far and fast they can travel, particularly during the snow-free season. Because Nuiqsut is on the periphery of the two caribou herds which they rely upon (Prichard, Macander et al. 2018), they are particularly vulnerable to small changes in overall herd distribution or migration.

Caribou responses to roads seem to vary from year to year based on the context in which roads are encountered; thus, while Project roads may not deflect caribou during all seasons or years, in some years, deflections or delays could take place (Willow MDP Supplemental EIS Section 3.12). The likelihood of deflections would be higher during construction, when traffic levels would regularly exceed 15 vehicles per hour. Based on available data, it is not possible to predict the exact frequency or intensity at which deflections would take place. However, it is reasonable to conclude that caribou would be deflected from Project roads in some years, resource availability would be affected as a result of such deflections, and subsistence hunters may experience decreased hunting success during those times.

According to CPAI (2018), the TCH may be less habituated to development activity than the CAH due to the relative lack of infrastructure within its range. Thus, TCH caribou may be more prone to disturbance than the CAH (Willow MDP Supplemental EIS Section 3.12). Impacts on resource availability would most likely occur during the summer and fall months when caribou hunting activity in overland areas and along the Colville River is highest (Table E.16.7 in the Supplemental EIS Appendix E.16). During the

oestrid fly season, groups of caribou could gather on gravel pads and gravel roads for insect relief; which may result in increased availability of caribou for individuals hunting along roads but may also increase the likelihood of vehicle strikes and mortalities. Individuals not using roads to access caribou may experience reduced success closer to Nuiqsut, as the caribou are delayed or deflected from crossing roads toward the community's primary hunting area west of the community or along the Colville River toward Ocean Point. Increased hunting along the road corridor could also reduce the availability of caribou for hunters along river corridors or to the east of the road corridor and create increased competition among hunters if road use becomes more common.

Overall caribou harvests for the community of Nuiqsut as a whole have remained stable over time (during study years spanning the 1980s through 2019) (SRB&A 2021). Residents have reported that access to roads has offset some of the impacts of increased infrastructure and activity on resource availability by providing hunting access to areas farther from the community, although some report avoiding the roads altogether. Use of roads, and use of trucks to hunt for caribou, increased substantially after the Kuukpik Spur Road was built. While the first few years of road use did not show an increase in harvests along the road system, in 2018 and 2019, the percentage of caribou harvested within 2.5 miles of new infrastructure increased by approximately 10 percentage points from previous years. This suggests that the increasing use of roads has translated to increased harvests in the area west of Nuiqsut (SRB&A 2021).These conclusions are based on 6 years of post–road construction data, and hunting patterns will likely continue to change and adapt to the increasing presence of roads. Consequently, it is difficult to draw conclusions at this time regarding the magnitude of impacts of the CD5, GMT-1, and GMT-2 roads based on existing data. Impacts of roads on resource availability will vary from year to year and will depend on multiple factors including traffic rates, environmental factors affecting caribou movement, and hunter adaptation to changes.

Displacement of Caribou Due to Air Traffic Disturbance

During construction, fixed-wing airplanes would be the primary source of air traffic, with helicopters used to support ice road construction, surveying, and monitoring (CPAI 2018). Once the airstrip is constructed, air traffic to the Project area would likely increase to multiple daily flights throughout the life of the Project, although at slightly lower levels during the drilling and operations phases. Helicopter traffic would occur on a periodic basis throughout the life of the Project.

Caribou responses to air traffic disturbance and related impacts on caribou hunters are discussed in Willow MDP Supplemental EIS Sections 3.12, *Terrestrial Mammals*, and 3.16, *Subsistence and Sociocultural Systems*. Until recently, air traffic, particularly helicopter traffic, has been the most commonly reported impact on caribou hunting to the Nuiqsut Caribou Subsistence Monitoring Project (CPAI 2018; SRB&A 2018a; SRB&A 2019b, 2021). Air traffic could cause direct and indirect disturbances to caribou availability both within and outside of the alternatives analysis area. Nuiqsut hunters have observed that caribou behavior often changes in response to air traffic, particularly helicopter traffic and fixed-wing traffic at low altitudes. Observed behavioral responses include caribou "scattering" rather than remaining in groups where they are easier to hunt, acting skittish, and deflecting away from the source of noise or away from riversides (where hunters wait for them) (SRB&A 2010a, 2011, 2012, 2013a, 2014, 2015, 2016, 2017a, 2018a; SRB&A 2019b, 2020a, 2021). Hunters have frequently recounted experiences where a potentially successful harvest was disrupted by air traffic overhead, with caribou diverting to locations too far from riversides for hunters to access.

Increased air traffic associated with the Project would likely affect hunting activities in overland areas and along rivers, including the Niġliq Channel and the Colville River upriver toward Ocean Point.
The increase in overall air traffic in the region associated with the Project would increase the frequency of disturbances experienced by Nuiqsut hunters. According to SRB&A (SRB&A 2021), the area west of Nuiqsut accounts for a substantial percentage of Nuiqsut's annual caribou harvest, and increased air traffic within that area could affect Nuiqsut harvesting success during the construction and operation phases. Impacts of air traffic to caribou resource availability would be most likely during the summer oestrid-fly season and in the fall when caribou migrate in an easterly direction, often crossing through the

Project area into areas heavily used by Nuiqsut caribou hunters (Willow MDP Supplemental EIS Figures 3.16.9 through 3.16.12; Figure E.16.2 in Willow MDP FEIS Appendix E.16). However, air traffic impacts could occur year-round.

Displacement of Caribou Due to Other Infrastructure and Sources of Disturbance

Other potential sources of impacts to caribou availability include construction noise (including noise associated with gravel mining), drilling noise, general human activity, and contamination events. These potential impacts to Nuiqsut subsistence resource availability are discussed in Willow MDP Supplemental EIS Section 3.16, *Subsistence and Sociocultural Systems*. Noise associated with gravel mining (including blasting), mining equipment and machinery, and excavation, could cause caribou to avoid the mine site area or to act skittish. Blasting and excavation would occur over six construction seasons, primarily during the winter months, when caribou hunting levels are reduced. While winter is not the peak caribou hunting season for the community of Nuiqsut, harvests occur when caribou are available in the area and when households are in need of meat. Winter harvests are often an important source of food when stocks of summer and fall subsistence foods begin to run low. Winter caribou harvests have been documented occurring to the west and north of the community, including near the proposed mine site. Access to winter ice roads may help offset some of the impacts to resource availability during this time; however, gravel haul ice roads, which would be the primary ice roads located within the community's hunting area, would be off-limits to subsistence users. Module transport ice roads would see less traffic than gravel haul ice roads and community use would be restricted only during ice road construction and active hauling of the modules. In addition to noise associated with mining, the presence of the mine pits could deflect movement of caribou year-round, resulting in localized changes in distribution. The mine pits would be allowed to fill with water following construction and would therefore no longer be suitable habitat for caribou, thus affecting availability of caribou in the immediate area.

Other disturbances associated with construction noise, general equipment operation, human presence and activity, and drilling noise could result in temporary avoidance behavior or deflection of caribou, thus affecting resource availability. Studies show that caribou, especially females with calves, avoid drilling sites, and caribou that do approach drilling sites spend less time feeding and lying down (Fancy 1983; Lawhead, Prichard et al. 2004).

Resources which are perceived as contaminated by subsistence users are often considered unavailable for subsistence use (SRB&A 2009); during a recent Bureau of Ocean Energy Management–funded study, 47% of Nuiqsut households reported avoidance in the previous year of certain subsistence foods due to concerns about contamination (SRB&A 2017b). Use and storage of hazardous materials, solid waste, and drilling waste; generation of air emissions; treatment and disposal of wastewater; and dust deposition, could result in real or perceived degradation of caribou habitat. If individuals perceive or confirm caribou to be contaminated and avoid harvesting caribou that feed near the Project, they may experience reduced caribou resource availability.

Displacement of Furbearers

Potential disturbances of wolf, wolverine, and other furbearers are discussed in Willow MDP Supplemental EIS Section 3.16, *Subsistence and Sociocultural Systems*, and in Appendix E.12, *Terrestrial Mammals Technical Appendix*. Wolf and wolverine are the primary furbearer resources harvested by Nuiqsut and Utqiaġvik subsistence users in the Alternative B analysis area. Although a higher number of overall caribou harvesters use the area, a higher percentage of wolf and wolverine harvesters—individuals who generally represent a smaller portion of the population and tend to be particularly active harvesters—use the area. During the construction phase, noise and other potential sources of impacts would be highest in winter, when most construction activities (e.g., pile driving, gravel mining, ice road operation) would occur. These activities would displace furbearers near Project activities.

Furbearer harvesters have observed reduced availability of wolf and wolverine near development and human activity, noting their sensitivity to noise and human activity, and their general tendency to avoid

developed areas. Throughout the life of the Project, furbearers are likely to avoid areas with equipment and infrastructure or areas with high levels of human activity, noise, and ground traffic. Ground traffic and construction and mining noise would be highest during the winter construction months when furbearer harvesting activities are at their peak. Construction is expected to occur over a period of approximately 7 years with varying levels of intensity. Because wolf and wolverine hunting areas are generally large, accessible by snow machine, and extend in various directions from the community, residents would likely use different areas where the resources are believed to be more available, particularly during the construction phase. However, in some cases, subsistence users may have to expend more effort or go farther because the area to the west of the community is a commonly used and easily accessible area. Furbearer hunters often have specific areas where they prefer to hunt, and a temporary decrease in resource availability in those areas has been reported in recent years as a result of development activities (SRB&A Forthcoming). Operations impacts would be similar to construction but would continue throughout the life of the Project (30 years) at somewhat lower levels. For Nuiqsut, high numbers of overlapping use areas for wolf and wolverine occur around BT1, BT2, BT3, and BT5, while low to moderate overlapping use areas occur around BT4. For Utqiaġvik, low to moderate overlapping use areas occur throughout the western portion of the alternatives analysis area, with greater intensity to the west and southwest of the analysis area.

Displacement of Other Resources*

While caribou, wolf, and wolverine are the primary resources harvested directly within the alternatives analysis area, goose hunting occurs directly to the east and north of the mine site and to the east of the proposed gravel access road along the Colville River, fishing (primarily for broad whitefish, a key resource for the community of Nuiqsut) occurs downstream from the alternatives analysis area on Fish (Uvlutuuq) Creek, and seal and eider hunting occurs in Harrison Bay near Oliktok Dock. Waterfowl hunting peaks during May when residents travel by snow machine to inland and riverine areas where white-fronted goose is known to be abundant (Willow MDP Supplemental EIS Appendix E.16). While most construction activity would be complete before goose hunting begins, it is possible the ice road season would overlap with the beginning of the waterfowl hunting season in late April. Additionally, blasting at the gravel mine pits may occur into April. Thus, traffic and mining noise may result in temporary displacement or disturbance of waterfowl at the beginning of the hunting season, potentially causing a temporary decrease in harvester success. Recently, Nuiqsut harvesters reported impacts to goose hunting during the 2020 hunting season as a result of disturbance from helicopter traffic, indicating that geese left their hunting area after a helicopter flew overhead and did not return to the area for several hours (SRB&A Forthcoming). Similar disturbances may continue to occur in association with the Project, but are not expected to cause overall impacts to resource availability for the community, as the mine site and ice roads are at a substantial distance from areas of high overlapping use for goose hunting, and activities would likely cease before the primary goose hunting season began (Willow MDP Supplemental EIS Sections 3.11, *Birds*, and 3.16, *Subsistence and Sociocultural Systems*).

While the Colville River and CRD are the primary fishing areas for the community of Nuiqsut, a number of families travel to Fish (Uvlutuuq) Creek and stay at fish camps to set nets for broad whitefish during the summer (July and August) and fall (September and October) months (SRB&A 2010b). Other fish resources harvested along Fish (Uvlutuuq) Creek, although in lesser quantities than broad whitefish, include burbot (in winter), Dolly Varden, and Arctic grayling (SRB&A 2010b). While construction activities, noise, and infrastructure (e.g., ice roads) may temporarily block or displace fish upstream and downstream, these impacts would be relatively localized and would not be likely to affect harvesting activities that generally occur a substantial distance downstream along Fish (Uvlutuuq) Creek (Willow MDP Supplemental EIS Section 3.10, *Fish*). In addition, ice infrastructure over stream channels would be removed, breached, or slotted before spring breakup to minimize blocked fish passage (Willow MDP Supplemental EIS Section 3.10). Water withdrawals to support ice infrastructure construction could alter fish habitat in some freshwater lakes, but these alterations would be temporary and are not expected to affect fish populations in Fish (Uvlutuuq) Creek (Willow MDP Supplemental EIS Section 3.10). Use of lakes in the alternatives analysis area for fishing is limited (see Willow MDP Supplemental EIS Appendix

E.16). The primary potential impacts to fish resource availability would be related to real or perceived contamination of the Fish (Uvlutuuq) Creek drainage. If a spill occurs or if residents perceive that activities upstream from their fish camps are contaminating the water, they may perceive that the fish are unsafe to eat and reduce harvesting activities in the area (Willow MDP Supplemental EIS Section 3.16). Although unlikely, a larger oil spill could affect residents' fish harvesting in the Fish (Uvlutuuq) Creek drainage in the long term.

Oliktok Dock would be used under all action alternatives for the delivery of Project construction materials. Nuiqsut harvesters use the offshore area near Oliktok Dock to hunt bearded seal (41% of harvesters), ringed seal (35%), and eiders (39%). Increased barge and vessel activity would occur in an area of low to moderate offshore Nuiqsut subsistence use for these resources, with areas of high overlapping use occurring directly west of the dock area in Harrison Bay. Increased barge and vessel traffic in the vicinity of Oliktok Dock, in addition to noise associated with screeding and lightering, could displace eiders and seals in the vicinity of these activities. However, activities at Oliktok Dock would occur in areas of existing industrial disturbance and would not involve the construction of new infrastructure; therefore, these activities would be additive rather than introduce impacts into previously undeveloped areas.

Several other resource uses have been documented in and around the alternatives analysis area but are not regularly documented and not considered to be primary uses of the area. These include moose hunting and vegetation harvesting along Fish (Uvlutuuq) Creek. Moose are rare within the Project area, and eider hunting occurs primarily in offshore and nearshore areas of Harrison Bay. Vegetation harvesting has been documented along Fish (Uvlutuuq) Creek; however, it is unlikely that impacts to vegetation resulting from dust deposition would extend to harvesting areas downstream from the Project.

Access to Subsistence Resources

Potential impacts to harvester access are discussed in Willow MDP Supplemental EIS Section 3.16. A 1,000-foot safety radius around all Willow facilities would be in place and would prohibit the discharge of firearms within those areas; additionally, CPAI asks hunters not to shoot in the direction of work areas, human activity, and infrastructure. In certain areas, the presence of infrastructure and human activity, and associated safety considerations, could reduce the area in which residents can hunt by up to 2.5 miles, depending on the firearm being used (Willow MDP Supplemental EIS Section 3.16). Thus, a portion of traditional harvesting areas would be inaccessible to subsistence users from construction through the life of the Project. However, Nuiqsut subsistence users would be permitted to use most roads to access subsistence harvesting areas as long as they follow established security protocols, and hunters do use areas and harvest resources within 2.5 miles of existing roads. Gravel haul ice roads would generally be off limits to Nuiqsut harvesters due to heavy traffic levels. Module transport ice roads would see less traffic than gravel haul ice roads; these roads would be restricted from local use during ice road construction and the active hauling of the modules, with some potential for periods of local use. Thus, while much of the Project footprint would be legally accessible to subsistence users throughout the life of the Project, certain areas, particularly during construction activities, would be inaccessible to local residents and may result in residents having to divert around infrastructure to access subsistence harvesting areas, or may act as a physical barrier or obstruction to harvester access. Additionally, the presence of humans and infrastructure would affect subsistence harvesting patterns in and around the development area due to safety concerns, thus rendering some areas unusable for subsistence purposes under certain conditions.

During much of construction, access to the Project area would be limited to overland travel or via ice roads during winter, which would be open from February to April, but would be limited to ice roads not used for gravel hauling or module transport activities. Some residents—particularly those without snow machines—may use ice roads to access caribou herds farther from the community if they are not available closer by. However, the gravel haul ice roads, which are close to the community's hunting areas, would be off limit to subsistence users, and individuals traveling by snow machine may have difficulty crossing over these ice roads safely due to high traffic volumes. While the winter is not a primary hunting time for

caribou, residents do hunt this resource, particularly in February and March (SRB&A 2021) to supplement their diet as needed throughout the winter. It is unlikely that furbearer hunters would use ice roads for wolf and wolverine hunting, as most individuals would begin snow machine hunting trips directly from the community and are not expected to hunt for these resources near human activity and infrastructure. If wolf and wolverine hunters want to cross over gravel haul and module transport ice roads to access areas farther from the community, they may experience difficulties due to the high traffic volumes and access restrictions. As gravel roads are gradually constructed, year-round access to the Project area via road automobile would increase. Gravel roads would extend the current area accessible by automobile for local residents and would likely be used, to some extent, for summer and fall caribou hunting, as well as during the winter. Use of roads would be particularly likely for residents who do not have access to alternate modes of transportation (e.g., boats, snow machines, ATVs), who have limited time to engage in subsistence activities, or who have health or other issues that make overland travel difficult.

In addition to Project roads, under Alternative B (Proponent's Project), CPAI would construct up to three boat ramps specifically for subsistence use. One of the boat ramps (common to all action alternatives) would provide access to the Ublutuoch (Tiŋmiaqsiuġvik) River along the existing gravel road between Alpine CD5 and GMT-1. Up to two additional boat ramps would be constructed along Judy (Iqalliqpik) Creek and/or Fish (Uvlutuuq) Creek pending further community input. The boat ramps would be accessible from existing Project roads with the addition of short access roads. Subsistence mapping data indicate limited travel along the Ublutuoch (Tiŋmiaqsiuġvik) River by boat; however, if it is possible for individuals to access Fish (Iqalliqpik) Creek via the Ublutuoch (Tiŋmiaqsiuġvik) River using boats (Figure 3.8.3 in Appendix A, *Figures*), the boat ramps could have substantial benefits to some users. Use of Fish (Iqalliqpik) Creek for subsistence purposes has declined in recent years with residents citing fuel costs and difficult travel and navigation conditions (e.g., shallower waters near the mouth of Fish [Iqalliqpik] Creek) for the decline in use. A boat ramp that facilitates access to Fish (Iqalliqpik) Creek could increase use of this traditionally important subsistence harvesting area. Of the three proposed boat ramps, residents would be most likely to use the boat ramp closest to the community (on the Ublutuoch [Tiŋmiaqsiuġvik] River), as it would require less travel and would provide more immediate access to the lower, most heavily used portions of Fish (Iqalliqpik) Creek where most traditional camps are located. However, the boat ramps farther upriver on Fish (Uvlutuuq) and Judy (Iqalliqpik) creeks would also provide a benefit to the community, particularly in the event that the Project reduces the availability of certain resources, such as caribou, near the community. Accessing the upriver areas of Fish (Uvlutuuq) and Judy (Iqalliqpik) creeks would allow residents to access areas that are currently not frequently used due to the long boat ride from the community, high costs associated with such travel, and reported difficulties in recent years navigating into the mouth of Fish (Iqalliqpik) Creek by boat. Access to these areas may result in a shift to the community's boat hunting areas, but it could also provide access to new areas with greater concentrations of caribou in areas that are considered less affected by development (e.g., to the west of the current Prudhoe Bay/Kuparuk/Alpine development complex).

Recent data from Nuiqsut households indicate that the percentage of households using roads decreases somewhat with distance from the community, or in areas with high concentrations of drill sites. For example, while 53% of households reported using the Spur Road extending north from the community in 2019, 44% reported using the road between CD5 and GMT-1, and 31% reported using the road between GMT-1 and GMT-2. In addition, only 11% used the roads crossing east of the Niġliq Channel toward the CD1 and CD4 developments (Willow MDP Supplemental EIS Section 3.16). Data are not available at this time to determine why road use declines with distance from the community, but reasons could include lack of time (residents report using roads due to the ease of access during times when they are unable to take longer trip), lack of money or fuel to take longer trips, or successful harvests closer to the community. Decreased use of roads to the east of Niġliq Channel could be due to a relatively lower abundance of resources in that area, or due to heightened concerns about safety due to the greater concentration of infrastructure and human activity. Thus, because of the greater distance of Project roads from the community and the relatively higher density of infield roads and drill pads (compared to the GMT and

Alpine developments), particularly near the junction of the access and infield roads where the airstrip, WPF, and WOC would be located, use of Project roads may be somewhat lower than other industry roads closer to Nuiqsut. Once Project roads and infrastructure are complete, they may introduce additional concerns for residents hunting along existing roads, particularly between GMT-1 and GMT-2, as there would be fewer directions in which to shoot without consideration of human safety.

Roads would act as a physical impediment to those traveling overland, or to those traveling on or off roads to access use areas. Tundra access ramps and road pullouts at regular distances would reduce issues with off-road travel. However, some Nuiqsut hunters report difficulty crossing onto or over existing roads, even using existing tundra access ramps, particularly when hauling a heavy sled (SRB&A 2018a; SRB&A 2021). Recent upgrades to these ramps, consisting of a more gradual slope, ramps on both sides of the road, and the inclusion of a landing area at the top of each ramp, have increased the usability and safety of the ramps according to caribou harvesters. Some concerns remain regarding the placement of the ramps in low areas where spotting for caribou is difficult (SRB&A Forthcoming). While tundra access ramps would reduce impacts to access, residents may have to travel extra distances to access crossing areas if they are traversing overland. Ice roads would not include tundra access ramps but would likely have a smaller slope that would pose less of a barrier to travel; however, crossing over ice roads may be difficult due to high traffic volumes and restricted access along certain routes. The mine pits, which would be located on either side of the highly used Ublutuoch (Tiŋmiaqsiuġvik) River drainage, would also act as a physical barrier to harvesters traveling overland; residents traveling by snow machine or ATV would have to divert around the mine site during construction and in subsequent summers when the mine would fill with water. Pipelines would be placed a minimum of 7 feet above the surrounding ground surface and would generally be high enough for harvesters to cross underneath on snow machines or ATVs, although large snow drifts may result in harvesters detouring to areas with increased clearance.

*Competition with Non-Federally Qualified Users**

Subsistence harvesters on the North Slope have increasingly reported impacts related to competition from non-federally qualified users, often referred to as sport hunters by local residents. Alternative B will likely not result in a direct increase in competition from non-federally qualified users, as the permittee would prohibit hunting and trapping by employees, agents, and contractors while on "work status" (see Willow MDP Supplemental EIS Table 3.16.4, ROP H-3). Competition with non-federally qualified users may occur under the cumulative case and is discussed in Section B.9.a.

b. Evaluation of the Availability of Other Lands for the Purpose Sought to be Achieved

The Naval Petroleum Reserves Production Act of 1976, as amended, instructs the Secretary of the Interior to conduct oil and gas leasing in the NPR-A. Congress authorized petroleum production in 1980 and directed the Secretary of the Interior to undertake a program of competitive leasing of potential oil and gas tracts in the Reserve. In 2012, the NPR-A IAP/EIS analyzed impacts of future development in and around the Alpine development, including potential development in the BTU. In 2018, BLM completed an analysis of the potential impacts of development of the GMT-2 site, including a road connecting the GMT-2 site to the existing GMT-1 site located to the northwest of Nuiqsut. The Section 810 analysis for the GMT-2 project also considered development of the BTU in its Evaluation and Findings for the Cumulative Case. The purpose of the Willow MDP EIS is to analyze impacts specific to the Willow MDP alternatives to aid in differentiation of impacts between the alternatives and to provide information to agencies and other stakeholders so that they can make informed decisions regarding the Project's development. The Project was designed to develop oil from a delineated reservoir on valid leases within the NPR-A. Other lands managed by BLM are too distant to access the BTU reservoir using current drilling technologies.

c. Evaluation of Other Alternatives that would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

Alternative A (No Action) would reduce or eliminate the use of public lands needed for subsistence purposes. However, BLM may not select Alternative A as its preferred alternative. BLM issued leases to

CPAI and is required to allow reasonable development of those leases. The Willow MDP Supplemental EIS Appendix D, Section 3.1.3, *Alternative Components Considered but Eliminated from Further Analysis*, discusses other alternatives (or alternative components) that were considered but eliminated from detailed analysis due to economic, or technological feasibility or practicability, or because they did not meet the purpose of the proposed action to produce the oil discovered on CPAI's leases.

d. Findings

1. Reductions in the availability of subsistence resources described above for Alternative B may significantly restrict subsistence uses for the community of Nuiqsut.

2. Limitations on subsistence user access described above for Alternative B may significantly restrict subsistence uses for the community of Nuiqsut.

This evaluation concludes that development of Willow MDP EIS Alternative B (Proponent's Project) is not expected to result in a large reduction in the abundance (population level) of caribou or any other subsistence resource. Neither is there any expectation that there will be a major increase in the harvest of caribou by non-subsistence users. Therefore, this finding of "may significantly restrict" is only triggered by two other primary factors that must be considered:

1. Reduction in the availability of resources caused by alteration of their distribution
2. Limitation of access by subsistence harvesters

The rationale for these findings and the determination of significance are summarized below.

1. Rationale for the Finding of Reductions in the Availability of Subsistence Resources Under Alternative B

The Project is likely to deflect TCH caribou from areas where Nuiqsut hunters harvest them. Caribou are a resource of major importance for Nuiqsut. The majority of caribou hunting in the Project area occurs in the eastern portion of the area surrounding the proposed gravel mine site and access road. Caribou would have to cross through the Project area before being hunted in overland areas west of the community and along the Niġliq Channel and Colville River. Deflection would likely occur due to reduced habitat, roads, road traffic, aircraft traffic (overhead flights and take offs and landings), construction noise (including mining activity), drilling noise, and general human activity.

Project roads have a high potential to disturb TCH caribou. Under Alternative B, the gravel access road would bisect the fall migration corridor for a portion of the herd and would be located in an area heavily used by TCH caribou in some years, both summer and winter. According to Nuiqsut residents, roads pose both physical and visual barriers to caribou and it has been observed that changes in caribou distribution and behavior around roads results in decreased availability of caribou closer to the community. Additionally, when caribou are near roads and pads, the availability of these animals is diminished due to safety considerations as residents do not shoot toward infrastructure or areas of human activity.

Impacts related to roads, and roads collocated with pipelines, would extend beyond the Project area. Although caribou are highly mobile during mosquito and oestrid fly seasons, deflected movements and delays are more common where roads and pipelines are close to one another. Project development would result in a second set of pipelines alongside existing pipelines from the GMT-2 drill site to the Alpine development. Deflected movement and delays would also be more common when traffic rates reach and exceed 15 vehicles per hour. Project development would also increase road traffic along existing roads connecting the Project area to the existing GMT-2, GMT-1, CD5, and Alpine developments. These traffic rates would be more common during construction, but it is likely that caribou deflections would continue at a lower intensity during the operations phase.

The Alternative B access road would create a pinch point where it intersects with infield roads, which could deflect some caribou away from the road during the fall migration. What could be small changes in caribou distribution from a biological perspective could have large impacts on hunter success because hunters are generally limited in how far and how fast they can travel, particularly during the snow-free

season. Impacts on the availability of TCH caribou would most likely occur during the summer and fall months, when caribou hunting in overland areas and along the Colville River is highest. Deflections or delays of several hours could have substantial impacts to harvesting success for residents hunting east of the road corridor, and particularly to hunters waiting along river corridors.

The location of the proposed gravel mine site could be particularly disruptive to both caribou and hunters. The site is directly west of Nuiqsut in an area commonly reached by hunters traveling overland. Although blasting and excavation would occur during winter when caribou hunting levels are lower, Nuiqsut hunters do harvest caribou in the area in winter and the presence of the mine could deflect caribou movement year-round, resulting in localized distribution changes. The mine site would fill with water after construction and thus would no longer provide habitat for caribou; the mine site would remain as a pond(s) directly overlapping an overland hunting area west of Nuiqsut.

Air traffic could cause direct and indirect disturbance to caribou availability both within and outside of the Project area. In addition to helicopter traffic throughout the analysis area, the Project would include a new airport with large fixed-wing aircraft taking off and landing directly west of Ocean Point, a common hunting area along the Colville River. Increased air traffic associated with the Project would likely affect hunting activities along the Niġliq Channel and the Colville River, upriver toward Ocean Point and in overland areas west of Nuiqsut. The increase in overall regional air traffic associated with the Project would increase the frequency of disturbances experienced by hunters. This type of disturbance would most likely occur during summer and fall when caribou would migrate in an easterly direction through the Project area into areas heavily used by Nuiqsut hunters.

Project activities, particularly during construction, would reduce the availability of furbearers in the vicinity. The alternatives analysis area has been reported as being used by 88% of wolverine harvesters and 87% of wolf harvesters. The highest overlapping use areas for wolf and wolverine occur around BT1, BT2, BT3, and BT5; low to moderate use occurs around BT4. Impacts to furbearers would be highest in winter when pile driving, mine site blasting and excavation, and ice road operations would occur. These activities would displace furbearers. Residents would likely use other areas where furbearers would be more available, but hunters would likely have to travel farther with greater expense, effort, and risk, because the area west of the community is commonly used and easily accessible. While furbearers generally are not a food source for the community, furbearer hunting and trapping is a specialized activity with special importance to Nuiqsut.

BLM anticipates that altered distributions of the TCH caribou and furbearers would occur during construction and operation of the Project. As described above, this altered distribution could have large impacts to hunter success due to how far and fast hunters can travel and because there would be deflections or delays in caribou movement for residents to the east of the road corridor and along the Colville River, which is a high subsistence use area. BLM concludes that this would cause a major redistribution of resources that would affect the existing availability of these resources for Nuiqsut hunters.

2. Rationale for Finding of Limitations on Subsistence User Access Under Alternative B

A portion of traditional harvest areas would be inaccessible to residents during all Project phases, including land permanently overlain by infrastructure. Much of the Project area would be legally accessible, but infrastructure may act as a physical barrier or obstruction to harvester access. Subsistence users would be prohibited from discharging firearms within safety areas (1,000-foot radii surrounding oil and gas exploration, development, and transportation facilities other than roads) (CPAI 2019a, 2019b). Security protocols prohibit shooting toward infrastructure, people, work crews, equipment, and pipelines. The presence of humans and infrastructure would affect subsistence harvesting patterns in and around the Project area due to safety concerns, rendering some areas unusable for subsistence purposes (the range common to hunting with rifles is 0.5 to 3 miles).

Ice roads used for gravel hauling would be off limits for any other use. These roads would only be present during winter construction, which is not a primary caribou hunting period. However, residents do

traditionally harvest caribou in winter along overland areas on the west side of Nuiqsut, particularly in February and March, to supplement their diet.

Access to the gravel mine area may be restricted during the construction phase. The mine site would be a physical barrier to harvesters traveling overland either by snow machine in winter or ATV in summer and fall. After construction, the mine site would be allowed to fill with water, and this would make the area inaccessible for overland travel in summer and fall.

Residents may use non-gravel haul ice roads and permanent gravel roads, once completed, to access subsistence areas. This facilitated access might provide a countervailing effect; however, use of roads declines with distance from the community. The use of Project roads may be lower than the use of roads closer to Nuiqsut (e.g., CD5, GMT-1) due to both the greater distance of Project roads from the community and the relatively high density of Project infield roads and drill sites. Industry road use is subject to standard safety rules, some of which would restrict use for some residents (e.g., no unaccompanied minors). During road construction, residents would not be able to use gravel roads and it may be difficult or impossible to cross them. Once road construction is completed, roads could be a physical impediment to overland travel; gravel roads may also prove to be difficult to gain access to or depart from to access subsistence use areas. Some Nuiqsut hunters have reported difficulty crossing existing gravel roads, even when using specifically constructed tundra/subsistence access ramps, particularly when hauling a heavy sled and in early spring when areas around roads and ramps thaw earlier than the surrounding tundra. Recent ramp upgrades have lessened but not eliminated these concerns. Crossing ice roads may be restricted due to heavy traffic and other roads may have periods of overall restricted access.

The totality of limitations on subsistence access associated with the Project, particularly during the 7-year construction phase but lasting through the life of the Project, would constitute a substantial restriction on subsistence access for Nuiqsut residents.

None of these impacts is expected to affect all subsistence hunters equally, and many of these impacts are uncertain. Caribou movement is highly variable; over time, some caribou may tolerate certain sources of disturbance (Willow MDP Supplemental EIS Section 3.12.2.3.2, *Disturbance or Displacement*), and harvesters may adapt to changes in resource availability to some extent. However, given the importance of caribou availability and access to traditional hunting areas to Nuiqsut hunters, BLM expects that limitations to subsistence access and the reduced resource availability anticipated to occur over the 30-year Project life, directly and indirectly attributable to Project development, would result in an extensive interference with Nuiqsut hunter access.

Nuiqsut residents have experienced limited access to their traditional subsistence lands and resources in large areas to the east, north, and west due to previous oil and gas infrastructure development, and they currently face substantial increasing development in those areas. As a result, their subsistence use areas have shifted away from developed areas. These impacts affect the relative value of remaining undeveloped land, including land that would be overlain by Project infrastructure and lands adjacent to the Project where subsistence value would decrease due to Project development.

3. Evaluation and Finding for Alternative C (Disconnected Infield Roads)

The footprint for Alternative C (Disconnected Infield Roads) is similar to that of Alternative B (Proponent's Project), except there would be no gravel road between the WPF and BT1/BT2/BT4, and therefore no road and bridge crossing Judy (Iqalliqpik) Creek. This alternative would eliminate the perpendicular intersection of the access and infield roads included under Alternative B. Alternative C would also locate the WPF, WOC, and primary Project airstrip (south airstrip) approximately 1 mile to the northeast compared to Alternative B, somewhat closer to the community of Nuiqsut but into areas of lower TCH density. Only one of the three subsistence use boat ramps proposed under Alternative B (the boat ramp accessing the Ublutuoch [Tiŋmiaqsiuġvik] River) would be constructed under Alternative C due to the lack of a gravel road connection to Judy (Iqalliqpik) Creek and upper Fish (Uvlutuuq) Creek.

The mine site footprint (excavation and perimeter berms) under Alternative C would be approximately 80 acres larger than under Alternative B.

a. Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs

The effects of Alternative C on subsistence would be similar to those described for Alternative B with three important differences:

1. Alternative C would reduce impacts to migrating caribou resulting from the elimination of the roadway "pinch point" between BT1 and the WPF and the relocation of the airstrip, WOC, and WPF into areas of lower TCH density.
2. Alternative C would increase the frequency and geographic extents of air traffic due to the need for additional air travel during the ice-free months and the addition of a second airstrip (north airstrip).
3. Alternative C would not include subsistence boat ramps on the upper Fish (Uvlutuuq) and Judy (Iqalliqpik) creeks.

Overall, Alternative C would require slightly higher levels of fixed-wing aircraft, helicopter, and ground traffic. However, ground traffic would be more concentrated in the winter months when caribou hunting activity is lower. The lack of a perpendicular road between the WPF and BT1 would decrease the potential for deflection of migrating caribou. The lack of access to the BT1/BT2/BT4 road corridor during the peak caribou hunting season would reduce ground traffic and hunting activity in that area, likely reducing deflection away from the access road and allowing caribou to move more freely along the Judy (Kayyaaq) Creek drainage. If the Project results in large-scale deflections of caribou despite the decrease in infield roads, hunters would have no summer or fall access to the BT1, BT2, and BT4 roads, nor would subsistence boat ramps on Fish (Uvlutuuq) and Judy (Iqalliqpik) creeks be constructed to mitigate effects by providing access to areas with heavier concentrations of caribou. Similar to Alternative B, Alternative C would construct a subsistence boat ramp on the Ublutuoch (Tiŋmiaqsiuġvik) River that would be more easily accessible from the community and that could provide access to key hunting areas on the lower portion of Fish (Iqalliqpik) Creek. Because the south airstrip, WOC, and WPF would be moved slightly farther east into areas of lower caribou density, impacts from air traffic may affect fewer caribou overall and could reduce deflection of caribou migrating toward the community's primary hunting area. However, moving the airstrip, WOC, and WPF closer to the community and core hunting areas may increase the frequency of disturbances to hunters related to aircraft takeoffs and landings, in addition to increased human activity. The increase in air traffic would be likely be offset by decreased ground traffic between the WPF and BT4, and lack of gravel infrastructure and associated human activity between the WPF and BT1 during the peak caribou hunting season. The long-term differences in direct impacts between Alternatives B and C are considered minimal because both alternatives would include a year-round access road to the west of Nuiqsut's core caribou hunting grounds. While air traffic would be substantially higher under Alternative C, impacts to caribou resource availability would likely be reduced under Alternative C due to the reduction in year-round infrastructure and ground traffic during peak hunting seasons.

b. Evaluation of the Availability of Other Lands for the Purpose Sought to be Achieved

The evaluation of the Willow MDP EIS Alternative C is identical to that provided above in Section B.2.b.

c. Evaluation of Other Alternatives that would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

The evaluation of the Willow MDP EIS Alternative C is identical to that provided above in Section B.2.c.

d. Findings

1. Reductions in the availability of subsistence resources described above for Alternative C may significantly restrict subsistence uses for the community of Nuiqsut.

2. Limitations on subsistence user access described above for Alternative C may significantly restrict subsistence uses for the community of Nuiqsut.

This evaluation concludes that development of Willow MDP EIS Alternative C (Disconnected Infield Roads) is not expected to result in a large reduction in the abundance (population level) of caribou or any other subsistence resource. Neither is there any expectation that there will be a major increase in the harvest of caribou by non-subsistence users. Therefore, this finding of "may significantly restrict" is only triggered by two other primary factors that must be considered:

1. Reduction in the availability of resources caused by alteration of their distribution
2. Limitation of access by subsistence harvesters

The rationale for these findings and the determination of significance are summarized below.

1. Rationale for the Finding of Reductions in the Availability of Subsistence Resources Under Alternative C

The rationale for the finding of reduced availability of subsistence resources under Alternative C is similar to that for Alternative B with a few distinct differences. Under Alternative C, the location of the WPF is an area with lower caribou densities, thus impacts to caribou from WPF-related traffic, activity, and noise would be somewhat reduced. The lack of subsistence hunter road access to infield roads between BT1 and BT4 may allow caribou to habituate to linear infrastructure more readily and allow caribou to establish a pattern of movement through (gravel) roadless corridor along Judy (Iqalliqpik) Creek. Ground traffic rates on these infield roads would likely be reduced during summer. Although increased air traffic would likely offset this to some degree, the reduced ground traffic may allow caribou to habituate to linear infrastructure. Overall, impacts to the disturbance of caribou under Alternative C could be reduced compared to Alternative B because more caribou may move north of the GMT-2-WPF access road due to the roadless corridor along Judy (Iqalliqpik) Creek. Currently, the majority of caribou hunting occurs in the eastern portion of the Project area near the proposed gravel mine and access road. Once this area is disturbed, the area north of the access road may have more caribou; however, restrictions on shooting toward pipelines would limit the actual availability of caribou hunting in the area.

Overall, despite the potential for reduced disturbance to caribou under Alternative C, BLM expects that altered distributions of TCH caribou and furbearers would occur during the Project's construction and operations phases. This altered distribution could have large impacts to hunter success due to how far and fast hunters can travel and because there would be deflections or delays in caribou movement for residents east of the road corridor and along the Colville River, which is a high subsistence use area. BLM concludes that this would cause a major redistribution of resources that would affect the existing availability of these resources for Nuiqsut hunters.

2. Rationale for the Finding of Limitations on Subsistence User Access Under Alternative C

The rationale for the determination that interference with subsistence access would be extensive under Alternative C is identical to the rationale provided for under Alternative B (Section B.2.d.2) with the exception that under Alternative C, residents of Nuiqsut would not have all-season road access to the infield roads between BT1 and BT4.

4. Evaluation and Finding for Alternative D (Disconnected Access)

The footprint for Alternative D (Disconnected Access) is similar to that of Alternative B except there would be no gravel access road connection between the Project area and the GMT-2 and Alpine developments. Under this alternative, transportation to the Project area would be exclusively by aircraft for approximately 9 months of the year (May through January) and primarily via ice road for 3 months of the year (February through April). Gravel roads would connect the WPF, which would be colocated with BT3, to the other four drill sites and Project infrastructure. The WPF, WOC, and airstrip would be located approximately 3 to 4 miles southwest of their locations under Alternative B, thus possibly increasing human-related disturbances within areas of higher caribou density. However, overall, this alternative would reduce linear infrastructure on the landscape, remove the intersection of the access and infield road, and reduce year-round ground traffic with the goal of reducing impacts to migrating caribou. Similar to Alternative C, only one of the three subsistence use boat ramps proposed under Alternative B (the boat ramp accessing the Ublutuoch [Tiŋmiaqsiuġvik] River) would be constructed under Alternative

D due to the lack of a gravel road connection to Judy (Iqalliqpik) Creek and upper Fish (Uvlutuuq) Creek. The mine site footprint (excavation and perimeter berms) under Alternative D would be approximately 80 acres larger than under Alternative B.

a. Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs

The effects of Alternative D on subsistence would be like those described for Alternative B with one important difference: Alternative D would reduce impacts to migrating caribou resulting from the elimination of the gravel access road connecting the Project to the GMT-2 and Alpine developments. Overall, Alternative D would require higher levels of fixed-wing aircraft and helicopter traffic resulting from the lack of year-round road access to the Project. On average, the increase in air traffic would amount to one or two additional fixed-wing aircraft trips per day for the life of the Project (32 years) and one additional helicopter trip per week during the drilling and operations phases; these trips would be more concentrated during the 9 months when there would be no ice road access. The increase in air traffic could result in a greater frequency of air traffic disturbances to caribou, resulting in decreased harvest success for Nuiqsut hunters during individual hunting trips. The lack of a gravel access road running perpendicular to the fall migration route, in addition to the lack of ground traffic in that area throughout the summer and fall, would decrease the potential for deflection of caribou migrating through the Project area in the fall, or disturbance of caribou that occur in the area in the summer. While the WPF, WOC, and airstrip would be located farther west into areas of higher caribou density (therefore increasing the potential for disturbances in those areas), they would be farther from Nuiqsut's core caribou hunting grounds.

The lack of a year-round gravel access road under Alternative D means Nuiqsut residents would not have the benefit of access to the Project area via road for hunting. However, it is unclear how much residents would use the Project road system given its distance from the community and the somewhat higher concentration of drill sites; some evidence shows decreased use of roads with increased distance from the community or in more densely developed areas (Willow MDP Supplemental EIS Section 3.16, *Subsistence and Sociocultural Systems*). Residents would still be able to use the road system to reach GMT-2 and hunt from those roads by ATV or snow machine. In addition, under Alternative D, there would no subsistence boat ramps on Fish (Uvlutuuq) and Judy (Iqalliqpik) creeks to mitigate larger-scale deflections of caribou if they continue to occur despite the decrease in road infrastructure. Similar to Alternative B, Alternative D would construct a subsistence boat ramp on the Ublutuoch (Tiŋmiaqsiuġvik) River that would be more easily accessible from the community and that could provide access to key hunting areas on the lower portion of Fish (Uvlutuuq) Creek.

Per the Willow MDP Supplemental EIS, Alternative D may result in less impacts on caribou availability due to the lack of a year-round access road. While air traffic levels would be somewhat higher, air traffic generally causes localized disturbances whereas roads can cause larger effects on caribou movement and distribution, in addition to changes in caribou hunting patterns. Across the 12 years of the Nuiqsut Caribou Subsistence Monitoring Project and as development activity has increased in the vicinity of Nuiqsut, reports of air traffic impacts have remained somewhat stable, while reports of impacts related to human-made structures have increased. In addition, avoidance behavior and changes in hunting patterns have been more evident since construction of roads in the area (SRB&A 2019a; SRB&A 2021). Thus, it is likely that while the increase in air traffic would contribute to existing impacts to hunters, additional road infrastructure to the west of the community would substantially increase impacts to resource availability and hunter access. By eliminating a large portion of year-round road infrastructure to the west of the community, Alternative D would reduce deflection of caribou as they migrate toward Nuiqsut's core hunting grounds to the west of the community. Additionally, while the Project area would not be road-accessible year-round for Nuiqsut hunters, they would likely still continue to use existing roads and hunt in the area between GMT-2 and the Project area.

b. Evaluation of the Availability of Other Lands for the Purpose Sought to be Achieved

The evaluation of the Willow MDP EIS Alternative D is identical to that provided above in Section B.2.b.

c. Evaluation of Other Alternatives that would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

The evaluation of the Willow MDP EIS Alternative D is identical to that provided above in Section B.2.c.

d. Findings

1. Reductions in the availability of subsistence resources described above for Alternative D may significantly restrict subsistence uses for the community of Nuiqsut.

2. Limitations on subsistence user access described above for Alternative D may significantly restrict subsistence uses for the community of Nuiqsut.

This evaluation concludes that development of Willow MDP EIS Alternative D (Disconnected Access) is not expected to result in a large reduction in the abundance (population level) of caribou or any other subsistence resource. Neither is there any expectation that there will be a major increase in the harvest of caribou by non-subsistence users. Therefore, this finding of "may significantly restrict" is only triggered by two other primary factors that must be considered:

1. Reduction in the availability of resources caused by alteration of their distribution
2. Limitation of access by subsistence harvesters

The rationale for these findings and the determination of significance are summarized below.
The rationale for these findings is similar to those described above for Alternative B (Section B.2.d, *Findings*) with key differences summarized below.

1. Rationale for the Finding of Reductions in the Availability of Subsistence Resources Under Alternative D

Alternative D may result in fewer impacts on caribou availability than Alternative B due to the lack of a year-round gravel access road connecting the Project to existing development (e.g., GMT-2, Alpine); however, BLM still anticipates a major redistribution of resources would occur under this alternative. The lack of a gravel-access road alignment being perpendicular to the fall caribou migration and the lack of ground traffic in that area throughout the summer and fall would decrease the potential for deflection of caribou migrating through the area. Higher levels of fixed-wing aircraft and helicopter traffic resulting from the lack of year-round access would overlap with peak caribou hunting months, which could result in a greater frequency of air traffic disturbances to caribou, resulting in decreased harvester success for Nuiqsut hunters during individual hunting trips. The increase in air traffic would likely not be enough to outweigh the benefits of reduced deflection of caribou as they migrate toward Nuiqsut's hunting grounds to the west of the community. While air-traffic volumes would be somewhat higher, air traffic generally causes localized disturbances whereas roads can cause larger effects on caribou movement and distribution.

Many benefits of reduced deflection from the lack of an access road would be offset by the aircraft traffic (including take offs and landings of large fixed-wing aircraft) in addition to the combined effects of a linear pipeline along the route between GMT-2 and the Project, parallel pipeline racks between GMT-2 and Alpine facilities, Project infield roads, drill sites, and the WPF, the location of and activity at the gravel mine site, and other disturbances described above for Alternative B.

2. Rationale for the Finding of Limitations on Subsistence User Access Under Alternative D

The rationale for the determination that interference with subsistence access would be extensive under Alternative D is similar to the rationale provided for Alternative B with the exception that the lack of a year-round access road under Alternative D means that Nuiqsut residents would not have the potential benefit of access to the project area via road vehicle for hunting. It is unclear how much residents would use the Willow MPD road system given its distance from the community and the somewhat higher concentration of drill sites; some evidence shows decreased use of roads with distance from the community or in more densely developed areas (Willow MDP Supplemental EIS Section 3.17). Alternative D would reduce limitations on overland travel but restrict access via roads. Residents would still be able to use the road system to GMT-2 and hunt off of those roads by four-wheeler or snow

machine. Limitations to access described above for Alternative B resulting from direct overlap with subsistence use areas, safety areas around sites, road use guidelines, security protocols restricting shooting, and gravel haul ice roads would be similar under Alternative D.

5. Evaluation and Finding for Alternative E (Three-Pad Alternative)*

The footprint for Alternative E (Three-Pad Alternative) is smaller than that of Alternative B because Alternative E would exclude drill site BT4 and move the BT5 drill site to the northeast. Drill site BT2 would move farther north. This alternative would reduce infrastructure within the TLSA and reduce the overall length of gravel roads compared to Alternative B. Alternative E would reduce linear infrastructure in the portion of the Project farthest from the community of Nuiqsut and least used by Nuiqsut harvesters, but closer to high-density caribou calving and preferred mosquito-relief habitat. Alternative E would include the three subsistence use boat ramps proposed under Alternative B. Construction of BT5 would be deferred to Year 7 at the earliest. This Year 7 construction scenario is considered to be the most impactful and thus is the scenario analyzed in the Willow MDP Supplemental EIS. If BT5 construction is deferred beyond Year 7, the anticipated impacts related to BT5 would be delayed, resulting in extended temporal impacts, although the severity or intensity of the impacts would be lessened due to there being less overall Project activity (i.e., other construction activity) occurring simultaneously.

a. Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs*

The effects of Alternative E on subsistence would be like those described for Alternative B with one difference: Alternative E would reduce infrastructure in the TLSA, a key habitat and migratory area for caribou. The reduction in linear infrastructure could lessen the frequency or severity of deflection of caribou migrating toward Nuiqsut subsistence harvesting areas to the west of the community. Roads and pipelines within 500 feet of one another increase the likelihood of caribou displacement and deflection; under Alternative E, there would be a 30% reduction in the amount of pipeline within 500 feet of gravel roads. In addition, Alternative E would reduce infrastructure within the TLSA by 43% and move infrastructure (including roads, pipelines, and the nearest drill site) farther from high-density calving areas and mosquito-relief habitat (Willow MDP Supplemental EIS Section 3.12). Aside from the reduction in infrastructure described above, a key feature of Alternative B would remain under Alternative E: all drill sites under Alternative E would be connected to one another and to the existing GMT-2 development by gravel road. Thus, while the reduction in linear infrastructure within the TLSA may help reduce obstructions during the summer and fall migration, many caribou would still encounter roads, including the pinch point where the access road intersects with infield roads, during their migration south.

The reduction in infrastructure under Alternative E would primarily result in a lessening of indirect impacts (e.g., impacts related to resource availability resulting from deflection of caribou). Overall, a slightly smaller percentage of Nuiqsut harvesters (88%) would be affected under Alternative E compared to Alternative B (91%), and the difference occurs specifically among goose hunters (Willow MDP Supplemental EIS Section Table 3.16.5). Alternative E will also reduce infrastructure in Utqiaġvik areas of low to moderate use for wolf and wolverine, thus somewhat reducing the area of impact for hunters from that community.

In terms of direct impacts, the reduction in infrastructure within the TLSA would occur in an area that is not heavily used by Nuiqsut harvesters relative to the entire Project area. When looking specifically at the alternative analysis area where it intersects with the TLSA, under Alternative E, 67% of Nuiqsut all resources harvesters reported use areas compared to 73% under Alternative B (Willow MDP Supplemental EIS Table 3.16.9). For caribou during the 1995–2006 time period, just over half of harvesters (56%) reported use areas in the alternative analysis area where it intersects with the TLSA. A smaller percentage of caribou harvesters have used the area in recent individual study years (2008–2019), and no caribou harvests were reported in this area for any of the action alternatives (Willow MDP Supplemental EIS Table 3.16.9). Thus, while the decrease in infrastructure within the TLSA may reduce

deflection of caribou and lessen impacts on resource availability for Nuiqsut harvesters, the difference in direct impacts on caribou hunters would be minimal.

Under Alternative E, there would be a slight reduction in air, ground, and marine vessel traffic. The reduction in traffic may reduce the frequency of impacts to hunters in addition to reducing impacts to resource availability resulting from skittish behavior in caribou, furbearers, marine mammals, and birds. A decrease in ground traffic would lessen the likelihood of vehicle strikes for terrestrial mammals.

Access to Project roads for Nuiqsut residents would be similar to Alternative B but with slightly less overall road length. It is unclear how far residents will regularly travel along Project roads, as recent data show a moderate decrease in road use with distance from the community (Willow MDP Supplemental EIS Section 3.16). Similar to Alternative B, Alternative E would construct a boat ramp on the Ublutuoch (Tiŋmiaqsiuġvik) River and up to two additional boat ramps on Judy (Iqalliqpik) Creek and Fish (Uvlutuuq) Creek. These boat ramps would be accessible along the road system from the community and could provide access to key hunting areas on the lower portion of Fish (Uvlutuuq) Creek. Use of these boat ramps to access areas on Judy (Iqalliqpik) and Fish (Uvlutuuq) creeks could help offset impacts to resource availability associated with deflection of caribou from roads.

Overall, while Alternative E would not result in a substantial reduction in direct impacts to Nuiqsut subsistence harvesters, the reduction in infrastructure within the TLSA may reduce impacts to caribou habitat and lessen the frequency and likelihood of roads deflecting caribou away from Nuiqsut caribou hunting grounds.

b. Evaluation of the Availability of Other Lands for the Purpose Sought to be Achieved*

The evaluation of the Willow MDP EIS Alternative E is identical to that provided above in Section B.2.b.

c. Evaluation of Other Alternatives that Would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes*

The evaluation of the Willow MDP EIS Alternative E is identical to that provided above in Section B.2.c.

d. Findings*

1. Reductions in the availability of subsistence resources described above for Alternative E may significantly restrict subsistence uses for the community of Nuiqsut.

2. Limitations on subsistence user access described above for Alternative E may significantly restrict subsistence uses for the community of Nuiqsut.

This evaluation concludes that development of Willow MDP EIS Alternative E (Three-Pad Alternative) is not expected to result in a large reduction in the abundance (population level) of caribou or any other subsistence resource. Neither is there any expectation that there will be a major increase in the harvest of caribou by non-subsistence users. Therefore, this finding of "may significantly restrict" is only triggered by two other primary factors that must be considered:

1. Reduction in the availability of resources caused by alteration of their distribution
2. Limitation of access by subsistence harvesters

The rationale for these findings and the determination of significance are summarized below. The rationale for these findings is similar to those described above for Alternative B (Section B.2.d, Findings).

*1. Rationale for the Finding of Reductions in the Availability of Subsistence Resources Under Alternative E**

The reduction in infrastructure under Alternative E may reduce deflection of caribou; however, the reduction in impacts to all resources will be minimal. Overall, a slightly smaller percentage of Nuiqsut harvesters (88%) would potentially be affected under Alternative E compared to Alternative B (91%), and

the difference occurs specifically among goose hunters. The Project is likely to deflect TCH caribou from areas where Nuiqsut hunters harvest them. Caribou are a resource of major importance for Nuiqsut. The majority of caribou hunting in the Project area occurs in the eastern portion of the area surrounding the proposed gravel mine site and access road. Caribou would have to cross through the Project area before being hunted in overland areas west of the community and along the Niġliq Channel and Colville River. Deflection would likely occur due to reduced habitat, roads, road traffic, aircraft traffic (overhead flights and take offs and landings), construction noise (including mining activity), drilling noise, and general human activity.

Project activities, particularly during construction, would reduce the availability of furbearers in the vicinity. Impacts to furbearers would be highest in winter when pile driving, mine site blasting and excavation, and ice road operations would occur; these activities have the potential to displace furbearers from areas where they are traditionally harvested. While furbearers generally are not a food source for the community, furbearer hunting and trapping is a specialized activity with special importance to Nuiqsut.

Although the overall road and pipeline length would be reduced under Alternative E compared to Alternative B (with corresponding reductions in Project construction activity), these reductions would not be enough to completely prevent potential redistribution of caribou and furbearers. BLM anticipates that altered distributions of the TCH caribou and furbearers would occur during construction and operation of the Project under Alternative E. As described above, this altered distribution could have large impacts to hunter success due to how far and fast hunters can travel, and because there would be deflections or delays in caribou movement for residents to the east of the road corridor and along the Colville River, which is a high subsistence use area. BLM concludes that this would cause a major redistribution of resources that would affect the existing availability of these resources for Nuiqsut hunters. See Section B.2.d for more details.

2. Rationale for Finding of Limitations on Subsistence User Access Under Alternative E*

A portion of traditional harvest areas would be inaccessible to residents during all Project phases, including land permanently overlain by infrastructure. Much of the Project area would be legally accessible, but infrastructure may act as a physical barrier or obstruction to harvester access. Some Nuiqsut hunters have reported difficulty crossing existing gravel roads, even when using specifically constructed tundra/subsistence access ramps, particularly when hauling a heavy sled and in early spring when areas around roads and ramps thaw earlier than the surrounding tundra. Upgrades to existing ramps have reduced but not eliminated these concerns. Crossing ice roads may be restricted due to heavy traffic, and other roads may have periods of overall restricted access. Subsistence users would be prohibited from discharging firearms within safety areas (1,000-foot radii surrounding oil and gas exploration, development, and transportation facilities other than roads) (CPAI 2019a, 2019b). Security protocols also prohibit shooting toward infrastructure, people, work crews, equipment, and pipelines.

The totality of limitations on subsistence access associated with the Project, particularly during the construction phase but lasting through the life of the Project, would constitute a substantial restriction on subsistence access for Nuiqsut residents. See Section B.2.d for more details.

6. Evaluation and Finding for Module Delivery Option 1 (Atigaru Point Module Transfer Island)

Module delivery Option 1 (Atigaru Point Module Transfer Island), would include construction of an MTI near Atigaru Point to support sealift module delivery to the Project. Module delivery by sealift barge to the MTI would occur over two summers; the modules would be stored on the MTI and then transported from the MTI to the WPF via an ice road. Gravel would be hauled from the Tiŋmiaqsiuġvik mine site via ice road to the MTI site for construction. During construction, the MTI would house facilities such as an office, break room, and helipad; a temporary 100-person work camp would be located onshore near Atigaru Point. Construction facilities and supplies would be demobilized once construction was complete.

In the Willow MDP Supplemental EIS, BLM analyzed potential direct impacts on subsistence based on a 2.5-mile buffer of permanent and temporary infrastructure, including the MTIs and associated module transport and gravel haul ice roads, for each module delivery option (module delivery option analysis area). While the MTI-associated activities would occur solely during the construction phase of the Project, the MTIs themselves would remain after module transport was complete. Differences in impacts between the construction and operation phases are discussed qualitatively. The module delivery option analysis areas do not include all areas where development-related activity (e.g., vessel traffic) or impacts would occur. The analysis area allows for more detailed analysis of the area where subsistence users are most likely to experience direct impacts from the Project. Additional direct and indirect impacts that would occur outside the analysis area are also addressed.

a. Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs

The analysis area for module delivery Option 1 (Figure 12) lies within areas heavily used by Nuiqsut residents for subsistence. Between 1995 and 2006, a substantial proportion of Nuiqsut harvesters reported using the analysis area for harvesting of caribou, wolverine, and wolf (over 80% of harvesters each); and goose (over 50% of harvesters) (Willow MDP Supplemental EIS Table 3.16.11). These resources are harvested primarily in overland areas crossed by ice roads, particularly where the gravel haul ice road crosses Fish (Uvlutuuq) Creek and terminates at the mine site (Figures 13 through 16). Between 2008 and 2019, the percentage of caribou harvesters using the analysis area for Option 1 ranged from 33% to 78%; caribou harvests within the area ranged from 4% to 19% of the total harvest during individual study years (Willow MDP Supplemental EIS Table 3.16.12). Nuiqsut harvesters also use the offshore area in Harrison Bay surrounding the MTI for subsistence harvesting of bearded seal (33% of harvesters), ringed seal (26%), and eider (14%) (Willow MDP Supplemental EIS Table 3.16.11). Uses of the area directly to the east of the analysis area for these resources are higher (Figure 17). Twelve percent of Utqiaġvik harvesters reported using the Option 1 analysis area, primarily for wolf and wolverine, during the 1997 to 2006 time period (Figure 18). While the bowhead whale hunt is a culturally important subsistence activity and provides a large portion of the Nuiqsut's annual subsistence harvest, the community's whale hunting activities occur a substantial distance east of the potentially affected area, near Cross Island. Thus, impacts to bowhead whale hunting associated with the Project are unlikely.

As discussed in Section B.2.a, both caribou and wolf and wolverine are key resources to the community of Nuiqsut, and the analysis area is heavily used by both caribou and furbearer hunters in Nuiqsut. Other resources of major cultural and/or material importance harvested within the Option 1 analysis area include white-fronted goose and bearded seal (Table E.16.9 in Willow MDP Supplemental EIS Appendix E.16, *Subsistence and Sociocultural Systems Technical Appendix*). Thus, impacts to subsistence activities related to caribou, wolf, wolverine, goose, and seal are considered in the ANILCA Section 810 evaluation of module delivery Option 1. The analysis area for Option 1 is on the eastern periphery of Utqiaġvik subsistence use areas for wolf and wolverine but is directly east of the Teshekpuk Lake area, which is a key traditional use area for many Utqiaġvik residents and includes areas of moderate to high overlapping subsistence use. Moderate overlapping subsistence use also occurs to the southwest of the Project toward Ikpikpuk River, which is a key subsistence drainage for the community of Utqiaġvik (Willow MDP Supplemental EIS Figure 3.16.4). Caribou are also harvested to the west of the Project; however, the analysis area is on the eastern periphery of the herd's range and is not expected to alter caribou migration routes to the extent that they would affect Utqiaġvik harvesting activities to the west. Thus, the ANILCA Section 810 evaluation for module delivery Option 1 focuses on impacts to furbearer harvesting for Utqiaġvik. As discussed in Section B.2.a, furbearer hunting does not provide substantial amounts in terms of food but is a specialized and culturally important activity that contributes to the local economy.

Option 1: Atigaru Point Module Transfer Island



Option 2: Point Lonely Module Transfer Island



Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

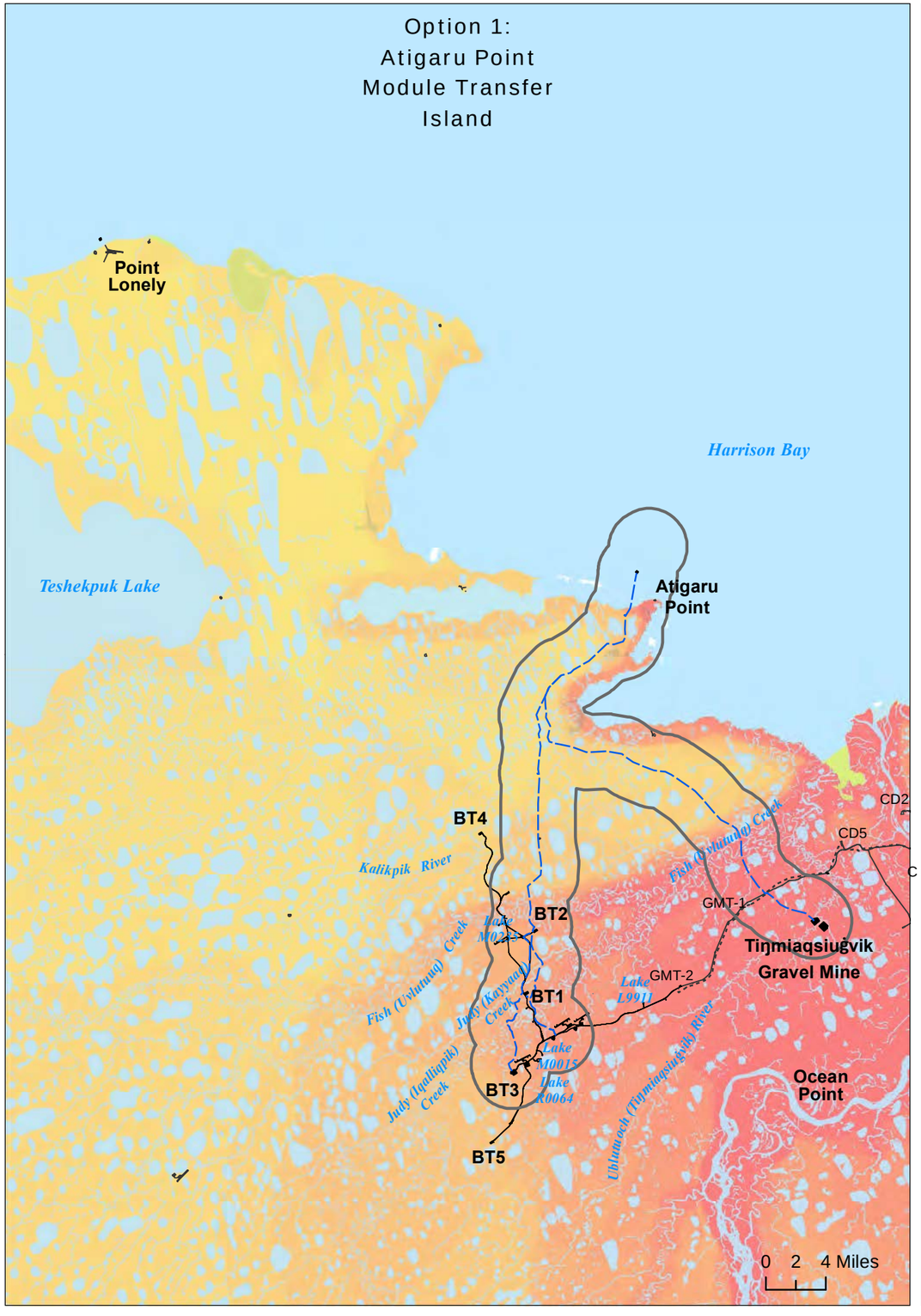
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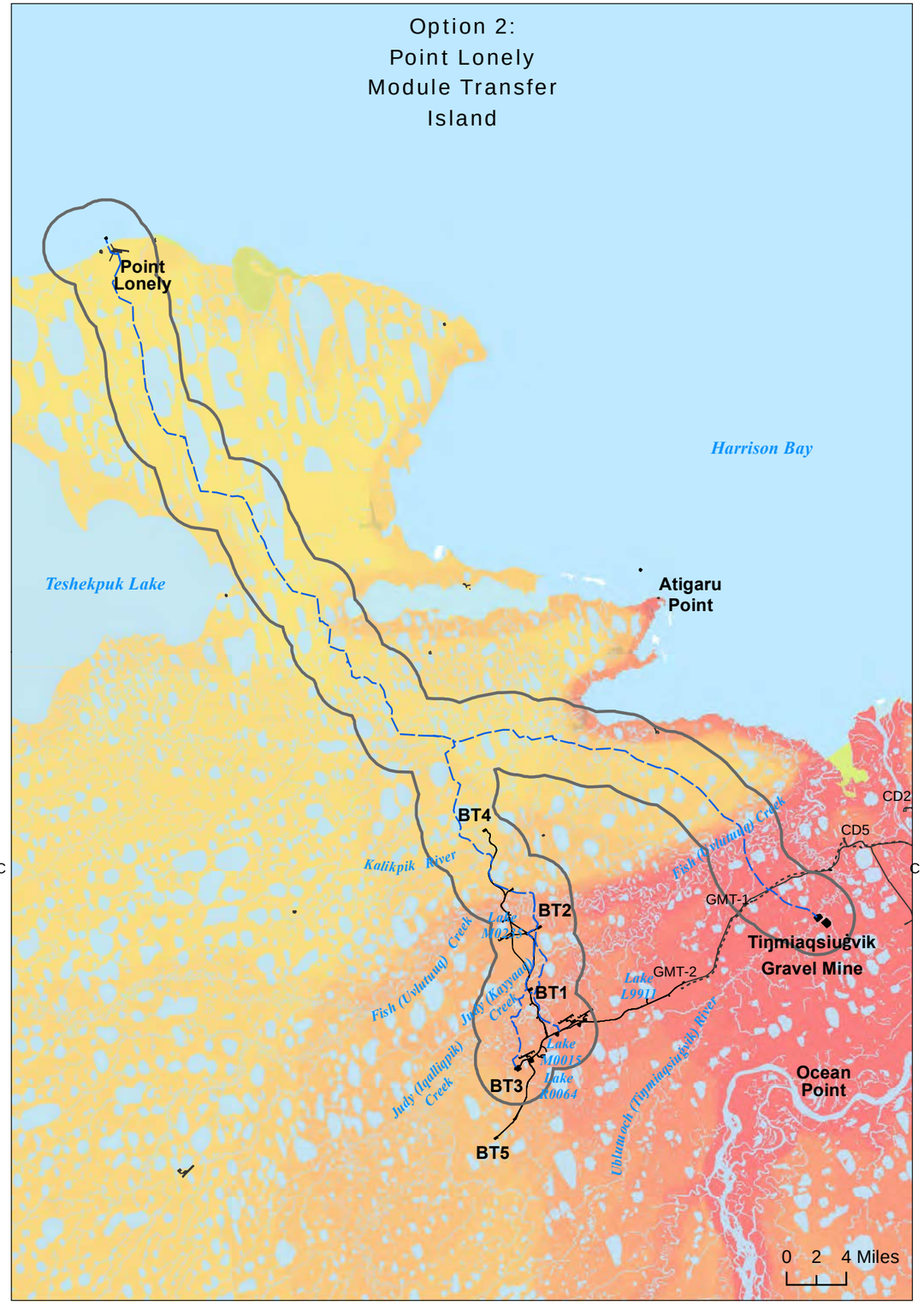


Figure 12

Option 1:
Atigaru Point
Module Transfer
Island



Option 2:
Point Lonely
Module Transfer
Island



Subsistence Data

High / Low — Overlapping Subsistence Use Areas Caribou, 1995-2006 [a]

Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Map prepared by
Stephen R. Braund & Associates

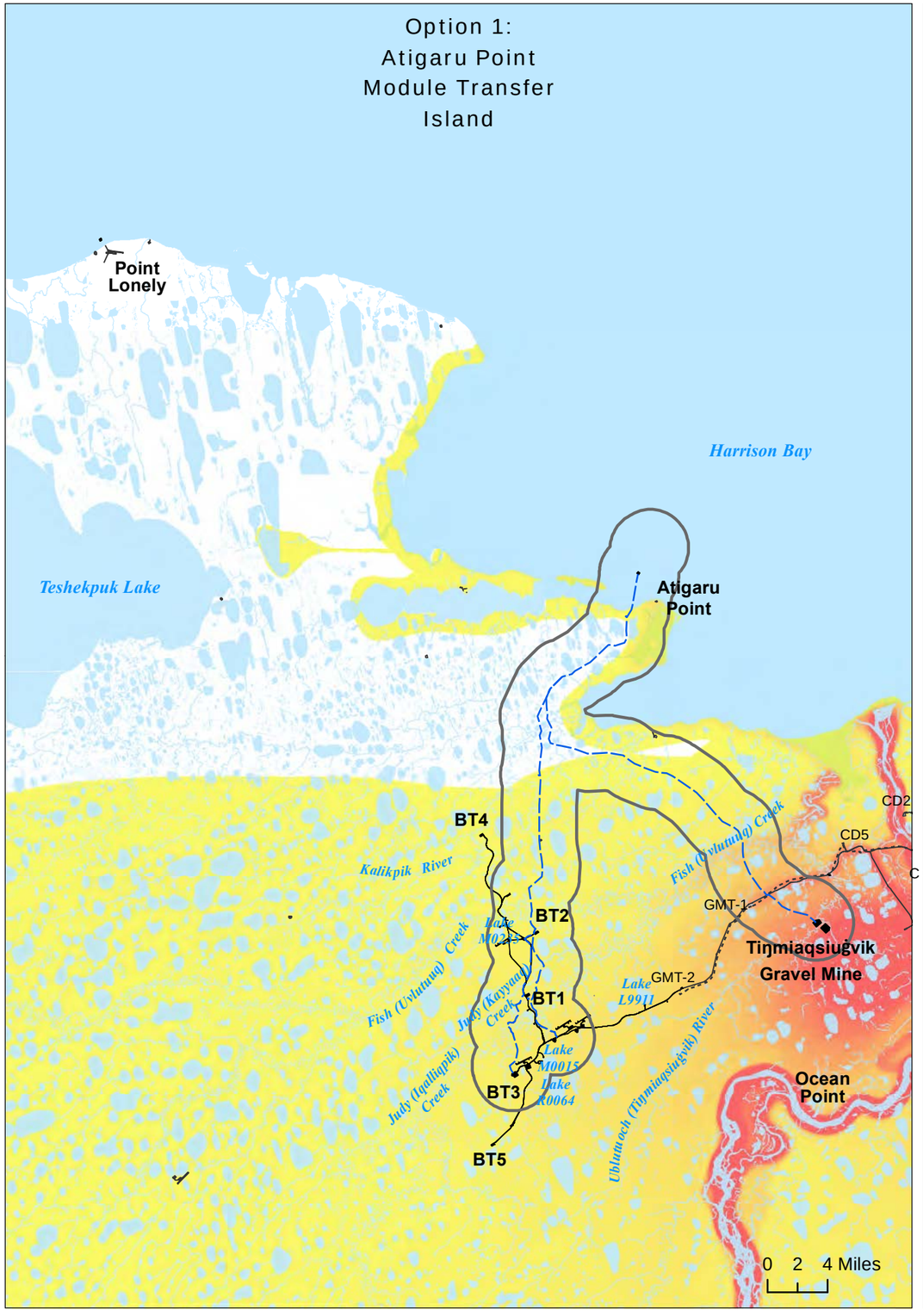
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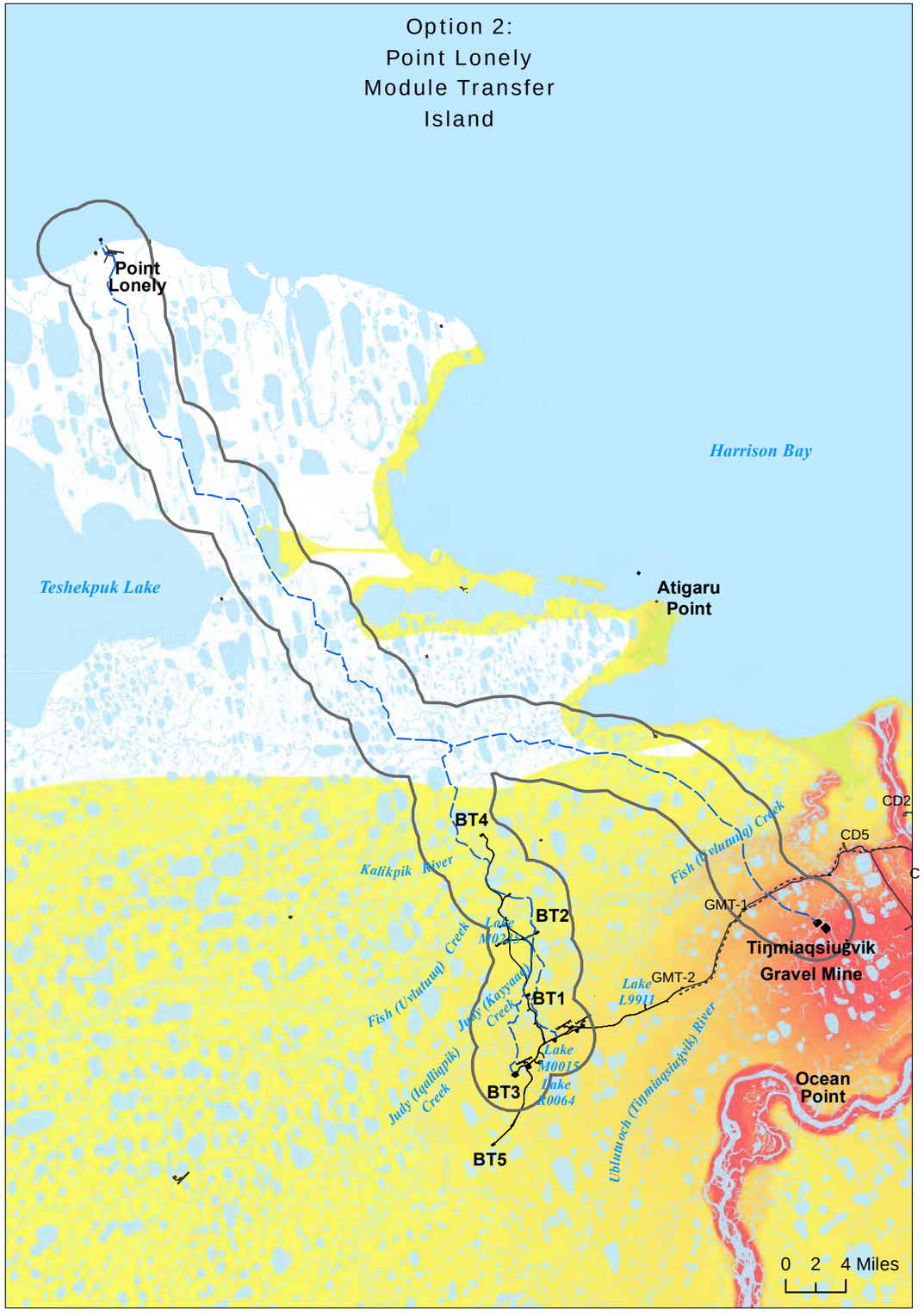


Figure 13

Option 1:
Atigaru Point
Module Transfer
Island



Option 2:
Point Lonely
Module Transfer
Island



Subsistence Data

High / Low — Overlapping Subsistence Use Areas[a] Caribou, January 2008 through December 2019

Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Map prepared by
Stephen R. Braund & Associates

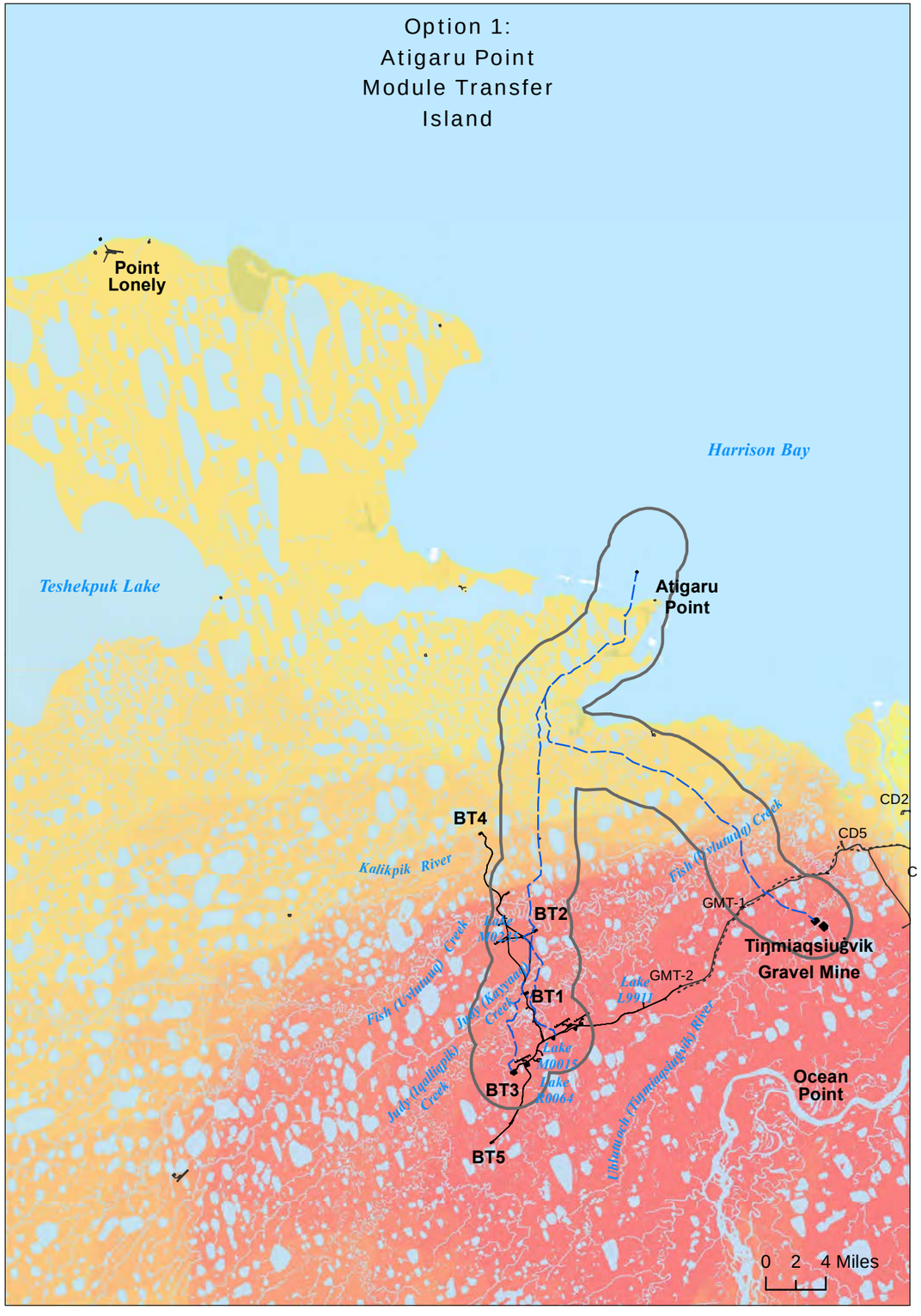
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a. SRB&A 2021

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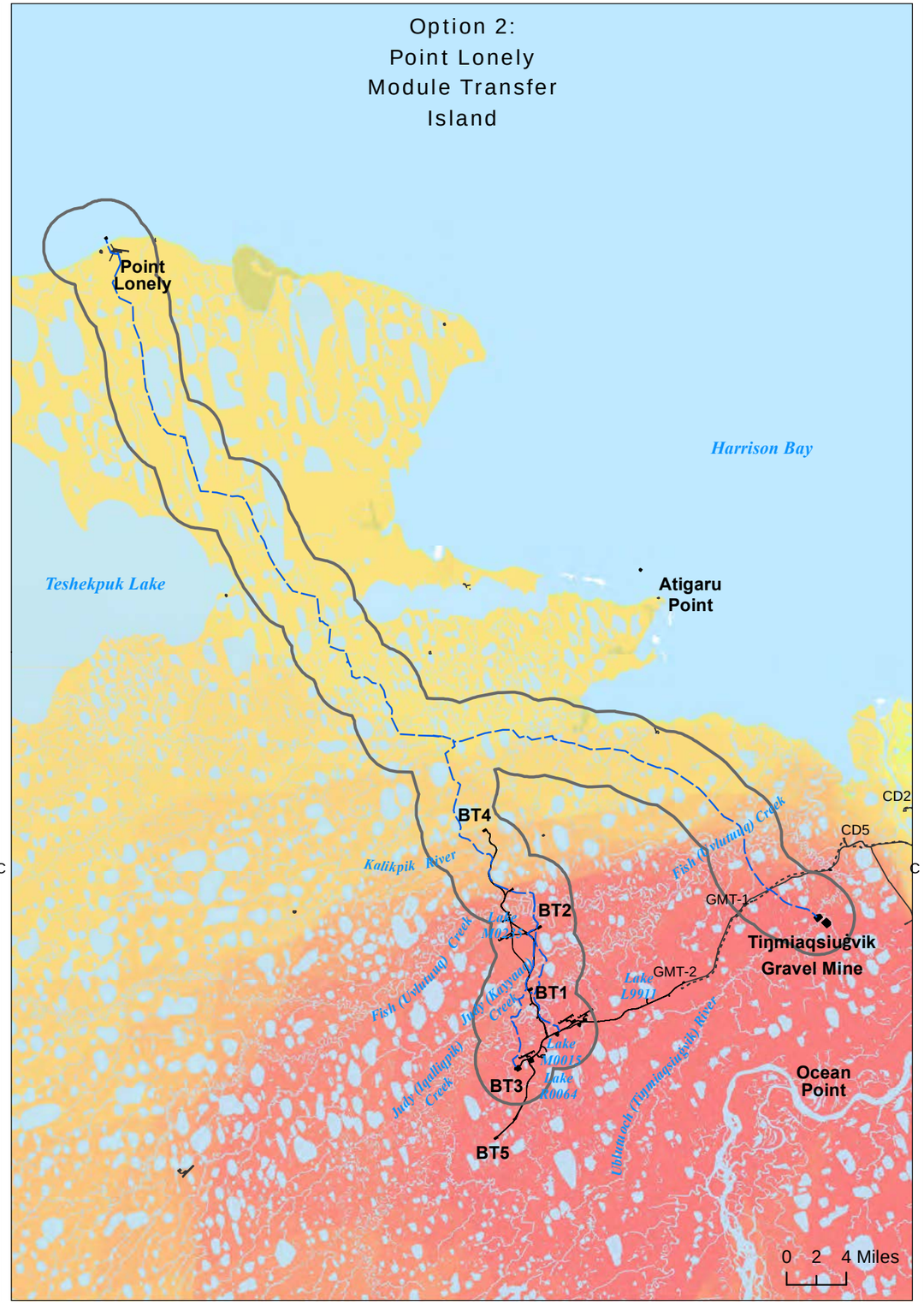


Figure 14

Option 1: Atigaru Point Module Transfer Island



Option 2: Point Lonely Module Transfer Island



Subsistence Data

- High / Low — Overlapping Subsistence Use Areas Wolf and Wolverine, 1995-2006 [a]

Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Map prepared by
Stephen R. Braund & Associates

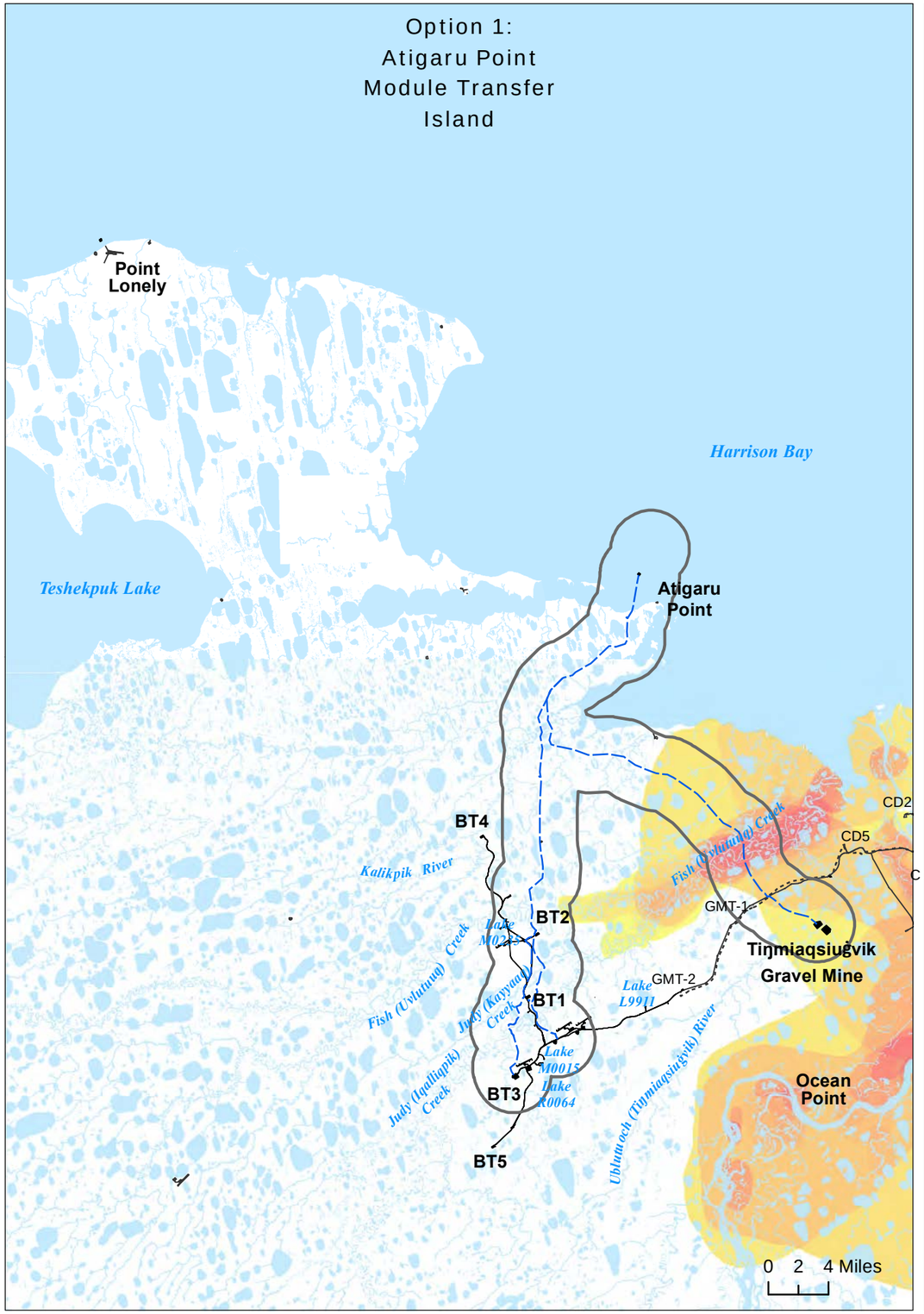
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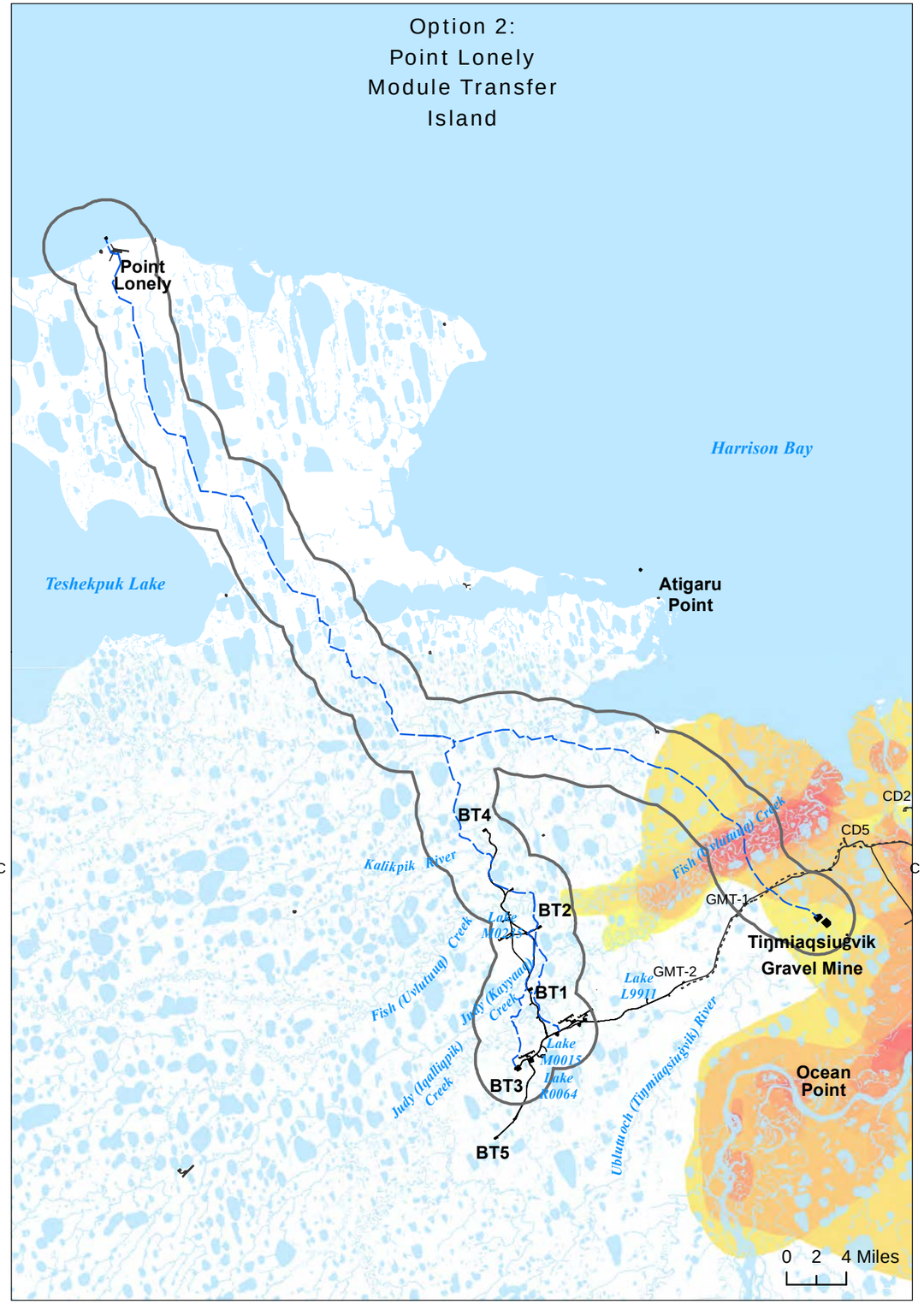


Figure 15

Option 1: Atigaru Point Module Transfer Island



Option 2: Point Lonely Module Transfer Island



Subsistence Data

High / Low — Overlapping Subsistence Use Areas Geese, 1995-2006 [a]

Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Map prepared by
Stephen R. Braund & Associates

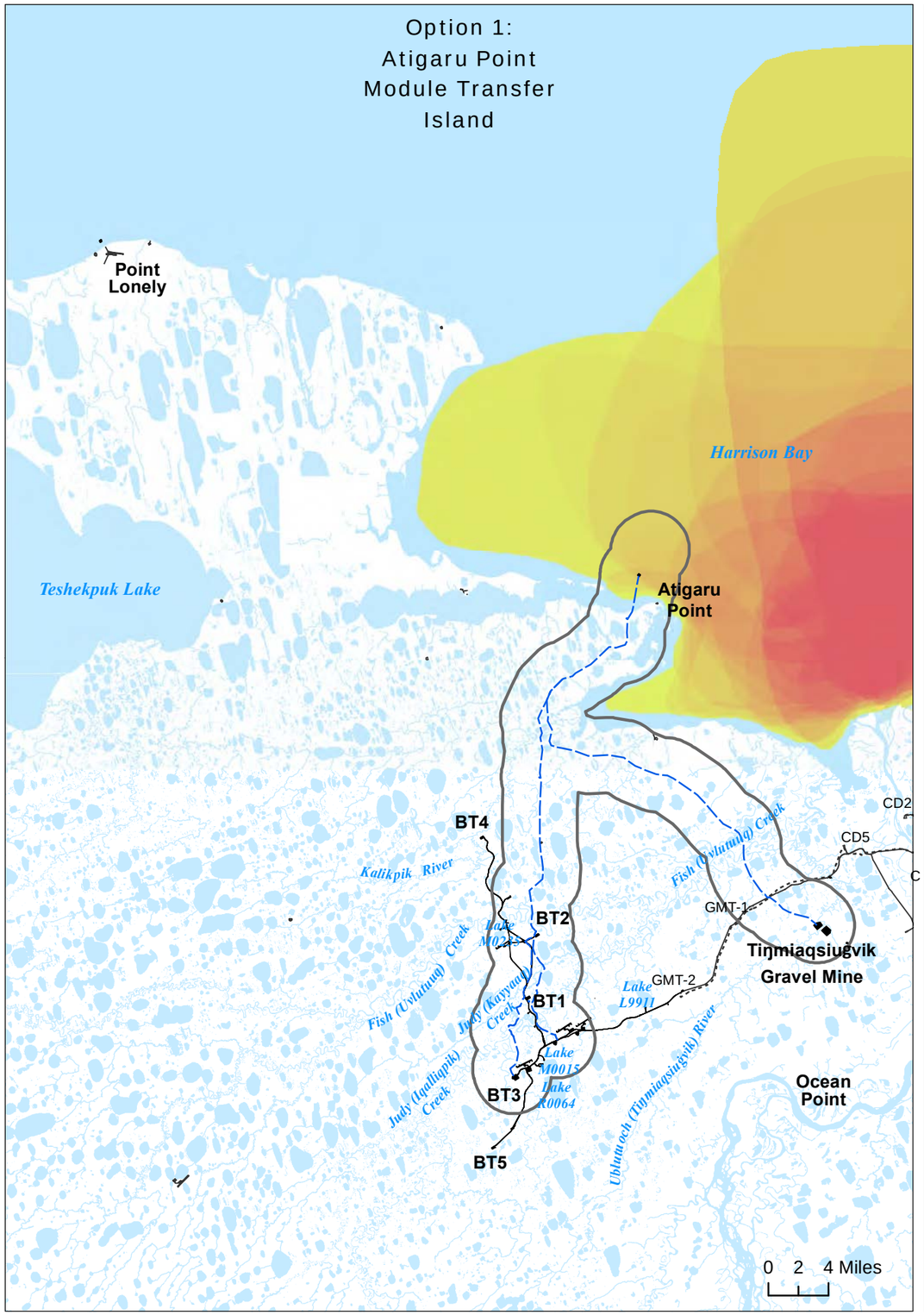
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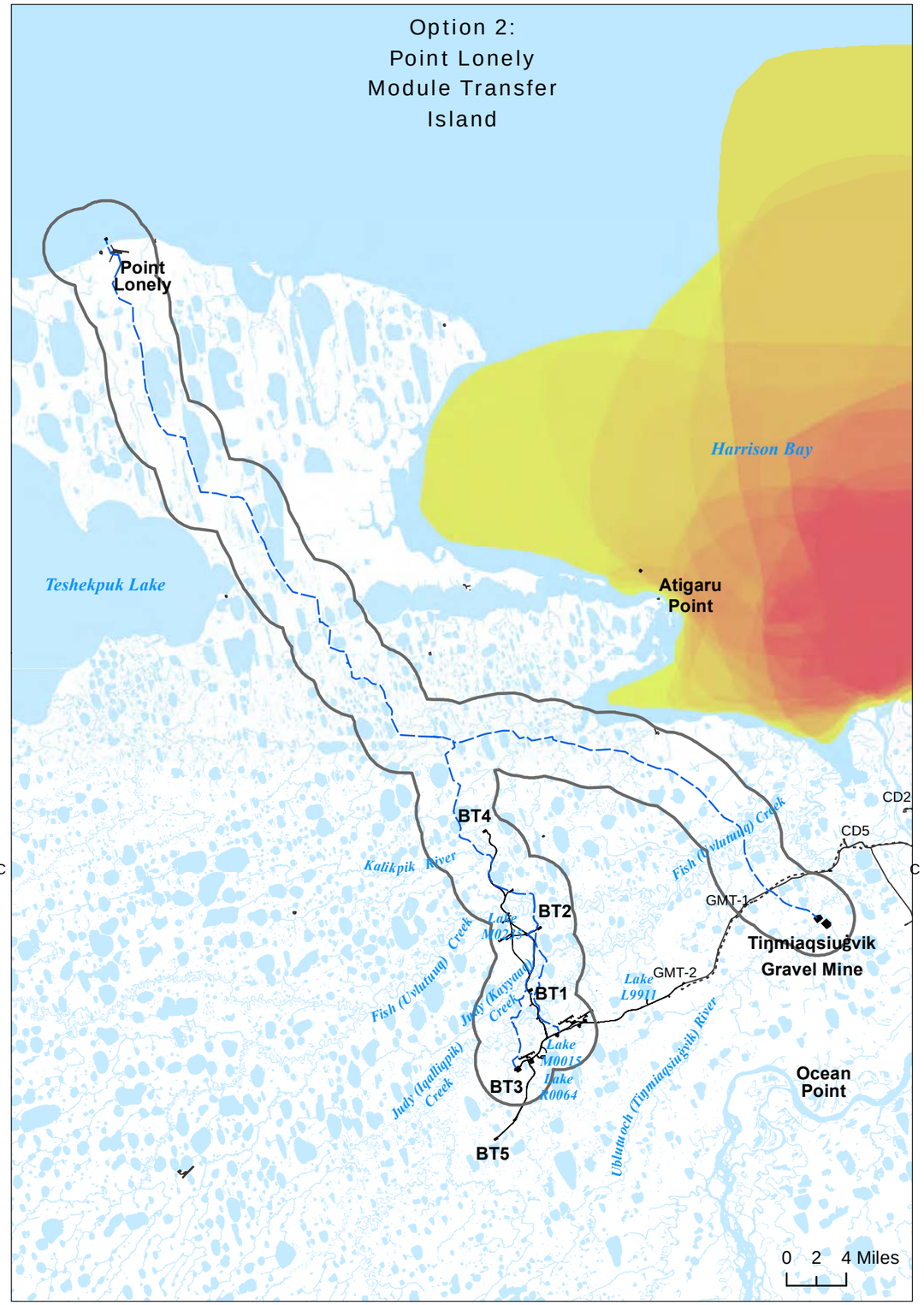


Figure 16

Option 1: Atigaru Point Module Transfer Island



Option 2: Point Lonely Module Transfer Island



Subsistence Data

- High / Low — Overlapping Subsistence Use Areas Seal, 1995-2006 [a]

Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Map prepared by
Stephen R. Braund & Associates

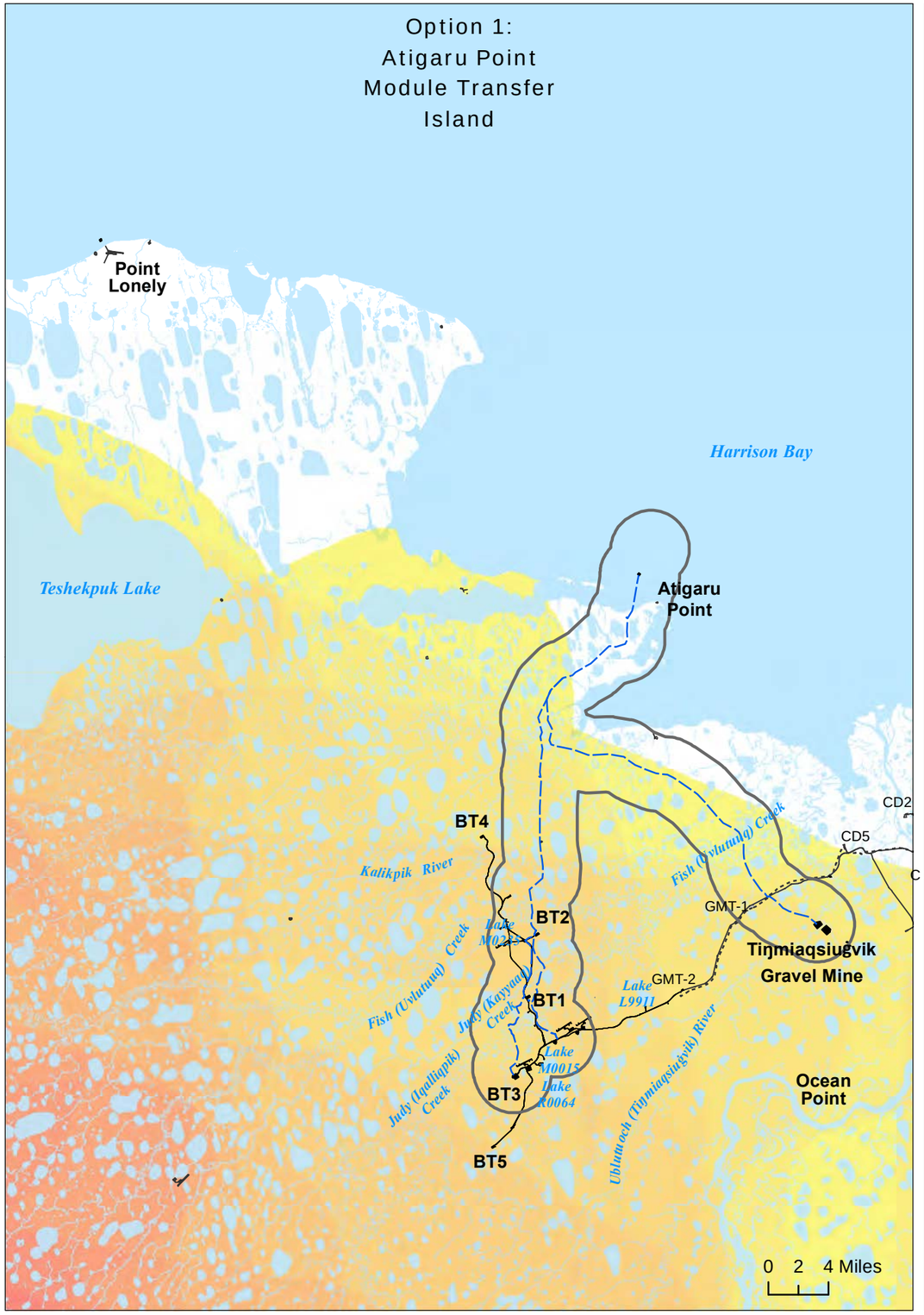
Source
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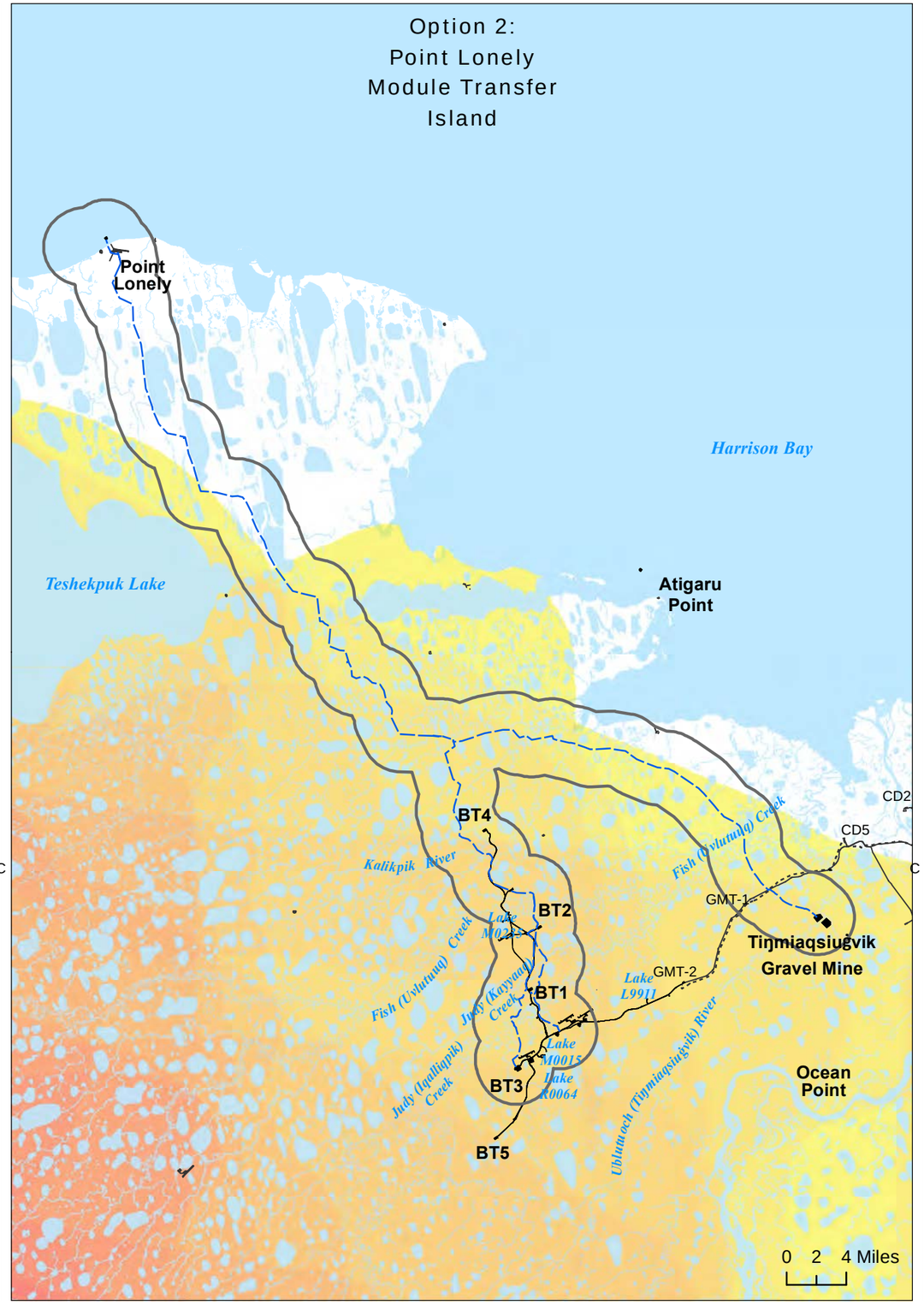


Figure 17

Option 1: Atigaru Point Module Transfer Island



Option 2: Point Lonely Module Transfer Island



Subsistence Data

High / Low — Overlapping Subsistence Use Areas Wolf and Wolverine, 1997-2006[a]

Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

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Source
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Figure 18

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Subsistence Resource Abundance

While construction activities associated with the MTI, including ice roads, would result in the temporary removal or disturbance of habitat for some resources and could cause direct mortality to individual animals, these are not expected to have population level effects on subsistence resources. Terrestrial mammals, including caribou, generally do not use sea ice habitat and therefore would not be directly affected by the MTI. Ice roads associated with the MTI occur within the TCH range but would be in an area of relatively low calving density (Willow MDP Supplemental EIS Section 3.12, *Terrestrial Mammals*). Traffic along ice roads, which would exceed 15 vehicles per hour during construction, could result in collisions and direct mortality of individual animals such as caribou. The area is not heavily used by caribou in winter and does not have a high density of wolf or wolverine; thus, the abundance of caribou, wolf, and wolverine available for subsistence use would not be impacted under module delivery Option 1.

While goose habitat occurs throughout the analysis area and could experience degradation or alteration, these changes are not expected to affect overall bird abundance. Individual mortalities could occur as a result of collisions with aircraft, vehicles, and infrastructure, but would not cause population-level effects (Willow MDP Supplemental EIS Section 3.11, *Birds*). Construction of the MTI would result in the direct loss of 12 acres of habitat for seals but is not expected to cause population-level effects to seals (Willow MDP Supplemental EIS Section 3.13, *Marine Mammals*). Fish, particularly broad whitefish, are harvested downstream from the proposed ice road crossing of Fish (Uvlutuuq) Creek. Nuiqsut residents generally do not harvest fish in Harrison Bay, but instead harvest them from river drainages. Water withdrawals for ice infrastructure could alter fish habitat but these alterations would be temporary and are not expected to affect fish populations in Fish (Uvlutuuq) Creek (Willow MDP Supplemental EIS Section 3.10, *Fish*). A large oil spill could have larger population-level effects to resource abundance, but such a spill is not expected to occur in association with the MTI or associated barging or ice road traffic (Willow MDP Supplemental EIS Sections 3.10, 3.11, and 3.13). Thus, the abundance of goose, seal, or fish available for subsistence use would not be impacted under module delivery Option 1.

Subsistence Resource Availability

A description of subsistence uses for Nuiqsut and Utqiaġvik is provided in Willow MDP Supplemental EIS Section 3.16.1, *Affected Environment,* and in Willow MDP Supplemental EIS Appendix E.16, *Subsistence and Sociocultural Systems Technical Appendix*. As noted above, use of the Option 1 analysis area for caribou hunting primarily occurs in the vicinity of ice roads—particularly gravel haul ice roads—associated with the MTI. The gravel haul ice road extending from the Tiŋmiaqsiuġvik mine site to Fish (Uvlutuuq) Creek occurs in areas of high overlapping use for Nuiqsut caribou hunting. Hunting along Fish Creek occurs by boat in the summer months; however, overland travel during the winter and summer months also occurs in the area between the mine site and Fish Creek. Hunting along Fish Creek by boat in the summer continues to be an important subsistence activity but the frequency has decreased in recent years; reasons for the decrease in use include difficulty accessing the mouth of Fish Creek due to increasingly shallow waters in nearshore areas near the mouth of the creek, and the high costs associated with traveling to Fish Creek via Harrison Bay (Northern Economics Inc. 2019; SRB&A 2019a). Subsistence boat ramps constructed as part of the Project may increase use of the Fish (Uvlutuuq) Creek area during the summer months. The overland area toward Fish Creek remains a heavily used area by the community of Nuiqsut during the summer and fall caribou hunting season and is primarily accessed by ATV, although residents increasingly access the area by truck along the road system. When traveling by ATV, residents can generally travel as far west as the Ublutuoch (Tiŋmiaqsiuġvik) River; however, access to the road system also allows residents to haul ATVs and travel farther toward Fish (Uvlutuuq) Creek than previously possible. Residents also hunt in coastal areas of Harrison Bay during the summer, with Atigaru Point being an important traditional hunting area where residents target TCH caribou during the insect relief season. In recent years, use of this area has decreased as a result of increased sedimentation and shallow waters along the coast, in addition to a reported decrease in the availability of caribou in the area (Willow MDP Supplemental EIS Section 3.16) (SRB&A 2018a).

Wolf and wolverine hunting within the Option 1 analysis area, particularly in the southern portions of the gravel haul and module transport ice roads, is similar to that described in Section B.2.a, *Evaluation of the Effects of Use, Occupancy, or Disposition on Subsistence Uses and Needs* (*Subsistence Resource Availability, Displacement of Furbearers*), and occurs primarily in the winter months to the west, south, and southeast of the Nuiqsut. Hunting of wolf and wolverine is less common in the northern portion of the Option 1 analysis area (Figure 15). For Utqiaġvik, wolf and wolverine hunting occurs primarily around the module transport ice road but extends throughout the southern portion of the analysis area (Figure 18).

Goose hunting in the Option 1 analysis area occurs most commonly in areas where the gravel haul ice road intersects with Fish (Uvlutuuq) Creek but also to the north and east of the Tiŋmiaqsiuġvik gravel mine site. Most goose hunting along Fish Creek and in overland areas occurs by snow machine in the months of April and May (Willow MDP Supplemental EIS Appendix E.16). Seal hunting by Nuiqsut residents occurs throughout Harrison Bay by boat, with moderate overlapping use offshore from Atigaru Point; high overlapping use occurs directly east of Atigaru Point in Harrison Bay. Seal hunting peaks in the months of July and August (Willow MDP Supplemental EIS Appendix E.16).

Noise and traffic associated with the gravel haul and module transport ice roads, and the physical presence of the ice roads themselves, could affect the availability of caribou, wolf, wolverine, and goose for Nuiqsut harvesters, and the availability of wolf and wolverine for Utqiaġvik harvesters. Depending on annual conditions, ice roads may still be present in late April, when goose hunting along Fish (Uvlutuuq) Creek intensifies (Figure E.16.1 in Appendix E.16); thus, goose hunters could experience direct hunting impacts while the gravel haul ice road is operational. This would only occur during a single winter ice road season when gravel haul to the MTI would take place. See Section B.2.a, *Evaluation of the Effects of Use, Occupancy, or Disposition on Subsistence Uses and Needs* (*Subsistence Resource Availability*), for a discussion of how roads and associated road traffic may affect the availability of caribou, furbearers, and other resources. Because MTI gravel haul and module transport ice roads would not be present during the fall caribou migration, it is unlikely they would cause overall changes in caribou distribution or migration; however, caribou may be deflected from ice roads in winter during times of heavy road traffic, affecting resource availability for caribou harvesters. Peak ground traffic levels associated with the MTI would reach up to 121 trips per hour in the winter and could have a high potential for disturbance. If ice roads are still in place and operational at the beginning of the waterfowl hunting season in mid-to-late April, residents may experience decreased harvesting success during this time for the single season during which the gravel haul ice road would be operational. Geese may be more easily disturbed or temporarily displaced due to traffic and noise, resulting in residents having greater difficulty hunting them.

Noise and human activity associated with construction of the MTI, which would occur during both the winter and summer seasons, could temporarily displace seals, periodically resulting in reduced harvest success for Nuiqsut seal hunters in the MTI area during the summer months. Vessel traffic between the MTI and Oliktok Point, which would occur throughout the open water season, may also cause temporary and periodic displacement of seals that could temporarily affect harvester success. The Project would require a total of nine sealift barges over the course of two delivery seasons; support vessel traffic would be much higher (an estimated 265 support vessels over the course of three open-water seasons). The presence of the MTI could also affect the distribution of marine mammals within the immediate area of the island (Willow MDP Supplemental EIS Section 3.13, *Marine Mammals*). However, noise and infrastructure related to MTI construction would not be likely to cause overall impacts to resource availability as most displacement would be temporary and localized; other suitable seal habitat would be available nearby, and residents would likely avoid areas where immediate disturbance is likely (e.g., around barges, support vessels, and the MTI during times of high activity) (Willow MDP Supplemental EIS Section 3.13). Noise and human activity at the MTI may also affect the availability of caribou along the coast during the summer; however, as discussed above, use of the coastal area in Harrison Bay has been limited in recent years due to access difficulties. Between 2008 and 2019, the Coastal West area has accounted for between zero and 2% of the total harvest (SRB&A 2021); thus, disruptions to caribou in this area would not likely affect overall resource availability for the Nuiqsut.

The Project would require additional fixed-wing aircraft and helicopter traffic to support module delivery Option 1. Most of this traffic would occur between Alpine and Willow. Potential impacts to resource availability related to air traffic are discussed in Section B.2.a, *Evaluation of the Effects of Use, Occupancy, or Disposition on Subsistence Uses and Needs* (*Subsistence Resource Availability*).

Access to Subsistence Resources

Potential impacts to harvester access are discussed in Willow MDP Supplemental EIS Section 3.16. Subsistence users would likely be prohibited from accessing the MTI area while it is under construction and operational, and the MTI would likely remain a gravel barrier island after decommissioning. Changes to coastal areas resulting from erosion and sedimentation around Atigaru Point is a key concern voiced by Nuiqsut residents who already have reported difficulty accessing nearshore areas in Harrison Bay in recent years. If construction of the MTI does contribute to the increasingly shallow waters in Harrison Bay, then it could further decrease access to coastal hunting areas. Long-term impacts to access would occur if construction of the MTI results in sedimentation or ocean floor changes that affect access to coastal and nearshore areas; however, the MTI is not expected to cause additional sedimentation or shoaling (Willow MDP Supplemental EIS Section 3.16). Some individuals may use the MTI after it is decommissioned as a stopover point when hunting in Harrison Bay, similar to their use of other islands such as Thetis Island; however, it is unknown how accessible the island would be by boat.

Gravel haul ice roads associated with MTI construction would prohibit local use. Module transport ice roads would be restricted during periods of heavy use but would be available for local use during other times. Thus, some Nuiqsut furbearer, caribou, and goose hunters traveling overland by snow machine would likely experience reduced access during the winter and spring months when crossing through areas with ice roads. The gravel haul ice road between the MTI and the Tiŋmiaqsiuġvik gravel mine site would bisect high overlapping use areas for goose on Fish (Uvlutuuq) Creek. Thus, residents would likely experience reduced access to a portion of their goose hunting areas when ice roads continue to be operational in April. Impacts to access resulting from ice roads would only occur during the construction phase of the Project.

b. Evaluation of the Availability of Other Lands for the Purpose Sought to be Achieved

The evaluation of the Willow MDP EIS module delivery Option 1 is identical to that provided above in Section B.2.b.

c. Evaluation of Other Alternatives that would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

The evaluation of the Willow MDP EIS module delivery Option 1 is identical to that provided above in Section B.2.c.

d. Findings

Module delivery Option 1 (Atigaru Point Module Transfer Island), in combination with any of the action alternatives (B, C, D, or E) would not result in any additional significant restriction on subsistence uses for communities in or near the Project area.

7. Evaluation and Finding for Module Delivery Option 2 (Point Lonely Module Transfer Island)

Module delivery Option 2 (Point Lonely Module Transfer Island), would locate the MTI at Point Lonely, a substantial distance west of Atigaru Point. Option 2 would also include module transport and gravel haul ice roads, but they would extend from the Tiŋmiaqsiuġvik gravel mine site and WPF to Point Lonely. This alternative would locate the MTI away from Harrison Bay, a key marine hunting area for Nuiqsut.

a. Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs

The effects of module delivery Option 2 on subsistence would be like those described for module delivery Option 1 with three important differences:

1. Option 2 would reduce potential impacts to Nuiqsut marine subsistence uses for seal and coastal caribou hunting activities.
2. Option 2 would increase potential impacts to winter subsistence uses to Utqiaġvik furbearer harvesting and other activities around Teshekpuk Lake.
3. Option 2 would increase the area and likelihood of disturbance for TCH caribou.

For Nuiqsut, impacts related to ice roads would be similar to those described for Option 1, as they would terminate in the same Project area locations (i.e., WPF, mine site), would cross Fish (Uvlutuuq) Creek in a similar area, and would affect similar subsistence uses.

The location of the MTI at Point Lonely would move potential marine impacts out of an area of moderate to high marine subsistence use for Nuiqsut into an area of low to limited use for both Nuiqsut and Utqiaġvik (Willow MDP Supplemental EIS Section 3.16, *Subsistence and Sociocultural Systems*), thus reducing the likelihood of direct impacts on marine subsistence uses for either community. However, the gravel haul and module transport ice roads would extend farther west, along the east side of Teshekpuk Lake, and terminating to the north of Teshekpuk Lake at Point Lonely. Teshekpuk Lake is a traditional hunting ground for Nuiqsut and is still used by Nuiqsut hunters, particularly during the winter, and it is a key contemporary subsistence use area for many Utqiaġvik families and hunters year-round. In addition, the lands surrounding Teshekpuk Lake, including those to the north and east of the lake, are critical calving, post-calving, and insect relief habitats for TCH caribou. Ice roads associated with Option 2 would occur over a larger area, resulting in a greater area of disturbance for TCH caribou. In addition, summer Project activities at Point Lonely and along the ice road route, including construction noise, litter clean up (known locally as stick picking), human presence, and air traffic, which would be somewhat higher under Option 2, could affect caribou during the calving and insect relief seasons. This increased disturbance could result in alterations to caribou distribution closer to Nuiqsut and increased disturbance of calving and migrating caribou.

While module delivery Options 1 and 2 would directly affect a similar percentage of Nuiqsut harvesters overall, Option 2 would affect a greater percentage of Utqiaġvik subsistence harvesters of wolf and wolverine (23%) and caribou (22%) (Willow MDP Supplemental EIS Table 3.16.11). The ice road would occur in areas of low to moderate overlapping use for wolf and wolverine for Utqiaġvik and could affect resource availability of furbearers for hunters in the vicinity of Teshekpuk Lake. However, these impacts would only occur for the length of ice road operations during MTI construction module hauling operations and would cause primarily indirect effects. The percentage of caribou harvesters using the analysis area for Option 2 was similar to Option 1, ranging from 33% to 72%; caribou harvests within the area ranged from 4% to 19% of the total harvest during individual study years (Willow MDP Supplemental EIS Table 3.16.12).

Overall, Option 2 would reduce direct impacts to Nuiqsut subsistence uses within Harrison Bay but would increase potential indirect impacts to caribou resource availability for Nuiqsut and Utqiaġvik and direct and indirect impacts to Utqiaġvik wolf and wolverine hunters. Under both options, the impacts would occur during the Project's construction phase. Direct impacts to key subsistence uses would be lower under Option 2 for Nuiqsut due to the decreased impacts to marine and coastal subsistence uses, with a slight increase in potential impacts to caribou availability and a slight increase in impacts to furbearer subsistence uses for Utqiaġvik.

b. Evaluation of the Availability of Other Lands for the Purpose Sought to be Achieved

The evaluation of the Willow MDP EIS module delivery Option 2 is identical to that provided above in Section B.2.b.

c. Evaluation of Other Alternatives that would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

The evaluation of the Willow MDP EIS module delivery Option 2 is identical to that provided above in Section B.2.c.

d. Findings

Module delivery Option 2 (Point Lonely Module Transfer Island), in combination with any of the action alternatives (B, C, D, or E) would not result in any additional significant restriction of subsistence uses for communities in or near the Project area.

8. Evaluation and Finding for Module Delivery Option 3 (Colville River Crossing)

Module delivery Option 3 (Colville River Crossing), would not construct an MTI, instead relying on existing infrastructure at Oliktok Dock, as described under Alternative B. Similar to Options 1 and 2, Option 3 would include a module transport ice road, which would extend from the existing gravel road at Kuparuk drill site 2P (DS2P) to GMT-2, crossing the Colville River near Ocean Point (Figure 19). Some modifications to the existing Oliktok Road would be required to ensure an adequate turning radii for the module transporters; however, this area is not regularly used by contemporary Nuiqsut subsistence users. Option 3 would not require a separate gravel haul ice road from the mine site. Overall, Option 3 would make greater use of existing infrastructure but would cross through areas of heavy subsistence use to the south and southwest of the community.

a. Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs

The effects of module delivery Option 3 on subsistence would be like those described for module delivery Option 1 with four important differences:

1. Option 3 would reduce potential impacts to Nuiqsut marine subsistence uses for seal and eider and coastal caribou hunting activities (Figure 20 and Figure 21).
2. Option 3 would have a greater potential for direct impacts to Nuiqsut winter subsistence uses due to placement of the module transport ice road in key subsistence harvesting areas to the south and west of the community.
3. Option 3 would reduce the intensity and frequency of impacts associated with ice road traffic because of the lack of a gravel haul ice road and overall reduction in traffic levels.
4. Option 3 would reduce infrastructure and activity within subsistence harvesting areas for Utqiaġvik, thus minimizing direct impacts to that community.

Unlike Options 1 and 2, Option 3 would not require the construction of a gravel nearshore island and would instead use existing infrastructure at Oliktok Dock. Because Oliktok Dock would be used under all action alternatives, regardless of module delivery option, potential impacts associated with the use of the dock are discussed under Alternatives B, C, and D. The use of existing nearshore infrastructure at Oliktok Dock for module delivery would reduce impacts to marine subsistence uses for Nuiqsut and Utqiaġvik.

For Nuiqsut, the types of impacts related to ice roads would be similar to those described for Option 1 and would terminate in the same Project area locations (i.e., WPF, mine site). However, under Option 3, the ice road would originate from the east, crossing through areas of high winter subsistence use for Nuiqsut near the Colville River to the south, southwest, and west of the community. Construction of the ice road under Option 3 would result in the community of Nuiqsut being completely encircled to the north, west, south, and east by gravel or ice roads for two winter seasons. This encirclement would occur over two winter seasons and would therefore be temporary. In addition, the impacts would be additive to existing infrastructure and traffic impacts along the North Slope Borough's Community Winter Access Trail, which provides access for North Slope residents to the Dalton Highway. While impacts of the Option 3 ice road would be additive to the Community Winter Access Trail, they would also be higher, as residents may be less likely to cross or use these roads due to their association with industrial development. Option 3 would affect a slightly higher percentage of Nuiqsut harvesters, primarily because the ice road crosses

through areas of high overlapping use for the community, including along the Itkillik River, the Colville River, and overland to the south and southwest of the community. As noted above, part of the ice road would intersect with the Community Winter Access Trail and therefore impacts would be additive in those areas.

Peak hunting activities in those areas occur in the summer and fall when the ice roads and associated activities would not be present. However, while overall hunting activity is lower in the winter, the area surrounding the Option 3 ice road is used heavily by those who conduct winter hunting of wolf (96% of harvesters) and wolverine (96%) (Figure 22), and caribou (91%). Compared to Options 1 and 2, a higher percentage of Nuiqsut caribou harvesters used the Option 3 analysis area over 12 study years (between 64% and 94%), and a greater percentage of caribou harvests came from this area (between 5% and 21%) (Willow MDP Supplemental EIS Table 3.16.12). While the area where the ice road crosses the Colville River is heavily used by Nuiqsut moose hunters (94%), these activities occur in the fall when the ice road would not be present. The road would also cross through areas of moderate overlapping use for waterfowl in areas used by 45% of goose harvesters (Figure 23). However, few birds are present in the ice road area during winter (Willow MDP FEIS, Section 3.11) and hunting activity in April is limited (SRB&A 2010b); therefore, impacts are unlikely. The ice road crossing on the Colville River is upstream from key fish harvesting areas on the Niġliq and East channels of the river; however, the crossing is located far enough upstream from the CRD that it would minimize impacts to fish passage. Option 3 would require one less winter ice road season (two winters) compared to Options 1 and 2 (three winters). In addition, substantially less ground traffic would be required under Option 3; therefore, the ice road and associated traffic are less likely to deflect or disturb subsistence resources such as caribou and are less likely to deter subsistence harvesters from crossing. Impacts to furbearer hunting success resulting from traffic along the 2L ice road (close to the proposed Colville River ice road crossing) were reported by a Nuiqsut furbearer hunter during recent interviews in Nuiqsut (SRB&A Forthcoming).

The ice road would overlap with the periphery of overland subsistence use areas for Utqiaġvik in areas of low overlapping use (Figure 24). In addition, the ice road would overlap with areas of moderate overlap for Utqiaġvik moose hunting; however, these moose hunting activities generally occur in summer or fall, when the ice road would be absent, and therefore impacts would be minimal. Compared to Option 1, Option 3 would affect a similar percentage of harvesters for wolf and wolverine (Figure 25), and a slightly higher percentage of caribou harvesters, in areas of low overlapping use. Impacts under Option 3 would occur for the length of ice road and module hauling operations, which would occur over the course of two winter seasons.

Overall, Option 3 would reduce direct impacts to Nuiqsut and Utqiaġvik coastal and marine subsistence uses. Option 3 could potentially affect a greater percentage of Nuiqsut wolf and wolverine and winter caribou harvesters; however, the frequency and intensity of impacts would be less due to the lack of a gravel haul road and decrease in associated traffic, as well as the reduction in ice road seasons from three to two.

b. Evaluation of the Availability of Other Lands for the Purpose Sought to be Achieved

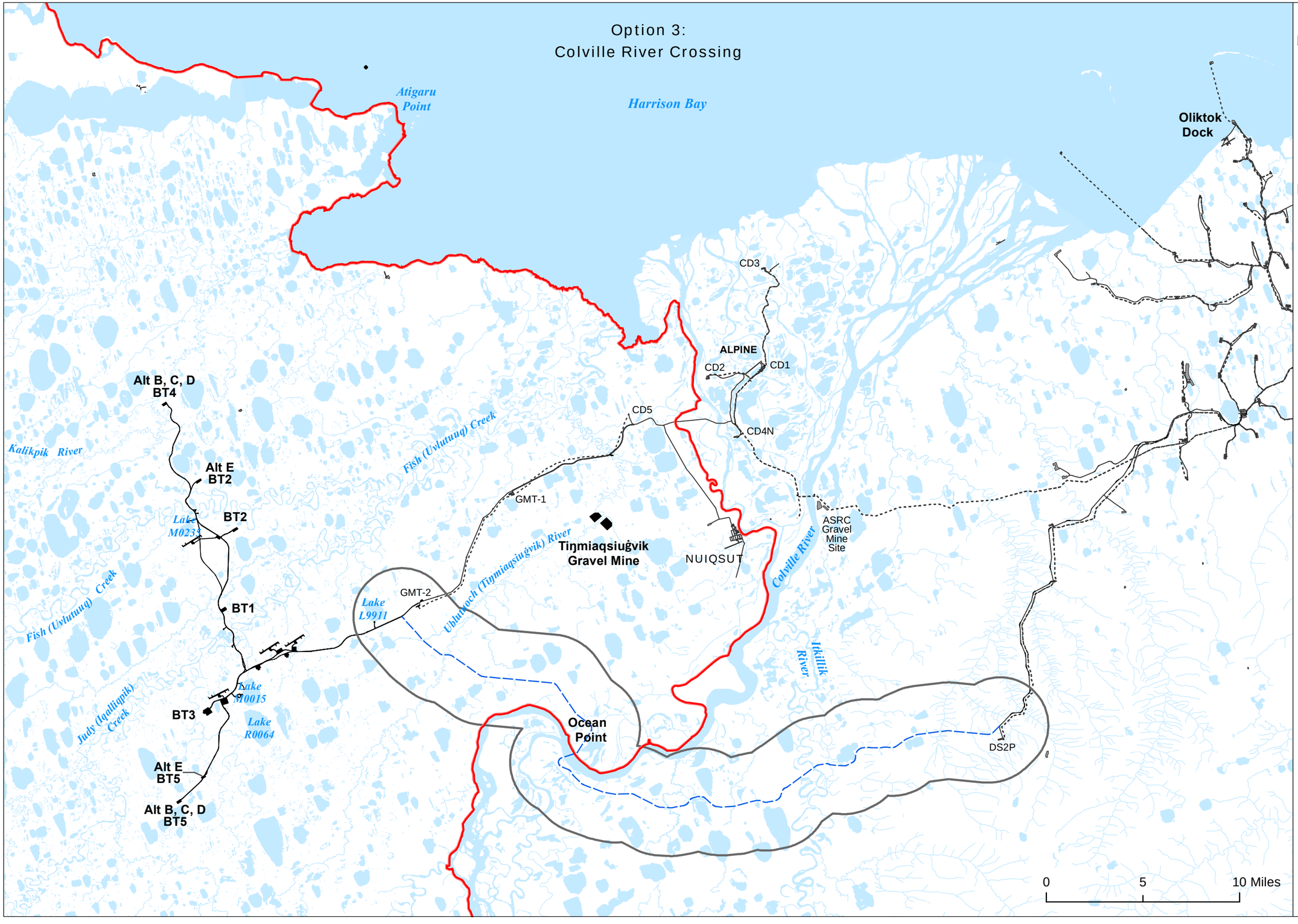
The evaluation of the Willow MDP EIS module delivery Option 3 is identical to that provided above in Section B.2.b.

c. Evaluation of Other Alternatives that would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

The evaluation of the Willow MDP EIS module delivery Option 3 is identical to that provided above in Section B.2.c.

d. Findings

Module delivery Option 3 (Colville River Crossing), in combination with any of the action alternatives (B, C, D, or E) would not result in any additional significant restriction of subsistence uses for communities in or near the Project area.



Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

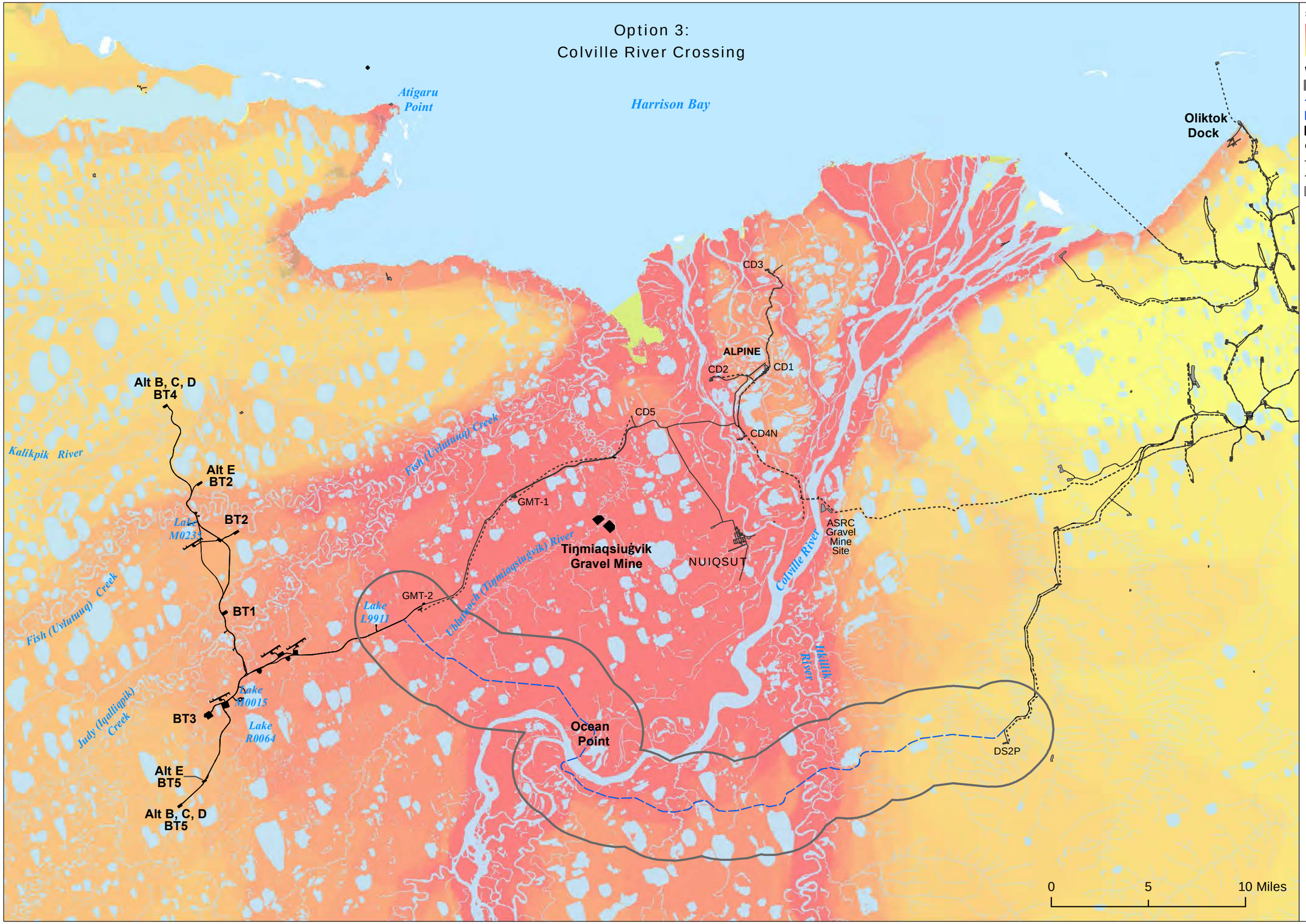
- National Petroleum Reserve in Alaska

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Figure 19



Subsistence Data

High / Low — Overlapping Subsistence Use Areas Caribou, 1995-2006 [a]

Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

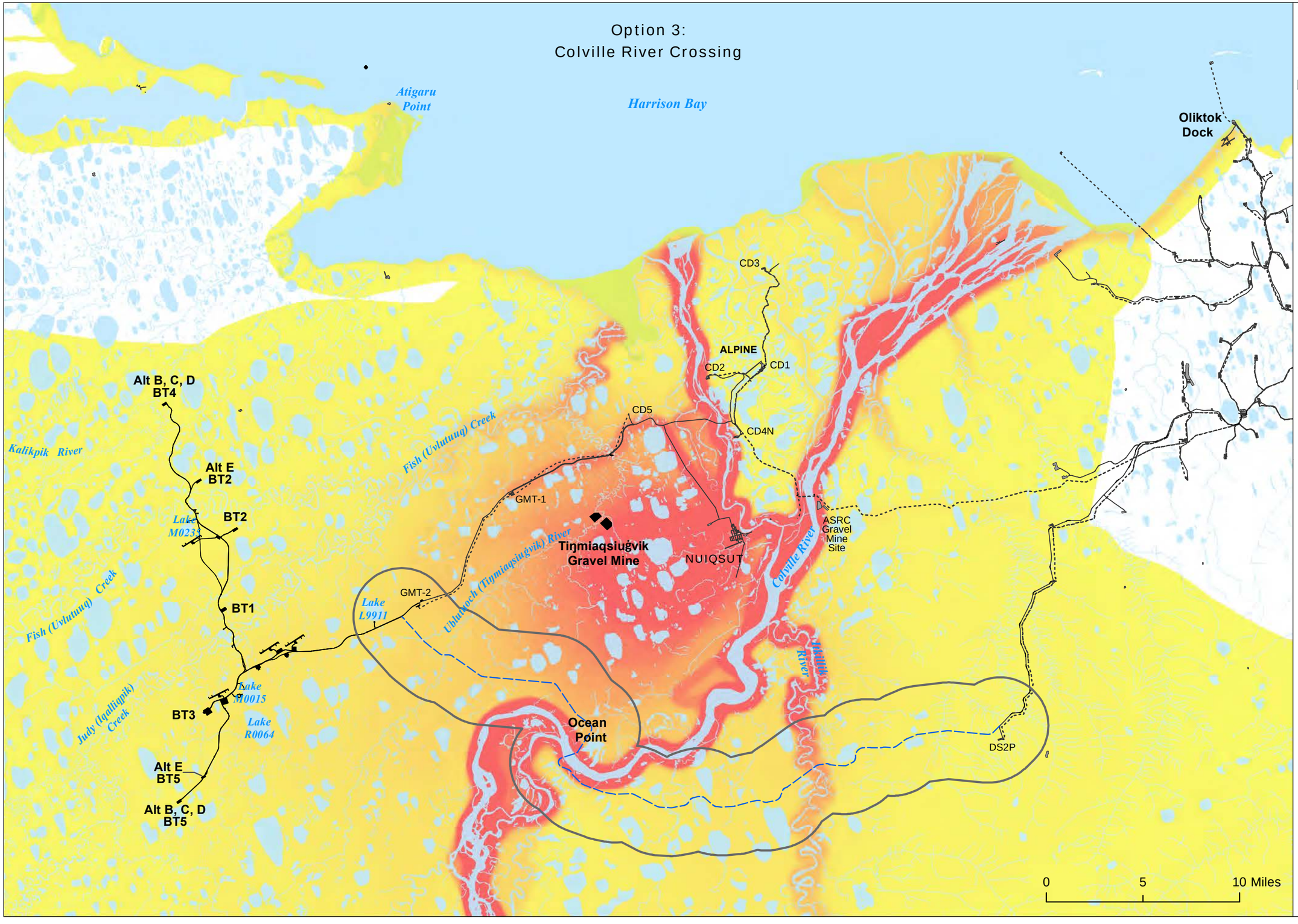
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Figure 20



Subsistence Data

High / Low — Overlapping Subsistence Use Areas[a] Caribou, January 2008 through December 2019

Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

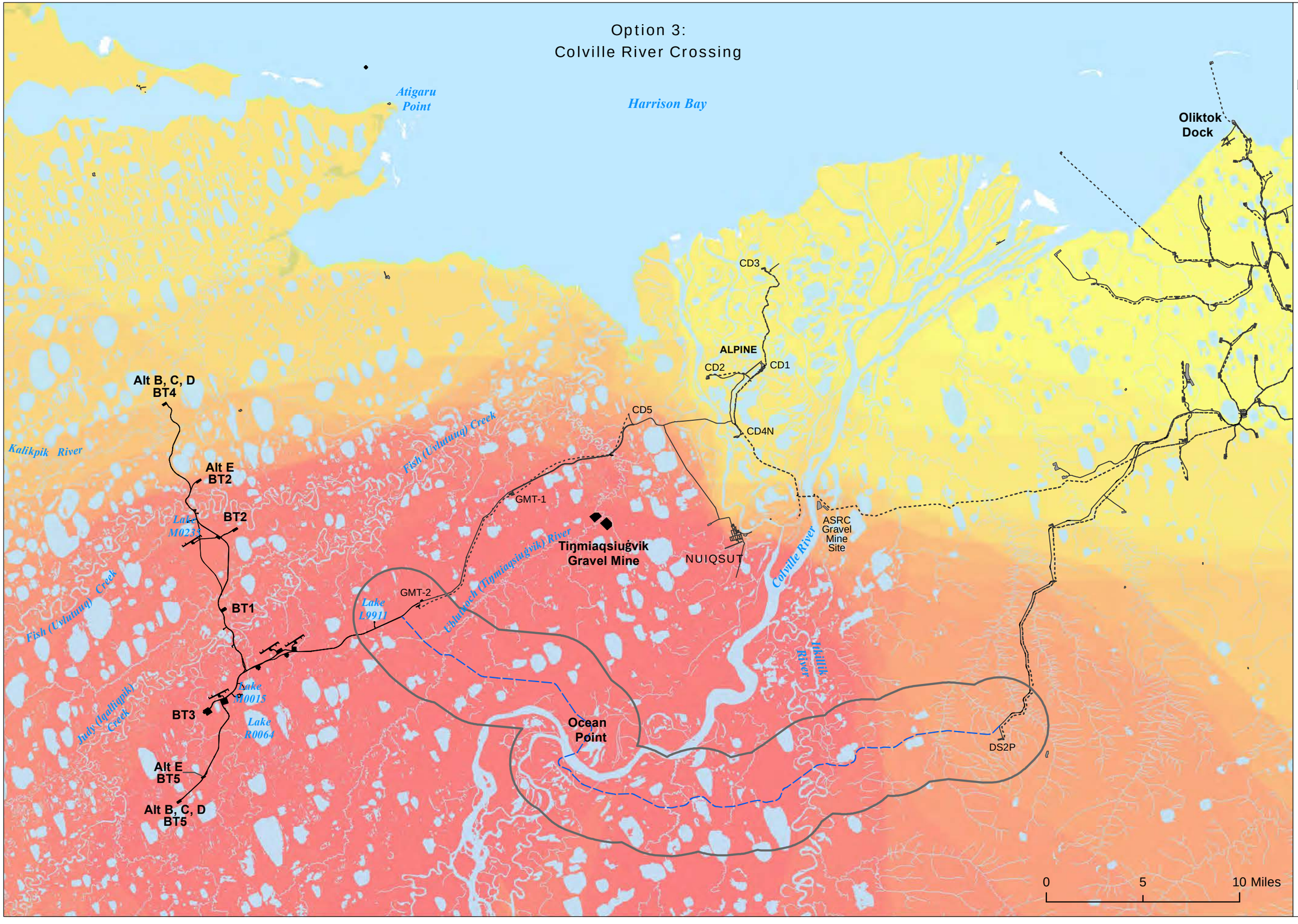
- Existing Road
- Existing Pipeline
- Existing Infrastructure

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Source
a. SRB&A 2010a

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Figure 21



Subsistence Data

High / Low — Overlapping Subsistence Use Areas Wolf and Wolverine, 1995-2006 [a]

Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

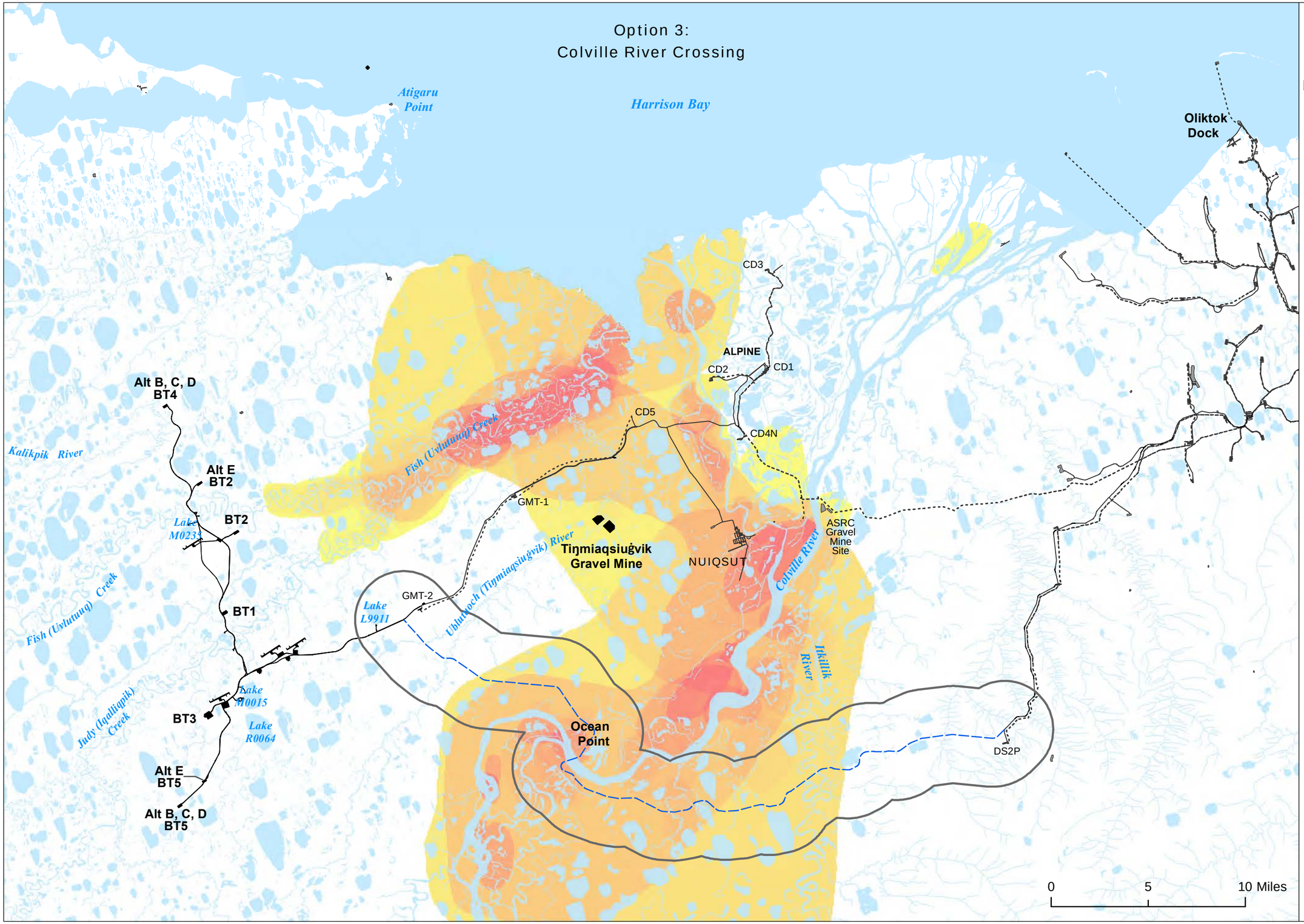
- Existing Road
- Existing Pipeline
- Existing Infrastructure

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

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Figure 22



Subsistence Data

High / Low — Overlapping Subsistence Use Areas Geese, 1995-2006 [a]

Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

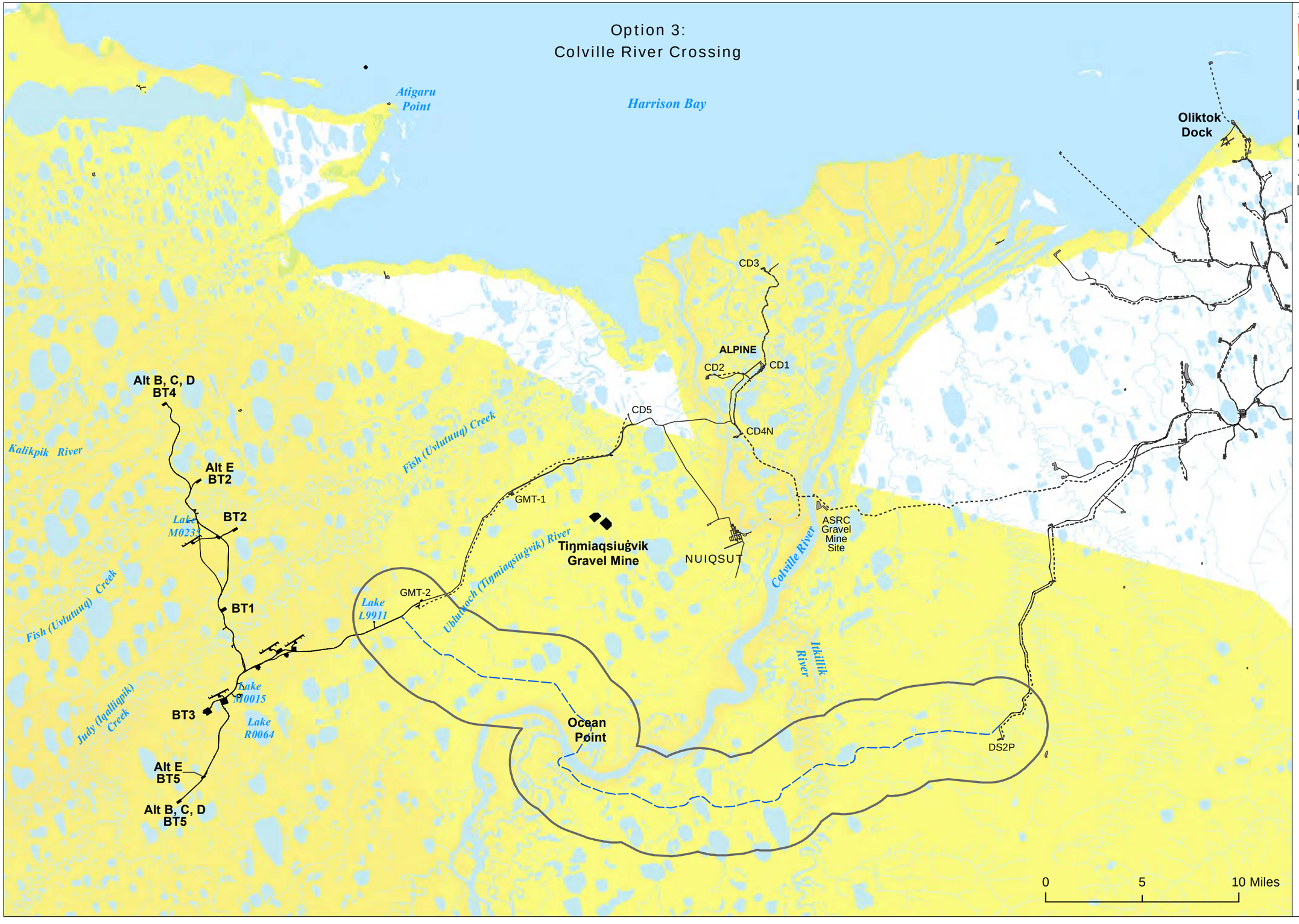
Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.



Figure 23



Subsistence Data

High / Low — Overlapping Subsistence Use Areas Caribou, 1997-2006 [a]

Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

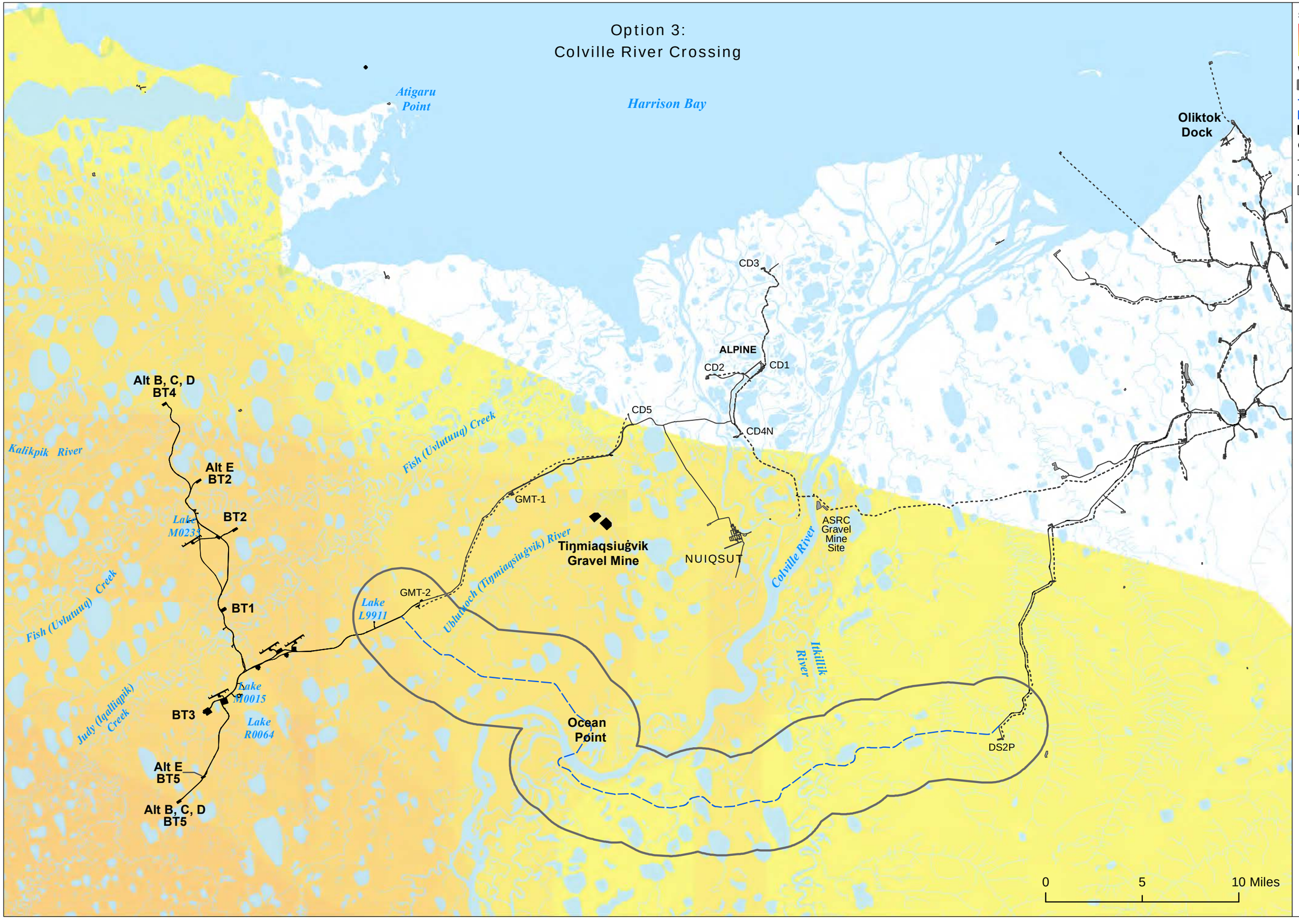
Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.



Figure 24



Subsistence Data

High / Low — Overlapping Subsistence Use Areas Wolf and Wolverine, 1997-2006 [a]

Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.



Figure 25

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9. Evaluation and Finding for the Cumulative Case*

Willow MDP Supplemental EIS Section 3.19, *Cumulative Effects*, contains a description of the cumulative case, which evaluates the impacts of the proposed action in conjunction with past, present, and reasonably foreseeable future actions on subsistence. Reasonably foreseeable future actions considered in the cumulative analysis are provided in Willow Supplemental EIS Section 3.19 and include oil and gas exploration, pipeline and oil field development, and transportation projects. The cumulative impacts of climate change on subsistence are considered as part of the future condition on the North Slope.

Reasonably foreseeable oil development that could contribute to cumulative impacts on subsistence for Nuiqsut, Utqiaġvik, and other North Slope communities include continued development of Kuparuk and Prudhoe Bay, the Nanushuk Development, CPAI drill site 3T (formerly known as Nuna DS2), Liberty Development in the Beaufort Sea, state offshore lease sales and development, oil and gas leasing and development within the NPR-A, and the Alaska LNG or Alaska Stand Alone pipelines. In addition, BLM is currently developing an oil and gas leasing program in the Arctic National Wildlife Refuge, which could lead to oil and gas exploration and development in the 1002 (Coastal Plain) area. Development of offshore leases in federal waters is not projected to occur in the Chukchi Sea during the sealift operations for the Project, or within the foreseeable future. In the Beaufort Sea, Hilcorp is still pursuing its proposed Liberty project; however, the project schedule has been pushed back indefinitely until Hilcorp revises its oil spill response plan and reevaluates its development and production plan, at which time the Bureau of Ocean Energy Management (BOEM) would have to complete additional NEPA analysis before it could reapprove the project. Although BOEM is currently working on the next 5-year leasing program, BOEM's current 5-year leasing plan (ending 2022) does not allow for lease sales in either the Beaufort or Chukchi seas. With the exception of the proposed Liberty project and Northstar development (which has been in production for decades) to the east, almost all federal offshore leases in this area have been surrendered.

Other reasonably foreseeable transportation and infrastructure projects include airport and community infrastructure improvements; continued marine vessel and air traffic associated with shipping, development, scientific research, and recreation and tourism activities in the region; and new permanent or seasonal roads such as the Arctic Strategic Transportation and Resources Project, which could lead to development of roads linking North Slope communities to each other and ultimately the Dalton Highway.

a. Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs*

Cumulative effects on subsistence would be similar if Alternatives B, C, or E are selected in the ROD for the Project. If Alternative D is selected, cumulative effects would differ due to the lack of a year-round gravel access road. Construction of the Project without a year-round access road could substantially reduce displacement or deflection of TCH caribou but would result in somewhat higher disturbances related to air traffic and would not provide year-round subsistence access. The module delivery options would not contribute substantially to the cumulative case as most associated activities would occur solely during construction. While Option 1 would have greater overall direct impacts to Nuiqsut marine and coastal subsistence uses, most of these impacts would cease after the construction phase ended.

Regardless of the alternative selected, cumulative oil and gas activity, transportation projects, and climate change will increasingly restrict subsistence uses and affect the availability of subsistence resources such as caribou and marine mammals. This analysis focuses in part on the impacts that would be associated with an access road to the Project (Alternatives B, C, and E) and assumes access roads to any future development west or south of the Willow development in the NPR-A. For the disconnected access road scenario (Alternative D), impacts from access roads as described below would not accumulate from development of the Project, though they may accumulate from other transportation projects in the region. Impacts related to air traffic would accumulate, to a greater degree, under Alternative D because of the slight increase in air traffic required to reach the Project area during the snow-free months.

Since 2000, oil and gas exploration and development has expanded into Nuiqsut's core subsistence use areas, including the CRD (Alpine drill sites CD1 through CD4) and to the north and west of the community toward Fish (Uvlutuuq) Creek (Alpine drill site CD5, GMT-1, and GMT-2). As a result, the frequency of conflicts between subsistence and development activities have increased (SRB&A 2019a). The Project, in addition to other reasonably foreseeable future activities such as the Nanushuk development, would contribute to the cumulative effects of development on subsistence resources and activities because it would represent a net increase in the amount of land used for oil and gas and other development, in addition to a related increase in industrial activity, including air traffic.

The Alpine CD5, GMT-1, and GMT-2 development projects are present actions that are most closely connected to proposed development in the BTU. These developments were facilitated by previous developments, including Alpine CD5 (for GMT-1) and GMT-1 (for GMT-2). Alpine CD5 was the first major oil and gas development west of the CRD and is connected to Alpine via a bridge and road. Development of Project drill sites, particularly in the case of a year-round access road, would likely facilitate future development to the west and southwest of Nuiqsut within the NPR-A. Development of these drill sites, in combination with existing and future developments, would continue a pattern of development infrastructure surrounding Nuiqsut to the north, west, and southwest of the community. Despite the greater distance from the community, many in Nuiqsut perceive that they are also surrounded to the east by infrastructure associated with the Prudhoe Bay and Kuparuk developments. These areas are now considered off-limits to subsistence uses despite being considered part of the community's traditional use area (SRB&A 2018b). Development of the Nanushuk project would introduce infrastructure directly to the east of the CRD and leave only the southerly direction untouched by oil and gas infrastructure. Despite the lack of infrastructure to the south, oil and gas exploration has occurred to the south of the community and may result in oil and gas development in the future. Finally, development of the BTU would introduce a major oil and gas development within Utqiaġvik's hunting area, although Project development would be located at the eastern edge of the subsistence use area for the community, within an area that provides a minimal amount of subsistence resources compared to land north and west of Teshekpuk Lake. Development of the BTU could lead to additional future development in the BTU and elsewhere in the NPR-A that is within the core harvesting areas for Utqiaġvik and Atqasuk, thus increasing the potential for direct impacts to subsistence users from other communities.

In addition to the additive effects of increasing oil and gas infrastructure in the region, increased activity, including oil and gas exploration and seismic activity, air traffic, scientific research, recreation, and sport hunting and fishing activities, would also contribute to subsistence impacts by increasing the frequency of noise and air traffic disturbances, and interactions with non-local researchers, workers, and recreationists. Increased noise disturbances would contribute to existing impacts on subsistence resource availability. Ongoing disturbances within the NPR-A, in combination with the Project, would likely contribute to changes in the availability of caribou within Nuiqsut's harvesting area.

Barges and vessel traffic associated with the Project would be additive to shipping and scientific research in the Beaufort and Chukchi seas. Vessel traffic would be required for 4 years of the Project's construction phase to transport the modules needed to construct Project infrastructure, and cumulative vessel traffic during this time period would have relatively minimal impacts on marine mammal availability (see Figure 17 for Nuiqsut seal use areas, and Willow MDP Supplemental EIS Appendix E, Figures E.16.9 and E.16.20 for Nuiqsut and Utqiaġvik marine mammal use areas). Development of offshore leases in federal waters is not projected to occur in the Chukchi Sea during the sealift operations for the Project, or within the foreseeable future. In the Beaufort Sea, Hilcorp is still pursuing its proposed Liberty project, however the project schedule has been pushed back indefinitely until Hilcorp revises its oil spill response plan and reevaluates its development and production plan, at which time BOEM would have to complete additional NEPA analysis before it could reapprove the project. Though BOEM is currently working on the next 5-year leasing program, their current 5-year leasing plan (ending 2022) does not allow for the possibility of lease sales in either the Beaufort or Chukchi seas. With the exception of the proposed Liberty project and Northstar development (which has been in production for decades) to the east, almost all federal offshore leases in this area have been surrendered. The 2021 Conflict

Avoidance Agreement (CAA) between whalers and oil and gas operators has been effective at reducing impacts to subsistence hunting of marine mammals. The CAA stipulates that all vessel routes should be planned so as to minimize potential conflicts with bowhead whales or subsistence whaling; in some areas, vessels are required to remain as far offshore as weather and ice conditions allow, and at least five miles offshore during transit. It is unlikely that transport of Project modules, normal shipping patterns, and the construction of the Liberty project would cumulatively cause a significant restriction to marine mammal harvesters on the North Slope in the absence of significant offshore oil and gas exploration and development.

Competition with non-local hunters would contribute to subsistence impacts by potentially decreasing harvest success rates for local subsistence users. Nuiqsut hunters have reported concerns associated with sport hunters along the Dalton Highway and the impacts of those hunters on the movement of caribou toward the community's hunting grounds. In addition, impacts from guided sport hunts to the south of Nuiqsut near Umiat and closer to the foothills of the Brooks Range have been reported by residents of both Nuiqsut and Anaktuvuk Pass (SRB&A 2013b, 2019b). Data from the Alaska Department of Fish and Game (ADF&G) harvest ticket database, which captures primarily non-local harvests (until 2017, state residents north of the Yukon River did not have to use a harvest ticket, and it is presumed that local harvest reports with these permits are low) (Braem 2014), show approximately 16,000 caribou harvested within Game Management Units (GMUs) 26A and 26B between 2000 and 2020 (Table 1). Approximately 87% of these harvests occurred within GMU 26B, which extends to the east of the Colville River and includes the Dalton Highway. The vast majority of harvests within Unit 26B were reported to be CAH caribou. In Unit 26A, where the proposed Willow development area is located, nearly all harvests were reported to be Western Arctic Herd (WAH) caribou (ADF&G 2022). Data by smaller uniform coding unit for Unit 26A indicate that the majority of non-local harvests occur to the south of Umiat and near the Brooks Range (Braem 2014). Harvests of TCH caribou by non-residents are thought to be minimal due to difficulty accessing their central range near Teshekpuk Lake (Braem 2014). Based on available data, non-local harvests within Unit 26B have decreased somewhat in recent years, while harvests in Unit 26A have remained relatively stable.

Table 1. Caribou Harvests by Study Year in Game Management Sub-units 26A and 26B*

Harvest Year	Number Harvested 26A	Number Harvested 26B	Total Number Harvested
2000	68	493	561
2001	57	510	567
2002	79	413	492
2003	117	397	514
2004	115	625	740
2005	87	670	757
2006	91	831	922
2007	114	665	779
2008	94	716	810
2009	75	803	878
2010	65	1,212	1,277
2011	84	1,162	1,246
2012	95	1,003	1,098
2013	95	865	960
2014	121	915	1,036
2015	121	763	884
2016	163	588	751
2017*	156	232	388
2018*	110	224	334
2019*	118	300	418

Harvest Year	Number Harvested 26A	Number Harvested 26B	Total Number Harvested
2020*	89	427	516
All Years	**2,114**	**13,814**	**15,928**

Source: ADF&G 2022
* Starting in 2017, ADF&G required all state residents, including local residents, to use a registration permit. Prior to 2017, residents north of the Yukon River were not required to submit a harvest ticket. It is presumed that harvest reporting by local residents from 2017 to 2020 is low; however, a small number of the 2017–2020 reported harvest may be from local subsistence users.

Data on Special Recreation Permits from BLM for guided hunts in Unit 16A show three guide services operating during the 2017–2021 time period. One guiding service operated in the Umiat/Colville River area, taking between 8 and 56 flights and harvesting between 9 and 38 caribou annually. Hunting trips and harvests in the Colville River/Umiat areas were on the high end in 2020 and 2021, as were user days. Other guide services operated farther west and south, in the Nigu and Etivluk river drainages. Overall, hunting guides on BLM land in Unit 16A took 141 caribou during the 2017–2021 time period.

Competition with non-local hunters may contribute to impacts on local subsistence users if there is a decrease in the abundance of caribou or if caribou are deflected from traditional hunting grounds. While CAH caribou generally do not occur within the Willow development area, they do occur to the east of the Colville River and are harvested by Nuiqsut residents. If TCH caribou experience a decline or become more difficult to harvest due to changes in their distribution or behavior, then Nuiqsut residents may shift their focus to the CAH, thus increasing the likelihood of competition with non-local users. Similarly, other North Slope communities that hunt from the TCH (e.g., Utqiaġvik, Atqasuk, Anaktuvuk Pass, Wainwright) may increase their harvests from other herds (e.g., the WAH) if the availability of TCH caribou declines. If the population of the WAH also continues to decline, as it has in recent years (Hansen 2021), this could increase competition for caribou across multiple communities with non-local users.

Development activities and infrastructure can change hunting patterns and use areas over time by introducing barriers, impediments, or restrictions to access; by facilitating access to lesser used hunting areas via roads; or by causing changes to the availability of subsistence resources in the vicinity of development. Nuiqsut's core subsistence use area has shifted west over time due to Prudhoe Bay development, and recent research has documented decreased use of traditional use areas, including the Niġliq Channel, in part due to development activities and infrastructure (SRB&A 2019a).

Decreased use areas in some development areas have occurred while road-accessible areas have seen increased use. The Kuukpik Spur Road was constructed in 2014 and 2015 to facilitate access for Nuiqsut hunters to the Alpine development's roads. The road has provided access to residents, and the road system has seen increased use in every year since its construction. In 2018 and 2019, harvests of caribou within 2.5 miles of Alpine-related infrastructure were on the high end of all previous study years (SRB&A 2021). Some hunters indicate that their use of the road system offsets decreased harvests closer to the community, which they believe are a result of deflection from the road itself (SRB&A 2018a). Thus, facilitated access to hunting areas via roads is a countervailing effect that partially mitigates the impacts of roads and associated development on subsistence resource availability; this benefit is particularly prevalent for hunters who are less active, do not have access to other non-road modes of transportation (e.g., snow machines, ATVs), or have limited time to spend harvesting resources. However, use has also increased among active hunters who have access to various modes of transportation. Similar to the Spur Road, the recently built Colville River Access Road provides increased access to the upriver hunting areas along the Colville River, which could also help to offset impacts resulting from increased development infrastructure to the north and west of the community. In recent years, access to the main channel of the Colville River has been difficult due to shallow river channels. During recent interviews in Nuiqsut, residents also reported using the road itself to hunt caribou (SRB&A 2021).

Increased development infrastructure on the North Slope would continue to cause alteration and degradation of habitats for key subsistence resources including caribou, furbearers, fish, and goose. Over

time, these changes could affect the health and abundance of different subsistence resources on the North Slope. Risks of oil spills and contamination associated with increased development infrastructure and activity could result in increased avoidance of subsistence foods due to concerns about contaminated food sources. This may be more likely to occur with fish resources downstream from potential contamination sites but could also occur with terrestrial mammals, marine mammals, and bird resources. Avoidance of subsistence foods could have sociocultural effects by reducing food security and reducing opportunities to engage in the distribution (sharing), processing, and consumption of subsistence foods. If development continues westward into the core calving area for the TCH, or if it reduces access to key insect relief habitats, then the herd could experience an overall decline in productivity and abundance. Under this scenario, impacts related to the health and abundance of the TCH would likely extend to subsistence users of the herd including Nuiqsut, Utqiaġvik, Anaktuvuk Pass, Atqasuk, and Wainwright. However, under BLM's 2022 ROD for the NPR-A IAP/EIS, BLM selected Alternative A, which is not expected to cause an overall decline in productivity and abundance.

The cumulative effects of current and future activities related to restrictions on access to traditional areas, changes in hunting patterns, and reduced resource abundance and availability are likely to continue as long as oil and gas exploration and development continues on the North Slope.

b. Evaluation of the Availability of Other Lands for the Purpose Sought to be Achieved

The evaluation of the cumulative case is identical to that provided above in Section B.2.b.

c. Evaluation of Other Alternatives that would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

The evaluation of the cumulative case is identical to that provided above in Section B.2.c.

d. Findings*

1. **Reductions in the availability of subsistence resources described above for the cumulative case may significantly restrict subsistence uses of caribou and furbearers for the community of Nuiqsut.**

2. **Limitations on subsistence user access described above for the cumulative case may significantly restrict subsistence uses for the community of Nuiqsut.**

This evaluation concludes that the cumulative case is not expected to result in a large reduction in the abundance (population level) of caribou or any other subsistence resource. Neither is there any expectation that there will be a major increase in the harvest of caribou by non-subsistence users. Therefore, this finding of "may significantly restrict" is only triggered by two other primary factors that must be considered:

1. Reduction in the availability of resources caused by alteration of their distribution
2. Limitation of access by subsistence harvesters

*1. The Rationale for the Findings of Reduction in the Availability of Subsistence Resources Under the Cumulative Case**

The GMT-1, GMT-2, and Alpine CD5 development projects are present actions that are most closely connected to the proposed Project in the BTU. Development of the Project, in combination with existing and future developments, would continue a pattern of development infrastructure surrounding Nuiqsut to the north, west, and southwest of the community that alter the traditional distribution of caribou within the Nuiqsut core subsistence use area. Additionally, despite the greater distance from the community, many in Nuiqsut perceive that they are also surrounded to the east by infrastructure associated with the Prudhoe Bay and Kuparuk developments. These areas are now considered off limits to subsistence uses despite being considered part of the community's traditional use area.

BLM concludes that altered distributions of TCH caribou and furbearers that are likely to occur during construction and operation of the Project, together with the existing GMT and Alpine developments and reasonably foreseeable developments within onshore NPR-A leases and on state land could cause a major redistribution of resources within the Nuiqsut core subsistence areas that would affect these resources for Nuiqsut hunters.

2. The Rationale for Findings of Limitations on Subsistence User Access Under the Cumulative Case

Nuiqsut's core subsistence use area has shifted west over time due to the development in Prudhoe Bay and recent research has documented decreased use of traditional use areas, including the Niġliq Channel, in part due to development activities and infrastructure (SRB&A 2019b). This shift, together with impacts anticipated to occur from development of the Project (described under Alternatives B, C, D, and E and Module Delivery Options 1, 2, and 3), BLM expects that limitations to subsistence access and the reduced resource availability attributable to development of the Project, would result in an extensive interference with Nuiqsut hunter access.

C. NOTICE AND HEARING*

ANILCA Section 810(a) provides that no "withdrawal, reservation, lease, permit, or other use, occupancy or disposition of the public lands which would significantly restrict subsistence uses shall be effected" until the federal agency gives the required notice and holds a hearing in accordance with ANILCA Sections 810(a)(1) and (2). BLM provided notice in the *Federal Register* that it made positive findings pursuant to ANILCA Section 810 that Alternatives B, C, D, and E and the cumulative case presented in the Willow MDP Draft Supplemental EIS met the "may significantly restrict" threshold. As a result, public hearings were held in the potentially affected community of Nuiqsut in order to solicit public comments from the potentially affected community and subsistence users. Notice of these hearings were provided in the *Federal Register* and by way of the local media, including the Arctic Sounder newspaper, and KBRW, the local Utqiaġvik radio station with coverage to all villages on the North Slope. Meeting dates and times were posted on BLM's website at www.blm.gov/alaska. The public hearing was held in-person.

D. SUBSISTENCE DETERMINATIONS UNDER THE ANILCA SECTIONS 810(A)(3)(A), (B), AND (C)*

ANILCA Section 810(a) provides that no "withdrawal, reservation, lease, permit, or other use, occupancy or disposition of the public lands which would significantly restrict subsistence uses shall be effected" until the federal agency makes the three determinations required by ANILCA Sections 810(a)(3)(A), (B), and (C). The three determinations that must be made are:

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

BLM found that Alternatives B, C, D, E, and the cumulative case considered in the Willow MDP Draft Supplemental EIS may significantly restrict subsistence uses. Therefore, BLM undertook the notice and hearing procedures required by ANILCA Section 810 (a)(1) and (2) in conjunction with the release of the Willow MDP Draft Supplemental EIS in order to solicit public comment from the potentially affected communities and subsistence users.

The determinations in numbers 1 through 3 above will be provided in the Final ANILCA Section 810 Evaluation issued in conjunction with the Willow MDP Final Supplemental EIS, using input from the subsistence hearing conducted in the potentially affected community of Nuiqsut.

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Willow Master Development Plan

Appendix H
Spill Summary, Prevention, and Response Planning

June 2022

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List of Acronyms

ADEC	Alaska Department of Environmental Conservation
BLM	Bureau of Land Management
CPAI	ConocoPhillips Alaska, Inc.
EPA	U.S. Environmental Protection Agency
FLIR	forward-looking infrared
HDD	horizontal directional drilling
IAP	Integrated Activity Plan
LS	lease stipulations
MDP	Master Development Plan
NPR-A	National Petroleum Reserve in Alaska
ODPCP	Oil Discharge Prevention and Contingency Plan
Project	Willow Master Development Plan Project
ROD	Record of Decision
ROP	Required Operating Procedure
SPCC	Spill Prevention, Control, and Countermeasure

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1.0 SPILL SUMMARY

Table H.1.1 summarizes drilling and operations spill types, spill volumes, spill likelihood, spill duration, and estimated geographic extent of spill for the action alternatives.

Table H.1.1. Potential Spill Types, Spill Volumes, Spill Likelihood, Spill Duration, and Estimated Geographic Extent of Spill during the Drilling and Operations Phases for Action Alternatives

Type	Spill Event	Type of Spill	Very Small Oil Spill Classification (< 10 gallons)a	Small Oil Spill Classification (10 to 99.9 gallons)a	Medium Oil Spill Classification (100 to 999.9 gallons)a	Medium-Large Oil Spill Classification (1,000 to 9,999.9 gallons)a	Large Oil Spill Classification (10,000 to 100,000 gallons)a	Very Large Oil Spill Classification (> 100,000 gallons)a	Likely Duration of Spill	Likely Geographic Extent of Spill
Oil wells	Shallow gas blowout	Drilling fluids (no produced fluids)	VL	VL	VL	VL	VL	VL	1 to 2 days	No crude oil would be spilled, but drilling muds and other drilling fluids could impact an area up to 20 to 25 acres adjacent to the well pad.
Oil wells	Reservoir blowout	Produced fluids and drilling fluids	VL	VL	VL	VL	VL	VL	A few days to a week or two	Modeling results suggest that up to 10% of the discharged oil would remain airborne as an aerosol and 90% would be expected to reach the ground surface in a swath up to 2,953 feet wide and up to 22,310 feet downwind of the well based on typical prevailing wind patterns at the time of the spill. (Details are in Section 4.3, *Potential Spills during Drilling and Operations*.)
Oil wells	Wellhead and well-casing leaks	Produced fluids	L	L	L	VL	VL	VL	A few hours for very small spills to a few days for large spills	Spills would be expected to be contained within the immediate vicinity of the well itself and would not be expected to reach areas off the gravel pad.
Pipelines	Facility piping	Produced fluids and various refined products	VH	VH	H	M	L	VL	Very short (less than 1 hour) for very small spills to a few days for large spills	Spills would be expected to be contained to the gravel pad and its immediate margin.

Type	Spill Event	Type of Spill	Very Small Oil Spill Classification (< 10 gallons)a	Small Oil Spill Classification (10 to 99.9 gallons)a	Medium Oil Spill Classification (100 to 999.9 gallons)a	Medium-Large Oil Spill Classification (1,000 to 9,999.9 gallons)a	Large Oil Spill Classification (10,000 to 100,000 gallons)a	Very Large Oil Spill Classification (> 100,000 gallons)a	Likely Duration of Spill	Likely Geographic Extent of Spill
Pipelines	Infield flowlines	Multiphase produced fluids and produced water	L	L	L	VL	VL	VL	Very short (less than 4 hours) or could continue for days to weeks depending on the size and location of the leak along the flowline	Leaks could occur on gravel pads or on tundra and adjacent waterbodies between pads. Large spills that go undetected for a period of time could spread to an area a few acres in size before the spill is stopped. The area reached by materials from large spills would be influenced by the location and time of year of the spill. If a large spill were to occur in the vicinity of a river or during the spring when water flows are high, the geographic extent of such a spill could be larger.
Pipelines	Process piping	Processed (sales-quality) oil	VH	VH	H	M	L	VL	Very short (less than 1 hour) for very small spills to a few days for large spills before the leak is repaired	Process piping associated with well manifolds and processing at the WPF would be expected to be contained to the gravel pad or its immediate margin, with very little reaching adjacent areas. The area reached by large spills would be influenced by the location and time of year the spill occurred.
Pipelines	Export pipeline	Processed (sales-quality) oil and make-up water (seawater)	VL	VL	VL	VL	VL	VL	Very short (less than 1 hour) or could continue for days to weeks before being detected depending on the size and location of the leak along the pipeline corridor	Leaks could occur on the WPF gravel pad or at the tie-in gravel pad at Alpine CD4N or on tundra and adjacent waterbodies between pads. Very small spills would be expected to be limited to a small area in the immediate vicinity of the spill; however, larger spills that go undetected for a period of time could extend to an area several acres in size before being stopped. The spill's location and the time of year also influence the extent of the spill. For instance, if a large or very large spill were to occur in the vicinity of a river, the geographic extent of such a spill could be much higher.

Type	Spill Event	Type of Spill	Very Small Oil Spill Classification (< 10 gallons)a	Small Oil Spill Classification (10 to 99.9 gallons)a	Medium Oil Spill Classification (100 to 999.9 gallons)a	Medium-Large Oil Spill Classification (1,000 to 9,999.9 gallons)a	Large Oil Spill Classification (10,000 to 100,000 gallons)a	Very Large Oil Spill Classification (> 100,000 gallons)a	Likely Duration of Spill	Likely Geographic Extent of Spill
Aboveground storage tanks	Large aboveground storage tanks	Various refined products and processed (sales-quality) oil	L	L	L	L	VL	VL	Would likely be noticed within a day of the start of the leak, but securing the leak could take a few days depending on where the leak occurred on the tank	Spilled material would be captured within secondary containment. In the unlikely event that a spill escaped the secondary containment, it is expected that the spill would be contained to the pad itself and would not reach the tundra, adjacent waterbodies, or other sensitive habitats.
Spills not specifically associated with petroleum development infrastructure	Spills associated with warehouse activities; storage facilities; equipment maintenance and repair activities; vehicle accidents; and vehicle and equipment refueling activities	Typically, a variety of refined products	VH	VH	H	L	VL	VL	On-pad spills would be observed and responded to quickly and be of short duration (less than 0.5 day). Spills from vehicle accidents would happen at the time of the accident and last less than an hour.	Spills would remain on the pad or within secondary containment; damage to areas adjacent to pads would not be anticipated. If a spill occurred due to a large bulk-fuel tanker truck accident and the tanker volume was released, the geographic extent would likely include the road, adjacent roadside habitats, and possibly waterbodies. The geographic extent of a spill of this size would vary depending location of the accident and the season in which it occurred; however, the spill would be localized and likely affect an area up to 0.5 acre in size.

Note: H (high); L (low); M (medium); VH (very high); VL (very low); WPF (Willow processing facility).
[a] Oil spill size classifications denote the likelihood of a spill or release occurring.

2.0 SPILL PREVENTION AND RESPONSE PLANNING

As described in Chapter 4.0, *Spill Risk Assessment*, ConocoPhillips Alaska, Inc. (CPAI) would implement numerous spill prevention and response planning measures as part of the Willow Master Development Plan Project (Project) to help prevent spills and minimize damage to human health and the environment in the unlikely event they occur. Spill prevention measures include the following:

- Specific design features to detect and contain leaks
- Adherence to required operating procedures (ROPs) and lease stipulations (LS)
- Systems to notify operators of potential leaks
- Procedures to maintain the pipelines and other infrastructure

Response planning measures include the following:

- Developing numerous response planning documents for a variety of spill scenarios
- Providing necessary equipment to prevent and respond to spills
- Ensuring personnel are trained and knowledgeable about the procedures to respond efficiently and effectively to oil spills and other accidental releases

Project facilities would be designed to mitigate spills with spill prevention measures and spill response capabilities. CPAI would implement a pipeline maintenance and inspection program and an employee spill prevention training program to further reduce the likelihood of spills occurring. CPAI's design of production facilities would include provisions for secondary containment of hydrocarbon-based and other hazardous materials, as required by state and federal regulations. If a spill occurs on a gravel or ice pad, the fluid would remain on the pad unless the spill is near a pad edge or exceeds the pad's retention capacity. Fuel transfers near pad edges would be limited to the extent practicable to mitigate this risk. In addition to regulations governing spill prevention and response, the Project would be managed under the BLM LS and ROPs described for solid waste, fuel, and chemical storage (BLM 2022) (Section 2.5, *Applicable Lease Stipulations and Best Management Practices*).

2.1 Spill Prevention

Spill prevention and response measures that would be used during construction, drilling, and operations would be outlined in the Project's Oil Discharge, Pollution, and Contingency Plan (ODPCP) and the Spill Prevention Control and Countermeasures (SPCC) Plan. The intent of the ODPCP and SPCC Plan is to demonstrate CPAI's capability to prevent oil spills from entering the water or land and to ensure rapid response in the event a spill occurs. The ODPCP would comply with applicable State of Alaska requirements (AS 46.04.030, 18 AAC 75) for spill prevention and federal U.S. Environmental Protection Agency (EPA) regulations in 40 CFR 112, D (Facility Response Plans). The SPCC Plan would comply with the federal EPA regulations contained in 40 CFR 112.

CPAI would design and construct pipelines to comply with state, federal, and local regulations. Pipelines would be constructed of high-strength steel and would have wall thicknesses in compliance with or exceeding design code regulatory requirements. Pipeline welds would be validated using nondestructive examination (i.e., radiography or ultrasonic) during pipeline construction to ensure their integrity and pipelines would be hydrostatically tested prior to operation. The production fluids, water injection, seawater, and export pipelines would be fully capable of accommodating pigs for cleaning and corrosion inspection.

CPAI would use two methods of leak detection for the seawater and diesel pipeline horizontal directional drilling (HDD) crossings under the Colville River: leak detection by mass balance (primary) and optical leak detection (secondary and within the pipeline carrier casing). To further prevent a pipeline leak under the Colville River, the diesel and seawater pipelines would be installed inside high-strength casing pipe. Simultaneous failure of both the pipeline and the associated casing is highly unlikely. If diesel or seawater leaked from the pipelines, it would be contained within the space between the outer walls of the pipelines and the inner wall of the casing rather than reaching the subsurface river environment. The design is analogous to secondary containment provided as a spill prevention technique for storage tanks.

The casing would perform a second function: accommodating the external loads that would normally be carried by the pipeline. The casing and pipelines would not apply significant, direct loads onto each other, with some load transferred by the plastic casing isolators attached to the carrier pipeline. A deformation of the casing pipe would not necessarily cause deformation of the carrier pipelines, thus providing protection against external loads. To prevent external corrosion, the casing and pipelines would be protected by an abrasion-resistant coating, in accordance with industry standards.

There would be an increased potential for pipeline spills where pipelines cross under roads due to corrosion of the buried portion of the pipelines. The likelihood of corrosion occurring would be reduced through design and monitoring. CPAI would maintain corrosion control and inspection programs that include ultrasonic inspection, radiographic inspection, coupon monitoring, metal loss deflection pigs and geometry pigs (applicable to pig-capable pipelines), and infrared technology. The inspection programs are API Standard 570–based programs that focus inspection efforts on areas with the greatest potential for spills.

2.2 Spill Response

CPAI would implement the Project's ODPCP and SPCC Plan to minimize accidental oil spills and associated impacts. Through the ODCP, CPAI would demonstrate that readily accessible inventories of fit-for-purpose oil spill response equipment and personnel would be available for use at Project facilities. In addition, a state-registered primary response action contractor would serve as CPAI's primary response action contractor and would provide trained personnel to manage all stages of a spill response, including containment, recovery, and cleanup.

The threat to rivers and streams from a possible pipeline spill would be minimized by quickly intercepting, containing, and recovering spilled oil near the waterway-pipeline crossing points. The road would be used for access and staging for spill response. Valves would be installed on each side of pipeline crossings at Fish (Uvlutuuq) Creek and Judy (Iqalliqpik) Creek, which would allow isolation of produced fluids pipelines on either side of the bridges to minimize potential spill impacts in the event of a leak or break.

Spill response equipment would be pre-staged at strategic locations across the Project area as outlined in the ODPCP for an initial response. This strategy would facilitate the rapid deployment of equipment by personnel. The effective response time would be enhanced with pre-staged equipment, which would expedite equipment deployment to contain and recover spilled oil, reducing the overall affected area. During summer, pre-staged containment booms would be placed at strategic locations near selected river channels to facilitate a rapid response. Pre-deployed booms may also be placed within selected stream channels to mitigate a spill, should one occur. During summer, spill containment equipment would likely be staged or deployed using helicopters. If a spill occurs, spill response activity could include watercraft (e.g., airboats, jetboats) use to access affected areas.

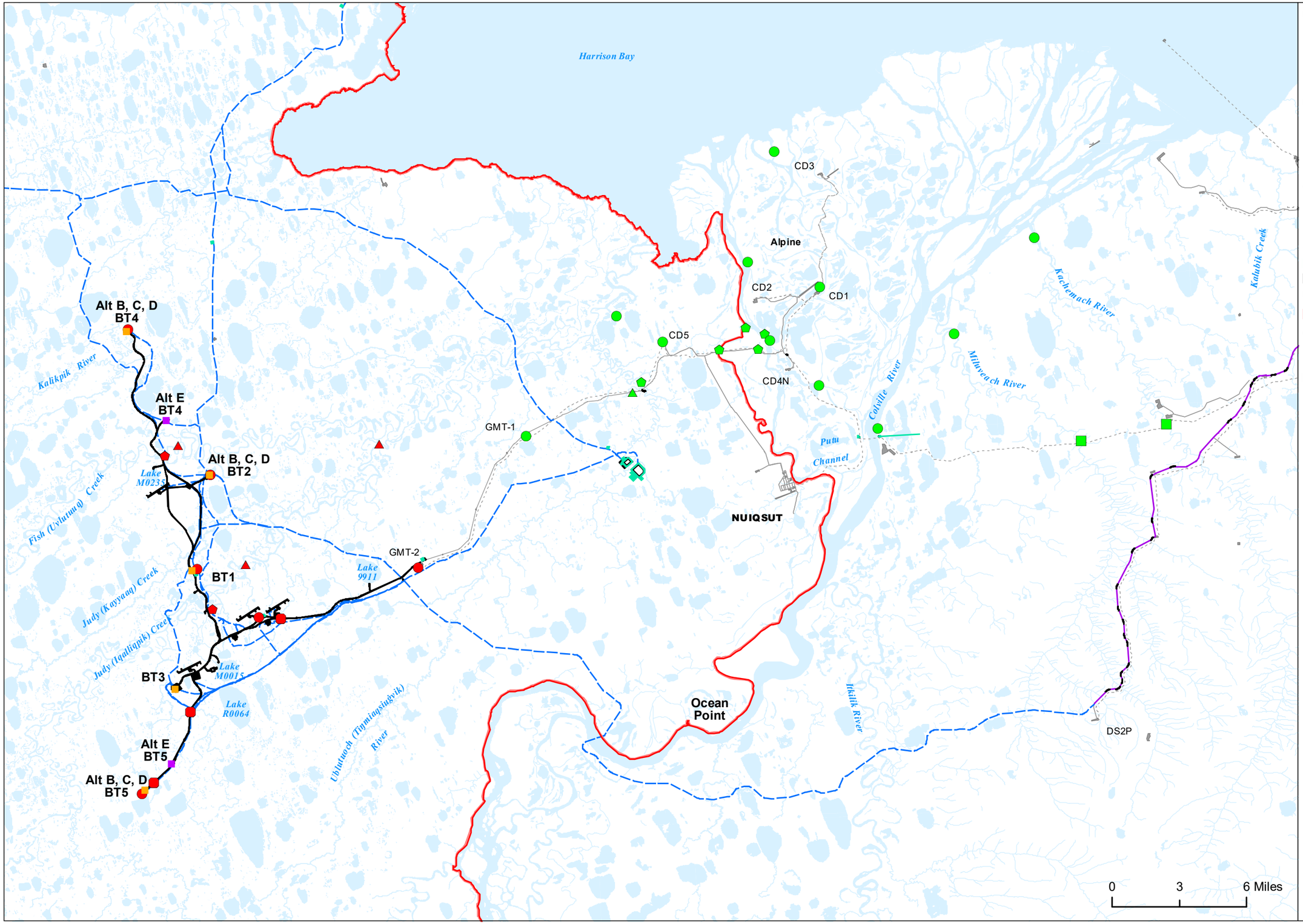
2.2.1 Pre-Staged and Pre-Deployed Equipment

Dedicated oil spill response equipment (e.g., boom, anchors, skimmers, hoses, pumps, portable storage) would be pre-staged and stored in connexes at dedicated storage locations near the pipelines and HDD crossing of the Colville River. Pre-staged equipment would be placed in close proximity to facilities and infrastructure, and in areas that are easily accessible, allowing for quick deployment. This includes equipment pre-staged along the east bank of the Colville River, just north of the existing Alpine HDD pipeline crossing (CPAI 2018).

Spill response team personnel may also pre-deploy diversionary or exclusion booms in the rivers each summer, including in the Colville River. Specific boom-laying configurations, and the exact footage lengths of booms pre-staged at each site may vary in response to seasonal changes in the river channel and weather-driven fluctuations in the river currents. At each pre-staging site, boom sections and anchors would be staged on the shoreline in a manner that optimizes the boom's intended use for containment and recovery. Response equipment would be maintained in such a manner that it could be deployed rapidly

and in a condition for immediate use. CPAI would routinely inspect and test on-site response equipment. CPAI's spill response contractor would also perform routine inspection and maintenance of all response equipment.

CPAI currently pre-stages and pre-deploys equipment throughout the Alpine and Greater Mooses Tooth developments (Figure H.2.1), including spill response equipment and pre-deployed boom. Figure H.2.1 also reflects general planned locations for pre-staged and pre-deployed spill response equipment (CPAI 2020).



Existing Spill Response Equipment
- Existing- Pre-staged equipment
- Existing - Pre-staged equipment/ Pre-deployed boom
- Existing - Pre-deployed boom
- Existing - Pre-deployed boom

Palnned Spill Response Equipment
- Planned - Pre-staged equipment
- Planned - Pre-deployed boom
- Planned - Pre-staged boom
- Planned - Pre-staged/Culvert blocking equipment

Willow Proposed Development Features
- Drill Site (Not to Scale)
- Alt E Drill Site (Not to Scale)
- Ice Road
- Option 3 Existing Road
- Ice Pad
- Gravel Footprint

Land Designation
- National Petroleum Reserve in Alaska

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.



Figure H.2.1

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2.3 Spill Response Training and Inspections

CPAI provides regular training for its employees and contractors on the importance of preventing oil or other hazardous material spills, including new employee orientation, annual environmental training seminars, and appropriate certification classes for specific issues covering spill prevention. CPAI's employees and contractors participate in frequent safety meetings that address spill prevention issues, as appropriate. The CPAI Incident Management Team participates in regularly scheduled training programs and conducts spill response drills in coordination with federal, state, and local agencies. Employees are encouraged to participate in the North Slope Spill Response Team where members receive regularly scheduled spill response training to ensure the continuous availability of skilled spill responders on the North Slope.

CPAI is required to conduct visual examinations of pipelines and facility piping with a frequency defined under 49 CFR 195.412 and 18 AAC 75.055 during operations at a minimum interval not exceeding 3 weeks. CPAI would provide aerial overflights as necessary to allow inspection both visually and with the aid of infrared technology, when required. Infrared technology allows for spill identification based on the temperature "signature" resulting when warm fluids leak. Infrared technology can detect warm spots in low-light conditions or when other circumstances such as light fog or drifted snow limit visibility. Infrared technology can also identify trouble spots along pipelines, such as damaged insulation, before a problem develops. CPAI would also conduct regular visual inspections of facilities and pipelines from gravel roads, where available, and from ice roads and aircraft for sections of pipelines not paralleled by gravel roads (Alternatives C and D).

2.3.1 Existing Area-Wide Oil Spill Response Training and Reconnaissance

In March 2020, BLM issued a Draft Update on North Slope Permitting and Activities (BLM 2020) for the NPR-A, including the Willow area. BLM intends to renew a right-of-way authorizing Alaska Clean Seas to conduct oil spill response training, deploy the equipment cache, and perform reconnaissance to determine the feasibility of pre-deploying a containment boom.

Summer reconnaissance activities will occur to determine the potential location of pre-staged equipment and pre-deployed containment boom sites and to obtain area knowledge to increase oil spill response preparedness. Training will consist of transporting Spill Response Team members to the sites and deploying boom and small skimming systems to determine the best methods of responding to an oil spill. This training would continue to identify ideal sites for collection and recovery of oil spilled from proposed pipelines and operating areas. These activities will occur regardless of the Project; however, it will affect preparedness and response for the Project should a spill occur and thus is considered when disclosing the Project's response training.

2.4 Fuel and Chemical Storage

Fuel and other chemicals would be stored primarily at the Willow central processing facility, with additional storage at the Willow Operations Center and drill sites. Diesel fuel would be stored in temporary tanks on-site during construction under all alternatives. During drilling and operations, the Willow Operations Center would include a diesel fuel supply storage tank(s), an associated fueling station, and a tank farm to store methanol, crude flowback, corrosion inhibitor, scale inhibitor, emulsion breaker, and various other chemicals as required.

Drill sites would have temporary tanks to support drilling activity, including brine tanks, a cuttings and mud tank, and a drill rig diesel fuel tank built into the drill rig structure. Production and operations storage tanks at drill sites would include chemical storage tanks that may contain any of the following depending on Project needs: corrosion inhibitor, methanol, scale inhibitor, emulsion breaker, antifoam, or ultra-low sulfur diesel. Portable oil storage tanks to support well and pad operational activities and maintenance (i.e., well work and well testing) may be present on an as-needed basis.

Fuel and oil storage would comply with local, state, and federal oil pollution prevention requirements, according to an ODPCP and a SPCC Plan. Secondary containment for fuel and oil storage tanks would be

sized as appropriate to container type and according to the requirements in 18 AAC 75 and 40 CFR 112. Fuel and chemical storage associated with the Project would be managed under BLM LS and ROPs (Section 2.5 of this appendix, *Applicable Lease Stipulations and Best Management Practices*).

2.5 Applicable Lease Stipulations and Best Management Practices*

Table H.2.1 summarizes existing applicable NPR-A Integrated Activity Plan (IAP) LS and ROPs that would apply to Project actions on BLM-managed lands and are intended to mitigate impacts to the environment from spills and accidental releases. CPAI would comply with applicable existing NPR-A IAP LS and ROPs related to fuels and hazardous materials handling and storage, spill prevention, and spill response, as outlined in BLM (2022). The LS and ROPs would reduce impacts to the environment from accidental spills or releases associated with the construction, drilling, and operations of oil and gas facilities. In 2021, BLM was directed to reevaluate the 2020 NPR-A IAP. The NPR-A IAP reevaluation resulted in the issuance of a new NPR-A IAP Record of Decision (ROD) that selected an alternative similar to the 2013 NPR-A IAP ROD. Full text of the requirements is provided in BLM (2022).

Table H.2.1. Summary of Applicable Lease Stipulations and Required Operating Procedures Intended to Mitigate Impacts from Potential Spills*

LS or ROP	Description or Objective	Requirement/Standard
ROP A-3	Minimize pollution through effective hazardous-materials contingency planning.	A hazardous materials emergency contingency plan shall be prepared before transportation, storage, or use of fuel or hazardous substances. The plan shall include a set of procedures to ensure prompt response, notification, and cleanup in the event of a hazardous substance spill or threat of a release. The plan shall include a list of resources available for response. In addition, contingency plans shall include requirements to: a. Provide refresher spill-response training to NSB and local community spill-response teams on a yearly basis b. Plan and conduct a major spill-response drill annually c. Develop spill prevention and response contingency plans and participate in the North Slope Subarea Contingency Plan for Oil and Hazardous Substances Discharges/Releases for the NPR-A operating area.
ROP A-4	Minimize the impact of contaminants on fish, wildlife, and the environment, including wetlands, marshes, and marine waters, as a result of fuel, crude oil, and other liquid chemical spills. Protect subsistence resources and subsistence activities. Protect public health and safety.	Before initiating any oil and gas or related activity or operation, develop a comprehensive spill prevention, control, and countermeasure plan per 40 CFR 112. The plan shall consider the following requirements: a. Sufficient oil-spill-cleanup materials shall be stored at all fueling points and vehicle-maintenance areas and shall be carried by crews on all overland moves. b. Fuel and other petroleum products and other liquid chemicals shall be stored in proper containers at approved locations. Fuel, petroleum products, and other liquid chemicals that in total exceed 1,320 gallons shall be stored within an impermeable lined and diked area or within approved alternate storage containers. Within 500 feet of waterbodies, fuel containers are to be stored within appropriate containment. c. Liner material shall be compatible with the stored product and capable of remaining impermeable during typical weather extremes expected throughout the storage period. d. Permanent fueling stations shall be lined or have impermeable protection. e. All fuel containers shall be marked with the responsible party's name, product type, and year filled or purchased. f. Notice of any reportable spill (as required by 40 CFR 300.125 and 18 AAC 75.300) shall be given to the authorized officer as soon as possible, but no later than 24 hours after occurrence. g. All oil pans (i.e., “duck ponds”) shall be marked with the responsible party’s name.

LS or ROP	Description or Objective	Requirement/Standard
RO A-5	Minimize the impact of contaminants from refueling operations on fish, wildlife, and the environment.	Refueling of equipment within 500 feet of the active floodplain of any waterbody is prohibited. Fuel storage stations shall be located at least 500 feet from any waterbody with the exception that small caches (up to 210 gallons) for motorboats, float planes, ski planes, and small equipment.
ROP A-7	Minimize the impacts to the environment of disposal of produced fluids recovered during the development phase on fish, wildlife, and the environment.	Discharge of produced water in upland areas and marine waters is prohibited.
ROP E-4	Minimize the potential for pipeline leaks, the resulting environmental damage, and industrial accidents.	All pipelines shall be designed, constructed, and operated under an AO-approved Quality Assurance/Quality Control plan that is specific to the product transported and shall be constructed to accommodate the best available technology for detecting and preventing corrosion or mechanical defects during routine structural integrity inspections.

Source: BLM 2022
Note: AO (authorized officer); LS (lease stipulation); NPR-A (National Petroleum Reserve in Alaska); NSB (North Slope Borough); ROP (required operating procedure).

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Willow Master Development Plan

Appendix I
Avoidance, Minimization, and Mitigation Technical Appendix

June 2022

Appendix I.1
Avoidance, Minimization, and Mitigation

Appendix I.2
ConocoPhillips Road Optimization Memorandum

Appendix I.3
Dust Control Plan

Appendix I.4
Permittee-Responsible Wetlands Compensatory Mitigation Plan

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Willow Master Development Plan

Appendix I.1
Avoidance, Minimization, and Mitigation

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List of Acronyms

µPa	micropascal
°F	degrees Fahrenheit
ADEC	Alaska Department of Environmental Conservation)
ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
agl	above ground level
AOGCC	Alaska Oil and Gas Conservation Commission)
BLM	Bureau of Land Management
BT1	Bear Tooth 1 drill site
BT2	Bear Tooth 2 drill site
BT3	Bear Tooth 3 drill site
BT4	Bear Tooth 4 drill site
BT5	Bear Tooth 5 drill site
CPAI	ConocoPhillips Alaska, Inc.
dB	decibel
DEW	Distant Early Warning
DMLW	Division of Mining, Land, Water
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
GIS	geographic information system
GMT-1	Greater Mooses Tooth 1
GMT-2	Greater Mooses Tooth 2
HDD	horizontal directional drilling
IAP	Integrated Activity Plan
ITR	Incidental Take Regulation

LS	lease stipulation
MDP	Master Development Plan
MMPA	Marine Mammal Protection Act
mph	miles per hour
MTI	module transfer island
NMFS	National Marine Fisheries Service
No.	number
NPR-A	National Petroleum Reserve in Alaska
NSB	North Slope Borough
OHW	ordinary high water
PM	particulate matter
Project	Willow Master Development Plan Project
RMS	Regional Mitigation Strategy
ROD	Record of Decision
ROP	required operating procedure
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VSM	vertical support member
WSE	water surface elevation
WPF	Willow Processing Facility

1.0 APPLICABLE LEASE STIPULATIONS AND REQUIRED OPERATING PROCEDURES*

The 2022 National Petroleum Reserve in Alaska (NPR-A) Integrated Activity Plan (IAP)/Environmental Impact Statement (EIS) Record of Decision (ROD) established performance-based lease stipulations (LSs) and required operating procedures (ROPs) that apply to oil and gas activities within the NPR-A (BLM 2022). Table I.1.1 summarizes NPR-A IAP LSs and ROPs that would apply to the Willow Master Development Plan Project (Project) and are intended to mitigate Project impacts. In 2021, the Bureau of Land Management (BLM) was directed to reevaluate the 2020 NPR-A IAP. The NPR-A IAP reevaluation resulted in the issuance of a new NPR-A IAP ROD (BLM 2022) that selected an alternative nearly identical to the 2013 NPR-A IAP ROD. Updated ROPs (BLM 2022) adopted in the new NPR-A IAP ROD replaced previous ROPs; however, applicable LSs have not changed because LSs are fixed at the time of the lease issuance. All projects are subject to the LSs and ROPs that are in place at the time the permit for development is issued. (The reader is referred to Section 2.2.7, *Lease Stipulations, Required Operating Procedures, and Lease Notices*, of the 2020 IAP/EIS for further discussion on this topic). The Willow MDP ROD will detail which of the measures described below will be implemented for the Project. Table I.1.1 summarizes the applicable NPR-A IAP LSs and ROPs that would apply to Project actions on BLM-managed lands; full text of the requirements is provided in BLM (2020b).

The ROPs are organized to address the following topics:

A. Waste prevention, handling, disposal, spills, air quality, and public health and safety
B. Water use for permitted activities
C. Winter overland moves and seismic work
D. Oil and gas exploratory drilling
E. Facility design and construction
F. Use of aircraft for permitted activities
G. Oil field abandonment
H. Subsistence consultation for permitted activities
I. Orientation programs associated with permitted activities
J. Endangered Species Act Section 7 consultation process
K. Additional protections that apply in select biologically sensitive areas
L. Summer vehicle tundra access
M. General wildlife and habitat protection

Table I.1.1. Applicable Lease Stipulations and Required Operating Procedures*

LS or ROP	Description of Objective	Requirement/Standard
ROP A-1	Protect the health and safety of oil and gas field workers and the general public by disposing of solid waste and garbage in accordance with applicable federal, State, and local law and regulations.	Areas of operation shall be left clean of all debris.
ROP A-2	Minimize impacts on the environment from non-hazardous and hazardous waste generation. Encourage continuous environmental improvement. Protect the health and safety of oil field workers and the general public. Avoid human-caused changes in predator populations.	Lessees/permittees shall prepare and implement a comprehensive waste management plan for all phases of exploration and development, including seismic activities. The plan shall be submitted to the AO for approval, as part of a plan of operations or other similar permit application. Waste generation shall be addressed in the following order of priority: 1) prevention and reduction, 2) recycling, 3) treatment, and 4) disposal. The plan shall consider the following requirements: a. The plan shall identify precautions that are to be taken to avoid attracting wildlife to food and garbage. b. Requirements prohibit the burial of garbage. Users shall have a written procedure to ensure that the handling and disposal of putrescible waste will be accomplished in a manner that prevents the attraction of wildlife. All putrescible waste shall be incinerated, backhauled, or composted in a manner approved by the AO. All solid waste, including incinerator ash, shall be disposed of in an approved waste-disposal facility. The burial of human waste is prohibited. c. BLM requires all pumpable solid, liquid, and sludge waste be disposed of by injection in accordance with EPA, DEC, and AOGCC regulations and procedures. d. BLM prohibits wastewater discharges or disposal of domestic wastewater into bodies of water, including wetlands, unless authorized by a National Pollutant Discharge Elimination System or State permit.
ROP A-3	Minimize pollution through effective hazardous-materials contingency planning.	A hazardous materials emergency contingency plan shall be prepared before transportation, storage, or use of fuel or hazardous substances. The plan shall include a set of procedures to ensure prompt response, notification, and cleanup in the event of a hazardous substance spill or threat of a release. The plan shall include a list of resources available for response. In addition, contingency plans shall include requirements to: a. Provide refresher spill-response training to NSB and local community spill-response teams on a yearly basis b. Plan and conduct a major spill-response drill annually c. Develop spill prevention and response contingency plans and participate in the North Slope Subarea Contingency Plan for Oil and Hazardous Substances Discharges/Releases for the NPR-A operating area.

LS or ROP	Description of Objective	Requirement/Standard
ROP A-4	Minimize the impact of contaminants on fish, wildlife, and the environment, including wetlands, marshes, and marine waters, as a result of fuel, crude oil, and other liquid chemical spills. Protect subsistence resources and subsistence activities. Protect public health and safety.	Before initiating any oil and gas or related activity or operation, develop a comprehensive spill prevention, control, and countermeasure plan per 40 CFR 112. The plan shall consider the following requirements: a. Sufficient oil-spill-cleanup materials shall be stored at all fueling points and vehicle-maintenance areas and shall be carried by crews on all overland moves. b. Fuel and other petroleum products and other liquid chemicals shall be stored in proper containers at approved locations. Fuel, petroleum products, and other liquid chemicals that in total exceed 1,320 gallons shall be stored within an impermeable lined and diked area or within approved alternate storage containers. Within 500 feet of waterbodies, fuel containers are to be stored within appropriate containment. c. Liner material shall be compatible with the stored product and capable of remaining impermeable during typical weather extremes expected throughout the storage period. d. Permanent fueling stations shall be lined or have impermeable protection. e. All fuel containers shall be marked with the responsible party's name, product type, and year filled or purchased. f. Notice of any reportable spill (as required by 40 CFR 300.125 and 18 AAC 75.300) shall be given to the authorized officer as soon as possible, but no later than 24 hours after occurrence. g. All oil pans (i.e., “duck ponds”) shall be marked with the responsible party’s name.
ROP A-5	Minimize the impact of contaminants from refueling operations on fish, wildlife, and the environment.	Refueling of equipment within 500 feet of the active floodplain of any waterbody is prohibited. Fuel storage stations shall be located at least 500 feet from any waterbody with the exception that small caches (up to 210 gallons) for motorboats, float planes, ski planes, and small equipment.
ROP A-6	Minimize the impact on fish, wildlife, and the environment from contaminants associated with the exploratory drilling process.	Surface discharge of reserve-pit fluids is prohibited.
ROP A-7	Minimize the impacts to the environment of disposal of produced fluids recovered during the development phase on fish, wildlife, and the environment.	Discharge of produced water in upland areas and marine waters is prohibited.
ROP A-8	Minimize conflicts resulting from interaction between humans and bears during oil and gas activities.	Lessees will prepare and implement bear-interaction plans to minimize conflicts between bears and humans. These plans shall include measures to: a. Minimize attraction of bears to the drill sites. b. Organize layout of buildings and work sites to minimize human-bear interactions. c. Warn personnel of bears near or on work sites and identify proper procedures to be followed. d. Establish procedures, if authorized, to discourage bears from approaching the work site. e. Provide contingencies in the event bears do not leave the site or cannot be discouraged by authorized personnel. f. Discuss proper storage and disposal of materials that may be toxic to bears. g. Provide a systematic record of bears on the work site and in the immediate area.
ROP A-9	Reduce air quality impacts.	All operations (vehicles and equipment) that burn diesel fuels must use “ultra-low sulfur” diesel as defined by the DEC, Division of Air Quality.

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ROP A-10	Prevent unnecessary or undue degradation of the lands and protect health.	This measure includes the following elements: a. BLM may require a project proponent to provide a minimum of one year of baseline ambient air monitoring data for any pollutants of concern. If BLM determines baseline monitoring is required, this pre-analysis data must meet DEC and EPA air monitoring standards and cover the year prior to the submittal. b. BLM may require monitoring for the life of the project, depending on the potential air emissions' magnitude, proximity to a federal Class I area, Class II area, or population center, proximity to a non-attainment or maintenance area, meteorological or geographic conditions, existing air quality conditions, existing area development, or issues identified during the project's NEPA analysis. c. For an application to develop a potential substantial air pollutant emission source, the proponent shall prepare an emissions inventory that includes quantified emissions of regulated air pollutants from all direct and indirect sources related to the proposed project. d. For an application to develop a potential substantial air pollutant emission source, BLM may require the proponent to provide an emissions reduction plan. e. For an application to develop a potential substantial air pollutant emission source, the AO may require air quality modeling analyzing the project's direct, indirect or cumulative impacts to air quality. The modeling shall compare predicted impacts to all applicable local, State, and federal air quality standards and increments, as well as other scientifically defensible significance thresholds. f. BLM may require air quality mitigation measures and strategies within its authority, in addition to regulatory requirements and proponent committed emission reduction measures. g. If ambient air monitoring indicates project-related emissions are causing or contributing to impacts that would cause undue degradation, exceedances of NAAQS, or fail to protect health, the AO may require changes to reduce emissions. h. Publicly available reports on air quality baseline monitoring, emissions inventory, and modeling results shall be provided by the project proponent to the NSB and to local communities and Tribes.
ROP A-11	Ensure that permitted activities do not create human health risks through the contamination of subsistence foods.	A lessee proposing a permanent development shall design and implement a monitoring study of contaminants in locally-used subsistence foods. The study shall examine subsistence foods for all contaminants that could be associated with the proposal. The study shall identify the level of contaminants in subsistence foods prior to the proposed development and monitor the level of these contaminants throughout the development's operation and abandonment phases. If ongoing monitoring detects a measurable and persistent increase in a contaminant in subsistence foods, the lessee shall design and implement a study to determine how much, if any, of the increase in the contaminant in subsistence foods originates from the lessee's activities. If the study determines that a portion of the increase in contamination in subsistence foods is caused by the lessee's activities, the AO may require changes in the lessee's processes to reduce or eliminate the contaminant's emissions.
ROP A-12	To minimize negative health impacts associated with oil spills.	If an oil spill with potential impacts to public health occurs, BLM will consider: a. Immediate health impacts and responses for affected communities and individuals. b. Long-term contamination monitoring of subsistence food sources. c. Long-term monitoring of potential human health impacts. d. Perceptions of contamination and subsequent changes in consumption patterns. e. Health promotion activities and communication strategies to maintain traditional food consumption.
ROP B-1	Maintain populations of, and adequate habitat for, fish and invertebrates.	Withdrawal of unfrozen water from rivers and streams during winter is prohibited. The removal of ice aggregate from grounded areas ≤4-feet deep may be authorized from rivers on a site-specific basis.

LS or ROP	Description of Objective	Requirement/Standard
ROP B-2	Maintain natural hydrologic regimes in soils surrounding lakes and ponds, and maintain populations of, and adequate habitat for, fish, invertebrates, and waterfowl.	Withdrawal of unfrozen water from lakes and the removal of ice aggregate from grounded areas ≤4-feet deep may be authorized on a site-specific basis. Current water use requirements are: a. Lakes with sensitive fish (i.e., any fish except ninespine stickleback or Alaska blackfish): unfrozen water available for withdrawal is limited to 15% of calculated volume deeper than 7 feet; only ice aggregate may be removed from lakes that are ≤7-feet deep. b. Lakes with only non-sensitive fish (i.e., ninespine stickleback or Alaska blackfish): unfrozen water available for withdrawal is limited to 30% of calculated volume deeper than 5 feet; only ice aggregate may be removed from lakes that are ≤5-feet deep. c. Lakes with no fish present, regardless of depth: water available for use is limited to 35% of total lake volume. d. In lakes where unfrozen water and ice aggregate are both removed, the total use shall not exceed the respective 15%, 30%, or 35% volume calculations. e. Additional modeling or monitoring may be required to assess water level and water quality conditions before, during, and after water use from any fish-bearing lake or lake of special concern. f. Any water intake structures shall be designed, operated, and maintained to prevent fish entrapment, entrainment, or injury. Note: All water withdrawal equipment must be equipped and must use fish screening devices approved by the ADF&G. g. Compaction of snow cover or snow removal from fish-bearing waterbodies shall be prohibited except at approved ice road crossings, water pumping stations on lakes, or areas of grounded ice.
ROP C-1	Protect grizzly bear, polar bear, and marine mammal denning and/or birthing locations.	a. Grizzly bear dens: Cross-country use of vehicles, equipment, and oil and gas activity is prohibited within 0.5 mile of occupied grizzly bear dens, unless protective measures are approved by BLM. b. Polar bear dens: Cross-country use of vehicles, equipment, and oil and gas activity is prohibited within 1 mile of known or observed polar bear dens, unless alternative protective measures are approved by BLM. c. To limit disturbance around known polar bear dens, implement the following: 1. Onshore activities in known or suspected polar bear denning habitat during the denning season (approximately November to April) must make efforts to locate occupied polar bear dens. All observed or suspected polar bear dens must be reported to USFWS prior to the initiation of activities. 2. Permittees must observe a 1-mile operational exclusion zone around all known polar bear dens during the denning season (or until the female and cubs leave the areas). Should previously unknown occupied dens be discovered, work must cease and USFWS must be contacted for guidance. Potential actions may range from cessation or modification of work to conducting additional monitoring. 3. Use the den habitat map developed by USGS. 4. Restrict activity timing to limit disturbance around dens. d. To limit disturbance of activities to seal lairs in the nearshore area (< 9.8-foot water depth): 1. Prior to the initiation of winter seismic surveys on marine ice, the permittee will conduct a sound source verification test approved by BLM and NMFS. 2. For all activities: i. Maintain airborne sound levels of equipment below 100 db re 20 µPa at 66 feet. ii. On-ice operations after May 1 will employ a full-time protected species observer on vehicles to ensure that all basking seals are avoided by vehicles by at least 500 feet and will ensure that all equipment with airborne noise levels are operating at distances from observed seals that allow for the attenuation of noise to levels below 100 decibels. iii. Sea ice trails must not be greater than 12-feet wide. iv. No unnecessary equipment or operations will be placed or used on sea ice.

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ROP C-2	Protect stream banks, minimize compaction of soils, and minimize the breakage, abrasion, compaction, or displacement of vegetation.	a. Ground operations shall be allowed only when frost and snow cover are sufficient to protect the tundra. Ground operations shall cease when the spring snowmelt begins (approximately May 15); the exact dates will be determined by the AO. b. Low-ground-pressure vehicles shall be used for on-the-ground activities off ice roads or pads. c. Bulldozing of tundra mat and vegetation, trails, or seismic lines is prohibited. d. To reduce the possibility of ruts, vehicles shall avoid using the same trails for multiple trips unless necessitated by serious safety or superseding environmental concern. e. The location of ice roads shall be designed and located to minimize compaction of soils and the breakage, abrasion, compaction, or displacement of vegetation. Offsets may be required to avoid using the same route or track in the subsequent year. f. Motorized ground-vehicle use within the Colville River Special Area associated with overland moves, seismic work, and any similar use of heavy equipment shall be minimized within an area that extends 1 mile west or northwest of the bluffs of the Colville River.
ROP C-3	Maintain natural spring runoff patterns and fish passage, avoid flooding, prevent streambed sedimentation and scour, protect water quality, and protect stream banks.	Crossing of waterway courses shall be made using a low-angle approach. Crossings that are reinforced with additional snow or ice ("bridges") shall be removed, breached, or slotted before spring breakup. Ramps and bridges shall be substantially free of soil and debris.
ROP C-4	Avoid additional freeze-down of deep-water pools harboring over-wintering fish and invertebrates used by fish.	Travel up and down streambeds is prohibited unless it can be demonstrated that there will be no additional impacts to over-wintering fish or invertebrates. Rivers, streams, and lakes shall be crossed at areas of grounded ice whenever possible.
ROP C-5	Minimize the effects of high-intensity acoustic energy from seismic surveys on fish.	a. When conducting vibroseis-based surveys above potential fish overwintering areas (water 6 feet deep or greater, ice plus liquid depth), operators shall follow recommendations by Morris and Winters (2005): only a single set of vibroseis shots should be conducted if possible; if multiple shot locations are required, these should be conducted with minimal delay; multiple days of vibroseis activity above the same overwintering area should be avoided if possible. b. When conducting air gun-based surveys in freshwater, operators shall follow standard marine mitigation measures that are applicable to fish (e.g., Minerals Management Service 2006): operators will use the lowest sound levels feasible to accomplish their data-collection needs; ramp-up techniques will be used. c. When conducting explosive-based surveys, operators shall follow setback distances from fish-bearing waterbodies based on requirements outlined by ADF&G (1991).
ROP D-1	Minimize surface impacts from exploratory drilling.	Construction of permanent or gravel oil and gas facilities shall be prohibited for exploratory drilling. Use of a previously constructed road or pad may be permitted if it is environmentally preferred.
ROP E-1	Protect subsistence use and access to subsistence hunting and fishing areas and minimize the impact of oil and gas activities on air, land, water, fish, and wildlife resources.	All roads must be designed, constructed, maintained, and operated to create minimal environmental impacts and to protect subsistence use and access to subsistence use areas.
ROP E-2	Protect fish-bearing waterbodies, water quality, and aquatic habitats.	Permanent oil and gas facilities are prohibited within 500 feet of fish-bearing waterbodies (as measured from the ordinary high water mark). Essential pipeline and road crossings will be permitted on a case-by-case basis. Note: Also refer to Stipulations K-1 and K-2.

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ROP E-3	Maintain free passage of marine and anadromous fish and protect subsistence use and access to subsistence hunting and fishing.	Linear infrastructure that connects to the shoreline (e.g., causeways, docks) is prohibited in river mouths or deltas. Artificial gravel islands and permanent bottom-founded structures are prohibited in river mouths or active stream channels on river deltas.
ROP E-4	Minimize the potential for pipeline leaks, the resulting environmental damage, and industrial accidents.	All pipelines shall be designed, constructed, and operated under an AO-approved Quality Assurance/Quality Control plan that is specific to the product transported and shall be constructed to accommodate the best available technology for detecting and preventing corrosion or mechanical defects during routine structural integrity inspections.
ROP E-5	Minimize impacts of the development footprint.	Facilities shall be designed and located to minimize the development footprint. Issues and methods to be considered include: a. Use of maximum extended-reach drilling for production drilling. b. Sharing facilities with existing development. c. Collocation of all oil and gas facilities, except airstrips, docks, and seawater-treatment plants, with drill pads. d. Integration of airstrips with roads. e. Use of gravel-reduction technologies (e.g., insulated or pile-supported pads). f. Coordination of facilities with infrastructure in support of offshore development. Note: Where aircraft traffic is a concern, consideration shall be given to balancing gravel pad size and available supply storage capacity with potential reductions in the use of aircraft to support oil and gas operations.
ROP E-6	Reduce the potential for ice-jam flooding, impacts to wetlands and floodplains, erosion, alteration of natural drainage patterns, and restriction of fish passage.	Stream and marsh crossings shall be designed and constructed to ensure free passage of fish, reduce erosion, maintain natural drainage, and minimize adverse effects to natural stream flow. Note: Bridges, rather than culverts, are the preferred method for crossing rivers. When necessary, culverts can be constructed on smaller streams, if they are large enough to avoid restricting fish passage or adversely affecting natural stream flow.
ROP E-7	Minimize disruption of caribou movement and subsistence use.	Pipelines and roads shall be designed to allow the free movement of caribou and the safe, unimpeded passage of the public while participating in subsistence activities. The accepted design practices are: a. Elevating aboveground pipelines a minimum of 7 feet as measured from the ground to the bottom of the pipeline at VSMs. b. In areas where facilities or terrain may funnel caribou movement, ramps over pipelines, buried pipelines, or pipelines buried under roads may be required by the AO. c. A minimum distance of 500 feet between pipelines and roads shall be maintained. Separating roads from pipelines may not be feasible within narrow land corridors between lakes and where pipelines and roads converge on a drill pad. Where it is not feasible to separate pipelines and roads, alternative pipeline routes, designs and possible burial within the road will be considered by the AO.
ROP E-8	Minimize the impact of mineral materials mining activities on air, land, water, fish, and wildlife resources.	Gravel mine site design and reclamation will be in accordance with a plan approved by the AO. The plan shall consider: a. Locations outside the active flood plain. b. Design of gravel mine sites within active flood plains to serve as water reservoirs for future use. c. Potential use of the site for enhancing fish and wildlife habitat. d. Potential storage and reuse of sod/overburden for the mine site or at other disturbed sites on the North Slope.
ROP E-9	Avoidance of human-caused increases in populations of predators of ground nesting birds.	a. Lessee shall use best available technology to prevent facilities from providing nesting, denning, or shelter sites for ravens, raptors, and foxes. The lessee shall provide the AO with an annual report on the use of facilities by ravens, raptors, and foxes as nesting, denning, and shelter sites. b. Feeding wildlife is prohibited.

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ROP E-10	Minimize bird collisions with infrastructure, especially during migration and inclement weather.	Flagging of structures (e.g., elevated utility lines, guy wires) shall be required to minimize bird collision. All facility external lighting shall be designed to direct artificial exterior lighting inward and downward or be fitted with shields to reduce reflectivity in clouds and fog conditions.
ROP E-11	Minimize impacts on bird species, particularly those listed under the Endangered Species Act and BLM special status species, resulting from direct or indirect interaction with infrastructure.	Bird species with special status are protected under ROP E-10 and ROP E-21, and by the protections outlined below. Before the approval of infrastructure construction, the following studies shall be conducted and recommended design elements shall be incorporated. *Special Conditions in Spectacled and/or Steller's Eiders Habitats:* a. BLM requires submittal of a minimum of 3 years of site-relevant survey data before authorization of construction, if such construction is within spectacled and Steller's eider habitats. BLM will evaluate adequacy of survey data and ecological mapping to determine if ground-based nest surveys are required. Information gained from these surveys shall be used to make infrastructure siting decisions. b. If spectacled and/or Steller's eiders are determined to be present within the proposed development area, the applicant shall work with USFWS and BLM early in the design process to site roads and facilities in order to minimize impacts to nesting and brood-rearing eiders and their habitats. *Special Conditions in Yellow-billed Loon Habitats:* The permittee shall determine and submit to BLM information on yellow-billed loon habitat presence within a project area using the most current data and analysis results from research conducted within the NPR-A. a. If yellow-billed loon habitat is determined to be present within the project area, BLM will require submittal of a minimum of 3 years of site-relevant survey data of lakes greater than 25 acres within 1 mile of the proposed infrastructure. b. The design and location of infrastructure must minimize disturbance. The default standard mitigation shall be a minimum 0.5-mile buffer around all recorded nest sites and shall be up to 1 mile, where feasible. Lakes with yellow-billed loon occupancy shall also include a minimum 1,625-foot buffer around the shoreline. Development would generally be prohibited within buffers; BLM would consider waivers or modifications to this requirement if no other feasible option exists.
ROP E-12	Use ecological mapping as a tool to assess wildlife habitat before development of permanent facilities to conserve important habitat types during development.	An ecological land classification map of the development area shall be developed before approval of facility construction. The map will integrate geomorphology, surface form, and vegetation at a scale, level of resolution, and level of positional accuracy adequate for detailed analysis of development alternatives.
ROP E-13	Protect cultural and paleontological resources.	Lessees shall conduct a cultural and paleontological resources survey prior to any ground-disturbing activity. Upon finding any potential cultural or paleontological resource, the lessee shall notify the AO and suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the AO.
ROP E-14	Ensure the passage of fish at stream crossings.	To ensure that crossings provide for fish passage, all proposed crossing designs shall adhere to the ROPs outlined in "Stream Crossing Design Procedure for Fish Streams on the North Slope Coastal Plain" by McDonald et al. (1994), "Fundamentals of Culvert Design for Passage of Weak-Swimming Fish" by Behlke et al. (1991), and other generally accepted best management procedures prescribed by the AO.
ROP E-15	Prevent or minimize the loss of nesting habitat for cliff nesting raptors.	a. Removal of more than 100 cubic yards of bedrock outcrops, sand, and/or gravel from cliffs shall be prohibited. b. Any extraction of sand and/or gravel from an active river or stream channel shall be prohibited unless preceded by a hydrological study that indicates no potential impact to the integrity of the river bluffs.

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ROP E-17	Manage permitted activities to meet Visual Resource Management class objectives described below.	Class I: Natural ecological changes and very limited management activity are allowed. The level of change to the characteristic landscape should be very low and must not attract attention. Class II: The level of change to the characteristic landscape should be low. Management activities may be seen but should not dominate the view of the casual observer. Any changes should repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape. Class III: The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape. Class IV: The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize impacts through location and design by repeating form, line, color, and texture. Requirement/Standard: At the time of application for construction of permanent facilities, the lessee/permittee shall submit a plan to minimize visual impacts consistent with the Visual Resource Management class for the lands on which facilities would be located. VRM classes: • Class II: Wainwright Inlet and those areas where new infrastructure is not allowed. • Class III: Except for those areas designated as VRM Class II, rivers and lands within 3 miles of segments of rivers identified as eligible for Wild and Scenic River designation in the 2013 IAP or the 2008 Northeast NPR-A Supplemental IAP. • Class IV: The rest of the area.
ROP E-18	Avoid and reduce temporary impacts to productivity from disturbance near Steller's and/or spectacled eider nests.	Ground-level activity (by vehicle or on foot) within 656 feet (200 meters) of occupied Steller's and/or spectacled eider nests from June 1 through August 15, will be restricted to existing thoroughfares, such as pads and roads. Construction of permanent facilities, placement of fill, alteration of habitat, and introduction of high noise levels within 656 feet of occupied Steller's and/or spectacled eider nests will be prohibited. In cases in which oil spill response training is proposed to be conducted within 656 feet of shore in riverine, marine, or inter-tidal areas, BLM will work with USFWS to schedule the training at a time that is not a sensitive nesting/brood-rearing period or require that nest surveys be conducted in the training area prior to a decision on approving the training.
ROP E-19	Provide information to be used in monitoring and assessing wildlife movements during and after construction.	GIS-compatible shape-files of all new infrastructure construction shall be provided to the AO. Infrastructure includes all gravel roads and pads, facilities built on pads, pipelines and independently constructed powerlines.

LS or ROP	Description of Objective	Requirement/Standard
ROP E-20	Minimize the impacts on bird species from direct interaction with aboveground utility infrastructure.	a. To reduce the possibility of birds colliding with aboveground utility lines, such lines would either be buried in access roads or suspended on VSMs. Exceptions are limited to the following situations: 1. Overhead utility lines may be allowed when located entirely within the boundaries of a facility pad. 2. Overhead utility lines may be allowed when engineering constraints at the specific and limited location make it infeasible to bury or connect the lines to a VSM. 3. Overhead utility lines may be allowed in situations when human safety would be compromised by other methods. b. To reduce the likelihood of birds colliding with them, communication towers would be located on existing pads and as close as possible to buildings or other structures and on the east or west side of buildings or other structures, if possible. Support wires would be avoided to the extent practicable. If support wires are necessary, they would be clearly marked along their entire length to improve visibility to low-flying birds. c. Design of other utility infrastructure, such as wind turbines, would be evaluated under a specific development proposal. d. The permittee shall comply with current industry-accepted practices for raptor protection on power lines, such as the most recent Avian Power Line Interaction Committee suggested practices.
ROP F-1	Minimize the effects of low-flying aircraft on wildlife, subsistence activities, and local communities.	The lessee shall ensure that aircraft used for permitted activities maintain altitudes according to the following guidelines (Note: This ROP is not intended to restrict flights necessary to survey wildlife. Flights necessary to gain this information will be restricted to the minimum.): a. Aircraft shall maintain an altitude of at least 1,500 feet aboveground level when within 0.5 mile of cliffs identified as raptor nesting sites from April 15 through August 15. b. Aircraft shall maintain an altitude of at least 1,000 feet above ground level over caribou winter ranges from December 1 through May 1. c. Land user shall submit an aircraft use plan as part of an oil and gas development proposal. The plan shall address strategies to minimize impacts to subsistence hunting and associated activities. d. Proposed aircraft use plans should be reviewed by appropriate federal, State, and borough agencies. Adjustments, including suspension of all flights, may be required by the AO if resulting disturbance is determined to be unacceptable. e. The number of takeoffs and landings to support oil and gas operations with necessary materials and supplies should be limited to the maximum extent possible. f. Use of aircraft, especially rotary wing aircraft, near known subsistence camps and cabins or during sensitive subsistence hunting periods (spring goose hunting and fall caribou and moose hunting) should be kept to a minimum. g. Aircraft used for permitted activities shall maintain an altitude of at least 2,000 feet above ground level over the Teshekpuk Lake Caribou Habitat Area from May 20 through August 20. Aircraft use by oil and gas lessees in the Goose Molting Area should be minimized from May 20 through August 20. h. Aircraft used for permitted activities shall maintain an altitude of at least 2,000 feet above ground level over the Utukok River Uplands Special Area from May 20 through August 20. i. Hazing of wildlife by aircraft is prohibited. Pursuit of running wildlife is hazing. j. Fixed-wing aircraft used as part of a BLM-authorized activity along the coast shall maintain minimum altitude of 2,000 feet when within a 0.5 mile of walrus haulouts. Helicopters used as part of a BLM-authorized activity along the coast shall maintain minimum altitude of 3,000 feet and a 1.0-mile buffer from walrus haulouts. k. Aircraft used as part of a BLM-authorized activity along the coast and shore fast ice zone shall maintain minimum altitude of 3,000 feet when within 1.0 mile of all listed marine mammal species.

LS or ROP	Description of Objective	Requirement/Standard
LS G-1	Ensure long-term reclamation of land to its previous condition and use.	Prior to final abandonment, land used for oil and gas infrastructure shall be reclaimed to ensure eventual restoration of ecosystem function. The leaseholder shall develop and implement an abandonment and reclamation plan approved by BLM. The plan shall describe short-term stability, visual, hydrological, and productivity objectives and steps to be taken to ensure eventual ecosystem restoration to the land's previous hydrological, vegetative, and habitat condition.
ROP H-1	Provide opportunities for participation in planning and decision making to prevent unreasonable conflicts between subsistence uses and other activities.	Lessee/permittee shall consult directly with affected communities using the following guidelines: a. Before submitting an application to BLM, the applicant shall consult with directly affected subsistence communities, NSB, and the NPR-A Subsistence Advisory Panel to discuss the siting, timing, and methods of their proposed operations. The applicant shall make every reasonable effort, including such mechanisms as conflict avoidance agreements and mitigating measures, to ensure that proposed activities will not result in unreasonable interference with subsistence activities. b. The applicant shall submit documentation of consultation efforts as part of its operations plan. The applicant must allow time for BLM to conduct formal government-to-government consultation with Native Tribal governments if the proposed action requires it. c. A plan shall be developed that shows how the activity will be scheduled and located to prevent unreasonable conflicts with subsistence activities. The plan should address the following items: 1. A detailed description of the activities to take place. 2. A description of how the lessee/permittee will minimize and/or address potential impacts identified by the AO. 3. A detailed description of the monitoring effort to take place, including process, procedures, personnel involved and points of contact both at the work site and in the local community. 4. Communication elements to provide information on how the applicant will keep potentially affected individuals and communities up-to-date on the progress of the activities and locations of possible, short-term conflicts with subsistence activities. 5. Procedures necessary to facilitate access by subsistence users to the permittees' area of activity or facilities. d. During development, monitoring plans must be established for new permanent facilities to assess an appropriate range of potential effects on resources and subsistence. e. Permittees that propose barging facilities, equipment, supplies, or other materials to the NPR-A in support of activities in the NPR-A shall notify, confer, and coordinate with the Alaska Eskimo Whaling Commission, the appropriate local community whaling captains' associations, and NSB to minimize impacts from barging on subsistence whaling activities. f. Barge operators requiring a BLM permit are required to demonstrate that barging activities will not have unmitigable adverse impacts on the availability of marine mammals to subsistence hunters. g. All vessels over 50-feet long engaged in operations requiring a BLM permit must have an Automatic Identification System transponder system on the vessel.

LS or ROP	Description of Objective	Requirement/Standard
ROP H-2	Prevent unreasonable conflicts between subsistence activities and geophysical (seismic) exploration.	Before activity to conduct seismic exploration begins, applicants shall notify the local search and rescue organizations of proposed survey locations. A potentially affected cabin/campsite is defined as any camp or campsite used for subsistence purposes and located within the boundary of the exploration area and/or within 1 mile of operation travel routes. a. The permittee will notify all potentially affected subsistence-use cabin and campsite users. b. The official recognized list of subsistence-use cabin and campsite users is the NSB's most current inventory. c. A copy of the notification, a map of the proposed exploration area, and the list of potentially affected users shall also be provided to the office of the appropriate Native Tribal government. d. The AO will prohibit seismic work within 1 mile of any known subsistence-use cabin or campsite unless an alternate agreement between the cabin/campsite owner/user is reached through the consultation process and presented to the AO. e. The permittee shall notify the appropriate local search and rescue organization of their current operational location within the NPR-A on a weekly basis.
ROP H-3	Minimize impacts to sport hunting and trapping species and to subsistence harvest of those animals.	Hunting and trapping by lessee's/permittee's employees, agents, and contractors are prohibited when persons are on "work status." Work status is defined as the period during which an individual is under the control and supervision of an employer. Work status is terminated when the individual's shift ends and he/she returns to a public airport or community (e.g., Fairbanks, Barrow, Nuiqsut, or Deadhorse). Use of lessee/permittee facilities, equipment, or transport for personal access or aid in hunting and trapping is prohibited.
ROP I-1	Minimize cultural and resource conflicts.	All personnel shall be provided information concerning applicable stipulations, ROPs, standards, and specific types of environmental, social, traditional, and cultural concerns that relate to the region. All personnel involved in permitted activities shall attend an orientation program at least once a year and the orientation program should: a. Provide sufficient detail to notify personnel of applicable stipulations and ROPs, as well as specific types of environmental, social, and traditional and cultural concerns that relate to the region. b. Address the importance of not disturbing archaeological and biological resources and habitats, and provide guidance on how to avoid disturbance. c. Include guidance on the preparation, production, and distribution of information cards on endangered and/or threatened species. d. Be designed to increase sensitivity and understanding of local community values, customs, and lifestyles. e. Include information concerning avoidance of conflicts with subsistence, commercial fishing activities, and pertinent mitigation. f. Include information for aircraft personnel concerning subsistence activities and areas/seasons that are particularly sensitive to disturbance by low-flying aircraft. g. Provide that individual training is transferable from one facility to another except for elements of the training specific to a particular site. h. Include on-site records of all personnel who attend the program for so long as the site is active. i. Include a module discussing bear interaction plans to minimize conflicts between bears and humans. j. Provide a copy of 43 CFR 3163 regarding Non-Compliance Assessment and Penalties to on-site personnel. k. Include training designed to ensure strict compliance with local and corporate drug and alcohol policies. l. Include training developed to train employees on how to prevent transmission of communicable diseases, including sexually transmitted diseases, to the local communities.

LS or ROP	Description of Objective	Requirement/Standard
ROP J	Endangered Species Act – Section 7 consultation process	The lease areas may now or hereafter contain plants, animals, or their habitats determined to be threatened, endangered, or to have some other special status. BLM may recommend modifications to exploration and development proposals to further its conservation and management objective to avoid BLM-approved activities that will contribute to the need to list such a species or their habitat. BLM may require modifications to or disapprove a proposed activity that is likely to adversely affect a proposed or listed endangered species, threatened species, or critical habitat. BLM will not approve any activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the Endangered Species Act as amended (16 USC 531 et seq.), including completion of any required procedure for conference or consultation.
LS K-1	*River Setbacks* Minimize the disruption of natural flow patterns and changes to water quality; the disruption of natural functions resulting from the loss or change to vegetative and physical characteristics of floodplain and riparian areas; the loss of spawning, rearing or over-wintering habitat for fish; the loss of cultural and paleontological resources; the loss of raptor habitat; impacts to subsistence cabin and campsites; the disruption of subsistence activities; and impacts to scenic and other resource values. *Colville River Special Area Management Plan—Protection 1* Minimize the loss of arctic peregrine falcon nesting habitat in the Colville River Special Area.	*River Setbacks* Permanent oil and gas facilities, including gravel pads, roads, and pipelines, are prohibited in the streambed and adjacent to the rivers listed below. On a case-by case basis, essential pipeline and road crossings will be permitted through setback areas. a. Colville River: A 2-mile setback from the boundary of NPR-A where the river determines the boundary along the Colville where BLM-manages both sides of the river up through T5S, R30W, U.M. Above that point to the juncture of Thunder and Storm creeks, the setback is 0.5 mile. b. Fish (Uvlutuuq) Creek: A 3-mile setback from the creek downstream from the eastern edge of section 31, T11N, R1E., U.M. and a 0.5-mile setback farther upstream. c. Judy (Kayyaak) Creek: A 0.5-mile setback. d. Ublutuoch (Tiŋmiaqsiugvik) River: a 0.5-mile setback. *Colville River Special Area Management Plan—Protection 1* To minimize the direct loss of arctic peregrine falcon nesting habitat and to protect nest sites in the Colville River Special Area, the following protective measures apply: Permanent oil and gas facilities, including gravel pads, roads, and pipelines, are prohibited in the streambed and adjacent to the rivers listed below. On a case-by-case basis, essential pipeline and road crossings will be permitted through setback areas.
LS K-2	*Deepwater Lakes* Minimize the disruption of natural flow patterns and changes to water quality; the disruption of natural functions resulting from the loss or change to vegetative and physical characteristics of deepwater lakes; the loss of spawning, rearing or over wintering habitat for fish; the loss of cultural and paleontological resources; impacts to subsistence cabin and campsites; and the disruption of subsistence activities.	Generally, permanent oil and gas facilities are prohibited on the lake or lakebed and within 0.25 mile of the ordinary high water mark of any deep lake as determined to be in lake zone III (i.e., depth greater than 13 feet [4 meters]; Mellor 1985). On a case-by-case basis, essential pipeline(s), road crossings, and other permanent facilities may be considered through the permitting process in these areas where the lessee can demonstrate on a site-specific basis that impacts will be minimal.

LS or ROP	Description of Objective	Requirement/Standard
LS K-3	*Waterbodies and Riparian Areas* Protect fish-bearing rivers, streams, and lakes from blowouts and minimize alteration of riparian habitat.	Exploratory drilling is prohibited in rivers and streams, as determined by the active floodplain, and fish-bearing lakes.
LS K-4	*Kogru River, Dease Inlet, Admiralty Bay, Elson Lagoon, Peard Bay, Wainwright Inlet/Kuk River, and Kasegaluk Lagoon* Protect fish and wildlife habitat (including, but not limited to, that for waterfowl and shorebirds, caribou insect-relief, and marine mammals), preserve air and water quality, and minimize impacts to subsistence activities and historic travel routes on the major coastal waterbodies.	The Kogru River, Dease Inlet, Admiralty Bay, Elson Lagoon, Peard Bay, Wainwright Inlet/Kuk River, and Kasegaluk Lagoon, and their associated Islands are unavailable for leasing. With the exception of linear features such as pipelines, no permanent oil and gas facilities are permitted on or under the water within 0.75 mile seaward of the shoreline of the major coastal waterbodies or the natural coastal islands. Elsewhere, permanent facilities within the major coastal waterbodies will only be permitted on or under the water if they can meet all the following criteria: a. Design and construction of facilities shall minimize impacts to subsistence uses, travel corridors, and seasonally concentrated fish and wildlife resources. b. Daily operational activities, including use of support vehicles, watercraft, and aircraft traffic, shall be conducted to minimize impacts to subsistence uses, travel corridors, and seasonally concentrated fish and wildlife resources. c. The location of oil and gas facilities shall be sited and constructed so as to not pose a hazard to navigation by the public using traditional high-use subsistence-related travel routes into and through the major coastal waterbodies as identified by the NSB. d. Demonstrated year-round oil spill response capability, including the capability of adequate response during periods of broken ice or open water, or the availability of alternative methods to prevent well blowouts during periods when adequate response capability cannot be demonstrated e. Reasonable efforts will be made to avoid or minimize impacts related to oil spill response activities, including vessel, aircraft, and pedestrian traffic that add to impacts on area resources and subsistence uses. f. Before conducting open water activities, the permittee shall consult with the Alaska Eskimo Whaling Commission and the NSB to minimize impacts to the fall and spring subsistence whaling activities of North Slope communities.
LS K-5	*Coastal Area Setbacks* Protect coastal waters and their value as fish and wildlife habitat (including, but not limited to, that for waterfowl, shorebirds, and marine mammals), minimize hindrance or alteration of caribou movement within caribou coastal insect-relief areas; protect the summer and winter shoreline habitat for polar bears, and the summer shoreline habitat for walrus and seals; prevent loss of important bird habitat and alteration or disturbance of shoreline marshes; and prevent impacts to subsistence resources and activities.	a. Drill pads and central processing facilities would not be allowed in coastal waters or on islands between the northern boundary of the NPR-A and the mainland, or in inland areas within 1 mile of the coast. Other facilities necessary for oil and gas production within NPR-A that necessarily must be within this area (e.g., barge landing, seawater treatment plant, or spill response staging and storage areas) would not be precluded. Lessees/permittees shall consider the practicality of locating facilities that necessarily must be within this area at previously occupied sites such as various Husky/USGS drill sites and Distant Early Warning-Line sites. Before conducting open water activities, the lessee shall consult with the Alaska Eskimo Whaling Commission, NSB, and local whaling captains associations to minimize impacts to subsistence whaling activities. b. Marine vessels used as part of a BLM-authorized activity shall maintain a 1-mile buffer from the shore when transiting past an aggregation of seals, Steller's sea lions, or walruses using a terrestrial haulout. Marine vessels shall not conduct ballast transfers or discharge any matter into the marine environment within 3 miles of the coast, except when necessary for the safe operation of the vessel.

LS or ROP	Description of Objective	Requirement/Standard
LS K-6	*Goose Molting Area* Minimize disturbance to molting geese and loss of goose-molting habitat in and around lakes in the Goose Molting Area.	*General*: Within the Goose Molting Area, no permanent oil and gas facilities, except for pipelines, will be allowed within 1 mile of the shoreline of goose molting lakes. No waiver, exception, or modification will be considered. *Development*: In the Goose Molting Area, the following standards will be followed for permitted activities: a. From June 15 through August 20, all off-pad activities and major construction activities using heavy equipment (but not drilling from existing production pads) shall be suspended unless approved by the AO. b. Water extraction from any lakes used by molting geese shall not alter hydrological conditions that could adversely affect identified goose-feeding habitat along lakeshore margins. c. Oil and gas activities will avoid altering critical goose-feeding habitat types along lakeshore margins (e.g., grass, sedge, moss) and salt-marsh habitats. d. Permanent oil and gas facilities (including gravel roads, pads, and airstrips, but excluding pipelines) and material sites will be sited outside the identified buffers and restricted surface occupancy areas. e. Between June 15 and August 20, oil and gas facilities shall incorporate features (e.g., temporary fences, siting/orientation) that screen or shield human activity from view of any Goose Molting Area lake, as identified by the AO. f. Strategies to minimize ground traffic shall be implemented from June 15 through August 20. These strategies may include limiting trips, use of convoys, different vehicle types, etc. The permittee shall submit a vehicle use plan that considers these and any other mitigation. The vehicle use plan shall also include a vehicle-use monitoring plan. g. Aircraft use shall be restricted from June 15 through August 20 unless doing so endangers human life or violates safe flying practices. Restrictions may include: (1) limiting flights to two roundtrips per week, and (2) limiting flights to corridors established by BLM. The permittee shall submit an aircraft use plan that considers these and other mitigation. The aircraft use plan shall also include an aircraft monitoring plan. h. Any permit for development will include a requirement for the permittee to conduct monitoring studies necessary to adequately determine consequences of development and any need for change to mitigations.
LS K-8	*Brant Survey Area* Minimize the loss or alteration of habitat for, or disturbance of, nesting and brood rearing brant in the Brant Survey Area. None of the area is available for oil and gas leasing or exploratory drilling.	a. Aerial surveys for brant nesting colonies and brood-rearing areas shall be conducted for a minimum of 2 years before authorization of construction of permanent facilities. The survey area shall include the proposed development site and the surrounding 0.5 mile area. b. Development may be prohibited, or activities curtailed within 0.5 mile of all identified brant nesting colonies and brood-rearing areas identified during the 2-year survey.

LS or ROP	Description of Objective	Requirement/Standard
LS K-9	*Teshekpuk Lake Caribou Habitat Area* Minimize disturbance and hindrance of caribou, or alteration of caribou movements through portions the Teshekpuk Lake Caribou Habitat Area that are essential for all season use, including calving and rearing, insect-relief, and migration.	In the Teshekpuk Lake Caribou Habitat Area, the following standards apply to permitted activities: a. Before authorization of construction , the permittee shall design and implement and report a study of caribou movement unless an acceptable study specific to the Teshekpuk Caribou Herd has been completed within the last 10 years. The study shall include a minimum of four years of current data on the Teshekpuk Caribou Herd movements. The study should provide information necessary to determine facility (including pipeline) design and location. b. Within the Teshekpuk Lake Caribou Habitat Area, permittee shall orient linear corridors when laying out developments to address migration and corralling effects and to avoid loops of road and/or pipeline that connect facilities. c. Ramps over pipelines, buried pipelines, or pipelines buried under the road may be required in the Teshekpuk Lake Caribou Habitat Area. d. Major construction activities using heavy equipment (but not drilling from existing production pads) shall be suspended within Teshekpuk Lake Caribou Habitat Area from May 20 through August 20, unless approved by the AO. e. The following ground and air traffic restrictions shall apply in the areas and time periods indicated: 1. From May 20 through August 20, traffic speed shall not exceed 15 miles per hour when caribou are within 0.5 mile of the road. Additional strategies may include limiting trips, using convoys, using different vehicle types, etc. The permittee shall submit a vehicle use plan that considers these and any other mitigation. The vehicle use plan shall also include a vehicle-use monitoring plan. 2. The permittee shall observe caribou movement from May 20 through August 20, or earlier if caribou are present prior to May 20. Based on these observations, traffic will be stopped: i. Temporarily to allow a crossing by 10 or more caribou. Sections of road will be evacuated whenever an attempted crossing by a large number of caribou appears to be imminent. ii. By direction of the AO throughout a defined area for up to four weeks to prevent calving caribou displacement. 3. Major equipment, materials, and supplies to be used at work sites in the Teshekpuk Lake Caribou Habitat Area shall be stockpiled outside the period of May 20 through August 20.
LS K-10	*Teshekpuk Lake Caribou Movement Corridor* Minimize disturbance and hindrance of caribou, or alteration of caribou movements (that are essential for all-season use, including calving and rearing, insect-relief, and migration) in the area extending from the eastern shore of Teshekpuk Lake eastward to the Kogru River.	Within the Teshekpuk Lake Caribou Movement Corridor, no permanent oil and gas facilities, except for pipelines or other infrastructure associated with offshore oil and gas exploration and production, will be allowed.

LS or ROP	Description of Objective	Requirement/Standard
LS K-11	*Southern Caribou Calving Area* Minimize disturbance and hindrance of caribou, or alteration of caribou movements (that are essential for all season use, including calving, post-calving, and insect-relief) in the area south/southeast of Teshekpuk Lake.	Within the Southern Caribou Calving Area, no permanent oil and gas facilities, except pipelines or other infrastructure associated with offshore oil and gas exploration and production, will be allowed.
LS K-12	*Colville River Special Area* Prevent or minimize loss of raptor foraging habitat (also see LS K-1).	If necessary to construct permanent facilities within the Colville River Special Area, all reasonable and practicable efforts shall be made to locate permanent facilities as far from raptor nests as feasible. Additionally, within 15 miles of raptor nest sites, significant alteration of high-quality foraging habitat shall be prohibited unless the lessee can demonstrate on a site-specific basis that impacts would be minimal. Of particular concern are ponds, lakes, wetlands, and riparian habitats. Note: On a case-by-case basis, essential pipeline and road crossings will be permitted where no other feasible or prudent options are available.
ROP L-1	Protect stream banks and water quality; minimize compaction and displacement of soils; minimize the breakage, abrasion, compaction, or displacement of vegetation; protect cultural and paleontological resources; maintain populations of, and adequate habitat for birds, fish, and caribou and other terrestrial mammals; and minimize impacts to subsistence activities.	On a case-by-case basis, BLM may permit low-ground-pressure vehicles to travel off of gravel pads and roads during times other than those identified in ROP C-2a. Permission for such use would only be granted after an applicant has: a. Submitted studies satisfactory to the AO of the impacts on soils and vegetation of the specific low-ground-pressure vehicles to be used. b. Submitted surveys satisfactory to the AO of subsistence uses of the area as well as of the soils, vegetation, hydrology, wildlife and fish (and their habitats), paleontological and archaeological resources, and other resources as required by the AO. c. Designed and/or modified the use proposal to minimize impacts to the AO's satisfaction. Design steps to achieve the objectives may include, timing restrictions, shifting of work to winter, rerouting, and not proceeding when certain wildlife are present or subsistence activities are occurring. At the discretion of the AO, the plan for summer tundra vehicle access may be included as part of the spill prevention and response contingency plan.
ROP M-1	Minimize disturbance and hindrance of wildlife, or alteration of wildlife movements through the NPR-A.	Chasing wildlife with ground vehicles is prohibited. Particular attention will be given to avoid disturbing caribou.
ROP M-2	Prevent the introduction, or spread, of non-native, invasive plant species in the NPR-A.	Certify that all equipment and vehicles (intended for use either off or on roads) are weed-free prior to transporting them into the NPR-A. Monitor annually along roads for non-native invasive species and initiate effective weed control measures upon evidence of their introduction. Prior to operations in the NPR-A, submit a plan for the BLM's approval detailing the methods for cleaning equipment and vehicles, monitoring for weeds, and weed control.
ROP M-3	Minimize loss of populations of, and habitat for, plant species designated as Sensitive by the BLM in Alaska.	If a development is proposed in an area that provides potential habitat for a BLM Sensitive Plant Species, the development proponent would conduct surveys at appropriate times of the summer season and in appropriate habitats for the Sensitive Plant Species that might occur there. The results of these surveys will be submitted to BLM with the application for development.

LS or ROP	Description of Objective	Requirement/Standard
ROP M-4	Minimize loss of individuals of, and habitat for, mammalian species designated as Sensitive by BLM in Alaska.	If a development is proposed in an area that provides potential habitat for the Alaska tiny shrew, the development proponent would conduct surveys at appropriate times of the year and in appropriate habitats in an effort to detect the presence of the shrew. The results of these surveys will be submitted to BLM with the application for development.

Source: BLM 2022

Note: < (less than); ≤ (less than or equal to); ADF&G (Alaska Department of Fish and Game); AOGCC (Alaska Oil and Gas Conservation Commission); AO (authorized officer); BLM (Bureau of Land Management); dB re 20 µPa (decibels referencing 20 microPascal); DEC (Alaska Department of Environmental Conservation); EPA (U.S. Environmental Protection Agency); IAP (Integrated Activity Plan); LS (lease stipulation); NAAQS (National Ambient Air Quality Standards); NEPA (National Environmental Policy Act); NMFS (National Marine Fisheries Service); NPR-A (National Petroleum Reserve in Alaska); NSB (North Slope Borough); ROP (required operating procedure); USFWS (U.S. Fish and Wildlife Service); USGS (U.S. Geological Survey); VSM (vertical support member).

2.0 DESIGN FEATURES TO AVOID AND MINIMIZE IMPACTS

The Project proponent has incorporated measures to avoid and minimize impacts into the Project design. These are listed in Table I.2.1; the measures are part of the Project and were used to evaluate the impacts described in the Willow MDP EIS, Chapter 3.0, *Affected Environment and Environmental Consequences*. Some of these measures are similar to existing NPR-A LSs and ROPs or other requirements and are included to show the Project proponent's commitment to adhering to them. The Project proponent may propose additional measures in subsequent permitting phases.

Table I.2.1. Design Features to Avoid and Minimize Impacts*

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
1	Use directional drilling to reduce the overall gravel footprint for drill site pads.	Gravel infrastructure	ROP E-5; AOGCC	All
2	Construct road surfaces to the minimum width required for Project operations to minimize the placement of gravel fill: 32-feet-wide Willow access and BT1 and BT2 roads 24-feet-wide water source access pads roads, airstrip lighting roads, BT3, BT4 (Alternatives B, C, and D), and BT5 infield roads. Roads designed with a smaller top (crown) surface avoid additional fill placement where wider roads are not required.	Gravel infrastructure	ROP E-5; ADNR DMLW	All
3	Use 20-foot well spacing (instead of 30-foot well spacing) to reduce the overall gravel footprint for drill site pads.	Gravel infrastructure	ROP E-5; AOGCC; ADNR DMLW	Wetlands and vegetation
4	Share use of existing equipment and facilities (e.g., camps, seawater treatment plant, warehouses, maintenance shops, emergency response equipment) to reduce the overall Project gravel- and ice-pad footprint.	Gravel infrastructure	ROP E-5; ADEC	Water resources; wetlands and vegetation
5	Use single-season ice roads to support winter construction of gravel roads, pads, and pipelines to avoid the need for additional gravel roads for construction. This includes accessing Tiŋmiaqsiuġvik mine sites via ice road instead of gravel.	Gravel infrastructure, mine site	ROP E-5; ADNR DMLW	Wetlands and vegetation
6	Use 2:1 side slopes (i.e., gravel road and pad embankment slopes) instead of 3:1 to reduce the Project's overall gravel footprint.	Gravel infrastructure	ROP E-5	Wetlands and vegetation
7	Locate drill site BT4 (and associated roads and pipelines under Alternatives B, C, and D) outside of the Teshekpuk Lake Caribou Habitat area which would reduce the overall gravel footprint and eliminate the need for a bridged crossing of the Kalikpik River.	Gravel infrastructure, pipelines	LS K-9; ADNR DMLW; ADEC; AOGCC	Wetlands and vegetation; terrestrial mammals
8	Avoid permanently flooded wetlands by locating Project infrastructure on higher, and relatively drier areas, when practicable. This practice applies to drill sites and other pads, road alignments, the new airstrip, and other project components.	Gravel infrastructure	None	Wetlands and vegetation; water resources
9	Suspend communications and power cables from horizontal support members to avoid additional fill associated with utility poles and to reduce the potential for bird strikes and perches for predators.	Utilities	ROP E-20	Wetlands and vegetation; birds

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
10	Use ice roads and pads, including multi-season ice pads, to support Project construction, including using ice pads to house construction camps; stage construction equipment; allow stockpiling of gravel and mine site overburden during construction activities; and support construction activities at bridge crossings, along the Project's pipeline alignment, at the HDD crossing of the Colville River, and at other locations as needed near the proposed infrastructure.	Construction activity	ROP E-5; ADEC; ADNR DMLW	All
11	Design pipelines to minimize redundant parallel pipelines to the extent practicable. (For example, infield pipelines from drill site BT2 would tie into drill site BT1 pipelines at BT1; and then drill site BT1 infield pipelines would connect with the WPF. Additionally, the Willow export pipeline would tie into the existing Alpine Sales oil pipeline at a tie-in pad near Alpine CD4N to connect the Project to the Trans-Alaskan Pipeline System.)	Pipelines	ROP E-7; AOGCC; ADEC	Wetlands and vegetation; birds; terrestrial mammals; spill risk
12	Colocate the WPF with drill site BT3 to eliminate the need for an additional gravel pad and associated gravel fill (Alternative D only).	Gravel infrastructure	ROP E-5; AOGCC	Wetlands and vegetation
13	Construct oil and gas facilities and other Project infrastructure more than 500 feet from fish-bearing waterbodies, to the maximum extent practicable. Only essential pipeline road crossings are proposed for the Project that would encroach on this minimum distance. (For example, the intersection between the BT1 and BT3 access roads was realigned and shifted west to locate the BT1 road outside of the 500-foot buffer of swale 2, an anadromous waterbody.) Construction camps would not be sited on frozen lakes or rivers. (Anticipated deviations are noted in the EIS.)	Gravel infrastructure, pipelines	ROP E-2; ADF&G; ADEC; ADNR DMLW	Water resources; fish
14	Consult with appropriate federal, state, and NSB agencies regarding the mine site design and reclamation plan. Design mine site to minimize impacts to wildlife, air quality, and water resources. Mine site operation and reclamation would include the storage and reuse of organic overburden (for the mine sites). Site the mine pits outside of the active floodplain to minimize impacts to water resources.	Gravel source	ROP E-8; ADF&G; ADEC; NSB; ADNR DMLW	Soils, permafrost, and gravel resources; visual resources; water resources; wetlands and vegetation; fish; birds; subsistence and sociocultural systems
15	Design, construct, maintain, and operate roads in ways to minimize environmental impacts and protect subsistence use areas and access. Gravel road alignments and pad layouts would consider topography, maintenance of natural drainage patterns, and the effects of spring breakup and other potential flood events. Road and pad layouts would also avoid ponds, lakes, and streams to the extent practicable.	Gravel infrastructure	ROP E-1; ADEC; ADNR DMLW	Soils, permafrost, and gravel resources; water resources; subsistence and sociocultural systems

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
16	Restrict summer tundra vehicle travel for Project personnel to emergency response or to permitted activities required by statute or regulation.	Personnel	ROP L-1; ADF&G; ADNR DMLW	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation; fish; birds; terrestrial mammals; marine mammals
17	Conduct overland (i.e., tundra) moves and similar off-road or cross-country activity use in accordance with ROP C-2 to minimize impacts to streambanks, soil substrate, and vegetation.	Off-road vehicle use	ROP C-2; ADF&G; ADNR DMLW	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation; fish; birds; terrestrial mammals; marine mammals
18	Use low-angle approaches for ice road waterway crossings to protect streambanks. Waterway crossings reinforced with additional snow or ice ("bridges") would be removed, breached, or slotted prior to spring breakup to maintain normal spring runoff patterns and fish passage. All constructed ice ramps and ice bridges would be substantially free of debris (e.g., sticks, brush).	Ice infrastructure	ROP C-3; ADF&G; ADEC; ADNR DMLW	Soils, permafrost, and gravel resources; water resources; fish; terrestrial mammals; marine mammals
19	Prohibit travel along streambeds unless it can be demonstrated that there would be no additional impacts from such travel to over-wintering fish or the invertebrates they rely on. Rivers, streams, and lakes would only be crossed with ice infrastructure at areas where waterbody or waterway ice has grounded, when practicable.	Ice infrastructure	ROP C-4; ADF&G; ADEC; ADNR DMLW	Water resources; fish
20	Inject produced water into the reservoir and do not discharge it to surface lands, surface waters, or marine waters.	Waste management	ROPs A-2 and A-7; ADF&G; ADEC	Water resources; wetlands and vegetation; fish; birds; terrestrial mammals; marine mammals; subsistence and sociocultural systems; public health
21	Use recent ecological mapping to assess wildlife habitat types to inform the design, placement, and development of permanent (i.e., gravel) infrastructure.	Gravel infrastructure	ROP E-12; ADF&G	Wetlands and vegetation; fish; birds; terrestrial mammals; marine mammals
22	Remove, slot, breach, or score ice road stream crossings prior to spring breakup to ensure adequate flow and drainage conditions at stream crossings.	Ice infrastructure	ROP C-3; ADF&G; ADNR DMLW	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation; fish; birds
23	Place gravel roads perpendicular to the general flow direction when crossing natural drainages to maintain the existing flow patterns and characteristics.	Gravel infrastructure	ROP E-6; ADNR DMLW; ADF&G	Water resources; wetlands and vegetation; fish; birds
24	Design and construct stream and swale crossings to ensure the free passage of fish, minimization of erosion, maintenance of natural drainage characteristics, and the minimization of impacts to natural stream flow. Bridges would be used to cross rivers and major streams.	Gravel infrastructure	ROP E-6; ADF&G; ADNR DMLW	Water resources; wetlands and vegetation; fish; birds

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
25	Collect 3 years of hydrologic and fish data at stream crossing and ensure fish passage at stream crossings.	Gravel infrastructure	ROP E-14; ADF&G; ADEC	Fish
26	Design fish-passage culverts in consultation with the Alaska Department of Fish and Game.	Gravel infrastructure	ADF&G; ADEC	Fish
27	Install cross-drainage culverts as needed to maintain natural surface drainage to mitigate the risk of sheet flow interruption and thermokarsting. The estimated spacing of culverts is approximately every 1,000 feet. (Exact placement would be adjusted based on a field survey of in-field local drainage patterns.)	Construction	ROP E-6; ADF&G	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation; birds
28	Place bridges and river crossings at narrow river sections, where practicable, to avoid gravel fill and minimize the number of piers/pilings placed below ordinary high water.	Gravel infrastructure	ADF&G	Water resources; wetlands and vegetation; fish
29	Construct bridge abutments from sheet pile to reduce the overall gravel footprint and protect the structures from embankment erosion and stream scour.	Construction	ROP E-6; ADF&G; ADEC	Soils, permafrost, and gravel resources; water resources; fish
30	Do not stockpile gravel in Waters of the U.S., including wetlands. Gravel would be stockpiled in upland areas or on ice pads.	Gravel infrastructure	ADF&G; ADNR DMLW	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation; birds
31	Install vertical support members (for pipelines) from ice roads and pads, and ensure drill cuttings are temporarily stored on ice and removed to the gravel mine site prior to spring breakup.	Construction	AOGCC; ADNR DMLW	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation
32	Conduct trenching activity (e.g., pipeline road crossings) during winter and temporarily store trench materials on plywood, plastic sheeting, or an ice pad to avoid additional impacts to wetlands (e.g., fill).	Construction	ADNR DMLW	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation
33	Minimize heat transfer and impacts to permafrost from Project infrastructure on gravel pads by: designing flare stack height to reduce radiant heating; filling the gap between well conductors and inner pipes with polyurethane foam; using thermosyphons adjacent to well rows and at-grade structures; and installing insulation below the foundation floors of heated, at-grade structures.	Construction and operations	ADEC; ADNR	Soils, permafrost, and gravel resources
34	Elevate on-pad heated buildings or structures using pilings, to the extent practicable, to prevent or reduce heat transfer to underlying soils and preserve the thermal integrity of the permafrost.	Facilities	ADEC	Soils, permafrost, and gravel resources
35	Implement snow removal management measures to reduce the potential for gravel to be pushed off roads and pads during snow removal operations.	Construction and operations	ADNR DMLW	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
36	Implement dust control measures for gravel roads, pads, and mining operations to reduce fugitive dust that can settle on vegetation or snow, which could increase thermal conductivity (i.e., reduce albedo), lead to thermokarsting, and promote earlier spring thaw in affected areas.	Gravel infrastructure	ROP A-10; ADEC	Soils, permafrost, and gravel resources; air quality; visual resources; water resources; wetlands and vegetation; fish; birds; terrestrial mammals; public health
37	Implement strict guidelines for travel on ice roads to avoid tundra damage, including requiring ice road driver training, establishing speed and weight limits, and installing road-edge delineators along both sides of roads.	Tundra travel	ADF&G; ADNR DMLW	Soils, permafrost, and gravel resources; wetlands and vegetation; birds; terrestrial mammals
38	Install Colville River pipeline crossings (e.g., diesel, seawater) with insulation and placed within an outer pipeline casing, which would inhibit heat transfer to permafrost, contain fluids in the event of a pipeline leak, and provide structural integrity to the pipeline crossing.	Pipelines	ADEC	Soils, permafrost, and gravel resources; Water resources; Spill risk
39	Design, construct, and use ice roads that are a minimum of 6 inches thick during winter construction to eliminate or minimize impacts to wetlands and tundra.	Ice infrastructure	ROP C-2; ADF&G; ADNR DMLW	Soils, permafrost, and gravel resources; wetlands and vegetation; birds; terrestrial mammals
40	Implement an erosion control plan to detail ways the Project would prevent or mitigate erosion that could impact terrestrial and aquatic environments. The plan would include CPAI's operations, monitoring, and maintenance procedures that detail the actions CPAI would undertake to monitor, maintain, and if needed, remediate gravel fill impacting surrounding tundra and wetlands.	Erosion control	ROP E-6; ADF&G; ADEC; ADNR DMLW	Soils, permafrost, and gravel resources; visual resources; water resources; wetlands and vegetation; fish; birds; terrestrial mammals; marine mammals; subsistence and sociocultural systems
41	Place cleared (i.e., plowed) snow in designated snow-storage areas and manage stormwater from all gravel pads to prevent contaminants from being released during spring breakup. Select snow push areas annually based on avoiding areas of thermokarsting, proximity to waterbodies, and evaluations of areas used the previous year.	Snow management	ROP A-3; ADNR; ADEC	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation
42	Use a minimum of 5-foot-thick section for gravel pads and roads to maintain a stable thermal regime by insulating the underlying tundra and offsetting the loss of insulating effect caused by the compression of the vegetated tundra beneath the gravel.	Gravel infrastructure	ROP E-5; ADNR DMLW	Soils, permafrost, and gravel resources
43	Route ice roads to avoid shrub areas and large areas of tussock tundra to the extent practicable.	Ice infrastructure	ROP C-2; ADF&G; ADNR DMLW	Wetlands and vegetation; birds; terrestrial mammals
44	Construct pipelines above ground, to the extent practicable, to minimize permafrost impacts.	Pipelines	ADEC; ADNR	Soils, permafrost, and gravel resources

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
45	On BLM-managed lands, withdraw unfrozen water from lakes and not rivers and streams during winter to maintain populations of, and adequate habitat for, fish and invertebrates. Ice aggregate would not be removed from areas of grounded ice less than or equal to 4 feet in depth (on BLM-managed lands) without authorization from the BLM, on a site-specific basis.	Water withdrawal	ROP B-1; ADNR DMLW; ADEC	Water resources; fish
46	Do not construct causeways or docks in any river mouth or delta. Causeways, docks, artificial islands, or other bottom-fast structures, if employed, would be designed to ensure free passage of fish and prevent changes to water circulation patterns or water quality.	Gravel infrastructure	ROP E-3; ADNR DMLW; ADF&G	Water resources; fish; birds
47	Maintain air-traffic altitudes consistent with NPR-A ROP F-1, except during takeoffs and landings, and unless doing so would endanger human life or violate safe flying practices, to avoid disturbing caribou, birds, and subsistence users, when feasible. (Some air traffic would be required to support the Project or for regulatory compliance [e.g., wildlife studies, hydrology studies] and to ensure cleanup following the ice-road season could require flying at lower altitudes.)	Air traffic	ROP F-1; ADF&G	Noise; visual resources; birds; terrestrial mammals; marine mammals; subsistence and sociocultural systems
48	Develop a bear-interaction plan for Project personnel to minimize conflicts between bears and humans.	All	ROP A-8; ADF&G	Terrestrial mammals; marine mammals
49	Minimize disruption to caribou movement by maintaining a minimum clearance of 7 feet between the bottom of pipelines and the ground surface.	Pipelines	ROP E-7; ADF&G; ADEC	Terrestrial mammals; subsistence and sociocultural systems; spill risk
50	Design facilities to minimize nesting, denning, or sheltering opportunities for ravens, raptors, and foxes. Prohibit intentional feeding of wildlife.	Facilities	ROP E-9; ADF&G	Birds; terrestrial mammals
51	Minimize the amount of light visible from outside of facilities, including directing artificial exterior lighting inward and downward during all months of the year, which would prevent waterfowl (including species listed under the ESA) from striking facilities during low light conditions.	Facility lighting	ROP E-10; typical ESA conservation measure; ADF&G	Birds
52	Minimize the take of species, particularly those listed under the ESA and BLM Special Status Species, by conducting eider and yellow-billed loon surveys and working with resource agencies to ensure facilities minimize impacts to species found (e.g., ensure off-pad utility lines are either buried or suspended from pipe racks to the extent feasible, locate towers on pads near existing buildings to the extent feasible, minimize the use of tower guy wires, clearly mark guy wires that are used to prevent collisions).	Facilities	ROPs E-11 and J; typical ESA conservation measure; ADF&G	Birds

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
53	Develop a new gravel mine site that would not result in the loss of raptor nesting habitat because it would not take gravel from cliffs, river channels, or stream channels in a manner that would affect river bluffs.	Gravel source	ROPs E-8 and E-15; ADF&G	Birds
54	Minimize the electrocution hazard by suspending electrical distribution lines from pipe racks or burying cables (versus the use of overhead power lines) off pad.	Utilities	ROP E-20; typical ESA conservation measure; ADF&G	Birds
55	Provide the BLM authorized officer with GIS-compatible location information to facilitate agency monitoring and assessment of wildlife movements through the Project area after Project construction.	Facilities	ROP E-19; ADF&G	Birds; terrestrial mammals
56	Locate pipelines parallel to new and existing gravel roads and maintain a minimum separation distance of 500 feet, where feasible, to minimize caribou disturbance and prevent excessive snow accumulation from snowdrifts and snow removal.	Pipelines	ROP E-7; ADF&G	Terrestrial mammals; spill risk
57	Contract with a state-registered Primary Response Action Contractor to assist with quick spill response impacts in the event of a spill.	Operations	ROP A-4; ADEC	Spill risk
58	Align pipe racks installed adjacent and parallel to existing pipeline racks so vertical support members for each pipe rack are in line, to the extent practicable, to reduce obstructions to caribou and subsistence user movements.	Pipelines	ADEC	Birds; terrestrial mammals; subsistence and sociocultural systems
59	Use a muted (i.e., non-reflective) coating on pipelines to avoid glare.	Pipelines	ADEC	Visual resources; birds; terrestrial mammals; marine mammals; subsistence and sociocultural systems
60	Implement policies, procedures, and training to prevent wildlife attraction to Project facilities, including use of predator-proof dumpsters for food waste collection; a strict policy prohibiting the feeding of wildlife; and the use of Ziploc bags or other sealed containers for meals-on-the-go to conceal food odors.	Waste management and wildlife interaction	ROPs A-8 and I-1; ADEC	Birds; terrestrial mammals; marine mammals
61	Implement a Wildlife Avoidance and Interaction Plan that would include procedures to eliminate, minimize, and mitigate bear interactions. CPAI conducts training on waste management practices and would conduct Project-specific training on waste management to guide employees and contractors on managing predators.	Waste management	ROPs A-1, A-2, A-8, and I-1;typical ESA conservation measure; ADF&G; ADNR; ADEC	Birds; terrestrial mammals; marine mammals
62	Protect grizzly and polar bear denning sites by prohibiting cross-country travel or use of heavy equipment within 0.5 mile of a grizzly bear den and within 1.0 mile of a polar bear den. Where necessary, CPAI would conduct surveys near coastal areas to locate potential polar bear dens, in consultation with the U.S. Fish and Wildlife Service, as appropriate, before initiating activities in coastal habitat between October 30 and April 15.	All	ROP C-1; typical ESA conservation measure; ADF&G; ADNR DMLW	Terrestrial mammals; marine mammals

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
63	Conduct training for Project personnel on NPR-A ROPs, standards, and environmental, social, traditional, and cultural concerns specific to the Project region, including training on community interactions. This training would be designed to ensure strict compliance with local and corporate drug and alcohol policies.	Personnel	ROP I-1; NSB	Subsistence and sociocultural systems; cultural resources
64	Prohibit Project employees from hunting and trapping activities while employees are on active work status to avoid increased competition for subsistence and recreational wildlife resources.	Personnel	ROP H-3; ADF&G	Subsistence and sociocultural systems
65	Use the results of cultural and paleontological resource surveys to inform project design and facilities placement. The Project would avoid known cultural and paleontological resources during ground-disturbing activities, including the construction of ice roads.	Construction	ROP E-13; ADNR	Cultural and paleontological resources
66	Implement a Visual Resources Management Plan to minimize visual resource impacts, consistent with the Visual Resources Management Class for the lands on which Project facilities would be located.	Project infrastructure	ROP E-17; ADNR	Visual resources
67	Avoid disturbance of caribou and strictly prohibit chasing wildlife with vehicles.	Personnel	ROP M-1; ADF&G	Birds; terrestrial mammals; marine mammals; subsistence and sociocultural systems
68	Continue to consult with affected subsistence communities, tribes, Alaska Native Corporations, and the NSB, as well as the Kuukpikmuit Subsistence Oversight Panel, Alaska Eskimo Whaling Commission, Nuiqsut Whaling Captains, and Barrow Whaling Captains to mitigate potential impacts to subsistence activities. Plans would be maintained to ensure these consultations continue both periodically and robustly.	All	ROP H-1; NSB	Subsistence and sociocultural systems
69	Continue to consult with the Kuukpik Subsistence Oversight Panel, the Native Village of Nuiqsut, and Kuukpik Corporation to ensure Project activities do not adversely affect subsistence activities. CPAI would continue to hold frequent public community meetings well in advance of future activities. Travel would be scheduled with flexibility and managed through the use of speed limits, rerouting, and traffic stoppages to avoid conflict with subsistence use and hunting areas during seasonal periods.	All	ROPs E-1, F-1, H-1, H-3, and I-1; NSB	Subsistence and sociocultural systems
70	Continue to provide annual funding for Kuukpik Subsistence Oversight Panel to help support the executive director and coordinate panel activities.	All	ROPs E-1, F-1, H-1, H-3, and I-1; NSB	Subsistence and sociocultural systems
71	Conduct high-disturbance construction activities such as gravel mining and placement, and pipeline and facility construction, primarily during the winter months when subsistence activity levels are relatively low and disruptions to water flow can be minimized.	Construction	ADF&G	Water resources; fish; birds; terrestrial mammals; subsistence and sociocultural systems

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
72	Include subsistence tundra access ramps and pullouts on gravel roads with locations based on community input. The pullouts would allow local residents to access the areas adjacent to roadways. The tundra access ramp and pullouts would be designed with considerations of lessons learned from the Greater Mooses Tooth 1 and 2 projects.	Gravel infrastructure	ADNR DMLW; NSB	Subsistence and sociocultural systems
73	Prohibit the use of airboats on rivers within BLM-managed lands and within a 50-mile radius of Nuiqsut, except for emergencies and emergency response training.	Operations	ADNR DMLW; ADF&G	Noise; birds; fish; terrestrial mammals; marine mammals; subsistence and sociocultural systems
74	Continue the internship program (CareerQuest) to introduce Nuiqsut high school students to jobs and careers in the oil fields and in their community.	Community outreach	NSB	Economics; subsistence and sociocultural systems
75	Continue to strive to hire qualified Nuiqsut, NSB, and Alaska residents for oil field jobs.	Personnel	NSB	Economics
76	Ensure current communications protocols for CPAI helicopter, fixed-wing aircraft, and marine-vessel traffic are adequate to address community (Nuiqsut) concerns about traffic-related impacts to subsistence activities.	Air and vessel traffic	ROP F-1; NSB	Subsistence and sociocultural systems
77	Allow Nuiqsut residents reasonable use of Project roads to access subsistence areas throughout the life of the Project.	Gravel infrastructure	ROPs E-1 and H-1; NSB; ADNR DMLW	Subsistence and sociocultural systems
78	Implement avoidance measures to ensure protection of cultural resource sites during Project activity by establishing a 500-foot avoidance buffer consistent with NSB regulations.	All	NSB	Cultural resources
79	Reduce and minimize air pollution through air quality monitoring and modeling, as appropriate. Develop an emissions inventory and apply additional mitigation measures and activity modifications, as appropriate, in response to the air quality information generated. Make reports generally available to the NSB and local communities.	Air emissions	ROP A-10; ADEC; NSB	Air quality; public health
80	Adhere to the BLM's oil and gas air resources ROPs, as applicable. These practices would minimize air emissions resulting from both Project construction and operations and would include: watering gravel roads to minimize fugitive dust, using clean fuels such as ultra-low sulfur diesel and natural gas, and the use of low emissions emitting equipment (including maximum use of electrical power, Tier IV final engines - or similar emission reduction technology for drill rigs and hydraulic fracturing equipment prior to WCF facility startup - storage tank closed vent systems to the extent practicable, and green completions).	All	ADEC	Air quality; water resources; wetlands and vegetation; public health
81	Use ultra-low sulfur diesel fuel (as defined by the Alaska Department of Environmental Conservation) in all diesel-fueled vehicles and equipment.	Vehicles and equipment	ROP A-9; ADEC	Air quality; public health

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
82	Use totally enclosed or acoustically packaged permanent electric power generator sets to abate noise.	Generators	ADEC	Noise; birds; terrestrial mammals; marine mammals
83	Generate Project power using the power plant at the WPF following facility startup and provide power to drill rigs except during periods when power from the WPF is unavailable. Use ultra-low-sulfur diesel powered portable generators to supply Project power prior to facility startup or during periods of facility maintenance, shutdown, or upsets.	Utilities	ADEC; AOGCC	Air quality; public health
84	Power off vehicles and heavy equipment (i.e., rolling stock) used for oil and gas operations when not in active use, to the extent practicable.	Vehicles	ROP A-7; ADEC	Air quality; public health
85	Equip vehicles with block heaters and institute Project practices to power off and plug in vehicle engines when temperatures are -30°F or above to conserve fuel and reduce emissions.	Vehicles	ADEC	Air quality; public health
86	Use Finewater Mist for process module fire protection and a non-ozone depleting agent for drill site and non-process module fire protection in lieu of Halon.	Fire protection	ADEC	Air quality; water quality
87	Manage all waste in accordance with a comprehensive waste management plan to reduce impacts to human health and safety and to minimize potential effects to subsistence resources, including fish and wildlife. This would be accomplished using the Alaska Waste Disposal and Reuse Guide (the "Red Book"). This guide addresses: waste prevention and reduction, recycling, treatment, and disposal. The waste management plan would include measures to avoid attracting wildlife, disposal of putrescible waste, disposal of pumpable waste, and disposal of wastewater. As allowed, injectable waste would be injected into the subsurface via disposal wells or used for enhanced oil recovery.	Waste management	ROP A-2; ADEC	Water resources; wetlands and vegetation; birds; terrestrial mammals; marine mammals; subsistence and sociocultural systems
88	Audit contractors' health, safety, and environment performance to ensure safe practices are followed.	Personnel	ADEC	Water resources wetlands and vegetation; fish; birds; terrestrial mammals; marine mammals; subsistence; public health
89	Audit the Project on a scheduled basis to ensure compliance with all environmental laws, regulations, and local requirements, company policies and procedures, and other regulations regarding safety, land use, fire codes, etc.	All	ADNR DMLW; ADEC	All
90	Employ Field Environmental Coordinators to monitor compliance with permits and other Project requirements.	All	ADNR	All
91	Evaluate environmental considerations when purchasing new storage tanks or adding new emissions sources that may affect the environment or operating permits.	All	ROP A-10; ADEC	All

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
92	Review new chemicals being considered for use on the Project to ensure the materials would minimize the generation of hazardous waste or risk to employees.	Operations	ROP A-3; ADEC	All
93	Develop and implement a spill prevention and response contingency plan for the Project (in accordance with 40 CFR 112) to reduce impacts to human health and safety and to minimize potential effects to subsistence resources, including fish and wildlife. The Plan would cover Project operations and describe spill prevention measures and on-site cleanup materials for permanent fueling stations, use of proper storage containers and liner materials, proper container identification, and notice of reportable spills. Identification of drip pans (i.e., "duck ponds") would be addressed through Project operating procedures.	Spill prevention and response	ROP A-4; ADEC	All
94	Use a hazardous materials contingency plan (also known as a spill prevention and response contingency plan), prepared pursuant to NPR-A ROP A-3, that would detail response actions, drills, and responder training.	Spill prevention and response	ROP A-3; ADEC	All
95	Build and operate pipelines with the best available technology for detecting and preventing corrosion or mechanical defects to minimize impacts related to point source pollution from oil spills or leaks.	Pipelines	ROP E-4; ADEC	All
96	Install pipeline valves on each side of Judy (Kayyaak) and Fish (Uvlutuuq) creek crossings, to allow isolation of produced fluids pipelines on either side of bridges and minimize potential spill impacts in the event of a leak or break. These valves would reduce subsistence user concerns related to downstream contamination from the Project. Isolation valves or vertical loops would be installed on the Willow (sales oil) pipeline at each side of the Ublutuoch (Tiŋmiaqsiuġvik) River, and on each side of the segment crossing the Nigliagvik Channel, Nigliq Channel, and lakes L9341 and L9323. Vertical loops would be installed on the diesel pipeline at each side of the Miluveach River, Kachemach River, and Colville River. Two methods of leak detection will be used for the seawater and diesel pipeline crossings under the Colville River: (1) leak detection mass balance (primary), and (2) optical leak detection (secondary, within casing).	Pipelines	ADEC	All
97	Implement CPAI's "Target Zero" spill prevention program, which is designed to raise awareness around spill prevention and pass on lessons learned, for the Project.	Spill prevention and response	ROP A-3, A-4, and A-5; ADEC	All
98	Implement a fuel transfer standard operating procedure and use secondary containment on regulated oil and hazardous materials storage tanks.	Spill prevention and response	ROPs A-4 and A-5; ADEC	All

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
99	Continue to implement an extensive corrosion inspection program which includes ultrasonic inspection, radiographic inspection, coupon monitoring, metal loss detection pigs and geometry pigs (applicable to pig-capable pipelines), and infrared (heat signature detection) technology. The inspection programs are American Petroleum Institute Standard 570-based programs that focus inspection efforts on areas of greatest potential for spills.	Spill prevention and response	ROP A-3; ADEC	All
100	Continue CPAI's operating practice to immediately and completely clean up all spills, recovering 100% of spilled material for recycling when possible.	Spill prevention and response	ROP A-3; ADEC	All
101	Periodically treat pipeline fluids, as appropriate to product types, with chemicals to limit corrosion potential.	Pipelines	ROPs A-3 and E-4; ADEC	All
102	Equip and maintain oil spill response equipment intended for use in winter conditions for effective use in Arctic conditions (i.e., in a manner to prevent the freezing or icing of the equipment).	Spill prevention and response	ROPs A-3 and A-4; ADEC	All
103	Hydrostatically test pipelines prior to placing them into operation.	Pipelines	ROP E-4; ADEC	All
104	Provide access to the GMT and Alpine developments (under Alternatives B, C, and E) to offer additional response capabilities and minimize response time in the event of a spill or other unintended release or emergency.	Spill prevention and response	ROPs A-3 and A-4	All
105	Stage spill response equipment in strategic locations (e.g., drill sites) for initial spill response. On-site staged equipment would facilitate the rapid deployment of response personnel and may minimize or reduce the overall impacts associated with a spill or other accidental release.	Spill prevention and response	ROPs A-3 and A-4; ADEC	All
106	Designate Spill Response Teams and Hazardous Materials Response Teams, consisting of trained volunteer spill and hazardous materials response personnel on site.	Spill prevention and response	ROP A-3; ADEC	All
107	Continue to participate in the Mutual Aid Agreement among North Slope operators to supply labor and equipment for immediate spill response. Spill response drills and exercises would ensure response readiness and awareness; these drills would be scheduled according to the National Preparedness and Response Exercise Program guidelines and typically involves production, drilling, or pipeline spill response scenarios	Spill prevention and response	ROP A-3; ADEC; NSB	All
108	Do not refuel equipment within 500 feet of the active floodplain of any waterbody unless approved by the BLM authorized officer. Fuel-storage stations, except as approved by the BLM authorized officer, would be located at least 500 feet from waterbodies except for small caches (up to 210 gallons) for fueling motorboats, float planes, and small equipment.	Spill prevention and response	ROP A-5; ADNR DMLW; ADEC	All

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
109	Design well cellars to contain fluid drips and leaks.	Spill prevention and response	ROP A-4; ADEC	All
110	Continue philanthropy programs from local oil fields to provide income and other benefits to the residents of Nuiqsut.	All	None	Economics; sociocultural systems; public health
111	Design all bridges to maintain bottom chord clearance of at least 4 feet above the 100-year design flood elevation, or at least 3 feet above the highest documented flood elevation, whichever is higher. Additionally, design the Judy Creek and Fish Creek bridges to maintain bottom chord clearance of at least 13 feet above the 2-year design flood elevation (open water) to provide vessel clearance.	Bridges	ROP E-6	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation; fish; birds; terrestrial mammals; marine mammals; Subsistence and sociocultural systems; public health
112	Include construction of up to three subsistence boat ramps to provide local residents with improved river access. Locations would include the Tiŋmiaqsiuġvik River near the existing GMT-1 access road, Judy Creek at the proposed Willow BT1 access road crossing, and Fish Creek at the proposed BT4 access road crossing.	All	ROP E-1	Subsistence and sociocultural systems; public health
113	Implement a speed limit of 35 mph and stop traffic when caribou are crossing the road on all 32-foot-wide (surface width) roads. On roads with a 24-foot-wide surface width, implement a 25 mph speed limit for health, safety, and environmental purposes, including to reduce potential impacts to vegetation from dust and to wildlife.	Gravel infrastructure	None	All
114	Build a constructed freshwater reservoir to ensure a reliable source of fresh water for the Project while minimizing the need for water withdrawals from Willow-area lakes. Adaptively manage water levels by installing a flow control gate and valve to allow reduction of flow velocity into the reservoir based on monitoring of water levels in Lake M0015 and the lake outlet into Willow Creek if necessary.	Water withdrawal	None	Water resources; wetlands and vegetation; fish; birds
115	Place pipelines at Fish Creek and Judy Creek on structural steel supports attached to the bridge girders below the bridge deck to avoid placement of pipeline VSMs below OHW.	Pipelines	LS K-1	Water resources; fish; birds
116	Remove the airstrip approach lighting access and secondary access roads from the proposed Project design to reduce the gravel footprint.	Gravel infrastructure	ROP E-5	All
117	Develop a module delivery option that uses the existing Oliktok Dock and staging pad to avoid the need to construct an MTI.	Gravel infrastructure, module delivery	ROP E-5	All
118	Minimize the footprint of the gravel mine based on amount of gravel needed (i.e., less gravel needed for Option 3).	Gravel infrastructure, mine site	ROP E-5	All

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
119	Reduce potential fugitive methane emissions by processing and compressing produced gas for reinjection and gas lift to enhance production.	Pipeline and Air Quality	None	Air Quality
120	Minimize vented hydrocarbon gas volumes by initially depressurizing pipelines to the production system, flare, and then purge lines with nitrogen.	Pipeline and Air Quality	None	Air Quality

Note: °F (degrees Fahrenheit); ADEC (Alaska Department of Environmental Conservation); ADF&G (Alaska Department of Fish and Game); ADNR (Alaska Department of Natural Resources); AOGCC (Alaska Oil and Gas Conservation Commission); BLM (Bureau of Land Management); BT1 (Bear Tooth 1 drill site); BT2 (Bear Tooth 2 drill site); BT3 (Bear Tooth 3 drill site); BT4 (Bear Tooth 4 drill site); BT5 (Bear Tooth 5 drill site); CPAI (ConocoPhillips Alaska, Inc.); DMLW (Division of Mining, Land, Water); EIS (Environmental Impact Statement); ESA (Endangered Species Act); GIS (geographic information system); GMT-1 (Greater Mooses Tooth 1); GMT-2 (Greater Mooses Tooth 2); HDD (horizontal directional drilling); LS (lease stipulation); mph (miles per hour); MTI (module transfer island); No. (number); NPR-A (National Petroleum Reserve in Alaska); NSB (North Slope Borough); OHW (ordinary high water); ROP (required operating procedure); VSM (vertical support member); WPF (Willow Processing Facility). All cited lease stipulations and required operating procedures are from the National Petroleum Reserve in Alaska Integrated Activity Plan/Environmental Impact Statement Record of Decision (BLM 2022).

[a] Other stipulations include typical State of Alaska or NSB permit stipulations for North Slope activities or typical ESA conservation measures or LSs or ROPs. The table lists the agency from which the typical stipulation would arise.

3.0 ADDITIONAL SUGGESTED AVOIDANCE, MINIMIZATION, OR MITIGATION CONSIDERED IN THE 2020 WILLOW EIS

In addition to Project design features, LSs, and ROPs already applicable to the Project, the EIS also considers additional suggested avoidance, minimization, and mitigation measures designed to further reduce or compensate for impacts from the Project. These measures are discussed in the relevant resource sections in the Willow MDP EIS, Chapter 3.0, *Affected Environment and Environmental Consequences,* and are summarized in Table I.3.1. They were developed based on suggestions from cooperating agencies, stakeholders, public comments, and BLM staff.

The decision whether to adopt each new measure will be made in the BLM's Willow MDP ROD.

Table I.3.1. Additional Suggested Avoidance, Minimization, or Mitigation

Section Number and Resource	Additional Suggested Avoidance, Minimization, or Mitigation
3.2 – Climate and Climate Change	None
3.3 – Air Quality	Implement a Fugitive Dust Control Plan to mitigate impacts from fugitive particulate matter emissions from the Project. This plan would require regular watering of pads and unpaved roads, enforcing speed limits on unpaved access and haul roads, and several other measures to reduce fugitive dust emissions and impacts. See Appendix I.3, *Dust Control Plan*, for additional details.
3.4 – Soils, Permafrost, and Gravel Resources	Use the following in design of roads and embankments: • Separate native soils from Project fill materials using geotextiles or fabrics • Use thick embankments and shallow slopes • Monitor thermokarsting, depth of active layer, and compression of soil and vegetation in annual resupply ice road footprint, for footprints that are used consecutively each year
3.5 – Contaminated Sites	None
3.6 – Noise	Alter flight paths to avoid sensitive areas (such as Nuiqsut) Limit blasting to the hours of 10:00 a.m. to 8:00 p.m.
3.7 – Visual Resources	Include the following in the plan to minimize visual impacts (plan is required as per ROP E-17): • Ensure structures are a color that blends in with the background colors of the natural landscape. All colors would be pre-approved by the BLM. • ROP E-7 and CPAI's design measure 58 (Appendix I.1, Table I.1.2) state that a non-reflective coating would be used on pipelines; that could be expanded to all metal structures not otherwise painted, including but not limited to communications towers and drill rigs. Minimize light visible from outside of Project facilities *at all times of the year* by using lighting fixtures with lamps contained within the reflector and shading externally facing windows on buildings. This will minimize impacts on visual aesthetics (i.e., reduce contrast from glare and artificial lighting).
3.8 – Water Resources	Appendix E.8 provides detail about culvert, bridge, and pipeline design and how that influences potential effects to water resources. Additional suggested measures to reduce impacts created by culvert, bridge, and pipeline crossings, could include: Unless a more appropriate method is available, when estimating flood-peak discharge at locations within the Fish (Iqalliqpik) Creek, Judy (Iqalliqpik) Creek, and Ublutuoch (Tiŋmiaqsiġvik) River basins, use a weighted average from a single station analysis of the BLM long-term monitoring station data on each of these streams and the Shell regression equations (Appendix E.8). Weight the results of the two computations based on the uncertainty associated with each estimate. As appropriate, consider both 1) snow- and ice-impacted conditions and 2) ice-free conditions in the hydraulic design of bridges, culverts, and pipeline river crossings. Cross-section data at the time of the peak stage and peak discharge that are available for many rivers and streams indicate that the WSE was affected by snow and/or ice blockage. Based on the available information, develop designs that would perform satisfactorily during the design event considering both the possibility of open water conditions and the possibility that snow and ice blockage is occurring at the time of the design event. At a minimum, the magnitude of the blockage used in the designs should be similar to the magnitude of the blockage that has been observed. At a minimum, design culverts to perform satisfactorily for all flood events up to and including the 50-year event. The headwater-to-diameter ratio at the maximum design condition should be no greater than 1.0.

Section Number and Resource	Additional Suggested Avoidance, Minimization, or Mitigation
	Identify the locations requiring cross-drainage culverts during spring breakup prior to construction, by noting all locations where water is flowing over the proposed alignment. This is necessary because it is often not possible to determine where water flowing in polygon troughs will cross the alignment during a summer or fall inspection. At the same time, identify the ends of the proposed culverts and the invert elevation of the ends of the culvert in order to maintain the flow in the historic flow path. At a minimum, design road bridges to pass the 50-year flood-peak discharge with a minimum of a 3-foot freeboard (assuming snow and ice conditions have been considered in estimating the design water surface elevation). Design for bridge foundation scour equal to the maximum scour depth produced by floods up through a magnitude equal to the 100-year flood event, and a geotechnical design practice safety factor of from 2 to 3. Check the bridge design using a superflood and a geotechnical design practice safety factor of 1. The superflood is defined as the 500-year event, 1.7 times the magnitude of the 100-year event, or the overtopping flood, whichever is the least. These are standard criteria used by Alaska Department of Transportation and Public Facilities for bridges on the North Slope in non-designated flood hazard areas. At a minimum, design pipeline river-crossings to perform satisfactorily for all floods up to and including the 200-year event (including crossings on bridges or VSM). This is the magnitude of the design event that has typically been used for common carrier pipelines on the North Slope and a higher level of design than is being proposed for the Project. Start bridge and culvert hydraulic computations sufficiently downstream so that the downstream boundary assumptions do not affect the performance of the proposed design. Consider the USACE (1986) report "Accuracy of Computed Water Surface Profiles" in determining the location of the downstream boundary for hydraulic computations. If the highest observed WSE or high-water mark is higher than the predicted 50-year WSE at a culvert, bridge, or pipeline, re-evaluate the design water surface elevation to confirm that snow and ice blockage, and other details of the computation are accurate. Given the conditions on the North Slope, it is unlikely that high water marks from a 50-year flood or greater would be recognizable unless it occurred in the last 10 to 20 years. Additionally, it is improbable that a 1- to 5-year field program would experience a 50-year flood. It is more likely that snow and ice blockage greater than accounted for in the model used to predict the 50-year WSE or an error in the downstream boundary condition used in the model has occurred. Use a freeboard at bridges and pipeline crossings which considers the uncertainty in the magnitude of the design flood, the uncertainty in the hydraulic computations, and the height of the ice and debris that may be carried by the flood but is not less than 3 feet. Where an aboveground pipeline crossing is *immediately* upstream from a road, backwater from the road during the pipeline design event should be considered when setting the bottom of pipe elevation. Additionally, if the road is designed for a smaller flood than the pipeline, the changes in hydraulic conditions at the pipeline as a result of the road wash-out should be considered (i.e., changes in location of the concentrated flow and the impact on erosion at the VSM). Where an aboveground pipeline crossing is *immediately* downstream from a road, the impact of the road on where water would be flowing and the velocity of the water at the pipeline VSM should be considered. Additionally, if the road is designed for a smaller flood than the pipeline, the changes in hydraulic conditions at the pipeline as a result of the road wash-out should be considered (i.e., changes in the location of the concentrated flow and the impact on erosion at the VSM). Breach ice road crossings sufficiently that ice from crossing would not contribute to ice jams or increase snow and ice blockage during spring breakup. Avoid placing multi-season ice pads in floodplains (e.g., construction pads at the mine site). Prior to HDD construction, provide a monitoring and response plan for determining if drilling mud is being lost to formation or making it to the river or groundwater during drilling. Should any spills occur on the MTI, the affected gravel would be addressed immediately and removed prior to MTI abandonment. If Option 1 or 2 is selected, place and maintain appropriate navigation aids on the MTI after it is decommissioned (the top of the MTI is expected to drop to or below the water surface) Provide annual surveillance of bridge, culvert, and pipeline river crossings to confirm that structures are functioning properly and provide maintenance as required.

Section Number and Resource	Additional Suggested Avoidance, Minimization, or Mitigation
	Continue to collect baseline data regarding discharge, ice and liquid water conditions and distribution, and bank conditions on the Colville River near Ocean Point throughout winters every year until ice bridge construction so that an ice bridge plan can be drafted that would include exact crossing location for bridge and ramps, plans for flow and fish passage management (should they be needed), and actions to be taken at the end of ice bridge use (such as slotting). Prepare an adaptive management plan that provides detail regarding how any unanticipated surface water flow blockages would be identified and corrected as quickly as possible, to avoid lasting environmental impacts. Include erosion mitigation features or options in engineering design of boat ramp(s) to prevent or minimize erosion potential at the boat ramp(s) and along adjacent riverbanks. Develop a maintenance plan for the boat ramps to ensure long-term viability and use of the site(s) while minimizing impacts to the adjacent waterbodies. Include the following points at a minimum: • Identify entity responsible for site maintenance • Annual maintenance (grading) of parking pads, turning pads, access ramps, and road access • Maintain a gravel supply (off-site) to reinforce boat ramps and pads when necessary • Regular clean-up of pads and surroundings, including back-haul of trash to suitable disposal site Before construction and continuing through operations, test and monitor freshwater sources that intersect the Project for hydrocarbons.
3.9 – Wetlands and Vegetation	If Alternative C or D is selected, monitor vegetation damage, and compression of soil and vegetation in annual resupply ice road footprint (footprints that are used consecutively each year). Because wetter landscapes show less impact from multiyear ice roads (Yokel, Huebner et al. 2007) and ADNR monitors only tussock tundra and soil compaction, this suggested measure would focus on non-tussock wetlands (including patterned ground) with a Cowardin water regime class of Temporarily Flooded, Saturated, or Seasonally Flooded Ground by vegetation type (total live cover of graminoid, shrub, forb, moss) and percentage of bare soil would be monitored with control points and points within ice road footprints to determine changes. Use vehicle and equipment wash stations and inspect vehicles and equipment for organic matter (e.g., invasive species) prior to moving equipment west of the Colville River to reduce the risk of introducing invasive species. Clean tires and wheel wells so they are free from soils, seeds, and plant parts. Provide stations to clean footwear and gear so they are free from soils, seeds, and plant parts. Provide training to employees and contractors in identification, control, and prevention of known invasive plant species. Confine loading and unloading of soils for gravel stockpiles to the downwind side of the pile; if piles would be on-site for longer periods of time, seed with appropriate vegetation to reduce wind erosion. Wind barriers (such as snow fences) may also be appropriate in some situations.
3.10 – Fish	Identify overwintering fish habitat (maximum water depths, particularly free-water depth under ice cover) in the Itkillik River and other tributaries to the Colville River that might intersect the Option 3 ice road. Avoid crossings of potential overwintering habitat. Adopt best management practices suggested by National Marine Fisheries Service for essential fish habitat for invasive species (Limpinsel, Eagleton et al. 2017): • Uphold fish and game regulations of the Alaska Board of Fisheries (AS 16.05.251) and Board of Game (AS 16.05.255), which prohibit and regulate the live capture, possession, transport, or release of native or exotic fish or their eggs. • Adhere to regulations and use best management practices outlined in the State of Alaska Aquatic Nuisance Species Management Plan (ADF&G 2002). • Encourage vessels to exchange ballast water in marine waters (in accordance with the U.S. Coast Guard's voluntary regulations) to minimize the possibility of introducing invasive estuarine species into similar habitats. Ballast water taken on in the open ocean would contain fewer organisms, and these would be less likely to become invasive in estuarine conditions. • Discourage vessels that have not exchanged ballast water from discharging their ballast water into estuarine receiving waters.

Section Number and Resource	Additional Suggested Avoidance, Minimization, or Mitigation
3.11 – Birds	Locate mast poles away from the pad edge. Minimize light visible from outside of Project facilities *at all times of the year* by using lighting fixtures with lamps contained within the reflector and shading externally facing windows on buildings to minimize the potential for bird strikes. Implement lighting controls to turn off exterior lighting at satellite pads and other unoccupied facilities when personnel are not present, between August 1 and October 31. Minimize the number of tall towers. Limit water withdrawal to lakes without sensitive fish or breeding yellow-billed loons. Route ice roads around identified yellow-billed loon nesting sites and nesting lakes to avoid vegetation compaction at nesting sites and delayed melt-out of nesting lakes. Restrict speed limits to minimize collision hazard and dust production (35 miles per hour except in areas of congestion, on bridges, and on pads, which should be slower). Haze birds out of the blast area before blasting (if resident birds are present in winter). Minimize noise impacts between June 1 and July 15 when birds on nests would be unable to move away from the disturbance. Minimize air traffic during the nesting period when the movements of incubating birds are restricted, and the molting period when birds may be energetically stressed and sensitive to disturbance. Avoid routine use of helicopters during drilling and operations activities to minimize noise and impacts related to birds. Consider revising traffic patterns, altitude, and location to minimize conflicts with molting geese. Avoid preferred habitats, where possible. Minimize barge and support vessel speed to reduce potential for bird strikes. Complete upgrades to the Kuparuk gravel road system involving wetland fill before or after the nesting season (June 1 through July 31), if possible.
3.12 – Terrestrial Mammals	ROP E-6 describes requirements related to caribou ramps over pipelines or buried pipelines. The Project could designate specific locations for these, such as northeast of the airstrip in Alternative B, or areas where caribou movements could be funneled or where roads and pipelines would be close together. The decision to add a crossing ramp over a buried pipeline should consider potential negative effects of reduced access to the pipeline for oil spill detection and response and thermokarst or changes in surface flow due to the resulting long-linear ditch that would fill with water. Install game cameras to study the effectiveness of measures used to reduce vehicle traffic impacts, such as stopping traffic or caravanning. Include the following in the vehicle use plan to minimize traffic impacts (plan is required as per ROP M-1): • Require vehicles to stop traffic when 25 or more caribou appear to be approaching the road. • Require vehicles to caravan or require periodic traffic closures when groups of caribou are near a road and the road has traffic rates of more than 15 vehicles per hour. Caravanning has limited ability to lower calving displacement (Lawhead, Prichard et al. 2004), but it may increase crossing success on roads with high traffic levels (more than 15 vehicles per hour) by providing periods without traffic to allow caribou to cross. It may be easier logistically to close the road for a specified number of hours a day (as determined by BLM) rather than caravanning. Spring, fall, and winter would likely be the periods of greatest concern for caribou crossing Project roads. Restrict Q400 traffic between Alpine and Willow at certain times of year to reduce impacts to caribou. Require the use of propylene glycol for deicing and for vehicle cooling systems, which is not toxic to wildlife.
3.13 – Marine Mammals	None
3.14 – Land Ownership and Use	None
3.15 – Economics	None

Section Number and Resource	Additional Suggested Avoidance, Minimization, or Mitigation
3.16 – Subsistence and Sociocultural Systems	Inform employees who are North Slope residents of company subsistence leave policies and ensure that leave policies are flexible to account for annual variation in the timing and length of subsistence activities. Employ subsistence representatives who receive daily communications on Project activities and report potential conflicts with subsistence users. Subsistence representatives should be provided with clear communication protocols and training, be local and knowledgeable residents, and be included in field activities the community believes have a high potential of conflicting with subsistence uses (e.g., helicopter-based surveys). In coordination with local organizations, such as the KSOP (required in CPAI design measure 68), ensure communications include the timing and location of development activities such as air traffic, blasting, and other construction activities. Identify areas with high drifted snow accumulation along pipelines after construction and implement a snow management program to clear drifts and create access points (i.e., openings) in areas where drifts accumulate for a long distance (e.g., quarter- and half-mile lengths) along pipelines. Consult with Nuiqsut residents on an appropriate distance for cleared access areas as well as the depth of snowdrifts that impede travel under pipelines. As part of the Subsistence Plan (required in ROP H-1) and as part of the Proponent's notification and consultation with Alaska Native groups (ROP H-1), provide equal opportunities for various local entities (e.g., KSOP, NVN, City of Nuiqsut, Kuukpik), in addition to knowledgeable subsistence users, to provide input. Continue to consult with local subsistence users and community organizations regarding the appropriate design and location of subsistence boat ramps, pullouts, and subsistence tundra access ramps. Consult with other operators regarding other boat ramp projects on the North Slope that may inform future designs. Participate in Conflict Avoidance Agreements with the Alaska Eskimo Whaling Commission to reduce potential impacts on bowhead whale hunting resulting from barge and vessel traffic. Work with community organizations to establish measures to reduce impacts of vehicle traffic on subsistence activities, particularly during the Project's construction phase. Install traffic control signs (e.g., stop signs) to halt industry vehicle traffic at all subsistence access ramps to ensure that subsistence users can cross safely Place development-free buffer around Native Allotment be at least 1 mile to ensure the viability of the allotment for subsistence use. Exceptions would be made for allotment owners who agree to having development closer than 1 mile.
3.17 – Environmental Justice	Continue to use the KSOP to maintain meaningful engagement in the Project and identify continuing concerns and specific Project impacts. Attend government to government meetings between NVN and BLM, as requested by NVN or BLM, to discuss issues and resolution strategies through construction and operations.
3.18 – Public Health	Limited health data are available for Nuiqsut. The best data available date from the NSB's 2010 survey. Funding a collection of health information for Nuiqsut and studies of contaminant levels in local subsistence resources would provide better data for evaluation of potential health effects associated with oil field development and operation. Create a public health monitoring program at a regional level to track health indicators that are vulnerable to impacts from oil and gas activities. These indicators should focus on health outcomes and/or determinants of local concern that can be tied to oil and gas activity. Where possible, indicators should include threshold levels and specific actions should be developed for when thresholds are surpassed. The State should be responsible for the development and implementation of the monitoring program; however, the NSB and the Alaska Native Tribal Health Consortium should be consulted in the identification of appropriate indicators, thresholds, and responsive actions. Establish a Nuiqsut public health coordination group to conduct health education and engage the community in the public health monitoring program described above.
3.19 – Cumulative Effects	None
4.0 Spills	None

Note: ADNR (Alaska Department of Natural Resources); BLM (Bureau of Land Management); CPAI (ConocoPhillips Alaska, Inc.); HDD (horizontal directional drilling); KSOP (Kuukpik Subsistence Oversight Panel); MTI (module transfer island); NSB (North Slope Borough); ROP (required operating procedure); USACE (U.S. Army Corps of Engineers); VSM (vertical support member); WSE (water surface elevation).

4.0 COOPERATING AGENCY SUGGESTED MITIGATION MEASURES IN THE 2022 SUPPLEMENTAL EIS*

During development of this Supplemental EIS' range of alternatives, BLM and cooperating agencies suggested additional mitigation measures during cooperating agency meetings and in correspondence that may reduce Project impacts. BLM developed potential mitigation measure comments made by cooperating agencies into potential mitigation measures by further developing the comment into an objective and a standard or requirement. Potential mitigation measures not enforceable by BLM were included if the measure could be imposed or mandated by another agency within their regulatory or permitting authority. Measures that were already included as part of Project LSs or ROPs, covered under other permit conditions (e.g., North Slope Borough rezoning), or would not be legal, were removed from further consideration.

The 2015 Greater Mooses Tooth 1 (GMT-1) ROD directed BLM to prepare a Regional Mitigation Strategy (RMS) to serve as a road map for mitigating impacts from GMT-1 and future oil and gas projects enabled or assisted by the existence of GMT-1 (such as the Willow MDP Project). The RMS identifies areas of potential impacts from oil and gas developments and provides examples of mitigation measures that may reduce those impacts. Additional suggested mitigation measures for the Willow MDP Project that were developed for the 2020 Final EIS and this Supplemental EIS are guided by the principles outlined in the RMS. The decision whether to adopt each new measure will be made in BLM's Willow MDP ROD.

Table I.4.1 presents the proposed cooperating agency mitigation measures under consideration in this Supplemental EIS.

Table I.4.1. Cooperating Agency Suggested Mitigation Measures*

No.	Objective	Standard/Requirement	Affected Resource(s)
1	Provide time between development projects to observe impacts and changes to baseline conditions. Observations from developed projects may result in additional NEPA review and analysis, changes to proposed projects (including phases), and/or new mitigation measures.	Proposed projects that would have a gravel footprint exceeding 300 acres would be limited to developing no more than 65% of the proposed project before instituting a minimum 2-year pause to observe project impacts. The authorized officer will be responsible for determining the need for permit review based on the monitored findings.	All
2	Provide time before the construction of Project drill site BT5 is authorized to observe overall project impacts and changes to environmental baseline conditions.	Drill site BT5 and the gravel roadway to BT5 will not be authorized for construction for three years after the construction of the Project's other three drill sites is complete.	All
3	Provide Nuiqsut with a guaranteed minimum proportion of the impact mitigation fund as the Nuiqsut is the community most directly impacted by oil and gas development.	The NPR-A Impact Mitigation Fund will direct a minimum of 15% of the grant funding to the City of Nuiqsut. This direct funding would not prevent Nuiqsut from applying for grants from the NPR-A Impact Mitigation Fund.	Socioeconomics; Environmental justice
4	Provide additional resources to Nuiqsut to support search and rescue efforts. With expanded oil and gas development, many Nuiqsut residents travel further from the village to pursue subsistence opportunities. This expanded range strains the current search and rescue program in the community.	CPAI will provide Nuiqsut $250,000 for search and rescue equipment and operations with the start of Project construction (i.e., gravel placement). CPAI will provide a second $250,000 payment to Nuiqsut for additional search and rescue equipment following commissioning of the Willow processing facility.	Socioeconomics; Public health
5	Reduce the amount of equipment traveling on Project roads at specific times to reduce impacts to caribou and subsistence users.	Install caribou monitoring stations that use real time caribou GPS telemetry data (i.e., caribou collars) and manage road use for successful caribou passage. The applicant and BLM will consult with the NSB wildlife department and ADF&G caribou experts to identify the minimum percentage of the Teshekpuk Caribou Herd that should have active GPS telemetry collars and the caribou density and distance from Project roads that will initiate traffic restrictions.	Caribou; Subsistence
6	Reduce impacts to calving caribou (approximately May 20 through June 20).	Outdoor construction activity (e.g., gravel working, building fabrication) will be halted during caribou calving season when calving caribou are within 1 mile of the activity. Drilling and operations activity will be minimized at drill site pads during caribou calving season to the extent that is safely practicable; new activities (e.g., initiating drilling for a new well, hydraulic fracturing) will not be initiated at drill sites during this time period.	Caribou; Subsistence
7	Collect air quality monitoring data in the immediate area of development, between Nuiqsut and the Willow Project, to confirm the Project is operating at anticipated emissions levels (i.e., as modeled) and provide a record of regulatory emissions violations.	Install air quality monitoring stations at a predominantly down-wind location on a gravel pad used to directly support drilling or operations (e.g., drill site pad, processing facility pad). One air monitoring station will be required for every five drill site pads or single processing facility, per development project. This data will be collected and be made publicly available in real time through the North Slope Science Initiative website.	Air quality; Public health; Environmental justice

No.	Objective	Standard/Requirement	Affected Resource(s)
8	Limit overall activity or minimize air traffic at specific times to reduce impacts to caribou.	ROP F-1 requires the use of an Aircraft Use Plan. The plan will include the following: • Minimize Q400 traffic between Alpine and Willow during calving (May 20 to June 20) to reduce impacts to caribou. Q400 traffic between Willow and Kuparuk or Deadhorse is necessary and would be allowed. • Plans to minimize the disturbance to calving caribou (description of areas avoided, how flight numbers were minimized, and that low altitude flights were avoided or limited).	Caribou
9	Maintain subsistence ramp access, including pullout surface area, free of obstructions, including equipment and material storage.	Materials and equipment shall not be staged on gravel road pullouts or in such a way as to block subsistence ramps or the roadway view for subsistence ramp users. Safe access to subsistence ramps will be maintained. Operators will incorporate staff training on the importance of maintaining clear and safe areas around pullouts and subsistence ramps into their orientation and safety programs. Operators will install signs at roadway pullouts stating, “Equipment and Materials Shall Not be Staged Here”.	Subsistence
10	Dispose all project waste properly and in a timely manner.	Waste management plans shall specify the intervals for total site cleanup at areas of activity. Cleanup intervals will not exceed 72 hours during periods of activity, including on project pads.	Water resources; Wetlands and vegetation; Fish; Birds; Terrestrial mammals; Marine mammals; Subsistence
11	Further reduce impacts to nesting Yellow-billed loons from vehicle traffic.	In areas where roads cross through Yellow-billed loon nesting buffers, restrict maximum vehicle speeds to 25 mph within the buffer zone during the nesting season (approximately June 1 through July 31). These speed limits will be prominently signed during this period.	Birds
12	To minimize or avoid environmental harms caused by greenhouse gas emissions and ensure NEPA adequacy over the life of the Project. Analysis by the EPA indicates that with technological advances and new data provided by infield drilling following a development and production environmental impact statements, more petroleum hydrocarbons are often extracted from the target reservoir than originally estimated. This results in more greenhouse gas emissions produced than estimated or disclosed to the public.	A NEPA adequacy review will be completed if the barrels per day gross annual average is greater than 10% of the original barrels per day production target (disclosed in the development’s most recent NEPA document) over a two-year period; or when the cumulative recovered reserves are greater than 10% of the original estimated recoverable reserves (disclosed in the development’s most recent NEPA document).	Climate change
13	Protect surface waters in the Project area through monitoring and mitigation.	The Project will include an adaptive management plan "that provides detail regarding how any unanticipated surface water flow blockages would be identified and corrected as quickly as possible, to avoid lasting environmental impacts" for monitoring and mitigation of potential surface water flow impacts throughout the project area.	Water resources; Wetlands and vegetation; Fish
14	Protect and minimize impacts to surface waters at Ocean Point and across the Project area.	The Project will include an adaptive management plan for the Colville River crossing activity at Ocean Point.	Water resources

No.	Objective	Standard/Requirement	Affected Resource(s)
15	Minimize floodplain impacts where gravel roads, pads, or boat ramps may block or restrict the flow of surface waters during spring breakup through timely detection and corrective action.	The Project will prepare an adaptive management plan to address potential floodplain impacts where gravel roads, pads, or boat ramps may block or restrict the flow of water during spring breakup. The adaptive management plan will provide methods for detecting and correcting unanticipated blockages before they lead to further environmental degradation. The adaptive management plan will address the potential for spring breakup surface waters to: • Increase the depth and duration of water impoundment • Increase thermokarsting • Cause a change in flow direction • Cause channel instability or a change in alignment • Result in erosion of the tundra or a stream channel • Result in the deposition of sediment on the tundra or in a stream channel	Water resources; Wetlands and vegetation; Fish
16	Minimize impacts to the water levels of Willow Creek 3 and Lake M0015 resulting from the construction of the constructed freshwater reservoir.	CPAI will collect stage monitoring data for Willow Creek 3 and Lake M0015 during ice-free periods for three consecutive years prior to the start of construction of the constructed freshwater reservoir (under Alternatives B, C, and D). This information will be used to ensure adequate water levels are maintained during the filling and operations of the constructed freshwater reservoir.	Water resources; Wetlands and vegetation; Fish
17	Minimize the potential impacts of thawing and thermokarst from climate change on project structures, including roads, pads, and the constructed freshwater reservoir to protect the TLSA.	CPAI will prepare an adaptive management plan that will be responsive to climate change by monitoring and mitigating potential thawing and thermokarst impacts on all project structures including roads, pads, and the constructed freshwater reservoir .	Climate change; Permafrost; Water resources; Wetlands and vegetation
18	Collect health baseline data for a Community Health Study what will inform evaluation of potential health effects associated with oil and gas developments.	Fund the collection of baseline health information on Nuiqsut residents and a Community Health Study that studies contaminant levels in local subsistence resources. The study shall include a section on potential trends that may have occurred in local health during the Covid-19 activity slowdown in 2020.	Public health; Environmental justice
19	Reduce the concentration and/or intensity of flaring near Nuiqsut.	CPAI will prepare a coordination plan between the Kuparuk, Alpine, and Willow developments to minimize the use flaring across all three developments and to reduce the incidences of multiple facilities flaring simultaneously. When simultaneous flaring must occur, the length of flare overlap shall be minimized to the greatest extent possible.	Air quality; Climate change; Public health; Visual resources
20	Improve local understanding and knowledge of traditional and scientific principles related to the oil and gas industry for school age children in Nuiqsut.	Fund traditional and western scientific education programs in Nuiqsut schools to help inform and improve the community's understanding of the oil and gas industry development and its associated impacts.	Environmental justice
21	Utilize local knowledge by including community members (e.g., elders, tribal council members, hunters, NSB wildlife experts) when conducting studies and project planning.	Include local advisors (e.g., elders, tribal council members, hunters, NSB wildlife experts) as team members when conducting studies, identifying historic sites, and completing project planning.	Fish; Birds; Terrestrial Mammals; Marine Mammals; Subsistence; Environmental justice; Cultural resources
22	Provide the community with information on the health of local subsistence resources.	Fund an NSB wildlife biologist position stationed in Nuiqsut to help the community and NSB monitor wildlife health and provide the community information on the safety of consuming subsistence resources.	

No.	Objective	Standard/Requirement	Affected Resource(s)
23	Improve the design and deployment of subsistence access ramps so they are safe and effective for community members.	Develop an adaptive management plan for subsistence access ramps that considers community input for improvements to subsistence ramp design and to address modifications of existing subsistence ramps. New subsistence ramps will be placed at a minimum of 4 ramp for every 3 miles of new gravel road. CPAI will meet with the community of Nuiqsut to establish design subsistence ramp design parameters to ensure the designs are adequate for users. Designs parameters will include a minimum length "landing ramp" at the top that is level and long enough to accommodate snow machines pulling sleds without sleds having to enter the associated pullout or adjacent road. The design parameters will set a maximum grade of the ramps. The subsistence ramp pullouts will be signed that materials and equipment are not to be stored at pullouts. Warning signs will be placed on the adjacent roadway approaching the subsistence ramp/pullout to warn drivers of the potential for vehicles (e.g., snowmachines, all-terrain vehicles) crossing the road. Subsistence ramp locations will be made available to local search and rescue groups (e.g., Nuiqsut, NSB) as GPS coordinates and on published maps.	Subsistence; Public health
24	Support the local community's needs for gravel infrastructure maintenance.	Provide Nuiqsut gravel to support road maintenance, specifically the subsistence access road.	Gravel
25	Collect additional air pollutant data in Nuiqsut and make the data available to the public.	Expand the air monitoring capabilities in Nuiqsut to include monitoring for hazardous air pollutants, volatile organic compounds, and polycyclic aromatic hydrocarbons. The measured concentrations will be made available in near real time for the community and the public at large.	Air quality; Fish; Birds; Terrestrial mammals; Marine mammals; Subsistence; Public health; Environmental health
26	Reduce caribou deflection.	Aboveground pipelines shall have a nonreflective finish.	Terrestrial mammals; Subsistence
27	Test local subsistence resources for contamination.	Provide periodic testing of consumable subsistence resources for contamination. Testing frequency and the number of samples tested per testing interval will be determined in consultation with the community of Nuiqsut.	Wetlands and vegetation; Fish; Birds; Terrestrial mammals; Marine mammals; Subsistence; Public health; Environmental health
28	Provide independent oversight and management to the air quality monitoring station in Nuiqsut.	CPAI shall fund the Nuiqsut air quality monitoring station. A third-party contractor will be identified to operate and maintain the station. The third-party contractor will develop a training program open to Nuiqsut residents for operating and maintaining the monitoring station, with appropriate technical oversight completed by the contractor.	Air quality; Public health; Environmental justice
29	Provide local subsistence oversight of all field activity being conducted in support of the Project.	A subsistence representative shall be present whenever field activity is occurring, including having representatives scheduled to cover day and night work shifts. Subsistence representatives are to be included in all field activities conducted in support of the Project.	Subsistence

No.	Objective	Standard/Requirement	Affected Resource(s)
30	Actively monitor for pollution indicators in the environment for the duration of the Project and modify Project activities as needed to address found contamination.	Develop an ongoing contamination study program (e.g., snow sampling, fish sampling) and adaptive management plan to address found contamination. Any contamination found in excess of State or EPA levels will be reported to ADEC within 72 hours of being determined.	Air quality; Water resources; Wetlands and vegetation; Fish; Birds; Terrestrial mammals; Marine mammals; Subsistence; Public health; Environmental justice
31	Monitor for and minimize impacts from hydraulic fracturing or underground injection control disposal well operation.	Monitor water quality, permafrost, and vegetation near sites where hydraulic fracturing or deep well injection (i.e., underground injection control wells) are occurring for potential contamination or unanticipated impacts. Develop an adaptive management plan that outlines how impacts would be analyzed and potentially addressed.	Air quality; Water resources; Wetlands and vegetation; Fish; Birds; Terrestrial mammals; Marine mammals; Subsistence; Public health; Environmental justice
32	Protect vegetation along ice road routes.	Monitor vegetation along ice road footprints for vegetation damage and compression of soil and vegetation. Because ADNR monitors only tussock tundra and soil compaction, this measure focuses on non-tussock wetlands (including patterned ground) with a Cowardin water regime class of Temporarily Flooded, Saturated, or Seasonally Flooded Ground by vegetation type (total live cover of graminoid, shrub, forb, moss). Additionally, the percentage of bare soil would be monitored with control points and points within ice road footprints to determine changes.	Wetlands and vegetation
33	Provide the Nuiqsut community with a level of control and oversight on baseline studies to Nuiqsut.	The community of Nuiqsut shall be involved in the development of studies in the Project area, from study design to implementation. CPAI shall present planned studies (e.g., study requirements, methodology, timing) to the community and incorporate feedback as practicable. CPAI will provide regular updates to the community about ongoing studies and study planning.	Water resources; Wetlands and vegetation; Fish; Birds; Terrestrial mammals; Marine mammals; Subsistence; Environmental Justice
34	New bridges will not interfere with subsistence activity.	CPAI shall consult with Nuiqsut on the design of proposed Project bridges to ensure they provide adequate clearances and safe passage for boaters traveling along waterways.	Subsistence
35	Protect oilfield workers from retaliation for reporting on-the-job issues.	CPAI shall institute whistleblower protections for CPAI employees or their contractors who report violations to company policy, regulatory requirements, or state and local laws.	Socioeconomics
36	Provide adequate agency (State of Alaska and the NSB) oversight of Project construction and operations to ensure permit compliance.	BLM shall coordinate with the State of Alaska and the NSB to provide an adequate number of inspectors on site during construction and operations of the Project to ensure the project is in compliance with its permits. CPAI shall provide site access and accommodations to the required inspection staff.	All
37	Identify important inter-community subsistence areas.	CPAI shall conduct at least two multi-village workshops during project development to identify important inter-community subsistence areas. The communities included for the Project are at a minimum: Nuiqsut, Utqiaġvik, Anaktuvuk Pass, and Atqasuk.	Subsistence
38	Determine potential impacts mine site blasting has on fish returns and caribou migration.	Develop and conduct a study to monitor for and determine potential impacts that may occur to fish returns and caribou migration from mine site blasting.	Fish; Terrestrial mammals; Subsistence

No.	Objective	Standard/Requirement	Affected Resource(s)
39	Determine if contaminants potentially migrate off the drill site BT2 North pad.	Institute a monitoring program for drill site BT2 North to determine if contamination migrates off the gravel pad. Monitoring shall include water, snow, soil, and vegetation sampling. Any contamination found in excess of State or EPA levels will be reported to ADEC within 72 hours of being determined.	Water resources; Wetlands and vegetation; Fish; Birds; Terrestrial mammals; Marine mammals; Subsistence
40	Nuiqsut residents must rely on imported foods to a greater extent when subsistence resources are negatively impacted by oil and gas development. Protect imported food supplies during transit through Utqiaġvik and Deadhorse to Nuiqsut.	Imported foods are frequently stored improperly and are damaged or ruined prior to arrival in Nuiqsut. CPAI shall pay to construct food storage facilities at airports in Deadhorse and Utqiaġvik to protect perishable goods from precipitation, freezing, spoiling, and wildlife.	Subsistence; Public health
41	Provide laboratory testing in Nuiqsut for standard testing protocols to avoid having to send samples for testing to Utqiaġvik (Barrow), Fairbanks, or Anchorage.	Construct and operate an environmental testing laboratory in Nuiqsut.	Socioeconomics; Environmental justice
42	Minimize the deflection and disruption of caribou migratory patterns.	Restrict noise (e.g., limit drilling, limit construction activity) when caribou are present during the calving and migration periods. When noise is unavoidable, avoid abrupt sounds. A steady drone of noise is easier for caribou to acclimate to, so consider adding a white noise generator if necessary to less abrupt sounds.	Terrestrial mammals; Subsistence
43	Minimize the deflection and disruption of caribou migratory patterns.	Limit the overall activity, including outdoor foot traffic, and minimize air traffic at specific times to reduce impacts to caribou (especially during calving and migration periods).	Terrestrial mammals; Subsistence
44	Minimize the deflection and disruption of caribou migratory patterns.	Minimize visual impacts by fencing or otherwise camouflaging or screening pads and areas that have the most activity and movement. Caribou are more likely to turn away from movement than from structures perceived as stationary objects. Caribou also react more strongly and habituate less readily to foot traffic than to vehicle traffic	Terrestrial mammals; Subsistence
45	Minimize the deflection and disruption of caribou migratory patterns.	Protect hunting success versus biological success by: • Reducing the number of animals required to halt traffic ("let the lead caribou cross"). • Limiting traffic during the fall hunting period (approximately September 15 through October 15) and incorporate local recommendations for the timeframe. • Following the Red Dog Mine model for caribou crossings, which has largely been viewed as successful: • Use recommendations from the subsistence committee. • Stopping regardless of the number of caribou. • Stopping traffic as soon as caribou are sighted or when caribou are a half mile or less from the road. • Incorporate crossing ramps, 7-foot tunnels/overpasses, and/or visual windows into road design when possible.	Terrestrial mammals; Subsistence
46	Minimize the deflection and disruption of caribou migratory patterns.	Buffer the Teshekpuk Caribou Habitat area by 5 to 6 kilometers (3.1 to 3.7 miles) to account for the avoidance response of calving caribou to infrastructure.	Terrestrial mammals; Subsistence
47	Minimize deflection and disruption of caribou migratory patterns.	Use convoys and/or checkpoints to moderate traffic flow and to consolidate traffic in space and time.	Terrestrial mammals; Subsistence

No.	Objective	Standard/Requirement	Affected Resource(s)
48	Minimize the deflection and disruption of caribou migratory patterns through monitoring and awareness.	Employ caribou monitoring personnel to maintain awareness of presence and movements of caribou.	Terrestrial mammals; Subsistence
49	Minimize the deflection and disruption of caribou migratory patterns through suspension of off pad activities at critical times.	Off-pad activities shall be suspended from May 20 through June 20, unless approved by the authorized officer. The intent of this requirement is to restrict activities that would disturb caribou during calving. The permittee shall submit a stop-work plan that considers this, and other mitigation related to caribou early arrival. The intent of this latter requirement is to provide flexibility to adapt to changing climate conditions that may occur over the life of the Project.	Terrestrial mammals; Subsistence
50	Minimize the deflection and disruption of caribou migratory patterns through ground traffic restrictions on permanent oil and gas-related roads.	The following ground traffic restrictions shall apply to permanent oil and gas-related roads: • From May 20 through August 20, traffic speed shall not exceed 15 mph when caribou are within 0.5 mile of the road. Additional strategies may include limiting trips, using convoys, using different vehicle types, stockpiling equipment and materials, etc. to the extent practicable. The permittee shall submit with the development proposal a vehicle use plan that considers these and other mitigation measures. • The permittee shall observe caribou movement from May 20 through August 20, or earlier if caribou are present prior to May 20. Based on these observations, traffic would be stopped: • Temporarily to allow a crossing by 10 or more caribou. The permittee shall submit with the development proposal a vehicle use plan that considers these and other mitigation measures. • By direction of the authorized officer, traffic may be stopped through the Project area for a limited amount of time, and only if necessary to prevent displacement of calving caribou. Such closures will not be undertaken without first consulting with permittees to assess operational impacts on permitted activities.	Terrestrial mammals; Subsistence
51	Minimize the deflection and disruption of caribou migratory patterns through air traffic restrictions.	ROP F-1 requires the use of an Aircraft Use Plan. The plan will include the following: • Minimize Q400 traffic between Alpine and Willow during calving (May 20 to June 20) to reduce impacts to caribou. Q400 traffic between Willow and Kuparuk or Deadhorse is necessary and would be allowed. • Plans to minimize the disturbance to calving caribou (description of areas avoided, how flight numbers were minimized, and that low altitude flights were avoided or limited).	Terrestrial mammals; Subsistence
52	Reduce the impacts to subsistence users resulting from increased travel requirements for subsistence users.	Provide household level vouchers for fuel (not fixed dollar value) to support subsistence activities on a quarter-annual basis.	Subsistence
53	Provide a funding source to support Nuiqsut healthcare needs.	Provide funding to support the Nuiqsut healthcare clinic so that treatment options available in the clinic can address the most frequent concerns (e.g., asthma).	Public health

No.	Objective	Standard/Requirement	Affected Resource(s)
54	Provide a funding source for a professional third-party contractor to design and administer a human health study.	Provide funding to the City of Nuiqsut to contract with a third-party professional organization to develop and administer a human health study. The study shall consider unique aspects to life on the North Slope, including the consumption of subsistence food sources.	Public health
55	Provide BLM with ready access to CPAI's North Slope roads (e.g., Kuparuk, Alpine, Greater Mooses Tooth, Willow).	Develop a road use agreement between CPAI and BLM that provides BLM unfettered access of project gravel and ice roads, except when safety may be jeopardized by road conditions or activity.	Water quality; Terrestrial mammals; Subsistence
56	Continue to the long-term caribou monitoring project in and near Nuiqsut through the life of the Willow Project to provide better understanding of the effects of North Slope oil and gas development on caribou.	Continue to fund the long-term caribou monitoring project in and near Nuiqsut through the life of the Willow Project.	Terrestrial mammals; Subsistence
57	Provide funding for a caribou collaring study within the Willow Project area.	Provide a funding mechanism to support ongoing caribou collar studies through construction of the Willow Project and five years of operations only activity to provide increased understanding of caribou responses to increased oil and gas development.	Terrestrial mammals; Subsistence
58	Support the development of a cultural center in Nuiqsut.	Provide funding to help design and develop a cultural center in Nuiqsut for the community's use.	Sociocultural systems
59	Provide funding for a caribou movement study in the Alpine and Greater Mooses Tooth project areas.	Provide a funding mechanism to support ongoing Teshekpuk Caribou Herd studies in the Alpine and Greater Mooses Tooth project areas with a focus on how caribou respond to roads and vehicle traffic.	Terrestrial mammals; Subsistence
60	Design and construct a Colville River boat ramp.	CPAI will assist the native Village of Nuiqsut with the design and construction of a Colville River boat ramp.	Water resources; Subsistence
61	Reduce air quality impacts during developmental drilling and well stimulation.	CPAI will use Tier 4 engines for developmental drilling and for well stimulation (prior to the high-line power being available from the Willow processing facility).	Climate change; Air quality; Public health
62	Reduce air quality impacts during Project operations	CPAI will use waste heat recovery for building and process heat the Willow processing facility.	Climate change; Air quality; Public health
63	Reduce impacts from ground-vehicle traffic during sensitive wildlife periods (e.g., caribou calving, bird nesting, peak caribou subsistence activity).	CPAI will institute the following restrictions to ground-vehicle traffic in the Willow Project area (i.e., gravel and ice roads extending south/southwest from GMT-2): • The maximum speed limit on Willow gravel roads will be 35 mph to reduce the potential for vehicular accidents and disturbance of caribou. Infield roads that are 25 feet wide will have a maximum speed of 25 mph. • Periodic traffic closures will be instituted when groups of 25 or more caribou appear to be approaching the road and current traffic exceeds 15 vehicles per hour. • Wildlife will always have the right-of-way and vehicle traffic will be slowed or stopped to allow animals to cross Project roads. • Bus transportation will be used as the primary means to transport personnel between camps and their assigned work locations, as well as between camps and the Alpine CD1 airstrip during mobilization and demobilization.	Birds; Terrestrial mammals; Subsistence
64	Design and construct subsistence pullouts and ramps for safety and subsistence user ease.	Subsistence pullouts and ramps will be design and located with subsistence user input and the designs will be evaluated for further improvements.	Subsistence

No.	Objective	Standard/Requirement	Affected Resource(s)
65	Provide safe access to Project roads to Nuiqsut residents, subsistence hunters, and Kuukpik Corporation shareholders	CPAI will institute the same safety access and use guidelines for Project roads as the operating Alpine development and Greater Mooses Tooth facilities.	Subsistence
66	Support the Nuiqsut search and rescue group with equipment needs and staging.	CPAI will engage the Nuiqsut search and rescue group to identify opportunities for CPAI to support them with equipment needs or equipment staging. CPAI will continue to support the Nuiqsut Community Development Foundation which supports the City of Nuiqsut in obtaining and managing these grants for community needs, such as search and rescue.	Public health
67	Prevent collisions by birds with overhead power lines and guy wires during mating, inclement weather (fog), and migration	Add to ROP E-15: Communication towers should be monopoles without guy wires that could be a collision hazard for birds.	Birds
68	Use white strobe lights instead of solid, or pulsating (beacon) red lights to reduce attracting night-migrating birds to tower structures exceeding 200 ft. with required FAA lighting	Add to ROP E-8: For tower structures exceeding 200 feet in height with FAA required lighting, use white (preferable) or red strobe lights. The strobes should be set at the minimum number of flashes per minute allowable by the FAA. The use of solid red or pulsating red warning lights at night should be avoided, if possible.	Birds
69	Protect birds during nesting season	Construction/placement of gravel for roads and pads should occur in winter to avoid damage to nesting birds, eggs, and hatchlings and adjacent tundra habitats. No gravel placement or tundra disturbance should occur during bird nesting season (June 1 to July 31). For FAA airstrip construction, snow removal and the first layer of gravel for the entire airstrip footprint should take place in late May, prior to the onset of the bird nesting season. Additional gravel layers within the footprint can then be placed and compacted throughout the summer without damage to birds and habitats.	Birds
70	Prevent ponding of sheet flow and maintain natural flow during rain events	Place culverts within long linear roads in sufficient number to prevent ponding of sheet-flow and to maintain natural flow throughout break-up and summer/fall rain events.	Water resources
71	Prevent high-water erosion of roads/pads and stream bottoms	Place erosion control material (e.g., supersacks, revetment) on banks of rivers under and adjacent to bridges and adjacent to and on bottom of stream approach and exit of large culvers (when necessary) to prevent high-water erosion of road or pad and stream bottom.	Water resources
72	Protect surface waters	Prohibit the discharge of any contact fluids into surface waters.	Water resources
73	Implementation of an Adaptive Management Plan	Implement an adaptive management plan that includes regular monitoring and is responsive to floodplain impacts, thermokarst development, changes in hydrology, vegetation damage, seasonal flows, water levels, erosion, deposition throughout the project area.	Soils
74	Recover and recycle fugitive emissions	Conduct leak surveys in accordance with New Source Performance Standard (40 CFR 60 OOOa or OOOOb [whichever regulation is applicable at the time]). Recycle the produced gas, not used for fuel or safety flare, and inject it for gas lift for reservoir pressure support.	Air quality
75	Reduce emissions	Use pneumatic devices powered by instrument air alone.	Air quality

No.	Objective	Standard/Requirement	Affected Resource(s)
76	Prevent hydrocarbon emissions	Install vapor recovery units on hydrocarbon process tanks and vessels to prevent hydrocarbon emissions. (Note: these are process vessels and not storage vessels in the regulatory sense of the word. The infield flowlines, processing facility, and sales pipeline design obviate the need for permanent oil storage capacity onsite.)	Air quality
77	Mitigate potential leaks	Use three-phase (gas, oil, and water) lines, which flow from each drill site to the Willow processing facility, and gas injection pipelines which flow from the Willow processing facility to each drill site, instead of gas gathering lines. Both types of overland pipelines have connections that are welded by design and largely avoid flanged connections minimize potential for leaks. None the less, these pipelines will employ the same leak detection surveys as the existing Alpine development (i.e., the lines will be surveyed in accordance with state regulations 18 AAC 75.080).	Air quality

Note: ADEC (Alaska Department of Environmental Conservation); ADF&G (Alaska Department of Fish and Game); ADNR (Alaska Department of Natural Resources); BLM (Bureau of Land Management); BT2 North (drill site BT2 North); BT5 (drill site BT5); CPAI (ConocoPhillips Alaska, Inc.); EPA (U.S. Environmental Protection Agency); FAA (Federal Aviation Administration); GMT-2 (Greater Mooses Tooth 2); GPS (global positioning system); mph (miles per hour); NEPA (National Environmental Policy Act); NPR-A (National Petroleum Reserve in Alaska); NSB (North Slope Borough); ROP (required operating procedure); TLSA (Teshekpuk Lake Special Area).

5.0 NORTH SLOPE BOROUGH REZONING REQUIRED MITIGATION MEASURES*

As part of the North Slope Borough's process to rezone the Willow Project area from Conservation District to Resource District land use designations, the Project received additional review from the NSB. The NSB's rezoning approval included both required stipulations and mitigation measures and conditions of approval. These NSB requirements are intended to further mitigate impacts to wildlife, subsistence use, and public health and safety from the Project. Table I.5.1. summarizes the NSB rezoning required stipulations and mitigation measures and Table I.5.2 summarizes the NSB rezoning conditions of approval.

Table I.5.1. North Slope Borough Rezoning Required Stipulations and Mitigation Measures*

No.	Category	Stipulation or Mitigation Measure
1	Overall/General – Duck Ponds	CPAI and its contractors shall place or affix permanent ownership identification and unique numbering on every duck pond owned and used.
2	Overall/General – Mitigation Fund	CPAI shall mitigate the impacts on local residents related to the additional infrastructure in the area and the potential for reduction of subsistence resource availability, including the impacts related to displacing resources from high priority subsistence use areas. Commencing with the start of construction and continuing for the life the project, in addition to any other agreements CPAI shall make annual payments in the amount of $50,000 per year to a mitigation fund directed and administered by the NSB.
3	Subsistence – Access	CPAI shall consult with the NSB, NVN, Kuukpik, and KSOP at least annually. Examples of uses and developments requiring consultation include but are not limited to the following: (1) construction of facilities and roads; (2) aircraft movement; (3) drilling; and (4) the selection of water sources. Through this consultation, CPAI shall make reasonable efforts to assure that planned activities are compatible with subsistence activities and will not result in unreasonable interference with subsistence harvests or subsistence resources. CPAI shall submit a report of this consultation, including areas of agreement and identification of any unresolved conflicts, to the Administrator prior to the commencement of the uses/developments at issue. The Administrator may take measures consistent with NSB municipal code Title 19 to address any unresolved conflicts relating to said uses/developments.
4	Subsistence – Due Diligence	CPAI shall exercise due diligence to mitigate all adverse impacts on subsistence use activities caused by CPAI's activities.
5	Subsistence – Timing	To the maximum extent practical, initial project construction activities, such as construction of gravel roads, pad, pipeline and bridges, will be done during the winter season.

No.	Category	Stipulation or Mitigation Measure
6	Wildlife and Habitat Protection – General Provisions for Studies on Wildlife and Subsistence	Study designs will be discussed and coordinated with the NSB DWM for submittal to the NSB by March 1, 2021, and each year thereafter as necessary. The NSB DWM and Planning will review, seek revisions as appropriate, and approve the study designs by April 1, 2021, and each year thereafter as necessary.
7	Wildlife and Habitat Protection – General Provisions for Studies on Wildlife and Subsistence	An annual report will be prepared and distributed to NSB DWM and Planning departments by February 15 and a meeting scheduled with NSB DWM and Planning, to occur by April 1. This meeting will discuss the results and the potential need for adjustments to scope to assess possible impacts to caribou, waterbirds, fish, and subsistence users. The Land Management Administrator and Director of the DWM will make the final decision of whether study designs need to be altered and/or additional data collection or analyses are required.
8	Wildlife and Habitat Protection – General Provisions for Studies on Wildlife and Subsistence	CPAI will consult with KSOP on study design prior to submittal to the NSB and provide KSOP with annual reports.
9	Wildlife and Habitat Protection – General Provisions for Studies on Wildlife and Subsistence	CPAI will make data available from their studies annually to the NSB DWM and within a year of completion of the study to the general public through a data archive (e.g., University of Alaska's Geographical Information Network of Alaska, Alaska Ocean Observing System).
10	Wildlife and Habitat Protection – General Provisions for Studies on Wildlife and Subsistence	CPAI will provide the DWM with reports from studies (e.g., wildlife, habitat, erosion) required by other agencies involved in permitting lands associated with the Willow Project, and to the maximum extent practical where multiple study requirements can be aligned, avoid duplication of study efforts among the NSB and such other agencies.
11	Wildlife and Habitat Protection – General Provisions for Studies on Wildlife and Subsistence	To the extent practicable, CPAI and its contractors will minimize flights by hiring local boat drivers, snow machine drivers, and allowing their contractors to camp at a study site.
12	Wildlife and Habitat Protection – General Provisions for Studies on Wildlife and Subsistence	To the extent practicable, CPAI will involve students from Nuiqsut (or other North Slope communities if no students are available from Nuiqsut) in their studies.
13	Wildlife and Habitat Protection – Caribou	CPAI will fund a caribou study to analyze the distribution and movements of caribou around the Willow Project area and adjacent areas to assess habitat relationships and possible impacts from development. CPAI will fund a third-party contractor to: • Characterize pre-construction caribou movements utilizing historic telemetry data • Assist ADF&G or the NSB DWM in the collection of GPS telemetry data (e.g., potential purchase of additional caribou collars or database management) • Determine caribou pre- and post-construction movement rates in relation to roads pipelines and pads associated with their project • Characterize habitat conditions (e.g., snow melt, vegetation habitat, plant biomass, infrastructure) within the study area using best available technology • Evaluate these indices of habitat conditions, with particular attention to possible impacts from development, on the distribution of caribou utilizing the study area
14	Wildlife and Habitat Protection – Birds	CPAI will conduct a study of molting waterfowl in the vicinity of the Willow Project and farther to the west. The final study area will be determined in consultation with the DWM and after consulting with the USFWS to determine the area that is currently being monitored for molting geese. The study will be conducted for at least three years. After that time, the results will be reviewed and a determination will be made about whether the surveys need to continue and if so, for how long. The final determination will be made by the Land Management Administrator and Director of the DWM.
15	Wildlife and Habitat Protection – Birds	CPAI will fund a third-party contractor to conduct a breeding shorebird study in and adjacent to the Willow Project area. As this is known to be important shorebird breeding habitat, baseline studies will be conducted annually pre-development, and at least once every three years after development has been initiated. This study will document shorebird abundance, density, and nesting success.

No.	Category	Stipulation or Mitigation Measure
16	Wildlife and Habitat Protection – Birds	CPAI will fund a third-party contractor to conduct a Yellow-billed loon study in and adjacent to the Willow Project area. To minimize impacts to breeding Yellow-billed loons, the study will document presence and habitat use (breeding/non-breeding) through techniques such as aerial or ground surveys but will avoid nest examination until termination of nesting.
17	Wildlife and Habitat Protection – Fish	CPAI will fund a third-party contractor to collect baseline data to help detect possible impacts, mitigate impacts, or conduct a damage assessment in the event of oil spills and/or release of oil-related products. Potential impacts are not restricted to population level effects.
18	Wildlife and Habitat Protection – Fish	CPAI will repeat required predevelopment studies (baseline) outlined by BLM and USFWS every four years. Should differences be detected from baseline, then CPAI will consult with NSB DWM on whether additional studies are required to explain differences and/or to monitor change. If CPAI divests, sells, or significantly alters management responsibility for the Willow Project, then CPAI is required to provide funding for another year of those studies to incoming management to be conducted during the subsequent summer season.
19	Wildlife and Habitat Protection – Fish	CPAI will experimentally determine the effect of sublethal hydrocarbon exposure and persistence of detection of exposure on two species of fish (fourhorn sculpin and Arctic Cisco) and two prey items of fish, at four temperatures that reflect local seasonal changes (summer, autumn, and spring and winter) using, Alaska North Slope Crude oil and, when available, hydrocarbon from the Willow Project (i.e., not mixed to produce Alaska North Slope Crude). This experimental method must be developed so that it can used to determine whether fish and their prey items have been exposed during accidental releases of hydrocarbons from CPAI operations. If no accidental releases occur in 10 years, then repeat the experiment using more updated tools, methodologies, and analyses, while making sure that previous experimental results can be used for comparison. If data are not sufficient to fulfill this stipulation, additional studies may be required.
20	Wildlife and Habitat Protection – Fish	Fish detected with water mold or other newly emerging infections in both the Nuiqsut Fall Fishery and in areas associated with CPAI's influence will be recorded, collected, and reported to the NSB DWM.
21	Wildlife and Habitat Protection – Water Quality	CPAI will collect data on water quality and hydrology to help detect potential Project related impacts on fish and the subsistence fishery. CPAI will be required to repeat required predevelopment studies (baseline) outlined by BLM and USFWS every four years. Should differences be detected from baseline, then CPAI will consult with NSB DWM on whether additional studies are required to explain differences and/or to monitor change. If CPAI divests, sells, or significantly alters management responsibility for the Willow Project, then CPAI is required to provide funding for another year of those studies to incoming management to be conducted during the subsequent summer season.
22	Wildlife and Habitat Protection – Subsistence	CPAI will fund a contractor to design and conduct a subsistence study that investigates the effects of CPAI's Willow Project development activities and associated infrastructure, as well as future exploration and development activities and associated infrastructure, to subsistence hunters from Nuiqsut. The study should focus on all of CPAI's facilities and activities within the area that is subject to this re-zone, as well as facilities and activities outside of this area that have the potential to impact subsistence resources and activities within the area, as determined by discussions with the NSB DWM and Planning staff. The project should at a minimum: • Examine possible effects from CPAI developments and activities to subsistence activities, especially on caribou and migratory bird hunting • Document hunter concerns and opinions about impacts from CPAI's facilities and activities associated with this rezone
23	Minimizing Traffic Impacts – General	CPAI shall coordinate with KSOP, Kuukpik, and the NSB DWM and Planning departments to establish standard air traffic routes that will minimize interference with animal concentrations. (Concentrations of caribou herds are of particular concern.) CPAI shall follow these routes unless there is a threat to human safety, or an animal concentration or subsistence user is positioned along the routes.
24	Onshore Oil and Gas Pipelines and Roads – General	Siting, design, construction, and maintenance of pipelines must minimize alteration of shorelines, water courses, wetlands, and tidal marshes and avoid significant disturbance to important habitats and critical migration periods.

No.	Category	Stipulation or Mitigation Measure
25	Onshore Oil and Gas Pipelines and Roads – Consolidation	Permanent oil and gas facilities, including gravel pads, roads, airstrips, and pipelines, must be consolidated to the maximum extent possible.
26	Onshore Oil and Gas Pipelines and Roads – Wildlife Crossing	Pipeline design and construction shall be based on the best available information and include adequate pipeline elevation, ramping, or burial to provide for unimpeded wildlife crossing. Aboveground pipelines and all associated infrastructure (including fiber optic and other cables) must be elevated at or above the 7-foot minimum height except at those points where the pipeline intersects a road, pad, or caribou ramp, or is constructed within 100 feet of an existing pipeline that is elevated less than 7 feet.
27	Onshore Oil and Gas Pipelines and Roads – Placement	Pipelines must be separated from roads by a minimum distance of 500 feet (except at those points where the pipeline intersects a road, pad, or caribou ramp).
28	Onshore Oil and Gas Pipelines and Roads – Placement	Pipelines shall not be constructed at a distance greater than 1,000 feet from any access road.
29	Onshore Oil and Gas Pipelines and Roads – Placement	Permanent oil and gas facilities, including gravel pads, roads, airstrips, and pipelines, are prohibited on the lake or lakebed and within 1,500 feet of the ordinary high-water mark of any fish-bearing deep lake (i.e., depth greater than 4 meters). If the fish-bearing status of a lake is unknown, the burden is on CPAI to demonstrate whether fish are present.
30	Onshore Oil and Gas Pipelines and Roads – Drainage	Appropriate facilities shall be installed to ensure adequate drainage patterns.
31	Onshore Oil and Gas Pipelines and Roads – Sedimentation	CPAI will monitor for sedimentation build-up or scouring resulting from all bridges and provide the Administrator with results of such monitoring on a regular basis. The Administrator may require measures to mitigate sedimentation and scouring, including dredging, to ensure that the subsistence use area is maintained.
32	Economic Opportunity – Job Fairs	CPAI will host a job fair annually in Nuiqsut beginning after the Assembly's approval of CPAI's Application.
33	Economic Opportunity – Employment Reports	CPAI shall submit annual reports to the Administrator by December 1st of each year showing the number of NSB residents employed by CPAI by job type. Overall employment statistics will be part of this reporting, showing the percentage of NSB resident employment, separate for Alaska resident employment. The overall employment report will also reflect the total workforce, by resident location, of CPAI' s workforce in Alaska.
34	Economic Opportunity – Bids	When CPAI solicits bids, it shall invite North Slope suppliers, subcontractors, and regional and village corporations to bid on Willow projects for which they are qualified.
35	Economic Opportunity – Subsistence Policy	NSB strongly urges CPAI to adopt a formal policy to avoid scheduling disruptions and misunderstandings when subsistence leave is needed while employed by CPAI. The use of seasonal employment options as a method of addressing subsistence leave flexibility is not a meaningful method of employment that allows NSB residents to gain CPAI workplace experience. This requirement should be passed onto all CPAI contractors to the maximum extent allowable.
36	Economic Opportunity – Land Management Orientation	NSB shall provide land management orientation for CPAI for its Willow projects on an annual basis.
37	Economic Opportunity – Subsistence Representative	CPAI shall fund a year-round subsistence representative.
38	Cultural and Historical Site Protection – Data Points for Critical Sites	CPAI must contact the NSB IHLC Division at (907) 852-0422 and SHPO to obtain a set of data points for sites of possible historic, prehistoric, cultural, traditional, archeological, and paleontological significance (Critical Sites). CPAI will maintain the data provided by IHLC in a secure place for internal use only and shall not disclose that data to any other person or entity except SHPO and those entities with a need to know for the purposes of the planned Willow and associated developments and associated facilities, including roads, bridges, gravel pads, airstrips, and pipelines. CPAI will retain and update this data throughout the life of the development project. Prior to the completion of the development project, CPAI will come to an agreement with IHLC as to the disposition of IHLC data once the project is completed. Data points provided by IHLC in the form of geographic coordinates may be imprecise. CPAI is nevertheless responsible for ensuring that its operations do not cause any adverse impacts to Critical Sites and for reporting to IHLC the proper coordinates of any such site discovered. CPAI will release NSB from any liability associated with CPAI's use of these data points.

No.	Category	Stipulation or Mitigation Measure
39	Cultural and Historical Site Protection – Buffer Zones	CPAI must maintain an effective buffer zone around all sites of possible historic, prehistoric, cultural, traditional, archeological, and paleontological significance (Critical Sites). An effective buffer zone will be at least 500 feet unless a smaller zone is necessary and can be mutually agreed upon by CPAI and the NSB Planning Department. CPAI must train its staff and contractors to observe this buffer and ensure that Critical Sites are not disturbed.
40	Cultural and Historical Site Protection – Discovery of Remains or Materials	Should any human remains or possible historic, prehistoric, cultural, traditional, archeological, and paleontological significant materials (Critical Site materials), including, but not limited to artifacts, house mounds, grave sites, ice cellars, and fossilized animal remains, be discovered in the course of this field survey that were not already identified by IHLC or SHPO, CPAI must stop all work in the vicinity of the discovery until CPAI has made contact with IHLC at (907) 852-0422, SHPO and, in the case of human remains, the Alaska State Troopers, and has obtained these agencies' approvals to continue work. CPAI must submit any information discovered that may be of historic, prehistoric, cultural, traditional, archeological, and paleontological significance to IHLC (including, but not limited to artifacts, house mounds, grave sites, ice cellars, and fossilized animal remains). CPAI must not disclose that data to any other person or entity except SHPO and those entities with a need to know for the purposes of working on the planned Willow and associated developments and associated facilities (including roads, bridges, gravel pads, airstrips, and pipelines). CPAI must not remove or disturb any items that may be of historic, prehistoric, cultural, traditional, archeological, and paleontological significance, except to the extent needed to document their existence and to comply with state and federal law and this ordinance.
41	Cultural and Historical Site Protection – Allotments	CPAI must not trespass on Native Allotments or private property. Owner permission must be obtained in advance to enter onto the surface of these lands. CPAI must work with the Inupiat Community of the Arctic Slope and Native Allotment owners in and around the area in a beneficial manner.
42	Cultural and Historical Site Protection – Site Visits	Upon IHLC's request, CPAI must allow an IHLC representative to accompany CPAI during field work. The IHLC representative shall comply with all CPAI safety and operational rules and requirements when accompanying CPAI during field work.
43	Reclamation Plan – General	An abandonment/reclamation plan must be submitted to the Administrator within three years of cessation of permitted activities. At a minimum, the plan must contain: • A grading and site plan drawn and certified by an Alaska licensed professional engineer or land surveyor, indicating the areas excavated or filled, the proposed finished grades and contours, drainage directions and any control structures to be installed. • The methods and plans to be employed for reclamation of the site during and after the activity shall be stated along with a timetable for completions. • A description of all roads and structures and a site map showing the locations of all roads and development which will be built indicating which ones will remain after cessation of activities. • A description of any known reclamation requirements of any other governmental entity, and a copy of any reclamation plan under development or in existence for the activity. • All maps shall be submitted at a scale of one inch equals 200 feet extending 200 feet beyond the site area with a maximum contour interval of five feet. The scale requirements may be adjusted by the Administrator to fit unusual circumstances.
44	State, Local, and Federal Compliance – Other Permits	This approval shall not become effective until all other local, state, and federal permits, approvals, and authorizations have been issued. CPAI shall comply with all local, state, and federal laws and regulations for all projects within the Unit area.
45	Tundra Protection – General	Vehicles must be operated in a manner such that the vegetative mat of the tundra is not disturbed, and blading or removal of tundra or vegetative cover is prohibited unless specifically approved by the NSB Land Management Administrator or his designee.
46	Tundra Protection – General	Development is required to maintain the natural permafrost insulation quality of existing soils and vegetation.
47	Tundra Protection – General	Trails, campsites, and worksite must be kept clean. No littering is allowed. All solid waste including incinerator residue must be backhauled to an authorized solid waste disposal facility.
48	Tundra Protection – General	Winter on-tundra travel may begin when six inches of snow cover and twelve inches of frost depth conditions exist, consistent with State regulations, for the activities intended as determined by an authorized field representative of the Administrator. Certain on-tundra activities may begin sooner than others depending on the impact or magnitude of the operations.

No.	Category	Stipulation or Mitigation Measure
49	Tundra Protection – General	After April 15 of each year, on-tundra travel must be subject to termination within 72 hours of notification by the NSB Administrator or his/her designee for protection of surface vegetation.

Note: ADF&G (Alaska Department of Fish and Game); BLM (Bureau of Land Management); CPAI (ConocoPhillips Alaska, Inc.); DWM (Department of Wildlife Management); GPS (global positioning system); IHLC (department of Inupiat History, Language and Culture); KSOP (Kuukpik Subsistence Oversight Panel); Kuukpik (Kuukpik Corporation); NSB (North Slope Borough); NVN (Native Village of Nuiqsut); SHPO (Alaska State Historic Preservation Office); USFWS (U.S. Fish and Wildlife Service).

Table I.5.2. North Slope Borough Rezoning Conditions of Approval*

No.	Category	Condition of Approval
1	Wildlife Disturbance – Gravel Infrastructure	CPAI will use insulation in the Willow gravel infrastructure to reduce the height (and visual barrier) of these features to minimize impacts on caribou movement, subject to obtaining necessary permits and agency authorizations. CPAI will submit a detailed implementation plan, including explanation of where insulation is and is not practicable, to the NSB by September 30, 2021, pursuant to NSBMC Chapter 19.50.
2	Wildlife Disturbance – Airstrip	CPAI will reduce the length of the Willow airstrip to a maximum 5,700 feet long. Final approval of the airstrip dimensions will be determined in accordance with NSBMC Chapter 19.50. CPAI has no plans to use the Willow airstrip for Boeing 737s or similar passenger aircraft, and therefore will leave the surface of the runway as gravel. Any modification of this condition, including the use of Boeing 737s or similar passenger aircraft, will require approval of the NSB Assembly. The airstrip permit application will include an analysis of required runway dimensions based on aircraft manufacturer guidance, Federal Aviation Administration requirements and recommendations, safety considerations, and engineering best practices.
3	Use Plans – Vehicle Plan	CPAI will provide the NSB a vehicle plan that includes restrictions on, and minimization of vehicle use, during sensitive periods (e.g., caribou calving, bird nesting, peak caribou subsistence activity).
4	Use Plans – Aircraft Plan	CPA will provide the NSB an aircraft plan that minimizes aircraft use during sensitive time periods (e.g., caribou calving, bird nesting, peak caribou subsistence activity) and will include a communication protocol with the local community. An aircraft plan will be developed in consultation with the NSB Wildlife Department and submitted for review and approval, in accordance with NSBMC Chapter 19.50, at least six months prior to the Willow airstrip commissioning.
5	Use Plans – Diesel Use Plan	CPAI will submit a diesel use plan for review and approval, in accordance with NSBMC Chapter 19.50, by October 31, 2021. The plan will include an analysis of diesel transportation, including the conversion of existing pipelines or the utilization of Willow pipelines authorized in the Willow Master Development Plan Environmental Impact Statement Record of Decision for diesel transportation. The objective of this plan is to minimize traffic impacts and spill impacts due to human error on roads in high-use subsistence areas.
6	Subsistence – Good Neighbor Policy	CPAI will develop a Good Neighbor Policy on caribou in consultation with the community of Nuiqsut and the NSB Wildlife and Planning Departments. During the construction period of the Willow Project (prior to start-up of the central processing facility), if requested by the NSB Subsistence Mitigation Committee, in addition to the existing contributions, CPAI will provide an annual air charter for a group of Nuiqsut hunters and their gear to support caribou subsistence activities. This will be requested and administered by the NSB's Subsistence Mitigation Committee.
7	Mitigation – Mitigation Fund Agreement Amendments	CPAI will amend Section 1(b) of the Oil Spill Mitigation Fund Agreement for the Alpine Development District (executed August 2019) ("Agreement"), to incorporate the Willow Development District into the Agreement, with an effective date prior to Willow first oil. The Agreement will also be amended to include spills to land. To accomplish that, Section 2(a)(i) of the Agreement will be deleted in its entirety and replaced with the following: "CPAI's oil and gas activities in the Alpine or Willow Development Districts cause oil to be present on land or in the water, or on the ice over water." CPAI will submit this amendment for NSB review and approval, in accordance with NSBMC Chapter 19.50, six months prior to anticipated Willow first oil.

Note: CPAI (ConocoPhillips Alaska, Inc.); NSB (North Slope Borough); NSBMC (North Slope Borough Municipal Code).

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6.0 REFERENCES

ADF&G. 2002. *Aquatic Nuisance Species Management Plan*. Juneau, AK: ADF&G, Aquatic Nuisance Species Task Force.

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Lawhead, B.E., A.K. Prichard, M.J. Macander, and M. Emers. 2004. *Caribou Mitigation Monitoring Study for the Meltwater Project, 2003: Third Annual Report*. Anchorage, AK: Prepared by ABR, Inc. for ConocoPhillips Alaska, Inc.

Limpinsel, D.E., M.P. Eagleton, and J.L. Hanson. 2017. *Impacts to Essential Fish Habitat from Non-Fishing Activities in Alaska: EFH 5-Year Review, 2010 through 2015*. NOAA Technical Memorandum NMFS-F/AKR-14. Anchorage, AK: NMFS.

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Yokel, D., D. Huebner, R. Meyers, D.A. Nigro, and J.M. Ver Hoef. 2007. *Offsetting Versus Overlapping Ice Road Routes from Year to Year: Impacts to Tundra Vegetation*. Anchorage, AK: BLM.

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Willow Master Development Plan

Appendix I.2
ConocoPhillips Road Optimization Memorandum

August 2020

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ConocoPhillips Road Route Screening Process

June 5, 2019

Introduction

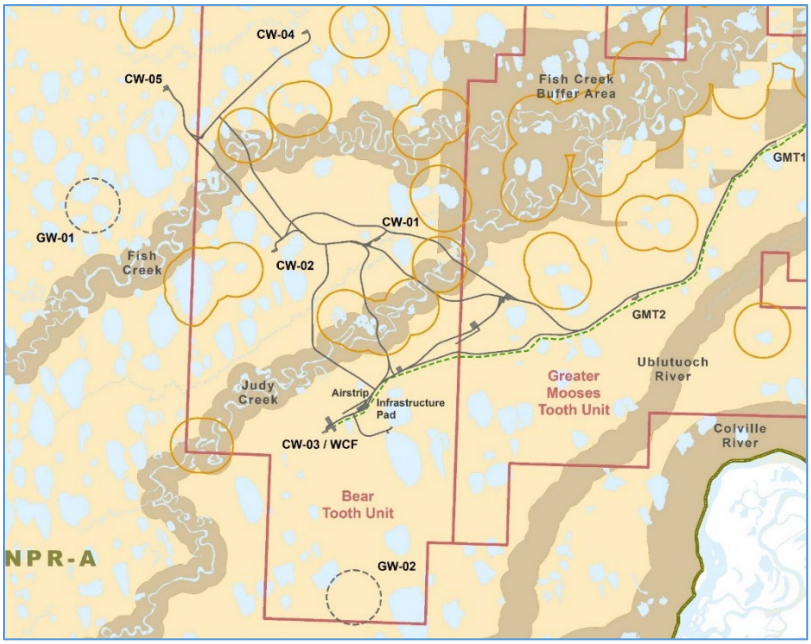
On March 3, 2019, ConocoPhillips Alaska, Inc. (CPAI) hosted a meeting with the Bureau of Land Management (BLM), the U.S. Environmental Protection Agency (EPA), and the U.S. Army Corps of Engineers (USACE). The purpose of the meeting was to review the evolution of road route concepts assessed by CPAI for the Willow development. From 2017 through the first half of 2019, CPAI undertook a significant program of field research and data gathering to inform infrastructure placement and road routing options for the Willow development. CPAI initially considered over 20 road route options, which were screened by CPAI down to three development concepts for analysis in the Environmental Evaluation Document (EED). This memo summarizes the process used by CPAI to generate road route concepts, and to perform screening evaluations of those concepts. This memo also documents information that was discussed during the March 3rd meeting with EPA and the USACE.

Initial Route Creation and Screening

Beginning in 2017, information was compiled and analyzed by a multidisciplinary team of civil engineers, petroleum engineers, environmental scientists, biologists, North Slope operations personnel, geoscientists, and construction planners in order to identify and minimize potential environmental impacts in addition to optimization of the overall road routing.

CPAI personnel and consulting experts identified initial road segments using a combination of satellite imagery and aerial photography, environmental studies (caribou, fish, avian, wetlands, hydrology, and cultural resource surveys), exploration and environmental field expertise, and an awareness of subsistence hunters' perspectives. Twenty-two road segments were developed, which were then organized into eight potential road alignments. Figure 1, below, shows the initial route alignments.

Figure 1. 2017 Initial Willow Road Segments



CPAI screened the road route options considering the following:

- Best Management Practices (BMPs) and Stipulations from BLM's 2013 Integrated Activity Plan for the NPR-A
- Guidelines in the BLM NEPA Handbook

- Section 404 of Clean Water Act and Section 10 of the Rivers and Harbors Act considerations, including a Least Environmentally Damaging Practicable Alternative (LEDPA). Practicability included costs, safety, and logistics.
- National Environmental Policy Act (NEPA) guidelines on alternatives selection
- Key comments from stakeholders on recent developments in the region
- Light Detection and Ranging (LIDAR) survey data, and a preference to avoid higher value wetlands
- Integrated Terrain Unit (ITU) habitat and wetlands mapping
- Avian Studies including yellow-billed loon nest observations
- Fish surveys and lake bathymetry data
- Hydrology studies
- Cultural resource surveys
- Subsistence surveys, including an awareness of locally important resources, methods, and use areas
- Caribou surveys
- Engineering recommendations for suitable bridge crossing locations and bridge span length
- Total road mileage and acreage of gravel fill in wetlands
- Support for future development by potentially reducing impacts from future projects on other CPAI leases
- Spill avoidance, inspection, and response
- Health and safety considerations

During the summer and fall of 2017, CPAI conducted studies to inform initial road routing options from infrastructure in the Greater Mooses Tooth Unit (GMTU) to the early Willow drillsite locations (CW-01 through CW-05).

Note that the early Willow drillsite locations are not the same locations as those now being considered for the Willow Master Development Plan (MDP) Environmental Impact Statement (EIS). Rather, the early locations were determined based on subsurface information known at the time. Drillsite locations have since been refined based on additional information as described below.

The initial eight road alignments were split into three categories:

- Northern routes: The most direct access from GMT2 to the early Willow CW-01 and CW-02 drillsite locations.
- Mid-routes: The most direct access to the full suite of Willow infrastructure including the proposed processing facility location, minimizing road lengths and providing the shortest bridge lengths at stream crossing locations.
- Southern Routes: These routes best complied with stipulations and/or BMPs in the 2013 Integrated Activity Plan (IAP; BLM 2013) and minimized the number of waivers required.

Criteria used to evaluate the eight routes included:

- Total road mileage, used to compare relative wetlands impacts and cost
- Judy Creek bridge crossing location and length, including potential impacts to streams from pier groups.
- Road length within the 3-mile wide Fish Creek setback established by IAP BMP K-1
- Conformance with other BLM stipulations including:
    - Avoidance of yellow-billed loon nest/nesting lake setbacks (IAP BMP E-11)

- Avoidance of 500-foot setback around waterbodies (IAP BMP E-2)
- Avoidance of ¼-mile setback around deepwater lakes (IAP BMP K-2)

- Route uniqueness compared with other routes.

Potential impacts to cultural resources were also considered, however, no impacts to cultural resources were identified for any of the evaluated routes thus it was not a differentiating factor in route selection.

Of the eight routes evaluated, four were screened out by CPAI and the remaining routes were analyzed in in more detail. Table 1 summarizes the eight routes evaluated and additional details are provided in the EED.

Table 1. Initial Road Route Alternatives Evaluated

Route	Road Miles[1]	Judy Creek Bridge (ft.)	Crosses Fish Creek Setback[2]	Crosses YBLO Buffer	Advanced for CPAI Analysis	Notes
North 1	37.6 mi	450	Y	Y	Y	Provides the most direct access from GMT2 to CW-01 and an optimal crossing location of Judy Creek with one of the shortest bridges. Includes essential crossing of the Fish Creek Setback (BMP K-1).
North 2	38.9 mi	-	Y	N	N	Similar to but longer mileage than North 1 and North 3. Places 2 miles of road in Fish Creek Setback (BMP K-1). Route not sufficiently distinct from other routes evaluated (North Route 1) but would require additional deviation from BMP K-1. Other similar routes (North Route 1, North Route 3) further minimize or avoid infrastructure in Fish Creek setback.
North 3	36.9 mi	1,400	N	Y	Y	Provides direct access from GMT2, but it would have a longer bridge crossing of Judy Creek than North 1.
Mid 1	35.5 mi	420	N	Y	Y	Provides shortest overall road length and minimizes tundra footprint.
Mid 2	42.3 mi	420	N	Y	N	Not sufficiently distinct from other routes evaluated (Mid Route 1) and would require additional deviation from BMP E-11. Other similar routes would have a smaller total footprint.
South 1	37.0 mi	1,850	N	N	Y	Conforms to BMPs and stipulations to the maximum extent practicable but has the longest bridge crossings of Judy Creek.
South 2	42.3 mi	1,850	N	N	N	Not sufficiently distinct from other routes evaluated (South Route 1). Other similar routes would have a smaller total footprint.
Southwest	37.3 mi	-	N	N	N	Not sufficiently distinct from other routes evaluated (South Route 1) and would require additional deviation from BMP K-2. Other similar routes further minimize infrastructure near deepwater lakes.

[1] Road mileages evaluated with common crossing of Fish Creek to access northern drillsites
[2] Established by BMP K-1; excluding essential crossings
Y: Yes; N; No; -: not evaluated; ft.: feet; BMP: best management practice

In addition to the eight routes discussed above, two Fish Creek crossing locations were also considered to connect drillsites CW-04 and 05 to the CW-02 area: west and central routes (see Figure 1). Table 2 describes the routes considered.

Table 2. Fish Creek Crossing Alternatives Evaluated

Route	Road Miles	Fish Creek Bridge (ft.)	Crosses Fish Creek Setback[1]	Crosses YBLO Buffer	Advanced for further CPAI Analysis	Notes
West	12.9	850	N	N	Y	Avoids known yellow-billed loon setbacks (BMP E-11) and provides the shortest alignment to early drillsite locations.
Central	13.4	650	N	Y	N	Provides shortest Fish Creek bridge but requires more road length, gravel fill, and crosses through yellow-billed loon setback (BMP E-11) near Fish Creek.

[1] Established by BMP K-1; excluding essential crossings
Y: Yes; N; No; -: not evaluated; ft.: feet; BMP: best management practice

Figures 2 through Figure 5 show the four road routes that were advanced during the 2017 screening process.

Figure 2. North Route 1 Road Alignment

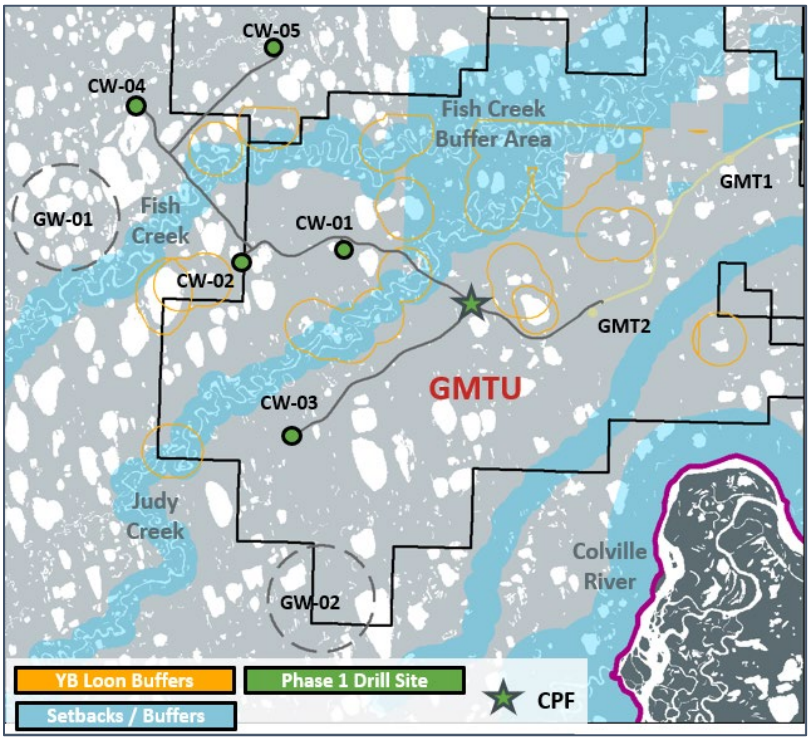


Figure 3. North Route 3 Road Alignment

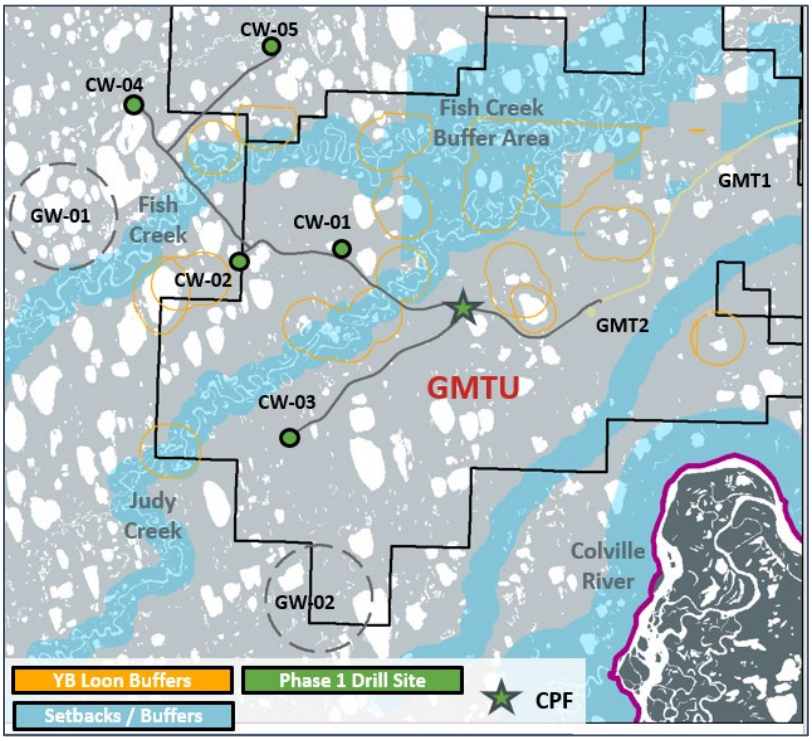


Figure 4. Mid Route 1 Road Alignment

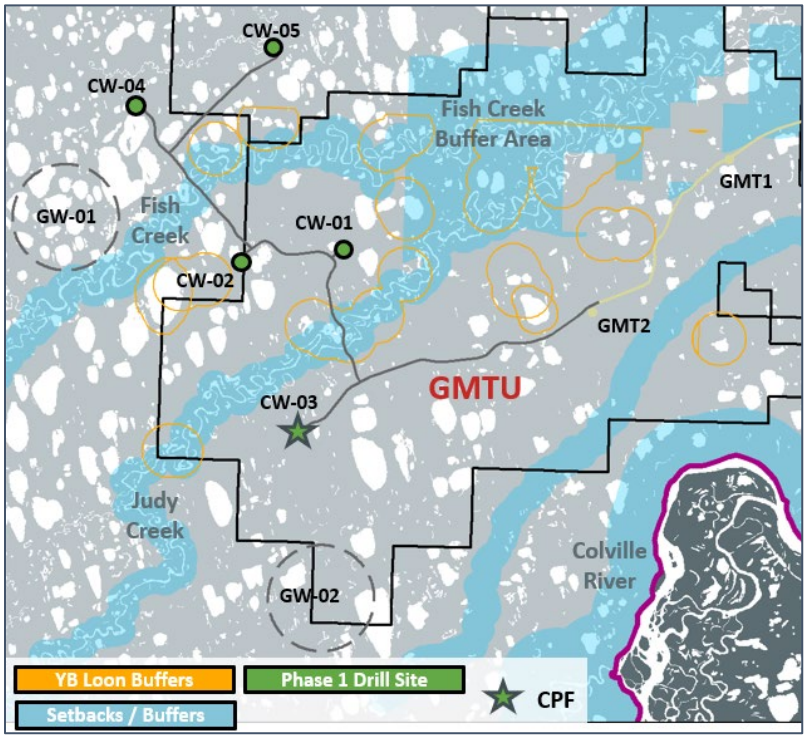
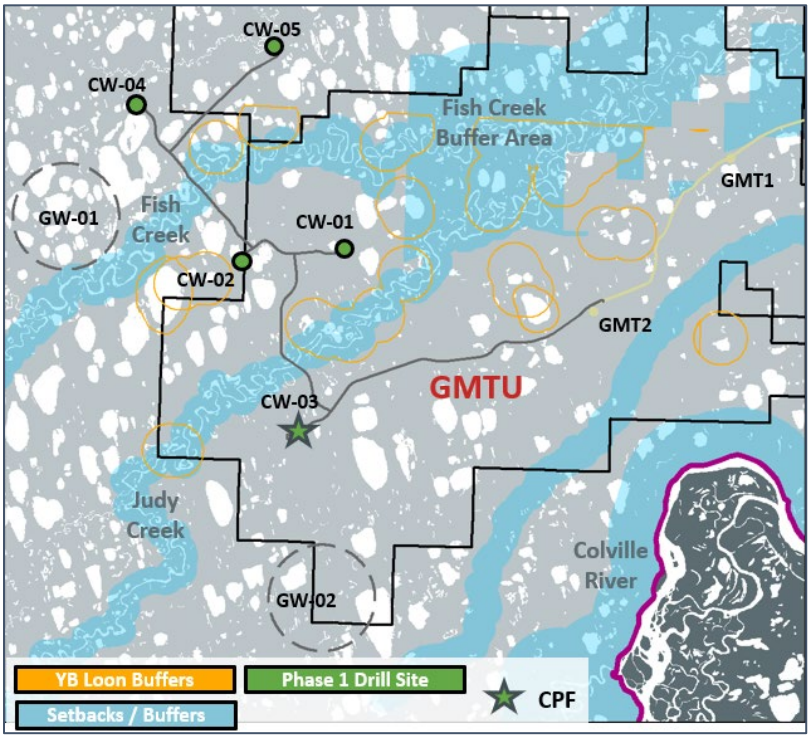


Figure 5. South Route 1 Road Alignment



Drillsite Location Refinement and EED Route Identification

After analyzing subsurface data from the 2018 Willow appraisal drilling season, CPAI refined some drillsite locations to further optimize recovery of the subsurface resource, while minimizing surface disturbance. The updated drillsites were located within the overall geographic area as the original sites, and the road routing evaluation criteria that was used during the previous screening effort was utilized to assess road route options to the new drillsite locations. Project engineers reevaluated the same general alignment corridors, bridge crossing locations, and road segments identified in 2017. During the spring and summer of 2018, LIDAR surveys were conducted throughout the field in order to further refine road routings, stream crossings, and bridge locations. New data from ongoing environmental studies including hydrology, avian surveys, fish surveys, ITU and wetlands mapping, and caribou surveys were also incorporated into route development and evaluation. CPAI shared the initial road alignments with the BLM and other regulatory agencies and received feedback that was also incorporated into road alignment reevaluation.

Route development and evaluation criteria and considerations were similar to those identified during initial route creation and screening but incorporated additional and/or more refined data. Criteria used for route development and evaluation included:

1. Gravel Footprint: Early analysis utilized road mileage as a surrogate for gravel footprint, as it assumed constant road width and depth based on aerial photography. Subsequent analysis used the LIDAR survey data and routings were optimized to avoid significant topographic changes that would increase gravel depth and footprint.
2. Caribou Migration Effects: Care was taken to minimize the potential for corralling effects due to loops or forks in the road.
3. Avoidance of Special Areas: Priority was given to avoidance of the Fish Creek 3-mile buffer (BMP K-1) as well as minimizing roadway length in the Judy Creek and Fish Creek ½-mile buffers upstream of the Fish Creek/Judy Creek confluence (BMP K-1). Additional special area considerations given to the Colville River Special Area and the Teshekpuk Lake Caribou Habitat Special Area (BMP K-5)

4. Stream Crossings: Routes were selected and evaluated with consideration given to the minimization of stream crossing impacts, mainly evaluated by the number of pile groups or pier groups in waterbodies.
5. Yellow-billed Loon Setback: Routes minimized crossing yellow-billed loon setbacks (defined as the area 1-mile from identified nests and 500 meters from the nesting lakes as stipulated in BMP E-11). Some routes may cross buffers where tradeoffs exist between crossing a setback and other potential environmental impacts, such as increased gravel fill. Discussion with BLM personnel in 2018 indicated that a waiver process allows for encroachment into setback, if it avoids causing more substantial impacts elsewhere, and that reducing gravel fill should be prioritized over encroaching within the setback.
6. Waterbodies Setback: Routes maintained waterbodies setback of 500 feet as stipulated in the 2013 IAP (BMP E-2)
7. Deep Water Lakes Setback: Routes maintained deep water lakes setback of ¼ mile as stipulated in the 2013 IAP (BMP K-11)
8. Teshekpuk Lake Caribou Habitat Area: Minimization of footprint in the Teshekpuk Lake Caribou Habitat Area (IAP BMP K-5)
9. General use of higher, drier ground: This is both a good engineering and maintenance practice, as well as use of a general assumption that drier ground was correlated with less highly functioning wetland areas.

Based on this evaluation, two road alignments, generally based on the Mid Route 1 and South Route 1 initial road alignments, were selected for further analysis as part of three alternatives within CPAI's Willow MDP EED.

EED Alternative 1

EED Alternative 1 was based generally on the road alignments evaluated as part of the Mid Route 1 alignment. The overarching goal in developing this road alignment was to minimize wetland impacts by selecting the most direct route from GMTU to proposed Willow facilities. This included the minimization of road length as well as the minimization of road footprint through optimization of topography by locating the road on generally higher, drier ground. It would also minimize wetland impacts by selecting optimal stream crossings to minimize bridge crossing lengths and gravel footprint within floodplains and adjacent wetlands. Alternative 1 would provide the shortest road alignment between drillsites and minimize the length of the Judy Creek bridge (420 feet) but it has the tradeoff of passing through yellow-billed loon nest/nesting lake setbacks near Judy Creek and would have a longer bridge at the Fish Creek crossing (1,100 feet). (Note: please refer to the EED for maps of the EED Alternatives.)

EED Alternative 2

Based on guidance from the BLM, this alternative sought to minimize the number of waivers to the 2013 IAP BMPs but requires tradeoffs of a greater gravel footprint and sub-optimal stream crossings. A major factor in this routing is avoidance of the yellow-billed nest buffers (BMP E-11), which drives additional road length, a longer bridge crossing of Judy Creek stream, the longest road mileage of the routes considered, and substantially more infrastructure in the Teshekpuk Lake Habitat Area (BMP K-5).

EED Alternative 3

This alternative evaluated a development scenario where the Willow area is not connected by gravel road to GMTU. This alternative reduces overall gravel footprint but results in tradeoffs of additional air traffic, freshwater use, subsistence impacts and reduced stakeholder access benefits, and challenges in emergency response (including spill) access. The gravel road alignments from the Willow processing facilities to each drillsite follow the same alignments considered as part of EED Alternative 1.

EED Alternative Evaluation

Table 2 summarizes CPAI's analysis of the road alignments evaluated in the Willow EED (September 2018) based on the evaluation criteria. Based on the overall minimization of gravel fill (and thus minimization of fill in wetlands and other water of the U.S.), minimization of the length of the Judy Creek bridge crossing, and balancing other environmental tradeoffs including compliance with the 2013 IAP BMPs, CPAI selected Alternative 1 as its proposed project for Willow development.

Table 2. Alternative Road Routes Evaluated

Project Component		Alternative 1	Alternative 2	Alternative 3
Gravel Roads		37 miles; 273 acres Eight 0.3-acre turnouts with ramps (2 acres total)	45 miles; 326 acres Nine 0.3-acre turnouts with ramps (3 acres total)	28 miles; 200 acres Six 0.3-acre turnouts with ramps (2 acres total)
Bridges (number)		8	10	7
Bridges (length)	Judy Creek	420 feet	1,850 feet	420 feet
	Judy Creek Kayyaaq	75 feet	Crossing 1: 75 feet; Crossing 2: 75 feet	75 feet
	Fish Creek	1,100 feet	850 feet	1,100 feet
	Kalikpik River	500 feet	550 feet	500 feet
	Willow Creek 2	80 feet	80 feet	NA
	Willow Creek 4	130 feet	130 feet	130 feet
	Willow Creek 4a	90 feet[1]	90 feet[1]	90 feet[1]
	Willow Creek 5	NA	20 feet[1]	NA
	Willow Creek 7	NA	75 feet[1]	NA
	Willow Creek 8	30 feet[1]	NA	30 feet[1]
	Other	Stream and cross drainage culverts as required	Stream and cross drainage culverts as required	Stream and cross drainage culverts as required
Acres in Special Areas	Acres in Colville River Special Area	8 acres	8 acres	NA
	Acres in Teshekpuk Lake Special Area	110 acres	130 acres	103 acres
Compliance with BLM BMPs	Acres in Teshekpuk Lake Caribou Habitat Area (BMP K-5)	19 acres, no deviation anticipated	56 acres, no deviation anticipated	19 acres, no deviation anticipated
	Yellow-billed Loon Nest/Lake Setback Deviations (BMP E-11)[2]	Lake M0151 (nesting lake shoreline setback) Lake M1522 (nesting lake shoreline setback, nest setback) Lake M1523A (nesting lake shoreline setback, nest setback) Lake M1524 (nest setback) Lake M0303 (nest setback)	Lake M0151 (nesting lake shoreline setback)	Lake M1522 (nesting lake shoreline setback, nest setback) Lake M1523A (nesting lake shoreline setback, nest setback) Lake M1524 (nest setback) Lake M0303 (nest setback)
	River Setback Deviations (BMP K-1)	Essential road/pipeline crossing of Judy Creek Essential road/pipeline crossing of Fish Creek	Essential road/pipeline crossing of Judy Creek Essential road/pipeline crossing of Fish Creek	Essential road/pipeline crossing of Judy Creek Essential road/pipeline crossing of Fish Creek
	Deepwater Lake Setback Deviations (BMP K-2)	Lake M0015	Lake M0015	Lake M0015

[1] Bridge versus culvert battery crossing structure to be determined.
[2] 1-mile nest setback and 1,625-foot (500-meter) nesting lake shoreline setback.
Notes: All values are approximate and subject to change; BMP: best management practice.

EIS Alternative Development

A description of the EED Alternatives was submitted to BLM and co-operating agencies in May 2018 and updated in September 2018. CPAI understands that these alternatives were considered by the agencies as part of the EIS alternative development process.

Since submittal of the EED, CPAI has also supported EIS alternative development through technical and engineering support. This has included further refinement and changes to the proposed project based on agency feedback. For example, in October 2018, at the request of BLM and co-operating agencies, CPAI evaluated moving the BT4 drillsite out of the Teshekpuk Lake Caribou Habitat Special Area (K-5) and east of the Kalikpik River. While infrastructure and development are allowed within the K-5 area, the agencies suggested locating the drill site outside of this area if practical. CPAI evaluated this request and was able to accommodate it with an associated negative impact to subsurface resource recovery. The shift of the BT4 drillsite caused another evaluation of the road route between BT2 and BT4 including the elimination of a bridge over the Kalikpik River.

CPAI also continued to advance engineering for the proposed project this spring to further avoid and minimize impacts. The most recent revision to the proposed project (March 2019) optimized the road alignments by incorporating the latest topographic data, gathered in the summer of 2018. Changes to the road alignments were made to avoid wetlands that are permanently inundated (H class water regime) or located within 500 feet of fish bearing waters. These changes were made in locations where design constraints would not be compromised. Updates have also been made to estimates of bridge lengths with specific focus on the Fish Creek crossing, reducing the bridge length from the June 2018 concept of 1,100 feet down to the current concept of approximately 500 feet.

Conclusions

From eight original route routes considered, CPAI screened out five using the criteria described above, and then advanced three for inclusion in the EED. CPAI understands that BLM is including CPAI's proposed project and two alternatives in the draft EIS that is in preparation, and that the three EIS alternatives share similar road alignments. While CPAI anticipates further refinements to road alignment may occur as engineering and the NEPA and permitting processes progress, the substantial analysis already completed demonstrate that the road alignments carried forward in the EIS meet the requirements of the 404(b)(1) Guidelines which requires a LEDPA project. As the routes evaluated by CPAI demonstrate, other road alignments, which are not included in the EIS, are unlikely to meet LEDPA requirements because they would result in greater fill to wetlands and would have a greater impact to the environment compared to the alternatives which are included in the EIS.

Willow Master Development Plan

Appendix I.3
Dust Control Plan

August 2020

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Willow Dust Control Plan

Scope

This Standard Operating Procedure (SOP) applies to ConocoPhillips Alaska, Inc. (CPA) and contractor personnel at Willow.

Regulatory Requirement

Fugitive dust consists of particulate matter (PM). The U.S. Environmental Protection Agency and the Alaska Department of Environmental Conservation (ADEC) define fugitive dust as "particulate matter that is generated or emitted from open air operations (emissions that do not pass through a stack or a vent)." The most common forms of PM are known as PM10 (particulate matter with a diameter of 10 microns or less) and PM2.5 (particulate matter with a diameter of 2.5 microns or less).

Alaska's current regulations that address fugitive dust include:

- 18 AAC 50.045(d)[1]: A person who causes or permits bulk materials to be handled, transported, or stored, or who engages in an industrial activity or construction project, shall take reasonable precautions to prevent particulate matter from being emitted into the ambient air.
- 18 AAC 50.110[1]: No person may permit any emission which is injurious to human health or welfare, animal or plant life, or property, or which would unreasonably interfere with the enjoyment of life or property.

Currently, ADEC applies its regulatory authority under 18 AAC 50.045(d)[1] to request fugitive dust sources apply “reasonable precautions” to reduce emissions.

Fugitive Dust Sources

Fugitive dust could be generated directly from road and pad construction, facility construction, and during operations and maintenance. The following construction activities are typical examples of activities that have the potential for generating fugitive dust:

- Movement of vehicles and motorized equipment
- Bulldozing and grading
- Excavation and filling
- Blasting
- Material movement, including loading and unloading
- Hauling of loose materials
- Use of parking, staging, and storage areas

[1] 18 AAC 50 as amended though January 8, 2020.

It is the responsibility of the Project entity's Construction Contractor(s) and the Project entity's Field Environmental Coordinators to ensure all sources of dust generation are identified.

Purpose

The purpose of this Standard Operating Procedure is to ensure compliance with ADEC air quality regulations, summarized above, and applicable project permitting stipulations, such as from the Bureau of Land Management, the U. S. Army Corps of Engineers, or the North Slope Borough. (Future update after permits are issued: permit numbers to be added as references, from any permits containing relevant fugitive dust stipulations).

Engineering & Administrative Controls

The Willow road and pad construction is typical of North Slope design and installation, consisting of a minimum of 5 foot of gravel fill above tundra level with 2:1 side slopes. The roads are designed with dust control in mind, and the specifications call for well graded sandy-gravel with low fines content in order to minimize both dust (during dry and/or hot conditions) as well as mud during the shoulder seasons and especially wet summer weather.

Willow utilizes both the Western North Slope (WNS) standard 32 foot wide (shoulder to shoulder) roads within the core field area, as well as 24 foot wide (shoulder to shoulder) roads at the outlying drill sites. Speed limits on the 32 foot wide roads are generally 35 mph. Due to safety concerns, speeds are reduced to 25 mph on the 24 foot wide roads. Speed limits are enforced by Security personnel. The table below displays road width and speed limits by segment.

Road Segment	Width (feet, driving surface)	Speed Limit (mph)
GMT2 to WOC	32	35
WOC to WCF	32	35
WOC to BT1	32	35
BT1 to BT2	32	35
BT2 to BT4	24	25
WCF to BT3	24	25
BT3 to BT5	24	25

Procedures

Large-scale dust control will be accomplished using on-site water trucks or other suitable equipment. Planned dust control equipment at Willow currently consists of two 325 bbl capacity water trucks, operating 24 hours per day under normal operations. However, if the need arises, vacuum trucks operating in other services can be utilized temporarily as dust control trucks. Dust

control activities will be monitored and scheduled by Western North Slope (WNS) Roads and Pads personnel. Activities will be conducted in a manner to comply with applicable permit stipulations. The following procedures will be utilized during dust control activities:

1. Conduct annual training for dust control regarding permit stipulations application, procedures, and techniques, identification of dust control areas, and location of permitted water sources.

    a. All Roads & Pads operators will be provided annual training that includes:

        i. Importance of proper dust control (air permit fugitive emissions stipulations, USACE permit stipulations, vegetation impacts, etc.)

        ii. Permit stipulations pertaining to water sources (fish screens, volume tracking, ADEC dewatering log, etc.)

        iii. Identification of areas needing dust control (road and pad surface conditions, lighter colored areas developing, discoloration of snow, visible dust in road, etc.)

        iv. Priority areas for dust control (active drilling locations and airstrips)

        v. Location of permitted water sources (impoundments, lakes and secondary containments)

        vi. Proper watering techniques (prevent erosion, ensure dust is controlled, etc.)

2. Reduce dust control activities when precipitation (rain, snow, frost, dew, fog, etc.) provides adequate coverage.

3. Apply proper amount of water at appropriate rates of application to avoid the creation of localized erosion due to water runoff.

4. Collect water for dust control from permitted raw water sources (e.g., lakes, impoundments).

5. Routinely inspect and evaluate facilities regarding dust control.

6. The following list recommends a watering frequency based on the number of expected vehicle trips;

    - Main Roads (32 foot width) – Once per day or as needed.

    - Secondary Roads (24 foot width) – Every 3 days or as needed. Watering frequency will increase to daily while there is an active drilling rig on the associated pad.

- WOC and WCF – Once per day or as needed.
- Drill Sites with rig activity – Every day or as needed.
- Drill Sites without rig activity – Every three days or as needed.
- Willow Airstrip – Twice daily or as needed.

7. Changes to watering frequency will be based on observations from Roads and Pads personnel, including gravel surface conditions, visible dust, or recent deposits on nearby snow or vegetation. Additional watering determinations are made at the discretion of the Roads and Pads Foreman and/or Operations personnel.

Inspection, Monitoring and Recordkeeping

Roads and Pads personnel will perform regular inspection and evaluation of facilities regarding dust control, and inspections will include surrounding areas to determine if visible dust accumulation are present on adjacent vegetation.

- Dust control activities and their effectiveness will be documented by recording to following information in a log book by the watering truck operator. Logs will include the following:
  - Date, time, and location (road segment)
  - Wind conditions (windy, calm)
  - Road surface conditions (dry, damp, wet).
  - Purpose: Watering for scheduled maintenance or based on road/pad conditions.

The watering logs will be available for review by interested local agency representatives upon request. Logs will be retained for a minimum of five years. Additional records of any deviations from the dust plan, along with the reasons for the deviation and corrective actions taken, will also be retained for at least five years.

Willow Master Development Plan

Appendix I.4
Permittee-Responsible Wetlands Compensatory Mitigation Plan

October 2020

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WILLOW MASTER DEVELOPMENT PLAN (WILLOW PROJECT) POA-2018-00190 HARRISON BAY

PERMITTEE-RESPONSIBLE WETLANDS COMPENSATORY MITIGATION PLAN

NORTH SLOPE, ALASKA

Prepared by:

ConocoPhillips Alaska, Inc.
Anchorage, AK

October 2020

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ABBREVIATIONS LIST

ABR	ABR, Inc.– Environmental Research & Services
ADF&G	Alaska Department of Fish and Game
ASRC	Arctic Slope Regional Corporation
ATV	All-Terrain Vehicle
BLM	Bureau of Land Management
BT	Bear Tooth
BTU	Bear Tooth Unit
CFR	Code of Federal Regulations
CFWR	constructed freshwater reservoir
CPAI	ConocoPhillips Alaska, Inc.
CRSA	Colville River Special Area
CRU	Colville River Unit
Culvert Repair	Nuiqsut Culvert Repair
DA	Department of the Army
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
FCI	Functional Capacity Index
GMT1/MT6	Greater Mooses Tooth 1/Mooses Tooth 6
HUC	Hydrologic Unit Code
KRU	Kuparuk River Unit
MOA	Memorandum of Agreement
NPR-A	National Petroleum Reserve–Alaska
NSB	North Slope Borough
Nuiqsut Subsistence Trail Project	Nuiqsut Subsistence Trail Tundra Rehabilitation

ABBREVIATIONS LIST

NWI	National Wetland Inventory
Thought Process	Alaska District Compensatory Mitigation Thought Process
TLSA	Teshekpuk Lake Special Area
USACE	U.S. Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
Willow Project	Willow Master Development Plan
WOUS	Waters of the United States

1.0 INTRODUCTION

ConocoPhillips Alaska, Inc. (CPAI) is seeking a Department of the Army (DA) permit authorization from the U.S. Army Corps of Engineers (USACE) to construct the Willow Master Development Plan (Willow Project). The Willow Project consists of five gravel drillsites in the Bear Tooth Unit (BTU) (Bear Tooth [BT]1 through BT5), a processing facility, an operations center, gravel access roads, bridges, pipelines, material sites, a constructed fresh water reservoir, an airstrip, and other ancillary facilities to support development of petroleum reserves within the BTU (Figure 1, Appendix A1). The Willow Project will result in 481.1 acres of permanent fill placement in Waters of the U.S. (WOUS) and will be constructed in two phases. Phase 1 consists of construction of drillsites BT1 through BT3, the processing facility, and support infrastructure necessary to support Willow Project drilling and production. Phase 2 consists of drillsites BT4 and BT5 and their associated access roads and pipelines. Phase 1 will include 356.4 acres of fill placement in WOUS. Phase 2 will result in an additional 124.7 acres of fill placement in WOUS.

Applicable USACE regulations (33 Code of Federal Regulations [CFR] § 320.4[r][1]) state, "Mitigation is an important aspect of the review and balancing process on many DA permit applications." The 404(b)(1) Guidelines followed by the USACE (40 CFR § 230.93[a]) provide that the District Engineer "must determine the compensatory mitigation to be required in a DA permit based on what is practicable and capable of compensating for the aquatic resources functions that will be lost as a result of the permitted activity." All compensatory mitigation "will be for significant resource losses which are specifically identifiable, reasonably likely to occur, and of importance to the human or aquatic environment. Also, all mitigation will be directly related to the impacts of the proposal, appropriate to the scope and degree of those impacts, and reasonably enforceable." (33 CFR § 320.4[r][2]).

In the Alaska District, implementation of regulations governing compensatory mitigation is guided by a document called the "Alaska District Compensatory Mitigation Thought Process," (Thought Process) (USACE 2018). The purpose of the Thought Process "is to guide regulatory project managers through the thought process necessary to determine whether specific project impacts will require compensatory mitigation, the determination of whether proposed mitigation is appropriate and practicable, and the determination as to when preservation will be considered as acceptable mitigation," (USACE 2018).

As directed by the USACE, CPAI used the Thought Process (discussed further in Section 5.0, Willow Baseline Information) to evaluate the need for compensatory mitigation for unavoidable impacts to WOUS as a result of constructing the Willow Project. This process identified compensatory mitigation that would be necessary for impacts to anadromous fish-bearing WOUS and jurisdictional wetlands within 500 feet of those waters, impacts occurring within the Colville River Special Area (CRSA), and impacts within the Teshekpuk Lake Special Area (TLSA) identified in the Bureau of Land Management (BLM) 2013 National Petroleum Reserve – Alaska (NPR-A) Integrated Activity Plan Record of Decision.

Nuiqsut residents use watersheds near the community for subsistence activities. Therefore, mitigating impacts to subsistence resources is a priority for CPAI. This is also consistent with the regulatory directive to focus on matters that are of importance to the human or aquatic environment.

2.0 OBJECTIVES

The overall objective of this Permittee-Responsible Mitigation Plan is to offset Willow Project impacts to aquatic resources through permittee-responsible wetlands mitigation for fill placement. Through consultation with USACE, CPAI understands that the Willow Project likely will be required to perform compensatory mitigation for project fill and excavation within 500 feet of anadromous waters, within the TLSA, and within the CRSA, a combined area of 122.8 acres of direct impact. CPAI has applied the USACE North Slope Rapid Assessment Method (Berkowitz et al. 2017), and the Alaska District Credit Debit Methodology (USACE 2016) to determine that this acreage results in 122.4 debits for direct impacts. CPAI also considered debits that could result from indirect impacts. Indirect impacts within 500 feet of anadromous waters, within the TLSA, and within the CRSA, could affect a total area of 115.0 acres. Based on CPAI's proposed approach for quantifying indirect impact debits (see Section 5.1.3), indirect impacts would incur an additional 11.5 debits. The total debits incurred for both direct and indirect impacts is 133.9 debits.

In order to offset Project debits, CPAI proposes (a) completing two permittee-responsible compensatory mitigation projects that will enhance 209.1 acres of palustrine wetlands functions and (b) preserve 800 acres of pristine Arctic Coastal Plain wetlands at the mouth of Fish Creek or at Cape Halkett. Preservation will include a legal instrument (see Section 4.0) that protects aquatic resources and allows for continued subsistence activities on the preserved lands.

Table 1, below, identifies the projects CPAI is proposing and their individual contributions in terms of acreage and credits. Preservation credits are discussed below in Section 6.4.

Table 1a. Proposed Willow Project Compensatory Mitigation Enhancement Projects

Mitigation Type	Project Name	Acres	Credits
Enhancement	Nuiqsut Subsistence Trail Tundra Rehabilitation	109.0	28.7
	Anaktuvuk Pass Subsistence Trail Tundra Rehabilitation	100.1	28.2
	Total	**209.1**	**56.9**

Table 1b. Proposed Willow Project Compensatory Mitigation Land Preservation

Mitigation Type	Credit/Debit or Acreage Ratio Approach	Acres	Credits
Preservation	**Approach A:** Fish Creek (or Cape Halkett) Preservation *(NSRAM & Credit / Debit Methodology)*	**800[a]**	**90.6**
	Approach B: Fish Creek (or Cape Halkett) Preservation *(Preservation Acreage Ratio)*	**800[a]**	**1:1 ratio = 800** **2:1 ratio = 400** **3:1 ratio = 266.7** **6:1 ratio = 133.3** **9:1 ratio = 88.9** (acre:credit ratio)

[a] Based on an 800-acre proposed preservation area. Credits generated are based on a 100-acre development scenario

Table 1c. Proposed Compensatory Mitigation Credit / Debit Summary

Summary	Acres	Credits[a]	Debits	Excess Credits
Enhancement + Preservation Approach *(NSRAM & Credit Debit Methodology)*	1,009.1	147.5	133.9	**+13.6**
Enhancement + Preservation Approach *(Preservation Acreage Ratio)*	1,009.1	1:1 ratio = 856.9 2:1 ratio = 456.9 3:1 ratio = 323.6 6:1 ratio = 190.2 9:1 ratio = 145.8	133.9	**1:1 ratio: +723.0** **2:1 ratio = +323.0** **3:1 ratio: +189.7** **6:1 ratio: +56.3** **9:1 ratio: +11.9**

[a] Credits for Approach B determined by adding the credits gained from enhancement projects (56.9) plus credits generated by preservation at the acreage preserved to credits generated ratio indicated.

In addition to these projects, CPAI proposes completing a voluntary Nuiqsut Culvert Repair (Culvert Repair) permittee-responsible compensatory mitigation project. The Culvert Repair project would enhance 11.8 acres of WOUS abutting the Nigliq Channel of the Colville River through rehabilitation/replacement of four culvert batteries near the center of the community. Additional detail regarding the Culvert Repair project are presented in Section 15.0.

Figure 2 (Appendix A1) illustrates an overview of the proposed Nuiqsut compensatory mitigation enhancement project and voluntary Culvert Repair project. Figures 3 in Appendix A1 illustrate the location and functional enhancement area provided Nuiqsut Subsistence Trail Tundra Rehabilitation. Figure 4 in Appendix A1 illustrate the location and functional enhancement area provided Anaktuvuk Pass Subsistence Trail Tundra Rehabilitation. The approximate preservation areas for Fish Creek and Cape Halkett are shown in Figures 9 and 10. The Voluntary Nuiqsut Culvert Project is shown on Figure 5, Appendix A1.

2.1 Nuiqsut Subsistence Trail Tundra Rehabilitation

The objective of the Nuiqsut Subsistence Trail Tundra Rehabilitation (Nuiqsut Subsistence Trail project) is to enhance 109.0 acres of natural hydrologic flow, sediment retention, aesthetics, and nutrient supply functions by rehabilitating a degraded tundra trail in the Nuiqsut area (Figure 3). Summer all-terrain vehicle (ATV) use along a primary subsistence trail from Nuiqsut to the Tiŋmiaqsiuġvik River has resulted in rutting and damage to vegetation, soils, hydrology, and aesthetics in wetlands. Because the vegetative mat helps insulate underlying permafrost, impacts from vehicle ruts typically continue to degrade over time after an area is disturbed. In addition, rutting tends to expand through continued use and impacts tend to increase over time.

The Nuiqsut Subsistence Trail project would install an open cell, semi-rigid geogrid material for use as a trail surface. The material would support the weight of ATVs while allowing plants to grow through openings in its surface. A supplemental geotextile layer may be placed beneath the panels to increase flotation in extremely wet areas. Small stream channels located along the geogrid trail would be spanned by bridging or would pass through culverts. Similar work has been done successfully near Utqiaġvik and in other wetlands throughout Alaska.

Geogrid installation would include strategic placement of 8-foot wide panels directly over the tundra surface. The Nuiqsut Subsistence Trail project area would originate along the north side of the Nuiqsut landfill road, near the current landfill and extend approximately 6 miles west to the Tiŋmiaqsiuġvik River, a subsistence fishing destination.

2.2 Anaktuvuk Pass Subsistence Trail Tundra Rehabilitation

CPAI is proposing an additional subsistence trail tundra rehabilitation project in Anaktuvuk Pass. The tundra damage and proposed solution for the Anaktuvuk Pass trail are similar to the project proposed in Nuiqsut. The Anaktuvuk Pass Subsistence Trail Tundra Rehabilitation (Anaktuvuk Pass Subsistence Trail project) would generate 100.1 acres of enhancement. Figure 4 in Appendix A1 illustrates the location and functional enhancement area provided by the Anaktuvuk Pass Subsistence Trail project. This project is contingent upon support from local stakeholders in Anaktuvuk Pass and landowners. Initial discussions with one of the landowners provided support for the project.

2.3 Fish Creek or Cape Halkett Preservation Area

CPAI is working with local landowners in the region to preserve high-functioning wetlands that are susceptible to loss of wetland function in the case of future development. This preservation will apply to 800 acres and more than offset the remaining debits. CPAI plans to preserve lands in one of the following two areas: (a) near Cape Halkett, adjacent to lands preserved in connection with Greater Mooses Tooth 1/Mooses Tooth 6 (GMT1/MT6) development; or (b) near the mouth of Fish Creek, adjacent to lands preserved in connection with Kuukpik Spur Road development, subject to CPAI being able to reach agreement with the landowner on land preservation. CPAI proposes to preserve the selected wetlands through a site protection instrument, based on similar projects such as the ASRC Energy Services' Deadhorse Pad, Kuukpik's Nuiqsut Spur Road, and GMT1/MT6. While those projects used a deed restriction, we recognize that the type of site protection instrument will be determined by USACE requirements, the availability of an easement holder, and the consent of the landowner. Whichever mechanism is approved by the USACE, permanent preservation at Fish Creek or Cape Halkett will apply to 800 acres.

3.0 SITE SELECTION

There are no mitigation banks or in-lieu fee programs with a service area that includes the North Slope. Permittee-responsible mitigation is the only remaining option according to *Compensatory Mitigation for Losses of Aquatic Resources* (USACE and United States Environmental Protection Agency [EPA], 2008 [2008 Final Rule]) published in the Federal Register on April 10, 2008.

CPAI considered restoration, enhancement, and preservation options within the watersheds containing the Willow Project's gravel infrastructure, which is largely located in the NPR-A, and adjacent watersheds. Preservation was identified as a feasible option. Within the Colville River watershed, which also contains Willow Project infrastructure, one practicable enhancement project was identified in Nuiqsut.

Consistent with governing regulations, CPAI looked for wetland enhancement and preservation opportunities that would:

- Occur in a watershed affected by the Willow Project
- Support aquatic resource functions of the Colville River or other important subsistence use areas
- Provide positive benefits to the Nuiqsut community
- Ensure economic and logistical practicability

Those goals are consistent with the site selection factors identified in 33 CFR § 332.4(c)(4), which are:

- Watershed needs
- Onsite alternatives
- Practicability of accomplishing an ecologically self-sustaining mitigation project

3.1 Watershed Needs

The Willow Project is part of the Arctic Coastal Plain and within the Barrow Alaska 190602 watershed (Figure 1), with the exception of 4.6 acres near Kuparuk. The Barrow Alaska 190602 watershed totals 15,543,685 acres. The majority of the 4.6 acres of impacts near Kuparuk occur in the Colville River 190603 watershed, with a minor amount of those impacts near Kuparuk occurring in the Prudhoe Bay 190604 watershed. These 6-digit HUC watersheds total 15,118,586 acres for the Colville River 190603 watershed and 8,511,188 acres for the Prudhoe Bay 190604 watershed. The precise amount of existing disturbance is not currently available but is estimated to be less than one percent. The ten 10-digit Hydrologic Unit Codes (HUCs) that will be impacted by the Willow Project have experienced 0.24 percent overall disturbance from previous activities, with no individual watershed exceeding 0.62 percent disturbance (except the Ugnuravik River watershed in the Kuparuk area, which lacks a close nexus to the Willow Project). The 10-digit HUC identifications of these watersheds and the existing disturbance are shown in Table 2.

Table 2. Existing Disturbance

Watershed (10-Digit Hydrologic Unit Code)	Total Watershed Area (acres)	Existing Disturbance (acres)	Existing Disturbance (percentage of watershed)
Colville River Delta-Frontal Harrison Bay (1906030413)	303,614.3	474.2	0.16
Kachemach River (1906030411)	145,577.7	123.6	0.08
Kalikpik River (1906020508)	233,090.1	<0.1	<0.00
Kalubik Creek-Frontal Harrison Bay (1906030414)	115,859.0	722.3	0.62
Miluveach River (1906030412)	113,932.6	178.3	0.16
Outlet Fish Creek (1906020507)	137,576.9	87.6	0.06
Outlet Judy Creek (1906020505)	246,274.6	<0.1	<0.00
Simpson Lagoon-Frontal Beaufort Sea (1906040116)	195,738.9	863.6	0.44
Ublutuoch River (1906020506)	150,954.4	87.1	0.06
Ugnuravik River (1906040115)	77,253.8	1,538.5	1.99
Total	**1,719,872.3**	**4,075.2**	**0.24**

The Colville River Delta-Frontal Harrison Bay, Outlet Fish Creek, and Ublutuoch River watersheds contain the proposed Nuiqsut compensatory mitigation enhancement project, and all benefit the community of Nuiqsut or enhance wetlands with a nexus to the Colville River. Existing disturbance in these watersheds consists of gravel infrastructure development associated with the community and oil and gas development, transportation corridors, and gravel mining. The immediate area around Nuiqsut and the enhancement projects drain to the Nigliq Channel of the Colville River and Tiŋmiaqsiuġvik River. Both are important fish-bearing waters supporting subsistence activities of Nuiqsut residents. The proximity of the compensatory mitigation projects to Nuiqsut creates an opportunity to provide functional enhancement to wetlands supporting anadromous fish habitat, and water-related benefits to the community nearest to the Willow Project.

The majority of Willow Project impacts located near Kuparuk occur in the Colville River 190603 watershed. CPAI's proposed Anaktuvuk Pass Subsistence Trail project is located in the same 6-digit HUC Colville River 190603 watershed where the majority of these impacts near Kuparuk are located. This project would benefit the community of Anaktuvuk Pass, as well as the Colville River.

The proposed Willow Project compensatory mitigation enhancement projects and voluntary Culvert Repair project would provide additional cumulative benefit to the Colville River watershed and Nuiqsut that has already experienced enhancement from compensatory mitigation projects approved for CPAI's Greater Mooses Tooth 2/Mooses Tooth 7 and Oil Search's Nanushuk projects (see Figure 6, Appendix A1). The additive effect of the proposed Willow Project compensatory mitigation projects together with the aquatic resource enhancement from those other similar projects, make this location appropriate and efficient for compensatory mitigation for all the

watersheds impacted by the Willow Project. The synergistic and integrated benefits of multiple enhancement projects, including the voluntary Culvert Repair project, in this area helps achieve meaningful enhancement to wetlands at a scale and location that has a positive impact on the human and aquatic environment. The Nuiqsut Subsistence Trail project will also provide enhancement to the Ublutuoch River watershed near the Tiŋmiaqsiuġvik River, an important local subsistence fishery.

Wetlands at the mouth of Fish Creek and at Cape Halkett are ecologically valuable, highly functioning wetlands that are in areas of potential future development and are connected to lands preserved for other compensatory mitigation projects. As was authorized for GMT1/MT6, Kuukpik's K-Pad, and Nuiqsut Spur Access Road, preserving wetlands in either location has proven appropriate and practicable in the past to offset impacts of development activities. Depending on which land is preserved (Fish Creek or Cape Halkett), Kuukpik or Arctic Slope Regional Corporation (ASRC) will receive revenue from the land preservation, which will economically benefit the shareholders of the company that receives the revenue.

The Fish Creek preservation area, and the majority of the Willow Project impacts and associated debits, are located along the Arctic Coastal Plain and within the same watershed (Barrow Alaska-190602). CPAI operates oil and gas fields to the east at Alpine and to the south at CD-5. CPAI also holds oil and gas subsurface leases within the Fish Creek preservation area. The adjacent CPAI developments and the Fish Creek preservation area are located within the designated Colville River Unit (CRU).

Preservation of the Fish Creek area is consistent with the watershed approach outlined in the 2008 Final Rule as the area provides important physical, chemical, and biological functions for the watershed. In addition, the lands under consideration for preservation are immediately adjacent to land preserved by Kuukpik Corporation as compensatory mitigation for construction of the Nuiqsut Spur Road. Preservation of the Fish Creek area would result in a larger continuous conservation area and would avoid fragmentation of conservation lands if preserved. Preserving these lands would protect existing subsistence resources and would help maintain the subsistence lifestyle of the North Slope communities.

The Cape Halkett preservation area, and the majority of the Willow Project impacts and associated debits, are located along the Arctic Coastal Plain and within the same watershed (Barrow Alaska-190602). The preservation area is adjacent to lands preserved for other projects and would, like Fish Creek, result in a larger continuous conservation area. The Cape Halkett parcel consists of pristine Arctic Coastal Plain wetlands in close proximity to Teshekpuk Lake that could support potential future oil and gas development to reach resources at or near Cape Halkett, or resources that could be reached laterally under the immediately adjacent NPR-A. The 2020 NPR-A Integrated Activity Plan Final Environmental Impact Statement (EIS) prepared by the BLM indicates subsurface resources could be developed in this region (BLM 2020a). While the final record of decision has not been issued, the BLM's preferred alternative in the final EIS would open currently closed lands nearby Cape Halkett for oil and gas leasing. Additionally, as described below, the Smith Bay discovery is nearby, and Shell recently applied to unitize 18 state leases that are approximately five miles away from the location of the Cape Halkett preservation lands.

Both preservation sites support habitat diversity. Mammals, fish, and birds alike use many of the wetland types proposed in these areas. Moreover, because of the presence of these wildlife resources, the selected sites serve as an important area for subsistence activities. Accordingly, the selection of either of the sites for preservation provides an ecologically self-sustaining aquatic resource that supports subsistence uses with a diversity of wildlife and anadromous fish.

3.2 Onsite Alternatives

Compensatory mitigation opportunities at the Willow Project are unavailable due to the undeveloped nature of the area and land ownership constraints. CPAI considered compensatory mitigation in the Kuparuk River Unit (KRU). KRU compensatory mitigation was determined by CPAI to be undesirable for the Willow Project because the KRU contains a small portion of the overall Willow Project gravel footprint. Additionally, Willow Project gravel fill within the KRU occurs at areas currently utilized for oil production, including the Central Processing Facility 2 pad and minor road widening to accommodate module transportation.

3.3 Practicability of Results Being Ecologically Self-Sustaining

The geogrid system that is proposed for the Subsistence Trail projects has been installed in Utqiaġvik, Wrangell-St. Elias National Park, and near Palmer, Alaska. In those locations, the system has proven to be effective at rehabilitating large areas of trail disturbance with minimal maintenance. The geogrid material provides trail users with a safer and easier route compared to the natural wetland landscape of the North Slope, and inherently reduces travel in sensitive wetland areas.

Site protection and monitoring will provide adequate protection for the lands preserved at the mouth of Fish Creek or Cape Halkett to ensure ecological sustainability.

4.0 SITE PROTECTION

Site protection is the legal arrangement that will be used to ensure long term protection of the mitigation site (33 CFR § 332.4(c)(4)). Site protection on private lands can take the form of a real estate instrument such as a conservation easement or restrictive covenant (33 CFR § 332.7(a)(1)).

CPAI will work with local landowners to secure a real estate instrument for the wetlands preserved at the mouth of Fish Creek or Cape Halkett. CPAI will explore opportunities for the real estate instrument to take the form of a conservation easement to be held by a third party. CPAI is aware, however, that past efforts in the region to find third party holders of conservation easements for compensatory mitigation have failed, and so CPAI may need to resort to consideration of a deed restriction, which has been successfully used on the North Slope, as another potential option. In either case, the real estate instrument will restrict surface disturbance but allow local recreational and subsistence activities. CPAI will secure a site protection instrument for the Cape Halkett or Fish Creek preservation area that is approved by the USACE prior to fill placement.

Subject to agreement with the landowner, the real estate instrument for wetland preservation will allow for continued subsistence use (including but not limited to hunting, fishing, trapping, egg gathering, berry-picking, and vegetation collection). Non-commercial site improvements such as

subsistence camps, cabins, shelters, ATV trails, boat launches, and other low impact uses will be allowed, so long as they would only result in minimal impacts to aquatic resources. Foundations for structures, such as subsistence cabins, would be built in a manner to minimize the placement of dredged or fill material in WOUS. For example, subsistence cabins could be placed on timber blocks, piles, or skis. The site protection instrument will not allow commercial guided hunting. Other commercial activities, such as snow trails, seismic data collection, or other business ventures will be determined on a case-by-case basis. The following list provides an example of activities that could be prohibited under a site protection instrument:

1. Any dredging or excavation of any existing soils, sediments, and other substrates.
2. Any discharge of dredged or fill materials.
3. Disturbance of soil, sediment, and other substrates by mechanical equipment and transportation vehicles.
4. Drilling for hydrocarbon resources and surface mining.
5. Vegetation removal, clearing, cutting, or other destruction except for subsistence food gathering.
6. Storage, abandonment, stockpiling, or disposal of any earthen materials, debris, refuse, supplies, durable materials, or other manmade objects.
7. Changing the surface hydrology of the area by ditching, pumping, damming, or other dewatering or hydration methods.
8. Mechanized snow and ice clearing operations and construction of snow or ice structures including ice roads and ice pads.
9. Commercial guided hunting (not subject to USACE enforcement).

For protection of subsistence and other uses, the following list provides an example of activities that could be expressly reserved as allowed uses under a site protection instrument:

1. Subsistence uses, such as hunting, fishing, trapping, egg gathering, vegetation and dead wood collection.
2. Winter snow vehicle use for local cultural activities and approved scientific uses.
3. Cultural, non-commercial site improvements such as temporary subsistence camps and other low impact subsistence uses.
4. Exploration, development, and production of the mineral estate in the property, including oil and gas, from surface locations outside the property.
5. Non-destructive education or scientific activities.
6. Emergency access by required means of transportation: vehicular, watercraft and/or aircraft.

Site protection on public lands can, when appropriate, be provided by a management plan. *See* 33 CFR § 332.7(a)(2)(4). The proposed trail rehabilitation enhancement projects will occur on federal

public lands and Native corporation lands that are managed for local public use including subsistence activities. The practical approach to site protection for these trails is to foster local stewardship. Prior to construction, CPAI will strive to secure a site protection instrument if practicable. In the absence of an agreement on site protection with landowners, CPAI will pursue agreements with landowners to promote the following aspects of local stewardship: (a) clarity on trail maintenance expectations and obligations, consistent with Section 8.1, below; and (b) signage or other public communications to encourage use patterns that protect the site over the long term. This consensus-based approach is a practical and appropriate approach to site protection for these improvements to existing trails on federal public lands and Native lands.

5.0 BASELINE INFORMATION

Alaska-specific conditions have complicated compensatory mitigation decisions for years. One difficulty is the lack of practicable in-kind and traditional mitigation options across the state, particularly on the North Slope.

The lack of practicable options was addressed via 1994 Alaska Wetland Initiative Summary Report (EPA et. al 1994). The report concluded that implementing wetland mitigation on all projects may not be practicable and clarified that the goal of achieving "no net loss" on a national basis did not necessarily require no net loss on an individual permit basis.

The 1994 report findings and direction were incorporated into a 2018 USACE/EPA Memorandum of Agreement (MOA) (EPA and DA 2018) that directed the agencies to evaluate compensatory mitigation considering the unique circumstances presented in Alaska, but has not adopted a formula for compensatory mitigation in Alaska. The USACE retains discretion to determine practical and appropriate mitigation on a case-by-case basis.

The USACE has developed the North Slope Rapid Assessment Method for evaluating functional impact on the North Slope for the purposes of determining sufficiency of mitigation (Berkowitz et al. 2017). The method relies on the presence of anthropogenic disturbance within 262- and 2,625-foot (80- and 800-meter) radii of a subject wetland in order to assess the wetland's ability to provide the functions along a scale ranging from 0.0 to 1.0. Remote projects with no anthropogenic impacts located in the assessment radii will score a 1.0, where projects located within areas that possess anthropogenic disturbance will score somewhere between 0.0 and 1.0 depending on the level and proximity of disturbance. As a result, this method provides information on the condition of each wetland based on proximity to anthropogenic disturbance, but it does not identify the importance of wetlands within the watershed or measure specific wetland functions (Berkowitz et al. 2017).

Because most of the wetlands affected by the Willow Project are located away from existing anthropogenic disturbance, they would receive a score of 1.0 under the North Slope Rapid Assessment Method. As a result, the method would not distinguish the relative value of the undisturbed wetlands in the watershed. A comparison of the alternatives in the final EIS for the Willow Project would reflect differences in acreage values. In light of this limitation of the rapid assessment method, and in consultation with the USACE, CPAI determined that a functional or condition assessment would not be useful for the full project area because the EIS process

documented sufficient information to assess the Willow Project and the National Environmental Policy Act alternatives on wetlands.

To account for debits and credits and evaluate compensatory mitigation projects, USACE asked CPAI perform the North Slope Rapid Assessment Method condition assessment in areas requiring compensatory mitigation, and at proposed compensatory mitigation projects. This assessment is in Section 6.0, below, and Appendix E to this mitigation plan. The North Slope Rapid Assessment Method does not provide guidance for quantifying debits from indirect impacts. Section 6.0 and Appendix E also describe CPAI's approach for quantifying debits from indirect impacts.

CPAI is proposing both regionally located mitigation projects that are considered out-of-kind and non-traditional, consistent with guidance stemming from the 2018 MOA, and traditional wetland preservation to balance project debits and credits. These options are appropriate and better serve the aquatic resource needs of the watersheds with the strongest nexus to the Willow Project and the Colville River. These projects also address stakeholder concerns relating to traditional use, subsistence, and aesthetics that are not evaluated in functional or condition assessments.

5.1 Willow Project Baseline Information

In the Alaska District, implementation of regulations governing compensatory mitigation is guided by the Thought Process, which provides in its introduction: "The purpose of this document is to guide regulatory project managers through the thought process necessary to determine whether specific project impacts will require compensatory mitigation..." Once the USACE Project Manager has made the determination that compensatory mitigation is necessary, the Project Manager will work with the applicant to determine the amount of compensatory mitigation required.

CPAI provides the following information with respect to steps A through C of the Thought Process.

5.1.1 Step A: Identify the Watershed

The Willow Project is encompassed within the Arctic Coastal Plain and within the Barrow Alaska-190602 watershed (Figure 1), with the exception of 4.6 acres near Kuparuk. The majority of the 4.6 acres of impacts near Kuparuk occur in the Colville River 190603 watershed, with a minor amount of those impacts near Kuparuk occurring in the Prudhoe Bay 190604 watershed. The Willow Project will involve placing gravel fill in portions of ten 10-digit HUC watersheds (Table 3).

Table 3. 10-Digit Hydrologic Unit Codes within Willow Project Fill Footprint

Watershed	10-Digit HUC
Colville River Delta-Frontal Harrison	1906030413
Kachemach River	1906030411
Kalikpik River	1906020508
Kalubik Creek-Frontal Harrison Bay	1906030414
Miluveach River	1906030412
Outlet Fish Creek	1906020507
Outlet Judy Creek	1906020505
Simpson Lagoon-Frontal Beaufort Sea	1906040116
Ublutuoch River	1906020506
Ugnuravik River	1906040115

Note: HUC: Hydrologic Unit Code

5.1.2 Step B: Identify Types and Extent of Waters of the United States (Area and Function) Impacts by the Project

The Willow Project is part of the Arctic Coastal Plain and within the Barrow Alaska 190602 watershed (Figure 1), with the exception of 4.6 acres near Kuparuk. The Barrow Alaska 190602 watershed totals 15,543,685 acres. The majority of the 4.6 acres of impacts near Kuparuk occur in the Colville River 190603 watershed, with a minor amount of those impacts near Kuparuk occurring in the Prudhoe Bay 190604 watershed. These 6-digit HUC watersheds total 15,118,586 acres for the Colville River 190603 watershed and 8,511,188 acres for the Prudhoe Bay 190604 watershed. The precise amount of existing disturbance is not currently available but is estimated to be less than one percent. Adding the Willow gravel footprint would result in a *de minimis* increase in total watershed disturbance.

As shown on Table 4, below, the ten 10-digit HUCs impacted by the Willow Project have experienced only 0.24 percent overall disturbance from previous activities, with no individual watershed exceeding 0.62 percent disturbance, except for the Ugnuravik watershed, in which the KRU is located. The Ugnuravik watershed will only receive 1.2 acres additional fill in connection with the Willow Project (related solely to module delivery) and those impacts will result in an overall reduction of impacts for the Willow Project by allowing the use of existing infrastructure, eliminating the need to construct a gravel island for module delivery in WOUS. The Ugnuravik watershed does not have as strong nexus to the Willow Project as do the other watersheds.

The total disturbance for Willow, including uplands, is 624.3 acres, which includes 135.8 acres of excavation disturbance to construct the mine sites and constructed freshwater reservoir (CFWR). This excavation from the mine site and CFWR construction will not result in a loss of WOUS, rather it will result in a conversion to valuable open water. However, CPAI incorporated these project features into the watershed disturbance analysis. As shown below in Table 4, the proposed Willow Project disturbance, combined with existing disturbance, will result in total percent disturbance ranging from 0.01 percent to 1.99 percent in each of the individual watersheds, and

0.27 percent across all ten watersheds. The total Willow Project-specific disturbance across all the watersheds is just 0.036 percent.

Table 4. Total Watershed Disturbance with the Proposed Project

Watershed (10-Digit HUC)	Total Watershed Area (acres)	Existing Disturbance (acres)	New Willow Project Disturbance (acres)[b]	Total Willow Disturbance (percentage of watershed	Total Disturbance (percentage of watershed)
Colville River Delta-Frontal Harrison Bay (1906030413)	303,614.3	474.2	2.3	<0.001%	0.16%
Kachemach River (1906030411)	145,577.7	123.6	2.6	0.002%	0.09%
Kalikpik River (1906020508)	233,090.1	<0.1	29.6	0.013%	0.01%
Kalubik Creek-Frontal Harrison Bay (1906030414)	115,859.0	722.3	1.1	<0.001%	0.62%
Miluveach River (1906030412)	113,932.6	178.3	1.3	0.001%	0.16%
Outlet Fish Creek (1906020507)	137,576.9	87.6	64.3	0.047%	0.11%
Outlet Judy Creek (1906020505)	246,274.6	<0.1	367.4	0.149%	0.15%
Simpson Lagoon-Frontal Beaufort Sea (1906040116)	195,738.9	863.6	0.2	<0.001%	0.44%
Ublutuoch River (1906020506)	150,954.4	87.1	155.1	0.103%	0.16%
Ugnuravik River (1906040115)	77,253.8	1538.5	1.2	0.002%	1.99%
Total[a]	**1,719,872.3**	**4075.2**	**625.1**	**0.036%**	**0.27%**
		4,699.5			

Notes: HUC: Hydrologic Unit Code

[a] Values may not sum to totals because of rounding

[b] Acreages include 8.4 acres of fill in uplands and 135.8 acres of disturbance due to excavation for gravel mine sites and CFWR

The gravel required for the Willow Project will be sourced from two gravel sites located in the Ublutuoch River (1906020506) watershed. CPAI plans to reclaim the mine sites contemporaneously with construction, pursuant to a reclamation plan approved by local, state, and federal agencies with material site jurisdiction. The two gravel sites and the CFWR will include berms for safety and thermal protection of adjacent permafrost.

5.1.3 Step C: Identify How Waters of the United States Impacts Relate to Mitigation Requirements by Regulation

The proposed Willow Project does not include fill placement in intertidal waters or use of federal dollars. The Willow Project Description presented in the Individual Permit application provides the footprint of Willow Project in WOUS by National Wetlands Inventory (NWI) code. When impacts are determined to be more than minimal, fill placed or excavation in fish-bearing waters and jurisdictional wetlands within 500 feet of fish-bearing waters have been identified by the Thought Process (USACE 2018) as potentially requiring compensatory mitigation. Within the Thought Process the USACE provides an example of how to apply the 500-foot buffer. In that example, the USACE applies the buffer to anadromous fish-bearing waters. The USACE has further clarified that for the Willow Project, CPAI should evaluate anadromous fish-bearing waters

in place of fish-bearing waters.[1] In addition, CPAI has considered Willow Project impacts (both fill placement and excavation) to WOUS within the CRSA and TLSA as potentially requiring compensatory mitigation.

In addition, CPAI considered indirect impacts to wetlands and WOUS within 500 feet of anadromous fish-bearing waters, the CRSA, and the TLSA. Although indirect impacts do not necessarily require compensatory mitigation, CPAI's plan includes sufficient credits to mitigate both direct and indirect impacts.

There are no approved methods for quantifying indirect debits resulting from functional losses of aquatic resources on Alaska's North Slope for compensatory mitigation purposes. The North Slope Rapid Assessment Method (Berkowitz et al. 2017) provides guidance in evaluating the current condition of WOUS and states that in areas converted from jurisdictional wetlands to uplands, the post-project assessment score quantifying wetland function is zero. It does not, however, include guidance for predicting indirect impacts from proposed fill.

In CPAI's proposed approach, the first step in identifying the level of indirect impact is to determine the lateral extent of indirect impacts. The spatial extent of effects from anticipated fugitive dust were used as a surrogate for determining the spatial extent of indirect impacts. BLM (2020) states that road dust has the greatest effect within 35 feet of a gravel road (BLM 2020). Furthermore, studies of dust deposition from nearby gravel roads (ERM Alaska 2016), comments from the EPA, and BLM-imposed Required Operating Procedures including measures documented in CPAI's Project Dust Control Plan support focusing mitigation for indirect impacts on areas immediately adjacent to the proposed gravel fill footprint. Therefore, CPAI calculated the spatial extent of indirect impacts requiring mitigation as the total WOUS present in an indirect buffer distance of 35 feet from the edge of gravel fill placement within 500 feet of anadromous fish-bearing waters, the CRSA, and the TLSA.

Tables 5 through 7 show project impact acres (direct and indirect) by NWI code of wetlands and WOUS within 500 feet of anadromous fish-bearing waters, the CRSA, and the TLSA. Wetlands mapping for these impacts are presented below on tables 5 through 7 and shown in Appendices B through D.

[1] Willow impact areas within 500-feet of anadromous fish-bearing waters were identified using riverine polygons from the Willow Final EIS Integrated Terrain Unit Mapping (ABR, Inc.), which were then identified as anadromous using the ADF&G Catalog of Waters. Anadromous riverine polygons were then buffered by 500 feet and evaluated for overlap with the Willow Project footprint.

Table 5. Total Acreage of Impact to WOUS within 500 feet of Anadromous Fish-Bearing Waters by National Wetlands Inventory Type

NWI Code	Description	Direct Impact Area (acres)[a]	Indirect Impact Area (acres)
PEM1/SS1B	Palustrine seasonally saturated persistent emergent/broad-leaved deciduous shrub meadow	9.4	6.6
PEM1/SS1D	Palustrine continuously saturated persistent emergent/broad-leaved deciduous shrub meadow	1.5	1.5
PEM1F	Palustrine semi-permanently flooded persistent emergent meadow	0.7	1.0
PEM1H	Palustrine permanently flooded persistent emergent marsh	<0.1	0.1
PSS1/EM1B	Palustrine seasonally saturated broad-leaved deciduous shrub/persistent emergent scrub	0.7	0.7
PSS1/USB	Palustrine seasonally saturated broad-leaved deciduous shrub/unconsolidated shore	1.0	1.4
PSS1C	Palustrine seasonally flooded broad-leaved deciduous shrub scrub	0.9	1.2
PSS3B	Palustrine seasonally saturated broad-leaved evergreen scrub	<0.1	<0.1
PUBH	Palustrine permanently inundated unconsolidated bottom pond	0.0	<0.1
R2UBH	Riverine permanently flooded lower perennial stream	0.3	1.2
R2USC	Riverine seasonally flooded unconsolidated shore	0.3	0.8
Total Acres within 500 feet of anadromous fish-bearing waters[b]		**14.8**	**14.5**
Total Debits[c]		**14.5**	**1.5**

Notes: NWI: National Wetlands Inventory.
[a] Includes fill footprint of gravel pads, gravel roads, mine site and CFWR excavations and thermal berms and pipeline vertical support members.
[b] Values may not sum to totals because of rounding.
[c] Debits for some impacts within 500-feet of fish bearing waters are discounted in accordance with the North Slope Rapid Assessment Method due to proximity to existing infrastructure. See Section 6.0 and Appendix E.

Table 6. Total Acreage of Impact to WOUS within the Colville River Special Area by National Wetlands Inventory Type

NWI Code	Description	Direct Impact Area (acres)[a]	Indirect Impact Area (acres)
PEM1/SS1B	Palustrine seasonally saturated persistent emergent/broad-leaved deciduous shrub meadow	5.2	6.1
PEM1/SS1D	Palustrine continuously saturated persistent emergent/broad-leaved deciduous shrub meadow	2.9	3.0
PEM1F	Palustrine semi-permanently flooded persistent emergent meadow	<0.1	0.1
Total acres within the Colville River Special Area[b]		**8.1**	**9.2**
Total Debits[c]		**8.1**	**0.9**

Notes: NWI: National Wetlands Inventory.
[a] Includes fill footprint of gravel pads, gravel roads, and pipeline vertical support members.
[b] Values may not sum to totals because of rounding.
[c] See Section 6.0 and Appendix E

Table 7. Total Acreage of Impact to WOUS within the Teshekpuk Lake Special Area by National Wetlands Inventory Type

NWI Code	Description	Direct Impact Area (acres)[a]	Indirect Impact Area (acres)
PEM1/SS1B	Palustrine seasonally saturated persistent emergent/broad-leaved deciduous shrub meadow	31.4	31.6
PEM1/SS1D	Palustrine continuously saturated persistent emergent/broad-leaved deciduous shrub meadow	32.1	26.8
PEM1/SS1E	Palustrine seasonally flooded-saturated persistent emergent/broad-leaved deciduous shrub meadow	0.2	0.3
PEM1/SS1F	Palustrine semi-permanently flooded-saturated persistent emergent/broad-leaved deciduous shrub meadow	5.6	3.6
PEM1F	Palustrine semi-permanently flooded persistent emergent meadow	23.2	19.6
PEM1H	Palustrine permanently flooded persistent emergent marsh	2.7	3.4
PSS1/USB	Palustrine seasonally saturated broad-leaved deciduous shrub/unconsolidated shore	0.2	0.3
PSS1B	Palustrine seasonally saturated broad-leaved deciduous shrub scrub	1.5	2.2
PSS1C	Palustrine seasonally flooded broad-leaved deciduous shrub scrub	0.1	0.2
PSS1D	Palustrine continuously saturated persistent emergent meadow	0.7	0.9
PSS3B	Palustrine seasonally saturated broad-leaved evergreen scrub	1.7	1.9
PUBH	Palustrine permanently flooded unconsolidated bottom pond	0.3	0.4
R2UBH	Riverine permanently flooded lower perennial stream	<0.1	<0.1
R2USC	Riverine seasonally flooded unconsolidated shore	<0.1	0.0
Total within the Teshekpuk Lake Special Area[b]		**99.8**	**91.3**
Total Debits[c]		**99.8**	**9.1**

Notes: NWI: National Wetlands Inventory.

[a] Includes fill footprint of gravel pads, gravel roads, and pipeline vertical support members, but excludes those areas within 500-feet anadromous fish-bearing waters.

[b] Values may not sum to totals because of rounding.

[c] See Section 6.0.

ABR, Inc. – Environmental Research & Services (ABR) performed wetlands habitat mapping for the proposed Willow Project. Excerpts of wetlands mapping from the ABR report relative to the WOUS impacts shown in Tables 5 through 7 are included in Appendices B through D.

Following identification of the indirect impact mitigation areas, CPAI determined the debits that impacts to these areas would incur (Table 5 through 7). CPAI performed an Aquatic Site Assessment and evaluated the condition of the wetlands in these areas using the North Slope Rapid Assessment Method (Berkowitz et al. 2017), and the Alaska District Credit Debit Methodology (USACE 2016) in order to calculate the debits from direct fill placement and excavation in the three areas identified in Tables 5 through 7.

To determine the number of debits incurred in the indirect impacts mitigation areas, CPAI followed past precedent from large North Slope projects where the functional loss to wetlands due to indirect impacts is assumed at 10 percent. By their nature, indirect impacts do not result in a complete loss of wetland function because the wetlands continue to provide wetland functions, although at a reduced capacity. The 10 percent functional loss factor has been used in calculating debits for indirect impacts on previous authorizations for North Slope projects, including the Point Thomson Project and GMT1/MT6. CPAI applied the 10 percent functional loss factor to the indirect impact areas shown in Tables 5 through 7. The resulting indirect debits were added to the direct debits to obtain a total project debit for each of the three areas where compensatory mitigation has been determined necessary.

The total Willow Project direct impacts that may require compensatory mitigation is 122.8 acres resulting in 122.4 debits. These 122.4 debits would be spread over two construction phases as shown in Table 8, below. In addition, indirect impacts resulting from the placement of fill could affect an additional 115.0 acres, resulting in an additional 11.5 debits. Table 8, below, shows the debits calculated per phase for direct and indirect impacts. A copy of the Aquatic Site Assessment report and debit accounting are located in Appendix E.

Table 8. Willow Project Debits per Phase

Area	Direct Impact Area (acres)	Indirect Impact Area (acres)	Total Debits
Phase 1			
WOUS within the TLSA	32.2	19.9	34.2
WOUS within the CRSA	8.1	9.3	9.0
WOUS within 500 feet of Anadromous Fish-Bearing Waters	13.2	11.6	14.0
Phase 1 Total	**53.5**	**40.7**	**57.2**
Phase 2			
WOUS within the TLSA	67.6	71.4	74.7
WOUS within 500 feet of Anadromous Fish-Bearing Waters	1.7	2.9	2.0
Phase 2 Total	**69.3**	**74.2**	**76.7**
Grand Total	**122.8**	**115.0**	**133.9**

Notes: WOUS: Waters of the U.S., TLSA: Teshekpuk Lake Special Area; CRSA: Colville River Special Area

5.2 Nuiqsut Subsistence Trail Tundra Rehabilitation Baseline Information

Local residents use multiple access points with ATVs to access subsistence areas to the northwest of the Nuiqsut landfill. The use of multiple access points and the saturated nature of the tundra have resulted in a web-effect of damage to the tundra including deep rutting that inhibits surface water flows, and increased sedimentation. Additional damage to the vegetative mat further contributes to sedimentation and reduces thermal insulation. The disturbance of native vegetation can provide a preferential pathway in which invasive species can become established. All of these issues can reduce the water quality in the area as well as aesthetics. The tundra damage extends along the 6-mile trail segment. Without a solution, the adversely impacted area is expected to grow over time.

For reference to actual ground conditions along the Nuiqsut Subsistence Trail project area, an aerial photograph showing representative damage is provided below (Photo 1). Also, representative photographs of a similar situation along a trail in Utqiaġvik, and the post geogrid application results, are provided to illustrate the anticipated results of completing the Nuiqsut project (Photos 2 and 3).

The Nuiqsut Subsistence Trail project location was not accessible during the site visit; therefore, current trail conditions and the estimated area of wetlands types and impacts were determined using aerial photography and NWI mapping (United States Fish and Wildlife Service [USFWS] 2020). The desktop mapping indicates the current wetlands in the proposed improvement area are comprised primarily of mixed saturated emergent scrub shrub wetlands. Soils in these areas typically range from histosols with thick layers of saturated organics, to histic epipedons that have a thick layer of saturated organics underlain by dark mineral soils made of silt loams and silty sands and some gleyed soils in areas of permanent saturation. Vegetation is comprised of emergent plants and low dwarf shrubs. The entire area is underlain by continuous permafrost and has remnants of dried pond/lake basins. The effects of the ATV damage on the wetlands appears to have severely disturbed the vegetative mat and altered the hydrology patterns. Areas where deeper rutting has removed the vegetative mat and blocked normal hydrology patterns are experiencing ponding that can alter the active layer depth, which impacts vegetation patterns from those mapped by NWI.

Table 9 below shows the resulting enhancement area calculated. The functional enhancement credit area and wetlands mapping are presented on Figures 7A through 7T, Appendix A1.

Table 9. Nuiqsut Subsistence Trail Tundra Rehabilitation Area Waters of the United States

NWI Code	Description	Area (acres)
PEM1/SS1B	Palustrine seasonally saturated persistent emergent/broad-leaved deciduous shrub meadow	82.8
PEM1/SS1E	Palustrine seasonally flooded-saturated persistent emergent/broad-leaved deciduous shrub meadow	6.5
PEM1E	Palustrine seasonally flooded-saturated persistent emergent meadow	12.4
PEM1F	Palustrine semi-permanently flooded persistent emergent meadow	7.3
Total WOUS		**109.0**

Notes: WOUS: waters of the U.S.; NWI: National Wetland Inventory.

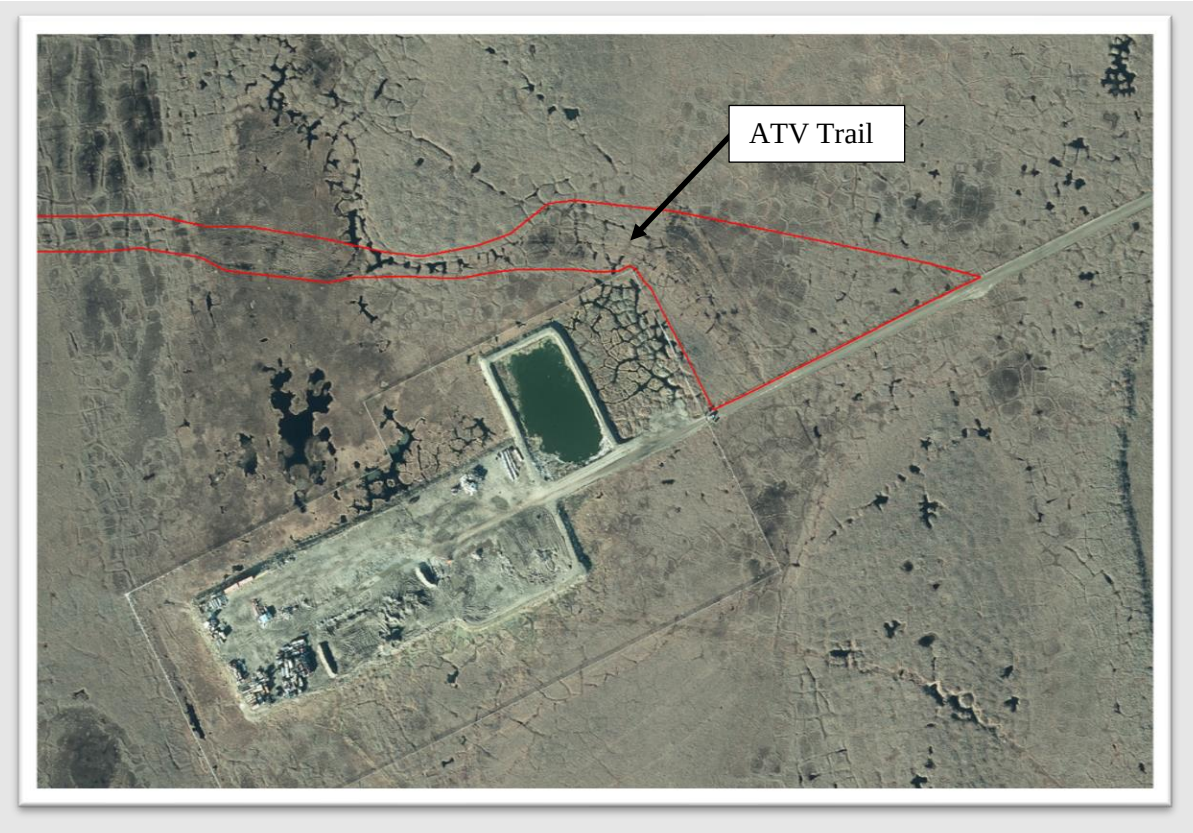


Photo 1. Representative aerial view of tundra damage from ATV use.



Photo 2. Example of trail damage in Utqiaġvik before installing geogrid. Photo Credit: North Slope Borough Website- Robert Suydam



Photo 3. Example of trail damage area in Utqiaġvik two years after installing geogrid. Photo Credit: North Slope Borough Website- Robert Suydam

5.3 Anaktuvuk Pass Subsistence Trail Tundra Rehabilitation

The baseline conditions of the Anaktuvuk Pass Subsistence Trail project are similar to the conditions documented at the Nuiqsut Subsistence Trail project. Local residents use trails departing from the existing road near the Anaktuvuk Pass landfill to access areas northeast of the community via ATVs. The north-trending trail ends near a group of cabins near Kongumavik Creek. The east-trending trail ends near an unnamed tributary of Kongumavik Creek. The east-trending trail includes two separate branches, as residents drive both north and south around a snow fence just east of the landfill.

Tundra damage along the Anaktuvuk Pass Trail is similar to the damage described for the Nuiqsut Subsistence Trail project except that rutting impacts are apparent across a wider area along the Anaktuvuk Pass Trail. The ATV damage to the wetlands includes severe disturbance of the vegetative mat and alteration of the natural hydrology. There are areas where deeper rutting has removed the vegetative mat and blocked normal hydrology patterns, resulting in ponding that has deepened the active layer depth of the permafrost-affected soils. In addition, the disturbance appears to be spreading over time. Review of multiple years of aerial imagery (e.g., Google Earth, Bing Imagery) by CPAI shows that ATV rutting disturbance continues to grow as ATV users fan out to avoid the more heavily disturbed areas.

USFWS NWI mapping (USFWS 2020) is not available for the Anaktuvuk Pass area. As a result, planning-level desktop wetlands mapping and NWI classification were conducted for the rehabilitation area. Table 10 shows the results of the wetland mapping within the enhancement area. The Anaktuvuk Pass Subsistence Trail project would rehabilitate 100.1 acres of disturbed

tundra, including approximately 94.6 acres of wetlands and other WOUS and 5.5 acres of uplands, which are directly connected to and help maintain the ecological viability of adjoining aquatic resources. For example, rehabilitation of upland areas will help maintain water quality in adjacent wetland areas through revegetation of trail ruts and the avoidance of increased sediment in down-gradient wetlands. The functional enhancement credit area and mapping are presented on Figures 8A through 8P, Appendix A1.

Table 10. Nuiqsut Subsistence Trail Tundra Rehabilitation Area Waters of the United States

NWI Code	Description	Area (acres)
PSS1B	Palustrine saturated broad-leaved deciduous shrub scrub	0.3
PSS1/EM1A	Palustrine temporarily flooded broad-leaved deciduous/persistent emergent scrub	0.9
PSS1/EM1B	Palustrine saturated broad-leaved deciduous/persistent emergent scrub	7.6
PSS1/EM1E	Palustrine seasonally flooded-saturated broad-leaved deciduous/persistent emergent scrub	0.3
PEM1/SS1B	Palustrine saturated persistent emergent/broad-leaved deciduous shrub meadow	79.3
PEM1/SS1E	Palustrine seasonally flooded-saturated persistent emergent/broad-leaved deciduous shrub meadow	1.0
PEM1/SS1C	Palustrine seasonally flooded persistent emergent/broad-leaved deciduous shrub meadow	5.2
R2UBH	Lower perennial permanently flooded stream with unconsolidated bottom	0.0
U	Upland	5.5
Total Waters of the U.S.		**94.6**
Total Area		**100.1**

Notes: NWI: National Wetlands Inventory.

5.4 Fish Creek and Cape Halkett Preservation Areas

5.4.1 Fish Creek Preservation Area

The Fish Creek preservation area and the Willow Project are both located on the Arctic Coastal Plain. The mouth of Fish Creek is classified as an estuarine delta that supports a wide variety of fish, mammal, and wetlands communities that are scarce on the North Slope.

The exact location of the 800-acre preservation area will be determined through consultation with the landowner and USACE, and it will be located within the lager area shown on the Fish Creek Vicinity map provided as Figure 9, Appendix A1.

The Fish Creek area contains tidally influenced estuarine habitat, both of which are considered unique and important areas in the USACE Thought Process. The high-functioning wetlands present at Fish Creek currently support ecological sustainability of the watershed. Fish Creek is an anadromous stream and supports chum salmon, Chinook salmon, pink salmon, broad whitefish,

Dolly Varden, and humpback whitefish (Alaska Department of Fish and Game [ADF&G] 2020) that are categorized by ADF&G as Species of Greatest Conservation Need (ADF&G 2015).

Subsistence harvests are a critical component of food security and cultural traditions on the North Slope. The mouth of Fish Creek is a common subsistence use area for Nuiqsut residents. The parcel lies in an overlapping, high-subsistence-use area where fish, caribou, goose, and moose subsistence resources are harvested (BLM 2020b). The parcel is also a low-use subsistence area for Utqiaġvik (Barrow) residents.

The Fish Creek area is located within the designated CRU, a producing oil and gas unit. The subsurface estate of the lands is held by ASRC, and CPAI holds oil and gas leases from ASRC for the lands. Thus, the land rights for oil and gas development are already held by an active oil and gas operator, although development remains subject to a funded development proposal and government permitting approvals. Preservation in the Fish Creek area will preserve lands that are privately held and available for development, including development under existing oil and gas leases. The Fish Creek area was previously approved for preservation credit for the Nuiqsut Spur Road project. For the foregoing reasons, preservation in the Fish Creek area satisfies the criteria of 33 CFR §332(h) for the Willow Project.

5.4.2 Cape Halkett Preservation Area

The Cape Halkett preservation area and the Willow Project are both located on the Arctic Coastal Plain. Cape Halkett abuts the Beaufort Sea and is immediately adjacent to the TLSA, and supports a variety of terrestrial and marine mammal, as well as wetlands and avian communities. The preferred alternative in BLM's 2020 Integrated Activity Plan, Final Environmental Impact Statement (BLM 2020a), allows for lands near Cape Halkett to be open to subsurface fluid mineral leasing, but subject to no surface infrastructure. Subsurface lease holders in the area would have few options to locate necessary surface facilities and equipment, such as pads and an airstrip. Cape Halkett, as a private parcel, is not subject to BLM's restrictions on development and offers a location where subsurface lease holders could locate necessary surface infrastructure to access adjacent subsurface resources through directional drilling. Lands to the east are state tidelands subject to oil and gas leasing by the State of Alaska, and Cape Halkett provides a potentially attractive location for locating surface infrastructure to support offshore development. The large Smith Bay discovery is nearby, to the northeast, and has generated significant industry interest in oil and gas exploration and development in this area. Furthermore, on September 2, 2020, Shell filed an application with the State of Alaska Department of Natural Resources to form the West Harrison Bay unit consisting of 18 leases in West Harrison Bay, which is only about five miles from the Cape Halkett preservation lands.

The Cape Halkett preservation area is focused on lands inland from the coast to mitigate the impact of potential future coastal erosion. The exact location of the 800-acre preservation area will be determined through consultation with the landowner and USACE, and it will be located within the lager area shown on the Cape Halkett Vicinity map provided on Figure 10, Appendix A1. Lands at Cape Halkett were approved for preservation credit for recent oil and gas related projects (GMT1 and AES Deadhorse Pad). For the foregoing reasons, preservation in the Cape Halkett area satisfies the criteria of 33 CFR §332(h) for the Willow Project.

6.0 MITIGATION CREDIT

CPAI evaluated the condition of the wetlands in the enhancement areas using the USACE's North Slope Rapid Assessment Method (Berkowitz et al. 2017), and the Alaska District: Credit Debit Methodology (USACE 2016) (Appendix E). The total acres of functional enhancement credit is 209.1 resulting in 56.9 credits. This functional enhancement will serve to partially offset 122.8 acres of direct impacts and 115.0 acres of indirect impacts, totaling 133.9 debits required by the USACE and identified in Table 8, above. The outstanding 77.0 debits will be offset through preserving land at either Fish Creek or Cape Halkett. The following sections describe each project and associated credit.

6.1 Nuiqsut Subsistence Trail Tundra Rehabilitation Credit Determination

Geogrid material will be strategically placed at 8-foot widths along approximately 6 miles of a subsistence ATV trail corridor. The geogrid material is not considered "fill" material as it does not either replace any portion of a WOUS with dry land or change the bottom elevation of any portion of a water (33 CFR 323.2). The geogrid will support ATV traffic and will address direct impacts along the central portion of the trail, as well as lateral web-effect damage radiating out from the central portion of the trail. Nuiqsut residents have stated that they prefer to use a common alignment to the target subsistence areas; however, rutted conditions and loose muddy soils in wetter areas force them to bypass existing trails and radiate out to new areas in many locations along the route. The total corridor area, out to the extent of existing and even future bypass trails would be rehabilitated by providing a common, safe access corridor along a single path with a stable base that can withstand sustained use over time. The geogrid material would allow the tundra directly under the geogrid to establish vegetation and maintain natural hydrologic flows. The ATV wheels will be supported by the geogrid and will not encounter the tundra mat, which will mitigate future compression and allow the vegetative mat to reestablish. The existing lateral area of impacts would improve as ATV traffic is established along the geogrid and bypass trails are no longer needed.

The Nuiqsut Subsistence Trail project would provide site-specific improvements such as 1) reduction in site landscape disturbance, 2) mitigation of anthropogenically derived surface water ponding, and 3) improvement of natural hydrologic function within the damaged portion of the tundra. The functional enhancement in the immediate area of impacts is defined longitudinally by the length of proposed geogrid, and laterally by the web-effect and bypass disturbance zone. Therefore, the Nuiqsut Subsistence Trail rehabilitation project will provide functional enhancement to the 109.0 acres referenced in Table 9, Section 5.2. This 109.0 acres is comprised of the total area of trail damage under the new geogrid and lateral web effect damage adjacent to the new trail. The area was delineated based on aerial interpretation of current impacts. Rehabilitation of the trail within the 109.0-acre area will result in 28.7 credits. A figure showing the functional enhancement credit area and wetlands mapping is presented on Figures 7A through 7T, Appendix A1. Supporting technical information regarding credit calculations is provided in Appendix E.

6.2 Anaktuvuk Pass Subsistence Trail Tundra Rehabilitation Credit Determination

Geogrid material would be installed in a similar fashion as the Nuiqsut project and would provide similar benefits to the community of Anaktuvuk Pass and the Colville River watershed. The Anaktuvuk Pass Subsistence Trail project would provide wetlands enhancement to 100.1 acres and would result in 28.2 credits. A figure showing the functional enhancement credit area and wetlands mapping is presented on Figures 8A through 8P, Appendix A1. Supporting technical information regarding credit calculations and enhancement area is provided in Appendix F.

6.3 Enhancement Projects Credit Debit Summary

Table 11 summarizes total impacts in terms of acres affected and debits associated with the Willow Project. Table 11 also shows total uplifted acres and credits of the proposed enhancement projects. On a debit/credit basis, the Willow Project generates 77.0 more debits than the enhancement projects (alone) generate in credits. On a debit/credit basis, the enhancement projects leave a 77.0 debit /credit deficit.

Table 11. Enhancement Project Credit-Debit Summary

Area Type	Area	Acres	Debits	Credits	Total
Project Direct Impact	Wetlands and Waters within 500-feet of Anadromous Fish-Bearing Waters	(14.9)	(14.5)	-	(14.9 acres) (14.5 debits)
	Wetlands and Waters in the TLSA	(99.8)	(99.8)	-	(99.8 acres) (99.8 debits)
	Wetlands and Waters in the CRSA	(8.1)	(8.1)	-	(8.1 acres) (8.1 debits)
Project Indirect Impact	Wetlands and Waters within 500-feet of Anadromous Fish-Bearing Waters	(14.5)	(1.5)	-	(14.5 acres) (1.5 debits)
	Wetlands and Waters in the TLSA	(91.3)	(9.1)	-	(91.3 acres) (9.1 debits)
	Wetlands and Waters in the CRSA	(9.3)	(0.9)	-	(9.3 acres) (0.9 debits)
Mitigation	Nuiqsut Subsistence Trail Tundra Rehabilitation	109.0	-	28.7	109.0 acres 28.7 credits
	Anaktuvuk Pass Subsistence Trail Tundra Rehabilitation	100.1	-	28.2	100.1 acres 28.2 credits
Total		**(28.7)**	**(133.9)**	**56.9**	**(28.7 acres) (77.0 debits)**

Notes: TLSA: Teshekpuk Lake Special Area; CRSA: Colville River Special Area

6.4 Fish Creek or Cape Halkett Land Preservation

Preserving lands at the mouth of Fish Creek or Cape Halkett would more than offset the balance of 77.0 debits that remain following implementation of the Subsistence Trail and Culvert Repair projects. This conclusion is reached under both a credit methodology based on a hypothetical development scenario, and on an acreage, basis using a ratio for discounting preservation acreage.

6.4.1 Preservation Credit / Debit Calculation (Approach A)

CPAI evaluated both preservation options (Fish Creek and Cape Halkett) following the example and guidance provided in Section 5.3 of the North Slope Rapid Assessment Method (Berkowitz et al. 2017) and direction provided by Sections 3.2 and 7.2.2 of the Alaska District Credit Debit Methodology (USACE 2016). Supporting technical information regarding these calculations is provided in Appendix E.

In accordance with the methodology, a reasonable development must be considered that would occur in the absence of preservation. To meet this part of the process CPAI proposed a development scenario based on past experience developing oil and gas resources on the North Slope.

A development scenario constructed at Fish Creek or Cape Halkett is likely to contain some or all of the following infrastructure:

- Central processing facility
- One or more drillsites
- Airstrip
- Operations center
- Subsistence turnouts and boat ramps
- Infield roads connecting facilities
- Valve pads at stream crossings
- A material site, and
- Constructed freshwater reservoir

A project with some or all these features is estimated to occupy between 50 and 150 acres of gravel fill depending on the specific site, development constraints, and other considerations. CPAI selected an average development footprint of 100 acres to evaluate the credits that could be calculated if that footprint were preserved. Because these areas are remote and have no existing impacts, the pre-project Functional Capacity Index (FCI) score (without preservation) using the North Slope Rapid Assessment Method would equal 0.0 because the area would be converted to upland through placement of gravel fill. The post-project FCI score (with preservation) would equal 1.0. The pre- and post-project FCI scores would thus return a change in FCI (an FCI delta) of +1.0 for each acre of wetlands and other WOUS that would be filled according to the development scenario, making the result of the first step 100 credits.

A change in FCI of +1.0 would typically net 1 credit per acre of WOUS preserved. However, the Alaska District Credit Debit Methodology applies a "preservation adjustment factor" to credits gained. The preservation adjustment factor discounts credits based on the level of threat to an area (with preservation of areas under lower threat receiving fewer credits) and the ecological significance (with preservation of areas with lower ecological significance also receiving fewer credits). The preservation adjustment factor represents a number between 0.0 and 1.0 which represents the sum of the threat score and the ecological significance score (Table 12). The estimated credits received per acre are multiplied by the preservation adjustment factor to determine the credits that would be generated by preservation of each site.

Table 12. Fish Creek or Cape Halkett Preservation Adjustment Factor Determination

Criteria[a]	Fish Creek	Cape Halkett
Threat (select highest applicable threat score)		
Demonstrated land use trend within the boundaries of an incorporated city, town, or borough. (Example: Platted land zoned for development); or Demonstrated threat of mining activities through extensive prospecting, which indicates there are economically recoverable reserves/commodities; or Demonstrated threat of oil/gas activities through exploration activities, which indicate there are economically recoverable reserves. (0.3 pts)	–	–
Demonstrated land use trend locally or regionally resulting in destruction or alteration of aquatic resources outside of incorporated areas; or Demonstrated threat of mining activities through sampling, i.e. sampling of water quality constituents, which indicate there are economically valuable reserves/commodities. (0.2 pts)	0.2	0.2
Inholdings within regionally important publicly held lands (0.1 pt)	–	–
Threat Score Total	***0.2***	***0.2***
Ecological Significance (select all that apply)		
Aquatic resources that are adjacent to or connect regionally important publicly held lands. (0.1 pt)	0.1	0.1
Site contains aquatic resources that have been identified as significant or productive within a specified Ecoregion. (0.3 pts)	0.3	0.3
Aquatic resources that provide habitat important to species that have some special (Federal, State, or local) designation or importance. (0.2 pts)	0.2	0.2
Scarcity of Aquatic Resource Type. (0.1 pt)	0.1	0.1
Ecological Significance Score Total	***0.7***	***0.7***
Preservation Adjustment Factor Total (sum of threat and ecological significance)	**0.9**	**0.9**

[a] Defined in the Alaska District: Credit Debit Methodology (USACE 2016).
Notes: pts: points.

CPAI applied a threat score of 0.2 for both preservation areas (Table 12). Specifically, both areas are located on lands outside of an incorporated city or town (but within an incorporated borough) that have a demonstrated land use trend locally or regionally resulting in destruction or alteration of aquatic resources. In addition, the Fish Creek area is located within the CRU and on leases purchased by CPAI, demonstrating the existence of financial interest in resources in the area.

CPAI applied an ecological significance score of 0.7 for Fish Creek and Cape Halkett (Table 12). Both areas contain aquatic resources that have been identified as significant or productive and provide habitat to species that have some special designation or importance. The Fish Creek parcel abuts and directly supports Fish Creek, which is an anadromous stream listed in the Anadromous Waters Catalog (ADF&G 2020). Both sites also support species such as caribou that are subsistence resources of major importance to Nuiqsut, Utqiaġvik and other North Slope communities (BLM 2020b, Appendix E.16, pg. 23, 46). Both Fish Creek and Cape Halkett are documented within the ranges of subsistence activities for Utqiaġvik, Nuiqsut, or both (BLM 2020b, Appendix E.16, pg. 4, 27). Furthermore, both sites are adjacent to regionally important publicly held lands within the NPR-A and adjacent to and functionally similar to lands that have

been identified as biologically sensitive in previous and current BLM Integrated Activity Plan documents for the NPR-A (Stipulations K-1- River Setbacks and K-5 Coastal Areas) (BLM 2013, BLM 2020a). The preservation areas would likely have similar stipulations on development if they were in public ownership.

Finally, the Fish Creek area contains tidally influenced estuarine habitat, an uncommon aquatic resource type on the Alaska North Slope. Arctic tidal marshes have been identified as a wetland of conservation concern in Alaska (Flagstad et al. 2018). Wetland types at Cape Halkett are also uncommon. The preservation area at Cape Halkett contains a high proportion of freshwater herbaceous permanently flooded or semi-permanently flooded wetland types. Permanently flooded or semi-permanently flooded freshwater emergent wetlands and waterbodies in the preservation area may also support *Arctophila fulva*-dominated communities, which have been observed in the Cape Halkett area. *Arctophila fulva* wetlands are widely considered to be relatively scarce and highly valuable habitat for birds of the Alaskan Arctic Coastal Plain. Based on wetland types present at Cape Halkett with consideration for its coastal location and availability for preservation based on private ownership, the aquatic resources in the preservation area are uncommon.

The threat score and ecological significance score are summed to generate the preservation adjustment factor (Table 12). Based on a preservation adjustment factor of 0.9 for Fish Creek and Cape Halkett and an average development footprint of 100 acres, preservation would generate 90 credits (Table 13). Additional credits were also included to reflect the avoidance of indirect impacts avoided as a result of preservation. Avoided indirect impacts were calculated in the same manner used for calculation of indirect impact debits for the Willow Project (e.g. the acreage of impact was determined using a 35-foot buffer and an assumed 10 percent functional loss). Inclusion of credits from avoided indirect impacts would add an additional 0.6 credits gained as a result of preservation for total preservation credits of 90.6 credits (see Table 13 and Appendix E).

Table 13. Fish Creek or Cape Halkett Preservation Credit Analysis

Preservation Area	Assessment Area	Acres[a]	FCI		FCI Δ	PAF	Adjust. Δ	Credits
			w/o Pres.	w/ Pres.				
Fish Creek or Cape Halkett	Development Footprint	100	0.00	1.00	1.00	0.9	0.90	90.0
	Indirect Buffer	7	0.90	1.00	0.10	0.9	0.09	0.6
Preservation Area Total								**90.6**

[a] Based on average development footprint and conservative assumption of buffer areas

Notes: FCI: functional capacity index; Δ: change; PAF: preservation adjustment factor; w/o: without; w/: with; Pres: Preservation.

Applying the preservation credits against debits that remain after the Nuiqsut enhancement projects are accounted for leads to the conclusion that the credits generated by preservation at either Fish Creek or Cape Halkett more than offset the remaining 77.0 debits. This analysis demonstrates that the proposed mitigation is sufficient to offset unavoidable impacts associated with the Willow Project.

6.4.2 Preservation Acreage Ratio Calculation (Approach B)

The credit / debit methodology applied in Section 6.4.1 is not the only way to evaluate the sufficiency of a mitigation plan. Historically, the USACE has often determined the appropriate amount of preservation by applying a ratio to discount the conservation value of the preserved lands. This was done for the CD5 development, the Point Thomson development, the Nuna development, and other recent North Slope projects. Although ratios have been applied in different ways, the prevailing ratio for preservation generally was 3:1 for direct impacts, that is, three acres of preservation lands to offset development impacts to one acre of pristine wetland. We acknowledge that the 3:1 ratio had a foundation in guidance that is no longer in effect, but the actual past practice remains a useful reference point.

As shown in Table 1b (Section 2.0), CPAI is proposing 800 acres preservation. For example, at a 3:1 ratio, 800 acres of preservation would generate 266.7 credits. Those 266.7 credits combined with the 56.9 credits generated from CPAI's proposed enhancement projects provide a total of 323.6 credits, a surplus of 189.7 credits over the 133.9 debits incurred by the Willow Project (Table 1c). Table 1c also presents several alternative credit balance calculations and shows that this approach would fully offset the 133.9 Willow debits if higher ratios were applied. The proposed compensatory mitigation, with enhancement plus preservation, is more than sufficient to appropriately compensate for unavoidable impacts to aquatic sites that will result from the Willow Project.

7.0 MITIGATION WORK PLAN

Additional site-specific data for the proposed enhancement projects are needed to support engineering design and planning efforts prior to ordering materials which must be purchased and shipped to Nuiqsut and Anaktuvuk Pass. Therefore, the compensatory mitigation projects proposed in this plan will occur in a phased approach coincident with Willow Project construction. CPAI will provide final design packages to the USACE for review prior to executing each project. CPAI proposes the following construction schedule identified in Table 14. General descriptions of the scope of each project are presented in the following sections. Please note that the dates proposed may need to be adjusted for contingencies, and in case of any project delay, the execution dates, in particular, may need to be extended.

Table 14. Proposed Compensatory Mitigation Construction Schedule

Project Name	Data Gathering, Design, Material Procurement and Delivery	Execution
Nuiqsut Subsistence Trail Tundra Rehabilitation	2021-2024	Summer 2025-2026
Anaktuvuk Pass Subsistence Trail Tundra Rehabilitation	2022-2025	2026-2027
Fish Creek or Cape Halkett Preservation Area	2020-2021	2020-2021

7.1 Nuiqsut Subsistence Trail Tundra Rehabilitation Work Plan

A new geogrid trail is planned to improve subsistence access and protect the natural environment from damage and degradation due to ATV traffic along this existing transportation corridor. The trail can be accessed via Landfill Access Road. It is our intent that the contractor selected to install the geogrid will prioritize job opportunities for local residents. CPAI will conduct a survey during the summer growing season to confirm wetland types, alignment, and design. CPAI will also use this time for coordination with the NSB and local stakeholders. CPAI anticipates constructing the geogrid trail during the summer. CPAI will provide a final design plan to the USACE for approval prior to construction. CPAI will also provide an as-built plan to the USACE once the trail is complete. A plan view and typical cross section of the proposed trail is included in Appendix A2.

The geogrid will be installed in coordination with the manufacturer's recommendations and specifications. The interlocking mat sections will be installed one at a time from the upgraded landfill road and proceeding approximately 6 miles along the central portion of the trail. The panels will be strategically placed by hand directly over the existing trail. Extremely muddy or boggy sites may require that a supplemental geotextile layer be placed beneath the panels to assist with flotation. The trail will be 8-feet wide and constructed using two 4-foot wide panels. After installation, the panels' surface will provide a tread surface for vehicles, and the panels' structure will distribute vehicle weight. The open structure of the panels will allow water to percolate and vegetation to grow through the panels.

7.2 Anaktuvuk Pass Subsistence Trail Tundra Rehabilitation Work Plan

A new geogrid trail is planned to improve subsistence access and protect the natural environment from damage and degradation due to ATV traffic along this existing transportation corridor. The trail can be accessed via Anaktuvuk Pass Landfill Access Road. It is our intent that the contractor selected to install the geogrid will prioritize job opportunities for local residents. CPAI will conduct a survey during the summer growing season to confirm wetland types, alignment, and design. CPAI will also use this time for coordination with local stakeholders. CPAI anticipates constructing the geogrid trail during the summer. CPAI will provide a final design plan to the USACE for approval prior to construction. CPAI will also provide an as-built plan to the USACE once the trail is complete. The typical cross section of the proposed trail shown in Appendix A2 is applicable.

The geogrid will be installed in coordination with the manufacturer's recommendations and specifications. The interlocking mat sections will be installed one at a time from the upgraded landfill road and proceeding along the central portion of the trail. The panels will be strategically placed by hand directly over the existing trail. Extremely muddy or boggy sites may require that a supplemental geotextile layer be placed beneath the panels to assist with flotation. The trail will be 8-feet wide and constructed using two 4-foot wide panels. After installation, the panels' surface will provide a tread surface for vehicles, and the panels' structure will distribute vehicle weight. The open structure of the panels will allow water to percolate and vegetation to grow through the panels.

7.3 Fish Creek or Cape Halkett Preservation Area

CPAI will work with Kuukpik Corporation (for Fish Creek) or ASRC (for Cape Halkett) to complete a survey and secure a site protection instrument for the preservation area selected. The site protection instrument will identify activities that will and will not be allowed on the preservation area. The site protection instrument will include an aerial photograph of the area and coordinates denoting the boundary. The site protection instrument will also identify the number and type of wetlands located in the preservation area.

8.0 MAINTENANCE PLAN

8.1 Nuiqsut and Anaktuvuk Pass Subsistence Trail Tundra Rehabilitation

Long-term management of the subsistence trails may be most effective if it includes local control. CPAI will perform three years of inspections and maintenance post construction. During this time, CPAI will collaborate with local stakeholders and fund the creation of a long-term management plan. Routine periodic maintenance is expected to include visual inspections for damage to geogrid or sections that are no longer passable. Repair work would focus on maintaining the functionality of the trail surface.

8.2 Fish Creek or Cape Halkett Preservation Area

CPAI is not providing a maintenance plan for the preservation area. No maintenance will be necessary for site preservation.

9.0 PERFORMANCE STANDARDS

9.1 Nuiqsut and Anaktuvuk Pass Subsistence Trail Tundra Rehabilitation

The geogrid material will be installed according to manufacturer specifications. Success will be considered attained if the material is capable of supporting the weight of anticipated loads and is wide enough to allow two-way ATV traffic along the length of the new path. This will mitigate ponding (ruts), allow the tundra vegetative mat under the geogrid and in adjacent tundra to recover, and encourage the return of wetland function. Success will also be measured by observing progressive vegetation growth through the geogrid and in the adjacent rehabilitation area over the monitoring period, which would indicate the damaged tundra is recovering. With the trail reinforcement, ATV use adjacent to the trail will be minimized to the extent practicable in order to access subsistence resources. Performance standards will also be considered met when vegetation growth and a reduction of ponding under the geogrid and laterally from each field target within the enhancement area used to calculate enhancement credits are observed and documented.

9.2 Fish Creek or Cape Halkett Preservation Area

CPAI's proposed performance standard for preservation is confirmation that prohibited actions identified in the site protection instrument are not present. CPAI will assess the area by a review of aerial imagery.

10.0 MONITORING PLAN

Site-specific monitoring plans for each project are located in Appendix G (Nuiqsut and Anaktuvuk Pass Subsistence Trails), and Appendix H (Cape Halkett and Fish Creek Preservation Areas). The general monitoring plan and schedule being considered for these projects is provided in Table 15, below. Monitoring along the Nuiqsut and Anaktuvuk Subsistence Trails will include observation data collected along the new trail, and in the adjacent tundra perpendicular to the trail to document tundra rehabilitation in the improvement area. A summary report of findings will be submitted to the USACE by December 31 of each monitoring year. The report will include an analysis of the monitoring criteria and describe performance relative to success criteria. Recommendations for adaptive management, if appropriate, will be include in the report. The report will include attachments that consist of site photographs, aerial imagery, field notes and documentation of the project's progress toward achieving the performance standards.

Table 15. Proposed Monitoring Plan and Schedule

Project Name	Responsible Party	Monitoring Method	Monitoring Frequency	Criteria Monitored
Nuiqsut and Anaktuvuk Pass Subsistence Trail Tundra Rehabilitation	CPAI/ Residents	Visual-photographic	Once at pre-construction to document baseline conditions and establish reference points/ once at end of the growing season for 3 years after construction along trail and at reference points. Additional Monitoring will be coupled with routine maintenance obligations once per year until year 10, or until success criteria relating to tundra mat recovery is achieved. Monitoring may be reduced at the USACEs discretion if conditions warrant.	• Establish up to 5 reference points along each trail enhancement project • Document trail is installed as recommended by manufacturer • Document and monitor that the trail is supporting traffic loads and two-way traffic • Document geo grid condition and ATV use on and adjacent to trail, and evaluate need for signage or adaptive management • Document vegetation recovery under the trail and adjacent to trail. Evaluate need for adaptive management
Fish Creek or Cape Halkett Preservation Area	CPAI/ Land Manager	Review of aerial imagery	One baseline monitoring event and then at 5 years and ten years. Additional monitoring may be required at USACE's discretion	Activities prohibited in the site protection instrument

Notes: CPAI: ConocoPhillips Alaska, Inc.; ATV: all-terrain vehicle.

Currently, CPAI sponsors a summer Career Quest program with Nuiqsut high school students. It is our intent to incorporate Career Quest students into the monitoring plan to help perform Nuiqsut trail evaluations. We feel this is valuable education opportunity for local children and will facilitate community ownership and pride in the new trail system

11.0 LONG-TERM MANAGEMENT

Long term management (beyond monitoring described above) would remain the responsibility of the local landowners and land managers.

12.0 ADAPTIVE MANAGEMENT

12.1 Nuiqsut and Anaktuvuk Pass Subsistence Trail Tundra Rehabilitation

CPAI will coordinate any adaptive management/maintenance that may be required along the new geogrid trails. CPAI has committed to perform monitoring and is subject to the concurrence of the landowner. Adaptive management could include:

- Replacing trail sections that have become damaged or lost.
- Adding trail sections where inspections indicate a wider trail is necessary.
- Fixing uneven areas as needed to maintain a useable trail surface. This may include adding or removing blocking, or other measures.

12.2 Fish Creek or Cape Halkett Preservation Area

Adaptive management is not applicable to the preservation area. Site changes are expected to occur only due to natural events or activities outside of CPAI's control. CPAI is not proposing an adaptive management plan for changes that are caused by natural events or other parties

13.0 FINANCIAL ASSURANCE

CPAI is a wholly owned subsidiary of a large, publicly traded company (ConocoPhillips Company) with a strong balance sheet and a history of meeting financial obligations in Alaska. CPAI proposes that no additional requirements are necessary to provide reasonable assurance that this mitigation plan will be executed. CPAI will endeavor to secure a Fish Creek or Cape Halkett preservation area in compliance with USACE's requirements prior to construction fill resulting from the Willow Project.

14.0 ADDITIONAL INFORMATION

14.1 Other Restoration Alternatives or Land Preservation Opportunities

Currently there are no approved third-party providers such as mitigation banks or in-lieu-fee entities with a service area that covers the North Slope.

CPAI investigated former gravel pad exploration sites across the North Slope during the summer of 2018 for their compensatory mitigation credit potential. None of the sites are in a watershed significantly impacted by the Willow Project. All the sites are located on the east side of the Colville River, near Kuparuk and Prudhoe Bay. The sites were estimated to cost several million dollars per credit gained, a dollar to credit ratio several orders of magnitude higher than common practice and therefore not practicable. Other shortcomings with restoring these sites are described below. The sites have existing permit stipulations that preclude gravel movement or are not

practicable to remove due to logistical challenges. Many of these sites have begun to naturally reestablish vegetation and wetlands indicators, provide insect relief for caribou, and based on visual observation, appear to be a functioning part of the local ecosystem. Previous experience in restoring legacy gravel pads has discovered that the resulting permafrost thaw, once the gravel insulation is removed, can have a detrimental effect on achieving the desired outcome of the project, which results in applying complicated and costly adaptive management procedures. For these reasons, restoration of former gravel pad exploration sites was determined by CPAI as not practicable.

CPAI also evaluated upgrades to the Nuiqsut freshwater supply access road to improve local hydrology, remove anthropogenically-derived surface water, and raise gravel thickness to conventional design standards for thermal protection of the permafrost. After further analysis it was determined that the project has limited conservation value for the level of investment given the project results in nearly as many debits as credits. For these reasons and based on current feedback from key stakeholders, the project is not currently deemed practicable.

14.2 Voluntary Nuiqsut Culvert Repair project

CPAI evaluated a potential project to replace a series of four culvert batteries near the center of the community that impair stream flow. This project was found to provide wetland functions, however CPAI determined it was impractical for compensatory mitigation because we could not ensure a site protection instrument for all the adjacent property parcels. As provided in 33 CFR 320.4 (r)(2), CPAI will support the project on a voluntary basis, although we are not requesting compensatory mitigation credits.

These culverts are necessary to convey water from a beaded stream to the Colville River. CPAI performed a desktop review using aerial imagery to assess current conditions. Our review and discussion with landowners and managers have provided sufficient information to warrant replacement of the culverts.

The culverts convey water from a beaded stream to the Nigliq Channel. At each of the four road crossings, the existing culvert inlets are damaged and are impounding water, which is contributing to permafrost thaw, sediment deposition in abutting wetlands, and changes to the vegetation. These areas of ponded water have converted palustrine wetlands types from mixed emergent/scrub-shrub wetlands to primarily emergent wetlands and open water habitat and have likely altered the function of the adjacent wetlands by inhibiting vegetation growth. The culvert blockage appears to have reduced flow to the Colville River, as evidenced by the visible loss of channel morphology downstream of the culvert batteries. No fish are known to currently inhabit the beaded stream.

Desktop wetlands mapping was completed using NWI base layers (USFWS 2020). The desktop review indicates as many as 11.8 acres of palustrine wetlands are currently affected by ponding.

Table 16 below shows the results of the analysis. A figure showing the functional enhancement credit area and wetlands mapping is presented on Figures 11A through 11B, Appendix A1.

Table 16. Nuiqsut Culvert Repair Area Waters of the United States

NWI Code	Description	Area (acres)
PEM1/SS1B	Palustrine seasonally saturated persistent emergent/broad-leaved deciduous shrub meadow	4.1
PEM1E	Palustrine seasonally flooded-saturated persistent emergent meadow	4.4
PUBH	Palustrine permanently flooded unconsolidated bottom pond	3.2
R5UBH	Riverine permanently flooded unknown perennial stream	0.1
Total WOUS		**11.8**

Notes: WOUS: waters of the U.S.; NWI: National Wetlands Inventory

CPAI will complete inspections and commission a hydrologic evaluation to facilitate design. Culvert design and construction will be coordinated with the NSB. CPAI will provide final design to the USACE for approval prior to construction. The work will take place in the winter to avoid impacts to the drainage and avoid the bird nesting window. Winter work will also mitigate potential sediment reaching the Colville River during construction. All work limits will be clearly staked, and work will occur from the existing roadway to avoid additional impacts to wetlands. A plan view and typical cross section of the proposed culvert repairs are shown in Appendix A2.

15.0 COMMUNITY SUBSISTENCE MITIGATION

CPAI has incorporated voluntary infrastructure development into the Willow Project to offset potential impacts to subsistence. This includes local resident use of project roads, tundra access pullouts located along Willow roads, and boat ramps at the Tiŋmiaqsiuġvik River, Fish Creek, and Judy Creek.

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APPENDICES

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APPENDIX A1
FIGURES

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APPENDIX A2
PLAN VIEWS AND CROSS SECTIONS

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APPENDIX B
WILLOW PROJECT IMPACTS WITHIN 500 FEET OF ANADROMOUS FISH-BEARING WATERS

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APPENDIX C
WILLOW PROJECT IMPACTS WITHIN COLVILLE RIVER SPECIAL AREA

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APPENDIX D
WILLOW PROJECT IMPACTS WITHIN THE TESHEKPUK LAKE SPECIAL AREA

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APPENDIX E
AQUATIC SITE ASSESSMENT AND CREDIT-DEBIT CALCULATION

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APPENDIX F
ANAKTUVUK PASS TRAIL REHABILITATION AQUATIC SITE ASSESSMENT AND CREDIT-DEBIT CALCULATION

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APPENDIX G
WETLANDS ENHANCMENT MITIGATION MONITORING PLAN-NUIQSUT AND ANAKTUVUK PASS TRAIL TUNDRA REHABILITATION

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APPENDIX H
WETLANDS PRESERVATION MITIGATION MONITORING PLAN-CAPE HALKETT OR FISH CREEK

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Willow Master Development Plan

Appendix J

National Petroleum Reserve in Alaska Integrated Activity Plan Environmental Impact Statement Traditional Knowledge Compilation

June 2022

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National Petroleum Reserve in Alaska Integrated Activity Plan
Environmental Impact Statement
Traditional Knowledge Compilation

September 19, 2019

Updated May 2022 with One Additional Citation in Response to Agency Comments

Prepared by
Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska
907-276-8222
907-276-6117 (fax)
info@srbak.com

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List of Acronyms

ADF&G	Alaska Department of Fish and Game
BLM	Bureau of Land Management
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
EIS	Environmental Impact Statement
IAP	Integrated Activity Plan
MMS	Mineral Management Service
NPR-A	National Petroleum Reserve in Alaska
SRB&A	Stephen R. Braund & Associates
USACE	United States Army Corp of Engineers

Note to Readers

To assist readers in identifying new information in this Supplemental EIS, new or substantially revised text is highlighted in light yellow (as shown in this paragraph). Substantial revisions include changes to the text or underlying data that have changed the analysis or analysis conclusion. All sections that are new or include significant or substantial revisions include an asterisk (*) at the end of the section header; all new or substantially revised tables and figures also include an asterisk at the end of the table or figure caption.

1.0 TRADITIONAL KNOWLEDGE COMPILATION

This report provides a compilation of available traditional knowledge that has been documented in the six North Slope communities of Point Lay, Wainwright, Utqiaġvik (formerly Barrow), Nuiqsut, Atqasuk, and Anaktuvuk Pass since 1976 and which is relevant to the National Petroleum Reserve in Alaska (NPR-A). Traditional knowledge is defined in a broad sense to include local observations and information that residents have provided regarding their physical, biological, and social environment. In response to a request from the Bureau of Land Management (BLM) that traditional knowledge be considered in the writing of the NPR-A Integrated Activity Plan (IAP) Environmental Impact Statement (EIS), EMPSi subcontracted Stephen R. Braund & Associates (SRB&A) to review existing sources of traditional knowledge and compile the information into a report. This report was later reproduced as an appendix for the Willow Master Development Plan Supplemental EIS and revised, based on agency comments, to incorporate one additional citation. The purpose of this compilation is to provide relevant traditional knowledge organized by various resource topics for consideration and incorporation in the EIS by the EIS resource authors.

SRB&A organized the traditional knowledge quotes using the section headings that are similar to those used in the NPR-A IAP EIS structure. When reviewing the quotes, EIS authors should review the entire document as the quotes often address multiple topics and not just the topic under which SRB&A categorized them (e.g., vegetation and caribou traditional knowledge addressed in the same quote but only categorized under vegetation).

2.0 METHODS

The study team reviewed a variety of sources including the Alaska Department of Fish and Game (ADF&G), Division of Subsistence technical papers; Bureau of Ocean Energy Management (BOEM)/Bureau of Safety and Environmental Enforcement (BSEE), Bureau of Land Management (BLM), Mineral Management Service (MMS) and United States Army Corp of Engineers (USACE) public hearings conducted for EISs; and federal, Native organization, and academically funded studies. The study team's initial review also included a number of studies such as subsistence studies, ethnographies, and EISs which are informed by or incorporate traditional knowledge. For the purposes of this review, the study team only documented sources that contained primary traditional knowledge (e.g., direct quotes included as part of a traditional knowledge or subsistence study, academic publication, or federal public hearings). The study team also only included quotes directly attributed to residents from the six North Slope communities, which are most likely to have direct observations related to the NPR-A.

Each quote identifies the community that provided the observation and the citation for the document. Both the community identifier and publication year attached to the quote provide important context and should be kept in mind when reviewing the quotes for applicability to the NPR-A IAP EIS. For example, some quotes dating from the early 1980s may describe effects associated with seismic survey methods that are no longer being used and may not be applicable to more current seismic survey methods.

The study team focused on compiling quotes that contained traditional knowledge applicable to the nature of development and relevant to impacts and mitigation associated with the IAP, or that contained traditional knowledge about the environment in and around the NPR-A. For example, with caribou, the study team focused on quotes describing knowledge about past impacts to caribou that could parallel potential impacts from future projects described in the IAP or quotes that focused on caribou habitat and movement in the NPR-A. The study team did not include more general traditional knowledge describing overall caribou distribution, migration, behavior, health, or abundance.

For several resource topics, SRB&A identified little to no traditional knowledge relevant to the NPR-A IAP/EIS in the 80 sources reviewed for this compilation. Topics lacking traditional knowledge included Geology and Minerals, Soil Resources, Sand and Gravel Resources, Environmental Justice, Recreation, Wild and Scenic Rivers, Wilderness Characteristics, and Transportation. Other such as Petroleum Resources, Paleontological Resources, and Visual Resources had only a few traditional knowledge quotes identified. The lack of traditional knowledge identified for the above topics does not mean that local residents are not knowledgeable about those topics, but rather that the sources reviewed did not focus on those topics. Furthermore, during the compilation, the study team categorized traditional knowledge quotes under the resources they were most directly related to; thus, some of the above topics may be addressed indirectly under other resources, in which case SRB&A identified the primary topic where related traditional knowledge could be found in the report. Additional reasons for the lack of traditional knowledge for certain topics that are relevant to the NPR-A IAP EIS include the following:

- A majority of the sources available for review were public scoping testimony, and residents' testimony usually focuses on the issues of greatest concern, and thus do not include traditional knowledge for all physical, biological, and social topics addressed in an EIS.
- Resource topics overlap in their focus, and traditional knowledge that is categorized as one topic may also pertain to another (e.g., socioeconomic/environmental justice, hazardous materials and contaminated sites/human health and safety/air quality).

While SRB&A's review included all major topics addressed in the NPR-A IAP EIS, SRB&A emphasized topics of concern that have been raised by local residents in the past including air quality, water resources, caribou, fish and fish habitat, noise, subsistence, sociocultural systems, economy, and public health. SRB&A also emphasized traditional knowledge that addressed key topics/questions provided to SRB&A by the EIS resource section authors. Where applicable, SRB&A added these topics as subheadings (e.g., Caribou under Terrestrial Mammals, Water Quality under Water Resources). SRB&A also added additional subheadings under several of the resource topics when there were many quotes that could be categorized under several themes. SRB&A's review also did not include a review of residents' issues and concerns regarding development in general or any mitigation measures proposed by residents in past projects.

3.0 RESULTS

3.1 Introduction

SRB&A reviewed 81 sources of traditional knowledge from publications dating between 1976 and 2019 (Table 3-1). The table lists each of the sources reviewed and provides relevant traditional knowledge topics addressed in each source under Physical, Biological, and Social environment headings. The table also includes a heading of Other that primarily identifies if the source included scoping comments and issues and concerns. The following sections provide traditional knowledge quotes by the NPR-A IAP EIS sections.

Table 3-1: Traditional Knowledge Topics by Source

Citation	Physical Environment	Biological Environment	Social Environment	Other
(ABR Inc., Sigma Plus Statistical Consulting Services, SRB&A (Braund Stephen R. & Associates), and Kuukpik Subsistence Oversight Panel Inc. 2007)	Climate and Meteorology, Water Resources, Solid and Hazardous Waste	Fish	Subsistence Uses and Resources	—
(BLM 1982)	Water Resources	—	Subsistence Uses and Resources	Scoping Meeting / Issues and Concerns
(BLM 1997a)	Acoustic Environment	—	Terrestrial Mammals	Scoping Meeting / Issues and Concerns
(BLM 1997b)	Paleontological Resources, Solid and Hazardous Waste	—	Cultural Resources, Subsistence Uses and Resources, Public Health	Scoping Meeting / Issues and Concerns
(BLM 1998a)	—	Terrestrial Mammals	Subsistence Uses and Resources	Scoping Meeting / Issues and Concerns
(BLM 1998b)	—	Terrestrial Mammals	—	Scoping Meeting / Issues and Concerns
(BLM 1998c)	—	Birds, Terrestrial Mammals, Marine Mammals	Landownership and Uses, Subsistence Uses and Resources	Scoping Meeting / Issues and Concerns
(BLM 1998d)	—	Subsistence Uses and Resources	Public Health	Scoping Meeting / Issues and Concerns
(BLM 2002)	—	Terrestrial Mammals	Landownership and Uses, Subsistence Uses and Resources, Sociocultural Systems	Scoping Meeting / Issues and Concerns
(BLM 2003a)	Acoustic Environment	Fish, Birds, Terrestrial Mammals	Subsistence Uses and Resources	Scoping Meeting / Issues and Concerns
(BLM 2003b)	Water Resources	Wetlands and Floodplains, Terrestrial Mammals, Marine Mammals	Subsistence Uses and Resources, Sociocultural Systems, Public Health	Scoping Meeting / Issues and Concerns
(BLM 2003c)	—	Terrestrial Mammals	Subsistence Uses and Resources	Scoping Meeting / Issues and Concerns
(BLM 2003d)	Water Resources	Terrestrial Mammals	Subsistence Uses and Resources	

Citation	Physical Environment	Biological Environment	Social Environment	Other
(BLM 2004a)	Vegetation	—	Subsistence Uses and Resources	Scoping Meeting / Issues and Concerns
(BLM 2004b)	Renewable Energy	Fish	—	Scoping Meeting / Issues and Concerns
(BLM 2004c)	Water Resources	Birds, Terrestrial Mammals	Subsistence Uses and Resources	Scoping Meeting / Issues and Concerns
(BLM 2004d)	Vegetation	Terrestrial Mammals	Subsistence Uses and Resources, Economy	Scoping Meeting / Issues and Concerns
(BLM 2004e)	—	—	Economy	Scoping Meeting / Issues and Concerns
(BLM 2004f)	Climate and Meteorology	Vegetation, Fish, Terrestrial Mammals	Landownership and Uses, Subsistence Uses and Resources, Sociocultural Systems	Scoping Meeting / Issues and Concerns
(BLM 2007)	—	Wildland Fire, Terrestrial Mammals	—	Scoping Meeting / Issues and Concerns
(BLM 2014a)	—	—	Subsistence Uses and Resources	Scoping Meeting / Issues and Concerns
(BLM 2014b)	—	—	Subsistence Uses and Resources, Economy, Public Health	Scoping Meeting / Issues and Concerns
(BLM 2014c)	—	—	Subsistence Uses and Resources, Sociocultural Systems	Scoping Meeting / Issues and Concerns
(BLM 2016a)	—	—	Public Health	Scoping Meeting / Issues and Concerns
(BLM 2016b)	—	Vegetation	—	Scoping Meeting / Issues and Concerns
(BLM 2018a)	—	Terrestrial Mammals	Subsistence Uses and Resources, Economy	Scoping Meeting / Issues and Concerns
(BLM 2018b)	—	Cultural Resources	—	Scoping Meeting / Issues and Concerns
(BLM 2018c)	Physiography	—	Economy, Public Health	Scoping Meeting / Issues and Concerns
(BLM 2019a)	Renewable Energy, Petroleum Resources	Birds, Terrestrial Mammals	—	Scoping Meeting / Issues and Concerns

Citation	Physical Environment	Biological Environment	Social Environment	Other
(BLM 2019b)	Physiography	Birds, Terrestrial Mammals	Subsistence Uses and Resources	Scoping Meeting / Issues and Concerns
(BLM 2019c)	—	—	Public Health	Scoping Meeting / Issues and Concerns
(BLM 2019d)	—	—	Cultural Resources, Subsistence Uses and Resources	Scoping Meeting / Issues and Concerns
(BLM 2019e)	—	Terrestrial Mammals	—	Scoping Meeting / Issues and Concerns
(BOEM 2011)	Climate and Meteorology	Fish	Sociocultural Systems	Scoping Meeting / Issues and Concerns
(BOEM and BSEE 2013)	—	Marine Mammals	Subsistence Uses and Resources	Scoping Meeting / Issues and Concerns
(Braem, Mikow, Brenner, Godduhn, Retherford, and Kostick 2017)	Acoustic Environment	Birds	Subsistence Uses and Resources, Sociocultural Systems	—
(Braund, Lawrence, Sears, Schraer, Regehr, Adams, Hepa, George, and Von Duyke 2018)	—	Marine Mammals	—	—
(Brewster and George n.d.)	Water Resources	Fish	Subsistence Uses and Resources	—
(Brown, Braem, Mikow, Trainor, Slayton, Runfola, Ikuta, Kostick, McDevitt, Park, and Simon 2016)	—	Fish	Subsistence Uses and Resources, Sociocultural Systems Public, Health	—
(Brown 1979)	—	—	Subsistence Uses and Resources	—
(Carothers, Cotton, and Moerlein 2013)	—	Fish	—	—
(Inc., Consulting, Research, Callaway, Associates, and Economics 2008)	Acoustic Environment. Water Resources	Marine Mammals	Subsistence Uses and Resources	—
(FEA 1976)	Acoustic Environment, Water Resources	Fish, Terrestrial Mammals	Subsistence Uses and Resources,	Scoping Meeting / Issues and Concerns
(HDR Alaska 2015)	—	Fish, Terrestrial Mammals	—	—
(Mager 2012)	—	—	Subsistence Uses and Resources	—

Citation	Physical Environment	Biological Environment	Social Environment	Other
(MBC AES 2004)	Climate and Meteorology, Physiography, Water Resources	Wetlands and Floodplains, Fish	Subsistence Uses and Resources, Economy, Public Health	—
(McBeath and Shepro 2007)	—	Fish	—	—
(Mikow, Retherford, Kostick, and Godduhn 2016)	Climate and Meteorology, Physiography, Solid and Hazardous Waste	—	Subsistence Uses and Resources	—
(MMS 1979a)	Water Resources	Cultural Resources	—	—
(MMS 1979b)	Water Resources	Terrestrial Mammals, Marine Mammals	Cultural Resources, Public Health	Scoping Meeting / Issues and Concerns
(MMS 1982)	—	Fish, Birds	—	Scoping Meeting / Issues and Concerns
(MMS 1990)	—	—	Economy	Scoping Meeting / Issues and Concerns
(MMS 1997)	Acoustic Environment	—	—	Scoping Meeting / Issues and Concerns
(MMS 2001a)	—	Terrestrial Mammals	—	Scoping Meeting / Issues and Concerns
(MMS 2001b)	—	Fish	—	Scoping Meeting / Issues and Concerns
(MMS 2006)	—		Public Health	Scoping Meeting / Issues and Concerns
(MMS 2007a)	—	Birds, Terrestrial Mammals, Marine Mammals,	Subsistence Uses and Resources	—
(MMS 2007b)	Acoustic Environment	Marine Mammals	—	Scoping Meeting / Issues and Concerns
(MMS 2007c)	—	Fish	—	Scoping Meeting / Issues and Concerns
(MMS 2009a)	—	Fish, Terrestrial Mammals	Public Health	Scoping Meeting / Issues and Concerns
(MMS 2009b)	—	Marine Mammals	Sociocultural Systems, Public Health	Scoping Meeting / Issues and Concerns
(Spearman and Nageak 2005)	—	Fish	—	—

Citation	Physical Environment	Biological Environment	Social Environment	Other
(SRB&A 2003)	Acoustic Environment, Solid and Hazardous Waste	Fish, Birds	Subsistence Uses and Resources	—
(SRB&A 2009)	Air Quality, Acoustic Environment, Physiography, Water Resources, Solid and Hazardous Waste	Vegetation, Wetlands and Floodplains, Fish, Terrestrial Mammals	Landownership and Uses, Cultural Resources, Subsistence Uses and Resources, Sociocultural Systems, Economy, Public Health	—
(SRB&A 2010a)	Acoustic Environment	Fish, Birds, Terrestrial Mammals	Subsistence Uses and Resources	—
(SRB&A 2010b)	—	Terrestrial Mammals	Subsistence Uses and Resources, Sociocultural Systems, Economy, Public Health	—
(SRB&A 2011a)	Climate and Meteorology, Water Resources	Fish, Birds, Marine Mammals	Subsistence Uses and Resources	—
(SRB&A 2011b)	Acoustic Environment	Terrestrial Mammals	Subsistence Uses and Resources, Visual Resources	—
(SRB&A 2013a)	Climate and Meteorology, Acoustic Environment, Solid and Hazardous Waste	Fish, Terrestrial Mammals, Marine Mammals	—	—
(SRB&A 2013b)	—	Terrestrial Mammals	—	—
(SRB&A 2013c)	—	Wildland Fire, Fish, Terrestrial Mammals	Subsistence Uses and Resources	—
(SRB&A 2014a)	Solid and Hazardous Waste	Terrestrial Mammals	Subsistence Uses and Resources, Visual Resources	—
(SRB&A 2014b)	Climate and Meteorology	Fish, Birds, Terrestrial Mammals, Marine Mammals	Cultural Resources, Subsistence Uses and Resources, Sociocultural Systems	—

Citation	Physical Environment	Biological Environment	Social Environment	Other
(SRB&A 2015)	Petroleum Resources	Terrestrial Mammals	Subsistence Uses and Resources, Sociocultural Systems, Visual Resources, Public Health	—
(SRB&A 2016)	—	—	Subsistence Uses and Resources	—
(SRB&A Unpublished)	Climate and Meteorology, Physiography, Water Resources	Vegetation, Wildland Fire, Fish, Birds, Terrestrial Mammals	Cultural Resources, Subsistence Uses and Resources, Sociocultural Systems, Economy	—
(SRB&A 2012)	Climate and Meteorology, Air Quality, Acoustic Environment, Physiography, Paleontological Resources, Water Resources	Vegetation, Wetlands and Floodplains, Wildland Fire, Birds, Terrestrial Mammals	Cultural Resources, Subsistence Uses and Resources, Sociocultural Systems, Public Health	—
(USACE 1983)	Acoustic Environment	—	—	—
(USACE 2010)	Acoustic Environment	—	—	Scoping Meeting / Issues and Concerns
(Wolfe 2013)	—	Marine Mammals	—	Scoping Meeting / Issues and Concerns
(Worl and Smythe 1986)	—	—	Cultural Resources, Sociocultural Systems	—

3.2 Physical Environment

3.2.1 Climate and Meteorology*

At my home I have a barometer and have learned how to read it. This year and the past few years, I have noticed changes that occur. The barometer would indicate that a wind from the west would be coming and then out of the blue an east wind would come and vice versa. So it seems like our weather cycle has done a circle. So what is occurring with the weather is actually opposite of what the barometer is indicating that it should do. (Nuiqsut) (MBC AES 2004)

It's unpredictable nowadays. Sometimes we wait and wait for the wind to die down before we go out boating. The last time they brought the whale in those boaters were really wet. Well [the ice] is not as thick as it used to be. We hope that the ice doesn't break off when the wind [comes in] from the northeast. (Wainwright) (SRB&A 2013a)

Easterly direction wind, we're going to be shallow…. East wind we get shallow waters. Westerly winds, southwest winds will push it in. (Point Lay) (SRB&A 2011a)

It's taking longer to become stationary ice. We can have an open ocean in January because the wind has broken it up. We can have big piles of ice on the barrier island. (Point Lay) (SRB&A 2011a)

And just being a hunter, I've noticed the ice is not as thick as it used to be. We're losing two weeks out of the year in the spring, thawing out too early. And then in the fall time, we're gaining over two weeks before it freezes up again. (Utqiaġvik) (BLM 2004f)

The past five years have been very unusual. There has been an early spring thaw out. We would be boating when it wasn't the time for us to be boating. This weather has been a phenomenon. (Nuiqsut) (MBC AES 2004)

I am now 82 years old and can remember since the time I was 9, when there used to be slow transitions from cold conditions to warm conditions. Now, these transitions from cold to warm are fast and abrupt. Fall used to freeze fast and now it is the reverse, the fall freeze is slow. (Nuiqsut) (MBC AES 2004)

A long time ago the Elders, when she was able to remember her surroundings, our Elders have spoken that the earth was going to shift. It is shifting today. Climate change in the Arctic, blizzards, snowstorms in the Lower 48, those are the kind of changes that the Elders have spoke of. And I, for one, I am witnessing this today. One day we will not have any winter. There will be no winter on this Arctic. The North Slope is going to be like Lower 48, ice and snow free. We will be able to travel year-round by boat. There will be vessels out there, either for industrial or commercial, which will be open. And it's already opening. (Nuiqsut) (BOEM 2011)

Of course, the ice has changed. [Hunting partner] and I used to go out and find pack ice, and it was different weather. It would have its own weather. Gray and wet and windy. It was less long and 30 feet high. We haven't seen that for 20 years. We've seen ice that's eight to 12 feet thick on top, which means it's 30 to 40 feet below. That's out deeper or it gets grounded. There's still that kind of ice going by and it's doing some gouging. It gets stuck. We're looking for ice that gets stuck because that's where the ugruks are. Near any inlet you can get in behind it but not too far. (Point Lay) (SRB&A 2011a)

The only thing that I'm worried about is the ice conditions, the thickness of the ice, we're getting less. Ever since about three years ago I started noticing it. Taking a little longer to freeze out there. A lot longer this year. Usually we won't see any open water out there for a mile. This time of year, we seen a lot of open water. Usually the whole area is just solid ice where we can just travel by snowmachine and not worry about falling through. (Point Lay) (SRB&A 2014b)

The ice is, like, an inch lesser than it used to be. When you fish lots, you notice the difference. That's been in the past three, four years. The water levels in the rivers are lower than what they used to be when it freezes. About six inches lower than it used to be. The lagoon ice used to freeze over six feet. It used to take us hours with an ice pick to get a hole. And now it only takes about a half an hour, 45 minutes. We check the ice ever year, and we've been busting through to water at four feet, and it used to be six feet. That's in January when the sun comes back; we go do the check for the ice, the thickness. (Point Lay) (SRB&A 2011a)

About five years ago [the ice started changing]. You can tell it's just getting less. I hope there's more ice this year, or next year. We'll see, we'll measure the ice. The ice we got that whale on, the whale wasn't supposed to go on the ice [because it was so thin], but we actually got it up. (Point Lay) (SRB&A 2011a)

[The weather is] changing [and becoming] warm. [It is] warmer up north, [in] Barrow. In Nuiqsut [the weather] don't change that much. But Barrow, it's warmer than this place! People they talk about it. They say the weather is getting warmer. Now it's down to 20 below. Or 35 [below] or so. I don't know what makes the temperature change in winter. Those people down Barrow they talk about "it's getting warmer and warmer every year" down there. I don't know from what. It used to be c-o-o-o-o-ld! Changing something, I don't know. (Anaktuvuk Pass) (SRB&A Unpublished)

There's been a different winter, in which there was a sound that was like a big bang and all of a sudden there was a storm that sets in. You couldn't even see across the street to the outhouse. (Anaktuvuk Pass) (SRB&A Unpublished)

This year we got a lot of snow, more than usual. You can tell, there's a lot of little snow in areas and now it's way up drifting. Where you're camping in those places, you used to camp right next to the hillside, now it's drifting every year. I think snow is getting more and more. Snow this year, there is a lot all over. This year we had a bad one. [It has been] snowing every day. I came down every morning and say "it's snowing again?!" We got a lot of snow all over. (Anaktuvuk Pass) (SRB&A Unpublished)

Melting, the climate. Global warming. Those ponds are not just forming but drying out. Permafrost shifting and melting more heat I suppose. Not evaporating and draining. In the last few years. I know it happens but it seems to be happening in the last few years. If you go to a lake that you know to be deep or a hole or anything, when you come to the edge of it has gone down on the edges. I would say throughout up here to Barrow and Deadhorse. (Nuiqsut) (SRB&A 2012)

It, the weather that has caused the water temperature to rise. Because of the tundra up here is hot. It affects the water and the river flows into the Beaufort Sea and today it is a lot warmer than it has been in the past. It is changing with the climate change that we are experiencing. (Nuiqsut) (SRB&A 2012)

When I was growing up the weather was a lot warmer in both summer and winter. During the years past it has changed to where… in March when I was growing up the weather would start warming up. In like November, December, January, February, that would be the coldest part of the year. Today they still are but March is to. It is unusual to see something like this, where it is over 50 below to where it is cracking the tundra in March. When it cracks it makes a lot of noise, it never used to do that when I was young today it is changing. Our weather is so different compared to what I observed in the 40s and 50s. Today we don't have any [prevailing] wind directions. (Nuiqsut) (SRB&A 2012)

The changes are due to possibly climate change. It was bound to happen because our elders have been speaking about it. They would think that there would never be blizzards or cold fronts. I am surprised there is a cold front now. It is very unusual to have weather like this without wind. We don't have, we don't know if there is going to be a blizzard or not. It used to be a lot warmer and windier when we were kids, today it is different. As for the ocean current I cannot speak to that, because that is for men to speak of. I can speak on the land issues because that is what I have experienced. (Nuiqsut) (SRB&A 2012)

In the fall time we get real strong winds, and then again in the winter. Last year we had 75 mile an hour winds in town which was pretty crazy. It doesn't happen all the time. Not really anything new. It is what you expect when you live up here. Sometimes it gets a little bit warmer when it gets windy, and when there is no wind at all it can be like 80 below with no wind. When it got windy it warmed up. It pushes all the wind from down south, it depends on the direction. It will get windy on the coast, if it is nice here it can be windy out there. You go to get away from the mosquitos. (Nuiqsut) (SRB&A 2012)

Back then we used to have more thunder clouds more thunder more rain more massive flooding and a combination of hail storms that we would see when we were young. Today we don't see that, those thunder storms we would see in the past and hardly any of those hail storms. It seems like they used to have more in the area. The weather pattern is changing every season. Hail storms usually started in August and September and those times used to be a rainy season and now it seems like it is a lot warmer. During my time it was hot with a lot of thunder storm... Now we hardly see those types of storms anymore. We used to have massive blizzards but today we hardly have any blizzards. (Nuiqsut) (SRB&A 2012)

Back then we would have massive amounts of snow; lots of blizzards and a lot of snow. Some of the areas on the river bank and the slopes would be covered in snow and those cliffs up there [Colville Bluffs?] are strait down and those cliffs would be gradual slopes with all of the snow. Today you don't see many blizzards and less snow overall. There are changes within my lifetime. We see less snow less blizzards and less snowfall today. That is why we have less water during the breakup time. (Nuiqsut) (SRB&A 2012)

We get less [snow] storms now. What I'm thinking is global warming, because down states they're getting all the snow. Before I left Anchorage, it got 16 inches. Here, we finally got some snow. Couple years, four years ago, we got every street filled to the housetops. You couldn't even see the truck going by. [There were] walls of snow. The school bus, you could only see the school bus that much [over the top of the snow]. It's more like getting colder and colder and some days it will get warm, and when you look at the lagoon you would see some [open] spots. (Point Lay) (SRB&A 2014b)

Currents will change. Weather's such a factor nowadays. We know that it's staying warm longer; the ice is taking longer to freeze, or the water is taking longer to freeze, and the ice is not as thick anymore as it normally would be in any winter. Like back about 40-50 years ago it would be 15-20 feet thick of ice. Now it's barely 4 feet, maybe not even 2 feet in some places. There's a lot of change in the ice. (Point Lay) (Mikow et al. 2016)

It usually freezes in September. When I was growing up, I'd be going to school and checking out the lakes and go skating, ice-skating, during school Early September. Now it's freezing later…in October, starting to. (Wainwright) (Mikow et al. 2016)

3.2.2 Air Quality

See traditional knowledge provided in the PUBLIC HEALTH section for traditional knowledge that is also applicable to this section.

Yes, we always see it every year. A haze, a dirty haze in the winter, all the haze goes down to ground level. (Nuiqsut active harvester; Experience timeline: 1980 and ongoing; Experience location: Kuparuk on over to Nuiqsut. SRB&A Interview 2007). (SRB&A 2009)

This fall I went out boating. I drove into a haze just off the Point (Barrow). It gave me a headache. It only stayed a few days until the wind blew it out. A big old, yellow cloud. I thought it came from the east, the oil field area. (Barrow active harvester; Experience timeline: 2006; Experience location: Pt. Barrow. SRB&A Interview 2007). (SRB&A 2009)

Our air quality is a concern. The industry is moving closer to us. They are burning waste oil and natural gas. This is in combination with what is coming up from down south with the warm air and then dropping down in the cold air. (Barrow active harvester; Experience timeline: 2001 and ongoing; Experience location: Barrow, Nuiqsut. SRB&A Interview 2007) (SRB&A 2009)

Air quality compared to how it was a long time ago has gotten a lot worse. I never notice the yellow haze around Nuiqsut when I was a kid. I started noticing it when Alpine came. I know when we are getting close to Prudhoe and that's how I know when I am getting close. When we drive there. We would go to get gas and see the yellow haze, now it is all around here now too. One of my aunts, she was a community healthy aid. She has noticed a lot of asthma in the last few years and that it's on the rise. You can see it on YouTube, she talks about all of that. (Nuiqsut) (SRB&A 2012)

The air pollution too. You can see it on a real nice day. There is a yellow haze if you look out you can see it. You probably could see it now. It's that way. Even in summer time you can see it too when it is a nice sunny day and you can see that yellow stuff. (Nuiqsut) (SRB&A 2012)

The winds too, they go back and forth a lot of the time. I have seen the wind change direction really quickly it seems like it all blows back to the same spot. If you can see the smog out there you know that it is somewhere in town. If you drive on the dump road past the natural gas station and you have your heater on in your truck it will suck it into your truck and give you a headache. You will smell the natural gas every time. All the toxins and carbon monoxide, when you release the pressure you see a big flame up in

the air. All that exhaust we are breathing that I know. (Nuiqsut) (SRB&A Unpublished-b)

Sometimes it will look darker and sometimes it will look lighter. Occasionally I will look out and it will be brown instead of yellow. I think that the winter is worse because there is no moisture in the air so all of the toxins just hang out there. You can tell if you stay here the whole winter and then summer comes around and it's different. (Nuiqsut) (SRB&A Unpublished-b)

At Alpine. It's about this time of the year that you start seeing that yellow haze and black smoke from the industry. All the way to Prudhoe Bay. You can see that yellow haze, it looks almost like lights. On the east side to by Oliktok and towards Kuparuk. And there might be some offshore at Northstar and Endicott. Those were also traced some particles going out. (Nuiqsut) (SRB&A Unpublished-b)

When they do flare ups all of the chemicals that they are dividing from the oil, and what has to be re-burned. Not all of it is burned. It is blown away before it even starts burning. Some of those fluid, chemicals are blown by the wind so it is carried elsewhere. They call that a flare up every time there is a lot of pressure or when they are separating oil or a lot of chemicals. It has to be cleaned, and divided with sand/silt/water. Other chemicals that are combustible are flared up. Some of it is not burned it is blown elsewhere. And also the acid rain that brings down those chemicals. (Nuiqsut) (SRB&A Unpublished-b)

It seems like there is a lot of smog lately. It seems like there is a lot of pollution. (Nuiqsut) (SRB&A Unpublished-b)

3.2.3 Acoustic Environment

3.2.3.1 Noise Effects on Subsistence Activities and Resources

See traditional knowledge provided in the SUBSISTENCE - NOISE, TRAFFIC, AND HUMAN ACTIVITY section for traditional knowledge that is also applicable to this section.

Onshore/Terrestrial Areas

The fact that we are not used to it (noise) affects us. I know more of the traditional hunters would much rather have it how it was, the quietness. You could hear the animals coming in, maybe the sounds geese and ducks make. And not just the sound but the smell. Walrus' for one you can smell. You can also smell the algae that comes up from the sea bottom and gets green. When that happens you know there is some kind of marine life out there. Waterfowl or maybe seagulls. (Nuiqsut) (SRB&A 2012)

The concern I have is with [my aunt]'s fish camp there. It's right by Alpine. And it upsets us because they run those airboats, on land and water and the noise scares off our game. They run wherever they want to with those choppers too. My aunt calls 'em noise makers. We can't pick eggs no more because they disrupt the birds and other game too. (Nuiqsut active harvester; Experience timeline: 2000 and ongoing; Experience location: Nigelik Channel. SRB&A Interview 2007). (SRB&A 2009)

When we were growing up we were always told to keep quiet. They can hear very well. We were taught this from our ancestors. We were told not to yell or holler. They can

hear very well. (Wainwright active harvester; Experience timeline: 1951 to present; Experience location: Wainwright. SRB&A Interview 2007). (SRB&A 2009)

Just to recall back in my time when we was in that area fishing with a hammer - you could use a hammer to strike right on the ice -observing the fish below you - you can strike right on the ice itself, stun the fish and kill it and kill it. That's how sensitive a noisemaker would be in any of these areas. I would say that permafrost would have the same effect, the detonation of a strong impact could be used in the permafrost. (Utqiaġvik) (FEA 1976)

First time [I experienced an impact] last year was when I saw a couple of airboats up there [Nigliq Channel]. You can hear them things for miles and miles. I've heard people complain about them when they go up river. That was in late May right before it broke up, that is when they start with the airboats and then they are there throughout the summer, on the main channel. There's just so much activity going on with the oil company, they are just trying to check up on everything, make sure there's no spills or nothing. (SRB&A Nuiqsut Interview May 2010). (SRB&A 2010a)

Airboats, they got airboats that are too loud [whole delta area.] That is every summer, July, August, end of June. You can hear the airboat before you ever see it. One time we had an accident a couple of summers ago, and we needed an assist from Conoco Phillips, a guy [fell] in the river, and we heard this thing coming, and it was so loud that we could hear it before we could ever see it. They do exercises, like a lot of oil-spill exercises. It's too shallow for [other kinds of boats] like they could use a jet unit, but they use an airboat for when it's too shallow. They have no access other than the use of the airboat. And then sometimes down by CD4 you will have an airboat and a small medium cargo boat, there is a little slough in there by CD4 and that's the one that they want to dredge in there and try to get into the lake, and then they could use that as a staging area as a possible use for area for oil spill response, but the community said no and then they rejected the application for the permit for that. (SRB&A Nuiqsut Interview May 2010). (SRB&A 2010a)

What they mentioned about the noise, and I guess that's why the fish are not coming back or they're depleting. That's one of the things you should study or monitor as you said. This drilling, you can barely hear it up, you know, up on the ground, but down it goes deeper and, you know, noise travels further especially I guess if it's close to the water. And I'm just saying that that could be the cause. And, as you may or may not know, we all love ahnalik here and we need it, too. So we need that for our subsistence. (Utqiaġvik) (BLM 2003a)

The air boats, every time they go do their surveys, or checking their Conexes, they disrupt anything that is there and us too. And the caribous will take off, or the seals will pop down; anything that is near that [noise], they take off. (SRB&A Nuiqsut Interview April 2010). (SRB&A 2010a)

They have those airboats that do that training. We do have a lot of airboats down there. They have access to a boat ramp at CD 4, and then you have those zodiac boats that come around from CD3 and they come around and go in this channel. I've seen how many that come around and go in. It has to be in this area. They come out from these two [channels]. And you know that the community is not informed about when they are going to have an exercise about those airboats. If we would know, that would inform our hunting. And now they have a bigger one [airboat] that is bigger than the two-

seater. They are louder than the planes [airboats]. You could hear them before you could see them. That is a concern to the area. That would be during the duration of the summer. Sometimes it could go later, like mid August. (Nuiqsut) (SRB&A 2010a)

I've got my camp down there [on Nigliq Channel]. There is always traffic through the river all through the summer, the loud boats all summer. And across is my brother's [cabin]. They drive around until September (June through September). They always come from somewhere from the ocean and then the go through the river all the way to Nanuq, and then they always go back out. (Nuiqsut) (SRB&A 2011b)

Plenty [of traffic]. Especially those boats with loud noise. Go through my allotment every summer. Really loud, you can hear them from a distance. Airplane, helicopter fly everyday. Even small planes, sometimes, Summer, in summer, mostly always fly. They always go through towards Fish Creek, land by my allotment, helicopters down there. Every summer, in July, June. I never see much in August, I always go up river moose hunting. They got three of them [airboats]. They can go through the shallow water. Lots of noise. Some of them get spooky. That noise is no good for an animal. Yeah, when some of the caribou get spooked, they run off. When they get spooked the just start running away. (SRB&A Nuiqsut Interview March 2009) (SRB&A 2010a)

I think I've heard that concern now from two other persons that directly told me that the existing seismic is already impacting subsistence hunters as we speak, that the seismic area has no game. The impacts, like Harry said, has scared and run the game off in one direction from that area already and numerous trips made by at least half a dozen hunters have attested that, that they've gone from the east side of the Ikpikpuk and Chipp River to the west side, where they're not there in that seismic area anymore. So these people have purchased gasoline and planned their trips just to find out that the seismic is in that area already and went up to those areas of normal hunting and the game is not there. So I just wanted to support Harry's comments in that sense. (Utqiaġvik) (BLM 1997a)

Humming coming from the infrastructure and facilities. If you are in proximity you hear it. 2-3 miles. And there are some occasions that they are flaring up their gas how they flare up and you can see a big flame and hear it too if the wind is right and it is coming this way. (Nuiqsut) (SRB&A 2012)

Some of the animals behave abnormally. Anytime they hear a noise they gather in a bunch. They don't know which way to go. I guess when they build the ice roads, all the noise and lights causes them to behave differently. When you get them by surprise, they know what way to go, but if you get in front of them, they bunch up and wait on you. (Barrow active harvester; Experience location: around Barrow area and further inland. SRB&A Interview 2007). (SRB&A 2009)

You know I just wanted to mention what some of my personal observations with what's happening with that seismic out there and that seismic displacing the animals, I just wanted to pass this on for your information and I didn't see any furbearers except for the foxes, the red foxes and the different faces anyway. I didn't see no wolves out there, no tracks or anything like that. I was on my way back home just this Saturday and met up with my cousin and he just said, yeah I just ran into a set of wolverine tracks and followed them 26 miles one direction, and he didn't take a close look at the tracks and he started following the trail and it had just been scared away from where the activity was occurring, which was up on the tops against that southeast side of Teshekpuk up in

this Pikes dunes out there and he found the den and the rig had just gone by. I just happened to be there when he was following the trail and coming back, he said he just followed the trail 26 miles one direction and the wolverine had just made a bee line from where the seismic activity was going on, it had been scared away from its den, it was just moving out. And there was no caribou in the area, well you know I'd seen that, I made these trips up to my cabin, it's up and the Ikpikpuk River and I've observed the displacement of the wildlife over the winter. I've been going back and forth since December to just last week and I've seen the different areas where they've been over the winter, and I just wanted to bring that out, of my personal observations where, and I just wanted to back up what Noah and what Warren was saying about, you know, I'm not going to be opposing any development or the different phases of the development. I just want to put that on record. (Utqiaġvik) (BLM 1997a)

They tend to drive the game away. The caribou in particular, not so much the fish. They migrate all the time. The caribou are moved off by the noise. In September when they're all fat, the same with the spawning fish. In the early 1980s, rollagons, seismic crews, and ice roads started. I hunt wolverines and wolves in winter, occasionally. But there are so few wolverines now, maybe because of the noise.... I do a lot of geese hunting; they're not as affected by the seismic crews, even when they're nesting. I do that in spring, right after whaling. Now they came up with that bird flu, I hope I don't get that! (Barrow active harvester; Experience timeline: 1982 and ongoing; Experience location: by Teshekpuk, south end in the river. SRB&A Interview 2007). (SRB&A 2009)

I do a lot of fishing. It will certainly change the migration of fish through gravel extraction or adding on. I have seen when the barges dock out here, and all the noise pollution from the engines. We all know that water is a good conductor for noise. As sensitive as they are, any noise will affect the migration route. The gray whales and belugas go to a certain point, and then go around it. This affects the fish species as well. During the storms and the barge dock, I have a net out by the point in Elson Lagoon. I get less fish. When the barges leave, I get more fish. (Barrow active harvester; Experience timeline: 2002 and ongoing; Experience location: Elson Lagoon. SRB&A Interview 2007). (SRB&A 2009)

Nearshore/Marine Areas

When a captain came in to talk to me, I knew he was going to say that the whales are displaced [by noise] farther than you scientists think they are. But some of them would also talk about 'spookiness'; when the whales were displaced out there and when the whaler would get near them, they were harder to approach and harder to catch (USDOI, MMS, 1997, USDOI, MMS, Herndon, 2001 [2002-2007 5-Year]). (Utqiaġvik) (MMS 2007a)

A lot of whales are traveling farther out than before. Five years ago they would go right off the point; now it is 20-30 miles. Too noisy, there has been a big change since seismic activity. (Utqiaġvik) (Inc. et al. 2008)

Twenty-two years ago, the Federal Government refused to listen to our people on issues related to the size and health of the bowhead whale population. Yet today, after the millions of dollars the North Slope Borough has had to spend on this, they must acknowledge that our Whaling Captains were right all along. Again, seven years ago, we were ignored [when we told the National Marine Fisheries Service and ARCO Alaska that seismic noise caused the bowhead whale migration to deflect off shore]and

again millions of dollars were spent to find that, again, our Whaling Captains were right. Despite this history, when we speak today on issues related to bowhead whale behavior, we continue to be scoffed at or ignored. I ask you, how successful would a bowhead whale subsistence hunter be if he did not have an intimate knowledge of the whale's behavior? (Utqiaġvik) (Inc. et al. 2008)

Of all the animals that I've known, the wolves are, when you are hunting them, they're very noise sensitive, but more so are the bowhead whales. Any noise that they hear, they respond to that by going, moving away from it. A lot of times polar bears are different. Their curiosity can kill them very easy. They go toward the noise or anything that moves, they go for that. (Nuiqsut) (SRB&A 2003)

Noise redirects marine mammals away from shore and toward the ice pack. It makes it more dangerous for hunters. (Wainwright active harvester; Experience location: offshore Wainwright. SRB&A Interview 2007). (SRB&A 2009)

Industrial noise, vibration, aircraft, including choppers. They're way louder than airplanes. I guess the animals always hear the noise and they go further out. We used to go out and there'd be a lot of seals out there. Now we have to further out to get them. Ugruk too. We used to go to Imaliktuk Island (Eider Island) when the weather gets real bad, but that place is real close to that oil island, and now they don't want us going there without escort; or we might have a barrier we can't go past, like a line. It's just really noisy now. Before Alpine was built it used to be nice and calm and you could just hear ice. Now, during the summer, when they're real active you could hear them 20 miles away and the noise travels better on the ocean than on the land. You can really hear it. (Nuiqsut active harvester; Experience timeline: since 2000 and ongoing; Experience location: Alpine/Eider Island. SRB&A Interview 2007). (SRB&A 2009)

One of the real concerns that we've got with this type of development is noise. Noise is something that maybe two or three years ago was much quieter all respects than now, but people are becoming much, much more concerned about the influence of noise on particularly the migratory route of the bowhead, and a lot of this happen to be related to a very clear situation that seems to be developing here in Barrow, and that is that since 1977, I think it is, there's only been one bowhead caught here in Barrow in the fall time, and from talking to a fair number of whaling captains here in Barrow, the feeling is that the animals in the fall are just steadily moving further and further out to sea off of Point Barrow. Thomas Albert. (Utqiaġvik) (USACE 1983)

And that the whales are sensitive to seismic sounds, to drilling sounds, to ship sounds, et cetera, et cetera. So the concern, of course, is, especially with barging, is why I asked about the timing of the barges, that the potential for the tugs that are pushing or pulling the barges, as well as the barges themselves, very feasibly will deflect bowheads. And so there's a concern about the subsistence hunts in Kaktovik, Nuiqsut and Barrow, and making sure that those hunts aren't disrupted, but also making sure that impacts to the whales themselves and to the kinds of the survival reproduction of the whales is not impacted. Robert Suyden. (Utqiaġvik) (USACE 2010)

The noise impacts have a devastating effect on fall whaling as demonstrated during the 1989 fall hunt in Barrow. All the meat was lost because our hunters had to go to great distances to hunt due to industrial activity east of Barrow. -Karen Burnell. (Utqiaġvik) (MMS 1997)

The whales are very sensitive to noise and water pollution. In the spring whale hunt, the whaling crews are very careful about noise. In my crew, and in other crews I observe, the actual spring whaling is done by rowing small boats, usually made from bearded sealskins. We keep our snow machines well away from the edge of the ice so that the machine sound will not scare the whales. In the fall, we have to go as much as 65 miles out to sea to look for whales. I have adapted my boat's motor to have the absolute minimum amount of noise, but I still observe that whales are panicked by the sound when I am as much as 3 miles away from them. I observe that in the fall migration, the bowheads travel in pods of 60 to 120 whales. When they hear the sound of the motor, the whales scatter in groups of 8 to 10, and they scatter in every direction (NSB, Commission on History and Culture, 1980; USDOI, MMS, 2003a). (Utqiaġvik) (MMS 2007a)

And the other thing is when it comes to the sound, we know from our ancestors, from history, from our Inupiat history that they didn't dare go near the ocean once -- they didn't even speak above a whisper because the whales were so sensitive to noise. This is documented. And I just listened to some whaling captain saying -- and I never thought of it when my brother's whaling crew that I'm a part of go down every year, where they urinate, you know, have a little bathroom area there, that this one crew didn't even let it accumulate because the whales and the animal smell was so sensitive. They can smell real sensitive. Dorcas Stein. (Utqiaġvik) (MMS 2007b)

3.2.3.2 Noise Levels and Effects Associated with Aircraft

See traditional knowledge provided in the SUBSISTENCE - NOISE, TRAFFIC, AND HUMAN ACTIVITY section for traditional knowledge that is also applicable to this section.

When we had the helicopter and the coal mine open, we had no caribou close to Point Lay at all, anywhere. All year round. For how many years…so then we started making rules and regulations for air traffic for the coal mine so we set down how high helicopters and airplanes could fly, and they're still going on to this day on these studies. Even with the walrus, the helicopters and the airplanes have to stay above 1500 feet or more…after our coal mine shut down, we noticed the caribou migration slowly started coming back, and then I say these past 2 years is the most I ever seen caribou hanging around Point Lay [since before the activity]. Not in herds but just in little pods—maybe 5 pods, 7 pod, 10 pod. But at least they're hanging around now. (Point Lay) (Braem et al. 2017)

Mainly aircraft over-flights. They've kind of been scaring the caribou. Last year I was waiting for a herd coming towards the river. And then that BP twin otter came over, maybe 2,000 feet off the ground, and those caribou turned right around and headed a different direction. (Nuiqsut active harvester; Experience timeline 2006; Experience location: Between Kokumak Channel and Colville. SRB&A Interview 2007). (SRB&A 2009)

There was a plane yesterday that was flying really low that we were wondering about. It kind of looked like Era's caravan, but it wasn't at the right time. We were wondering what was going on, and we got mad cause there was caribou out there that they were scaring. They were flying lower than the street poles. (Point Lay) (SRB&A 2013a)

Especially in the Alpine area. You can hear them in town. It will scare the caribous. They will be easily spooked for days. They will just start running and keep on running and running. With that chopper it likes to go on the rivers and around here the way the

rivers are there are two river split apart and then go together and the caribou are in the middle. And the birds are trying to avoid the activity and noise. (Nuiqsut) (SRB&A 2012)

With caribou, this summer there was a chopper going around. It was about 40 miles west and south of Barrow. That chopper, they were so spooked. The helicopter scared the caribou. Maybe they think all the noise from the rotors is gunfire. When you're out there for a couple weeks hunting and the game keep getting scared off, it gets old. (Barrow active harvester; Experience timeline: 2006; Experience location: Southwest of Barrow. SRB&A Interview 2007). (SRB&A 2009)

Planes. We were at our camp, choppers and planes were scaring caribou. We had to go further out. About 35 miles southeast of here, near our camp. (Barrow active harvester; Experience timeline: 2006; Experience location: small lakes out there [Barrow area]. SRB&A Interview 2007). (SRB&A 2009)

When we were way down by the Chandler area and there was air traffic going on over here at Umiat and that red and white plane of Alpine kept following the river and scaring the caribou like he is doing it on purpose. We have bright clothes on and he knew we were there and he made a couple passes and made the caribou run further inland. That was wrong. Red and white plane. We had the caribou in our sight and plane comes and it took off and turned back around and did the same thing and same path and that pissed us off. Right between those two rivers. Just following the river. We had the caribou in our sight waiting for a good shot and we heard the plane and they just took off. That was in July. Red and white, Alpine. Four boats waiting for them caribou. (Nuiqsut) (SRB&A 2010a).

3.2.4 Renewable Energy

Several traditional knowledge observations in the reports discussed the renewable nature of subsistence resources and the importance of preserving and utilizing these "renewable" resources.

We, the Inupiat people in Atqasuk and the Arctic Slope and Barrow that have survived and rely on subsistence resources to sustain our livelihood. Even today these include the residents of Wainwright because they are heavy users on the renewable resources form Ikpikpuk to Wainwright to Colville River. And we need to maintain these protective setbacks for stipulations on our renewable resources on which we have survived and maintained our subsistence livelihood, and support those persons that are in need of subsistence who are trying to draft these stipulations and protect our renewable resources in the advent of oil and gas exploration in NPR-A. (Atqasuk) (BLM 2004b)

These are the renewable resources that we depend upon for tradition use for subsistence so those are the things that can be funded by these things _____ (59:44.67) gravel roads permitted and potential um renewable resources for our community to protect, enhance our fresh water lakes that have fish bearing lakes. Those are very important lakes and we have to protect in the Teshekpuk area even in the NPRA. (Utqiaġvik) (BLM 2019a)

And for those like himself and those of the community need to also voice more concerns to protect our renewable resources, even in lakes where there are no drainages, because these lakes with no drainages have over wintering fishes, habitat fish habitat, that they -- in these deep lakes. A concern besides that is of the early warming weather, the thawing of permafrost can cause some lakes and have early drainages and may

cause some lakes to drain even with fish in it, and that that needs to -- those needs are very sensitive, especially lakes that are near ravines or rivers that should not be encroached upon. And that needs to have a more sensitive protection. (Atqasuk) (BLM 2004b)

3.2.5 Physiography

See traditional knowledge provided in the WATER RESOURCES section for traditional knowledge that is also applicable to this section including comments on permafrost and erosion.

3.2.5.1 Permafrost

There's reports, recent reports, even at Prudhoe Bay, where the permafrost is even affecting the infrastructure with oil and gas where they had to close down wells because of that. (Nuiqsut) (BLM 2018c)

We are dealing with a lot of permafrost subsidence not just in Point Lay but across the North Slope. I'm sure that, BLM should be aware of that. Having any infrastructure put in place there needs to be a permafrost study put in place first to sustain the infrastructure that's supposed to be put in place to allow for the oil and gas. I think that's a must need that if you're going to build infrastructure up here that you need to look at the land underneath it to make sure that it's stable and able to hold that type of infrastructure. Any special buildings where there's permafrost that is subsiding and you are putting infrastructure there if there's special engineering that is put in place, I want record of that special engineering of that infrastructure. (Point Lay) (BLM 2019b)

I am sure that the melting, or the process of making the soil deeper, with the permafrost underneath, the soil is not very deep. There are times when an area has dropped maybe three feet down and there is ice underneath. (Anaktuvuk Pass) (SRB&A Unpublished)

If the sun starts shining on the big rocks, and the sun warms them up, it affects the permafrost when the exposed rocks get warm. (Anaktuvuk Pass) (SRB&A Unpublished)

She was mentioning that there is some water [from melting permafrost]; there used to be areas where it's walkable but now it has some deep water. Even in the midst of those rocks there is a lot of water coming, there's water in those areas. And it's staying there in the summer time. (Anaktuvuk Pass) (SRB&A Unpublished)

About coastal areas, the ice is being affected somehow by the changing permafrost. There are some areas that are not usable anymore; you know, this methane that seeps out of the ground and if its enclosed in a cellar, people have died in there. You can't smell it, you can't see it, and if you breath it you can die. So the permafrost is getting thinner there is more chance of cracks in it, and if ice cellars are down through permafrost and then they aren't useable anymore. And the water level is [higher] and seeping down and flooding areas. (Anaktuvuk Pass) (SRB&A Unpublished)

You probably know how water melts the ice. It eats through it. My experience, I have been going out boating every year and seeing how the land changes. It makes that one area shallow and wider, and the water flows where it can flow the easiest. I have seen a lot of change in the river. It moves a lot of gravel. The routes that we used to use going upriver it used to be pretty deep. Now in my lifetime I have seen the mud move in the

river. The gravel and mud will move the water into certain places. There is land, or ground that hasn't been touched in so many years and the mud and gravel will get onto it. Water works really quick on that permafrost. The more it melts the more the ground will start falling in the river. (Nuiqsut) (SRB&A 2012)

If the water hits it, it will erode the permafrost really fast. If it is just exposed to the light it takes a lot longer than if it is exposed to the water. I have seen dry permafrost stay around for 10 years and not do anything. (Nuiqsut) (SRB&A 2012)

No, but those pipelines that go over the rivers, now that will affect the river. There are those pipes that they sink that are filled with Freon and they keep the ground frozen. That is the only place I would see permafrost aggravation. Seems like they didn't go far enough away from the river. I bet those permafrost things will begin falling over. (Nuiqsut) (SRB&A 2012)

3.2.5.2 Erosion*

We noticed changes in the landscape along the river from erosion. We first had a sod house then a cabin. But we had to move the cabin 150 feet from the river because of erosion. We used to have a cellar located 100 feet from the river that eroded away. There was lots of ice [permafrost] where our cellar was and it eroded away very fast. And the water level is coming up higher than in the past when it used to be east winds. The west wind causes the water to rise. The ice movement was so tremendous that it started affecting the landscape and eroding the bluffs. (Nuiqsut) (MBC AES 2004)

With the main ice pack receding, the storms are affecting our banks -- eroding them. Many cellars have been affected by erosion. If the ice pack was nearby, the storms wouldn't be as severe. We used to have a house with land. After so many storms, the door was next to the bank. (Wainwright) (SRB&A 2009)

The ice movement was so tremendous that it started affecting the landscape and eroding the bluffs. The water level is coming up a lot higher than it used to. (Nuiqsut) (MBC AES 2004)

The erosion is more noticeable down there, at the mouth of the Colville [River] down there, I know. Maybe they aren't paying attention to that. People from Barrow do a lot of boating and they say some of those, where they use to go in the small inlets, some of those are just loaded [with silt] and [they] can't use them anymore. I have no information; you have to talk to them. This part here [mouth of the Colville River], or Nuiqsut maybe has more to say about that. (Anaktuvuk Pass) (SRB&A Unpublished)

One thing you have to know about building anything around here you have to build it in land to make it last any length of time. We notice all the erosion all the time. It's not a new thing. They have always known about erosion. You have to build further away from the river if you want it to last. (Nuiqsut) (SRB&A 2012)

Atigaru Point has been eroding a lot. I used to dock at the point and it never got shallow…. (Nuiqsut) (SRB&A 2012)

… Atigaru Point is now forming lakes and stuff inside the bay too. I see a lot of changes at Eskimo Island, there used to be a small island that was right on the other side of Atigaru Point. Eskimo Island has grown twice or triple as it was back then. It used to

be a small island now it is expanding. Either the water has dropped but it is mainly gravel. The high part is tundra. (Nuiqsut) (SRB&A 2012)

Also that side has erosion control because it is on the oil field side. There are big concrete blocks that protect the coastline from the surf. (Nuiqsut) (SRB&A 2012)

…I think it is because of the Colville crossing, the bridge they slot it at the end of the season, it seems to the oil companies that it helps but it is still causing flooding. The water gets so high, I think the bridge, the Colville Bridge is underwater before it goes out. That is probably what causes erosion down that way because of the force of water that is behind it. The currents definitely help with erosion. (Nuiqsut) (SRB&A 2012)

Where there is ice it is eroding and where there is grass on the tundra there is a change in the weather pattern. Particularly where there is ice it will eroded. Nigliq, there used to be a big mass of tundra but that is gone now. (Nuiqsut) (SRB&A 2012)

Well, there's been a lot of erosion going on. Our coastline is diminishing every several years, it gets smaller and smaller the, ah, you see these barrier islands here in front of Point Lay here—they're all getting smaller due to erosion from the sea, from the ocean eroding. Even our lagoon area by the village, or all the way up and down, up and down the coast is eroding 'cause more water is coming in and eroding a lot of our coastline. (Point Lay) (Mikow et al. 2016)

3.2.6 Geology and Minerals

See traditional knowledge provided in the PALEONTOLOGICAL RESOURCES section for traditional knowledge that is also applicable to this section.

3.2.7 Petroleum Resources

Same thing with crude oil, guess what we've been using it for thousands of years. It's called _____ (01:15:32.99) oil seeps that go on the tundra that we harvested and there's a lot of historical knowledge behind that. There's some basis for using crude oil just in its raw form for energy on the Slope. It's a prime topic to be talked about in such a way that Arnold described it a little bit ago. (Utqiaġvik) (BLM 2019a)

Yeah, like a couple of years ago – two summers ago – let's see, right across here [near Kachemach], I have been going to this lake with my boat but now what we noticed is that there is some bubbles are coming up in the lake and we thought, 'that is not fish; that must be methane gas.' One time I took my nephew in there, we were looking for caribou, and I happened to go inside that creek and when we got to that lake, we saw a lot of bubbles coming up. That methane lake. It is right on his aaka's land. We stay away from that area now. I checked it out this summer, and it is still bubbling. (Nuiqsut) (SRB&A 2015)

3.2.8 Paleontological Resources

Also like to view into the realm of paleontology, and emphasize an area I think it's around Ocean Point on the Colville, where there's a large paleontological site that has been investigated for many years by paleontologists from UAF, I just wanted to point that out as an important area. (Nuiqsut) (BLM 1997b)

> *The Colville River region is very well known for that. We will happen by the tusks, Ivory, bones. I am quite sure that it is over there.* (Nuiqsut) (SRB&A 2012)

3.2.9 Soil Resources

See traditional knowledge provided in the PHYSIOGRAPHY section for traditional knowledge that is also applicable to this section.

3.2.10 Sand and Gravel Resources

See traditional knowledge provided in the PHYSIOGRAPHY section for traditional knowledge that is also applicable to this section.

3.2.11 Water Resources

See traditional knowledge provided in the PHYSIOGRAPHY section for traditional knowledge that is also applicable to this section.

3.2.11.1 Watersheds, Rivers, and Streams

Teshekpuk Lake Area

> *Teshekpuk Lake is a source land. It is a source land that offers relief, nutrition, rebirth and a health to a culture. It must be respected. This is not your place. It is not my place. So, we must use traditional wisdom here. I did not hear that when I stepped into the room. You spoke of technology, new technology. You spoke of expert science. I want you to leave this room thinking source land.* (Utqiaġvik) (BLM 2003d)

> *And the recent clean up that we did out here, there was so much contaminants that the government did a band-aid job. I was there. I was their operator. I had questions for them, but I was never answered. I asked them why are we doing a band-aid job and how many years of field spill -- then I would not want to see that around Teshekpuk Lake. That's our subsistence, you know. There's a -- I heard there's a big fish in there and nobody caught for years. I heard stories of that big fish that come through the ice, and one day I want to catch that big fish. A big healthy fish, and I wouldn't want it to be contaminated.* (Utqiaġvik) (BLM 2003d)

Other Rivers in NPR-A

> *Ikpikpuk River is a migrating river. It migrates. It moves and sometimes it moves 300 feet a season...What is our -- these boundaries that they are putting at a half mile, three quarter of a mile on the rivers, erodes, I mean, you know, there's some real tough questions in there. But we know that the rivers still migrate. You will see how much the rivers have moved within these years, they've moved miles.* (Utqiaġvik) (BLM 2004c)

> *The Meade River. You see all the ground falling down in the river. Not just there, but other spots. It's getting wider and wider. You can tell. Especially when it rains.* (Atqasuk active harvester; Experience timeline: since 2005 and ongoing; Experience location: Meade River near Atqasuk. SRB&A Interview 2007). (SRB&A 2009)

> *Underneath the tundra, starting from Tavie's [Daniel Leavitt] cabin on the Mayuabiaq, there are a lot of underground rivers. A lot of fish go through there. Those are good fish that come from those underground rivers. Big, fat fish. They're aanaakjiq coming in the mouth of the river. They don't know which way they come from. I've seen them*

just coming out of the shallow part of the river. They're the best fish from the shallow part of the river. And there's lots of little fish like that. They came from the swamp. They're really good fish. (Utqiaġvik) (Brewster and George n.d.)

The people up there would like to see a three mile buffer zone from each side of the river. They don't want to see any roads going across this river. By that, I mean you have three proposed roads going across the Colville and going across Fish Creek on one of these road corridors. There is the initial drilling for the entire NPR-A program that we will be starting soon is based within a few hundred feet from this river. We are adamant and persistent and presume that we should try and stop this because it's one of the most highly prized rivers that we have in the country where the people are concerned. By that, I mean without a buffer zone, where we will protect these rivers, it don't make any difference whether you drill three miles from the ocean shore or fifty miles up the river. It still drains into the entire river stream. Therefore, you have a prevailing chance of destroying the whole river all at one crack. Sam Talak (Utqiaġvik) (BLM 1982)

We're pretty much contained here, but rivers that are attached to the Colville [River], those are very important. You know that proposed road [to Umiat]? Those rivers have great value to us for the purpose of not creating, we don't have a lot of fish to talk about but when there are fish they are one of the biggest change of diet, just for a small while. And those are the things that people don't ever look at, and that proposed criss-crossing of those rivers to Umiat, there are five rivers we talk about, and the migratory routes for caribou. (Anaktuvuk Pass) (SRB&A Unpublished)

3.2.11.2 Nearshore Marine

When the weather is warm, [there is an] overflow from ocean, in July. It changes the fish coming in. [I saw that] in [the] last few years. When the overflow from saltwater is coming in [from a west and southwest wind], it coincides with warm spell of the weather. (Nuiqsut) (ABR Inc. et al. 2007)

Before the ice did not break. Now the ice is always breaking. We used to know the currents, when the ice would go in, come out—nowadays, it is unpredictable. (Utqiaġvik) (Inc. et al. 2008)

When it's south wind we get high water: South to southwest wind. North and northeast wind, everything gets shallow, except for around this time of year [September]. With a slight north wind [in the fall], it won't get shallow in the [Kasegaluk] lagoon. At the beginning of summer it will look like you can walk across almost. (Point Lay) (SRB&A 2011a)

Dirty water, [Kasegaluk] lagoon, the water will be coming in blue, but eventually it pushes all the dirty water and it will slowly turn blue in every inlet. It doesn't happen all at once. You'll end up with a whole blue lagoon. All the blue water will be by the spit side, first, and then it'll take all the dirty water away from the mainland side and turn it blue. (Point Lay) (SRB&A 2011a)

We're seeing first-year ice instead of multi-year ice. Arctic Ocean is melting. Our ice is melting. (Point Lay) (SRB&A 2011a)

We had seismic on the ocean last year and some fishermen don't catch fish anymore. They blame the seismic and air guns because one guy said you were lucky if you get

two fish. That was under ice fishing. Usually you get lots. That's with the qaaktaq. This is why I want them to follow the seismic where they blast and see what it's doing to the animals. It'd be better if they search for oil and gas on land rather than the ocean. That way they can have a better chance to work if something happens with their drills. If they have an accident, this way they can cap it. It's easier than in the ocean. Without affecting our hunting areas. I don't want to see any development in our hunting areas or on the rivers where we go fishing. And the calving grounds and bird nesting grounds and any kind of animal that lives there. Their denning grounds. And without damaging the tundra where they work, or lakes that are connected to the rivers. (Wainwright) (SRB&A 2009)

3.2.11.3 Water Quantity

He's concerned about why a lot of these lakes and rivers are getting too shallow. He's found where they…these seismigraphic testing. He's even seen them at the edge of Tsukpuk Lake and he's…he can't help but blame something like that because there's lakes where they just could put part of a fish net and they will get fish. When they stop for lunch with just part of a net in the water but now even people try with two hundred foot nets and still don't get that much. There is one lake where you can't find any fish at all. Daniel Leavitt, through interpreter. (Utqiaġvik) (MMS 1979a)

The streams, little rivers, whatever you call them, where they shoot out from Tsukpuk Lake, they used to be able to go in boats in those but they can't even go on them. Some of them less than half an inch of water on them. Daniel Leavitt, through an interpreter. (Utqiaġvik) (MMS 1979a)

The lakes are shallower than what I used to know. They're draining out. Or some of them are just flats now. No water in them. The outlets into the rivers have opened. (Utqiaġvik) (Brewster and George n.d.)

There's a difference right now in this river [Meade River]. When I was growing up with my parents, there were thousands of fish here, but now there's fish but not as plentiful as when I was growing up. When I was growing up we used to check the net three times a day and it used to be full, but now they don't get as full. I'm talking about aanaakjiq. When I was growing up this river used to be high tide constantly, but it's draining down. It's getting shallower. That's why I think there aren't as many fish. Since the river is getting shallower here the fish don't come out from the lakes no more. 'Cause there's no more river drainage, or overflow from the river in to fill these creeks. That's why I think there's not as much fish as there used to be. (Utqiaġvik) (Brewster and George n.d.)

I remember when the delta was deeper, in 1940, and now it is shallower. When the water is shallower during the winter, the delta freezes and gets grounded therefore there are not so many fish around. This year there was a lot of west wind and more currents; therefore there was good fishing. (Nuiqsut) (MBC AES 2004)

When it snows before it freezes, it causes slush to block the mouth of the river; we move [our] nets; the current pushes the slush toward mouth, the mouth is shallow; it leaves snow at the mouth of river when the wind comes from the west. (Nuiqsut) (ABR Inc. et al. 2007)

The ice has changed, even Contact [Creek] that comes through the village. Kids use to go to the end of the creek and get little fish, but this fall, but this summer it never emptied; it used to dry up in August. It never happened until October so that affected the ice formation on the river… …There must be some warmer water someplace that keeps it running and the water temperature has risen; the temperature of the water probably has changed. (Anaktuvuk Pass) (SRB&A Unpublished)

Back then the river was the same as it had always been. It has never gone down below the level. Today it has changed. The river is shifting and the river is getting shallower and further up there are sandbars that are getting higher and higher. Some of the creeks that connect to the lakes… unable to go in those creeks for fish or whatever they are subsisting for. For the Colville River it is changing a lot. The pattern of the current is shifting because the rivers are not one strait deep way, today we have to maneuver around the sandbars. I noticed that the rivers are getting wider because of the current is pushing the water down river, that current is shifting. (Nuiqsut) (SRB&A 2012)

In 1973 I moved here from Barrow I was originally from Atqasuk and Barrow and we moved here by snow machines. There was nobody over here at that time. One year here, more than that, I know so many times we would take the shortcut to the Colville River using the Putu (main access channel in the 1970s to get to the Colville), today that river is dry. It is all dried up. We used to use that as a shortcut to go way up there. (Nuiqsut) (SRB&A 2012)

I think it was three years after we came from Barrow. It started drying gradually and then it came to a point where it was no longer access to the Colville by boat… Back then we noticed that we used to have massive flooding and that is because there was a lot of water coming down from the foothills and mountains but now we don't see that much of it. One summer we had a massive flood, it changed when we first got here, there used to be massive flooding as time goes by, gradually, it has changed to where it is drying. The water level has really gone down from what it was in 1973. That is why the Putu has gone dry because gradually the water level has gone down. It is not like we have those massive floods like we had in the past. We hardly see that today. It has so changed. It is hot, [in July] the temperature has changed because the sun is a lot closer and the moon is a lot closer to us. July is when it gets really hot. That is about the time of the year when the Colville gets hot, the river gets warmer too. (Nuiqsut) (SRB&A 2012)

Chandler River has changed in the past. It used to have access going in and our but today it is all gone and it is shallow. For some reason it has gone down and we don't have the same access to the Colville we used to. It is all different. It is hard to get to the deeper channels. It has changed from the passed from where it is today. They have a difficult time getting into the river. It is a unique moose hunting area and it is wolf and wolverine hunting area. There are lots of rabbits now. It is an important place for subsistence hunting along with the Anaktuvuk River. Today sometimes we don't have access to go in there but there are areas we depend on for moose and Chandler and Anaktuvuk are important rivers. (Nuiqsut) (SRB&A 2012)

I haven't experienced it, but I am sure that the lake will dry out in that area. With the permafrost. It will make a river to it and dry out that lake. I haven't seen that. The water moves a lot over the ground. It will make its way through. The water won't stop until it has settled. It will flow down until it finds a spot to stop. Once you are on the river you watch it for years and years. There is a lot of difference. My experience going out every

year, I look at the land, I like looking and it is changing a little bit. It hurts a little. It will make me go different directions and think about the animals. It bothers me not knowing how to go up again, if I have to buy different equipment or a new motor. It will take a piece of the land and I can't stop it. Every year it changes, every year. The water has to go somewhere. (Nuiqsut) (SRB&A 2012)

With the lakes drying out I don't remember where but we caught a caribou and walked past a pond that was super dried out. It was like a big crack 40 feet away and I think that's why it leaked out. (Nuiqsut) (SRB&A 2012)

I stick by the coast in that area [by Oliktok], but when I go to Alpine I see that the lake they use is getting lower. They use it for everything. It's their main source of water. They use it all the time. They must use them a lot. We have used our lake over here and it hasn't gone down or anything. It has always stayed the same. (Nuiqsut) (SRB&A 2012)

Some of the lakes are drying up further up river, there used to be lakes further up river and now it is drying up and there is no lakes at all. The changing has to be with the weather pattern and whether or not more ice is being exposed on the river. Where those ice areas are the tundra sinks and erodes. (Nuiqsut) (SRB&A 2012)

They say that during winter the water on the lakes and ponds are refreshed by ponds but they are really extracting a lot of water for their use in these camps. I think [community member] has a strong point, how much water these development projects are going to use water. They are important spawning areas out there too. How can they minimize that impact? They are using the river to ice chips to build ice roads and they pump a lot of water from the river to these ice roads every year those are being extracted. The only way to reduce that is to have a permanent road to connect these places. Not just to Nuiqsut but also to the different oil pads. Eventually there will be an ice road to Pt. Thompson. (Nuiqsut) (SRB&A 2012)

I remember my surrounding and growing up around Colville Delta the Colville Delta had not changed, it was normal. The river break-ups were stronger in the 40s and 50s and the industry had hardly been around to destroy or damage the environment. And speaking of wetlands, the wetlands were abundant during the breakup and summer. There were more wetlands back then than today. Today they are getting dryer due to the lack of rain. There used to be an abundance of rain that would feed the wetlands and ponds. The thunder [storms] would bring rain but today we do not have those thunder [storms] that bring the rains. As for the lakes, I cannot speak because I do not know how they are today. Along the coastal line, particularly at Oliktok Point, that area used to be a nice big tundra before it was touched by exploration and today Oliktok is no longer tundra because it was expanded with gravel by the industry. There used to be a small creek but that isn't there anymore because industry has been expanding the point to put drill rigs and buildings… during the summer we used to go to Thetis Island to hunt seals and reindeer seals. There used to be an abundance of seals but today that has changed because the industry is there and they have changed the patterns of the current. It has changed because the oil companies are here and they are destroying the original land and expanding the gravel. Lots of the tundra that was once there are now lost. As far as what the Colville has done in the past, today it has changed. When I was growing up, in the 40s and 50s the Colville was once a big Colville Delta, there were no erosions then. When we came back in 1973 to reestablish the village… We could show you on a map. There used to be a point 5 or 6 miles upriver there was a point but

that is gone now. Down towards the end there is a fishing cabin and, on the west side of the bend that area is eroding a lot to. (Nuiqsut) (SRB&A 2012)

Number 1 is: All drilling operations, will take a lot of water. That means the same thing will happen like they did in Sagavanirktok River. They ran it dry, completely dry twice in one year. And, if that happens in the Colville River or any of these places that are printed up here -- like the lakes, the big lakes and river -- if any one of those go dry, the animals are goi- -- the fish are not going to be there. That's destroying the villages. Raymond Neakok. (Utqiaġvik) (BLM 1982)

I noticed in the first exploration that some of these lakes, especially Shinmar-Rock have dropped about two to three feet loss of water, a depth which is known to be about eight feet. At the time I noticed it-it went down to about five to six feet -and therefore it cannot support any more fish because a tremendous amount of water has been lost in that first exploration at Shinmar-Rock. We enjoy these fish because we know where they're at - and during the winter whenever we need them we can go and get them but these lakes that I mentioned I would say they are zero fish in them -and even if I was to go in an emergency to survive on these fish I wouldn't be successful. (Utqiaġvik) (FEA 1976)

3.2.11.4 Water Quality

What about pumping millions of gallons of water out of streams that cisco depend on for oxygen and habitat? If [there is] no oxygen or a place to spawn, that is different from what they know; they will not go there anymore. When you extract thousands of gallons of water, it changes the temperature of those streams or lakes. (Nuiqsut) (ABR Inc. et al. 2007)

When we get this west wind we get a lot of water, the water gets real dirty. That's the time we try to go way upriver, when we get this west wind. All three rivers fill up. East wind is when it drains out. Same thing. North wind drains it out. Northwest current still comes in, southwest it still comes in, [and] southeast it still goes out. (Point Lay) (SRB&A 2011a)

The lakes have changed, I'm sure there are other areas where activities will certainly affect them. [I am] not too familiar with that [project] area, but things around here like the gravel pit over here. I'm sure they will put some padding, using gravel. Where they get the gravel will affect the area, close to the river. The river will get mudded, where the fish are in that area. The rivers here aren't being affected, but there are, knowing how human activities are affecting the creeks, the small rivers coming down from the lakes. (Anaktuvuk Pass) (SRB&A Unpublished)

Last summer the water near Alpine in the Colville River delta was 70 degrees. What is happening? What will happen if development continues at these rates? (Nuiqsut) (BLM 2003b)

Even [Eleanor Lake] that is here is not usable here, where we used to get ice and get water. We can't use it anymore because there has been too much human activities; you know, skidoos and snowmachines spill oil, and it makes it not useful. (Anaktuvuk Pass) (SRB&A Unpublished)

There are whale bones and old ruins at Pingkok Island. The lands and its wildlife, fish, have changed today. For example, Putu used to have a free flowing channel. Now, last

year, it had to be physically channeled. Two years ago, my brother Paul went to fish at Itkillikpaat where he ordinarily fished. He came back with no fish. We used to catch fish anytime we put a hook in. The Itkillik River is now rusty colored. There are even a bridge at Puviksuk. This river used to be glassy clear, as I have known it. These are the effects of past activity. Bessie Ericklok. (Nuiqsut) (MMS 1979b)

3.2.12 Solid and Hazardous Waste*

Mayor Rossman Peetook indicated that that he would like to talk about the area that is being used for NPR-A, Alaska EIS. That area is being used for subsistence area uses and will probably be polluted if the industry takes over the land. He's very concerned about that because he wanted to use the example that the DEW line sites have been left vacant. There's pollution there that's never been cleaned up, and he feels that that same thing will probably be there if the industry or the seismic people use that area oil and gas. He is not against oil and gas leasing. But that he feels that until such time that better technology is available to be used in order to safeguard the area for fish for the caribou, for water fowl, these are very important to the lifestyle of our people. He knows also that Teshekpuk Lake, there's all kinds of various fish there available. And what it would what would happen if something drastic happened there, and then the livelihood of the people that are dependent for subsistence what will happen to them. (Wainwright) (SRB&A 2003)

Down by Icy Cape there's been a lot of reports of sick animals in that area. There's a few people who have gone down there. When they walk up on the land they noticed that there's drums buried in the ground from the old DEW line site. They didn't dispose of their fuels the right way. That's why everybody thinks the animals are getting sick. (Point Lay) (SRB&A 2013a)

Cause of the fast motion of the Colville, that's getting close to where the contaminated buried sites, cause each year, the erosion on the Colville seems to be faster every year. I travel a lot on the Colville during the summer months, especially when the moose season's opened up and we noticed that the erosion, every year it's faster. (Nuiqsut) (BLM 1997b)

Contaminants and drums were found in the rivers near the runway. A lot went in our rivers; that could be one factor to review. (Nuiqsut) (ABR Inc. et al. 2007)

We've got that Umiat, the erosion of the Umiat dump is floating through the river. That's a possibility, that the caribou might have been hanging out at that area. That's where the caribou's actually coming from. We've been finding containers, material containers along the river, you know? From the Umiat dump. The river actually eroded the ground and the dump is falling into the river. We left it [on the tundra]. (Nuiqsut) (SRB&A 2014a)

But these Air Force sites that were put up all along the coast of Northern Alaska shorelines have put in a lot of trash dumps, machinery that were left behind with contaminations from oils and other fluids that were in them. Also from a lot of the iron and other metals that themselves from corrosion produce a lot of contaminations in other ground and waters—on the coast wherever the landfills were put. Most of them were either on the Air Force sites or a couple miles away. And even the lakes behind our village present today have rotten oil drums in the lakes that are on the bottom and

they're constantly corroding every summer when the water and the ice melt, and the water's that the corrosion all over and keep going never stop and that puts a lot of strain on our animals and fish—particularly the birds that we live on. They do their nesting in a lot of these flats and a lot of these lakes and ponds are the home where the birds and other animals that depend on them for survival. And we in turn live off these animals for sustenance, for our food, also for our clothing to keep warm, and also did a lot of hunting for animals that we used for transportation—but this was of course 30 years back but it still was a major concerns back then this contamination that had been put all over wherever we have settlements alongside with DEW Line. (Point Lay) (Mikow et al. 2016)

3.3 Biological Resources

3.3.1 Vegetation

See traditional knowledge provided in the CLIMATE AND METEOROLOGY section for traditional knowledge that is also applicable to this section.

This is an effect. I've seen it. I have to go further and further out to get our food. Our ice pack is getting smaller. Our ice is not freezing. Used to be nine to 10 feet thick, now it's four feet thick. Our climate is changing. It affects our plants, like our salmonberries. If rain is low, it will affect us. We mainly need salmonberries for vitamins. We are mainly meat eaters so we need the berries to prevent scurvy. (Wainwright) (SRB&A 2009)

Berries used to grow in abundance one year and don't grow the next year and now its seasonal, every summer. Salmon berries, blueberries, black berries are growing every summer. Before, there was a break. Seems like the berries are more prevalent, and they grow every summer now. And there used to be a break from year to year. Now there's no break. So the wet summer helps the plants. (Anaktuvuk Pass) (SRB&A Unpublished)

And on the tundra travel, there's always never any snow on the foothills, because I've been hunting up there. There's always -- the snow is always blown off on the top, on top of the foothills because of the wind. And I thought there would have to be a foot of snow or something for the Cat trench to start. And there's always not enough snow so you tear up the vegetation. No matter what you do, you tear up the vegetation because the wind blows up -- blows so much in the North Slope. There is always not enough vegetation -- I mean snow to cover all the vegetation. And that's why I would keep that -- keep the traveling at a minimum instead of extending the days of travel for the seismic crews and the oil companies. I think that would be something to think about too. Because I've seen them plow theirselves right through bushes, those little willows along the creeks. If you break a willow, it takes over 30 years or something for it to grow back. So you've got to keep that in mind. (Utqiaġvik) (BLM 2004f)

You look at Pik Dunes up there, you somehow char up the tundra a little bit, and because of the rate of revegetation is so slow, that sand, if you rip open the sand, the desert storm ripple effect can happen. So it's a very sensitive tundra we have. (Utqiaġvik) (BLM 2004a)

The changes in transportation has caused a lot of trails and changes to the water accumulation in these areas. There's a lot more ponding in areas that have been used

for ice roads and other activities. The ponding creates crevices in the land and it damages the vegetation. There's areas that were available for nesting and such that get under water after the usage occurs. There's increased concentration to activities from our community because there's diversion from other areas that are already being developed and are being explored and developed. So those increased concentrations from our village are now into the areas of this Northeast NPR-A. (Nuiqsut) (BLM 2004d)

Less berries. We used to go right out here and have berries and stuff. We don't hardly ever see berries anymore. When we go to the traditional spots that my grandma went there are still berries out there. It's cause I used to do that all the time when I was young. Me and my friend would be ptarmigan hunting with slingshots and eat berries at the same time. After a while we just stopped seeing them all the time. I don't really know why, they just stopped I guess. (Nuiqsut) (SRB&A 2012)

The ice roads, when they melt you can see where the road has been. I don't' know what they use, they use lake water and make ice chips and spread them where the road is going to be. Then they put regular water on it. I think it's cause it [the road] stays there a lot longer. They just don't grow; it's completely brown where the road goes. (Nuiqsut) (SRB&A 2012)

In Nigliq we used to get buckets of berries and now we hardly get any. (Nuiqsut) (SRB&A 2012)

In the Colville Delta region the vegetation were abundant to the point where you could smell them. Now we cannot smell them anymore. You have to get closer to their patches now to find them. They have been gradually depleting. (Nuiqsut) (SRB&A 2012)

Since we left the Colville Delta region in the 1950s coming back in 1973 I noticed that the changes had already happened. The plants and the vegetation and the berries that grew a lot were abundant and now there are hardly any. The willows, the leaves were edible because they grow in abundance and they were just like having dinner salad and now you don't have those today we don't eat what we would have eaten off of the bush. (Nuiqsut) (SRB&A 2012)

Like the rhubarb doesn't grow anymore. I saw some at Fish Creek but I don't see them anymore. I noticed that when we were young we used to pick rhubarb and eat them off of the shorelines and now there is hardly any. (Nuiqsut) (SRB&A 2012)

They are not really that sensitive; they seem really strong because of the soil. It has a lot of nutrients. You could sell it like miracle grow the soil. It is even better. My cousin was growing a plant that took 6 months to grow, with our soil it grew like huge. The reason is that we have such a short summer. (Nuiqsut) (SRB&A 2012)

3.3.1.1 Shrubby Plant Species

Well you know it is obvious that climate change and development is something that, you know that's happened – 10 years ago you are not going to see these willows growing along the road side but now we're seeing those a lot– and now we're seeing land otters that we don't, we don't normally see coming or new animals migrating up North – that's climate change effects – because of how geographically (unclear) may be. (Nuiqsut) (BLM 2016b)

There are some birch trees growing, and cottonwood. Birch wood or cottonwood trees are growing here. That didn't use to happen. (Anaktuvuk Pass) (SRB&A Unpublished)

There's birch trees, over here [pointing east]. I don't know why they are growing now. We always have alders, they are always here. (Anaktuvuk Pass) (SRB&A Unpublished)

There are spruce trees right here to the south now, just close by. (Anaktuvuk Pass) (SRB&A Unpublished)

3.3.2 Wetlands and Floodplains

See traditional knowledge provided in the WATER RESOURCES section for traditional knowledge that is also applicable to this section.

With the satellite programs, I, too, am very concerned about satellite -- the crossing of the Nigliq Channel, the bridge design, as well as CD-4 as well as CD -- I believe it's 7, the most southern site. Nuiqsut has not experienced, neither has Alpine, what we call the 100 year Colville flood. We've only experienced a 25 year flood and with that 25 year flood, it came very close affecting those areas. Now, with the 100 year flood that hasn't occurred -- and I know you have data of what a 100 year flood might look like, but when we first moved here in Nuiqsut, that 100 year flood -- the whole plains down there was covered except for the hill down there. And we haven't seen that ever since we've been here in the 30 some years we've been here. But, you know, the industry needs to know of these dangers Mother Nature brings out on these sites and areas. There are things that -- you can do all the protections you can do, we can have all the policies and stipulations in places, but when Mother Nature's forces come in line, there's nothing any of us can do to stop her of what she's planning to do. And this 100 year flood will come and it will occur and it will devastate those well sites that will go into the Nigliq Channel. (Nuiqsut) (BLM 2003b)

Every year we get flooding in the Niġlik Channel, and every time at the mouth the ice builds up and carries gravel or sand and then slows down and drops gravel. So every year it drops more gravel and it gets further out. The channel, mouth of the river, is getting shallow. (Nuiqsut, Experience location: Nuiqsut. SRB&A Interview 2007). (SRB&A 2009)

During the break up of Kuukpik River, there used to be floods all the way up to Kayuqtusiluk. During the ice break up of 1945 the water level rose 20-30 feet. I haven't seen that since. (Nuiqsut) (MBC AES 2004)

Back in the 70's we used to have major flooding. The whole place looked like an island. You could see the hill over here like an island with water covering the whole land. That will probably happen again in the future when we start getting more snow. (Nuiqsut) (SRB&A 2012)

They used to have really big floods, I haven't seen the river go up that high in a long time. (Nuiqsut) (SRB&A 2012)

3.3.3 Wildland Fire

For some reason the caribou haven't been coming as far east [toward Colville River]. There haven't been as many caribou lately. It's just variability in the migration. They had that huge fire in here a couple years ago. So much smoke poured out of there it

might have kept them from coming. I don't know. Maybe they got out of the habit of coming here. (Utqiaġvik) (SRB&A 2013c)

And it's just sad to see that also the fire that came in July, how it affected the migration. And we -- we talk with the borough, and they wanted that fire to burn out itself, but it didn't. And like Charlie said, it takes about 50 years to grow them lichens. And where the fire is, I think it burned a lot of that. And we'll just have to see next year where the migration will be. (Anaktuvuk Pass) (BLM 2007)

We do get the effects. It covers the whole Umiat area. Forest fire comes from the interior and over the Brooks Range. The whole village area will be affected by the smoke. You can smell that burning all of the way up here. It doesn't go away right away it stays in the area for a while. Even when the tundra fire up… visibility was zero up there. Majority of the caribou migrating south accidently turned around and headed south. The moose was driven down river because of the smoke. (Nuiqsut) (SRB&A Unpublished-b)

[There are] fires down south, over there [tundra fires]. Inside the house it's getting stinky from the smoke. You can't see the mountains for two days. Planes can't even make it. [The wind blows] both ways north and south. [We have] east wind and west wind. It goes through the valleys. The mosquitoes come when [there is] no wind outside, [when it is] hot. (Anaktuvuk Pass) (SRB&A Unpublished)

3.3.4 Fish

See traditional knowledge provided in the ACOUSTIC ENVIRONMENT, WATER RESOURCES, and SUBSISTENCE USES AND RESOURCES sections for traditional knowledge that is also applicable to this section.

3.3.4.1 Salmon, Whitefish, and Other Fish Observations

Whitefish

Mr. Ahvakana: Thank you. Thomas Itta, Sr. was born and raised in the vicinity of Teshekpuk Lake, Cape Halkett is the place were he was born. Ever since he could remember he used that area for subsistence hunting. And all those lakes that are there visible, all of them, have fish in them. And he also stated that all the rivers that are around Teshekpuk Lake all flow into that lake and , therefore, they do have fish also. That Teshekpuk Lake from the beginning that we could remember that's been passed on by--from generation to generation. Our forefathers had stated that there's fish there that nobody knows that exist in that lake. (Atqasuk) (SRB&A 2003)

Get qaaktaq in the Kuugaagruk River [Inaru] around December, although that's getting late, it's getting too cold. The qaaktaq come up the river later than the other fish. They're milling around and then they decide to come up later for some reason. We don't get a whole lot, like they do in Nuiqsut. In October on the Chipp River, you can catch qaaktaq going upriver. You can catch more of them later in the season, like December or January, rather than in October. I don't know why they do that. Maybe they're out on the coast and then they come in? You can get qaaktaq in all of the river drainages, including Chipp, but only a few of them. You get them, but not a whole lot of them. We get the ones that are going up river in October. I haven't seen any with eggs then. Although have seen qaaktaq in Nuiqsut with eggs starting to grow in them. Maybe they spawn in the springtime so in the winter when they're being caught the eggs

are just starting to grow. Then they will be bloated with eggs by the spring. (Utqiaġvik) (Brewster and George n.d.)

Food for qaaktaq is less. They used to have shrimp in their stomach in the past; now it is like they are eating mud. (Nuiqsut) (ABR Inc. et al. 2007)

Before industry came, they [qaaktaq] were always healthy: size was larger, the amount of fat was higher. After the causeway, they are smaller, unhealthy, their food is unhealthy; they are eating something different. In the past, they had shrimp in the stomachs, when they were caught before the causeways were built. (Nuiqsut) (ABR Inc. et al. 2007)

I get qaaktaq at the mouth of the Chipp River before I go home, before freeze-up. I use a three inch mesh net. I also get them at the mouth of the Alaqtaq River, where it enters Pittalugruaq Lake [Pittallukruak Lake]. Also, I've seen qaaktaq all the way up to Chipp 9. I've caught them in my net. I've caught them up that far. We eat them fast. They're choice fish. (Utqiaġvik) (Brewster and George n.d.)

Qaaktaqs are known by their white fins. They don't have a black tip. The large cisco are blue. And it looks like you couldn't see the scales. And they're about that thick. There used to be a lot of them when I was going up to my camp. Back in them years when I'd go with a canoe I would sometimes get started too late. And I just go around the Point [Point Barrow] on the other side, towards the [Elson] Lagoon side. And then drop my net from the boat, along the edge of the boat. By Nuvualuaq [Plover Point]. But you have to watch closely because there are a lot of seals and loons and other animals going through that deep channel, including walrus. (Utqiaġvik) (Brewster and George n.d.)

The boundaries of paikjuk doesn't go beyond that area that's west of Alaqtaq. I've never seen it beyond that. That's kind of why I protected that area from seismic. I didn't want to lose sight of that only fish that I know called paikjuk. It's a beautiful colored fish. They are located only in that area. By Warren Matumeak's. Alaqtaq. From here, going over toward the Tasiqpatchiaq. I went through there one time before there was this break into Chipp River. And this old man that fished here talks about them and he goes up into the Chipp River up to where Charlie Edwardsen was fishing then, too. And Paul Kignak's camp. East. I've never seen them west of the river. But the west of the river, those fish become to look like lake trout family. Some big ones. And the aanaakjiq up where those lake trout were, were different color than the ones we were getting at the river. I don't know if they can spawn together maybe. I don't know if lake trout can participate in that. That large lake near Chipp 2 contains the smaller ones. And you can kill them in three inch mesh net. They're beautiful fish. I like them. And they're right up over in that area. Along with Alaqtaq. And that was the reason I was opposing making a landing field for delivery of diesel on those lakes. If they destroy those fish and they don't live in any other area where we know them and we can't ever find them in any other place, then I don't want them destroyed. Also the natural habitat is being destroyed by natural erosion of the river and other areas where you can't protect anything when that happens. If the river breaks through, it breaks through those lakes containing some species of fish. Some with lake trout. (Utqiaġvik) (Brewster and George n.d.)

I know these lakes, rivers and lakes, but I think this is the one that I heard so many times to be a subsistence spawning area. This little lake right here, [Chipp-Ikpikpuk Report, AB-19] it's a spawning ground for those fish, and they know it and when they spawn they go and pick up a lot of fish, you know? And they just go in there and get grayling and

whitefish and all that spawning and they just mingle in there and get them. (Utqiaġvik) (Brewster and George n.d.)

There are lots of fish in Qaababvik. At the mouth of it. We used to go there while traveling and needed a safe place to wait for good weather before crossing Dease Inlet. And we'd fish there. We'd get aanaakjiq [broad whitefish] and lots of iqalusaaq [least cisco]. (Utqiaġvik) (Brewster and George n.d.)

The Chipp River is known for aanaakjiq, and also for burbot [tittaaliq] and iqalusaaq [least cisco] and those little humped whitefish - pikuktuuq. There are many in those areas where they seek burbot and grayling. They follow the spawning of aanaakjiq every year. Boy, you catch those with a hook, the pikuktuuq and the tittaaliq. They just follow the spawning run of the aanaakjiq. The Alaqtaq River is good for whitefish. It's good fishing in summer until July. By last part of July they're starting to disappear. We know they're moving someplace. So, all those lakes in there between Alaqtaq and Chipp River are mingled with those fish, with aanaakjiq. And they don't have to be deep, as long as they are about seven feet deep. (Utqiaġvik) (Brewster and George n.d.)

The biggest fish I've seen are from Tasiqpak. The ones that are fat are right from this area. I think that some of these spots are fifty feet deep, and they contain big fish -- aanaakjiq. All of our nets were too small, when they got tangled up. But this guy had a very unusual net, made with three mesh deep. It was a big one. And he would make his own nets. And he'd get two fish, it was more than enough of a load for him to take home. The fish were big. And me and Tommy Jr. went up going through west Tasiqpak [showing on map] -- this way I guess. In this one lake. It was deep water. It was about fifty feet. And the aanaakjiq were big. And when we started to pull the net in it was moving like mad, but when we got it out, we got only two or three fish. Big ones. And five fish was pretty near a sled load. There are big fish down there. The biggest aanaakjiq I know about came from the Mayuabiaq River. This was Elavgak's grandpa. Daniel Leavitt's mother's grandpa. He had one net. One fish was enough for him. He would drag it home like a seal. Put a rope through the mouth and pull it over his shoulder; you know just like dragging a seal home. It was that big. One fish filled the net. (Utqiaġvik) (Brewster and George n.d.)

Char and Other Freshwater Fish

Most of the lake trout I've seen outside of Tasiqpak are in deep lakes. They don't stay in the shallow lakes. Where lake trouts are found is usually an impossible area for the fish to get in. They don't escape to travel like aanaakjiq do. (Utqiaġvik) (Brewster and George n.d.)

In Barrow, in August, the fish along the coast are coming from the east. One time I saw the water churning off the beach and it looked like Iqalukpik [dolly varden char]. They're good eating fish, so after I saw them I put a net in and got some. I put the net out in front of NARL [along Chukchi Sea coast]. People don't know this. They put their nets on the Elson Lagoon side for aanaakjiq, but the dolly varden are traveling out on the other side. I've seen them at Point Barrow, too. In Point Hope, they put a net out from the shore at a 45 degree angle and wait for the fish because they are traveling along the edge of the shore. So that's what I was doing. (Utqiaġvik) (Brewster and George n.d.)

There are some underground rivers around the middle of Teshekpuk Lake. There's the shallow part and they have rivers through there. They call them rivers. That's where the

fish travel. The big fish, the thirty-five pound lake trout, are in those deep channels. (Utqiaġvik) (Brewster and George n.d.)

This certain place where they used to set up their nets is by where we put cabins in on the Tupaabruk River [Tupaabruk 2 area, see Figure 96]. There are three houses there, plus Mary Lou Leavitt set up a house across from our houses. We put the cabin there because it is a good fishing spot. We put the nets out around the bend and they catch all kinds of fish. Besides at night when we want some burbot, we can just go fishing. It's close by. (Utqiaġvik) (Brewster and George n.d.)

Tittaliq [burbot], that's the Meade River, at Atqasuk. The real Atqasuk. That's what they call it, Atqasukiak. The real place, before they moved it to the village. Winter ice fishing. And we get the qaaktaq at the same time, and the humpback, the pikuktuuq. Right at this creek, right there [Usuktuk River]. A lot of burbot, big burbot. The biggest one I got was this long and this wide. (SRB&A Barrow Interview March 2006) (SRB&A 2010a)

And when I go up inland, go fishing, you start getting catfish. Those are unusual in our rivers up inland. You start getting these catfish. And those catfish are always on the ocean, not on rivers. Johnny Aiken. (Utqiaġvik) (MMS 1982)

Now, the Elders up here warned us about what happens to our food chain when they get -- it gets destroyed, and we look at -- you know, that sound down there, and the herring hasn't come back yet. And what is the herring? The basic food for most of the animals that are there. You destroy that kind of fish up here, my seals are gone, my walrus is gone. And if you destroy the lower part of the food chains, well, America, you will have finally achieved your goal, to destroy the Arctic whale. You tried it in the early 1800s by overharvesting it. Now you are going to pollute it. George Edwardsen. (Utqiaġvik) (MMS 2009a)

Salmon

I think all the estuaries are major spawning. I get a lot of salmon fish in the lagoon. I get coho, chum, pink, humpies, some [Arctic] char once in a while, and in August King salmon. I've had a net out right at Kokolik mouth, and I was getting Least Cisco in there one year, and I used a small net in the fall time, August and September. (Point Lay) (SRB&A 2011a)

Salmon, they never used to come up here. In summertime, by our cabin, I got a net. And it started getting some salmon. Dog [chum] salmon. Real big toothed ones. Not very many of them. We never used to get them, but now we do, so maybe they start moving from someplace. (Utqiaġvik) (Carothers et al. 2013)

Kukpowruk and Kokolik are our important spawning grounds [for] the salmon, the grayling. When I first came there was a lot of fish bones on the ground. Past Niklavik, [it is] just graylings. (Point Lay) (SRB&A 2014b)

I think our prevailing wind has changed to the south, southwest. It's been dominating the winds have been dominating from the south and southwest. It's warmer air and high tide in the lagoon and it's not favorable for salmon fishing. The current has to be going out when the salmon come in. (Point Lay) (SRB&A 2013a)

3.3.4.2 Fish Movement Patterns

Lakes and Rivers

> *And when I thought about that and I -- if you looked at a picture of the whole North Slope from the Canadian border to Point Hope, you look at where NPR-A is and the central part of the North Slope, there is thousands of lakes and lots of little creeks and rivers. That's where the majority of those lakes are. And what that tells us is that that habitat is so critical to fish. You know, you could see there, all those lakes that have fish in there, that's just a snapshot of fish that, you know, they identify as fish bearing lakes. But listening to elders in my family, even biologists who study fish on the North Slope, that these fish, they move from lake to lake through streams, through creeks that are seasonal. They might not be there year-round. And if you build roads in these areas that don't have a river, like a permanent river, but you're going to block their connection between these lakes, from moving from river to lake to ocean or whatever it may be. And I don't think there's been enough research to document that. So you need to seriously think about how that's going to impact the habitat of the fish on the -- in that area of the North Slope.* (Utqiaġvik) (BLM 2004f)

> *Wind in Teshekpuk Lake affects the fish. When it's ufalaq [west wind] they never come. There are no fish there. When the wind is from nigiqpaq [the east], that's good. That river [Mayuabiaq] is so different when it's east wind. The water gets better. But when it's west wind the water is low. In our area around there, Mayuabiaq, when it should have lots of water at ufalaq, it's different. The water goes down. I think the wind pushes the water from Tasiqpak.* (Utqiaġvik) (Brewster and George n.d.)

> *Also we've mentioned before that we're now moving in to the heart of the broad white fish, the ahnalik center of distribution and population density, and these fish have a complicated lifestyle that requires use of several types of habitats: lake habitat, deep river, spawning habitat, small ephemeral streams for accessing summer feeding areas - they go out in the near shore area - and all of those different habitats are used in different parts of their life cycle. So it's important when building gravel roads and structures not to impede even very small streams in order to retain healthy populations of this fish.* (Utqiaġvik) (BLM 2003a)

> *I notice that these fish we have, the white fish, have not migrated out into the ocean, they just migrated back into these lakes and stayed there for the winter, they are locked in for the winter when they get there. Some of these lakes that I named as the rearing ponds are also the wintering areas for these fish.* (Utqiaġvik) (FEA 1976)

> *The area around the lake … is all flat tundra. Every spring, at break up … all the flat tundra around the lake is very grassy and when the water level rises, the low-lying areas with dips and hollows become flooded. That's when all the pike go all over those grassy pools. When people are short on food, they would go fishing for them. They are ideal for dog food (Arctic John Etalook, pers. comm. 1981)* (Anaktuvuk Pass) (Spearman and Nageak 2005)

> *They are real resilient fish. They go up these streams [the Miluveach River and others off the Colville River] and right up the waterfall, and they feed off the waterfall. ... It depends on the season [what the fish eat]. Like late August, early September, they feed on beetles. … [Also,] we have little stickleback that graylings and the other fish eat.* (Nuiqsut) (HDR Alaska 2015)

The big run for iqalusaaq is in the summer. In the wintertime, you can put a net out under the ice and get a lot of them. We'd go to Kuugaagruk [Inaru] River for that. We used to eat a lot of those iqalusaaq and then feed them to our dogs, too. (Utqiaġvik) (Brewster and George n.d.)

There's usually two to three weeks of a fish run in the fall. Just when the ice is forming. Aanaakjiq, iqalusaaq and pikuktuuq they come together. And sulukpaugaq. They all run together. Our belief is that after the rivers begin to form ice, the fish are heading back in up towards the inland area into the lakes where they came from. (Utqiaġvik) (Brewster and George n.d.)

The Alaqtaq River is good for whitefish. It's good fishing in summer until July. Last part of July, they're starting to disappear. We know they're moving someplace. They're heading up to Chipp River. We know exactly the route they are taking to go up there. They go through Tasiqpatchiaq. And go through Pittalugruaq one time. But the river has broken through to Chipp River and is flowing this way now. It still flows out, but the channel has built up [increased water flow] and it's deep water now. And there are those streams that flow into the Chipp River and other main rivers. There're some streams like Tittaaliq, Aumalik, Qaksrabavik and Qubafnaq and stuff, but those are up in the headwaters where the water is coming from. There has to be enough water up there that they continually flow in the summer without letting up. So the fish are going up there, too. Those little fingerlings are the ones that go through those, too. And there are some lakes up there we know where the grayling are found, where the fish will go. And then four or five years later the big ones that are ready for spawning. Male and female. They go down. And you are tagging them coming up. They go from Alaqtaq area and then go in there. Those that are spawning grade are going up. And in the fall, just before around freeze-up, they stampede back down to spawn in those qaglus. Same thing, going up or coming down to spawning, I imagine those fish know where to go for spawning. Now, some of the things you didn't catch out. All the fingerlings don't go all the way here. Some get lost. The majority of them, they go into these bays. When the break-up pushes them all out, they have to go somewhere. They run around, probably escape predators. The only way they will reproduce is in these lakes. (Utqiaġvik) (Brewster and George n.d.)

Fish in the lakes, the small ones, are in the rearing ponds. As they grow into big fish, big enough to spawn, early in the spring they stampede out while it's high water. That's when we get some good fish. I like to be there to catch some of those. They already have roe. They are not prime, not ready to spawn out, but they are there. The eggs are glued together. You can't separate them easily, like you would at spawning time. During spawning time, you just squeeze the fish and the eggs pop out. Sometimes we have to clip the tail end to leave the eggs in there and then freeze them that way. All the fish [ones in rivers and ones that had been in lakes and moved to river through streams at high water] go to the headwaters of the Chipp River in the summer. They head up to the headwaters. How far up? I've never made it up to the very end of the Chipp River, but I have gone a ways up. Even tittaaliq and grayling go that way. In the fall, the fish are coming down the Chipp River for spawning to the deep water. There are deep water holes in the river where the fish spawn [qaglu]. Those fish know what they're doing. I think they know that during spawning they want to come down with a spawning group. If the run is good, the majority will go down towards the bay, and to qaglus where they spawn. (Utqiaġvik) (Brewster and George n.d.)

Nalaakruk Lake has really good, tender fish. It was different. I think the oil companies used that water and it's really different now. The water looks different, they say. Our son

[Billy] usually goes there for a few days in the fall and gets real good fish. They are different than the river fish. Aanaakjiq. (Utqiaġvik) (Brewster and George n.d.)

In the 1930s, '40s and '50s, we usually ended up fishing on October 6. We started around September 23rd with a dog team traveling through snow and ice crossing small lakes that were already frozen enough and useful for traveling. We knew the fish run would start around September 25th or 26th. The fish don't miss that. We have to be there to catch them, otherwise after five or six days the run is over. And if you don't catch them then, you don't have much subsistence food to put away. Today, it runs all the way into October, 10th or 15th. (Utqiaġvik) (Brewster and George n.d.)

Six days before spawning, seven days at the most, that's when I want to arrive at my fishing spot on the Chipp River. That's why I have to be there. You have to catch the fish run when it's happening. After the 10th of October, it makes no sense. The run is over. Right now, it's changed to the 10th. The run used to be from September 26th on down to October 1st. It's ten days difference now. I figure the change of climate or some measure of change has to do with it, because we have a late freeze-up today. In my younger years, I would go ice skating maybe on the 15th of September. And then the reindeer corralling time would be the last week of September. And the ice would be that thick and it was just right for making a huge ice corral. We put all the reindeer into that. So that's the difference today. I mean somewhere around October 8th or 10th, up to there. In those two areas, I would pull all my nets out. No matter which way you look at it, spawning has to take place. I don't know if the fish can hold off that long. (Utqiaġvik) (Brewster and George n.d.)

Nearshore Marine

When the weather is warm, [there is an] overflow from ocean, in July. It changes the fish coming in. [I saw that] in [the] last few years. When the overflow from saltwater is coming in (from a west and southwest wind), it coincides with warm spell of the weather. (Nuiqsut) (ABR Inc. et al. 2007)

The Arctic cisco and broad whitefish always come in [on the eastern side of the mouth of the Colville River]. A lot of animals like bearded seal, [ringed] seal, and spotted seal begin coming into the river from the ocean during the time that it is continuously dark. Also at the mouth of the Nigliq [Channel] is where bearded seals increase in numbers in the darkest months of the year [early winter]. … We get seals, bearded seals, sea lions do come in there near the mouth of these channels to feed on fish. And they do hunt in those areas: Colville Delta region all the way to Nigliq and some are in Fish Creek area. They're abundant in August- September. That's when the fish start coming in.…Some do come in way inside somehow.…I got ugruk [bearded seal] by Kayuqtusiłuk…It was around with a lot of spotted seals. (Nuiqsut) (HDR Alaska 2015)

It is noted of 28 species of fish that comes over winter and have them -- and half of those fishes winter in the Colville River. Like the Arctic cisco is a migration fish that spawn from the MacKenzie that has been pushed through the current until they are three-, four-year-old. By that time they are in our river system. But there is fishes that comes in the river. That's why we are worried what will happen. (Nuiqsut) (BOEM 2011)

I have fished most of my life and have noticed that the fish follow the currents. During the summer months we would never have to leave the shore to catch fish. I also remember that most of the Arctic cisco caught during the summer had eggs within them. Starting in

July when it starts getting darker, they follow the salinity of the ocean. They never leave the shoreline in summer. The families used to fish where Helmerick put his cabin. Once the causeway was built, the seawater treatment plant, changes began to occur. These changes affected the size and abundance of fish. (Nuiqsut) (MBC AES 2004)

In older days, with a west wind [we] hardly caught any fish, but today we catch most fish [in a west wind]. In the past, the west wind used to push fish out, whereas today, we depend on the west wind to push the fish in. (Nuiqsut) (ABR Inc. et al. 2007)

In the beginning of August, the Arctic cisco turn around and start moving back into the river. Large fish seem to disperse a long way east and west from the Mackenzie River. Other white fish from the Mackenzie peter out at Herschel Island. Other fish from the Colville peter out at Flaxman Island. But Arctic cisco are found all the way along between the Colville and Mackenzie. (Nuiqsut) (MBC AES 2004)

The reason why I had my sons pull out all the fish nets in December was it was an unusually different weather pattern this year [December 2003 - February 2004]. It was hardly below zero until December. [On the rivers] the salt water will flake up, and there's flakey ice that looks like maybe the fresh water is coming out from the river or somewhere. It forms paper-thin, and is real sharp and then it moves. But in the salt water it is in a different form and it will collect easy on your net. And it will float the net no matter how much weight you put on it. It collects so fast through the current that I told them that happened to me more than once. So you might as well pull the nets out, because I think you're going to have a bad situation trying to pull them out later. Because I know, I've done it before. I got caught in it. Got caught twice, it's enough. And then I remember it. (Utqiaġvik) (Brewster and George n.d.)

3.3.4.3 Health and Physical Abnormalities

The fish we get, the cisco—it seems more contaminated—like chemicals are eating away at it, not that another fish had taken a bite out of it. There are big sores on fish, and some are deformed. You see this especially on the belly and tail. They have pale-colored meat, the color is reddish. You have to throw it away; you can't even feed it to the dogs. (Nuiqsut) (McBeath and Shepro 2007)

When I started seeing dark spots in the liver [of burbot], I, I mean I ask questions. 'Cause I know for a fact there's an old dump site just a few miles upriver and lot of it is toxic. So might have something to do with those dark spots showing up on those livers 'cause the liver of a burbot is our delicacy. I mean it's probably the best part of the fish that we go after. But then after start seeing that dark spots in the liver they might start shying away. Start telling my boys no more from that place. (Nuiqsut) (Brown et al. 2016)

They are smaller, skinnier fish now. I have a picture taken in 1973, when things were different. Fish are very small now in the channel compared to thirty years ago. Then people caught from two hundred to six hundred fish per net per day. Now we get one to thirty fish per net per day in the same area, on a good day. (Nuiqsut) (McBeath and Shepro 2007)

She said that she was raised here and she's been living here, and over the years she has personally consumed qaaqtaq, Arctic cisco. And the liver is a delicacy for her, but over the past couple of years there has been discoloration of the liver in Arctic cisco. Although

the fat contents are still evident, there appears she hasn't had any liver from the qaaqtaq for the past two years because of the discoloration of the liver from its normal color to a darker, blackish color in some cases. Flora Ipalook, translated by Delbert Rexford. (Nuiqsut) (MMS 2007c)

In the 1970s [the] fish were healthy and you could cook all of those fish and [the] taste was good most the time; now, the fish has changed, the taste has changed; even the fresh fish they catch today tastes like it has been in the freezer for a long time, freezer burn. (Nuiqsut) (ABR Inc. et al. 2007)

3.3.4.4 Effects of Seismic on Fish

In the wintering years when ice gets thicker and the waters and the fishes are even more sensitive because the ice, the more ice there is the water becomes more dense, so much that it's -- any little sharp noise or bang of those effects can kill fish. And included one incident where when there was fishes site on a clear day you can see it clear, but under the water and - and for -- not for it to be lost, the ice is 10 to 14 inches and you can slap that with a -- like a bang and cause that fish either to die instantly and those are known types of things that have killed the fishes and especially when the ice is thick, because the pressure of the ice makes that water more dense and easy to kill the fishes. (Atqasuk) (BLM 2004b)

He said they were sounding along the river bank by Kuugagruk, and put up poles all the way by the river banks. And, they were sounding there ever since the fish were scarce. All the other rivers drain to the ocean, and when there's Spring breakup, then all the debris and everything that's in the river goes out. But, Kuugagruk happened to be different than those other rivers, because it does not flow out to the ocean. And sometimes, the debris will collect in that river because the oil companies had been doing some testing there. After they did that, there was lot of dead fish along the along the river banks, like they were just a long line of wood that they gather from the bank of the river, sometimes. They said the river banks were just full of dead fish after those testing on that river. Noah Itta translated by Alice Solomon. (Utqiaġvik) (MMS 1982)

And, as told in a comment made by an inland person earlier, he said his father would kill fish by hitting (the ice) from the top, and if there is ice-free water under there the fish would die. And then he would make some holes in the ice down-current for the dead fish to float up through. This, (his story) is also true. This is how the (people) that are drilling, using explosives on land during the winter near the lakes, kill the fish. And also in the ocean when they are using compressors, it is no different. A person saw this with his own eyes and knows that just by hitting the top of the ice the fish would be dead. A compressor which sends off a very loud noise (and vibrations) can also kill a lot of fish. (Utqiaġvik) (SRB&A 2003)

Due to the ships traveling about we didn't get any whitefish this year. Usually we get plenty. This year, with all the ships dragging seismic equipment, we didn't get any fish on our river. (Wainwright active harvester; Experience timeline: 2006; Experience location: Kuk River. SRB&A Interview 2007) (SRB&A 2009)

And he's more concerned about the east -- the lakes east of the Ikpikpuk because they are filled with fish, and he's very concerned about these for wintering and seismic because these are the Community of the Arctic Slope, Barrow, Atqasuk, Nuiqsut and Wainwright, they still rely heavily on the nutritional supplements from subsistence, and

renewable resources especially in these fishes -- I mean, lakes where there are fishes. These are known, you know, for to supplement the dietary and nutritional needs. And they need to be heavily protected. There is not much more else that we can rely on other than our renewable resources that is just so sparse right now, but being on the whim of extinction, on especially in the advent of seismic and oil and gas exploration. (Atqasuk) (BLM 2004b)

During the course of early seismic testing during that oil exploration, the blasting of the dynamite gave a good recording. But they were destroying all of the fish. The only way we found out that we were destroying fish was in the springtime during break-up when it produced dead fish on the surface. Seagulls enjoyed them all, I think. But the seismic was responsible in them years by using dynamite. Today, they've got different methods. We made a report on that. I was fishing and working for the Navy. By testing dynamite in the river, I learned that I killed a whole bunch of fish. I was part of them, working for the Navy - and I didn't even know it until one guy mentioned that Tasibruaq Lake fish were gone, and there's so many fish on the edge of the lake. They blew one, two, three charges of that dynamite there in that lake. It had some effect too, probably even poisoned rainbows, killed them by concussion, I don't know. (Utqiaġvik) (Brewster and George n.d.)

Noise bothers the fish. Seismic crews in the early days used dynamite on fish bearing lakes and rivers. Norman Leavitt said he saw lots of dead fish on the Kuugaagruk River [Inaru]. That's sad. The state allowed that to happen. We had no say. Now they've developed a vibrosis method for seismic surveying, shaking, that doesn't hurt anything because it's gradual not sudden. (Utqiaġvik) (Brewster and George n.d.)

My next-door neighbor he mentioned at the time he was up in the fishing area near Alaktak that the dead fish were on the edge of the lake that the seismic had got to during the winter. They did tremendous damage, not only at the lakes that I pointed out but also some other lakes around the area - all these lakes that are ten feet, eight feet or more. There's - or was a tremendous amount of fish in these lakes - one lake has more than three species of fish. (Utqiaġvik) (FEA 1976)

A compressor which sends off a very loud noise (and vibrations) can also kill a lot of fish. An elder (made a comment) to stop (the drilling for five (5) years.) since we, ourselves are elders now. I will support his comment to stop (for five years) to see if the animals will return to(their habitats); I am glad to know that a person thinks in this way. If they are going to drill near the river, don't use the water in that river. The (abundance) of fish will change. (Utqiaġvik) (SRB&A 2003)

This year my husband went fishing. He only took home two whitefish. Not like years past. Ever since the seismic, anything that has to do with noise. They've done some sort of search up by our cabin on the Utukok River. We did not get very many fish. If they stop the seismic, maybe they will come back! (Wainwright active harvester; Experience timeline: 2006; Experience location: Utukok River. SRB&A Interview 2007) (SRB&A 2009)

We never see those fish anymore through here. I think I know why. One of these seismic people, they were sounding in this area, all the way up here. When they dynamited that down there, they blocked that road for the fish when they come up that way. We never get anymore. Last year, was the same way. It's been six or seven years now since we ever catch any. In the summer, sure, we get a little bit, but not too much. Sometimes ten,

twelve fish in one net. But, we used to get a lot of them. We have to come out in here, where Noah Itta's place is. We can get our fish in the summer right there only. That's the only place in the river in this area that we can get fish. That's aanaakjiq. (Utqiaġvik) (Brewster and George n.d.)

And he's concerned on fish in lakes and rivers over wintering areas and seismic. Sometime ago they had been involved with the -- working with seismics before and it has devastated known wintering areas near here and Ikpikpuk. And these were -- these are dynamite things and they know that this does kill and devastates fishes, stocks of fish, many of them and many known over wintering areas. And he's -- and perhaps on account of those that the setbacks, maybe that may be warranted to be even a little bit more to -- rather than relaxing them in all the ravines, including rivers. (Atqasuk) (BLM 2004b)

This year my husband went fishing. He only took home two whitefish. Not like years past. Ever since the seismic, anything that has to do with noise. They've done some sort of search up by our cabin on the Utukok River. We did not get very many fish. If they stop the seismic, maybe they will come back. (Wainwright) (SRB&A 2009)

3.3.4.5 Effects of Development on Fish

I believe that sediment studies along the DEW line should be looked at. Nowadays, the fish are skinny and not fat like they used to be. You should look at those problems from the past. Perhaps the fish have an altered migration path in order to avoid contaminated areas. Maybe they migrate out in the ocean farther. But there is something that is causing a change in their migration route. They are traveling longer distances and that is evidenced by the fact that they are not as fat as usual. (Nuiqsut) (MBC AES 2004)

It is a lot of work to go out there and chisel ice and coming back the next day to check the nets and there is only one fish. It was really sad last year. I barely made a half a sack of fish. When we caught fish, we send some to Barrow. Last year we sent three fish to Barrow and two elders fought over them. This year they are happy with what we are catching. We are able to send more. I hope it gets better. I feel the decline in fish occurred when development began. It has really declined after three years of construction of the HDD (horizontal drilling under the river) near Putu. This year they drilled at Iqalliqpik (Fish Creek); we didn't catch many fish when that rig was there. Now that development is slowing down, we hopefully will see the fish counts increase. I believe noise and development are the cause for the decline in fish counts. Prior to development there were no complainants with the fish counts. First there was Alpine and then North Star. (Nuiqsut) (MBC AES 2004)

I am concerned with industry building more and more ice bridges every year. They build these ice bridges over the rivers of the Nigliq Channel as well as the Colville River. These ice bridges are used to enable rigs to travel over the river in order to reach the drilling site. These ice bridges are built in December and January. My theory is that late in the season, with the building of ice bridges, migration routes are being blocked. With ice bridges being built across rivers, it naturally forms ice underneath. By the time the ice road was done in April we found about 70 feet of ice formed beneath the bridges and only about five feet of open water left at the bottom for the fish to pass. That practically covers the whole river and prevents any wildlife or fish to pass the river at these areas where ice bridges have been built. I would like a study to be done to determine if these bridges are being grounded to the ground. I feel that the bridges

affect the fish greatly as well as the community. Industry says no, we need the oil here, but further studies need to be done to do it right… This is a concern because the fish travel within a specific temperature of water and a specific depth. When the ice forms and blocks those specific areas they will turn around and go back or elsewhere. They probably will not go underneath and figure it out. A similar situation is seen among the caribou and the pipeline height. When the caribou encounter the pipeline they will turn away and go somewhere else. They will not stop and think that perhaps nearby there is a crossing path that could be used. With the forming of ice bridges I believe that the fish that encounter it will turn around and go back. I don't think they will go under it. (Nuiqsut) (MBC AES 2004)

The effect of outboard motors on the fish is the noise. Any time you create noise, it's going to effect the fish. That's why when you put out a seine net, you use a rowboat. Fish are closer by if you don't use an outboard. They scatter from the motor noise, but they come back. (Utqiaġvik) (Brewster and George n.d.)

When there's noise from people walking on top of the ice or people traveling on top, fish like tittaaliq move away from where the people have made a trail. Now they don't stay around there when there's noise. When there's noise, they're more afraid than other fish. (Utqiaġvik) (Brewster and George n.d.)

I feel the decline in fish occurred when development began. It has really declined after three years of construction of the HDD (horizontal drilling under the river) near Putu. This year they drilled at Iqalliqpik (Fish Creek); we didn't catch many fish when that rig was there. Now that development is slowing down, we hopefully will see the fish counts increase. I believe noise and development are the cause for the decline in fish counts. Prior to development there were no complainants with the fish counts. First there was Alpine and then North Star. (Nuiqsut) (MBC AES 2004)

Maybe [the change in quality] is related to the ice road. Maybe it's blocking wintering fish feeding grounds, blocking the freedom of movement for wintering fish; they are blocked from the ice road near Spy Island [a barrier island east of the Colville delta; Most [of the ice road] is grounded. (Nuiqsut) (ABR Inc. et al. 2007)

My theory is that late in the season, with the building of ice bridges, migration routes are being blocked. With ice bridges being built across rivers, it naturally forms ice underneath. By the time the ice road was done in April we found about 70 feet of ice formed beneath the bridges and only about five feet of open water left at the bottom for the fish to pass. That practically covers the whole river and prevents any wildlife or fish to pass the river at these areas where ice bridges have been built. I would like a study to be done to determine if these bridges are being grounded to the ground. I feel that the bridges affect the fish greatly as well as the community. Industry says no, we need the oil here, but further studies need to be done to do it right. (Nuiqsut) (MBC AES 2004)

Titaaliq, the burbot, just about every year I go ice fishing. Last year I caught one and it was yellow where it was supposed to be white. A few other times the liver was discolored and I am wondering if that is coming from Umiat or all that stuff they buried at Pivoqsook and all the erosion from the banks. (Nuiqsut active harvester; Experience timeline: 1992 and ongoing; Experience location: Tuiqauraq. SRB&A Interview 2007). (SRB&A 2009)

Dredging affects the turbidity of the water and in turn affects the Arctic cisco and their migration patterns. (Nuiqsut) (MBC AES 2004)

There are little fish that are good for qaaktaq that discharge out of the Colville River– ice bridges are blocking them in. (Nuiqsut) (ABR Inc. et al. 2007)

Our fish used to be a lot bigger. We have gone from 3-inch mesh net to 2.5 inch. One year they said the low catch in the Nigliq was because of the slush. After the first year of the crossing [HDD drilling under the river], there was a lot of drilling mud that was lost. Scientists and biologists believe that this mud has not affected or harmed the fish because the mud contains a lot of salt. Some people are skeptical; they feel that this didn't help the fish at all. (Nuiqsut) (MBC AES 2004)

We're already a living example of if you would eat contaminated animals or fish. Right now, our burbot is contaminated with PCP form the contaminants in Umiat. And we're - I'd say like 60 percent of the village used to harvest burbot. Now I'd say only 10 percent if even any 10 percent. (Nuiqsut) (MMS 2001b)

There are lots of fish within the area. The plant sucks in the yearling fish and also changes the salinity of the water within the area. The place where the most cisco are found is where Old Nuiqsut, currently Helmericks fishery, was located. Causeways could block the fish from traveling between the Mackenzie and Colville Rivers. (Nuiqsut) (MBC AES 2004)

They are extracting gravel from Napaung Lake. This will affect the Broadhead and Whitefish. The lake is very long. When they pump these lakes it takes away the food source of the fish. At Oliktok, there is a large salt water intake. How big is the screen? Is it small enough that it doesn't suck in the food source for qaaktaq and other marine animals? (Nuiqsut active harvester. SRB&A Interview 2007). (SRB&A 2009)

The changes are the burbot, that eat the fish. The burbot are more slimy in their skin, and the liver has changed; the taste of the liver has changed, the burbot liver. I don't know, maybe after that one big mud [discharge], when they drill and also when they are near Umiat, and there's a lot of debris in the Umiat area. We found out now that burbot, after they found out that they had PCP in the livers. The elders that have been eating those have died from cancer. (Nuiqsut) (SRB&A 2013c)

*Before development began the abundance of fish was higher and the fish were fatter. Since the development started there has been a low recruitment of fish and they have become skinnier over the years. (*Nuiqsut) (MBC AES 2004)

There was a decrease of Arctic cisco in Colville after a few years of the HDD drilling. Since it is up and operating and drilling has stopped, it seems like the Arctic cisco run is getting better. Now the fish counts seem to be getting better, perhaps because there is less industry activity, less underwater drilling. (Nuiqsut) (MBC AES 2004)

We don't know how much, the ones that affect the areas where the fish travel on these rivers and the activities that are going on in the Colville [River] are the ones that really affect our area. Last spring we didn't get hardly any fish over at Chandler and Shainin Lake. Like the alpine development; that's really affecting us. Do fish migrate? The activities on the Colville River, those that drain in there, that affects us. (Anaktuvuk Pass) (SRB&A Unpublished)

Not on a regular basis. A major oil company here on the North Slope was fined heavily for illegally dumping at Endicott, which is on the migration route of the Arctic cisco to the Colville. I feel that illegal dumping is a serious problem, whereas five kids playing

in a swimming hole is probably not the problem that has wiped out the cisco. (Nuiqsut) (MBC AES 2004)

There was a decrease of Arctic cisco in Colville after a few years of the HDD drilling. Since it is up and operating and drilling has stopped, it seems like the Arctic cisco run is getting better. Now the fish counts seem to be getting better, perhaps because there is less industry activity, less underwater drilling. (Nuiqsut) (MBC AES 2004)

3.3.5 Birds

Black brant, you can catch those up here [directly east of Barrow], and if you want to harvest large [amounts] you can go [here] [Wainwright area]. Black brant are not my favorite type of geese, but if I'm in the area and I can harvest them, I harvest them. When I go eider duck hunting over here [in the lagoon], the black brants sometimes fly back and forth where the eider ducks fly south. The black brants fly back and forth between feeding grounds. (Utqiaġvik) (SRB&A 2010a)

That's pretty much it except for on the spit, there's lots of eiders along the whole lagoon spit, lots of eiders. The whole thing; I've seen eider nests throughout the whole spit from here to Icy Cape. They don't nest too far apart, from here to the wall and there'll be a whole pod of them. (Point Lay) (SRB&A 2011a)

All those birds I tell you about, they go all along the coast. After they're born, first two weeks they stay around there, then we see big bunches of babies floating around the lagoon. Inside the lagoon. Hundreds and hundreds of birds. They raise them in the lagoon. All the way up to Icy Cape we always see babies bunched up. (Point Lay) (SRB&A 2011a)

Eider ducks, geese, swans, loons, and there's aahaaliqs [long tailed ducks], what you call it in English? Always see them raising their young all over the lagoon. They call them isas. (Point Lay) (SRB&A 2011a)

[The brants are] mainly inside the lagoon going south. We're always seeing them in the lagoon. They go from point to point (in the spring). They hit the points like this and fly this way and head over. But when there's open water they seem to fly over the open water a lot. (Point Lay) (SRB&A 2011a)

All along the coast, the whole spit is key habitat for the birds nesting, all over. Up Kukpowruk River, in all the lake areas [there are], loons, terns, everything, swans, cranes. I have never seen a crane egg but a swan egg. I saw a nest that was abandoned and they never came back. (Point Lay) (SRB&A 2014b)

There's an island at Kukpowruk. That's called Snow Goose Island, The big one. That's where there's a lot of snow goose end of June. Elders used to tell us where to go for that [egg harvesting]. If you want to get snow goose eggs, don't get too much. Plus [they nest] right from the village. I think it's this one [lake] here [near Point Lay]; it's got to be this one. That's where the Canadian geese go. There'll be hundreds of them end of June. Canadian geese. They're nesting there. Swampy area around that area, it must be their food. (Point Lay) (SRB&A 2011a)

There's some birds that don't normally come this far north, but they do nowadays. The weather warming up, they have more areas where they could raise their chicks and produce, reproduce. (Point Lay) (Braem et al. 2017)

Also at the mouth of Niglingaurat black brant used to nest there by the hundreds. There were so many that they looked like bowls from a distance filled with eggs. We could have hunted them if we chose to. When they flew away, it looked like there was a big, black cloud. But we do not hunt them. (Nuiqsut) (BLM 1998c)

When the thin ice near the mouth of the river breaks up, that is when they start duck hunting. We, the residents of Nuiqsut go there to hunt for ducks when they arrive. I do not know how the ducks that nest along the sea coast are doing because it has been so long since we lived there before we moved back to Nuiqsut. There is a very big nesting area along the sea coast though but since we moved here some time ago, we do not know whether it is still that way. (Nuiqsut) (BLM 1998c)

Back in, when I was beginning to be a boy, my parents, they owned a canoe. So we have to go down the coast when the, when they, after all the ice caved. We had to haul some driftwood for when, winter use, along the coastline. There used to be some, these stellar eiders just bunched up in one spot, another bunch, another bunch, in the summer months, after they nesting in the, in the, up inland. They stayed along this coastline in a big bunch, you know, in bunches, bunch, bunch. But for the last years that I have known, have seen my, personally, I haven't seen any flock along this shoreline for the last few years. I don't know what, what became of those ducks. Kenneth Toovak (Utqiaġvik) (MMS 1982)

Birds, migratory birds nest quite a bit around the delta...Also, quite a bit of goslings and nestingers (ph) from Iysuk (ph) by Cape Halkett along the Harrison Bay to Fish Creek near the Ocean on those swampy areas. (Nuiqsut) (BLM 1998c)

I'm not sure about what kind of studies were done on the National Petroleum Reserve or how many studies or how far those studies went because it is warming up here in the Arctic and we're kind of warming up at a rapid rate up here and you know we're starting to see new species of bugs, new species of birds traveling this way. (Point Lay) (BLM 2019b)

They're all over that flat [spit]. [There are] all kinds of eggs, even seagull eggs. The birds lay right in the flat area there. Eider ducks, seagull, aaqhaaliq [long-tailed duck], Arctic tern, geese, and all them birds, they always lay eggs right there. Always in June, they lay eggs. (Point Lay) (SRB&A 2014b)

Right here [mouth of Kukpowruk River] is where they feed, I guess, or rest. Probably both resting or feeding, last year me and my uncle saw maybe 1500 take off at once. They were all bunched up all in this area. When you look up to the sky you could see nothing but ducks. (Point Lay) (SRB&A 2014b)

Phalarope. There used to be millions. You don't hardly see them any more. The whole shoreline used to be covered every time in the fall. And you don't see them inland where they nest. (Utqiaġvik) (MMS 1982)

Same way with these, these little birds, snipes. Used to be in the fall, along the beach, just hundreds of it, along the beach, you know, in the ocean. But same, same thing.

They're gone. Maybe you'll see one or two there, this and there, but not hundreds anymore. (Utqiaġvik) (MMS 1982)

I think [when] the weather changes, animals come early like the geese. We were trying to go by the calendar by how we used to hunt them and by the time we get there they have already gone north. (Anaktuvuk Pass) (SRB&A Unpublished)

That is where they all nest, all the way over here and on the channels. They go in the wetlands. We could see all of the nests over there, just hundreds of them. That's where all of the eiders and King Eiders and the Brants nest (by Oliktok Point)… (Nuiqsut) (SRB&A 2012)

There are different waterfowl that are coming up here; they cannot be named because they are new to the region. The sand hill cranes used to be much larger and there are stories that they killed people. We have them up here I have shot them before. I didn't know what to do with them when I shot them. The one mate started circling me and it kept going up and up and it disappeared… I buried the other sandhill crane. Some of these birds must have been huge to where they could kill people. (Nuiqsut) (SRB&A 2012)

Ravens too, they were gone for a while and now they are starting to pop up again. I saw a swan in October. We saw a lone swan after freeze up. It must have been lost, it looked weak. Someone maybe shot the mate because if that happens then they die too. (Nuiqsut) (SRB&A 2012)

3.3.5.1 Teshekpuk Lake Special Area

In addition, this is also Carroll's testimony, in addition the entire area around Teshekpuk Lake is an extremely important habitat for waterfowl nesting, molting, and feeding should be excluded from leasing, exploration, and development there for that reason. (Utqiaġvik) (BLM 2019a)

In addition to the area north of, this is the last page of Carroll's transcript, in the area of the lake it is extremely important for habitat of molting black _____ (01:30:35.85) and then Nesting White Footed Geese and the construction of a pipeline could be very detrimental on these populations. (Utqiaġvik) (BLM 2019a)

The area to the north and east of Teshekpuk Lake is vitally important for many molting geese. Up to 20 percent of the entire Pacific flyway population of black brant can molt in the Teshekpuk area at any one time. This is a great concern that molting birds are susceptible to disturbance and any activity in these areas has a potential to greatly reduce the population of brants and other geese. Also in the area there are relatively dense populations of king eiders which are very important again for subsistence and king eider populations have declined by about 50 percent in the last 20, 25 years. There are also many other species of waterfowl that are important in this area and we need to learn a great deal about them. (Utqiaġvik) (BLM 2003a)

3.3.5.2 Effects of Development on Birds

I'll go get your oil from your part up here and then when you look at this area up here this is the nesting ground of the migratory birds of this planet. This is where they go nest. We saw what happened to the Snow Geese in Prudhoe Bay. They were chased into

Canada and once they got there they overpopulated. Now their nesting ground in Canada is destroyed. Where the Snow Geese going to plan for home now? And we're going to do that to all the other animals? Let's get our Secretary to do the work right and first take care of our private property we need and then two to look at our climate, how we're living in it. It's not important to go after oil and gas when you can save all the species that migrate and when you go to the ocean it gets scarier yet. (Utqiaġvik) (BLM 2019a)

I do have a few other wildlife issues and concerns and these mostly have to do with birds. The first is oilfield activity or the development of oilfields on the North Slope has most likely increased -- well certainly has increased some predator populations and has mostly likely led to the increase of other predator populations. And the predators I'm speaking of are foxes, ravens, and gulls. Part of the issue is garbage and that garbage has allowed -- has provided additional food sources for these predators. There's another issue that's out there, though, too, and that concerns mostly ravens, but foxes as well, and that's -- there are places where ravens can now build nests or foxes can den or take their young. And so those are some of the reasons that the predator populations have increased as well. The result of those increased predator populations has been a decrease in the productivity of many birds that nest within the oilfields and many of those birds are important for subsistence. (Utqiaġvik) (BLM 2003a)

These wildlife folk that see it—they've witnessed, I guess they are wildlife folks, that walk in the country and [are] looking at birds and things in the Colville River Delta, maybe the east side, down by Ulumniak (ph), that's next to—not far from the old Nuiqsut site, they're monitoring these birds and go to and from these places with a chopper—upsets, disrupts, displaces—perhaps some of [our] only opportunity to go get…game, especially caribou, in the area are scared and may…run off because of these impediments that arrive [and] are not natural. Naturally, [we] would walk along the coast where they're at and be able to harvest…caribou. (Ruth Nukapigak, as cited in USDOI, BLM, 1998, NE NPR-A Scoping, Nuiqsut) (MMS 2007a)

I have gone how many times to Inigok where there was some drilling that took place, and I have seen bones from birds that have been killed from the, from after they drill a hole, the stuff they leave behind, the fluids. I don't want to see that kind of thing happening where we see our wildlife and waterfowl dying from contaminants being left after having conducted drilling activity, I don't want to see that kind of thing. And leaving an area without having done some kind of thing to put it back into the shape it was before the drilling took place. (Atqasuk) (SRB&A 2003)

Now, let's look at what's going to happen after you discover the oil: you're going to have to lay roads, you're going to have to lay gathering systems, you're going to have to lay buildings, you're going to have to lay pipelines. And when you start laying pipelines, then you start harassing animals like spectacled eiders, steller eiders, snow geese, the peregrine falcon, those kind of animals are going to be bothered. When I, as a person, shoot one of those animals I can get fined up to $10,000 and put in jail up to five years. What does the industry get when they damage those animals? What do they get? Nothing. You might give them maybe a $10,000 fine, but heck, that's the price of developing, it's very affordable. But me, that live here, I go to jail...And when you start your development and you endanger those animals that are endangered -- that are on the threatened or endangered species list, when I do it I become a criminal. What are you when you allow it to be done? What is BLM? What is the State of Alaska? When

they allow these threatened animals to be endangered you are a criminal too. And it becomes premeditated because you plan it ahead of time. (Utqiaġvik) (BLM 2004c)

3.3.6 Terrestrial Mammals

See traditional knowledge provided in the ACOUSTIC ENVIRONMENT and WATER RESOURCES sections for traditional knowledge that is also applicable to this section.

3.3.6.1 Caribou

Teshekpuk Lake Habitat

With all these possibilities we are likely to have ample oil revenues in the future. This greatly reduces the motivation to restore and develop the crucial wildlife habitat areas such as Teshekpuk Lake and the Western Arctic Special Area and the Colville River Special Area. We should continue to protect these areas. They are very important to wildlife and subsistence hunting. End of Carroll's transcript. (Nuiqsut) (BLM 2019e)

You also ask our opinions for areas where there should not be pipelines. Again, the area around Teshekpuk Lakes should be avoided, one of the worst places for a pipeline would be just north of the land. A pipeline running east and west would interfere with the ability for the caribou to travel towards the coast or encourage _____+ (01:29:51.86). It would also impact caribou moving south away from the insect relief area grazing areas where weather conditions are favorable and insect harassment is reduced. This would have a negative nutritional effect especially in the years that conditions cause the trail to the insect relief areas and that back and forth multiple times. Every age _____ (01:30:16.45) through the herd uses that area so it would affect the entire herd. (Nuiqsut) (BLM 2019e).

Please take notice that Teshekpuk Lake is the core habitat of what we subsist on. This area supports the caribou, fish and waterfowl habitats. If this area is disturbed, you have no idea what detrimental effects it will have on our resources in the long run. (Utqiaġvik) (BLM 2004c)

And our caribou always go down to that Teshekpuk Lake or for the -- they always come through in springtime to go down north to that Teshekpuk Lake. And then after they have their calves in the fall time they -- if somebody don't scare them off on their way coming this way, they usually come back in the fall right through our village and that's how we have our food gathered up for winter. (Anaktuvuk Pass) (BLM 1998b)

We need to be very careful there because this planning area is starting to get over into the calving area of the Teshekpuk Herd. There are very -- there are narrow migration corridors over in that area that the herd needs to move through and it's an important insect relief area. Insect relief areas are very important to a herd because during the summer when the bugs are driving them crazy, they need to be able to get out and get relief from the bugs and they also need to be able to get into feeding areas. So, you know, as work progresses in that direction, we need to be extremely careful not to hinder the movement of the caribou to their calving areas and their insect relief areas. (Utqiaġvik) (BLM 2003a)

The west side [of the proposed area of development] is getting over into the Kogru River area in the area that was originally excluded from leasing because it's extremely important for waterfowl, nesting, and molting, and it's also very important as a caribou calving area. This, of course, is getting over into the Teshekpuk region and our Teshekpuk Caribou Herd, which is the most important subsistence caribou herd for

most of the villages on North Slope. For the villages of Barrow, Nuiqsut, Atqasak, Wainwright, this is the herd that we hunt and this is the one that we're very much dependent upon. (Utqiaġvik) (BLM 2003a)

The caribou migration and the Teshekpuk herd is the most important component of our wildlife here on the North Slope. They don't migrate as much so -- as essential caribou herd does, or porcupine over to the east. Teshekpuk caribou herds is always on the North Slope, they don't go no further than the foothills in the Brooks Range. (Nuiqsut) (BLM 2004d)

Nearly all of the parturient cows move north through the narrow corridor between Teshekpuk Lake and the Kogru River. It would be very difficult to have any development in this corridor without the risk of seriously affecting the population. However, this corridor is part of the area that BLM has proposed to open to leasing and development. (Utqiaġvik) (BLM 2004c)

The Teshekpuk Lake herd uses the planning area for calving, like the gentleman just explained to you, feeding, insect relief, and 19 percent of the time, for over wintering. (Utqiaġvik) (BLM 2003d)

Even the caribou know that their calves have a better chance of surviving if they can just get to the narrow corridor to the east of [Teshekpuk] Lake. The Teshekpuk caribou herd somehow gets enough sustenance from this area to winter in the North Slope, unlike other Arctic caribou herds that head south. It is from this herd that the Inupiat who live here get the majority of their year's supply of tuttu meat. (Utqiaġvik) (BLM 2004c)

The area to the southeast, the east and northeast of the lake, Teshekpuk Lake, which is critical caribou calving area. There are probably ten to fifteen thousand caribou that calve in that area each year. And also to the north of the lake, that entire area from the Beaufort Sea coast to along the northern edge of the lake and on over to the Ikpikpuk River area are all fairly crucial insect relief areas. The movements of this caribou herd during much of the year are somewhat erratic and unpredictable during the fall and the winter they go to many places, but what is predictable about this herd is that most of them show up in that area east of the lake and pass through that area between the Kogru River and Teshekpuk Lake every year, that's pretty consistent in that most of the herd will be seen north of the lake in the summer, usually up to twenty-six to twenty-seven thousand caribou can be counted in that area. It's pretty hard to imagine that any development could occur in some of these critical areas without being detrimental to that caribou here and incidentally this is the herd that most of the villages on the north slope harvest. It's the primary herd for harvest in Nuiqsut, in Barrow and Atqasuk, and many years it is in Wainwright. It's kind of split in Wainwright between the Western Arctic herd and the Teshekpuk herd. The Teshekpuk herd is smaller than some of the other herds but probably more important on a subsistence basis to the people of the North Slope. (Utqiaġvik) (BLM 1997a)

There used to be thousands of caribou in that area in the 70s. [For the] first time we see a little bit of herd this summer come from the east, because the migrations of the caribou has changed a lot. The Porcupine Herd comes from the east, that's along the coast, and the Teshekpuk Herd comes from the west; that's the western herd. The migration of the western herd has diverted southward. We used to see them coming in from the coastline, but now we see them coming from the south. Mainly [because of]

too much traffic. Bow hunters and head hunters. I think they don't usually wait for the first herd to come by and then the second herd gets diverted. (Nuiqsut) (SRB&A 2015)

Other Important Caribou Habitat

Another place where there should be no leasing is the Western Arctic Herd special area in the southwest part of the NPRA. The area contains the calving area. For the Western Arctic Caribou Herd there are several important migration corridors. The trauma and activity in that area would be detrimental for the herd. The Western Arctic Herd is an extremely important subsistence resource for some North Slope villages and many villages in the northwest part of the state. (Utqiaġvik) (BLM 2019a)

That [caribou calving] would be in Kukpowruk area; in October when we are fishing they are all over, that is where they are calving, that whole area. They usually are there every October. For some reason they didn't make it there this year. (Point Lay) (SRB&A 2014b)

We get [one] herd coming from the south and [another] herd coming in from the north. We get the best of both of them. They're calving, giving birth. This whole area right here [south of Wainwright] because of all the vegetation. (Point Lay) (SRB&A 2014b)

They seem to be coming down behind Wainwright, and back behind us toward the mountains. When you see them along the coast, it's smaller groups of them. October, mainly. Sometimes they're right in our yard. They winter here. (Point Lay) (SRB&A 2014b)

We don't go south in July because all the caribous are out here [indicating an area from Anajuk Point northeastward to Qulvi], all the way, all the coast. … It's cool over here. We start feeling the ocean breeze around [Anajuk Point]. When we turn, right when we turn, you know, there's the breeze, … and that's where the caribous are, from right here [at Anajuk Point], you know, all along—where they should be. (Nuiqsut) (HDR Alaska 2015)

Other Caribou Observations

It's unusual to see our caribou in the dead of winter; they're mostly south at this time of year. The weather trends [are affecting the caribou]. (Nuiqsut) (SRB&A 2015)

Looking at your Alternatives A, B, C, and D, it's a --it's a real coin and the toss issue for me with our caribous being in that location right in October. Maybe there's global warming taking effect from past ten years up here. We used to get caribou migration during September. Last year I think they came in December. And we're in October, and there is no caribou migration. I -- I like Alternative A and also D, but I would also benefit from C -- B and C. With exploration being up there, it would be able to misplace the caribou herd, possibly changing those herd, sending them south -- southward bound toward Anaktuvuk. That's where we would also benefit. It -- it's exploration versus subsistence. That's the type of my -- my thinking that I've been thinking. All these alternatives are good. I've -- I really want to benefit. Maybe I'll -- I'll leave it up to the caribou herds. If there was full-scale exploration to move those herds southward, that's where we would benefit. If there is a lot of structures in that area, maybe we'll benefit year round up here. (Anaktuvuk Pass) (BLM 2007)

We're seeing the changes. The caribou have problems. Lesions on the liver with a bad cover. They have lesions on the joints and internal organs. We asked the North Slope Borough about testing, but they said they have no budget for that. Where do we turn to identify the problems? (Nuiqsut) (BLM 2003b)

When the caribou was in short supply we would travel to Tasiqpak knowing that we would find caribou and to the area close to Kuuguluk. Before we moved back to Nuiqsut I used to also do my hunting at Umiat. That area is a prime hunting ground… (Nuiqsut) (BLM 1998c)

Back in 80s and 90s... [caribou] used to go right up to village and turn that way and some of them would pass that creek we always go through, and some would pass that and go to Itkillik River and go back out, and not anymore. The closest caribou I ever caught was two and half miles [from the village]. (Nuiqsut) (SRB&A 2014a)

Normally they come through this oil field right around here and I have been doing a lot of hunting on this side and we haven't seen much caribou over here. Half of the caribou we catch are sick. Green, yellow. They have big pus bubbles the size of my fist. (Nuiqsut) (SRB&A 2012)

Yeah, it's different now, the migration. I know that years back it used to be end of June, July. Now I think it's later than July and the herds are smaller. There's smaller herds down there. I think because of the pipeline over here. They say it's not affecting [the caribou], but it is. They're coming later and later. If you get an aerial thing [picture], you can pretty much see the footprints of the caribou, coming east-west like [local elder] was saying. Since they made the other pipeline going from the river crossing, it has changed, too. (Nuiqsut) (SRB&A 2010a)

Porcupine Herd that comes to Kuparuk, they changed from there and some of these in Central and Teshekpuk are slightly changed in timing, July most of them are on the coastline. There were times in July that all the caribou were on the coastline until August-September. (Nuiqsut) (SRB&A 2010b)

I guess the caribou are more skittish nowadays. People are approaching them and they are gone. Before they used to just hang out and you could drive by them with the boat and they would just look at you. Now when they hear that outboard motor they are gone. They are more skittish nowadays. Maybe it is that aircraft activity. There is a lot of traffic out in that area. (Nuiqsut) (SRB&A 2014a)

This year we didn't get no caribou. What would BLM do that would help our community that was impacted by no caribou at all? No migration because of that infrastructure that are being built north of our community, and the activities that are going on no north of our community. And for 50 years we had— or more than 50 years we had depend on caribou. And every time we get no caribou, we don't get no disaster funding. We get help from Wainwright people. We get help from Barrow people, from Nuiqsut people. [unclear] 13-15 caribous at a time. But that's not BLM helping us. It's our own entity that's helping us. We're being impacted, but like the community that we are depending on caribou all our lives. What kind of impact funds that we have BLM would do for our community when this happens to our community in every year. To those sport hunters, activities going on up North and all that infrastructures that are being built. What kind of impact funds that would —anybody that would help our community. We tell you guys over and over we've been impacted for years. We never get any disaster

funding. We get help from the other villages. Last year we got to help from Kenai. They sent us some fish. I really appreciate Kenai for helping us. They understood us. But for years, we told you guys over and over who are these people that are affecting us? We don't get any disaster funds. We don't get any help from BLM. Nobody except from North Slope Borough or the communities of Wainwright, the community of Nuiqsut, or the community of Barrow. If there was some kind impact fund, what would this kind of situation be reported? Because we're telling you, over and over, about our situation about the caribou. (Anaktuvuk Pass) (BLM 2018a)

Caribou is still important right now. From years and years from when I was a little boy [caribou has been important]. Guide hunters, well, they push the first caribou and [the caribou] turn around and go someplace else. And we wait and wait and wait [for the caribou]. [Traditionally] we wait until they pass the village, three miles down and then we start shooting them. They [the ones that pass] don't care, they [other caribou] just come by. (Anaktuvuk Pass) (SRB&A Unpublished)

In springtime we hunt the caribou in April, May. [They come] from the south. Sometimes [in] October [the caribou come] from the north. (Anaktuvuk Pass) (SRB&A Unpublished)

TAPs has a lot of negative impacts because the Dalton Highway is open to the public. Our caribou, the Central and Porcupine herds, go through the Sag. River and they are diverted by bow hunters. These folks have access to it, they can come across the right-of-way but they are not allowed to walk along the road because that is private property. I have run into so many people looking for wounded caribou which they have shot and are looking for caribou. A lot of impacts from TAPs are happening today. Any of these still, if only ADF&G could put seasonal [restrictions] on these bow hunters then our caribou would be able to come across the Sag River and move westward. We do not see 1000s of caribous coming this way anymore. There have been a lot of impacts and what kind of programs have they done to us? Nothing, none. Even though we are impacted these programs were not given to the community. That is what I have seen and experienced. (Nuiqsut) (SRB&A 2012)

Caribou Calving Sensitivity to Disturbances

The challenge is to decide where to draw the lines between where petroleum exploration and development occur and where wildlife and subsistence values are protected. In the past planning processes, we have come up with compromises where leases were available for much of the NPRA but the critical wildlife habitat areas were protected. You asked us to outline areas that should not be opened to leasing, exploration, and development. Teshekpuk Lake continues to be one of the most biological productive areas in the circle polar arctic that should be protected. The area just south of the lake is extremely important for caribou calving of the Teshekpuk Lake Herd. The area north of the lake is critical for insect relief. The areas east and west of the lake have narrow gaps of land that are important migration corridors. Most of the cows and calves migrate through this narrow gap between the lakes and ____ (Cogro? 01:27:10:42) Inlet to the east and cows and calves are particularly sensitive to roads and cows and calves are particularly sensitive to roads and industrial activity at the time of calving. (Utqiaġvik) (BLM 2019a)

The pipeline should not run within forty miles of the south side of the lake because of the caribou calving area. They should not be run through the narrow gap of land

between the east side of the lake _____ (Cogro? 01:31:03.11) Inlet because it's a very restrictive and important caribou migration area for cows and youth calves to travel to get insect relief. Cows with calves are very sensitive to structures and activity and would be detrimentally affected by construction of the existence of the pipeline to that area. There should also be no pipelines running through the calving and insect relief areas of the Western Arctic Herd. There should no pipelines running along any of the major rivers because of the danger of a spill destroying a major subsistence fishery. Even pipes running across the main _____ (01:31:42.07) could result in major damage to a fishery. Pipes should not be run in areas where there are a lot of subsistence camps where people commonly come because it would lower the volume of those people's lives. (Utqiaġvik) (BLM 2019a)

The females have effects during calving. They're under a lot of stress. They lose a lot of little ones. (Wainwright) (SRB&A 2009)

...there is a narrow corridor of land between the east side of Teshekpuk Lake and the Kogru River, which nearly all of the parturient cows must travel through shortly before or after calving to get to insect relief areas. Cows with calves are very sensitive to disturbance, so we have the most important segment of the population passing through this corridor during the time of year when they are having calves and are most sensitive to disturbance. Development in this corridor and the calving area south of there could have a detrimental effect on the herd. (Utqiaġvik) (BLM 2004c)

Very important that the calving area right by Teshekpuk Lake there should be no allowed for oil drilling and disturbing the caribou herd there. Also caribou migrate route from that area through Anaktuvuk roads, Chandalar Lake area. During the fall migration, there shouldn't be no activities. Also spring migration from south, if they start going down to the -- towards north, there should be no activities in the way of travel north and south. (Anaktuvuk Pass) (BLM 2007)

It is very important for pregnant cows to get to and use the calving area, which is south, east, and north of Teshekpuk Lake. Over ninety percent of pregnant cows calve in this traditional calving area. During years when cows can't get back to the calving area, calving success has been much lower than years when most of the cows did get back. (Utqiaġvik) (BLM 2004c)

Effects of Development on Caribou

And I notice that game appears thicker along the pipeline corridor than it does in other areas and I believe that the phenomenon that the Mayor spoke to earlier about the pipeline deflecting the game is, in fact, a converse. I believe it is an attractant, it's luring, if you will, game away from areas which may have traditionally been used by subsistence hunters. So I think the effect that people are experiencing, a decrease, perhaps in game density is real but the effect that they are scribing to it is as a deflection is, in fact, incorrect, it's actually an attractant. And I attribute this to two phenomenon. I'm not a scientist, I'm an economist by training but I do observe these game patterns on an annual basis. First of all, the dust from the Dalton Highway spreads out and settles on the snow and then when the sun returns, that's the first areas that become snow free so the game then, rather than having to paw through the snow, the caribou especially and the ptarmigan, are attracted to this corridor and then the predators follow suit. So the best place, if you want to observe game is actually up and down the Dalton Corridor, especially in the spring. The second phenomena that I attribute this

attractant phenomena to is the fact that it's something of a hunting sanctuary, you know, there's the 10 mile Dalton Highway Corridor which is limited to bow hunting only and the entire area around Prudhoe Bay is closed. And it doesn't take game long to figure where they're not persecuted. And as I think as you experience in other areas where there's a game refuge, that's where all the game is especially on opening day of hunting season. I think the caribou have figured out rather quickly that they're safer from hunting along the corridor and then the Prudhoe area and so tend to collect there. Mark Helmericks. (Utqiaġvik) (BLM 2002)

It will be about 12 to 15 that we average in that area. It was less than that. Too much air traffic. That is the main problem, is that during summer there is too much air traffic. The caribou is unable to come near this area. Conoco has an interest in this area too [Fish Creek.]. (Nuiqsut) (SRB&A 2010b)

Fish Creek towards Tingmeachsiovik [River], before they put the bridge on, [there] used to be caribous around there. They used to hang around there, but I don't know. Now [because of] that bridge they don't go over there. Used to be some, lots of caribou out that way [by]Atigaru [Point]. And [now] hardly any caribous. They used to go look for caribous around there. (Nuiqsut) (SRB&A 2015)

Only thing I could say is they're confused, because they get to this area where they usually go and they can't go there. They're trying to find any way to get to the west side. This one was about, I'd say more than a thousand, but one went a few miles and crossed. [They're] lost. Migration where they've been going has changed. Where they're used to going they can't go anymore. They have the pipeline by CD3 they have to go farther. Same way with the pipeline that goes the other way. I'm surprised that they even go past that. Some will go. Ever since they put that up they only go through there the west side. (Nuiqsut) (SRB&A 2015)

Ever since the pipeline came in from Alpine to 2L, the caribou migration's been different. When I came in in '93, we caught 12 caribou in by Nanuq, and since then I've never seen them come through that area. Since the pipeline came in, they don't go through the village any more. We caught like 12 bulls, and we never seen caribou in there again. And that's definitely an impact. (Nuiqsut) (SRB&A 2014a)

The pipeline, wish they could change it to make it more dull. They [the caribou] think it's ice, so they think they need to stop and go back from where they come from. Summer time I can see it from my house. Pipeline and helicopters [are] probably the two main distractions for caribou in this area. That pipeline needs to go. (Nuiqsut) (SRB&A 2014a)

The pipeline keeps them from crossing. Not like they were crossing [before], because the Western [Herd] and Porcupine [Herd], they normally come this way, but last two years they've been on Point Thomson side, Prudhoe side. I haven't seen a Porcupine herd in how many years? (Nuiqsut) (SRB&A 2014a)

[For the] first time we see a little bit of herd this summer come from the east, because the migrations of the caribou has changed a lot. The Porcupine Herd comes from the east, that's along the coast, and the Teshekpuk Herd comes from the west; that's the western herd. The migration of the western herd has diverted southward. We used to see them coming in from the coastline, but now we see them coming from the south. Mainly [because of] too much traffic. (Nuiqsut) (SRB&A 2015)

Fumes: When the caribou smell exhaust fumes, without even looking they will go. When they smell man or combustion, the noise, they go up straight inland. That's why you don't let them smell you when you're hunting. You have to get upwind. I think there are a lot of caribou around Prudhoe. When I worked there I noticed that somehow the smell doesn't bother them. But around here they're bothered. (Barrow active harvester; Experience timeline: since 1950 and ongoing; Experience location: Barrow area. SRB&A Interview 2007) (SRB&A 2009)

I've heard from other hunters complaining about caribou looking sick. I caught a couple maybe two or three years ago. It's possible. I think the caribou are getting sick because of the flares they are burning over at Alpine. You see this dirty air. And we have north winds a lot of the time when they burn that yellow smoke and it gets deposited on the tundra. That's why I think the caribou are getting sick. (Nuiqsut active harvester; Experience timeline: 2004; Experience location: Just up the river. SRB&A Interview 2007) (SRB&A 2009)

The caribou on the west side of the village, some are okay on the ocean side but the ones closer, the one I got was a sick [one.] I decided to not even bother to hunt [that type of] caribou because they're loners, and the loners are the ones who hang around [the developed areas]…they're protecting themselves from the bears and wolves and they're using the pipeline as coverage. They can get close to the Alpine or the village, and the wolves won't. They have peace away from the other carnivores. They're picking up air quality damages or something. For us, when we ingest something wrong, we get heartburn or hiccups. I think they do that to, they get the same thing but it stays in them like cigarettes. (Nuiqsut) (SRB&A 2011b)

Just the flares that are always going. I kind of think that's why they are getting sick. Flares are on 24/7, and I think that mercury is making them sick. The [pollutants are in the] air and drops down to the ground, and [gets on] the food that the caribou eat. (Nuiqsut) (SRB&A 2014a)

There's always caribous on this side of Itkillik and not too far from Itkillik-Pa…. I go up inland. There's always caribou there in August. Plus, there's always helicopter flying, doing their survey, and I don't get caribou just for, you know, the helicopter [to come] bother me. There was [a] helicopter doing their survey [over] Itkillik-Pa and on this side of Ocean Point. There's always caribous [there], but there's always helicopters disturbing [them]. That was in August. (Nuiqsut) (SRB&A 2014a)

In the beginning you were mentioning that the Secretary of the Interior had the authority over this NPRA, how it works. What's so hard about the Secretary of the Interior settling the ownership of the land inside the NRPA? What is holding him from doing that? And when you're looking at making roads and pipelines and wealth like that you know the structure of the North Slope. You have a calving area at Teshekpuk Lake. The caribou after they are born _____ (01:08:07.41), swing by Nuiqsut and head up toward Anaktuvik. Then after Anaktuvik they all head out west. This is their natural migratory path and we also know that when you lay a pipe in front of their path the caribou no longer uses that path. Knowing this you would endanger the ability of _____ (01:08:33.81), Nuiqsut, and Anaktuvik and probably up into Wainwright of the migration of one herd. We watched what the other herds have done over further east, east of Prudhoe Bay and in Prudhoe Bay. They don't follow their migratory paths anymore. We should have learned something from this but I don't know what's going on there when it comes to the learning part. The caribou will not cross a pipe, with have a

pipeline right there or a gas line going to the east field over fifty, sixty years. The caribou still don't like to cross that piece of pipe right there. It's alive to them and it scares them and then we start laying pipelines all over the North Slope. The caribou is going to be the first animal to go. (Utqiaġvik) (BLM 2019a)

In those things we recognize some of the hurtles and we also recognize the current state of infrastructure on the Slope from North Star, from ENI _____ (01:33:57.79) Development to the Hooper Development using unstable areas on the North Slope that are um free from permafrost issues that's why they call it thaw stable areas and the pipelines that are buried in these areas are um part of the future dialog in the technical report of how change in dynamics of local climate change issues and, and other areas that BLM needs to consider about thaw stable areas along rivers being the Trans Alaska Pipeline, if you go down the highway there's about a forty mile section of that pipeline that's buried in the thaw stable section of the _____ (Sauanatuk? 01:34:58.76) River on the Snake River in that, in that river corridor where it's thaw stable. Those are some of the things that have not been highlighted and they are important features of development not just because they are out of sight and out of mind, because of the more important needs of the free movement of terrestrial animals. (Utqiaġvik) (BLM 2019a)

[My] biggest concern is the caribou migration, if the oil exploration would bring a pipeline. The migration passes through Wainwright almost every year. I've lived here since 1991. I get my yearly supply of caribou in September and October. I've heard from people in Nuiqsut: once Alpine came in the caribou migration was affected. (Wainwright) (SRB&A 2009)

There used to be a lot more caribou, but it's getting to be a lot less going to that area. Because they're getting diverted in Meltwater. The pipelines from Meltwater to Kuparuk are so low and they can't cross the pipeline. (SRB&A Nuiqsut Interview March 2009) (SRB&A 2010b)

Well, the pipeline is a problem. When you look at it, it is reflective. All that pipeline that comes to Alpine and goes to Kuparuk, it shines and it looks like ice out there. The caribou look at that and they are re-routed. If you come here in the summer time, and look, it looks like a glaring ice pack out there. And we told Conoco Phillips that the caribous that are coming from the east side and the west side, they need to do something about the pipeline. It goes all the way from Colville all the way to Kuparuk and where are the caribous? Some of them do migrate all the way through there. And once they see that pipeline, the caribous think that they are close to the ocean [that's why they reroute]. But on this side [west side] you don't have that yet. (Nuiqsut) (SRB&A 2010b)

He knows that Teshekpuk has never changed much, they still go on the migration of their past. Central Herd is same general area, but changed slightly, because low water happened and some pipeline in Meltwater. Can't come across it, and that's why it's up, caribou can't cross to the other side. They go around the pipeline. Some of them [pipelines] are real low. Make sure they are seven feet [tall]. The older ones are those ones deflecting the caribou [new pipes are better, taller]. (Nuiqsut) (SRB&A 2010b)

I never seen a real lot of caribou. Back then we used to have a lot. There'd be a lot more caribou in this area than compared to the west, Teshekpuk Herd. When they'd migrate there'd be more. In the 50s there's lots of caribou used to cross right down there, in the summer time. Never do that anymore, hardly. They start CD3 and Alpine, but that Tamayayak River used to have lots and lots of caribou but hardly any more.

CD3, the people told Alpine, there's hardly any here. There used to be a lot of caribou that migrate right here, they don't do that anymore [by the coast]. (Nuiqsut) (SRB&A 2010b)

The Porcupine Herd that comes from Canada through here, when the pipeline, when it went all the way to the Meltwater, when they build that pipeline to Alpine, they stopped seeing them. Oliktok, to Meltwater. (Nuiqsut) (SRB&A 2010b)

They start to come in late, they used to come in early, now they start to come in late. Right now, there's nothing there and Teshekpuk stay around there most of the time. We can't get any caribou around here, there's the pipeline and Kuparuk [even if the caribou were there]. This is the caribou area. Nowadays they gonna get the caribou [south]. (Nuiqsut) (SRB&A 2010b)

One of the main caribou crossings on the Colville River delta. And then what I had never realized what Sara Koonalin (ph) had said was that during the migrations and when it's very hot in the summertime, the caribous like to go along the high banks of the rivers to stay cool when they're in mass amounts. And then I just wanted to point out, and then keep in mind that, you know, that we have to take care of our caribou and stuff like that, and then just wanted to point out that it hasn't been pointed out in a long time, when the caribou start migrating in low areas where there's swamp and stuff and they like to get on high banks when it's really hot and then that they like to travel through there to try to cool off from the Arctic breeze and stuff. And that's the only thing that I was against, is that pipeline structure is a little too low and I'd like to see it like 10 or 12 feet high because most of our winds are from the east to the west and then, you know, they make -- with that pipeline there, they make an unnatural barrier for the caribous to cross. (Nuiqsut) (BLM 2003b)

In the NPR-A Northwest draft, it says that there will be 150 flights a year. Well, Alpine, the model of a smaller footprint, had 1900 flights from Alpine in the summer of 2001. How was it expected we would not be impacted in a significant way with the subsistence harvest study that showed our village harvested there? They claim that the caribou herd is healthy with numbers, but the only caribou I got last year was bad. Twenty caribou were harvested in October when we could access areas not accessible by boat. Seventeen were sick. When I went camping last year, I waited three days for the herd, to have a helicopter to divert them away from us. When they were diverted, we went without. We have had to deal with harassment. We had overflights three times while trying to cut the harvest. It is disturbing. The next year we had a helicopter do the same thing, but it was worse. They were carrying a sling going from Alpine to Meltwater, another oilfield. It went right over us three times. The herd was right there and it put us at risk. I had my two young sons with me and it made me very angry. What am I to do when the activities that have been handed down for thousands of years to our people are being changed by the global need for energy? (Nuiqsut) (BLM 2003b)

The caribou haven't been coming about the last few years. There seems to be a border of where the caribou want to go. I don't know if they have realized that [they don't want to go to those areas] due to past activity. It has become like that ever since they started seismic explorations, probably five to 10 years. The seismic activity has been moving further west, all over. Every time we go to Umiat we experience exploration. They [oil industry] have been moving further and further west, and the caribou have been moving further and further west. Looks like a mini-town when you see it from a distance. You would find exploration activities but it would be further east, closer to Colville.

The next year, it is further west, and that's where you find the end of the caribou. This year, where they last did seismic exploration, that's where you find the caribou. It seems like they've learned the exploration boundary, it seems like they're not crossing them [the boundaries] anymore. (Utqiaġvik) (SRB&A 2013c)

It varies whether we have a lot of activities going on. When there are a lot of activities going on, we hardly see any or they [caribou] change their migration route. Oil and gas, airplanes, helicopters, bird survey people—airplane, floatplanes. Either there are less caribou or they are changing migration with activities. I don't know which. (S.R. Braund and Assocs., 2003, Field Interviews, USDOI, BLM, 2004) (Nuiqsut) (MMS 2007a)

…I feel because of all the traffic between Fairbanks and Endicott, much more increased traffic, that caribou are hesitant to cross the main roads because of all the traffic. I feel that has something to do with the caribou migration as well, because of increased [air] traffic…not just ground, as well as…seismic operations happening all over. (Lampe, 1997, NE NPR-A Scoping, Nuiqsut, USDOI, BLM, 1998) (MMS 2007a)

We will have the same problem we did in the Prudhoe Bay and the Kuparuk area with our caribou. Right now I call our caribou that are existing around here that don't go nowhere our 'industrial dope addict caribou.' They already sick and nobody's doing anything about them. (USDOI, BLM, 2004) (Nuiqsut) (MMS 2007a)

Caribou displacement. You've heard of the Meltwater and Alpine. The caribou are displaced where they used to go to eat. Instead of caribou, we have vertical supports. If you put up a pipeline, you displace the wildlife. Before Alpine we'd see caribou every summer, every year. They came in the thousands every year. After the pipeline, we don't see them like we used to. We used to catch a lot of caribou from the Porcupine Herd. Not any more. (Nuiqsut active harvester; Experience timeline: 2002 and ongoing; Experience location: Nuiqsut. SRB&A Interview 2007) (SRB&A 2009)

The migration of the Eastern Herd that comes through the Colville River has really changed since Alpine with all the pipelines. It's deflected the Teshekpuk Herd from the east and south; because of the pipeline changing their migration route. (Nuiqsut active harvester; Experience timeline: Since 1977 and ongoing; Experience location: Colville River. SRB&A Interview 2007) (SRB&A 2009)

Before they started the [helicopter] activity, the caribou were in the area by the thousands. Now they migrate out and none come in. It is harder to find caribou every year. I grew up hunting caribou from Wainwright. Barrow used to be like Wainwright. The caribou are starting to winter further south. When you reach Wainwright they are everywhere. They are all around Pt Lay. You would always meet the caribou just before October, they were always here. They don't come up from the south anymore. They changed their migration route. From Wainwright they start heading to Barrow but at Peard Bay they turn around and head south. (Barrow active harvester; Experience timeline: since 1996 and ongoing; Experience Location: Alaktak. SRB&A Interview 2007) (SRB&A 2009)

Maybe it's over the last five to six years the caribou routes have dramatically changed since the oil and seismic going on. Like this summer, there were hardly any big herds coming through. You have to go way up for subsistence hunting. You have to go further and further. There were a lot of complaints this summer. All the helicopters flying

around. Maybe they're chasing them away. (Atqasuk active harvester; Experience timeline: 2001 and ongoing; Experience location: We go way up. Sometimes 7-12 miles from our cabin. Sometimes we go out by Skull Cliffs. SRB&A Interview 2007) (SRB&A 2009)

Nothing has been done. They say caribou can go under [pipelines], but sometimes they turn back. We mention that to oil companies, to bury the pipeline half a mile away from the coast so caribou can get away from mosquitoes. They say they can go under, but I don't see them go under. Especially along the coast, crossing Sagavanirktok River, then they could go along the coast. (Nuiqsut active harvester. SRB&A Interview 2007) (SRB&A 2009)

Here in Nuiqsut I hardly get any caribou due to the pipeline diverting the caribou. I used to see five to six thousand caribou. I haven't seen a herd like that in years. It's like a rolling thunder when you see that many of them. But they're real sensitive. I don't see that here any more because of the pipeline. (Nuiqsut active harvester; Experience timeline: since 2000 and ongoing; Experience location: Nuiqsut. SRB&A Interview 2007) (SRB&A 2009)

Because of the pipeline and the choppers and aircrafts that were flying around. When we were way down by the Chandler area and there was air traffic going on over here at Umiat and that red and white plane of Alpine kept following the river and scaring the caribou like he is doing it on purpose. We have bright clothes on and he knew we were there and he made a couple passes and made the caribou run further inland. That was wrong. Red and white plane. We had the caribou in our sight and plane comes and it took off and turned back around and did the same thing and same path and that [made us angry]. (SRB&A Nuiqsut Interview March 2009) (SRB&A 2010b)

You know, what I think about it, since they built that pipeline up, the Porcupine Herd doesn't want to come this way. I think that pipeline is diverting them. Because the Porcupine Herd that's coming in from the east usually travels along the shores. I think they come in from the shore and stay in this area around Beechey Point, because there's no way to go further westward. (SRB&A Nuiqsut Interview March 2009) (SRB&A 2010b)

Mostly the caribou used to come from the west, back in the old days before that Alpine there was nothing around, we had caribou coming this way and that way. They mostly came right [through], the whole section of this from the eastern [direction]. Back in the old days, before that activity. Alpine, it started happening since they build that pipeline. Some [caribou] go further north coming in. Especially when they build that pipeline, they really divert that caribou that used to come straight across before Alpine was here. The pipeline's just right over here. All that pipeline goes there and the Western Herd, before the pipeline, they used to go straight there. They really divert that caribou. All those caribou used to come from the eastern herd and go right through. (SRB&A Nuiqsut Interview March 2009) (SRB&A 2010b)

There used to be a lot more caribou, but it's getting to be a lot less going to that area. Because they're getting diverted in Meltwater. The pipelines from Meltwater to Kuparuk are so low and they can't cross the pipeline. (SRB&A Nuiqsut Interview March 2009) (SRB&A 2010b)

That's where most of the Porcupine Herd usually comes, around here, due to that pad; that pipeline that goes from Alpine to Prudhoe has pretty much changed the route of the caribou migration. The only big herd that usually came around is the Teshekpuk Herd; they came around. None of the Porcupine Herd that usually comes around, they never really came around, [because of] that big pipeline and the pads that connect to Alpine. And that other pipeline that goes all the way to Kuparuk. And from the north pad, CD3, down to Alpine. And then it goes to Kuparuk. It's shiny and makes the caribou not want to go through. Those caribou are scared of the pipeline. Some stick around. Some go towards it and go back. (SRB&A Nuiqsut Interview March 2009) (SRB&A 2010b)

It's mostly the pipeline that is affecting the caribou pattern. In the 70s when we first came, there would be 10,000 in a herd but now, due to the pipeline, it affects the people here and they have to go 30 miles out in all directions to hunt for caribou. It's too shiny. The coating is too shiny. More likely…when we were riding on the ice roads one time, we could see quite a few caribou crossing but maybe in the summertime, due to the reflection of the sun, they don't want to cross. They'll pass right under the pipeline [in the winter]. (SRB&A Nuiqsut Interview May 2010) (SRB&A 2010b)

Also the pipeline is so reflective that sometimes the caribou thinks that is the edge of the ocean, the ice pack, so that is why they go and travel further south of us. Those pipelines are still shiny, it's not coated. All the way from Alpine, pretty much from CD north, all the way to Alpine, it's so shiny; all the way it looks white. And it's reflecting. We always address that with them, and they say they might change that but they didn't. That always [is] a problem with their representative that comes to our meetings. (SRB&A Nuiqsut Interview May 2010) (SRB&A 2010b)

When a caribou is going to run for safety, they jump six to seven feet and they have their racks on so they have to be able to get underneath the pipeline if they're going to cross freely…when it's running away if the pipeline's too low with its racks it could be running and hit the pipeline and then sheer off its horns and it could cause it permanent or lethal damage to itself. (Anaktuvuk Pass) (BLM 2003c)

And just last week when I was cruising through Prudhoe Bay area like from where the bridge crosses Miluveach and where you start hitting these orange drill sites, pads, and stuff and it just hit my mind that your infrastructure of your pipeline is so low that at times that while you're cruising from that area past that bridge all the way past KOC of Kuparuk that your pipeline is so low that even a caribou wouldn't even attempt to try go over or under, neither. And then your caribou crossing things are so far distance when you look at it, I think I only see three of them. And then on top of that, I just want to point out that the infrastructure like that are for where the pipeline is also they're like permanent unnatural snow fences where the caribou crossings and stuff are, and then that's one of the things that on the environmental side that you all have to be looking out and be aware. And then I really disagree of this five feet pipeline -- five feet high of the structure that you guys are proposing around our land and our area where the caribou migrations and stuff are. (Nuiqsut) (BLM 2003b)

Infrastructure: Atqasuk. When we travel we see roads and I'm pretty sure it makes the caribou go away from our village and closer to Atqasuk. We noticed when we went to get our new snow machine from Barrow. (Wainwright active harvester; Experience timeline: ongoing; Experience location: Barrow to Atqasuk to Wainwright. SRB&A Interview 2007) (SRB&A 2009)

Seems like they're sticking over by the pad, that one. They mainly stay around this area, don't move nowadays. I know that they spend a lot of time over by Alpine. They don't move once they get by over there. I guess just like at Prudhoe Bay. You even see herds go under the building, to cool off.. Because it's cool, there's a draft going under that building. I used to work in Prudhoe Bay for how many years, a technician, for their annual tests to see if there's anything leaching from their pads. (SRB&A Nuiqsut Interview March 2009) (SRB&A 2010b)

That CD 5 and 6, that's going to divert my caribou farther south. [During] some winters there's too much air traffic and hardly any caribous come from the west. It's not like back in the old days before the Alpine was there, before the air traffic was there. Yeah, we were camping out and the activities, the caribous used to come over here [from Teshukpuk towards Nuiqsut] They never could come over this year. Mostly with choppers, and airplanes, and the flights to Alpine, that really affects the noise problem. [It affects me] when I'm up there in the summer. [And the] regular plane to Alpine. (SRB&A Nuiqsut Interview April 2010) (SRB&A 2010b)

The caribou migration has been changed rapidly because of the road or too many traffic (sic). Mostly the caribou with the collar don't have enough fat and the meat always taste different. I think if they took the collar off from the caribou I would be satisfied or if I see one I'll kill and leave the collar right there because I won't eat it, too skinny. The problem we got, they put too many collars. And some cows that come through here this fall, I saw two cows with a collar, I think they don't have fat. They were -- probably had more worms than my dog had worms because of the collar. And besides it hurt the skin. You can see when it moves around right here, it rubs the fur. Gilbert Lincoln. (Utqiaġvik) (BLM 1998a)

And another thing is, the pipelines, they need to be-- they need to have crossways for the caribou because the caribou I think will just follow the pipeline if they don't want to go under. I think that would be very important if they start development around that area. The caribou have to have a place to get down to the ocean in the summertime for --from the -- get away from the mosquitos. I've watched -- as a hunter, I've watched caribou when they're migrating. I've watched them cross my snowmachine trail, they don't have any problem with that. But if I walk across their trail, the caribou will immediately turn back, just from the scent of my feet. I've noticed that, I've watched that as -- just from being a hunter. I think the -- it will really impact my hunting; if the caribou move away from that area, I have to go somewhere else. So I would think that the caribou have to be taken care of, that's my main concern. (Utqiaġvik) (BLM 2004f)

Pipelines; we have seen caribou turn back from pipelines because they [caribou] see a flash from the pipeline. They used to go to Helmericks' in the thousands, not any more. Maybe two or three or less. Especially females with young used to go down there. Westside at Kugaruk, Harrison Bay, there are caribou there. You always see them. We had to go out to the ocean and to Kugaruk to catch them. (Wainwright active harvester; Experience timeline:1999 and is ongoing; Experience location: around Alpine, Meltwater and Nuiqsut. SRB&A Interview 2007) (SRB&A 2009)

There is so much activity going on it drives the caribou away from the insect relief areas. This makes them keep running, wearing off fat, not lying down. They want to do seismic testing there in the insect relief areas. This is one of my biggest concerns. (Barrow active harvester; Experience timeline: 2006 and ongoing; Experience location:

The southern boundary of the North Slope; the mountain side, central and western parts. SRB&A Interview 2007). (SRB&A 2009)

We're getting to go further and further to catch caribou. Because their route has changed. They're not in our backyard. Now I have to go to other communities' backyards, like Anaktuvuk, Atqasuk and Barrow. Caribou you have to go out further because of seismic testing, helicopters, small aircraft. They'll be flying those choppers again. They'll be doing it soon when they gather information like when the ice goes out or when they haul their contractors out. This scares the caribou. What happens when the belt breaks on your snow machine? I walked 10 hours home once. (Nuiqsut active harvester; Experience timeline: since 2001 and ongoing; Experience location: Nuiqsut. SRB&A Interview 2007) (SRB&A 2009)

I've noticed that since they started making ice roads, the caribou are hardly out there anymore. The caribou are 30 to 40 miles out. Some people told me they go 60 miles out. That's the Village of Atqasuk. I called them once to see when there were caribou. (Barrow active harvester. SRB&A Interview 2007) (SRB&A 2009)

It's longer [until the caribou arrive], we have to wait for the caribou to cross the river. Sometimes they don't even cross the river. Yeah, ever since Alpine started, we are having to wait for caribou to cross the river. It seems like they're sticking over by the pad, that one. They mainly stay around this area, don't move nowadays. (SRB&A Nuiqsut Interview March 2009). (SRB&A 2010b)

If I'm able to hunt within 1,000 feet of the pipeline, then it isn't an issue. But a lot of areas between here and Deadhorse, the pipeline is just too low. The snow builds up and they aren't going to put their head down to go under. I saw a caribou blocked just the other day, by Deadhorse. One side of the pipeline is all bare, and the other side is all open land. (SRB&A Nuiqsut Interview March 2009). (SRB&A 2010b)

The caribou that we see at Fish Creek are so far away from the channels, and it's not that easy to harvest caribou and wait for the caribou. And sometimes we have to travel farther west. But a lot of us who go there, we have to wait and a lot of the caribou are diverted by the aircraft. They [aircraft] are counting fish and some caribous that have collars on them. (SRB&A Nuiqsut Interview March 2009). (SRB&A 2010b)

It is hard to say, you see helicopters flying around, you have things going out there that are not usually there, human activity. It is hard to say, with the Meltwater road. With the last couple years the caribou haven't been coming like they used to. I usually catch 20, 30 caribou for my mom and other people. [I have been harvesting] way less than usual. (SRB&A Nuiqsut Interview April 2009). (SRB&A 2010b)

The Prudhoe Bay spine road is like a gate: the caribou get corralled in the area by roads, traffic, pipeline reflections, and staging. They get confused. They are scared to cross the pipelines, they are as scary as a grizzly bear would be to the animals. Some caribou are driven south, others are driven to the coast. If more roads are built, then there will be more blockage of the caribou. They will get stuck in the oil fields like a corral. The ones stuck south stay south and get little insect relief, while those going north get to the beach and the coast and get relief (S.R. Braund and Assocs., 2003, Field Interviews, USDOI, BLM, 2004). (Nuiqsut) (MMS 2007a)

I think the pipeline in a big factor in the caribou migration being disturbed. Because when I first came to Nuiqsut in 1993, we would be at Nanuq downriver and the caribou would come straight across – Fish Creek, hundreds of caribou – and then the pipeline came and…. And that year – 1993 – I got 10 fat bulls in July. We got a whole bunch of caribou right about where they put that pipeline. After the pipeline the caribou don't go through there anymore. They either go, their route changed, go through Fish Creek and come this way. The pipeline definitely changed their route. (Nuiqsut) (SRB&A 2015)

Pipeline height is always an issue. Five feet minimum is inadequate. I mean you hear so much. You hear that it's a concern to the community. And the coating of the pipe, the outside layer, you know, it's just like a reflection especially during the summer hot months. I mean you could see that, you know, the pipe having reflection. I think they should put better, you know, coating or something that wouldn't reflect. I think that's where the problem -- maybe -- I don't know. Maybe that's one of the issues that needs to be addressed, that it's deferring the caribou. I mean there's some studies, I think, that needs to be done. (Nuiqsut) (BLM 2003b)

The pipelines, you know, maybe the caribous don't like to go through the pipeline even if they can go through, they hardly don't' do that anymore; they always have to go around somewhere. They always start to go up river and then up around Fish Creek. We can see tracks down by Ocean Point and then going up towards Fish Creek [circle around south and then back north toward Fish Creek]. There used to be big herds going through there almost every year. We would have lots of caribou in my area [before], they go by my house; bunch of caribou would be hanging around in that area and go over towards Fish Creek. Those pipelines, some of them are not too high, and some of them there are places for them to go through alright, but they always be scared or something, I don't know. (SRB&A Nuiqsut Interview May 2010) (SRB&A 2010b)

With the five foot proposed pipeline height, it's a big concern to me. As you are aware of the studies that were done on this was for caribou during the summertimes and, as we all know, it snows during the winter and the snow drifts and builds up. It's a different case during the wintertime where caribou may have problems crossing pipeline during the winter months. So I would recommend a minimum height of seven foot instead of the five foot minimum. (Utqiaġvik) (BLM 2003a)

In addition to this 13-mile pipeline I'm talking about, with the new discoveries that already occurred south of the Kuparuk field, we have about another over 10-mile pipeline again, that that's three feet high. And then you look at the caribous when they - when they're trying to get to the ocean side, they're always migrating, keeping away from these bugs and everything. They stop right at Oliktok. They - we don't see those anymore, these thousands of migrating caribous. Now, at the same time, we're seeing hundreds. (Utqiaġvik) (MMS 2001a)

Look at Nuiqsut. Couple years ago they were finally able to catch caribou around their town because -- three years ago there was seismic being done around Teshekpuk Lake, and what they did was take that herd around Teshekpuk that used to come here to Barrow to feed us, they chased it all the way over to Nuiqsut. And that winter we caught nothing here. We had -- our hunters had to go above Atqasuk, above Wainwright to find caribous for themselves. You are talking traveling from 60 to 100 miles just to find something to feed your family. Did we get any assistance from anybody? Heck, no. And the federal government couldn't lease it fast enough. (Utqiaġvik) (MMS 2009a)

Seems like they're sticking over by the pad, that one. They mainly stay around this area, don't move nowadays. I know that they spend a lot of time over by Alpine. They don't move once they get by over there. I guess just like at Prudhoe Bay. You even see herds go under the building, to cool off. Because it's cool, there's a draft going under that building. I used to work in Prudhoe Bay for how many years, a technician, for their annual tests to see if there's anything leaching from their pads. (Nuiqsut) (SRB&A 2010b)

Actually, with the Meltwater road on there, the caribou are getting lost. They don't' know where the migration route is. We've got the Prudhoe roads over there, but the Meltwater comes farther down, and in the caribou's mind, where's the direction? We used to have the caribou coming into town, the migratory route [used to] come in, but now they don't do that anymore. (Nuiqsut) (SRB&A 2013b)

That migration pattern has gone southward. We hardly see the western herd this year. The Porcupine Herd, haven't seen them lately. We used to see thousands of Porcupine Herd coming through the villages, but we haven't seen those for a number of years and since that pipeline was built, that changed the pattern of the migration of the caribou. [We are] mostly harvesting caribou from Western or Central Herd. (Nuiqsut) (SRB&A 2014a)

Pipelines; we have seen caribou turn back from pipelines because they [caribou] see a flash from the pipeline. They used to go to Helmericks' in the thousands, not any more. Maybe two or three or less. Especially females with young used to go down there. Westside at Kugaruk, Harrison Bay, there are caribou there. You always see them. We had to go out to the ocean and to Kugaruk to catch them. (Wainwright) (SRB&A 2009)

I don't think that has changed much, except we used to get the Porcupine Herd, but no more. After the pipeline, we don't see them anymore. (Anaktuvuk Pass) (SRB&A Unpublished)

There has been some adjustment time for the caribou from the Alaska pipeline, the oil pipeline. And I think they have adapted to that pipeline now. So this project might not have as much affect because it's along the one that's there. The road to Umiat will definitely affect the route of the migration, but that's another study. (Anaktuvuk Pass) (SRB&A Unpublished)

Any activity that goes from north to south, [the elders] made the statement, north to south activity is not too harmful. It's not affecting the migration of the caribou that go north and south. They travel north and south, so that north to south activity doesn't have much of an effect on the migration of the caribou. So that's not a concern, and it's already going through completed project before. (Anaktuvuk Pass) (SRB&A Unpublished)

We live on caribou. I don't know what they changed, the haul road or who knows what now. [after road and pipeline we are] hardly catching caribou [in the] fall time. The [proposed road to Ambler], that's gonna make it worse. Cause that'd be in the winter [that it would be used for construction]. DOT [will] make an ice road, snow road. (Anaktuvuk Pass) (SRB&A Unpublished)

Maybe on the seismic – it's always the most distracting, because there's a lot of wires, and you are crossing [over] wires. When they do the seismic, the caribou seem farther out. Even in wintertime, when we see lots of seismic activities going on. You could see it right there, just laying on the ground in the land area. They're bright orange and you can see them for miles and miles. (Nuiqsut) (SRB&A 2015)

Pretty much the caribou herd, what they always talk about. The migration route is a big concern to all of that. As long as I have been here we used to get the caribou herd run through town. When I was little. IT's been about 10-15 years or something. Since they actually came through town. They actually come into town, the caribou trails. You can see them come into town. And then there is a couple more, and on top of that hill around here, that hill has a caribou trail that has always been there and everything. (Nuiqsut) (SRB&A 2012)

Nigliq seems a little wider. The caribou don't really go. They used to go further into the pipeline and now they split into little groups. I remember when there used to be thousands. (Nuiqsut) (SRB&A 2012)

One of the concerns I have, I was about 13 years old when the porcupine caribou came through town. I don't see tutu come through town anymore. There are trails that are old caribou trails, they used to run strait through town but that was before Alpine. They go around now and stay away from the community. (Nuiqsut) (SRB&A 2012)

Yea, they will divert the migrations when they are in the middle of their construction because they will not stop for caribou pass by. The caribou were already affected by the TAPs. When those drill sites expanded that is when the caribou were diverted. They were diverted eastwards instead of going through the village. The development is going to be a concern to the wildlife. It will actually be more difficult to go further to harvest caribou. If they open that Umiat road what will happen to Anaktuvuk Pass and Nuiqsut? They will cut off our access to the Central and Porcupine caribou herd. That is going to be an issue when they build this. How are the wildlife, and the caribou, be address under that APP project? (Nuiqsut) (SRB&A 2012)

Undoubtedly for good the animals need a sanctuary. I have always joked and said that since I have worked the oil field for several years. Before that the closest I could get to a caribou was maybe 500 yards, but in the oil field you can get a whole heck of a lot closer. They know it is safe. (Nuiqsut) (SRB&A 2012)

3.3.6.2 Moose

The wolves are a major impact on the moose population. There has been industrial activity that takes place there more recently. I don't know if that's affecting the moose or not. You theorize activities there in winter time, it's so cold there, that any additional movement or pushing of the animals has an impact on their ability to survive the winter. They're using their fat reserves. Additional activity is going to burn that off quicker. One year they found a couple animals off the Umiat runway, they had pneumonia, a cow and a calf. If you run animals hard in the winter time you can frost their lungs. This is just my opinion, but the wolves probably pushed them hard enough to where that happened. (Utqiaġvik) (SRB&A 2013c)

And some people always run into moose that are – they say that some moose have a big lump on the side of their bodies and they don't really know what are causing the bumps

in that area. We have learned back in the 1980s that there was a lot of seepage of battery acid from the Umiat site…. Maybe from the battery acid from that Umiat site. (Nuiqsut) (SRB&A 2013c)

There's two places that I know where there's always a lot of moose. Right by our camp [at Sentinel Hill] on the east side mainly, the majority of them. One year we saw maybe five to six calves in there. Two cows had calves. Then by the Uluksrak [Bluff]. The high country is on the west side, so we could go up there and then scan the area from the west side and look at the east side [for moose]. (Nuiqsut) (SRB&A 2013c)

Basically on the Colville, between Anaktuvuk Pass and 20 miles up from Umiat is where you find the most concentration. They usually tend to gather around Umiat area, in about a 10 mile radius of Umiat, but basically on the river. That's where you find the bulk of the moose herd. It's always been like that due to probably the highest concentration of willows in that area. (Utqiaġvik) (SRB&A 2013c)

Well, the first time they declined there were high incidence of brucellosis and leptospirosis. We thought that contributed to the decline. This time we're testing them, they don't seem to have their disease. They're dying of pneumonia, which is usually secondary to other diseases. We're in the midst of doing range studies there. The population isn't really high, but we're finding moose that starve to death. We sampled the willows and there was plenty of browse. Now we're sampling the quality. They're way up on the ragged edge of where moose ought to be. Maybe the plants don't pick up nutrients the moose need. And, to keep things more complicated, the snowshoe hares just moved into the area in the early '90s, before it didn't have rabbits. Just as the hares came in, the moose population fell. One thing that can happen with willows is if they're being preyed upon heavily, they'll start producing toxins that make them less digestible. (Utqiaġvik) (SRB&A 2013c)

3.3.6.3 Small Mammals

It should also be known that leasing in the Colville River Special Area, this oasis is a riparian habitat is very productive and supports wildlife populations such as moose, hares, lynx, that are not abundant on the rest of the North Slope. It's an important area were North Slope people can harvest meat and fur trapping, conduct fur trapping. (Nuiqsut) (BLM 2019e).

They're basically in the Umiat area, that's where you tend to see the most concentration of rabbits is Umiat area. Probably about same as moose, where the willows are the thickest. Up the Chandler and up the Anaktuvuk River, but more in the main river. I think they're about ready to crash. I don't know how many year cycle they have, but it's getting close. (Utqiaġvik) (SRB&A 2013c)

Trapping was abundant east of here. Now, we don't go over because of the oil field. Just recently, it is known that the foxes are very dirty, discolored and rabid in that area. Trapping is done elsewhere. We used to see grizzly bears around. Now, they are not around. Where's the caribou now? One summer when we used to walk miles looking for caribou, we came across two dead caribou for unknown reasons. The animals have faced a change. We have faced a change since activity began. If there is to be further activity, the fish and the sea mammals will suffer and we will suffer too. We depend on the fish, wildlife and the birds, still, today. Bessie Ericklok. (Nuiqsut) (MMS 1979b)

You don't see lynx anymore, at least up there. There were hardly any to begin with but my grandpa would get them all the time. I don't know why they aren't really around anymore. You just don't see them. (Nuiqsut) (SRB&A 2012)

Also there have been porcupines this far north. Camp robbers [birds] or chickadees are up here until January. (Nuiqsut) (SRB&A 2012)

3.3.7 Marine Mammals

3.3.7.1 Distribution of Marine Mammals in Nearshore Environment

Seals

When the river floods, near the mouth of Nigliq river it becomes filled with a hole or thin spot in sea ice that has melted as the river breaks up. When it reaches the sea that is the time that they begin to hunt for seals, through that thin spot in the sea ice that has melted. They hunt for bearded seals and other types of seals. (Nuiqsut) (BLM 1998c)

About a quarter mile off here, the brown water and the green water off of the shore. Off of the coast. [It looks] like there's already a line right there [on the map]. That color, that brown water and green. And then at the end of June those seals kind of eat on the outside of the brown water for some reason. I don't know why but maybe it's that muddy taste. I'd rather wait until the lagoon clears up and then start getting fish. Dirty water – the fish don't taste that good. They (seals) are on the green side of the water. (Point Lay) (SRB&A 2011a)

I know the ugruk season was kind of slow because the river water was kind of murky and as soon as it cleared up, they started showing up. I just got one. I think I was the only one that harvested one in June, and then the ice went out all of a sudden. It is every year [that the water is murky] and you don't see them until it clears up. You only have like a two week window for hunting ugruks and seals. (Point Lay) (SRB&A 2013a)

Utukok Pass. They go feed there for herring I think. That is a special place, there is like 50, 60 [seals] around there. I have never really seen them on the passes south of Five-Mile [Kukpowruk Pass]; I see them on Five-Mile Pass, Eleven-Mile [Akunik] Pass, Utukok Pass. The pups stay in the pass. All along the spit the pups are down there. There is quite a few of them. (Point Lay) (SRB&A 2014b)

Hardly any [bearded seals]. It seems like if we're not catching them, something's happening. I used to see lots of bearded seals on the ice but this year, like I said, I saw a pod of 100 seals on the ice but this year I didn't see that number. I saw like half of that number, maybe 30 when it should have been 100. I almost want to say this is my theory, because of our climate changing and the ice getting rotten farther, the seals have more of a chance of swimming away from the areas. When they have good ice these animals can't swim away. They have to stay in the area and keep that ice open. They have the freedom to go anywhere now. There's more rotten ice. (Point Lay) (SRB&A 2013a)

Well, the seals have been coming onshore onto the land more frequently than previous years. I think it's because of our ice. It hasn't been there. Same thing with the walruses too. They've been onshore here for almost a month now. I think they go out and feed and then come back to shore because there's no ice for them. Yeah, I guess our northern ice cap has been melting so all the ice that does form over the winter is mostly first year ice which melts over the summer. That's been the case here the last few years with our

walruses and seals. They come to shore here near town because there's no ice for them to rest on. (Point Lay) (SRB&A 2013a)

It's earlier than usual. First of June we get that breakup, end of May. That was the weirdest point of the season. It goes right away, it don't stay anymore. We used to get that ice first two weeks of July but end of June is when the ice is going out. We used to hunt bearded seals. Nowadays we're lucky [to harvest a bearded seal]. Lot of animals like to stay up where the ice is. (Point Lay) (SRB&A 2011a)

Walrus

Point Lay seems to be a good habitat for walrus, lately! It's typical, but we've been seeing big haul-outs. We're seeing 1,000 [count] haul-outs. Right out here on the first point I was talking about. It seems to me like they've been hauling out right there for the last three or four years in the thousands. I see like 800 or more. Uh-huh, there's lots of haul-outs all the way to Icy Cape right now, a hundred, fifty, but for some reason they want to stop right here. Icy Cape would be another big group of haul-outs. They gather up there, right on the point. (Point Lay) (SRB&A 2011a)

We live on the mainland, but we have Kasegaluk Lagoon, which is an 80-mile stretch of lagoon that goes from the foothills down south about 30 miles from our village all the way up to near Wainwright, which is considered the longest lagoon in the world. And there are 11 inlets. And every year we have birds migrating from down south coming up and utilize that lagoon. The walrus use that lagoon to get out of storms that happen in the ocean because I've witnessed it quite a few times during my 40 years. The belugas go in there and, you know, as well as, you know, ducks, geese. We have a wide variety of waterfowl that utilize that lagoon. (Utqiaġvik) (BOEM and BSEE 2013)

Walrus are hauling out more and more in the fall. The ice is changing. During the fall time the ice is way too far for the walrus. They go haul out on the shore. They picked our barrier islands to do that. About the first of September, they start doing that. That's when the Fish and Wildlife do the walrus tagging with the crossbow. They say there's a lot of clams out there. They wanted one of us hunters to get one, just to see what they're eating. And they are full of clams. Sometimes there's a few… this one year they found 30 dead walruses out there that just beached and died with a lot of sores on their face and bodies. But these last two years, I never saw anything like that yet. (Point Lay) (Wolfe 2013)

That, you got it right there. Yeah, we do sometimes occasionally go past Cape Sabine. This is where we get the walrus over here…. Walrus , you'll see them here and there [adding a small use area to the existing one], maybe just a mile from shore. (Point Lay) (SRB&A 2011a)

Polar Bear

Now we see they use the islands and banks a lot more now. Even when ice floes are big enough to use, it is the time of the year when there is a lot of snow during November, December, and that is when we see a lot of snow come around. Even if the snow is not dropping, it is drifting. That snow is drifting into areas where they have to put a den. You could see hardly any snow in one area when you go outside, but snow has accumulated enough for use. We see a lot of that happening now. By March they know

where to go when they come out of their dens. (SRB&A Utqiaġvik Workshop, January 2018) (Braund et al. 2018)

He indicates there are more bears starting to den using the land. Some bears are denning in low, flat areas where snow can build over time in that area. They are starting to look for other places to den other than mostly the ice. (SRB&A Wainwright Workshop, January 2018) (Braund et al. 2018)

When the young ice that we call siguliaq is older, young ice that has gotten thick over time, and it starts to ridge and it gets long and go for quite a ways. A lot of ringed and bearded seals look for that kind of condition so they can live in there year round. There is enough snow for a lair, so they do not have to move away so much. The bears are looking for that type of ice to hunt in. The puktaagruaq are large multi-year or large chunks of ridged up ice. Icebergs. Puktaaq. Single large piece of heavy ice. Bears like that area too. They like to be on the thin stuff too. Siguliaq [thin ice]. (SRB&A Wainwright Workshop, January 2018) (Braund et al. 2018)

Generally, bears start coming from the east when the lagoons are freezing. In September and October they come from north with ice then they get on the ice with the beach. In the winter time, with the west wind, they come onto the shore fast ice. In the spring time, they know where to go; they know it is whaling season and know they will have food to eat. You see that pattern with almost all of the whaling villages; they know how to learn when it is time to go whaling and go to those places. The seals are moving too with the seasonal migration happening and belugas and walruses with the floating ice. The timing is important for animals migrating and with those migrations are going to be the predators (SRB&A Utqiaġvik Workshop, January 2018) (Braund et al. 2018)

When a polar bear is really hungry it does not matter how big or small it is. When there is that factor the bear will not stop. There is that source of seal skins, rendered oil or food in the community. It has been like that for many, many generations that he has seen and these communities know that when an animal is starving when he smell something, he will not stop at a gun or person or dog. He will be determined to get that source of food. (SRB&A Wainwright Workshop, January 2018) (Braund et al. 2018)

Participant 1: You have to scare them so they will not come back; not just shoo them away. You scare them. Gun shots and shoot near them on the ice if not going to take them. It reduces them coming back.
Participant 2: Chase them out with snowmachine. I think we need to chase them farther rather than just a little bit out of town so they will not come back.
Participant 3: When they first come around, you shoo them away, but they go out and you think they not going to come back. When they do come back, the bear hunter will chase the bear out until it knows [Name] that it is not welcome in the town. Chase him really hard. Chase him until the point they are tired, and that will reduce that bears chance of coming back. It knows it will get tired. That has been taught to whalers and community members. That sort of action. It is in our bear patrol. We try to teach the same kind of tactics that were used through generations. We put that part in our bear deterrent program.
Participant 1: Cracker shells and bean bags.
Participant 3: Hard chasing been around a long, long time. (SRB&A Wainwright Workshop, January 2018) (Braund et al. 2018)

I would like to mention our polar bear as well. I know that I didn't mention them. Lupita for the record. I know that there is polar bear calving. The polar bears do come up into our mountains and they calve up here. Be aware that they are calving. I know that there's special consideration for our polar bear right now, especially with that new treaty that's being issued so there's some protection for our polar bears that Fish and Wildlife already put into place in some of these areas so I would like to make mention of that to take a look at that. That way when we, when we come back with another scoping you have a projected map with those markings on there. That way we could see it because I mean it does say River Uplands Special Area but it doesn't really say what it's protecting, why it's protecting… (Point Lay) (BLM 2019b)

[Point Lay resident] will attest that they'll den close to the old village. And you can find polar bears almost anywhere. All they need is a snow drift to den in and they do. We'll find them along the barrier island. They're not in the numbers that you might see in Kaktovik and Point Hope. (Point Lay) (SRB&A 2011a)

She said they have lived subsistence living as their forefathers did also. They traveled with animals. They survived on animals. And she stated that once…the polar bears, they live on ice, but the females, when they tend to their young, they don't live on ice. They go towards the land and the rivers. Go towards the rivers to tend to their young. The fish travel towards land when there's no ice, when it's easier. And then they out to the ocean when it starts freezing up. And she states that animals know fish go towards ocean underneath the ice. Sarah Kunaknana through translator. (Nuiqsut) (MMS 1979b)

Whales

In the past we have -- we have seen a lot of ice making it difficult for us to go out to the main open water. Now you don't see that. In recent years, once the ice goes out, you don't see it. It don't come back. Now that will change the pattern of the migration of bowhead whales. They will be traveling closer to the shore, closer to these barrier islands in the 30-meter mark, and that's where these marine vessels like to travel from. And that has been their pattern since the ice pack had gone further north, 100, 200 miles north of us. And since then, all these bowhead whales have been traveling a lot closer, and some are traveling inside the islands. And now they migrate -- they use these islands as more of, like ice because they are shallow. Thirty-meter mark is real shallow. And if we cannot -- like Archie Ahkiviana said, we had a successful season in the past couple years because the whales were closer to the islands and we did not have to go further out, no more than eight miles out to -- to catch our harvest. And a lot of times we may be weathered in because of the weather, high seas. Edward Nukapigak. (Nuiqsut) (MMS 2009b)

Seventy-five percent of our food comes from the ocean. We get some of our food from the land, but the ocean is our garden. Whales, beluga, walrus and seals are all foods we need. OCS is something people are concerned about because it can contaminate our garden. We know about Prudhoe Bay. The tundra is fragile and if you scar it, then it will last for years. We have seen that with oil development. But, if you spill oil in our garden, the scar will be forever. (Utqiaġvik) (Inc. et al. 2008)

[We hunt in] June, July, but it has been earlier these past few years; it used to be July but you can say June now. All the animals come early, even the bowhead. They used to hunt them in May and now they do it in April. Animals don't have a calendar. Maybe it

is the climate that lets them move back and forth. Whales have been coming earlier. (Point Lay) (SRB&A 2014b)

If we don't have any down there [Cape Sabine], we'll come up and scout around there. We've herded them more down there more often than we've herded them from up north. We go out here, and then we go this way [toward shore]. We don't want to cut them off and scare them back to where they're so far away and we have to wait…it's safe to say five miles [offshore is the furthest they go when beluga hunting]. I think we've gone as far as Eleven-Mile [Akunik Pass] to turn them around. Those are reference points, so you might go a little further than that…[you go to] whatever inlet you're nearby. You can lose the beluga real quick out there. You herd them in through the closest inlet. (Point Lay) (SRB&A 2014b)

3.3.7.2 Health and Quality

The bearded seals used to be fatter. They're not fat at all. They travel more, we hardly see them, that's why there's a short time [when they are] around. I bet that's the problem with the beluga, too. They're not as big as [they were] a long time ago. (Point Lay) (SRB&A 2011a)

A lot of sick seals, [ringed seal]. Couple of bearded seals me and my crew got their hair wasn't all there. They were already molted, the big ones anyway. I found maybe five or six eider ducks dead. [More than usual]. It was, I think it's the heat. Yeah. There's a lot of sick walruses, seals, a few I saw bearded seals, ducks, eider ducks. From Eleven-Mile north that's where I saw most of the sick animals. (Point Lay) (SRB&A 2013a)

I have been butchering seals for more than 20 years now. I can safely say in the last five years I have had six seals uneatable, unusable to where I had to just throw them out, throw them back into the ocean. One of the -- I did have them tested, and it did come back malignant with cancer. So another thing to be watching out for, too, for these ships that are going is the waste that they are putting in the waters because it is affectic -- it is affecting all these -- the bearded seal, we hunt that for kiniqtug and misigaq. And that's one of the things that is important, too for our well-being. Take a teaspoon of misigaq, and that's better than Dimetapp. It really is. You know, you -- it may sound funny, but -- beluga oil, you rub it on your chest for a chest cold. We use it more for than just food. Roberta Leavitt (Utqiaġvik) (MMS 2007b)

3.3.7.3 Climate Change

Animals were only available during very narrow opportunities because of the weather, the sea state conditions, and the early warming. We not only lost our ocean ice early, we also lost all our beach cover early as well as [losing] all the ice in the inlets early. [There was] no way to really go any farther than 20 miles without dragging a boat with you. But yet the lagoon ice was very thick and did not go out until the middle of July so we couldn't use the boat ramp to launch our heavy boats. All the weather conditions worked against us. We have to adapt to it; it's normal. (Wainwright) (SRB&A 2013a)

If you look at everybody else's data, there's a one week period in August that everyone got bearded seals. That was it; that's not normal. We usually get them all the time. It's because there's no ice; it was all blown out to sea. Not having no ice. We had no ice, open water for about 200 miles all summer long. It was pretty hard to use the ocean because it was too dangerous. There was that one week period that they had gotten

those seals. After that, nothing. When that opening happened I wasn't home so my boat didn't even go out in the ocean. (Wainwright) SRB&A 2013 (SRB&A 2013a)

The seals typically come the middle of June, and we're here, we're waiting, people are struggling to get their boats launched because of the soft sand and there's no seals. Wide open water. The conditions were a little choppy, and then one day toward the end of June about the same time I started getting hits on the fish finder then the seals come, and we had—it was an amazing hunting window. Almost two weeks of perfect weather. (Wainwright) (SRB&A 2013a)

The ice conditions; I noticed the ice isn't thick as it used to be 10 years ago, 15 years ago. Even last year, too, wasn't as thick as we'd like to see it. They're probably going further north just to find good hunting grounds because there's hardly any ice. (Point Lay) (SRB&A 2014b)

I've noticed that the shorefast ice has come closer and the lead opens up closer than it used to when I first moved down here. I went out seal hunting one time and my speedometer said 15 miles and I just looked down, and I said 'Hey boys, we're going back; this is way too far for me.' We didn't even reach it [the lead]; we had two miles to go. Nowadays, it opens up two to three miles out…. I think it made it easier for our subsistence activities to have an open lead closer. We would have to go north, you know, to find closer open leads. (Point Lay) (SRB&A 2011a)

3.3.7.4 Effects of Development on Marine Mammals

...there are other persistent organic pollutants that are concentrating in our animals. There are studies of the polar bears that are showing these concerns. These pollutions from industry developed elsewhere are coming to our lands with the way the air currents are and the precipitation, they are coming to our lands and we did not have to identify the issues, but we have to deal with it. This adds to what is coming from the fields of Prudhoe Bay, Alpine, and Kuparuk. There are changes to the animals which are our resources for survival, the fish, the caribou, the whale, and others. (Nuiqsut) (BLM 2003b)

People that use the ice road leave trash, and animals eat that trash. Caribou and polar bears—have trash inside of them. Seals—plastic pop rings. Within the last 5 years, on the ice road, [I] see a lot of trash all over (S.R. Braund and Assocs., 2003, Field Interviews, USDOI, BLM, 2004). (Nuiqsut) (MMS 2007a)

3.4 Social Systems

3.4.1 Landownership and Uses

See traditional knowledge provided in the SUBSISTENCE USES AND RESOURCES section for traditional knowledge that is also applicable to this section.

On the issue of the Haul Road. The direct environmental impacts of the pipeline has been limited and manageable. Issues associated with the Dalton Highways or the Haul Road and their relationship to the pipeline issues complicate matters. Clearly, the Haul Road and the pipeline are related and the management of the two assets must be a coordinated undertaking. The State of Alaska, over the strong objections of the North Slope Borough opened the Haul Road to public traffic. The ongoing and potentially serious impacts associated with the Haul Road must be considered together with the

pipeline for purposes of impact assessment. Originally a restricted industrial supply route to the oil fields, the Haul Road is promoted in a lot of travel magazines as one of the America's great frontier driving experiences. This attracts more and more travelers every year to a road that was not designed for public use and is not adequately maintained for public travel. There is a critical shortage of sanitary waste, emergency facilities, including toilets, waste receptacles, roadside pullouts and call boxes. Drivers of 18-wheelers feel they have a priority on that road, just drive it one time and you'll see it, as was the intention and the case since the highway was first constructed. Slow-moving or stranded passengers vehicles can create dangerous situations out there. It is, of course, the North Slope Borough which must respond to emergencies on that very road within our boundaries. This is an added expense to us, to our local government and diverts limited response equipment and personnel from potential needs in our communities. George Ahmaogak, Sr. (Utqiaġvik) (BLM 2002).

The eastern bank of the Colville River is virtually not a subsistence area anymore. And that's probably -- you know, if your research people look at that, that's an overwhelming fact that it has happened. Although, in the comprehensive planning in Prudhoe Bay, the industry, State of Alaska had assured us that they would not restrict hunting, they have barred and restricted hunting from the eastern bank of the Colville River to the Sagavanirktok River already. (Utqiaġvik) (BLM 2004f)

My major concern is access to areas we've been using that may be developed and possibly we'll be prohibited from going in there. That's a major thing I've seen with what's happened in Prudhoe bay and the Kuparuk area. You go through Deadhorse to Barrow and a number of times I've been denied the ability to go off the road system. A snow machine on the road is a bad idea. I went from Deadhorse to Aluktak and had to hire a trailer and truck to carry my snow machine. (Barrow active harvester; Experience timeline: 1995 and ongoing; Experience location: Prudhoe Bay, Deadhorse, Aluktak. SRB&A Interview 2007) (SRB&A 2009)

All the western side of the Colville River and the rivers that they used to harvest game, to harvest fish, waterfowl and to use as camping areas because traditionally, these areas have been used by their forefathers. They continue to try and do this but what do they do? They are blocked completely by the industry. Even though that it's written, it's black and white on paper, Native people could subside in these areas, you try and do that, you get jailed. (Nuiqsut) (BLM 1998c)

3.4.2 Cultural Resources

We have not been able to have access to our traditional hunting grounds that we were raised with…The Inupiat have a close relationship with the land and animals. It changed the spiritual need between the Inupiat people and their traditional hunting grounds because they had a very close relationship between land and animals. Jonah Leavitt. (Utqiaġvik) (Worl and Smythe 1986)

To understand our culture is to understand the correlations of history, archaeology, socio economic factors, land and wildlife factors to a livelihood of subsistence patterns of the Inupiat people. The relationships of history and culture cannot be separated. The same is true for subsistence resources and the human food web process, including organisms of the smallest regime. The total regime of sea mammals, fish, land animals, birds, and caribou is all interrelated and dependent upon each other. To destroy one

small part of the regime is to endanger the other parts. One begins to wonder if the hierarchy of State and Federal Governments understand these inter relationships of the total ecosystem as a whole. The total ecosystem provides the network for the continuation of a subsistence lifestyle. Flossie Hopson. (Utqiaġvik) (MMS 1979a)

Cultural resources along the Beaufort Sea coast are not defined in terms of architecture or buildings alone. Beyond such static material categories is a whole panoply of dynamic resources. Spiritual associations with places and activities shared by local residents, subsistence hunting, fishing and gathering pursuits. John Carnahan (Utqiaġvik) (MMS 1979a)

Cully Hill is the original graveyard for Point Lay, and we started another one by the freshwater lake. There's been people lost up and down the rivers and you occasionally find skulls. These are old war grounds. You'll find places where they made spearheads. This is where Point Hope and Barrow used to fight. You'll read a lot about the war grounds. Kukpowruk, at the base of Igloo Mountain, there's a lot of stones there. One story, that [a local resident's] parents told was that they were taking dog team down there and suddenly it started snowing red, and that sounds like fallout to me. These are two well-seasoned travelers. You have to wonder what was going on….There's a couple of sod houses at Kuchiak, just south of the mouth. Every river is significant. Pigmiaq River, at one time when Point Lay had only one man here, he was born at the mouth of Pigmiaq River, and there's sod houses there. Just south of it. And the coastline is encroaching, so at some point those are going to erode away. Cape Sabine, we used to go there all the time. When Point Lay was unemployed, Cape Sabine was a common place for people to go there. (Point Lay) (SRB&A 2014b)

The old village, right across [from the community]. Where the plane is on the landing strip [on the map]. We have old sod houses and graves. The second one is across the river. We lived on an island. That [on the river] used to be the second village. [The first village] was an island. The houses were lined up. All the houses would get buried. This is the third site. (Point Lay) (SRB&A 2014b)

So, I know that this area right here like Jane was saying, the Kasegaluk Special Area that is protected right here, well there's the Tuniluk River right here and there's the Tuniluk Lake and these are all historical spots where our people were, a large amount of our people and it's in our record. So, I just want to point that out that I would like to have this site right here protected. (Point Lay) (BLM 2019d)

The main one is up here [at Icy Cape]. There is a well-known Native village there. I want to see it [designated] as a historic site. One time my dad would say there used to be a thousand people there. (Point Lay) (SRB&A 2014b)

I'd just like to emphasize the importance of the Chipp, Ikpikpuk and the Colville River areas historically and still today. (Utqiaġvik) (BLM 1997b)

My mother is from Oliktok. When they were developing Alpine, the "rollagon" almost stepped on my mother's sister's grave: the industry never apologized to her. That would be my strongest point. (Barrow active harvester; Experience timeline: 1999; Experience location: Oliktok area by the mouth of the Colville River. SRB&A Interview 2007) (SRB&A 2009)

The Haul Road was built right over my grandfather's mother's grave. My father brought up the concern. The answer was given as "It was the other company's fault." Gravesites and campsites should be documented. No mitigation was done. It might not have been the only grave there. (Barrow active harvester; Experience timeline: 1976; Experience location: Dalton Haul Road. SRB&A Interview 2007) (SRB&A 2009*)*

Narrow view of sites. We got grave markers and burials. In the winter we have markers, but they're buried by snow. You get oil companies driving all over the area. That's not right to do. We are Iñupiat. We respect our elders. (Barrow active harvester. SRB&A Interview 2007) (SRB&A 2009)

We went seal hunting during May and in June, before breakup, we had to land again. The islands are used heavily for nesting and molting ducks, geese and pintails. The islands are important and have historical and cultural significance. There are whale bones and old ruins at Pingkok Island. The lands and its wildlife, fish, have changed today. For example, Putu used to have a free flowing channel. Now, last year, it had to be physically channeled. Two years ago, my brother Paul went to fish at Itkillikpaat where he ordinarily fished. He came back with no fish. We used to catch fish anytime we put a hook in. The Itkillik River is now rusty colored. There are even a bridge at Puviksuk. This river used to be glassy clear, as I have known it. These are the effects of past activity. Bessie Ericklok. (Nuiqsut) (MMS 1979b)

Our family stayed at Prudhoe Bay until the late 1930's. Our old sod house is still standing today. When I visited last summer, I saw the pingos we used for duck blinds was a burning pit. Our place is a barge landing place instead of a fishing camp site. I guess people that are aware of Prudhoe Bay know that old shack on the east dock. That's where her house is still in position. That's the one she's talking about. There are a lot of old sites, camping sites, fishing sites along the coast line. The are there and are being threatened by development. Sarah Kunaknana. (Nuiqsut) (MMS 1979b)

The oil companies travel doing seismic and surveys outside right now with snow vehicles. They should watch what they are doing. They don't know what they are stepping on. There are some graves out there they are running over. I see a lot like that. There is a graveyard southwest maybe 20 miles from here and some survey people don't care what they are doing. Do they have a monitor? Do they hear what Native people say, not to step on or run over [a grave] - a dead person might be under it. Don't just ignore the stakeholders. Watch what you are doing. There is a graveyard out there. It was there before you were there. They did not dig down far in permafrost. Not just one graveyard out there, there are more. (Nuiqsut active harvester; Experience timeline: 1999; Experience location: Fish Creek; Judy Creek. SRB&A Interview 2007) (SRB&A 2009)

They are still recognizable if you know what you are looking for. I think it was AARCO at the time who contracted an archaeologist on west side of the Colville. Settlements about 3-400 years old over there. Still some remains there that people were living there. He was showing me the old bones with cut marks, the fire pits, the sod depressions. I would say that happened within a decade. When HDE was first coming on before the project. It was either AARCO or the state or both that contracted him to look for sites on both sides of the river. And he has found several more not just in the crossing but going east. (Nuiqsut) (SRB&A 2012)

There are a lot of unmarked trails up there. A lot of history actually. A long time ago before development when they were living in sod houses and dancing there was a lot of trade in caribou and muktuk. That is how they would do it. They would do a lot of trading in the winter and do a lot of hunting in the summer time. (Nuiqsut) (SRB&A 2012)

Not so much on the ocean coast, but [I have spent time] on the rivers. Last year when I was working for Umiat, they didn't tell me but Umiat became a historical site and you can't take anything off of the ground. I found an arrowhead and I put it in my pocket. I showed everybody and they were like "No". They freaked out about that. I got kind of mad at them because I was like "Go ahead and put it back then or are you going to keep it". I found a pair of old metal binoculars. I had to leave them though. (Nuiqsut) (SRB&A 2012)

At Oliktok there are old grave sites. I think they have been covered by the gravel. It is a desecration. My grandfather was born and raised there. I am sure one of his parents or both are over there. (Nuiqsut) (SRB&A 2012)

Yeah, I say that now because of Alpine we have had some displacement of camping sites, fishing sites. Some families have abandoned because of the development. The impact of noise and traffic and the infrastructure itself the roads and facilities. They tell us we can use our camping grounds to hunt and fish but it's just not… And besides that with the fire arms these days the industry is wary of that. (Nuiqsut) (SRB&A 2012)

Yeah, that has a lot of history there. That was a route that the Barrow folks used when they went to the trade fair (unclear) site at the Nigliq Channel. So that, as well as that being a very sensitive area for the calving areas for the caribou, apparently, that's more or less overlooked because you're already talking of having a number of drill -- drill pads with 50 wells on them. (Anaktuvuk Pass) (BLM 2018b)

So we have on record, of people that resided there well before Nuiqsut was even there from -- from our people. It's on state record, also, of who was there. They have names and people and they're -- they're our direct kinfolk because they were our last names; people with our last names and our immediate kinfolks… I'm just asking, because we have kinfolk that are buried around that area there. (Anaktuvuk Pass) (BLM 2018b)

There used to be some people in Itkillik; there were allotments in Itkillik Lake. (Anaktuvuk Pass) (SRB&A Unpublished)

The nomadic lifestyle would have some activities over [in the project area]; there might be some grave sites in that area. The Inupiaq people would travel there, and when a loved one died they would bury them in that area. So the Alyeska pipeline might have affected some of that. (Anaktuvuk Pass) (SRB&A Unpublished)

We would find some old graves. A real long time ago, people would build [graves]. And they would start drilling and [find] some old bones. I said "2,000 years ago the last one was buried". There was caribou skin right there by the camp fire. I know over there in this area [gestures broadly to the map], it might be the same. They lived here a long time ago. This [TAPS] pipeline goes through the graves. During the starvation my wife's dad was three years old. He was three years old when he was starving there. People were right by the river and it overflowed in the winter. And that's where they

found them [dead]. [speaking about the graves or bones by the rivers]. (Anaktuvuk Pass) (SRB&A Unpublished)

[Important places?] All the elders know, nobody else [knows about the burial sites]. People died in that area right there [west of TAPS]. When the person died, they called that area that person's name. [When a] person died there they called that place his name. [Do people still use those names?] More people [are] traveling over here because more animals are over here. Down, up, the mountains, and up and down. (Anaktuvuk Pass) (SRB&A Unpublished)

I travel all over place, what it is. [I] travel to the ocean from here. [I travel to the] Colville River. People from here and people from north they go right there [to the Colville River]. They make something down here they make something there, [and] they go and trade [these items]. That's how they used to be. There was no store here, it's a long way to the store. [We had a] dog team [in the] winter for groceries [laughs]. They know what month they [are supposed to] go to meet, [in the] springtime. They know where to find each other. Mostly the people live right here live here most of the time [in Anaktuvuk Pass]. People over there leave from Porcupine [to travel to Galbraith Lake]. It used to start a war, a long time ago. [If an] Eskimo find an Indian he [would] kill him. A very long time ago, [there was a] big war. Down south was the last time they had war. Only whites went back to Arctic Village. They made a story on a tape recorder. They said, "talk Eskimo so that they couldn't understand Eskimo". (Anaktuvuk Pass) (SRB&A Unpublished)

It's the same thing that can happen when the pipeline is open to the public; we know people have no sentimental value [when they visit] up here. But for us [this area] has a great sentimental value. (Anaktuvuk Pass) (SRB&A Unpublished)

3.4.3 Subsistence Uses and Resources

3.4.3.1 Key Subsistence Harvesting Uses and Locations

First of all I'm aware that Nuiqsut is greatly affected by these development proposals, but as he just showed caribou that migrate through Anaktuvuk Pass also travel up north to these areas and these herds are what our lifestyle here in Anaktuvuk is based on. And for thousands of years the animals that migrate north have followed their routes every year. These areas are summer home to the caribou, among other wildlife. The caribou that traveled north are the main source of subsistence for our people. Mike Morry. (Anaktuvuk Pass) (BLM 1998d)

Please stay away from the water. I don't know how many times we have to say it. These are the subsistence highways. Stay off the rivers and the big lakes because these are important areas for fish habitat that Craig just mentioned, and for waterfowl. Oil industry and water essentially don't mix. (Utqiaġvik) (BLM 2003d)

We rely on fishes from Teshekpuk Lake quite heavily. The amount of fish that is caught from Miuliak (ph) River as it goes to the Ikpikpuk River is very popular. I've been in the area most of my life and these in the summer months. When I'm hunting in the area besides Chipp River. (Utqiaġvik) (BLM 1998a)

That Anaktuvuk River, which is part of the, if that…lets take the Colville River, even west of the pipeline. Some of the project [components] get way up in here, and that

effects the fish and the habitats for the animals that we eat here; the birds, the geese, and those kinds of things. Lakes sometimes are further up from the river, and human activity, I've heard this, that if the lake is kinda stationary and the river is not then that lake starts draining out, and human activities can do that. (Anaktuvuk Pass) (SRB&A Unpublished)

I use the general area around the Ikpikpuk up to Navy Creek for the last 15 years I hunted caribou and reindeer, there's a lot of reindeer up in that area. Fishers in the area catch reindeer annually. (Utqiaġvik) (BLM 1997b)

My favorite spot would probably be right in here [12-18 mile radius around Atqasuk]. If there's hardly any caribou up here, I head out there. That's when I need caribou. That's a go-to place. My favorite hunting spot. The caribou are the fattest right there. (Utqiaġvik) (SRB&A 2010a)

Wainwright, around Wainwright, the caribou seem to be fatter, less stressed. [I go there] in the fall time. Along the coast line all the way from Barrow, that's the one I prefer to hunt, the caribou seem to be fatter and less stressed because they come from the south, the ones that come from the east are bugged out. (Utqiaġvik) (SRB&A 2010a)

We utilize that lagoon every year. We go all the way up to Icy Cape, sometimes even all the way to Wainwright. You know, it's sort of like a somewhat safe trail in case the ocean is too rough to travel. We utilize that lagoon to harvest caribou along the mainland shore. We harvest off of the barrier island that is there. We harvest eggs, which is going on right now this time of year. You know, we don't have to go to the store to buy eggs. You know, there is a wide variety of seagulls, geese, ducks, terns. (Utqiaġvik) (BOEM and BSEE 2013)

It's really more a way of life. As you know, subsistence is an unfortunate term, it's really a lifestyle. And gathering wild foods and that sort of thing, is, is super important in a lot of cultures, but definitely here. And you know you hear the cliché that whaling brings the community together. It's true, it really is true. It's amazing. People that have been campaigning against each other, all this kind of rough stuff, when a whale is caught all that goes away and food is shared. And that sharing hasn't changed. In fact, that is probably the single most impressive, or important, let's say, aspect of the way things are done here. Is that it's, it's sort of communal hunting. And the way people distribute food is really amazing. And you can tell it's absolutely genuine. (Utqiaġvik) (Brown et al. 2016)

People fish in Chipp River in the fall time. The fish spawn just before October, early October. Or maybe more like the end of September. The bloated fish with eggs all come together and you get lots of them. Then all of a sudden the fish get lean. They've dropped their eggs and they get skinny. I catch aanaakjiq in lakes in the fall and they have suvak. One time I got two that were just big and round with eggs. I was holding the fish and that suvak was just draining out of it. The lakes are connected during high water of break-up, but then the water drops and the lakes get land-locked. The fish end up land-locked, too. (Utqiaġvik) (Brewster and George n.d.)

When you catch reindeer near Peard Bay, that's part of Wainwright's herd. When you go over here to Admiralty [Barrow], that's part of the Barrow herd. The reindeer Nuiqsut gets, that's part of Teshekpuk herd over there. (Utqiaġvik) (Mager 2012)

With hunters from seven villages taking animals from the Teshekpuk Lake caribou herd, it remains the most important herd on the North Slope from a subsistence standpoint. (Utqiaġvik) (BLM 2003d)

I hunt seals every summer. Eleven-Mile [Akunik Pass], and Five-Mile [Kukpowruk Pass]…around that area. We get ugruks outside Eleven [Mile], and here too; both places. Usually they hang around on the outside. When there's ice out here, they're all over. We go all over when there's ice. That area over there [Utukok Pass], and about this far [Neakok cabin], all the way up and down for ugruk. Outside [the lagoon]. About three or four miles [offshore]. (Point Lay) (SRB&A 2014b)

I got three of them [wolverines] and four wolves. When the caribou are close by the town, I usually come around here and here [Kokolik] and here [Kukpowruk]. You get them along the rivers, mostly. Just up in here [foothills around rivers]. Deadfall Creek, around the hills. Last time I was chasing a wolf, it was a three and a half hour chase; we chased it from the coast to the river. Probably here where the foothills meet the flat land. They're right in the foothills near the flatlands, up to Utukok. (Point Lay) (SRB&A 2014b)

Kukpowruk is the main river there. You can go all the way up to fish camp. I'm gonna guess it's…gotta be this one. Kokolik, just for fish. Those are the two good areas. Everybody makes holes for fishes between that area and this area. (Point Lay) (SRB&A 2011a)

[We harvest fish] in Kukpowruk at the cabin, and we go to the school cabin and to other cabins. We start at the cabin there. We do that river and the Kokolik River. You can keep going up and then up to the coal mine. [We harvest] grayling, trout, during the whole month of October. At the same time we hunt caribou, wolves, and wolverine. (Point Lay) (SRB&A 2014b)

[We go] pretty much all the way from here [Cape Beaufort] all the way up to Icy Cape. [I go by] snowmachine and boat. [I hunt] black brant, emperors, white-fronted geese, king eiders, common eiders, Canada, snow geese…there's one good spot up here, right here [inland on the Kukpowruk], for Canada geese. There's a whole bunch of migration routes that they follow [crossing the rivers]. Inside the six mile, 12 mile boundary, too, for eiders. (Point Lay) (SRB&A 2014b)

[The migration pattern changes] only when helicopters [disturb them] or young people get too anxious to get them. Usually they can pass right between the snow fences right there. If we leave them, the first bunch goes through. If we leave those alone, the caribou will follow the scent of the first. But some young people like to get too anxious for caribou and go after the first bunch, changing the migration route. We try to tell them [not to hunt this way]. (Point Lay) (SRB&A 2014b)

When they come up, we herd them to shore. We stay close to shore, not even a mile out. One time we did that from Utukok Pass. We herd them from there. Usually when we hunt them from the south, we take them through Kukpowruk Inlet, and when we bring them from Icy Cape we bring them in here [Akunik Pass]. One time we herded them from the ocean, eight, nine miles out. That was not that long ago. Usually we spot them from the village and hunt them from there. We used to use airplanes, the last few years we haven't but it is good to use the airplanes because they spook easy with outboard motors. (Point Lay) (SRB&A 2014b)

This past summer I spent most of the time in Fish Creek Bay. And also on the west fork [of Fish Creek], the one that comes in on the bay side. From here I took about 10 to 12 miles in [to Fish Creek]…. Caribou are out here [along the coast], but this bay is too shallow [so you can't reach them]…. But there were caribous around here, but you don't have access to go to them because the majority of this area is too shallow…. But I focused my camping out here [Fish Creek area]. Teshekpuk herd tastes better. I've seen caribou when I've gone to Oliktok, when I go to pick up my supplies, from Pisiktaġvik coming down. On the east side, we have caribou but it seems like they want to stay away from the shoreline [because] we have so much activities going on. Here I only got a few caribou because in summer we have so many activities going on…. Majority of the caribou were on this side [west] of Fish Creek…. [I went] about maybe four or five times out on Fish Creek. I focus on Fish Creek a lot because I know that caribous on this side are being disturbed by industry. That way you don't have a lot of choppers flying every day. (Nuiqsut) (SRB&A 2016)

…in the summer when it is time to fish for large, round-nosed whitefish the place called Tillabruaq gets filled with them as well as the entrance to Itqiliq. Nigliq river gets filled with nets all the way to the point where it begins. We do not go to Kuukpiluk in the summer months. Then we enter Fish creek and that is where hunting sites and cabins have been built. That is where they build racks for drying fish and for drying caribou meat. (Nuiqsut) (BLM 1998c)

That Fish Creek area is most popular fishing for Nuiqsut for the fall time. Summer time around Nigliq Channel. So it's most popular fishing. So if that's happened, if the oil -- if that bridge pipeline broke up, there will be more devastation on our fish out there, especially the seal on the mouth of the rivers. There's all kinds of seals out there, there's all kinds of birds. So if there's an oil pipeline break up on that bridge, boy, you're going to have -- devastate our wildlife out there. (Utqiaġvik) (BLM 2003a)

The reason I was disagreeing on the numbers is I have a campsite near the mouth of Fish Creek and I take my family there every summer, every spring, summer and fall. We geese hunt down there in the spring. We set nets in the summer. We hang fish to dry. All the time, we go caribou hunting for the prime caribou in the fall, the one that's -- that's the best time to get them, but during all those three seasons, I'm still hunting caribou, taking my family down. Now I've got my grandchildren I'm taking down this summer and we were down there a couple of years ago. A nice herd came through. We got a couple of nice bulls and I didn't see you down there and I'm just -- all these assumptions and these good numbers you're getting from a collar or two in the area, I just -- I just have to disagree with that. (Nuiqsut) (BLM 2014c)

The residents of Nuiqsut use Fish Creek in their subsistence activities. In addition Nigliq area is used extensively where they do their fishing and in the summer months when the fish enter it, fish nets can be seen all the way down. (Nuiqsut) (BLM 1998c)

We go here near the Kuparuk River and here along the Kikiakrorak and Kogosukruk rivers. That's where we go for furbearer hunting. If we don't see anything we'll go to White Hills. (SRB&A Nuiqsut Interview November 2005) (SRB&A 2010a)

[Speaking about the rivers he uses for subsistence hunting and fishing]: The principle one, of course, west of Colville that I used to pursue subsistence resources are Uglooktok (ph) River, Judy Creek and Fish Creek. Judy Creek. (Nuiqsut) (BLM 1998c)

What they said about fishing for whitefish at Kuukpik is true. While that is true, it is most true that another place where they fish for whitefish is Nuiqsaoruaq. You also know that from here all the way to the end of (?) those fishing for whitefish would fish from the frozen waters. (Nuiqsut) (BLM 1998c)

They'll go boating down towards the mouth of the river out to the delta at far as an hour out to the sea to get seals and things that are with animals or birds that are prevalent down there, but not old squaw ducks and those other little birds that were mentioned earlier. And sometimes when the route is good, they'll go to the Fish Creek and around -- and especially through the Nugaluk (ph) Channel for these things. (Nuiqsut) (BLM 1998c)

[The Teshekpuk area] has been used by subsistence hunters ever since he could remember. It's the area that when other areas within the close area of the villages like in Barrow, there's no game of any type, people usually go to the Teshekpuk area to harvest game that they don't have in the close proximity of various village. (Nuiqsut) (BLM 1998c)

Kowalski, Nageak, Obie (ph) all stated in the EIS that the Village of Nuiqsut hunt for fish and game at the Colville River. That is completely wrong because when the fish are there, all the way from where the boats are docking, that's down here. All the way down to the mouth of Nagaluk (ph) they put their nets. It's true that during the summer, that (Inupiaq), they put nets there, yes, but for whitefish, this is -- this Nagaluk (ph) River is what they use the most. And then if they cannot do it there when the bay opens up, they go through the fish screen and use that area also for fishing. The Ulutuooh River which is really close from here and it bends like crazy like a snake, there's no fishing there. They don't I fish there. It's the Fish Creek area is what they use so everything that has been stated in that EIS is completely wrong. (Nuiqsut) (BLM 1998c)

Another thing that we have been given as the point that we can hunt for moose is the area at the mouth of Anaqtuuq. We have been told that we cannot hunt for moose past it. We cannot hunt past it, we've been told. When the residents of Nuiqsut begin hunting for moose, they are not able to get a moose right away and very often get a moose right at the end of the moose hunting season. The village of Nuiqsut is not like Barrow. When you live on the coast, like Barrow, there is a lot of game to catch. You don't have to travel very far either to catch it. That includes the geese, and seals, etc. But when you live inland, like Nuiqsut, you have to travel quite a distance to the coast to hunt...The hunting grounds extend all the way to Fish Creek. (Nuiqsut) (BLM 1998c)

For some reason our caribou on the west side didn't come. They wintered, summered, and wintered again in Wainwright. So the pattern is changing, maybe because of the industry is expanding and that's how we look at it. Because all this west side is undeveloped so why is that when you're supposed to be there, why aren't they? (Nuiqsut) (SRB&A 2014a)

To set our nets we have a tool that is a 15 –20 foot stick with a hook on the end. We cut through the first hole and then drop the hook with a weight attached. We move to the second hole and pull the rope using the tool in that hole; then move to next hole and pull the rope again, until all the holes have the rope connecting them. The net then gets pulled into the water and lies under the ice. Everyday we have to cut through the ice by hand to check the net; the thickness of ice is about 2 to 3 inches. This is all done in the cold, no tents and no warm-up shack. It takes one person 1 to 1.5 hours to perform this

activity. The nets must be checked every day that takes about 20-40 minutes. Fifteen to 18 miles at 40 below and then finding one or two fish. It isn't fun after a while.

You can see the frustration; frustrated not only with industry, but the State and agencies, because, "How could this be happening to us?" We used to be a thriving fishing community. Now all of a sudden we get two to three cisco. It is very frustrating to an individual and as a family as well. You spend time and effort and money. The average family will set two nets, sometimes three nets to try to make up the loss of one net. It takes a lot of money to fish; prepare the snowmobile, buy gas and nets and you have to spend time away from your family and home. Our diet consists of 30-60% Arctic cisco. (Nuiqsut) (MBC AES 2004)

I just wanted to add in the 25 years I've been going to Fish Creek with my family and seen the caribous come and go, I've gone up the river all the way up to Judy Creek seeing caribou. I even got a couple of reindeer one summer and all these groups, even small groups, two or three, even larger ones, I've not once seen a collar on any one of them in the 25 years I've been hunting in that area and it scares me to think that the next generations with this GMT1 going up, are not going to be able to experience the good hunting that we have in the Fish Creek/Judy Creek area and I just wanted to say that now while I have a chance before this thing is over and I just hope you folks take that to heart if you have children or grandchildren, I would hope that you will listen to what's coming in the future. (Nuiqsut) (BLM 2014c)

3.4.3.2 Noise, Traffic, and Human Activity

They're too far out, too far from the rivers. Gotta be lucky [to get them] when they're migrating, but they never came through last year. Now they're over toward Atqasuk. There's none over there. People gone to Umiat and back around. Like I said they were at the dump for months. Traffic, when they start putting in all those ice roads, constantly going back and forth. The roads and stuff scare them off, the congestion and we have to go further to get caribou. Three years ago people were going 75 miles just to get caribou and that's ridiculous. Just the oil companies, the ice roads. I heard that's what's been keeping them away from town. Go back and forth on the ice roads, it's putting a hamper on it. Once the ice road gets built there's equipment and congestion, seems like they go further [the caribou]. (SRB&A Nuiqsut Interview March 2009) (SRB&A 2010b)

Well, the wildlife, I think it's just the timing of the studies, the month of the studies has an impact. In the summer. Even the wildfowl notice, starting in May that's when they're really active doing their studies and that's a prime time when our local folks are trying to harvest their meat and they're being interfered by their summer activities. That's what it is. Just the changing of the pattern of their studies. (Nuiqsut) (SRB&A 2010b)

When I went camping last year, I waited 3 days for the herd, to have a helicopter to divert them away from us. When they were diverted, we went without. We have had to deal with harassment. We had overflights three times while trying to cut the harvest. It is disturbing. The next year we had a helicopter do the same thing, but it was worse. They were carrying a sling going from Alpine to Meltwater, another oil field. It went right over us three times. The herd was right there, and it put us at risk. I had my two young sons with me, and it made me very angry. What am I to do when the activities that have been handed down for thousands of years to our people are being changed by

the global need for energy? (Mayor Rosemary Ahtuangaruak, USDOI, BLM, 2004) (Nuiqsut) (MMS 2007a)

That would be a lot of people if they built the road, like the haul road. The haul road [was] not supposed to be open but for commercial drivers. But now it's open for everybody. Every year they go back and forth. Trucks, cars, everything. [There are] more guide hunters. (Nuiqsut) (SRB&A 2012)

We experienced four years of no caribou with -- because of aircraft noise, mostly with helicopters and our migration - Western Arctic Herd that came from the south was diverted inland to where for four years, we had basically no caribou and the caribou that we had were… Real skinny, no fat caribou and it was four years, you know, even -- even we got so desperate for caribou meat, we had -- some people went up to Icy Cape, even myself, and also we went up to Wainwright just to harvest caribou. (Point Lay) (BLM 2014a)

*Caribou hunting I see a lot of helicopters going back and forth and might change the migration of the caribou. Last year I was out hunting for two weeks and only got four caribou because of them. I don't know what they were doing. I didn't make them out but all the caribou were gone. (*Barrow active harvester; Experience timeline: 2006; Experience location: by Meade River. SRB&A Interview 2007) (SRB&A 2009)

They claim that the caribou herd is healthy with numbers, but the only caribou I got last year was bad. Twenty caribou were harvested in October when we could access areas not accessible by boat. Seventeen were sick. When I went camping last year, I waited three days for the herd, to have a helicopter to divert them away from us. When they were diverted, we went without. We have had to deal with harassment. We had overflights three times while trying to cut the harvest. It is disturbing. The next year we had a helicopter do the same thing, but it was worse. They were carrying a sling going from Alpine to Meltwater, another oilfield. It went right over us three times. The herd was right there and it put us at risk. (Nuiqsut) (SRB&A 2003)

Last winter, nobody caught any caribou within 100 miles of this town because they were doing exploration on both sides of Teshekpuk and on the east side of Ikpikpuk. Last year, not a single one came through. They were all herded from the Ikpikpuk to Teshekpuk area toward Nuiqsut and Nuiqsut hunted them all winter. In Prudhoe Bay there was a union agreement that they could hunt wherever they used to - Nuiqsut - I'm using Nuiqsut as an example because they're right smack in the middle. This pristine land has been their hunting grounds. It starts from onshore and goes off. My dad was at Beechey Point. He was born there and grew up there. They used to pull up flounder and sole. The last time they tried that, 10 years ago, they hardly pulled up anything and they were very scarred and skinny. (Barrow active harvester; Experience timeline: 1996-2006; Experience location: Teshekpuk, Ikpikpuk, Wainwright, Atqasuk. SRB&A Interview 2007) (SRB&A 2009*)*

Don't follow the river. Because that is what they are doing. That is where the hunters are. That plane I wish and the chopper I wish they would reroute instead of following the river from Umiat. (Nuiqsut) (SRB&A 2010b)

It comes back to my whaling experience. Be quiet on the ice. No drilling on the ocean. It will affect us as hunter-gatherers. The noise drives the animals away. (Wainwright) (SRB&A 2009)

I heard they are always counting the caribou through helicopters. One time before Alpine had happened, they did a lot of caribou stuff by Piniqtuk and they noticed they used chopper and planes to scoot them away from the area where they planned to build Alpine. Then they say helicopters don't interfere with the migration. I think they always be together when they start coming in, the main herd that stay together. Then one lone caribou [makes it near Nuiqsut]. We always wait long time for caribou. Then July we're hungry because we got one in June, waiting for August. How we gonna get the meat from the store, it's expensive? $16 a steak. (Nuiqsut) (SRB&A 2010b)

[I] believe all of our caribou migration routes during the time that they are in their seasonal migration turn that those, those drill sites need to be turned off to allow our people to go out after them. Sometimes when you have too much loud noise during the caribou, they'll change their migration route and looking at the area of impact that our caribou are running through all that area I believe our caribou migration route should be protected. It needs to be logged and protected because of the decline in caribou. That's a resource that we use here every day on a yearly, we are every day, all year, 24/7. (Point Lay) (BLM 2019d)

Well the planes do come, but it don't scare them. No, the helicopters are the ones that scare the caribous. (Nuiqsut) (SRB&A 2015)

Hunting caribou; when we hunt caribou on the tundra where there are no trees, you've got to be very unobtrusive, there's nothing to hide behind. We were up at our camp, and this has happened many times, were sneaking up on the caribou, and over a hill, bingo, there comes a helicopter; there goes the caribou. Same place, different time we went up there. There are signs all around that the caribou were there, but then there are ruts, deep tracked ruts in the ground where there have been vehicles, tracked vehicles. Caribou don't go where they've been chased out of. Over a couple of years, they change their activities. Same area, they have restrictions on activities, and some drivers didn't follow there where they were supposed to, and some broke through the river and spilled oil and left various foreign objects and never cleaned it up. That's part of why there's no fish there. About this time of year we'll take off on our snow machines and go wolverine and wolf hunting. Where do we go hunting? We go right here at Cape Simpson but there aren't going to be any out there. And what about all the money and time it takes to do this? I'm debating if it's even worthwhile. (Barrow active harvester; Experience timeline: Since 2000 and ongoing; Experience location: Chipp 6. SRB&A Interview 2007) (SRB&A 2009)

These caribou been so far out, so I started using four-wheeler [to hunt]. All these caribou start being away from the river. Last year, every time there's caribou, [they are] away from the Colville River, about five to six miles. Some are close to the river sometimes....We got a cabin down here and caribou are way, way out here instead of close to the river. There's too much traffic. Airborne [traffic] is one of the problems we had. That really affects our hunting. (Nuiqsut) (SRB&A 2010b)

[I caught] less [caribou compared to the previous year], same thing – [it was difficult to hunt] with the helicopters and low flying planes. And there's actually rolligons that go, when we go up and Puviksuk there's one really big hill and we could see a whole bunch of rolligon trails. There were hardly any [caribou] up there. (Nuiqsut) (SRB&A 2014a)

Where the hunters are going out 30 miles to get caribou and a chopper that's doing study of the area tested by the industry, that industry will not take terms or responsibility for that impact. The State of Alaska, same thing, as well as the federal government. There are no mitigation impacts to these hunters, so therefore, you have a diverted caribou as well very interfered and upset hunters. It's been like this for many years. (Nuiqsut) (BLM 2004d)

Like I said I wasn't having any luck in this area [near Fish Creek]. I think it is because they were looking at GMT1 [surveying the area]. I got satellite collar imagery, and it is really familiar to – the caribou avoided the GMT1 area. They went around, it is because they are doing a lot of surveys over there. Helicopters. I've seen a lot of choppers inside Fish Creek. I ran into BLM out there. [The exploration around] GMT1 and Fish Creek are diverting the herd around their proposed development. The caribou are going south. A lot more activity this year, close to 1,100 Conoco Phillips helicopter flights. If you take a look a Cassin 6 and Cassin 1, those are wells, there is a big resemblance as to how and where the caribous are going. It has gotten worse. I can see with the caribou are not coming into this area. During the summer Conoco did a lot of studies over there. The wells, hydrology, UAF [University of Alaska – Fairbanks] is down there at Fish Creek, studying the fish. (Nuiqsut) (SRB&A 2015)

It was sort of like different from last year, for some reason they decided to go towards west side Harrison Bay area. That's what happens when they were being crowded by planes and helicopters. I think they [industry] are starting to understand that during the migration of caribou, they're staying away [from those areas]. That was some difference we finally saw. Maybe that's the reason they [caribou] start coming through town. (Nuiqsut) (SRB&A 2015)

Also the helicopters – they are scaring off the caribou. We had to call the people around here and tell them to hold off the flight. They are always flying their helicopters around here [west of Nigliq, around the CDs]. I don't know [what they are doing] but they are from Alpine. Always out there from – well, out there year round. Well, summer time is the worst. They get water samples and stuff, and when it comes June for breakup, they always want to get water samples rushing from the rivers. It's already broken up and too much water. They always try and let the residents make money by guiding [them to those areas] but there is no way to get out there [poor conditions]. Planes weren't the issue this year for me, just helicopters. It was really affecting other hunters. (Nuiqsut) (SRB&A 2015)

Helicopter traffic. There was a herd that was coming from the east side going west and we were at our cabin on Nigliq Channel and when the caribou were coming in [closer to the cabin], a chopper flew over them and turned them around. At that time we were hunting for the blanket toss. Just when they were coming towards us, a chopper flew up and went straight towards the caribou. It was a blue and white one. My uncle was angry; he called them. He was so upset. It went right straight towards the caribou and it turned them around. That was in June. Just mostly helicopters. This year there was a lot of them. My uncle was sure mad when those got diverted. That chopper pilot knew it too. No they didn't care. No regards. A lot of people talk about that. Town folk say a lot that the chopper activity was really bad. (Nuiqsut) (SRB&A 2015)

They [oil company personnel] are all on this side of the river. If they put CD5 there it would be a big problem. That is right around the area that we hunt. (Nuiqsut) (SRB&A 2015)

I didn't notice at Fish Creek actually surveyors but they were walking. And they were just being picked up by helicopter at the end of the day those surveyors walk a good 30 miles a day. I see some people walking over there. A lot continuously all summer. (Nuiqsut) (SRB&A 2015)

A lot [of traffic] continuously – all summer long. It's the surveyors. They're surveyors out there. I don't know who they are, but all summer long they're just there. I think they're the ones – I don't remember the color – but I think it's the same helicopter that takes off and lands at Alpine all the time, but they're dropping off these equipment for surveying and bridge planning – whatever they're planning – to make these bridges for these roads. Basically at Miluveach, they're really utilizing that area to drop [supplies] off. They just so happen to utilize the area where the caribou are. Wherever they're setting their camps and drill sites is the best route [for the caribou]. When these animals travel, they travel on the lowest slopes possible and the most level, and where these people want to drill just so happen to be on a [migration] route. Right at the creek, and this is a flat area. You can see clearly for at least four miles; it's so flat, you can see as far as you want – but they basically use these two mounds for grazing areas; they're the feeding grounds, and when the disturbance comes they force them to go to Pisiktagvik and then Alpine. The helicopters are flying from Northstar to there. And from Oliktok to Northstar Island, the offshore drill rig. Every time that helicopter came in they just scare them around and the caribou move to where they left. (Nuiqsut) (SRB&A 2015)

I grew up as a hunter. I knew, back in the mid-40s there was not that much game at that time. In the late 40s the caribou showed up, so that's what we hunted. In Pt. Lay we did not hunt whales. The caribou would be real close, two to three miles. They'd come from the south and go north. Throughout the 50s it was good. People didn't have to worry. Going into the 70s and 80s, that's when we noticed the pattern of the caribou had changed. They came from the North. They went further inland. It wasn't just oil, but more snow machines. I think a lot of it is our own fault. We were always told not to shoot the first group that came through. Any disturbance to the first herd, whether it's hunting, snow machines, or any kind of activities, the first part of the herd determines where they go. I know this. We cannot force the animals to change their path. Not just the caribou. We hunt beluga by Pt. Lay. If we make too much noise, my dad says we should wait for them, instead of looking for them. The outboards will change their path until they get by Icy Pt. I strongly believe any kind of disturbance will change the animals' ways. The animals know when they travel year after year, where to avoid. The beluga, caribou, ugruk. If you disturb the first bunch, you can bet there will be hardly any ugruk. When the barges go through, they make a lot of noise. When the DEW lines first came in there were a lot of barges. We couldn't hunt beluga there. We had to go 30 miles south. We know now if there's no disturbance we should just wait for them. (Wainwright) (SRB&A 2009)

Now for the trapping people that are here -- where they make their livelihood -- they're going to not be able to trap at all in those areas that are designated for exploration. We know this for a fact because we're not able to trap around Prudhoe or any areas now being explored. Raymond Neakok. (Utqiaġvik) (BLM 1982)

It takes a long time for the tundra to grow all the way back. It will leave a mark. That is why they invented the rollogons to try and avoid the tundra damage. The rollogons will leave a mark in the tundra after the snow melts. (Nuiqsut) (SRB&A 2012)

I would say so [that TAPS has made subsistence more difficult], I have heard it mentioned from other elders and my grandparents. The people and the wildlife being displaces. Historically the Kuukpik people were nomadic along the coastlines. From the Brooks Range to the coast and east to west. We are settled now. We are here. We have the village here. Some of the campsites. I have heard of a couple of elders who were born in the Prudhoe Bay area. They grew up there and were raised there and tried to get allotments and somehow there was trouble with them doing that. Staking claim to those areas. I know that there is at least a family to two that tried that. I don't know if they were successful. Here I mean people aren't used to staking claims for their area. Game was everywhere. There would be 100 families who would harvest. You didn't need permission from my neighbor. You could camp and fish where you wanted. It was shared land, shared waters. Now we have to stake claim and tell people when they are trespassing. We still do that today; a lot of our campsites are shared. No one is ever really denied. (Nuiqsut) (SRB&A 2012)

3.4.3.3 Infrastructure

Pipeline has really changed our caribou hunting because Porcupine Herd used to cross the river, cross the road this way and come out to our Anaktuvuk and Anaktuvuk Valley from east, it doesn't happen no more. Once they build a road up here from -- from Alpine area to -- all the way across to NPR-A, once they build a road it's going to change the subsistence just like every one of those coastal villages, if they build a road that's going to change their subsistence. (Anaktuvuk Pass) (BLM 2003c)

Pipelines; we have seen caribou turn back from pipelines because they [caribou] see a flash from the pipeline. They used to go to Helmericks' in the thousands, not any more. Maybe two or three or less. Especially females with young used to go down there. Westside at Kugaruk, Harrison Bay, there are caribou there. You always see them. We had to go out to the ocean and to Kugaruk to catch them. (Wainwright) (SRB&A 2009)

That migration pattern has gone southward. We hardly see the western herd this year. The Porcupine Herd, haven't seen them lately. We used to see thousands of Porcupine Herd coming through the villages, but we haven't seen those for a number of years and since that pipeline was built, that changed the pattern of the migration of the caribou. [We are] mostly harvesting caribou from Western or Central Herd. (Point Lay) (SRB&A 2014b)

The impact I would say would be the infrastructure. Caribou they like the pads because it is a sanctuary. They know they are not getting shot or hunted there. We spent a whole day just waiting on them to [cross over]. Right in Nanuq area. Some scattered caribou and wasn't large or significant. Three there, four there, one there, what have you. (Nuiqsut) (SRB&A 2014a)

I want to elaborate on ice roads that are used to connect ice pads. There were two pads that blocked the route to Kuupik from Oliktok to Amoniktuk through July. Usually these pads are completely melted and we can hunt seals. Generally we can take our boats and go across our hunting grounds but with this big iceberg in our way, we had to work our way around. Usually we have complete boat access at the beginning of July. Also when the cost of gas was $4.00, we used to go by 4x4 in order to travel to Oliktok to buy cheaper gas. When construction was taking place, they would push the snow into the roads that we traveled making it more difficult to travel. Within the Nigliq Channel

we had to follow 7 to 11 miles of ice when we went out seal hunting. (Nuiqsut) (MBC AES 2004)

You present the socioeconomic aspects and the connection to subsistence, which they really understand and which I dealt with during my terms as mayor here sometime back. So I think, no question, helicopters, air traffic is the biggest disruption. So it seems almost like a no-brainer to be in support of the road project there and by the way, that spur road for Nuiqsut that Kuukpik had been -- their company had been working on was just permitted here a day or two ago. So that's what the community wants and I just want to echo and support their desire to be able to live off the land, considering development is all around them. (Utqiaġvik) (BLM 2014b)

Before I would go east of here but there is so much activity going on that I don't hunt that way anymore. Occasionally if I miss one I don't want a stray [bullet] going that way. We are allowed but most people don't hunt up there. (SRB&A Nuiqsut Interview March 2009) (SRB&A 2010b)

While I -- you know, there could be impacts on wildlife through the area. I kind of repeat that the major impact will probably be on people. As you can look at the map, Nuiqsut is nearly completely -- will be completely nearly boxed in with the completion of this project. There's a huge area to the east that they don't use to hunt in any more because of all the development over there. The Alpine development interferes with people going north. The first two satellites that will be put in will only make this worse; it will further interfere with people trying to go to the north and the later developments will kind of block them off to the west. So that doesn't leave them many more options, particularly if there are, you know, more satellite fields out there after these ones are developed. (Nuiqsut) (BLM 2003b)

...it's to look at what happened in Ukudu (ph) Bay in Kuparuk because that is a cumulative impact. The people of Nuiqsut don't use that area like they did in the past. And, you know, there is research that shows that. And what's happened there is going to happen here. So the people who use that area are fearful of that. So that is going to be an impact to all of us. You know, whether industry is very -- you know, you try to do it the right way, people aren't going to want to go hunting there. You might have access or the right to go hunting there but it's not -- you know, it's not going to be a favorable place because you let -- how many people from Nuiqsut want to go back and hunt in Kuparuk with all the pipeline, the roads, or go fishing near Alpine? You know, it's not a preferred place to go. And that's exactly what's going to happen in this area as well as -- the more it moves to the left, it's going to happen. And people are nervous about that, you know? People are. I hear people say, you know, I'm going to go out now before industry comes and enjoy it as much as they can before it comes to our area. So that, you know, I see that as something I want to have on record. (Utqiaġvik) (BLM 2004f)

We're getting to go further and further to catch caribou. Because their route has changed. They're not in our backyard. Now I have to go to other communities' backyards, like Anaktuvuk, Atqasuk and Barrow. Caribou you have to go out further because of seismic testing, helicopters, small aircraft. They'll be flying those choppers again. They'll be doing it soon when they gather information like when the ice goes out or when they haul their contractors out. This scares the caribou. What happens when the belt breaks on your snow machine? I walked 10 hours home once. (Nuiqsut active harvester; Experience timeline: since 2001 and ongoing; Experience location: Nuiqsut. SRB&A Interview 2007) (SRB&A 2009*)*

Yeah, we can't go near the pipeline. You can't shoot near the pipeline. That's restrictive to the hunters. They always warn us not to shoot toward the pipeline or cross under the pipeline. So if the caribou are on the other side, they don't want us to go near it. You have to get permission from Conoco Phillips to go there. (SRB&A Nuiqsut Interview May 2010) (SRB&A 2010b)

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The pipeline. They say we can't hunt near the pipeline; most of the caribou are near the pipeline. We can't hunt with a certain miles of the pipeline. I think it's around here. We went through but they say if we catch caribou in there and get caught they'd give us a fine. (Nuiqsut) (SRB&A 2010b)

If they start making pipelines on land, we have to go twice as far. It's scary. It's an obstacle to us. (Barrow active harvester; Experience timeline: 2006; Experience location: Barrow. SRB&A Interview 2007) (SRB&A 2009)

They're too far out, too far from the rivers. Gotta be lucky [to get them] when they're migrating, but they never came through last year. Now they're over toward Atqasuk. There's none over there. People gone to Umiat and back around. Like I said they were at the dump for months. Traffic, when they start putting in all those ice roads, constantly going back and forth. The roads and stuff scare them off, the congestion and we have to go further to get caribou. Three years ago people were going 75 miles just to get caribou and that's ridiculous. Just the oil companies, the ice roads. I heard that's what's been keeping them away from town. Go back and forth on the ice roads, it's putting a hamper on it. Once the ice road gets built there's equipment and congestion, seems like they go further [the caribou]. (Nuiqsut) (SRB&A 2010b)

Actually, with the Meltwater road on there, the caribou are getting lost. They don't know where the migration route is. We've got the Prudhoe roads over there, but the Meltwater comes farther down, and in the caribou's mind, where's the direction? We used to have the caribou coming into town, the migratory route [used to] come in, but now they don't do that anymore. (Nuiqsut) (SRB&A 2014a)

Although we will benefit for our economics, but we will benefit very little for our subsistence because of the pipeline and because it will up affect the caribou migration, it will displace -- may displace some of the nesting areas of the waterfowl, shoreline birds, that she mentioned from Cape Halkett around the Harrison Bay to Fish Creek and the Colville River delta. (Nuiqsut) (BLM 1998c)

Another area that is no longer accessible is Uuliktuq. Last fall because ARCO made Uuliktuq inaccessible, it took over one week to haul two whales back at Cross Island. That has made things very difficult for us. As a result they were brought back through a big aircraft. Uuliktuq had always been a place where our people left their boats after whaling because of the ice that usually formed making it impossible to return by boat. That is why they left their boats at Uuliktuq. Last fall they did bring their boats back. Where are they going to leave their boats from now on if they are not permitted to use Uuliktuq which had always been used? Right now the way it is, they cannot leave their boats at Uuliktuq. (Nuiqsut) (BLM 1998c)

I've traveled the haul road in the fall time the last three years, and I see more and more outside hunters. When I say outside I mean non-North Slope residents. The caribou seem to be less since that's happening. (Nuiqsut) (SRB&A 2013c)

With the ice road and the diesel, when they make a road, it goes through the land. I know they try to be careful, but the land is ruined. (Barrow active harvester; Experience timeline: since 2000 and ongoing; Experience location: Around Barrow area; Ualiqpaa. SRB&A Interview 2007) (SRB&A 2009)

Within the city of Nuiqsut you see all the activity of Alpine. The caribou migration has really changed over the last two decades. Our subsistence users have to go further for waterfowl and caribou. We've experienced this both on and offshore. Development really affects our wildlife. Our subsistence users have really had to change the last two decades. Much further to go for harvest. (Nuiqsut active harvester; Experience timeline: 1987 and ongoing; Experience location: Nuiqsut. SRB&A Interview 2007) (SRB&A 2009)

And the ice road does. When they melt and all the snow is gone you will see the grass and it is dead and flat. I have no idea why… Probably no oxygen getting to the ground because of the ice… I think it must be from the weight of the ice too. It is heavier than snow and the trucks add pressure to the ground. (Nuiqsut) (SRB&A 2012)

… I think the gravel they have added on the tundra causes early thawing. But it is insulated by the gravel. At some point the gravel can sink and during the summer when it is hotter. She can only talk about Beechey point. She is going to give the young men a chance to talk about these topics. (Nuiqsut) (SRB&A 2012)

3.4.3.4 Contamination*

They can leak and you don't see that until summer. The caribou then eats the moss. You won't know they're sick until you eat them and they taste funny. I tried to go caribou hunting and there was a pipeline. I had to use twice as much gas to go around it. (Barrow active harvester; Experience timeline: 2006; Experience location: Barrow. SRB&A Interview 2007) (SRB&A 2009)

On- and offshore development are different. Onshore there is less chance for contamination because they can control it. We can live with it onshore and work around its effects on our seasonal activities. Offshore it is a hostile environment with moving ice and heavy seasons. It is very risky. If they invade our hunting grounds, that is not acceptable to us because of the risk. (Utqiaġvik) (Inc. et al. 2008)

I try not to hunt on Nigliq because a couple of them [caribou] hanging around CD4 have been sick – got pussy lungs and liver. They're abnormal. [Used to hunt near CD4] and every time I made my catch between here and Nigliq it was a sick one. (Nuiqsut) (SRB&A 2015)

Yeah, all of the caribou migrated through there. When I was a young man, I would wait for them there [near Fish Creek] with my uncle. Uncle used to say you go right at that point meaning at Nigliq. Used to be they migrated… even to Teshekpuk Lake. You know the caribou calving grounds, north of Teshekpuk… caribou kind of roam, up to the Brooks Range, up to Wainwright, this is the western herd…This is something else too. My own personal view is it because of the lights from the structures, the oil field

infrastructure, and the smell. The smell from Prudhoe Bay, you notice with the haze that comes in. Those caribou have a good sense of smell. (Nuiqsut) (SRB&A 2015)

With the ice road and the diesel. When they make a road, it goes through the land. I know they try to be careful, but the land is ruined. The tundra is affected which affects the wildlife. When I've hunted caribou and am skinning them, I've noticed the meat is yellow. I've had to leave it there. It was due to the mosquitoes or to contamination. Sometimes the mosquitoes are so bad there are nests under the skin of the caribou which turns the meat yellow. (Barrow active harvester; Experience timeline: since 2000 and ongoing; Experience location: Around Barrow area; Ualiqpaa (Walakpa). SRB&A Interview 2007) (SRB&A 2009)

And the only biggest problem I have with that is you have 3 million gallons of gray water you dump on the ground now. And when you look at 3 million gallons of, you know, sewage and dish wash water, and you leave it on the ground, it gets pretty dangerous for the fish. The ground is very flat. We live in a flat ground and all the water that is put on top of the surface goes to the rivers. It works its way to the rivers and to the lakes. When I was young and being taught how to fish by my uncle up at the Chipp River, one time one of us washed our hands in the dish wash basin with soapy water and we went down to the river and rinsed our hands in the river and for 24 hours we never got fish in our nets that day just from rinsing our hands in the river. That's how sensitive that Aanaaklliq that we catch, that white fish we eat. And you're looking at dumping 3 million gallons of gray water on the ground? (Utqiaġvik) (BLM 2004c)

As you all know we've had pollution that's been identified and that needs to be cleaned up, in part of the NPR-A I here's a rare potential pollution contaminating material that were buried by the Air Force, needs to be considered looking at too, the possibility of me whole Colville, cause of that possible of effecting all of our species, there's been some areas, you probably heard a couple, last year, they had found pretty close to over 30 moose carcasses that were unknown causes of death. And I'm kind of wondering if it's coming from that contaminated site. And these are some of the issues that need to be clarified before the proposed NPR-A lease. (Nuiqsut) (BLM 1997b)

The first cat train in the 1940s, from Barrow to Oliktok, they did not open drums with a bung wrench but with an axe; they pumped what they needed and just left them in the river or lake. That was how they worked when they first came here. (Nuiqsut) (ABR Inc. et al. 2007)

The ice trail they have is only one mile from our cabin and it goes over the river we fish in. That might be an impact for the summer. Lots of trash and traffic. We know which way the trail goes. We see it while we go for caribou. We see more trash on their trail. I've written to the Borough and BLM about it. Their rollagon trail from Barrow. In the summer it leaves marks even though they say it doesn't. After the snow melts you can see where they've been. They say there's no impact, but there is. (Barrow active harvester; Experience timeline: current; Experience location: Ice road from Barrow. SRB&A Interview 2007) (SRB&A 2009)

There are small creeks that tend to develop from an area where there's development. It gets higher, and from that high area, the small creeks tend to go toward the bigger river. And from the bigger river, out into the ocean. And one of the things he's concerned with -- that the water that the animals drink, the caribou and the foxes, the wolves, those

that are on land -- if that water is polluted, the effect on the animals would be such that it would affect the lifestyle of the North Slope people. (Utqiaġvik) (BLM 1982)

And, this waste material that has accumulated, is quite a bit. We've seen too many caribous that have wires on their antlers. Some of them just die because they just happen to have a couple of them right around their feet our their legs, and a doggone leg drops off. I mean, these are the waste materials that we would like to be protected from as human beings and also for our animals which can not protect themselves. (Utqiaġvik) (BLM 1982)

One drum diesel, five gallon motor gas, they were floating down the river. Some changes in the 40s and 50s, there were lots [of changes]from the Navy explorations. Some of the buoys were left behind before they clean up that area. The caribou changed, and everything changed with the caribou. Notice that, I trace changes back to that. That's what I know happened. From Umiat. I think it was 15 years ago [drums floating down the river]. They been cleaning up slowly, but they're still out there. (Nuiqsut) (SRB&A 2010b)

I don't know how many more sites inside the NPRA that you guys have but if you're going to be doing any kind of oil and gas those sites need to be cleaned so that they can be used later because those were original migration routes and this happened what, maybe seventy, seventy years ago, fifty to seventy years ago and they are still not cleaned up. There's still nothing done there. Um, when I traveled out that way maybe 2012, 2013 or 2012 there was a like a rut from barrels that were dumped there. I know that we're not part of the National Petroleum Reserve and we are looking for a water source. We cannot use these. This being one that we have because it had old metal and stuff dumped into it. I know that our waterways run all the way into this reserve and so Lapita is right. We need to be able to have these lakes open and protected for the water source. (Point Lay) (BLM 2019b)

In a sense, they feel like the oil companies are coming freely without rules or regulations guiding them, in a sense. These are things that were happening in state lands and one of the things that they saw the change in the environment was the development when they started going up toward Umiat to do their hunting in the summer and the fall time, they noticed that there was a lot of drums along the shoreline of the river that were floating down and sometimes, if they -- they found drums of fuel, diesel, white gas, gallons of -- one gallon and five gallons and this wasn't happening in just one season. It was a lot of things that were floating down and they think it was from Umiat because they started falling into the river from the oil -- whatever they did back in Umiat and I think they did a lot of things within that area. (Nuiqsut) (BLM 2014c)

Bilge water, that's a concern. We're totally against [drilling fluids]. Deck drainages, we're not that concerned about that. Blowout preventer fluid. When they were doing the Louisiana thing, it was a mud that thickened. All of this is alien to the area. I've heard horror stories about bilge water because it has other life in it. (Point Lay) (SRB&A 2011a)

That's going to be a massive problem, what they're putting back in the water after it's treated. Chlorine and caustic soda. They say it won't affect the water, but they don't know that. It removes the oxygen. What it does it kills the oxygen in the water, in the bottom. (Point Lay) (SRB&A 2011a)

If they're discharging, then let them look around first. There's always ugruks and seals that are curious and pop up to see what you're doing. A couple of ugruks keep popping up around us down at Omalik just to see what we're up to. We had four of them come up right next to the boat. I heard breathing and they went down. (Point Lay) (SRB&A 2011a)

Through krill and other small species, then to work their way up to larger species over time. Well the main thing I'm worried about is the krill and the small species. I'm not sure if that mud is going to be killing them off or poisoning them. Maybe they'll start feeding on the small particles on the mud that's being discharged. (Point Lay) (SRB&A 2011a)

We will have meetings and it doesn't change anything. Like at Umiat, they assumed 40 years ago that what we didn't know wouldn't hurt us but now it is all spilling out of the ground. (Nuiqsut) (SRB&A 2012)

It's just something we don't want to risk chancing losing. It's the lifestyle, the circle of life, you know. It's the stuff that they can spill in our water that will affect one animal and it's going to affect the other animal. And that's going to die off. Look, we are our own people. Without those animals, who are we going to be? (Point Lay) (Mikow et al. 2016)

I do not like it: that is the way I feel… They're coming into my backyard, and this is a very fragile ecosystem, and we hope we get a lot of migration, animals migrating from pretty much all over the world. They come up to go eat and reproduce in this ecosystem, and once oil starts coming in, it certainly would pretty much kill off all the krill. And that is probably one of the best areas to eat before they go back out. I think they eat a lot of krill to get fat and make their way back. We get all kinds of animals, birds, mammals, fish. (Wainwright) (Mikow et al. 2016)

3.4.3.5 Non-Oil and Gas Impacts

Fish and Game regulations don't help us. Moose season is too late so we can't get our boats upriver before freezeup. Guides and sport hunters from Fairbanks can fly in and get the moose we need for meat, especially now that we can't get enough caribou. (Nuiqsut) (Brown 1979)

Once in a while we get these private planes or…other people from the other major hubs flying up here and taking the scenery route, doing something, taking pictures I guess. Those ones we can't stop. They don't get out, because they're, they're just somebody who owns their own Cub and just go take a joy ride up here. But we try to tell the airlines and everybody in North Slope Borough to help us printing those ads, just like to the airplanes or the helicopters. They need to start honoring that no fly zone. (Point Lay) (Braem et al. 2017)

[There is] less of a migration every year, because of those guide folks over there. I think there are two or three guide folks, and they are starting to [hunt] over toward the Galbraith [Lake] area, and sometimes [they go] to Shainin Lake with float planes. So if the caribou are coming from the pipeline area, as soon as they come down the hill they shoot them, and send [the second group] over in another direction. A few might come [toward the village], but most end up in the western area. Some [caribou] might [make it to the village], but there are less than eight years ago when we had assistance from

Wainwright and Nuiqsut. The North Slope Borough chartered an airplane to get caribou down here; we had maybe 30 caribou for the whole community. Some years it gets to be that way…. Sometimes it would be super smoky, you can't see the mountains, and it plugs up the area. When [the smoke] gets just above the mountains caribou don't like [it]; I don't blame it all on guide folks. When there's forest fire smoke [the caribou] go [somewhere else]. It's always been smoky here. (Anaktuvuk Pass) (SRB&A 2013c)

Sportshunters. As a hunter we're already there to harvest game. Caribou may be coming toward us, and helicopters or small planes with sport hunters fly in and divert the caribou from their normal routes. They use our cabins; help themselves; then they hunt the caribou and don't take the meat or the skin - only the trophy rack they want. It's going to have an impact over time if they keep it up. If they were limited to maybe 10 a year (now they're taking 40 to 50 [total] caribou a year) it would be devastating! I provide for a lot of families, elders and widows, etc. Since the state allowed sport hunting we're fighting for our rights. We need bag limits to keep below the harvest threshold. We need to set a certain limit -- do drawings on caribou hunts like they do on bears. With sports hunters it's an attitude of have at it -- sport hunters don't have to deal with our extreme environment and over harvest resources we've preserved for thousands of years. (Barrow active harvester; Experience timeline: 1997 and ongoing; Experience location: Hunting areas on the North Slope. SRB&A Interview 2007) (SRB&A 2009)

You know, that's— but that Haul Road is open to public, so there's so much hunters over there. Now the caribou herd comes straight from over there and I don't see them. Like Porcupine Herd that used to cross, now they make separate herd, Western Herd. We depend on Western Herd and Central Herd through fall time. Western Herd we depend on, but I heard they are decreasing now. 400,000 to 200,000. We are not the only hunters. There are so many hunters to the north of us. It is open to the public. But we can't control it anyway. But we do depend on the fall caribou herds. They used to come right through our valleys. I hardly see them anymore. Now they go 30 miles west of us, maybe same distance on pipeline over there. Anyway, I wanted to bring that up. I subsisted hunt all my life. We still depend on caribou herds, but when I say that, it also—airlines, there is no road here, only airlines come through here. So everything comes through the air. Very expensive. I save too much time at meetings... If you had to pay, that's what I witness. I have to pay $10 or more a gallon for gas, $21 for a quart of oil. Some young people or some people don't have a job. They can't afford it. White gas, $11-$15 a gallon. People don't have no job. It is hard for them. You know, I just want to bring that up. I witness that. (Anaktuvuk Pass) (BLM 2018a)

Sportshunters. As a hunter we're already there to harvest game. Caribou may be coming toward us, and helicopters or small planes with sport hunters fly in and divert the caribou from their normal routes. They use our cabins; help themselves; then they hunt the caribou and don't take the meat or the skin - only the trophy rack they want. It's going to have an impact over time if they keep it up. If they were limited to maybe 10 a year (now they're taking 40 to 50 [total] caribou a year) it would be devastating! I provide for a lot of families, elders and widows, etc. Since the state allowed sport hunting we're fighting for our rights. We need bag limits to keep below the harvest threshold. We need to set a certain limit -- do drawings on caribou hunts like they do on bears. With sports hunters it's an attitude of "have at it" -- sport hunters don't have to deal with our extreme environment and over harvest resources we've preserved for thousands of years. (Barrow active harvester; Experience timeline: 1997 and ongoing;

Experience location: Hunting areas on the North Slope. SRB&A Interview 2007) (SRB&A 2009)

What I've noticed over the years, you know, we were taught by our elders to let the first herd go, the first bunch needs to go to make the path. Nowadays, once they hear about caribou, boats go out and they shoot whatever comes through. So we're kind of losing our -- what our elders have taught us to do. Some of our young hunters aren't allowing the herds to go through like they're supposed to and we can't force them. We can only tell them. (Nuiqsut) (BLM 2014c)

[I noticed] campers out there – other people, not local. Most people seen them with their loud jet boats and stuff. It was upriver somewhere, past Ocean Point, by Chandler. Like, I don't know how many miles, but somewhere around there, because when we were camping they were right there. Lot of noise, you could see caribou out there scouting on the hills, so they could hear the noise. The jet motor was loud as heck, definitely scared like three caribous away. (Nuiqsut) (SRB&A 2014a)

[There are] more activities. Planes [travel]back and forth [in the] springtime and summertime. That's when the people are hunting from the plane. [They come] from [the] Bettles area. [There is an] airstrip about 25 miles [away] and [people illegally] catch [caribou] down [near] Bettles. I called down Bettles and said "watch out for that plane, it's got [illegally caught] caribou". [There are] more guide hunters down there now, about 15, 20 miles towards Galbraith[Lake]. It's a long time [that they've been doing it]. They gave them permission to do it down there. We hate them though. They give out permits to make money. What do we get? Nothing. (Anaktuvuk Pass) (SRB&A Unpublished)

3.4.3.6 Legal or Regulatory Barriers

My concern is stray bullets. When I'm out subsistence hunting, I'm used to having a 50 mile area to myself. If there are 10 to 15 people in that area, that is crowded. I don't want to accidentally shoot someone. What if there are people on the other side of the hill and I don't see them? (Barrow active harvester; Experience timeline: 1990s; Experience location: Chipp River area. SRB&A Interview 2007) (SRB&A 2009)

Winter time we'd go toward the west side, because the caribou are coming in from the west, so over by Fish Creek. We'd be on the west side. All the way back to Fish Creek. The caribou come in from the west. The caribous are coming west from the coast to here and out in the Fish Creek, CD5 area. Caribou hunting in this area is tough, because most of these areas [north and west] are closed. You have to have a permit to go on CD4, Alpine area, so we go more on the west side. [We start hunting by snowmachine] winter time, somewhere around November. (Nuiqsut) (SRB&A 2016)

In addition, despite the relatively benign impact of the TAPS itself, there have been negative impacts that are not associated with TAPS operations along the Right of Way such as stressed public services and sport hunting pressure. The Borough is saddled with some of the TAPS corridor public services and the Mayor went into great length in describing these. Providing these services in a remote area that is devoid of permanent Borough residents is costly and difficult in times of shrinking Borough revenues. And when it succeeds in delivering these services, it seems only that it increases the influx of outside visitors traveling along the Haul Road who need even more support. So this is an undesirable feedback, effect, the more support we give to

the Haul Road corridor, the more people use it, the more people who use it the more support they need. In addition, some visitors use the Dalton Highway and the associated airstrips to exert sportshunting pressure and produce other negative impacts that are not associated with TAPS operations. (Utqiaġvik) (BLM 2002)

We were able to hunt where the pipelines are and stuff. But now it's all built around there and our hunting lands is being diminished because of the pipeline then the oil field productions that are being up. And now I can't even go hunting over there 'cause I don't want to get in trouble for hunting near pipelines or where people are working. And even though there's caribou or animals around there, which I know I can go get, I don't go around those areas. (Nuiqsut) (Brown et al. 2016)

Beyond the dangers associated with the Haul Road travel are impacts to subsistence can be linked to that highway. While by comparison under normal operating conditions, the pipeline's impact are somewhat constant and manageable. The impacts of the Haul Road are largely dependent on traffic levels. More traffic generally means more impact on wildlife and to the North Slope residents. Since the opening of the Haul Road to the public subsistence hunters in Anaktuvuk Pass and Nuiqsut have noticed a decrease in the availability of caribou near their villages. Sport hunters and game guides using aircraft and off road vehicles cache supplies and use the road as a jumping off point to reach vast areas of the North Slope traditionally utilized only for subsistence by these and other communities. Competition for resources, disruption of subsistence activities and non-subsistence hunting practices which deflect animals from traditional subsistence harvest areas are a major concern. Without mitigation, these impacts will sure increase with the increasing traffic on that road. This is a very serious concern for those residents and more focus should be placed on scientific study and mitigation measures to address the village concerns. The village concerns of Nuiqsut and Anaktuvuk Pass. (Utqiaġvik) (BLM 2002)

Another big concern I have about any of the Plans is, if you build an industrial road within NPR-A, people are going to find a way to use it. You look at the Dalton Highway; when that was first built that was an industrial road and it was only going to be used for industrial purposes. Today it's a public road. And we have issues there where people -- we have competition for resources: sport hunters, recreational people, tourism, all that stuff is happening. And they want to even make it more accessible for people to hunt from that road. And if you build a road into NPR-A, people are going to come. Whether they say it's an NPR-A -- or an industrial- only, it's going to change. I just know it is because that's what happened in the past with the Dalton Highway. (Utqiaġvik) (BLM 2004a)

Yeah right now it is difficult to go to Alpine because they have a buffer zone in that area where we can't enter within two miles of buffer zone and that impact the hunters too. Most of the time they used to be a lot of caribou towards Alpine but that has changed a lot. Too many [regulations]. (Nuiqsut) (SRB&A 2014a)

3.4.3.7 Safety/Security Concerns

Yes, [ice road activity] affects me. It makes me nervous at the same time. I don't like to shoot my rifle towards this. There's an ice road southwest toward CD5; that makes me nervous. I know there's traffic out there. I don't like to shoot my rifle toward southwest and even if I try to shoot that caribou, pointing my rifle toward southwest there's traffic, caribous, tracks, rolligons, you name it, it's out there. That scares me, makes me

nervous. I always thinking about shooting my rifle northeast because there's less traffic. More traffic going southwest. On facing southwest there's more traffic. That make me nervous, super. There's people out there just traveling. They're walking sometimes, doing seismic. October, November, December. Rolligon, cat train. I look with my binoculars and see people walking. (SRB&A Nuiqsut Interview March 2009) (SRB&A 2010b)

And a lot of caribou this year was towards the Alpine side so I couldn't shoot or anything because the drill rigs and the pipeline there were very few on this side….I just don't shoot towards the pipeline. I'm not taking that kind of risk. (Nuiqsut) (SRB&A 2010b)

We don't go down that way to caribou hunt because of the pipeline in there; it is a big obstruction. A lot of times they [caribou] are on the pipeline side and we don't shoot. They [industry] tell us it is OK to shoot, but common sense says not to shoot into pipeline! (S.R. Braund and Assocs., 2003, Field Interviews, USDOI, BLM, 2004) (Nuiqsut) (MMS 2007a)

Yeah right now it is difficult to go to Alpine because they have a buffer zone in that area where we can't enter within two miles of buffer zone and that impact the hunters too. Most of the time they used to be a lot of caribou towards Alpine but that has changed a lot. Too many [regulations]. (Nuiqsut) (SRB&A 2014a)

We get these fliers in the mail about Alpine safety and it talks about using firearms around pipelines and all that other stuff. ConocoPhillips is always stressing that, so it kind of scares us off a little bit. I don't go over there [toward Alpine]. (Nuiqsut) (SRB&A 2014a)

My concern is stray bullets. When I'm out subsistence hunting, I'm used to having a 50 mile area to myself. If there are 10 to 15 people in that area, that is crowded. I don't want to accidentally shoot someone. What if there are people on the other side of the hill and I don't see them? (Barrow active harvester; Experience timeline: 1990s; Experience location: Chipp River area. SRB&A Interview 2007) (SRB&A 2009)

Yeah, we can't go near the pipeline. You can't shoot near the pipeline. That's restrictive to the hunters. They always warn us not to shoot toward the pipeline or cross under the pipeline. So if the caribou are on the other side, they don't want us to go near it. You have to get permission from Conoco Phillips to go there. (SRB&A Nuiqsut Interview May 2010) (SRB&A 2010a)

Yes, [ice road activity] affects me. It makes me nervous at the same time. I don't like to shoot my rifle towards this. There's an ice road southwest toward CD5; that makes me nervous. I know there's traffic out there. I don't like to shoot my rifle toward southwest and even if I try to shoot that caribou, pointing my rifle toward southwest there's traffic, caribous, tracks, rolligons, you name it, it's out there. That scares me, makes me nervous. I always thinking about shooting my rifle northeast because there's less traffic. More traffic going southwest. On facing southwest there's more traffic. That make me nervous, super. There's people out there just traveling. They're walking sometimes, doing seismic. October, November, December. Rolligon, cat train. I look with my binoculars and see people walking. (Nuiqsut) (SRB&A 2010b)

3.4.3.8 General Resource Availability

And hearing that this impact is going to be more and more and more each year and each time is telling me I have to try 100% more harder to get food on my table. And I just keep wondering, how am I going to survive if these animals are being impacted? What is it going to take for me to make a supper? What is it going to take to find something to eat? And the animals that I depend on are being impacted and these are things that I depend on daily. And I just want you guys to know that subsistence is a big thing in my life and that's what I depend on each day to survive. (Nuiqsut) (BLM 1998c)

Go out further to get caribou. Gas costs more, when we first got here, we could walk across the river and get caribou. In summer we used to get lots, now only ones that come in are from the West side. (Nuiqsut active harvester; Experience timeline: Since 1998 and ongoing; Experience location: Nuiqsut. SRB&A Interview 2007) (SRB&A 2009*)*

So I have lived there and I'd like to know -- this is about the hunting area or fishing around Nuiqsut, especially on Fish Creek area. There's a lot of fish out there, especially Nuiqsut residents had used that for subsistence for more than thousands of years. Also around the east portion on this land where the Arctic ciscos are coming in through all the creeks over here. I fished with my mother for -- ever since I was a little boy. So there's hardly any Arctic cisco nowadays that used to be like 30 years ago. So ever since all this activity start happening around Alpine, the Nuiqsut have been impacted so much, by 100 percent, because all the birds that are around this area, they're nesting all over because I had experienced that before. I used to get a lot of Arctic cisco when I lived -- was a little kid with my mother, by hundreds and hundreds, and right now what my mother have been telling me, there's hardly any Arctic cisco nowadays ever since the Alpine has started about a few years ago. (Nuiqsut) (BLM 2003b)

We have to protect all of the moose as well. There's a lot of moose that come in and out of the National Petroleum Reserve all over and we're starting to see change in patterns of migrations and birds and in caribou and in moose. We've seen owls that never came this way, now they are migrating this way more and more and I know some of that might be due to the fire that they had down in the Brooks Range on the other side but we know that our animals are always coming this way for protection, same with your muskrat and our large squirrels. Our (Chikshukpuk? 37:24.19) is what we call them. They are starting to move and change their routes where they usually be. They are starting to spread out. Where people used to never see them now, they are seeing them. So, any, any of those, any of our subsistence resource that we go off of I believe that they need to watch out for in the migration pattern of those species. (Point Lay) (BLM 2019d)

The caribou herds used to migrate through our village and now they migrate away from us. Last summer only three houses hung caribou. There are over 100 houses and most houses went hunting last summer. The offshore developments have caused problems with our fish. They are not coming. It's been eight years now. I know one family that hunted all summer, 80 days, and not one caribou. Where is the help for us when we go without? (Nuiqsut) (BLM 2003b)

3.4.4 Sociocultural Systems

3.4.4.1 Social Issues and Change Resulting from Development

Right after the oil boom. This is when I noticed the change. When I grew up people might have a drink or two, but not get drunk. Now we hear about meth, cocaine, and the small villages first. Our Barrow is the hub, then it spreads to the little villages. (Wainwright active harvester; Experience timeline: since 1972 and ongoing; Experience location: Barrow and North Slope villages. SRB&A Interview 2007) (SRB&A 2009)

I think about it a lot. I teach our history and when you understand what's happened in our past and what's happening today, it's cause for wonder. Socioeconomically, we've gone from a barter society to a borough that has been able to tax industry, until recently, when the life of the industry [has] now degenerated. It's had a lot of economic implications. When we go back to a traditional social framework that we loved 60 years ago, there's an increasing concern with dependence on government welfare. There's a lot of social implications associated with development that have been neglected. We've spent a lot of time, a lot of resources finding out what's been going on with the caribou, the whales, but not with what's been going on with our people. (Barrow active harvester; Experience timeline: 1945 and ongoing; Experience location: Barrow and all over the North Slope. SRB&A Interview 2007) (SRB&A 2009)

We have also spoken before about another less obvious category of impacts, these are the social and the cultural impacts associated with North Slope oil and gas activities that continue to affect our communities. They are not always specific to a single project or incidents, but can certainly be heightened by individual events. More continuously, these impacts reflect the cumulative level of industrialization that makes people worry and feel threatened by the effects of change. Over a relatively short three decade period of time our people have experienced changes, felt over perhaps 200 years by the greater American society. Despite the clear benefits with oil and gas development on the North Slope has generated, industrialization has also created the conditions for a whole range of anti-social responses to a deeply felt sense of loss. The stress and anxiety and the depression associated with dramatic change is evident in individuals, in families, and in the broader North Slope communities. George Ahmaogak, Sr. (Utqiaġvik) (BLM 2002)

Not long after that, we had another bad season when one of our whaling captains was killed. We sent supplies to Prudhoe Bay because if you do not bring it to the island, you go without. When the captain went to pick them up, the weather turned bad. The captain was lost after a conflict with the manager at the camp there did not know about our lifestyle and us. The whalers were unwelcome at the camp and tried to return to the island, but they struck an iceberg and took on water. They called for help and they came with a helicopter to rescue them, but that captain was lost. The helicopter was not designed for the rescue. All the whalers came back to bury their fellow captain. The weather did not allow them to return to finish the season. Both seasons caused us to lose out on subsistence resources. The people were hurting. They had no jobs and they had no food in the ice cellars. They were suffering as seismic activity continued around our land and resources had gone with them. No alternatives; no income to buy from the store. I saw the effects of alcohol or drug abuse, domestic violence, suicide attempts and successes, conflict amongst the people with only a few jobs and every

house had bills, but many houses had only one member working and most were seasonal short-term jobs. When the sun goes down in the north, the subsistence resources go with it. They may take many months to come back. The people suffered waiting for the sun to return and the subsistence resources with it. Some lost hope and they could not wait. (Nuiqsut) (BLM 2003b)

I guess I would have to say the urbanization of the Arctic. By that I mean, proliferation of roads, loss of language, TV worries me a lot. I've seen a huge change in community activities. Nobody walks; people are staying at home. The wildlife impact is more nebulous; my greatest concern is the impact to people. For example: When [I was] mushing from Barrow to Nuiqsut, I encountered a seismic crew on Teshekpuk Lake and they freaked out and said we had to divert 10 miles. That was a wake-up call. (Barrow active harvester; Experience timeline: 1993; Experience location: Teshekpuk Lake. SRB&A Interview 2007) (SRB&A 2009)

The communities are pretty much like a big family. When there's not much subsistence, when there are young men who can't go out with others, it affects them. They socialize the wrong way. (Barrow active harvester; Experience timeline: ongoing; Experience location: Barrow and other North Slope communities. SRB&A Interview 2007) (SRB&A 2009)

They're not here yet, but when they [oil companies] do [come], it'll be like Nuiqsut. There'll be roads to bigger cities. Then the wrong kind of things will come in like drugs and alcohol. It's starting now, even though we're not impacted. Once something gets started in town, we'll need more public safety officers. We used to get by with people hired by the city. Now we need training by public safety officers. (Wainwright active harvester. SRB&A Interview 2007) (SRB&A 2009)

With tourists videotaping us every time we go out. With the ice so close nowadays, I mean like three-quarters of a mile out with all that global warming or whatever. Now we're right off shore and they walk out there and videotape us. I don't like that. What if they twist it around and make us look like bad people? (Barrow active harvester; Experience timeline: 1978 and ongoing; Experience location: Barrow. SRB&A Interview 2007) (SRB&A 2009)

My son's first harvest impacted by change, the loss of sharing that harvest within the family and the community, the joy of sharing a meal within the community, the joy of being recognized by the elders of our community. Those are losses that occur to our families. And these are things that are occurring on a daily basis. Rosemary Ahtunagaruk. (Nuiqsut) (MMS 2009b)

You see it. When there is an influx of money locally, there is rising consumption of alcohol and drugs. Where there is development, gold rush in Fairbanks, just like Nuiqsut, alcohol and drugs are readily available in the bigger picture of things. Who will be the people in power to solve [the problems]? Who will bend more backwards to oil development or subsistence? If there's lots of money, drugs and alcohol follow behind. Whether there is a conspiracy to bring in drugs and get them drunk up, who knows? That's in the back of my mind. How come it's so easy for drugs and alcohol to come in? Big money means drugs and alcohol. (Barrow active harvester; Experience timeline: since 1971 and ongoing; Experience location: Villages, Barrow, Nuiqsut. SRB&A Interview 2007) (SRB&A 2009)

Drugs and alcohol, that's the worst part of it. It's expensive; $300 for a quart [of alcohol]. They made money bootlegging. When the pipeline started I guess, everything came from there. (Anaktuvuk Pass) (SRB&A Unpublished)

We were living in Bethel. We moved back to Wainwright. This is when I noticed problems. When there was lots of construction [and] we began to see drugs and alcohol abuse. The NSB has grants for suicide and drug abuse [treatment], but you have to be a real bad guy to get help. Lots of our young people do not know how to deal with these problems. Since the 1980s people have started showing disrespect. That's alcohol abuse. If we stay strong to our Iñupiat values. I do not want drugs and alcohol to overrun us. Our young people have to deal with peer pressure. The in-crowd. Listen to your heart, like I was raised. You may become a loner, but deal with it. We do not have professionals to deal with our problems. (Wainwright active harvester; Experience timeline: ongoing; Experience location: Wainwright. SRB&A Interview 2007) (SRB&A 2009)

The staging and mobilization for ice road building, the housing of drilling and construction crews in Nuiqsut, and general oil development and exploration creates multiple interrelated and cumulative impacts to our community. These impacts include more trucks on the community streets and more planes landing and taking off at the airport, pressure on the community's water and sewer systems, landfill, fuel storage capacities, and local clinic. The demand on the local services will increase as the five proposed satellite projects take place. Additionally, the supporting documentation for Alpine Satellite Development Program, production and project description, September 2002, mentions a very real possibility of ten future satellite projects within 30 miles of Alpine. The community disruption from oil and gas exploration and development leads to sociocultural impacts in the areas of our health, economic well-being, recreational activities, and the social and cultural structure of our community which deserves mitigating measures. (Nuiqsut) (BLM 2003b)

I've noticed a lot of people who have worked for Prudhoe Bay or in the oil fields have moved to Fairbanks or Anchorage. It's easier for them to transit. Easier for them to spend their money. The ones who go to college get job offers to work in Anchorage. I'm afraid they will not come back. We have a brain drain. (Barrow active harvester; Experience timeline: since 1995 and ongoing; Experience location: North Slope. SRB&A Interview 2007) (SRB&A 2009)

Younger generations are leaving: They have no chance of making it, to build their own house and raise a family because costs are so high [here]. Anchorage is the place they are moving because it costs less. There is no way in hell I can live in Anchorage. I can take it about 10 days at the most. It's too fast paced. Younger kids won't really make it here. (Barrow active harvester; Experience timeline: beginning in 2000 and ongoing; Experience location: Barrow. SRB&A Interview 2007) (SRB&A 2009)

We're losing the younger generation and the traditional ways. The oil company jobs are good, but it takes them away from traditional ways. (Atqasuk active harvester; Experience timeline: 2004-2005; Experience location: Atqasuk. SRB&A Interview 2007) (SRB&A 2009)

The ills of alcohol and drugs. It comes into Nuiqsut through the Haul Road and through Alpine. It will hurt us even more if they build a road and start driving in. (Wainwright

active harvester; Experience timeline: since 2005 and ongoing; Experience location: Nuiqsut. SRB&A Interview 2007) (SRB&A 2009)

My only concern is the impact of people that are going to be coming again. Not only will this public route be more impact for our situation, I think it's going to create more impact. I don t know that, but we will see. We know what the impacts are, socially it has had a great impact. Not only do we have a different outlook, but other things were created and we have to deal with it. You know, more drugs will probably be on the road. Use to be it was just alcohol, but not anymore. The drugs are light and not visible. I think that will create more problems in the long run. That's me observing. We've had the impact of animals, we say, the stopping of the porcupine herd, we don't see them ever. We only deal with the Teshekpuk herd, and occasionally the western herd, we get that, but not always. The one we are really concerned [about] is the Teshekpuk. It will be a real big impact if they are stopped. Like I said, at Nuiqsut you could see three oil rigs right from the village. Three oil rigs and one blew up about a month ago and people were sick for about a week. I don't know if we want that for ourselves. They were sick for a whole week. Whenever the wind blew from the north they got the fumes, maybe it reached us here, I don't know. It's natural gas, maybe we should worry about that. (Anaktuvuk Pass) (SRB&A Unpublished)

in 1973… when we first got here in 1973 social and economic was different we never experienced anything like that. Since Prudhoe Bay started expanding westward we see a lot of changes today. The changes have to do with the environment but it has also changed the pattern of the animals and the vegetation. To socio-economics has impacted the village. By the time they got to Colville Delta… we never had any social problems or economic problems when we got here in the early 70s but today we are experiencing lots of impacts from development gradually coming westward acre by acre and soon they are here and they are right there and we don't know how it will affect us when they open the west one. (Nuiqsut) (SRB&A 2012)

My grandparents would talk about displacement, hunting routes, campsites and things. I was heavily involved with Alpine as cultural Guardian for the city. Before that the Borough gave our permits and ASRC and the State did the same to the companies without talking to the village. They didn't even consider coming to a place like Nuiqsut until we changed it. Now it's a requirement. I know for a fact that since then and along the way the North Slope Borough had to change the ordinances and plan for that. (Nuiqsut) (SRB&A 2012)

There is a lot of anger in the community because of the pipeline. (Nuiqsut) (SRB&A 2012)

It is hard to compare, back then [when TAPS first came] they had cocaine, alcohol and marijuana. There are a ton of other things now including methamphetamines. I have had to take care of friends that were one it. It is not a good drug to get into. I smoke marijuana, but that's natural stuff and I don't have a problem with it. It's not like it was made with chemicals in the bathroom. (Nuiqsut) (SRB&A 2012)

It just got worse [as development increased]. When they first started [building the pipeline] it [the drug and alcohol problem] was ok but after the pipeline started working it just got worse and worse. These people are ok when they are sober but later on like sometimes like a year or so everything turns around and they go to alcohol instead of

trying to get away from it. That is what they done so… it has been up ever since. There is no way of stopping it. (Nuiqsut) (SRB&A 2012)

when we first got here in 1973 people all pulled together happiness as here there was no alcohol. There were times when we had lots of activities going on when we were a tent city. We all worked together. We didn't worry about alcohol. People were subsistence and living together, working together. We had outdoor sports and people gathered together and had activities. It was going on for quite some time until one day all of this illegal stuff came in and the happiness was going down. We were rising and the happiness was on top and gradually it was going down. All of those activities that we used to have are not there anymore. We have no evening or weekend activities with our people. We don't have something to show to our younger generations or grandchildren. (Nuiqsut) (SRB&A 2012)

There is a big increase in the people using the area. There isn't a lot of housing around here and when one comes on the market it is too expensive for the local people, but the industry can afford it so they buy them and change them into offices. It bothers me a lot. (Nuiqsut) (SRB&A 2012)

There are big families all crowded into one house. There will be multiple families. They have money; they should just build their own buildings (the industry). (Nuiqsut) (SRB&A 2012)

3.4.4.2 Social Organization

Prudhoe Bay has drastically changed the political atmosphere of Barrow. Back when they were exploring, there was not political impact. The Inupiat pretty well had the governing, had the last say on political activities. But when oil was discovered in Prudhoe Bay, then everything changed in the governing scope in a short period of time. And everything that has materialized today is because of oil in Prudhoe Bay. The Prudhoe Bay area was a haven for hunting in the past. Since the oil industry has become active, the traditional hunting grounds have not been available to the Inupiat people. This is the most impact it has had on our cooperative sharing. Jonah Leavitt. (Utqiaġvik) (Worl and Smythe 1986)

When they first started moving from Barrow, one of the things that a lot of the old people, and we heard this story before, but I'm going to retell it, that the elders that had moved away from there wanting to go back, back to their homelands because we remember that they told them that if the children didn't come -- take them to Barrow for education, that they would take them away. That's one of the reasons why all the people that lived down in this area went to Barrow back in the 1940's, 1930's, somewhere in there when a school started in Barrow and then when the Native Claims Settlement Act started, they started their -- a lot of the elders that were taken -- to be home, wanting to go back home because they felt like this is their land and they don't want to lose their land and that's why Nuiqsut was restarted for the people that are wanting to go home and that -- those were the years that they stayed in tents for a year or many years.. and there was plenty of animals when they first moved because hardly -- the oil companies hadn't gone this far west and they were mostly out on the Prudhoe Bay area and there was a lot of caribou and the fish were fat in the Colville River. Then when we're talking about this -- the elders that have lived the subsistence way of life and not depended on store-bought food, they always prefer subsistence food, like the caribou, the fat caribou (speaking Inupiaq) that were available around here and things have changed and she

talked about the glass - another thing that came from the gravel pit preparing for expansion of the industry and it was interruptions like then with the industry coming closer to Nuiqsut and now, come closer, they're catching fewer caribou. For her family, 10 caribou is good for the winter, but they couldn't catch any when they were flying planes all the time. They only got about two this year. When they (indiscernible)look back when the industry was getting closer and there were a lot of meetings like these, well, in a sense, not going to those meetings might have caused a lot of things to happen. (Nuiqsut) (BLM 2014d, c)

3.4.4.3 Mixed Cash/Subsistence Economy

Impact mitigation funds from Pioneer and Conoco Phillips. That helps because if the helicopters scare our caribou further from here, like to Fish Creek, then that helps to go out there. We can get fuel vouchers from that impact fund, and once or twice a year they will give out a small check to the household, but you have to be an active subsistence household, not just any household; like the elders aren't active, but they have people hunt for them. (Nuiqsut) (SRB&A 2010b)

Subsistence lifestyle is priceless. There is no price to it, period. It's our livelihood, part of our culture. That has been passed on to us for thousands of years. (Nuiqsut) (BOEM 2011)

Having to adapt to a cash economy. Living in a capitalist world, you can't live without income. I've seen this more over the last 23 years. You hardly see anyone camped out all season like the summer gathering time like you used to when I was growing up. The whole family would spend the time out there. Making seal oil, drying meat, preparing for winter. Now most folks spend two weeks or a month at the most. We've had to find more full time jobs with less time to hunt. It's a gradual change. I guess it's normal for any society. (Barrow active harvester; Experience timeline: 1982 and ongoing; Experience location: North Slope. SRB&A Interview 2007) (SRB&A 2009)

The gas prices are what really get us, we have to wait to get a paycheck. Some people would rather use their boat and wait for a later time, and us we don't own a boat, so we borrow one or go with somebody. (Nuiqsut) (SRB&A 2015)

It's just, the cost of living, high cost of gas, high cost of ammo, high cost of maintaining your snowmachine or boat…and it adds up…So, you spend $3- to $4,000 on grub, gas, and whatnot to go out for 10 days or 2 weeks to harvest caribou before the long winters and yet, you know, there's no caribou. You come home empty. Sometimes you just get a couple due to a lot of activities happening up here. (Utqiaġvik) (Brown et al. 2016)

It costs more to do subsistence activities now than in the past. So, in that regard, for an adequate comfort level to cover your costs, you work longer and take shorter time with your families. (Barrow active harvester; Experience timeline: 1995 and ongoing; Experience location: Barrow area. SRB&A Interview 2007) (SRB&A 2009)

The way I hunt now is much different. I need a snowmachine, four-wheeler, outboard. I used to need a dog sled and boat with a sail. If you don't have these things, you have to buy meat from your neighbor. Now hunters are more independent with fewer helpers. I used to take out five to nine people. Families and hunters are trying to be independent. You rarely see people out unless they are related to the boat owner. Wainwright and Pt. Lay are very lucky. Oil development is not here yet. Like Nuiqsut and Barrow, we've

had meetings with oil companies. They're coming on our land and ocean. They did seismic testing last year. I did not see much effect on ugruk, but I did not see any beluga. (Wainwright active harvester; Experience timeline: 1954 and ongoing; Experience location: Wainwright, Pt. Lay. SRB&A Interview 2007) (SRB&A 2009)

These are some of the diets, our customary diet that we depend on, not just whales, but whales are one of the main species that we really depend on, and it's been known over 10,000 years, known that we have been whaling. It's been passed down from generation to generation. My brothers and I came from a big whaling family. As a matter of fact, came from a real subsistence economic. Our parents are gone now. Had raised 12 -- 12 children with no cash economic. It's been all subsistence, living off the land, living off the sea. And we are -- and they are gone now. And now it's our responsibility to continue keeping the tradition alive, and we are passing it on to our kids. That's how the chain -- the chain of -- the chain link occurs. When we are gone, they will still be here, even when the oil is gone, been extracted out. (Nuiqsut) (BOEM 2011)

There are people with no job, there are people that are with jobs, and it's just hard for people, you know people think of their families, of themselves, but they have their family take care of them. People that are working aren't there to fish and it just work both ways you could say. I'm a fisherman that goes out there and whenever I get the chance to go out there and fish, and I give it to people—to whoever needs. (Point Lay) (Braem et al. 2017)

Our subsistence is food on our table; if we start having to pay for licenses like it's starting to happen, then we'll need more money. I don't think it's right for somebody out of state to tell us that you need to have a license to hunt where you were before we were even born. I don't think it's fair for them to say that if you break that law, you'll be put in jail. We want our kids to have the freedom that we had. It seems like our freedom is being limited and we can't go back to what we had. Fuel is so expensive and you need a lot to do the hunting you need to do. And a lot of my relatives have a lot of kids and they need to put food on the table. (Point Lay) (SRB&A 2014b)

My grandfather sued the oil industry for trespassing on his Native Allotment. Many others of his generation had the same adversarial attitude. So people who looked up to my grandfather thought that this was the right attitude to have. So a whole generation of leaders grew up fighting industry, which was in some ways justified. There's a small group of people that were quiet and worked in the industry. Now our job is to put these young people to work and they're used to this adversarial attitude, it's hard. You ask if I know someone, whether it's a personal concern, it's everyone. Kids should be able to learn that they can work a rotational schedule, do subsistence, get benefits, and still be proud of their heritage and background. That's what industry should represent for us. (Barrow active harvester; Experience timeline: 1920 and ongoing; Experience location: North Slope. SRB&A Interview 2007) (SRB&A 2009)

When construction began on the NARL, there was a very definite change in the attitude of the people due to the introduction of employment to the community. You could really see a change in the cooperative sharing. [Illustrations?] Right after employment was introduced, everyone sort of abandoned the fur trading as a means of bartering for making ends meet. When everyone got jobs, things became easier. People began building wood frame homes, build some boats, outboard motors, etc. As things got a little easier, people started to stick to themselves around their immediate families since

everyone was now in a position of self-reliance. So, at that time it became a little easier for everyone to look after themselves. (Utqiaġvik) (Worl and Smythe 1986)

[You have to make a choice between] having to stay home and going to work. Because you've got to have money to get your fuel and you've got to have money to get your food. In the old days, everything you depended on was out in mother nature. But now you've got to have money in your pocket. It's starting to change a lot. (Point Lay) (SRB&A 2014b)

The (indiscernible) Lakes, Pik Dunes, and those hills, we call them the Blue Hills up past the Kogohokruk River, are our prime areas that our young men go for wolverine, wolf hunting and trapping. And this is there for our traditional clothing, for our -- because this sustains our natural warmth in our body, when we have our traditional clothing. So it's for our tradition and culture. We do not want to -- if those become restricted and -- you know, we will lose our traditional way of life. You know, you start to make -- knit a sweater and you loosen one -- and now you're pulling it out from the seams. And now it's -- you know, we can't be bare naked in the Arctic Slope. (Utqiaġvik) (BLM 2004f)

There's people who have traplines, and it's just a matter of going out there in this cold because right now [February] it's the time of the year…it's the coldest time of the year and there's a very few people who go out and do it, because you have to travel miles and you have to go out and get these predators, wolverines and wolves. And it's just, you know, the excitement of getting them and bringing them home, actually getting these predators out there, that stuff we use to make our warm clothing, that's how it's been for years…you look back in the history and we had no stores, we had no way to buy up our clothing, it was out there for us to hunt, to make our clothing. (Point Lay) (Braem et al. 2017)

It is important to me because it was my wife and my kids' heritage. I tried to get in on as many activities as I could that involved that sort of traditional thing. [My son] is one of the better hunters and trappers in this community. And I was all for it, go with them, live with them, travel with them (his grandparents). It's the reason why people were here and it's a reason to stay here. (Point Lay) (SRB&A 2014b)

The person who is willing to work every day and passes his UA is willing to work every day. He wants to work every day. If he wants stuff he will work more. Alcohol and drugs will not help him make more money. The more money they want to make, there is a whole bunch of these kids I don't like, they make money all year long selling drugs and alcohol. They don't think of other people they only think of themselves and their own money. Why do you want to make more money, if you had a chance to do that why would you do that? I don't want to be like that, I want to make good money but not through selling drugs. I kind of wonder about these drug and alcohol dealers. They make more money and more profit but they are causing problems. Everyone has got to work and make a living. (Nuiqsut) (SRB&A 2012)

You will hardly see anybody doing seal pokes 'cause the weather warmed up too much, it won't let the seal oil render right—the way it's just traditionally been worked 'cause when it get too warm it gets rancid, strong. This cold weather we was brought up in the early '50s…I miss that a lot. 'Cause that food was staying fresher longer. Even our ice cellars held the food fresh longer. Nowadays we don't have ice cellars anymore 'cause they all melted. There's water and water gets in them and they get rotten and gaseous.

> *People been known to have died from going in the cellars because of the gas that's produced like methane or whatever from the foods that rotted…we had to resort to electric freezers and walk in freezers. Temperature-controlled climate, however they might put it.* (Point Lay) (Braem et al. 2017)

3.4.5 Environmental Justice

See traditional knowledge provided in the SUBSISTENCE USES AND RESOURCES, SOCIOCULTURAL SYSTEMS and ECONOMY sections for traditional knowledge that is also applicable to this section.

3.4.6 Recreation

Traditional knowledge holders from the six study communities generally do not consider their activities on the land to be "recreational." Therefore, see traditional knowledge provided in the SUBSISTENCE USES AND RESOURCES section for traditional knowledge that is also applicable to this section.

3.4.7 Wild and Scenic Rivers

See traditional knowledge provided in the other sections of this report for traditional knowledge that is applicable to wild and scenic rivers in the planning area, particularly the Colville, Kokolik, and Utukok rivers.

3.4.8 Wilderness Characteristics

Traditional knowledge holders from the six study communities generally discuss "Wilderness Characteristics" in the context of their subsistence activities. Therefore, see traditional knowledge provided in the SUBSISTENCE USES AND RESOURCES and CULTURAL RESOURCES sections for traditional knowledge that is also applicable to this section.

3.4.9 Visual Resources

> *I hadn't seen nothing, other than lights at night. Just when you're coming in from this side, you can see the lights; that's the only thing. [It can be] somewhat distracting – it's irritating. Because I remember on the blue moon days you can see Prudhoe Bay when I was a kid. [It is] hard to say if they caribou are affected. Normally if you see lights, you wouldn't want to be hunting in that direction.* (Nuiqsut) (SRB&A 2014a)

> *I still have a complaint [about the pipeline]: it is just too shiny. It reflects too much.* (Nuiqsut) (SRB&A 2015)

> *You can notice them [pipelines] from far away. Even from my camp I can see them [still shiny].* (Nuiqsut) (SRB&A 2011b)

> *I keep telling them that pipeline's got to be covered, because it's too shiny. They colored the one down by POW 2 - the one on the Oliktok Point - they colored that, and you can't see that one. It's like a dark green, navy color, army color.* (Nuiqsut) (SRB&A 2011b)

3.4.10 Transportation

See traditional knowledge provided in the CLIMATE AND METEOROLOGY, VEGETATION, and SUBSISTENCE USES AND RESOURCES sections for traditional knowledge that is also applicable to this section.

3.4.11 Economy

See traditional knowledge provided in the SOCIOCULTURAL MIXED CASH/SUBSISTENCE ECONOMY section for traditional knowledge that is also applicable to this section.

3.4.11.1 Local Labor

People talk about the past and hunting with skin boats and dog I've never done that. I grew up at a life where I drive a snow machine. I drive outboard motors and four-wheelers to hunt. That's the life I know and that's the life my kids know. Nobody uses dog teams or skin boats to hunt year-round and where do I get that money from? My job, dividends from the companies that we're enrolled in [village and regional ANCSA corporations] and that's just for my family. What about the other hunters that I have to work with? That's where their income comes from, the North Slope Borough and that's how we live and that's the life we know and that's the life we have to continue to move forward. I cannot go back to dog -- I cannot envision myself using a dog team, let alone train a dog, because I don't even know how. I can train one to pee outside, but that's about it. You know, that's all animals are to us today. So I have to make up my mind and move forward and support projects like this that will benefit our people and not just us as Inupiats, everybody who lives on the North Slope, no matter what race, creed, or color they come from. That's the benefit of the -- of our system today. So we benefit everybody and that's why I have to support what we're doing here today. (Utqiaġvik) (BLM 2014b)

One of things that needs to be included in your alternatives is to see whether or not we can, economically, make Nuiqsut benefitted economy wise to create jobs. There's nothing. There's lot of people here that aren't working. They subsist, but we can't -- they can't go further out, because of their limited cash value that they have on hand. (Nuiqsut) (BLM 2018c)

I've noticed a lot of people who have worked for Prudhoe Bay or in the oil fields have moved to Fairbanks or Anchorage. It's easier for them to transit. Easier for them to spend their money. The ones who go to college get job offers to work in Anchorage. I'm afraid they will not come back. We have a brain drain. (Barrow active harvester; Experience timeline: since 1995 and ongoing; Experience location: North Slope. SRB&A Interview 2007) (SRB&A 2009)

I know they're always looking for qualified people. You need certification and lots of Iñupiat people are prepared for this. At the college we encourage them before they ever go get a job, they usually end up in laborer jobs because they're not prepared. They should notice this. (Wainwright) (SRB&A 2009)

Our younger generations are planning to move out because there are hardly any jobs. I have five kids of my own but one already moved out looking for a job. Oil companies promise jobs, but they hire people from the Outside and don't keep the promise to hire locals. My oldest son went to Barrow for a job for three or four years. (Nuiqsut active harvester; Experience timeline: since 2001 and ongoing; Experience location: Nuiqsut. SRB&A Interview 2007) (SRB&A 2009)

This doesn't happen to just the North Slope Borough. It goes right down to the families. If there is no work, it's the people who depend on oil development jobs who will be hurt. You hear this every year from the North Slope Borough. It'll affect everything we enjoy today. The revenues have been declining for years. They're laying off. People who thought they had jobs for life are unemployed. It's hard on the people. (Wainwright) (SRB&A 2009)

Alcohol problems. When you look at the people, right now I'm - have to deal with - without any federal monies, without no help, not from the churches, not from the state governments or from the federal governments - we have to deal with over 250 child cases every six months without no help, and a major portion of them is alcohol related because the parent's are worried about, 'Where am I going to feed my kids from? I can't find a job.' And we're sitting in the richest oil field in American. And major portions of our population are unemployed and can't get work, with the biggest oil field sitting right to the east of us here. George Edwardson. (Utqiaġvik) (MMS 1990)

3.4.11.2 Cost of Living and Economic Consequences of Subsistence Impacts

And then when the transportation to fly into a city, you don't get any discounts. You pay the price at price at all the time—the full 365 days a year. You know Alaska Airlines give out $76 one-way from Seattle to New York. We fly here from Fairbanks its $600 for a round trip. We don't get those deals. If some way, the state can help us to get some kind of deals. Everetts is trying, they are giving—once you reach Fairbanks that you'll be all right for a hotel. Which is highly needed because once you go Fairbanks, you are already spending your Christmas money and you go to a hotel. But Everetts is trying, they're trying they're giving once you land in Fairbanks, you're being delivered to a hotel for free and paying the taxes. We need to sometimes [unclear comment]. Give us a discount at Christmas holidays. WEIO. Activities that every community tries to come together and try to gather in one place. That was for transportation in that kind of way, maybe the state would have some more funding for the other people, people who don't have WEIO. Alaska Airlines does—give us some discount. (Anaktuvuk Pass) (BLM 2018a)

They changed everything in this area [TAPS]. It's not what it used to be. [It's] more expensive, more money from somewhere, especially groceries. You buy one loaf of bread it costs you six bucks. (Anaktuvuk Pass) (SRB&A Unpublished)

[It costs] 295 dollars for a bottle [of propane]. [The pipeline is] so close and yet so far away. We don't benefit from it. (Anaktuvuk Pass) (SRB&A Unpublished)

It's always been part of our whaling community. Due to our subsistence way of life, we try to avoid compensation from the oil companies. We deal with the IWC [International Whaling Commission]. If they see we get monetary assistance, it will impact us. I know Nuiqsut does, but they have agreements. I'm talking about Barrow. This is our livelihood. We don't want to lose this. Sure gas is expensive and the equipment. The cost is there. Each individual is burdened with the price of oil, fuel, and equipment. It's the same difference on and off shore. Most of these people fight for their subsistence. They get seasonal jobs so they don't have the money for fuel and equipment. Due to the impacts that affect most of our hunters. In Barrow we see this with the whaling captains and subsistence users. When I go to my cabin I used to be able to estimate exactly what I needed for fuel. Now you can't because you never know where the caribou will be. The cost of fuel is not going down. You've got to understand. They don't look back once they pass a community. They look to the next. Once they're done they're happy. They say, ok let's move. We could use the economics. (Barrow active harvester; Experience timeline: 1965 and ongoing; Experience location: Barrow. SRB&A Interview 2007) (SRB&A 2009)

When there are ships out there, you'll have to go further south to get your ugruk. You have to hunt ugruk in the summer to put skins on your whaling boat. When I have to

change skins I will have to catch six the summer before I change them. You can't use the ones you catch a year or two before, they'll be rotten. It's expensive now. To get 10 gallons of gas you spend $45. Oil is another $30. The things the oil industry brought to the North Slope, more boats, more motors. You have to compete with that now. The things you buy up here are much more expensive than in Fairbanks or Anchorage. (Barrow active harvester; Experience timeline: since 1985 and ongoing; Experience location: Barrow. SRB&A Interview 2007) (SRB&A 2009)

We recognize the importance of oil and gas development for the national need for energy, it's not that we oppose this, it's that we want development to be done in a way that's not costing to us. We have increased our distance of travel to try to attempt a harvest as well as the number of trips that we make to try to harvest. These are costs that come up on our families. Our families have to try to go without other things because we're trying to continue our traditional lifestyle. (Nuiqsut) (BLM 2004e)

The economy these days. We try to hunt. We got game coming toward us, then these planes, choppers fly over. It costs a lot. I spend $600 to $1,500 to go hunting for two weeks. Then the choppers fly over and the game gets scared off. It's very frustrating to come home with nothing. (Barrow active harvester; Experience timeline: 2003 and ongoing; Experience location: Peard Bay. SRB&A Interview 2007) (SRB&A 2009)

When there are ships out there, you'll have to go further south to get your ugruk. You have to hunt ugruk in the summer to put skins on your whaling boat. When I have to change skins I will have to catch six the summer before I change them. You can't use the ones you catch a year or two before, they'll be rotten. It's expensive now. To get 10 gallons of gas you spend $45. Oil is another $30. The things the oil industry brought to the North Slope, more boats, more motors. You have to compete with that now. The things you buy up here are much more expensive than in Fairbanks or Anchorage. (Barrow active harvester; Experience timeline: since 1985 and ongoing; Experience location: Barrow. SRB&A Interview 2007) (SRB&A 2009)

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Having to change my patterns of hunting and fishing. I had to change my calendar. I had to buy more gas and more food for my trips. I had to go to a whole new area. I couldn't hunt and fish in the places I traditionally went. I have hunted in my traditional area all my life; now I have been approached by security and told that I'm not allowed to have a firearm in that area. That took a big toll on me. And in my house I found myself very frustrated and angry. And there's no counseling of any kind and no help. I found myself a very unpleasant person to be around. I had a good wife who told me that I would have to leave to get counseling and the proper help that I needed to learn how to deal with these problems. Then I tried to educate myself on the matter of development and learn how I can't stop it, how it's for the good of the country and how we will have to learn to live with it. I found myself reading EIS's constantly at work and learning everything I could. And then I became a local leader. You see, I grew up on caribou, whale, fish - hamburger was not available, but now I can't do that as much. I have less time and need more money to hunt and now my kids aren't learning the

subsistence ways. It's not a priority to them. And that takes a toll on me. It makes me disappointed but not surprised that this next generation doesn't depend on subsistence. There is a lot of stuff for people to fight about. There's a lot of mitigation funds coming into the village and the North Slope. And for that money the people all fight. Local leaders, families, and there's controversies in the village itself. And there's no formula or method for resolving these problems. It's all new, and we're just still learning how to properly use these impact funds and mitigate. (Nuiqsut active harvester; Experience timeline: 2001 and ongoing; Experience location: Nuiqsut. SRB&A Interview 2007) (SRB&A 2009)

Using the vouchers isn't enough. If you're gonna divert our caribou, that 10 gallons of gas ain't gonna get us there. We're gonna go further out, got to spend more money on gas. Mitigation hasn't done nothing, since they're gonna divert our caribou further south. That's from the oil company mitigation, from the city [City of Nuiqsut]. Some of these mitigations are being misused. Given to non-hunters around here. They want to gas up their vehicle, not go out there [hunting]. Go to City and write where you're going and what game you're going for. Some of the non-hunters mistreat it. Last year they shut it down cause there was misuse. (Nuiqsut) (SRB&A 2010b)

We have increased our distance of travel to try to attempt a harvest as well as the number of trips that we make to try to harvest. These are costs that come up on our families. Our families have to try to go without other things because we're trying to continue our traditional lifestyle. (Nuiqsut) (BLM 2004d)

The scientists at the beginning of all this, you could subsidize your diet with food at the store. Heck, no, we can't. It's over $20 for a steak, $50 for a box of 20 bullets. If you're a good hunter, that's 20 tuttus. That's a lot of meat for them 20 bullets. But we can't find them. These roads, all that gravel hauling -- I haven't been able to get tuttu in two years. Myself -- for my kids, we're getting from son, my son-in-law. Other people are giving to us because we're unable to. (Nuiqsut) (BLM 2018c)

We go to the store on payday. It's six to eight hundred dollars just to feed our family. And we still struggle to get to the next payday after paying six to eight hundred dollars to them. We can't subsidize our diet with these foods, what they cost… You're running all our food off and you're forcing us to subsidize our diet with what's at the store and order from other places. (Nuiqsut) (BLM 2018c)

You can see the frustration; frustrated not only with industry, but the State and agencies, because, How could this be happening to us? We used to be a thriving fishing community. Now all of a sudden we get two to three cisco. It is very frustrating to an individual and as a family as well. You spend time and effort and money. The average family will set two nets, sometimes three nets to try to make up the loss of one net. It takes a lot of money to fish; prepare the snowmobile, buy gas and nets and you have to spend time away from your family and home. Our diet consists of 30-60%Arctic cisco. (Nuiqsut) (MBC AES 2004)

When my mother and I go hunting, my mother always says, and I say, I think we need more meat because prices in our store are getting higher and higher. Hardly any jobs and gas is getting expensive. We decide to go get meat. And we go by boat for caribou and there is Alpine aircraft and helicopters flying over and it seems like they are disturbing our hunting. And all of a sudden a helicopter files over us and scares our caribou away. My mother gets so mad. It used to not be like this before Alpine came

around. Alaska Airlines too. Alpine helicopters and Frontier Airlines. (Nuiqsut active harvester; Experience timeline: 1990 and ongoing; Experience location: Nuiqsut. SRB&A Interview 2007) (SRB&A 2009)

This is a true statement in itself. Some of our relatives don't make that much money so they cannot even go out to hunt. Quite a few people have had to make longer travels whether it's for consumption or clothing. We're used to going to a general area. Now we have to go out further because there are no animals in the general area. (Barrow active harvester; Experience timeline: since 2001 and ongoing; Experience location: 20-30 miles south of Barrow. SRB&A Interview 2007) (SRB&A 2009)

And things that will help to reduce these are looking at the pipeline routes, making sure that the pipeline is high enough that the caribou are able to migrate, that we're able to follow the migration and hunt without having to travel to an area that's designed to allow us to hunt through them. The cost of our travels come out of our pockets, it takes away from other things that our families need. And it's really important that the cost of trying to live our lifestyle is not taken from our families. (Nuiqsut) (BLM 2004e)

Most of the people who can hunt have to work. If the hunting is 50 miles out, I will not go. Even if there is an agreement between the workers and the employers. If the animals are too far out, people will not go. They have to worry about the job that puts food on the table. This is why you find people in town who've never had a permanent job. (Wainwright active harvester; Experience timeline: Since 1972 and ongoing; Experience location: Wainwright. SRB&A Interview 2007) (SRB&A 2009)

It's always been part of our whaling community. Due to our subsistence way of life, we try to avoid compensation from the oil companies. We deal with the IWC [International Whaling Commission]. If they see we get monetary assistance, it will impact us. I know Nuiqsut does, but they have agreements. I'm talking about Barrow. This is our livelihood. We don't want to lose this. Sure gas is expensive and the equipment. The cost is there. Each individual is burdened with the price of oil, fuel, and equipment. It's the same difference on and off shore. Most of these people fight for their subsistence. They get seasonal jobs so they don't have the money for fuel and equipment. Due to the impacts that affect most of our hunters. In Barrow we see this with the whaling captains and subsistence users. When I go to my cabin I used to be able to estimate exactly what I needed for fuel. Now you can't because you never know where the caribou will be. The cost of fuel is not going down. You've got to understand. They don't look back once they pass a community. They look to the next. Once they're done they're happy. They say, ok let's move. We could use the economics. (Barrow active harvester; Experience timeline: 1965 and ongoing; Experience location: Barrow. SRB&A Interview 2007) (SRB&A 2009)

3.4.12 Public Health

See traditional knowledge provided in the SUBSISTENCE USES AND RESOURCES CONTAMINATION, SOCIOCULTURAL SYSTEMS MIXED CASH/SUBSISTENCE ECONOMY and ECONOMY COST OF LIVING AND ECONOMIC CONSEQUENCES OF SUBSISTENCE IMPACTS sections for traditional knowledge that is also applicable to this section.

3.4.12.1 Human Health

> *I have been a health aid for over a year now in Nuiqsut. And it is a tough job and I know. And I have found out in one year, that on our little children and the older people, their hemoglobin has dropped way down. Some of the little children have to have two doses of iron. And it's really hard. And it's because we are so short on our caribou and all the animals are scarce. Rosa Kaigelak.* (Nuiqsut) (MMS 1979b)

> *Health problems. Thyroid problems. People are starting to complain about inner problems [like] asthma. Non-smokers too. Like my mother, her doctor told her that she should consider moving to where there's less development and better air. And this isn't from smoking. These health problems are between her family and her health. Should she leave the community and her family and her husband's grave? For her health? And we don't even have anything but a health aide here. When we came up with 15 people who have died of cancer, in the past few years, well, maybe something's happening here. I blame it on development. On the days when they have those flares from Alpine, my mother feels sick. And it's not just her. It's her peers too. It's not good for us, the people who live here, to have all that smoke in the village. The doctors don't know what's wrong with my mom. All the data doesn't match up.* (Nuiqsut active harvester; Experience timeline: 2005 and ongoing; Experience location: Nuiqsut. SRB&A Interview 2007) (SRB&A 2009)

> *I know our health care system can't afford the cost that respiratory illness is causing our region right now. This data isn't even there to fully assess how much our exposure is, because the data sets are mixed into a very difficult assessment process where you have to know who the people are, where you're reading it from, to know where to get the data sets from. Some of our information might be in the village, some of it might be in Barrow, some of it might be in Fairbanks, some of it might be in Anchorage, some of it is nonexistent, but the cost is tremendous for one person on a ventilator for a short period of time. Our village suffered 10 people at one time on a ventilator. That's a small village. Why? Why? Why? I still don't have the answers, but I'm still here asking these serious questions. I want to believe that not all my grandchildren will need inhalers to breathe because there are many that do and some of them are very serious. When there's flares that are going on and there's lots of them, those are hard days for people who have trouble breathing and it's serious. This is a drawing point in the sand. Clean up what you've already done before you get into this area because the devastation is going to be tremendous.* (Utqiaġvik) (BLM 2014b)

> *When I started as a health aide in 1985 I had one asthma patient. By the time I went to the University of Washington for my physician assistant certificate in 1989, I had 20 to 25. When I came back in '91, there were 35. When I quit in 2000, there were over 60. The village make-up has not changed; it is still mostly Inupiaq. What was contributing, the most overwhelming issue, was that oil development around the community had increased and gotten closer. The worst nights on call were nights with many natural gas flares occurring. We could see it in the flares or in the fields around us. They release*

particles and they travel to us. The chance of an inversion will affect us. An inversion is a bowl-like air trap with cold air trapped by warm air. Increased concentrations of particulate matter occurs during these episodes. (Nuiqsut) (BLM 2003b)

Oil and gas. I think that that onshore development definitely has some issues with the resources. They use our lakes for water to build ice roads, and there are just a lot of little things that can add up to make the caribou have sicknesses. I've helped with little spills and I know they have that. It's the same thing with our humans. I can guarantee that at least 10 of my elders passed away from cancer, we had some from heart attacks, but at least 10 from cancer. I think it might be the air pollution, it might contain small particles, but it adds up. That one with the tumor, I cut off the head and took the horns, but I left the rest for the animals to eat, cut the gut open so it wouldn't explode. (Nuiqsut) (SRB&A 2010b)

I'm concerned for our health too. You can see those flares for miles. What they're burning is, I think unwanted gas and it's harmful to us humans over here in the village and the animals too. I just see that smoke from miles away. Alpine's north and a lot of time we have north, northeast wind in the village here. It's not good for us when they burn. (Nuiqsut active harvester; Experience timeline: 2004; Experience location: Just up the river. SRB&A Interview 2007) (SRB&A 2009)

Other factors that need to be looked at are unknown toxins. Take samples at the DEW line (old military sites) along the coast at Oliktok Point. When we first came in 1973, there were so many barrels and debris scattered around. There was a lot of dumping early on that was just buried over and now this has created a problem with the onset of erosion. I think these could be some factors affecting the water. (Nuiqsut) (MBC AES 2004)

So we don't have good data sets to know what are all these things, but I know we have a tremendous amount of asthma. We have a tremendous amount of diabetes. We have a tremendous amount of heart disease. We have a tremendous amount of obesity. We have a tremendous amount of thyroid disease. These are all different things that are happening to our people, without the studies to assess what's going on, but we have only one industry that are contributing tons of emissions to the air that we breathe, the animals that we depend on, to the waters that we feed our families from and that we feed our -- we give to our families to drink, to bathe, to hunt, to fish in. (Utqiaġvik) (BLM 2014b)

I know our health care system can't afford the cost that respiratory illness is causing our region right now. This data isn't even there to fully assess how much our exposure is, because the data sets are mixed into a very difficult assessment process where you have to know who the people are, where you're reading it from, to know where to get the data sets from. Some of our information might be in the village, some of it might be in Barrow, some of it might be in Fairbanks, some of it might be in Anchorage, some of it is nonexistent, but the cost is tremendous for one person on a ventilator for a short period of time. Our village suffered 10 people at one time on a ventilator. That's a small village. Why? Why? Why? I still don't have the answers, but I'm still here asking these serious questions. I want to believe that not all my grandchildren will need inhalers to breathe because there are many that do and some of them are very serious. When there's flares that are going on and there's lots of them, those are hard days for people who have trouble breathing and it's serious. This is a drawing point in the sand. Clean up

what you've already done before you get into this area because the devastation is going to be tremendous. (Utqiaġvik) (BLM 2014b)

There's a lot of social and health impacts because we're connected to the food chain and we eat the fish and caribou and, you know we, for the past 2–3 years we've been having the fish crisis, we're getting more fish that are being sick. I know of an elder family that don't even fish in the rivers no more they now go to the lakes because they know the river's contaminated by the legacy wells that eroded into the river by Umiat coming down and coming from up river going down to the ocean. (Nuiqsut) (Brown et al. 2016)

Like maybe there is something we have to do to protect ourselves if there is some type of adverse event, if there is gas in the air or drilling mud. And you know, the drilling mud has chemicals in it. and It sits there, but it dries up pretty easily and it can easily get into our air. It can get turned to dust. And that, because, you know, it is so windy it can dry pretty fast and you know, particulates from that dust can get in the air and that can really affect a lot of people's respiratory especially around here, people have– they are more susceptible to respiratory issues because of that. And there's a lot of people that have sensitivities, they have asthma, the have… you know. Some people are more sensitive to those kinds of things. And the younger they are, and the older – the risk is even more. (Nuiqsut) (BLM 2016a)

I have a concern on air quality too, we've had concerns on the Alpine and we didn't know how much of a concern it was until Alpine came out of what air quality, that's going to be a major concern for the village, we've seen some gathering stations in Prudhoe where they pollute quite a bit, especially during the winter where it's real visible, so that's going to be another real concern of the village is air quality. We have quite a few numbers of children with asthma and bronchitis cases and we still haven't figured out exactly where's that coming from and how's that affecting the village, it's not only children, it's adults as well with bronchitis and asthma that didn't occur, these disease until later in their lives and that now occurring in Nuiqsut, most of these cases, so air quality is a big concern of mine. (Nuiqsut) (BLM 1997b)

And when you look at the cause of death, you will see a lot of suicide. And if you want to know why there is suicide, let me tell you something. These Elders taught us, you know, how we lived, who we are, and how proud we are supposed to be. Taught us how to hunt. And then these children of ours get big enough to go do that, what do they run into? State law that says no, federal law that says no, oil development that have destroyed the land. This is the reason for suicide amongst our young kids, something that should have never happened. We can't stop it. All we can do is try to teach them how to be proud of who they are. (Utqiaġvik) (MMS 2009a)

And I'd just like to say that, you know, with the air emission, the air quality, it is not being analyzed. It's not being looked at. We have a lot of people with chronic illnesses that is being ignored. A lot of lung disease that -- that -- that federal, state government and other agencies have not even looked at. (Nuiqsut) (MMS 2009b)

When you look at the North Slope, we have the highest suicide rates of our youngsters. I lost two of my brothers. They both worked in the oil patch. One was a truck driver. They couldn't take it anymore and they both killed themselves. I can't afford that. I've got kids. When you teach a child what kind of culture and what kind of things their ancestors did, you can go into any village and you will end up with the same story.

Teenagers, some of them in their pre-teens. You show them the longest lasting culture and they get to watch it die in their minds. I'm not worried because it's not going to die, but they don't know it. There's not one family who hasn't lost someone like that. There's going to be a dying peak in the next three to four years (of elders in the community). There was no oil and gas when I was valedictorian. I learned what I was taught. (Barrow active harvester; Experience timeline: since 1971 and ongoing; Experience location: The whole state of Alaska. SRB&A Interview 2007) (SRB&A 2009)

The worst part of it is, is the social disruption that occurs to our families. When you have the young hunter that's gone out and now this $10,000 snow machine is broken and the parts to replace it cost $500, but it costs over $100 to even attempt to go out to do a short hunt, it's tremendous impacts to what we're thinking about, but when you have those young men commit suicide because they can't find a way to understand the changes to our lands and the changes to our way of life and the value they are felt (sic) as hunters to our village, it's a big problem for our whole community. When our young hunters see the infrastructure and they can make the logical decision that it's not logical to try and go out into traditional lands because you can't harvest in the way that our elders have taught us to. That's tremendous impacts. (Utqiaġvik) (BLM 2014b)

There's no way for people to be protected from the air pollution. Its ultra fine particulate matter from these diesel exhaust emissions from all these drilling rig emission. All the big risk that's coming from oil and gas development rigs catching on fire or, not just the rigs, the chances for that—explosions happening. Cranes and equipment catching fire. All of that happened last year. There was, you know, a crane caught on fire and it was near the pipeline. What chances of that happening for a pipeline explosion are great, the risks and the chances are great. Yeah, for what little resources they want to get from the oil and gas underneath. But the chances of the oil still happening and the risk of all the air pollution greatly harming the people, all of that—those are not being monitored. All that always ozone being created—the warmer temperatures being created from all of this oil and gas industries are creating warmer temperatures. All those warmer temperatures are increasing all the ozone in the air and they say, well, there's not very much ozone and what they don't even monitor for it. They don't even put it in their analysis. How much of that ozone is in our air and it's affecting our children and is affecting our elders? It's affecting people's health. And they're not even trying to even acknowledge that. There's not even a working system for the state of Alaska or the health department or the planning department or the North Slope Borough to even come together to even understand those issues of the health impacts. (Nuiqsut) (BLM 2019c)

Like maybe there is something we have to do to protect ourselves if there is some type of adverse event, if there is gas in the air or drilling mud. And you know, the drilling mud has chemicals in it. and It sits there, but it dries up pretty easily and it can easily get into our air. It can get turned to dust. And that, because, you know, it is so windy it can dry pretty fast and you know, particulates from that dust can get in the air and that can really affect a lot of people's respiratory especially around here, people have– they are more susceptible to respiratory issues because of that. And there's a lot of people that have sensitivities, they have asthma, the have… you know. Some people are more sensitive to those kinds of things. And the younger they are, and the older – the risk is even more. (Nuiqsut) (BLM 2016a)

A lot of people have been getting sick from the air lately. There are a lot of people that have been getting bronchitis and pneumonia for how many years. My buddy worked

with the air quality people over here and he put out air canisters. He is still waiting to see the results of the air quality out here. (Nuiqsut) (SRB&A Unpublished-b)

She has noticed a change in the air as the industry was working westward. None of our people got sick and no one experienced any strange odors. We noticed our air started to change. Today the air has changed a lot. The air is blowing towards the village and today we are experiencing the problems with Alpine too. The blowout has really affected the village big time. (Nuiqsut) (SRB&A Unpublished-b)

I've been here -- a resident since then. I've seen some changes since I've been here, and mostly in the air quality portion. There's a lot of air pollution coming from a lot of this exploration and developments that are going on, especially with oil and gas industries. There's a lot of risk that come with the oil and gas industries in -- in our area. There's a lot of risk of blowout, fires, and a lot of hazardous air pollutants that are being produced from all of these developments with the flaring going on, with a lot of things going on here, especially with utilizing a lot of diesel equipment. There's a lot of diesel exhaust being produced. And a lot of the times, these diesel vehicles will be parked or running and idling and they'll be producing a lot of emissions, and it's at a ground level. This is where we breathe. A lot of our people are being impacted health wise. There's so many health problems that come with breathing in oil and gas development emissions, especially even from the diesel exhaust. Brings on cardiovascular health issues. It brings respiratory health issues to our people here. (Nuiqsut) (BLM 2018c)

If you talk to the elders every one of them takes oxygen. I don't know why, some of these elders can't breathe sometimes. It makes me worried. What happens if that blowout air comes over here? There are going to be a lot of sickness that comes from that. (Nuiqsut) (SRB&A Unpublished-b)

3.4.12.2 Sharing and Community Networks

Our Inupiat way of life is centered around sharing what food is available. We also exchange fish with other villages of the North Slope so that, in return, they may send us what they have that we don't have. The stores supplies only supplement food like milk for the babies. The main plane that carries our supplements does not come in for weeks in the wintertime when the weather is bad. Trisa Hopson. (Nuiqsut) (MMS 1979b)

And we support the villages up north, like Nuiqsut I know they will also have that problem like we have had in the years since the pipeline had come. And if those other villages stop having caribou too, when our caribou doesn't come around those villages up north they gather up money somewhere to bring us caribou. They go out hunting and take just caribou to bring up here because that's the only food we eat up here. We do eat fish, too, but we only have little graylings in our river. And they're usually easy to catch around last part of July and August in our little river. Delia Ahgook. (Anaktuvuk Pass) (BLM 1998d)

The other thing is, we share our food. I just sent over 3,000 pounds of Arctic cisco to Barrow to Wainwright and that's every year. We share with family across the North Slope and that's going to affect not just this community with our Arctic cisco, it's going to affect the North Slope. (Nuiqsut) (MMS 2006)

No, not enough. One caribou will feed your family but you got to worry about other families too. If you catch one you can't just keep it, so you have to share it between

households. I would say about 10 [caribou is ideal]. Yeah – 10 or 12 [caribou], that would be enough to last all winter. When you haven't had it in a while and someone brings it over it is so exciting, when someone brings it over it is like a delicacy now, it is like a treat now. Caribou are so hard to find now, it is such a treat. When you catch one it is gone in a week because you are sharing it between so many families. We all watch out for each other when it comes to caribou. The other day a buddy of mine dropped off a caribou. There were 13 of us living in my house, so that one caribou went a long way for us. My kids, they love it. When you cut it up they can't get enough. (Nuiqsut) (SRB&A 2015)

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