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

Ambler Road

Environmental Impact Statement

FINAL

Volume 2: Appendices G–K

March 2020

Prepared by:
U.S. Department of the Interior
Bureau of Land Management

In Cooperation with:
U.S. Army Corps of Engineers
U.S. Coast Guard
U.S. Environmental Protection Agency
Alatna Village Council
Allakaket Tribal Council (representing Allakaket Village)
Hughes Traditional Council (representing Hughes Village)
Noorvik Native Community
Northwest Arctic Borough
State of Alaska Department of Natural Resources

Participating Agencies:
Federal Highway Administration
National Park Service
U.S. Fish and Wildlife Service

Estimated Total Costs Associated with Developing and Producing this EIS: $4,880,000

Mission

Sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

Cover Photo: Looking north at the Brooks Range from the Alatna Hills. Photo by Crystal Glassburn (BLM).

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BLM/AK/PL- 19/013+1610+F030

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Appendix G:

Alternatives Development Memorandum

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October 2018, Updated June 2019

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Revisions History

October 2018: The BLM completed this document in its original form to document the alternatives evaluation process undertaken in consultation with cooperating agencies and completed in 2018.

February 2019: The BLM included revisions related to refinement of Alternative C, as had been anticipated in the October 2018 publication. Blocks of text were marked as "February 2019 Update."

June 2019: The BLM added a few technical corrections in response to comments made by cooperating agencies. The agency review came at the time this document was attached to the preliminary draft environmental impact statement as Appendix G and distributed to cooperating agencies as part of the PDEIS review package. The date was retained as "October 2018, Updated February 2019."

Acronyms and Abbreviations

AIDEA	Alaska Industrial Development and Export Authority
ANILCA	Alaska National Interest Lands Conservation Act
BLM	U.S. Department of the Interior, Bureau of Land Management
CA	Cooperating Agency
CEQ	Council on Environmental Quality
DMTS	Delong Mountain Transportation System
DOT&PF	Alaska Department of Transportation and Public Facilities
EIS	Environmental Impact Statement
GAAR	Gates of the Arctic National Park and Preserve
MP	Milepost
NEPA	National Environmental Policy Act
ROW	Right-of-Way
SF 299	Standard Form 299

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1. Introduction

The Alaska Industrial Development and Export Authority (AIDEA) has filed an application to construct a road across federal public lands to the Ambler Mining District in north-central Alaska. The federal public lands include areas managed by the U.S. Department of the Interior, Bureau of Land Management (BLM). BLM is charged by law under the National Environmental Policy Act (NEPA) with evaluating reasonable alternatives in an environmental impact statement (EIS). This *Alternatives Development Memorandum* documents the alternatives BLM has considered and those BLM is carrying forward for further evaluation. The document originally was completed in October 2018 and has been updated in 2019 to reflect 2019 refinements going into the EIS.

AIDEA is a public corporation of the State of Alaska that has a purpose to promote, develop, and advance the general prosperity and economic welfare of the people of Alaska and to create additional employment. AIDEA filed Standard Form 299 (SF 299), Application for Transportation and Utility Systems and Facilities on Federal Lands, pursuant to Title XI of the Alaska National Interest Lands Conservation Act of 1980 (ANILCA). The completed form is a right-of-way (ROW) application for surface transportation access across federal public lands to economically valuable mineral deposits in the Ambler Mining District on the southern flanks of the Brooks Range. SF 299 was filed with 5 federal agencies[1] for a proposed Ambler Mining District Industrial Access Road Project. The original filing of the application was November 24, 2015. The filing date of the ROW application was revised to June 20, 2016, when AIDEA submitted additional information to supplement the application.

AIDEA is requesting a ROW to construct and operate an all-season, industrial-access-only road that is approximately 211 miles long. The road would provide industrial access from the Dalton Highway for exploration and development of the Ambler Mining District. The project is being proposed in accordance with the access provisions of ANILCA Section 201(4)(b) and ANILCA Section 1101(a). The application was developed in the context of route studies the Alaska Department of Transportation and Public Facilities (DOT&PF) conducted in approximately 2011 and those AIDEA conducted more recently.

The BLM, Central Yukon Field Office (Fairbanks, Alaska), is developing the EIS under NEPA and Title XI of ANILCA. The EIS is required prior to any decision about federal authorizations and is in response to AIDEA's application. BLM is the lead federal agency for preparing the EIS because the proposed route begins at the Dalton Highway and would need to first cross BLM land; without BLM's approval, the remainder of the route could not be accessed. BLM has authority to grant a ROW across BLM-managed lands (approximately 23 miles of the proposed 211-mile-long corridor). BLM must also comply with Section 810 of ANILCA (subsistence evaluation) and Section 106 of the National Historic Preservation Act, among other environmental laws and regulatory requirements.

This Alternatives Development Memorandum marks a key milestone in BLM's analysis. It summarizes alternatives development work undertaken to date, and documents interim decisions on the project purpose and need and screening criteria that were necessary in preparation for addressing the range of alternatives. This memorandum documents the range of concepts and alternatives considered, including those previously studied by DOT&PF and AIDEA and those suggested during scoping. It also discloses to the public those alternatives BLM and the cooperating agencies have determined to move forward for additional analysis and those considered not reasonable. It is possible that additional alternatives will be screened out as the alternatives continue to be developed and refined and more is known about them.

[1] The U.S. Bureau of Land Management, National Park Service, U.S. Army Corps of Engineers, U.S. Coast Guard, and Federal Highway Administration.

2. Alternatives Development Process

An EIS is required to present the purposes for which an action is proposed (purpose and need statement), evaluate all reasonable alternatives for satisfying the project purpose, and present the impacts of each alternative for the consideration of decision makers before they make their decision. It is necessary to determine the range of potential alternatives and ultimately determine which are reasonable. According to the Council on Environmental Quality (CEQ),

> the phrase 'range of alternatives' refers to the alternatives discussed in environmental documents. It includes all reasonable alternatives, which must be rigorously explored and objectively evaluated, as well as those other alternatives, which are eliminated from detailed study with a brief discussion of the reasons for eliminating them.
>
> – Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations

CEQ also states:

> When there are potentially a very large number of alternatives, only a reasonable number of examples, covering the full spectrum of alternatives, must be analyzed and compared in the EIS.
>
> – Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations

The process of identifying the range of alternatives and determining the reasonable alternatives is preliminary to preparing a Draft EIS and may be continually refined as the Draft EIS is developed. The steps BLM has undertaken and expects to undertake to identify the reasonable alternatives are illustrated in Figure 1. These are:

1. Develop and Refine Purpose and Need
    a. Develop initial statement of purpose and need.
    b. Revise the statement based on scoping input (public and agencies) and cooperating agency input.
    c. The revised statement of purpose and need is reflected in Section 3 of this alternatives memorandum.
2. Identify Alternatives and Screening Criteria
    a. Develop initial criteria proposed for screening alternatives considering the purpose and need and scoping comments.
    b. Revise criteria based on cooperating agency input.
    c. The screening criteria are presented in Section 4 of this alternatives memorandum.
    d. Identify a range of potential alternatives (modes and routes) from the applicant and from scoping (public and agency input). Alternatives considered are presented in Section 5 of this alternatives memorandum.
3. Apply Screening Criteria / Evaluate Alternatives (the subject of this document)
    a. Apply screening criteria for an initial screening of alternatives. Screening results are presented in Section 6 of this alternatives memorandum.

b. Gather cooperating agency input regarding initial screening and potentially reasonable alternatives in this document.
c. Document BLM interim decisions about reasonable alternatives in this document.
d. Revise this document based on cooperating agency input and release it to the public to document BLM interim decisions regarding alternatives not carried forward for further analysis.

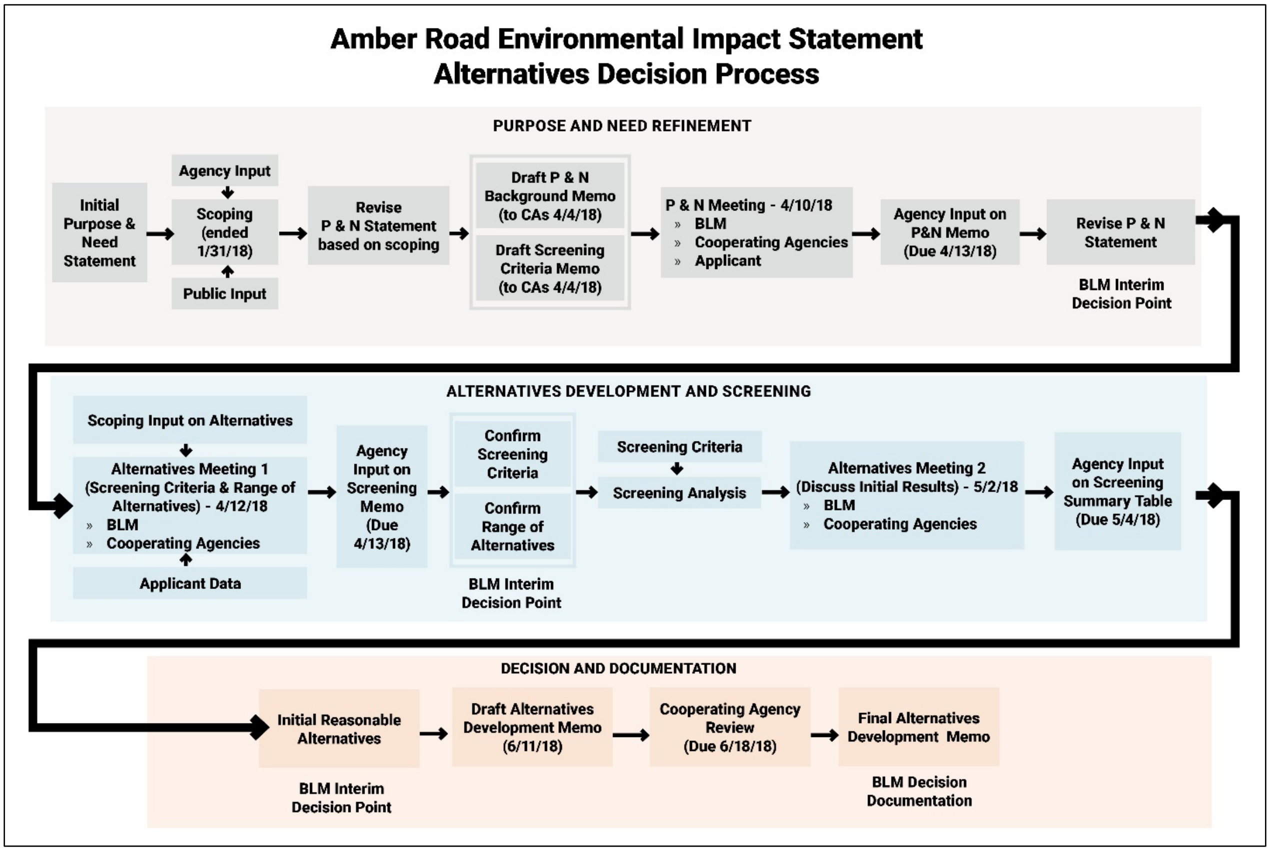

Figure 1. Alternatives development process

This figure depicts the alternatives development process BLM used to identify and evaluate alternatives. This process is described throughout the remainder of this document.
Source: Graphic developed by HDR

3. Purpose and Need

The statement of purpose and need is critical to the development of alternatives carried forward into an EIS. An alternative is reasonable only if it satisfies the identified purpose and need for the project. Elements of the statement of purpose and need become criteria used to consider a wide range of alternatives and identify those that are reasonable.

BLM developed an initial statement of purpose and need related to the decisions it must make as the lead federal agency. BLM shared the initial statement of purpose and need during the EIS scoping process with the public and agencies, and invited comment on the statement. BLM also convened a meeting with cooperating agencies, in part, to obtain input on the statement of purpose and need and discuss refinements to it based on public and agency scoping comments. Following discussion with cooperating agencies, BLM revised the purpose and need statement. Compared to the initial statement, changes included the addition of a statement of need, addition of the term “year-round,” and a general rewording to make these changes read more clearly. The current statement of purpose and need is as follows.

Project Need

The Project need results from the requirement of the BLM to consider a ROW application for industrial surface transportation access across BLM-managed lands to the Ambler Mining District.

Project Purpose

The purpose of the BLM action is to issue a ROW grant which provides for:

1. technically and economically practical and feasible year-round industrial surface transportation access in support of mining exploration and development, and
2. construction, operation, and maintenance of facilities associated with that access.

4. Screening Criteria

Screening criteria are measures used to evaluate alternatives and ultimately to “screen out” those that are not reasonable (i.e., those that do not meet the criteria). As noted in the previous section, the statement of purpose and need is a key source for screening criteria. Other criteria were developed as part of the larger scoping and screening process based on input from the public, tribes, agencies, and internal deliberations within BLM.

BLM’s NEPA Handbook indicates that in determining the alternatives to be considered, the emphasis is on what is “reasonable” rather than on whether the proponent or applicant likes or is capable of implementing the alternative. It reiterates guidance from the CEQ, indicating that:

> Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant. (BLM NEPA Handbook)

Furthermore, the BLM NEPA Handbook indicates that BLM “can only define whether an alternative is ”reasonable” in reference to the purpose and need for the action.” Finally, the handbook (Section 6.6.3) indicates that the BLM may eliminate an action alternative from detailed analysis if:

- It is ineffective (i.e., it would not respond to the purpose and need).
- It is technically or economically infeasible (i.e., whether implementation of the alternative is likely given past and current practice and technology; this does not require cost-benefit analysis or speculation about an applicant’s costs and profits).
- It is inconsistent with the basic policy objectives for the management of the area (e.g., not in conformance with the land use plan).
- Its implementation is remote or speculative.
- It is substantially similar in design to an alternative that is analyzed.
- It would have substantially similar effects to an alternative that is analyzed.

BLM used this guidance to develop criteria for this project and shared these criteria with cooperating agencies. The criteria were then refined based on the input received. The project screening criteria, used to identify alternatives warranting further analysis, is as follows:

- **Effectiveness.** Is the alternative effective (would it respond to the purpose and need)?

- Does the alternative provide year-round surface transportation access? (yes or no)
  - Factors to consider:
    - Year round
    - Surface access
- Is the alternative feasibly and practically able to support mining exploration and development activities in the Ambler Mining District? (yes or no)
  - Factors to consider:
    - Logical termini2
    - Support hauling mining equipment and heavy loads
    - Constructed length
    - Distance to transportation network

- **Technical Feasibility.** Is the alternative technically feasible?
  - ***Constructability.*** Would the alternative use proven construction methods and minimize construction risk by taking into consideration topography, poor soils, difficult river crossings, and access to construction materials? (yes or no)
    - Factors to consider:
      - Topography
      - Poor soils
      - Difficult river crossings
      - Access to construction materials
- **Existing Technology.** Can the alternatives be accomplished using existing technology and equipment? (yes or no)
  - Factors to consider:
    - Generally accepted design criteria for the intended mode of transportation and intended use
- **Economic Feasibility.** [3] Is the alternative economically feasible?
  - Are construction costs reasonable compared to other alternatives? (yes or no)
    - Factors to consider:
      - Construction costs
  - Are operations and maintenance costs reasonable compared to other alternatives? (yes or no)
    - Factors to consider:
      - Operations and maintenance costs
- **Practicality.** Does the potential alternative require remote or speculative assumptions for implementation?
  - Does the alternative require speculative assumptions or remotely foreseeable circumstances? (yes or no)
    - Factors to consider:
      - Speculative assumptions?
      - Remotely foreseeable circumstances?
  - Is the alternative practical using common sense? (yes or no)
    - Factors to consider:
      - Common sense

[2] Based on cooperating agency input, the BLM determined that the logical termini for the project should be defined as a connection from the mining district to an existing port or to existing transportation infrastructure that leads to an existing port.
[3] For the economic feasibility criterion, costs for alternatives were derived largely from the DOT&PF effort in 2011–2012 and the applicant's materials. For alternatives not considered previously and therefore did not have original cost estimate, costs were extrapolated from these existing data sources. Older costs were escalated to 2018 dollars. Growth rates were based on the Bureau of Labor Statistics Urban Alaska Consumer Price Index. Escalation rates used were as follows: from 2011 to 2018: 10.1 percent; from 2012 to 2018: 7.7 percent; from 2016 to 2018: 1.8 percent. Additional documentation regarding costs were also considered.

  - Does the alternative have unacceptable environmental impacts relative to other alternatives? (yes or no)
    - Factors to consider:
      - Environmental data[4] on caribou habitat crossed, anadromous fish stream crossings, and hydrologic conditions
- **Duplication.** Is the alternative substantially similar in design to an alternative that is analyzed, or would it have substantially similar effects to an alternative that is analyzed?
  - Is the alternative substantially similar to one that is also being analyzed? (yes or no)
    - Factors to consider:
      - Duplication
  - Is the alternative similar to (but not as good as) an alternative with similar routing or other key characteristics? (yes or no)
    - Factors to consider:
      - Duplication

5. Alternatives Considered

NEPA requires consideration of a range of alternatives. BLM considered alternatives proposed by the applicant (AIDEA) in their application. In addition to their proposed alternative, AIDEA's application included consideration and evaluation of several routes originally investigated by the DOT&PF. BLM also considered the comments of the public and agencies, particularly received during the scoping process, including multiple comments related to alternatives. Each of these alternatives is briefly described below.

5.1. Applicant Alternatives

AIDEA, as the applicant, submitted a Proposed Route and an Alternative Route. Both are roads that connect the Dalton Highway at Milepost (MP) 161 with the Ambler Mining District to the west. The Alternative Route dips southward to take a different route through Gates of the Arctic National Preserve. Figure 2 illustrates these routes.

AIDEA Proposed Route (Gates of the Arctic National Park and Preserve [GAAR] North): The AIDEA Proposed Route is a 211-mile-long eastern alignment (accesses Ambler Mining District from the east), with its eastern terminus at MP 161 of the Dalton Highway. It runs almost directly west to the Ambler Mining District across principally State, BLM, and Gates of the Arctic National Preserve lands.

AIDEA Alternative Route (GAAR South): The AIDEA Alternative Route is a 228-mile-long eastern alignment, with its eastern terminus at MP 161 of the Dalton Highway. It is the same as the Proposed Route except that it loops to the south to pass through Gates of the Arctic National Preserve at the narrowest possible location. This adds 20 miles to the overall route length.

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[4] For the practicality criterion, environmental metrics used during screening included consideration of caribou habitat, anadromous fish streams, and hydrology related to stream crossings and riparian acreage, based on data from Alaska Department of Fish and Game and the U.S. Geological Survey (USGS). Environmental metrics for caribou habitat and anadromous fish stream crossings were calculated in June 2018 using GIS and based on a 250-foot-wide corridor (the applicant's proposed right-of-way width); in July 2018, riparian area was calculated based on a buffer of USGS' National Hydrography Dataset lines that intersected the 250-foot ROW. The 250-foot width represents a conservative estimate of impacts and would account for cuts and fills beyond the typical footprint, indirect (adjacency) impacts, and construction impacts. DOT&PF proposed a typical section for both road and rail alternatives that required a 32-foot top width, and they used the same centerline for their analysis. For this reason, the road impacts and the rail impacts calculated for this screening are identical. For alternatives that move forward, it is anticipated that more precise footprint impacts will be calculated.

5.2. DOT&PF Previously Identified Alternatives (Corridors)

DOT&PF had examined multiple routes (corridors) before the project was transferred to AIDEA, completing most of its work in 2011. The alternatives DOT&PF examined are shown on Figure 3 and include the following rail and road alignments:

- Original Brooks East Corridor – Road
- Kanuti Flats Corridor – Road
- Elliott Highway Corridor – Road
- Parks Highway Railroad Corridor – Rail
- Delong Mountain Transportation System (DMTS) Port Corridor – Road or Rail
- Cape Blossom Corridor – Road or Rail
- Selawik Flats Corridor – Road or Rail
- Cape Darby Corridor – Road or Rail

Original Brooks East Corridor (Road): The Brooks East Corridor is a 220-mile-long road alternative. It is an eastern alternative (approaches Ambler Mining District from the east) and is the original basis for the AIDEA Proposed Route. It would upgrade a currently used seasonal ice road to the Bettles/Evansville area, including Evansville in the route. The route is hilly but not truly mountainous.

Kanuti Flats Corridor (Road): The Kanuti Flats Corridor is a 240-mile-long road alternative. It is an eastern alternative that starts with the Original Brooks East Corridor but diverges at Evansville and follows a flatter route westward, skirting south of Gates of the Arctic National Preserve.

Elliott Highway Corridor (Road): The Elliott Highway Corridor is a 370-mile-long road alternative. It is a southeastern alternative, with its southern terminus at the existing Elliott Highway. From there, it heads west (crossing the Yukon River), then heads north and west. Its final miles are the same as the Kanuti Flats Corridor. Its route is mostly the same as the Parks Highway Railroad Corridor.

Parks Highway Railroad Corridor (Rail): The Parks Highway Railroad Corridor is a rail alternative that splits at each end, providing 4 routes that vary between 420 and 450 miles long. It is a southeastern alternative, with its southern terminus at the existing Alaska Railroad at the Parks Highway, west of Fairbanks. From the Alaska Railroad, the route heads generally northwest, crossing the Yukon River, jogs north through a band of low mountains, then heads north and west to the Ambler Mining District. Its route is much the same as the Elliott Highway (road) Corridor.

DMTS Port Corridor (Road or Rail): The DMTS Port Corridor is a 260-mile-long road or rail alignment. It is a western alternative (approaches Ambler Mining District from the west). DMTS refers to the Delong Mountain Transportation System that connects the Red Dog Mine in western Alaska with a mining port on the coast west of Noatak. From the port, the route heads east-southeast and crosses Noatak National Preserve and Kobuk Valley National Park.

Cape Blossom Corridor (Road or Rail): The Cape Blossom Corridor is a 250-mile-long road or rail alignment. It is a western alternative, with its western terminus at Cape Blossom, south of Kotzebue, which has been identified as a potential port site. From Cape Blossom, the route heads southeast, then northeast, crossing Selawik National Wildlife Refuge.

Selawik Flats Corridor (Road or Rail): The Selawik Flats Corridor is a 330-mile-long road or rail alternative. It is a western alternative, with its western terminus at the Nome-Council Road, which leads to Nome, where there is an existing port. From the Nome-Council Road, the route heads northeast across the Seward Peninsula and Selawik National Wildlife Refuge. Most of the route is with the same as the Cape Darby Corridor.

Cape Darby Corridor (Road or Rail): The Cape Darby Corridor is a 340-mile-long road or rail alternative. It is a western alternative, with its western terminus at Cape Darby, which has been identified as a potential port site. From Cape Darby, the route heads northeast, crossing the base of the Seward Peninsula and the Selawik National Wildlife Refuge. Most of the route is with the same as the Selawik Flats Corridor.

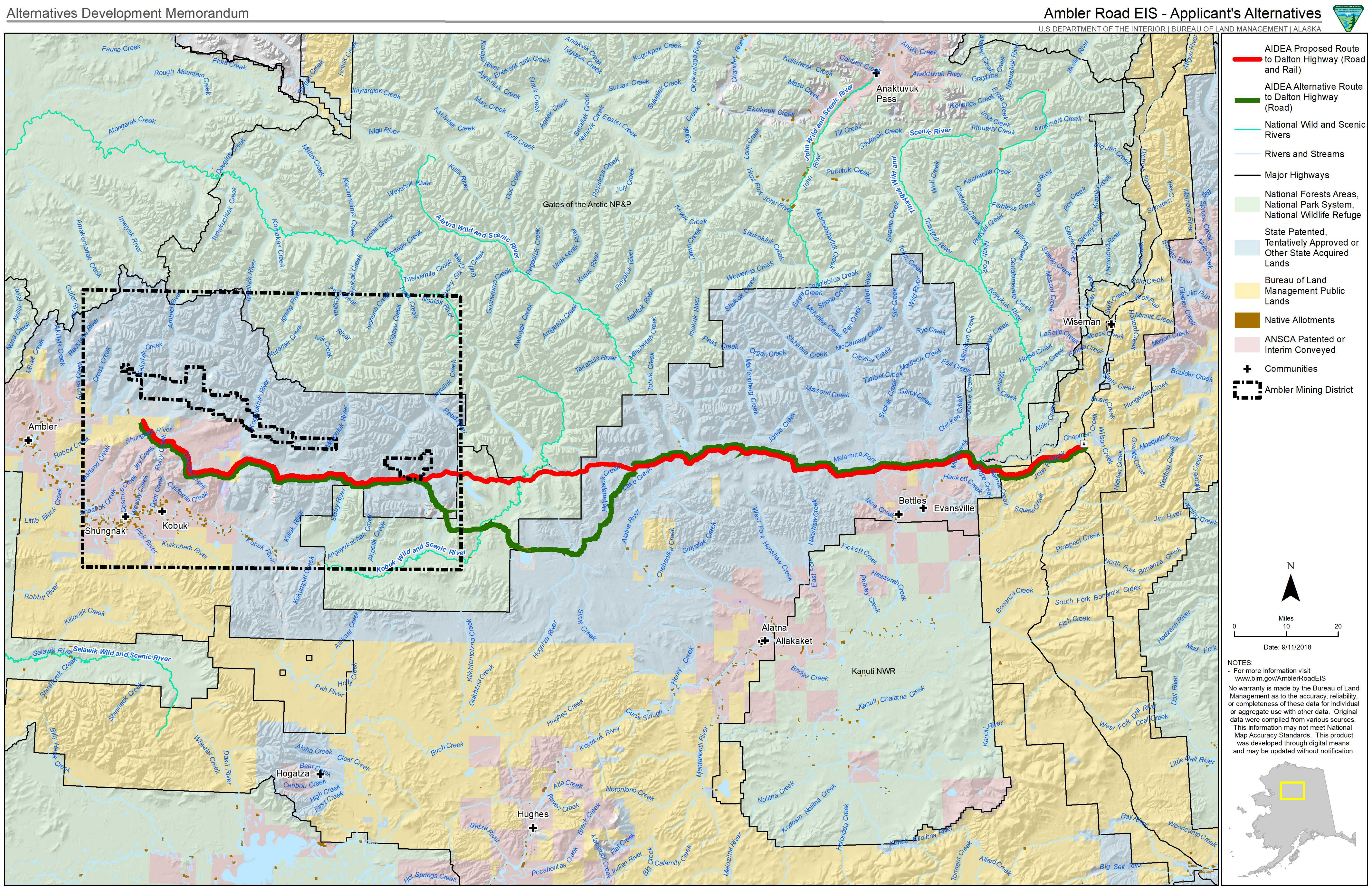

Figure 2. Applicant's proposed alternatives

Source: AIDEA SF 299

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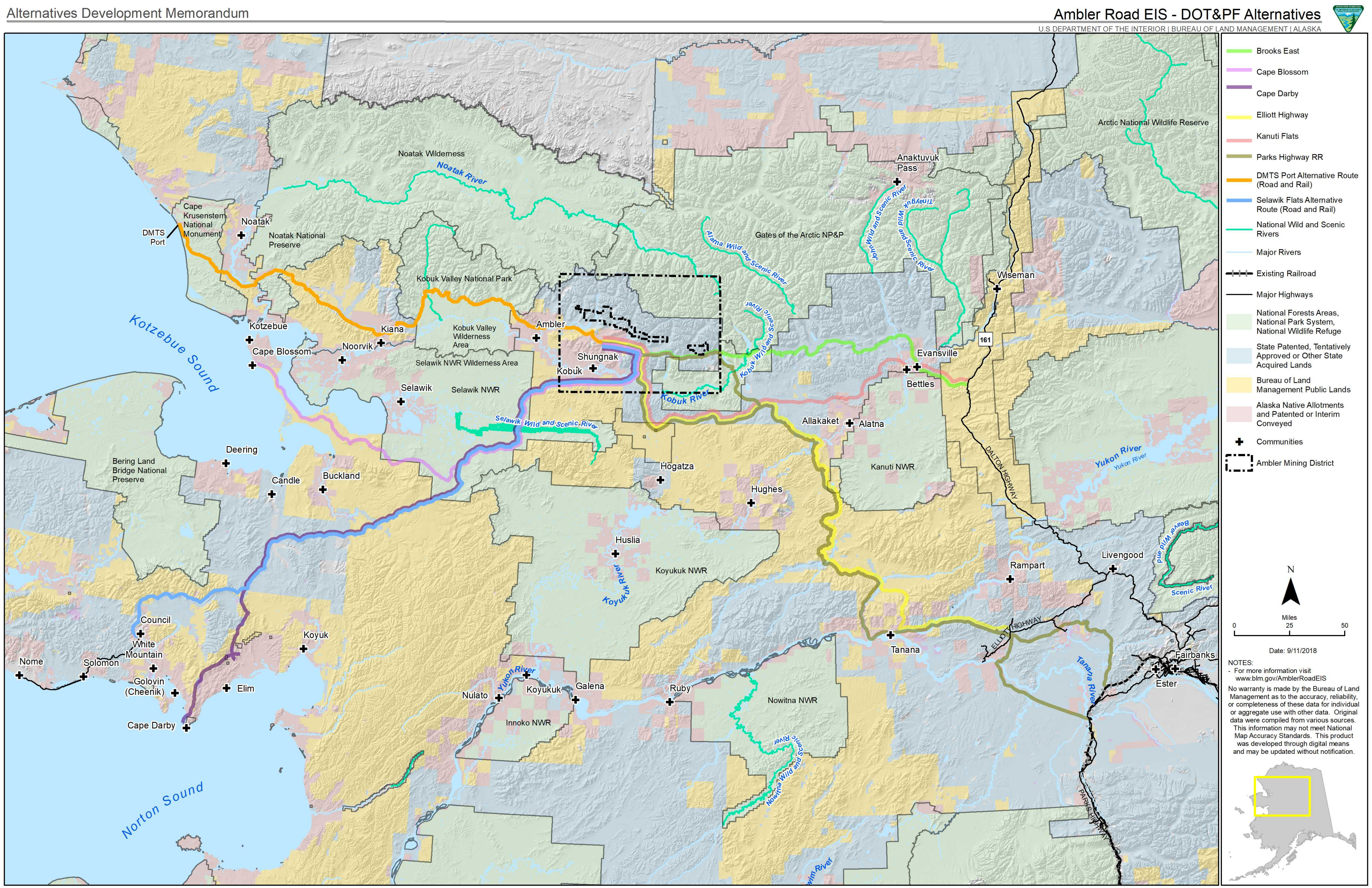

Figure 3. DOT&PF previously studied routes

Source: DOT&PF. September 2011. Corridor Development Memorandum. Ambler Mining District Access and AIDEA SF 299

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5.3. Alternatives Identified During Scoping and Post-Scoping

The 2017–2018 scoping process undertaken by BLM generated comments related to alternatives. These are compiled in Appendix A of this document. Based on these comments during scoping and the alternatives development/screening phase, BLM identified several mode alternatives as well as several road or rail routes.

Commenters noted road or rail routes but often did not specify a location or route, for example, "west to the coast" as a general route suggestion. Given that DOT&PF had already identified several routes west to the coast and that these had engineering behind them, BLM did not undertake to create new alignments based on such comments, although it did consider some potential refinements to the DOT&PF routes based upon comments. Figure 4 illustrates these routes.

Additional alternatives/concepts gleaned from public and agency scoping comments and other input are as follows:

- Kobuk River Routes/Concepts
  - A route down Kobuk River to tidewater
  - An ice road to lower Kobuk River
  - A shorter road to Kiana, then barge on Kobuk River; truck-to-barge mode in general
  - Improvements (dredge) to Kobuk River for barge access
  - Kobuk River crossing(s) moved downstream of Pah River confluence
- Southwest Routes/Concepts
  - Variations on Selawik Flats/Cape Darby corridors that access other resources
  - A variation of the Selawik Flats route (referred to as the Nome route in this document; note this specific route was suggested after the scoping period had concluded)
- Southeast Routes/Concepts
  - A Tanana-Hughes-Hogatza-Kobuk alignment (in this document called the Communities Route)
- Gates of the Arctic National Preserve Routes/Concepts
  - Variations to reduce airfields and other features within GAAR
  - More route options crossing GAAR
- Variations on Proposed Routes/Other Connections to Dalton Highway
  - Rail to Dalton Highway by any route (implies ore would transfer to trucks at highway)
  - A route across the Alatna River and up Helpmejack Creek
  - More take-off points from Dalton Highway
  - A more southerly route tying directly to national park southerly route
- Other Concepts (suggestions for alternatives that were not described sufficiently to map)
  - A route "close to villages"
  - A seasonal road with ice bridges only
  - "Heavy haul" road design (implies oversize mining vehicles, not just street vehicles)
  - One-lane road with passing areas and traffic-tracking software
  - Variations on phasing, or no phasing, of construction
  - Variations on placements of airstrips
  - Variations on ROW ownership
  - Pipelines for fuel import and ore export, coupled with air transport for personnel
  - Existing infrastructure and traffic routing (e.g., truck or rail to Port MacKenzie or Seward)
  - A route developed to have least possible impact on subsistence
  - A "Tribal Alternative" developed with traditional/local knowledge

- An elevated rail—a concept generally described by a University of Alaska engineering professor—that was included in internal scoping at BLM

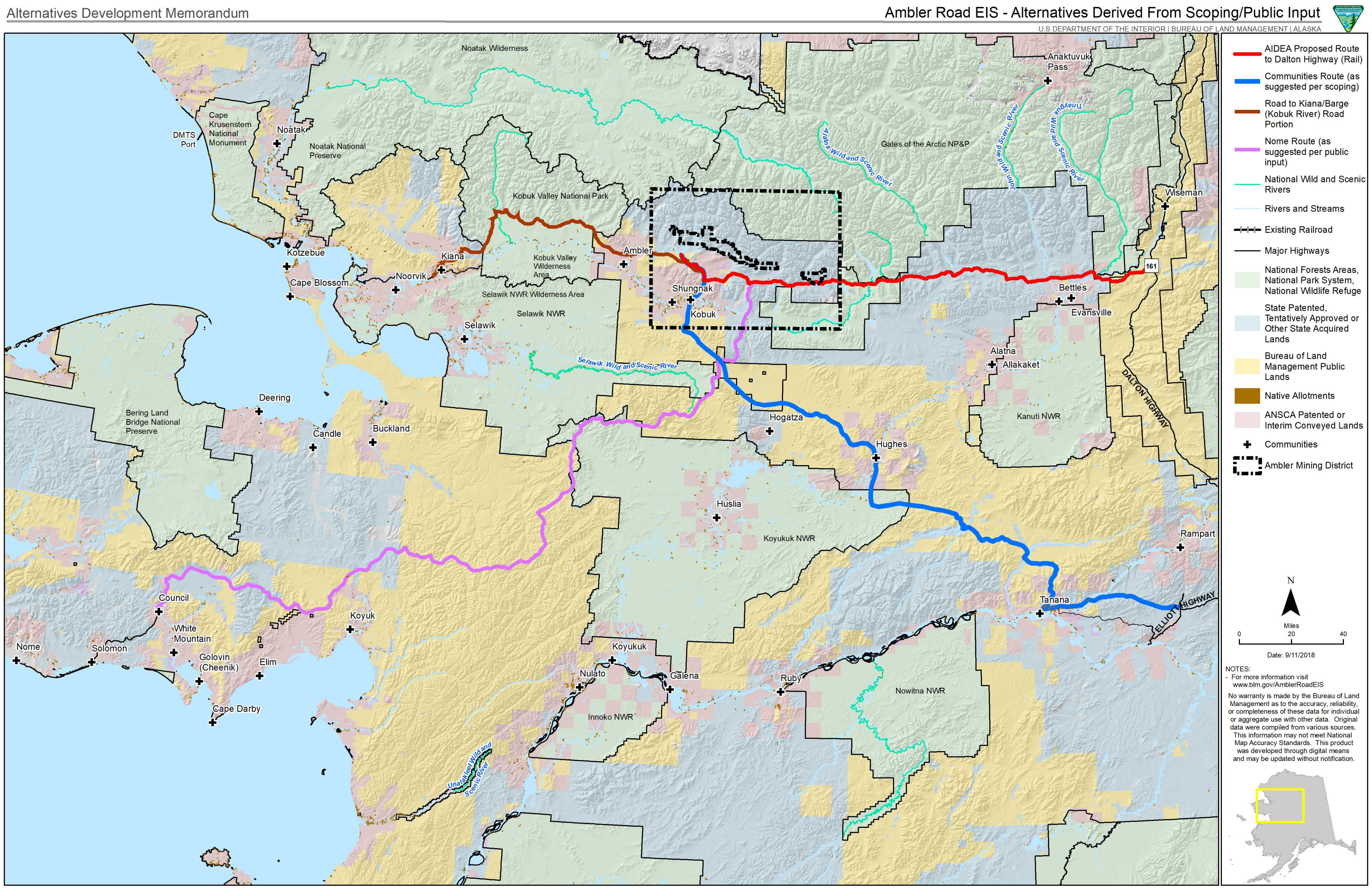

Figure 4. Alternatives derived from public input

Source: Prepared by HDR based on EIS scoping comments and other input received by BLM.

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5.4. Cooperating Agency Input on the Potential Range of Alternatives

The cooperating agencies discussed the various concepts and routes proposed in scoping comments at a meeting in Fairbanks on April 12, 2018. Based on this discussion, BLM made the following decisions:

- The route should provide year-round access based on the statement of purpose and need.
- Logical termini for the project should be defined as a connection from the Ambler Mining District to an existing port or to existing transportation infrastructure that leads to an existing port.

The following provides a brief summary of the input related to each of the corridors introduced during scoping as described above.

Kobuk River Routes/Concepts: Agency discussion of the Kobuk River routes noted that barging and ice roads are not year round, not practical, and would have unacceptable impacts if dredging for additional river depth were part of the alternative. To be responsive to scoping comments, BLM's determination was to include a road-to-barge alternative and a road alternative in the Kobuk River corridor for screening.

Southwest Routes and Concepts: Based on agency discussion and map inspection, it was determined that other mining districts to the southwest were near enough to the alignments DOT&PF had examined that those routes already could be considered to provide reasonable access to those districts. BLM's determination was to not include any additional routing or variation in the southwest/Seward Peninsula area as it would be duplicative to routes that already had considerable engineering consideration in their development. (Note: Subsequent to scoping and the April 12, 2018 cooperating agency meeting, the BLM received an additional public request to consider a specific variant to the southwest, which became known as the Nome route. The BLM incorporated this route for consideration in the screening process).

Southeast Routes and Concepts: There was a determination that an alternative that better incorporated the communities of Tanana, Hughes, Hogatza, and Kobuk had a sufficiently different routing than those evaluated by DOT&PF/AIDEA that it warranted screening. This alternative was labeled the Communities Route.

Gates of the Arctic National Preserve: Discussion about reducing airfields and gravel sources within the National Preserve resulted in a determination that these were design variations or impact topics to be evaluated in the EIS but were not distinct alternatives needing screening.

Variations on the AIDEA Proposed Route: Discussion resulted in a determination that scoping suggestions for other alignments and variations on AIDEA's Proposed Route were too vague to be considered distinct alternatives for screening. However, a rail connection to the Dalton Highway was not previously evaluated and was suggested for screening.

Other Concepts: Discussion of alternatives related to the other concepts noted in the bulleted list above (most of which could not be mapped) resulted in a determination they were ambiguous or duplicative to routes already being considered. The concepts from scoping often were vague or about process. For example, input already has been given by communities/tribes that has resulted in alignment changes. Pipelines would not serve exploration or fully meet the project needs (e.g., a pipeline would not be able to move equipment or support mining exploration). BLM did determine, however, to consider the elevated rail mode in the screening process. None of the other scoping ideas warranted inclusion as an alternative method of meeting the purpose and need.

Based on the discussion with the cooperating agencies and review of previously studied routes, BLM determined that 4 additional alternatives suggested during scoping warranted screening. The following provides additional information on these 4 routes.

Rail to Dalton Highway: The Rail to Dalton Highway route is a 211-mile-long rail alternative. It is an eastern route—it was assumed to follow the approximate alignment of the AIDEA Proposed Route (acknowledging it may need to vary from this route in places to achieve grades that can be traversed by trains). The route's eastern terminus is the Dalton Highway, and it runs almost directly west to the Ambler Mining District. This alternative assumes any mining ore would transfer from trains to trucks at the Dalton Highway. From there, the transport would occur in the same manner as the Proposed Route.

Route along Kobuk River to Tidewater: The route along the Kobuk River is an approximately 150-mile-long (no alignment was proposed, so no firm length was calculated) road alternative. It is a western route, with its western terminus at "tidewater," near the mouth of the Kobuk River. There is no existing port in the vicinity; the nearest port is the DMTS port, which is the terminus of the DMTS Port Route. The suggested route is assumed to roughly parallel the Kobuk River.

Road to Kiana Area, then Barge via Kobuk River: This alternative would include a road route to the Kobuk River near the village of Kiana and the barging/lightering of materials from there to an off-shore location where ocean going vessels would moor. BLM used the DMTS route to the vicinity of Kiana on the Kobuk River because that route had been engineered by DOT&PF. No engineering has been completed on the short segment from the DMTS route to the Kobuk River; however, it appears feasible based on inspection of topographic maps. From the Kiana area, it was assumed that barge traffic would operate seasonally on the Kobuk River and would continue across Hotham Inlet to Kotzebue Sound, where ore ships could anchor offshore in deeper water as ships do today to serve Kotzebue (15 miles off shore). Ore ships operate similarly farther north at the DMTS port (where ore ships anchor 3 miles off shore and materials are lightered to and from shore). The mapped road portion would be approximately 149 miles long. The Kobuk River has multiple channels and many oxbows; the river mileage is estimated at 60 miles. The additional water distance to an anchorage off of Kotzebue could be up to an additional 50 miles.

Communities Route: Because no alternative had been previously delineated, BLM drafted a generalized route for this alignment. The Tanana-Hughes-Hogatza-Kobuk route is a 306-mile-long road alternative. It is a southeastern alternative, with its southern terminus at the existing Elliott Highway. From there, the route follows the DOT&PF Elliott Highway Route westward across the Yukon River, then northwest. It diverges from that route, however, to stay farther west, winding though Hughes, north of Hogatza, and ending near Kobuk. Because of mountainous topography, it crosses a corner of the Koyukuk National Wildlife Refuge, although BLM is assessing whether it is feasible to route this potential alternative to avoid the refuge.

5.5. Conclusion – Range of Alternatives for Screening

BLM considered the full spectrum of ideas generated during public scoping and internal scoping with cooperating agencies and identified modes and routes that constitute the range of alternatives to be screened. The ideas and alternatives include the following modes:

- Road
- Standard rail
- Blimp/dirigible
- Pipeline
- Elevated rail

- Narrow gauge rail
- Ice road
- Barge/road to barge

BLM determined that the applicant’s Proposed Route and Alternative Route, the road and rail alignments considered by DOT&PF, and several routes and concepts suggested by the public during and after scoping should undergo screening. The range of potential routes includes the following:

Routes Proposed by Applicant
- AIDEA Proposed Route (GAAR North)
- AIDEA Proposed Alternate Route (GAAR South)

Routes Studied By DOT&PF
- Original Brooks East Corridor – Road
- Kanuti Flats Corridor – Road
- Elliott Highway Corridor – Road
- Parks Highway Railroad Corridor – Rail
- DMTS Port Corridor – Road or Rail
- Cape Blossom Corridor – Road or Rail
- Selawik Flats Corridor – Road or Rail
- Cape Darby Corridor – Road or Rail

Routes Suggested During Scoping
- Rail to Dalton Highway along AIDEA’s Proposed Route (GAAR North)
- Road Route along Kobuk River to Tidewater
- Road to near Kiana, then Barging Down the Kobuk River
- Communities Route (Tanana, Hughes, Hogatza, Kobuk) - Road
- Nome Route (a Selawik Flats variant) – Road

6. Alternatives Screening

6.1. Process Overview

The screening process was broken into 2 phases: an initial screening of transportation modes and a secondary screening of routes associated with the reasonable modes. This was an iterative process, based in large part on scoping comments received, input from cooperating agencies, and review of available data. Many of the scoping comments related to alternatives that were not specific about a location for an alternative, but instead identified perceived advantages of modes other than automobile-based transportation, such as standard aircraft, dirigibles, standard and narrow gauge railroad, elevated railroad, barge transportation, and pipelines. Screening first examined these modes to see which were reasonable to advance, with the idea that location information (engineering route detail) could be applied to those modes that moved past the first screening.

The second screening pertained to those modes that were found potentially reasonable based on the criteria. Only road and rail modes were determined reasonable (see analysis in Section 6.3). Where necessary, engineering information that had been developed in detail for DOT&PF alternatives was used to evaluate new routes to a level sufficient for screening. Routes were delineated based on topographic maps and aerial photographs. Construction costs were based on DOT&PF’s estimated costs per mile of other road and rail alternatives in similar terrain. Costs done several years ago were all escalated to the same year (2018).

In both screenings, draft data were displayed in large matrices (spreadsheet tables) for discussion with cooperating agencies and for internal BLM consideration. Following a meeting with cooperating agencies, the matrices were revised, and BLM made initial decisions about which alternatives would be carried forward for further analysis and which were not reasonable and would not be carried forward. Additional data were reviewed to help further screen the alternatives.[5] Final summary matrices appear in Appendix B (modes) and Appendix C (routes) of this document.

6.2. Cooperating Agency Input on Alternatives Screening

Agencies met in Fairbanks on April 12, 2018, and in Anchorage on May 2, 2018, to review changes to the statement of purpose and need, review changes to the screening criteria, discuss the range of alternatives, and review and provide input on drafts of the screening matrices. Relevant points from the discussion include the following:

- Narrow gauge rail may be considered a variation on the rail mode rather than a separate alternative. In any case, agencies noted it is used in mining applications around the world and has design criteria that lend it to tighter curves and steeper grades. Agencies felt it should pass through the mode phase of screening.
- “Egregious environmental impact” should be added as a criterion. Based on the input, BLM did add a criterion for unacceptable environmental impact relative to other alternatives.
- Some agencies felt that a “year-round” requirement makes ice roads and barges impractical, and such modes would not satisfy the purpose and need. It was not clear how “year round” should be applied to ports that ice over. The participants expressed a need to further understand if there is a necessity to have access to a year-round port in addition to a year-round road, especially considering that the DMTS port, also owned by the applicant, operates seasonally and is touted by the applicant as the road-operating model on which this project is based.
- There is a need to better understand the necessity for a “deep water” port versus lightering loads from ships anchored offshore.[6] DOT&PF considered deep water ports (e.g., Cape Blossom and Cape Darby) and shallow draft ports that rely on lightering (e.g., DMTS and Nome). The Northwest Arctic Borough noted that the Kobuk River is too shallow to support mining operations, and that even the shallow draft barges that operate there now often cannot get through.

In terms of specific modes, the cooperating agency meetings resulted in general agreement on the following points:

- Year-round roads, standard rail, and narrow gauge rail modes appeared to be reasonable modes for further consideration.
- Air modes do not constitute “surface transportation” as specified in the statement of purpose and need and therefore are not reasonable. Dirigibles are unproven technology in arctic conditions.
- The elevated rail concept is based on an unproven technology in arctic conditions, is very expensive, and is likely not practical.

[5] Available wetlands data was reviewed and determined by the BLM and the USACE to be insufficient for screening purposes due to its coarseness and inaccuracy. Existing documentation regarding ports and mining district activity was reviewed and independently assessed in regards to the logical termini, economic feasibility and practicality criteria.

[6] As part of the alternatives screening process, the BLM concluded that they did not need to determine if having a shallow water port would result in an alternative being screened out for not having a logical terminus. While deep water ports were considered during the logical termini discussions, alternatives connecting to a shallow water port were eventually screened out for other additional reasons.

- Seasonal winter ice roads and barging are not "year-round" transportation as specified in the statement of purpose and need.
- Pipelines, while they might be useful for transporting fuel or ore slurry, would not support the need for hauling equipment and supplies.

In terms of specific routes, the cooperating agency meetings resulted in the following general agreement regarding routes:

- Rail access to the Dalton Highway may be difficult to screen out at this point.
- The Original Brooks East Route is largely duplicative of the AIDEA Proposed Route, but AIDEA's Proposed Route avoids impacts to communities.
- The Cape Darby Route does not connect to an existing port. It would be speculative to assume a port would be developed at Cape Darby.

6.3. Mode Screening Results

This section describes BLM's rationale for screening out some mode alternatives as not reasonable and carrying others forward to the second level of screening. BLM took all available information (e.g., matrices, scoping comments, cooperating agency input, and applicant material) into consideration. The results are presented below as summary lists, with detailed explanation following. This section should be read in conjunction with the mode screening matrix information presented in Appendix B of this document.

6.3.1. Modes Eliminated

Modes eliminated from further consideration:

- Seasonal ice road
- Elevated rail
- Standard aircraft
- Dirigible
- Barge
- Pipeline

Air (standard air): Standard air access—airplanes or helicopters using runways or helipads—was evaluated but eliminated from further consideration because this mode would not provide surface access and therefore would not adequately support hauling mining equipment and heavy loads. Operating costs were noted as excessive and unreasonable given the loads in question. Air access would require speculative assumptions about whether this mode would be effective in support of mining operations and therefore would not be practical. Key considerations included:

- Purpose and Need: Does not meet purpose and need because it does not provide surface access.
- Purpose and Need: Does not meet purpose and need because it does not reasonably support hauling heavy mining equipment and heavy loads.
- Technical Feasibility: Not technically feasible given the anticipated loads and equipment needed to be hauled.
- Economic Feasibility: Has economic challenges. High numbers of flights at high costs would be necessary because of the small load capacity of planes compared to truck or rail modes.
- Practicality: Not practical using common sense and because it requires speculative assumptions. Aircraft are not suitable for the kinds of hauling needed; it would be highly speculative to believe mines would be able to develop if dependent on this mode.

Air (blimp/dirigible): Screened out for similar reasons as standard aircraft service, plus additional speculation and risk related to untested technical feasibility for mining support purposes in an arctic environment.

- Purpose and Need: Does not meet purpose and need because it does not provide surface access.
- Technical Feasibility: Technical feasibility is questionable. Heavy lift dirigibles supporting mining in the arctic do not have generally accepted design criteria.
- Practicality: Not practical using common sense and because it requires speculative assumptions. Requires speculation that an untested mode, in a dark, harsh arctic environment, would be safe and reliable. An untested mode in the unique environment of the project area is not reasonable using common sense.

Rail (elevated rail): Screened out because of the speculative and untested technical feasibility of the concept in arctic environments and because of anticipated very high construction costs of what would amount to building a continuous bridge that could be in excess of 200 miles long. Where standard rail construction might cost approximately $6 million/mile, elevated rail capable of hauling mining loads was estimated to cost in excess of $100 million/mile.

- Technical Feasibility: Not technically feasible. There are not established design criteria for this technology in arctic conditions.
- Economic Feasibility: Not economically feasible. Consultant engineers estimated this technology could cost in excess of $100 million/mile.
- Practicality: Not practical using common sense and because it requires speculative assumptions. Requires speculation that an untested mode, in a dark, harsh arctic environment, would function well. The high cost and unproven technology in arctic conditions make it not practical using common sense.

Road (seasonal ice road): Screened out because an ice road would not provide year-round surface access and therefore would not satisfy the project purpose and need. An ice road concept was noted as unreliable in the face of a changing climate. Operations and maintenance were noted as not reasonable because potentially greater than 200 miles of new road would need to be built each winter. Therefore, an ice road was deemed not practical.

- Purpose and Need: Does not meet purpose and need because it does not provide year-round access. Moreover, it is questionable as to whether river crossings can provide reliable access to support mineral exploration and development given changing climate conditions. Heavy loads require stable, consistent ice conditions.
- Technical Feasibility: Technical feasibility is questionable. There are not established design criteria for constructing ice roads that support heavy mining operations.
- Ice roads of this length are not practical; changing climate conditions make reliability of ice roads speculative and therefore not practical.
- Economic Feasibility: Not economically feasible. Constructing new ice roads each year is not economically feasible. It is reported that ice road construction and maintenance on the North Slope costs $1 million/mile/year. Furthermore, limiting surface access to the mining district to only a portion of the year does not meet the applicant’s need for year-around access.
- Practicality: Constructing an ice road of the required length each winter is not practical using common sense and is not economically feasible.

Water (barge/boat)[7]**:** Screened out because a water-only route would not provide "year-round" surface access and therefore would not satisfy the project purpose and need. The Kobuk River would be too shallow for reliable seasonal access and/or would require dredging; other routes were not identified. The impacts of dredging would also make this mode not practical for environmental reasons, but the alternative was screened out primarily based on purpose and need issues.

- Purpose and Need: Does not meet purpose and need because it does not provide year-round access.
- Technical Feasibility: Technical feasibility is problematic. Rivers near the Ambler Mining District are too shallow for barges hauling the kinds of materials anticipated, which would require dredging. Dredging raised unacceptable environmental concerns for cooperating agencies.
- Practicality: Changing climate conditions require speculation that water levels will remain constant over time, introducing technical feasibility issues and making barge modes not practical based on the necessary speculating.

Pipeline: This alternative was screened out because it would not support the required hauling and would not be practical on its own. A system of pipelines could, in theory, carry fuel into the Ambler Mining District and carry mineral ore slurry out. A pipeline alone, however, would not satisfy the project purpose and need of supporting mineral exploration and mineral development because it would not handle the heavy loads of equipment or large vehicles needed at mining sites.

- Purpose and Need: Does not meet purpose and need because it does not reasonably support hauling heavy mining equipment.

6.3.2. Modes Moving Forward

Modes moving forward for further consideration:

- Road
- Rail (narrow gauge and standard rail)

Road (standard road): Forwarded to second level screening because roads provide a surface transportation method that is technically feasible and can satisfy the project purpose and need, depending upon route. This mode is a proven technology for supporting mining, including in the arctic environment of the project area. The design criteria for this mode are well understood. This mode was proposed by the applicant.

Rail (standard rail): Forwarded to second level screening because rail provides a technically feasible surface transportation method that could satisfy the project purpose and need, depending upon the route. Rail was noted as being effective at hauling heavy loads for long distances in support of mining operations around the country, including Alaska. This mode is a proven technology in Alaska's northern climate.

Rail (narrow gauge): Forwarded to second level screening, with a note that narrow gauge rail rolling stock could not freely interchange with standard gauge rails on the existing Alaska Railroad. Narrow gauge rail was forwarded to second level screening, most likely as a variation on standard rail, rather than as a stand-alone alternative. It was noted that narrow gauge rail, while not as widely developed as it once was, is used in support of mining operations elsewhere and may provide advantages for reducing impacts because of its narrower footprint and generally more flexible design criteria.

[7] **Road to Kiana Area, then Barge via Kobuk River.** This combination road/barge alternative was forwarded to the second level screening because it had a relatively long roadway component that would have been year round. To give this idea a hard look, BLM conducted additional analysis. In the end, however, it was eliminated because it was not technically feasible. See more in Section 6.4.

6.4. Route Screening Results

BLM's second phase of alternatives screening was to apply the screening criteria to the modes carried forward—road and rail modes—and to assess specific routes. This section describes BLM's rationale for screening out some route alternatives as not reasonable and carrying others forward for further analysis. BLM considered all available information (e.g., matrices, scoping comments, cooperating agency input, and applicant material). This section should be read in conjunction with the route screening information presented for all screened route alternatives in Appendix C of this document.

6.4.1. Alternatives Considered but Determined Not Reasonable

Alternative road and rail routes eliminated from further consideration:

- Original Brooks East Route (road; previous DOT&PF alternative)
- Kanuti Flats Route (road; previous DOT&PF alternative)
- Rail to Dalton Highway along AIDEA Proposed Route (from scoping)
- DMTS Port Route (road; previous DOT&PF alternative)
- DMTS Port Route (rail; previous DOT&PF alternative)
- Route along Kobuk River to Tidewater (road; from scoping)
- Road to Kiana Area, then Barge via Kobuk River (road and barge; from scoping)
- Cape Blossom Route (road; previous DOT&PF alternative)
- Cape Blossom Route (rail; previous DOT&PF alternative)
- Selawik Flats Route (road; previous DOT&PF alternative)
- Selawik Flats Route (rail; previous DOT&PF alternative)
- Cape Darby Route (road; previous DOT&PF alternative)
- Cape Darby Route (rail; previous DOT&PF alternative)
- Variation of Selawik/Cape Darby to access other mining resources (road; from scoping)
- Nome Route (road; a Selawik Flats variant suggested post-scoping)
- Elliott Highway Route (road; previous DOT&PF alternative)
- Parks Highway Rail Route (rail; previous DOT&PF alternative)

Original Brooks East Route

Type: Road Area: Eastern Length (miles): 220

This alternative is similar to the AIDEA Proposed Route. It preceded the Proposed Route but was superseded by it to avoid community impacts and concerns. Its screening results generally were positive. However, it was noted as not favorable to the communities of Bettles and Evansville, which it passes through or near. Community objections were a substantial reason AIDEA refined the route to avoid the communities. The alternative connects to the Dalton Highway, some 15 miles south of the AIDEA Proposed Route, but no substantive functional difference between these connection points would be anticipated. The revised connection point was proposed by the applicant. Between the refinements already made and the substantive duplication, this route is not being carried forward for detailed analysis in the EIS.

- Duplication: This route is duplicative of the applicant's proposed route, but is less favorable environmentally (i.e., has unacceptable community impact compared to the applicant's proposed routes) and therefore is not carried forward.

Kanuti Flats Route

Type: Road Area: Eastern Length (miles): 240

This alternative was an early route examined by DOT&PF that passes near or through Evansville and Bettles and south of Gates of the Artic National Preserve before bending north to access the Ambler Mining District. Community objections were a substantial reason AIDEA refined its routes to avoid the communities and did not continue to pursue the Kanuti Flats Route. BLM found it substantially similar in concept to the AIDEA Proposed Route and AIDEA Alternative Route, and did not find a compelling need for an alternative that would avoid the Preserve given that Congress explicitly wrote into law a provision for access through the Preserve. Of the environmental factors measured during screening, this route generally had higher caribou habitat impacts, crossed more anadromous fish streams, and impacted more riparian acreage compared with other alternatives.

- Duplication: This route is duplicative to the applicant's proposed routes but is less favorable in regards to geotechnical concerns, difficult river crossings, access to construction materials, anadromous fish stream crossings, and construction cost. Therefore, this route is not being carried forward for detailed analysis.

Rail to Dalton Highway

Type: Rail Area: Eastern Length (miles): approximately 211

This alternative follows the same general route as the AIDEA Proposed Route but for a railroad instead of a road. During screening discussions with cooperating agencies, concerns were noted about construction costs (more than $1 billion) and impracticality of transferring ore from rail to truck at the Dalton Highway, then potentially transferring it back to rail in Fairbanks for shipment south. DOT&PF did not analyze this alternative in its 2011 effort. The route had a cursory engineering overview for fatal flaws as a rail route, because railroads require lower maximum grades than roads, and then it was screened.

The concept is not practical due to substantial handling inefficiencies (and therefore increased operating costs). Due to the steepness of the terrain where the mines would be located it is not anticipated that rail spurs could be feasibly connected directly to the mines because of grade limitations. This implies ore and equipment would need to be loaded/unloaded at the rail line's western terminus and trucked to and from the mines themselves and necessitating an intermodal transfer facility at the rail line's west end. A similar intermodal facility would be needed at the east end (Dalton Highway), to again transfer ore/equipment to/from highway-legal trucks for transportation over the Dalton Highway to Fairbanks. According to testimony before the Alaska Legislature, Trilogy Metals intends to load containerized ore onto the Alaska Railroad near Fairbanks (necessitating yet another transfer point and handling facility). The transfer of modes at each end of the rail line and yet again in Fairbanks is inefficient and impractical due to the double, or triple handling of each truckload or container. Compared to loading trucks at the mine that can then drive onto the road system all the way to Fairbanks for 1 transfer to the Alaska Railroad (or trucked directly to a port), this requirement for multiple transfers would be inefficient. The time, infrastructure, and labor costs for the extra transfers would be high and not practical.

Also, having an "isolated" rail system not connected to a port or railroad was determined not to be practical. This isolated rail system would not allow an efficient or practical way to bring in locomotives, railcars, or other large equipment. During initial construction the locomotives would likely have to be disassembled and then reassembled at the site. This is very nearly cost prohibitive. Not having a connection to the existing railroad infrastructure would prohibit sending out any on rail equipment to existing Alaska Railroad maintenance shops. Thus all maintenance facilities would have to be self-contained on site.

There is also the added concern that the disassembled rail equipment may still be too heavy for the bridges on the Dalton Highway. Locomotives of the type anticipated to be needed for an alternative such as this weigh approximately 430,000 total pounds (over 215 tons) are over 10 feet wide, 16 feet high, and 76 feet long.

This alternative would be expected to follow the same general alignment as the AIDEA Proposed Route (with considerations regarding where grades need to be shallower for rail) and is therefore duplicative of that route. Its primary benefit was thought to be the somewhat less likelihood of people using street vehicles, all-terrain vehicles, or snowmobiles to access the land along the route, either legally or illegally. However, the rail concept includes a single lane maintenance road alongside the tracks, so the possibility of public access would remain. There is likely little practical difference in impacts between the road and rail modes on this alignment.

Key factors the BLM considered in not carrying this alternative forward for detailed analysis were the following:

- Economic Feasibility (in 2018 dollars): Cost would be $1.05 billion, which would be nearly 3 times more (approx. $700 million) than the applicant’s proposal ($356 million).
- Practicality: Not practical. Multiple handling requirements and mode transfers, inefficiency, and technical problems moving to, and maintaining rail equipment at, this remote, “isolated” rail line make this alternative impractical using common sense.
- Duplication: This alternative is expected to follow the same general alignment as the AIDEA Proposed Route with very little meaningful difference in impact and no clear benefit to outweigh the costs and practicality concerns.

DMTS Port Route – Road

Type: Road Area: Western Length (miles): 260

This alternative would access the existing DMTS port, which primarily serves mining at the Red Dog Mine. However, a 2012 DOT&PF assessment of needs at the DMTS port resulted in an estimated additional cost of $215 million to $260 million for additions to the port facility to enable adequate support for Ambler Mining District activity. Screening indicated intermediate values for geotechnical concerns (poor soils and relatively poor access to construction material, such as gravel); a higher number of difficult river crossings compared to other alternatives; and high construction costs (nearly $800 million, which is more than double the applicant’s proposed route cost even before adding the cost to build new port facilities). There may be limited or no port use in winter if the Chukchi Sea continues to freeze over and there is a lack of investment in icebreakers. Both the future sea ice conditions and the prospect of icebreaker use to maintain access to ports is speculative. The route would cross substantial caribou habitat (8,030 acres), but these values are still intermediate relative to other alternatives. Crossings of anadromous fish streams would be relatively high at 13 compared with other alternatives.

Considering all the criteria, BLM initially retained this alternative for further evaluation. Additional information was collected and reviewed, particularly with regard to capacity at the DMTS port. A 2014 feasibility study prepared for a separate proposed mine development in the vicinity assessed capacity at the DMTS port site and concluded that additional capital expenditures would be required to accommodate additional mine development (HDR, Inc. 2014).

While the DMTS port site exists and functions for mineral export currently, in addition to being owned by the applicant, existing capacity concerns exist; while space appears to be available adjacent to the existing DMTS site, the additional construction to provide sufficient capacity required is so extensive BLM determined it would be akin to building a new port. Furthermore, the existing port provides only seasonal access with open water roughly 3 to 4 months out of the year.

Key factors the BLM considered in not carrying this alternative forward for detailed analysis were the following:

- Purpose and Need – Logical Termini and Practicality: The existing port with its current infrastructure is at its practical capacity. Therefore, BLM determined the route does not have a logical terminus because it would require the construction of a new port.
- Economic Feasibility (in 2018 dollars): The total project would be between $1.02 billion and $1.07 billion, which would include both the road construction and port construction. The road cost would be almost $800 million, which is more than double the applicant's proposal (approx. $356 million).
- Environmental Factors: compared with other alternatives, this alternative has relatively high impacts to caribou habitat, anadromous fish streams (13), NHD stream crossings (269), and NHD riparian habitat (151 acres), without substantive environmental benefits. There is a lack of substantive environmental benefits in other metrics compared to other alternatives, which might otherwise warrant this alternative's continuing analysis.

DMTS Port Route – Rail

Type: Rail Area: Western Length (miles): 260

This alternative would access the existing DMTS port, which primarily serves mining at the Red Dog Mine. It would follow the same alignment as the road but would be a railroad. Screening indicated intermediate values for geotechnical concerns (poor soils and relatively poor access to construction material, such as gravel), difficult river crossings, and high construction costs. The values indicated were the same as indicated above for the road, but the construction costs were much higher, at approximately $1.46 billion for the rail, in addition to the cost to build new port facilities which would be an additional $232 million to $280 million (in 2018 dollars). There may be limited or no port use in winter if the Chukchi Sea continues to freeze over and there is a lack of investment in icebreakers. Both the future sea ice conditions and the prospect of icebreaker use to maintain access to ports is speculative. The route would cross substantial caribou habitat (8,030 acres). Crossings of anadromous fish streams would be relatively high at 13. Considering all the criteria, BLM initially retained this alternative for further evaluation during the screening process. Usability of the port is a key consideration of this alternative. Additional information was collected and reviewed to help determine if use of the DMTS port meets the purpose and need.

This alternative is not being carried forward for detailed analysis. The same key factors applicable to the road version of this route apply to the rail route. Additionally, the project would cost between $1.61 billion and $1.66 billion (which includes both rail and port development).

Route along the Kobuk River to Tidewater

Type: Road Area: Western Length (miles): 150 (no route to officially measure)

This concept was suggested during scoping, but the concept was vague and had insufficient detail to delineate a specific route. DOT&PF already engineered routes in this general corridor and found a technically feasible route along the Kobuk River as far as Kiana (see the DMTS route). Moving the route closer to the Kobuk River would only serve to increase impacts and decrease the route's technical feasibility. For example, it would increase floodplain impacts, and would be worse for subsistence values (the Kobuk River was identified during scoping as a critical river for subsistence fishing) compared to the DMTS route. Moreover, a route closer to the river would cross more challenging soils from an engineering perspective and would be farther from material sites, increasing costs and decreasing its technical feasibility. Screening indicated poor results on most criteria. Critical issues include lack of any existing port near the mouth of the Kobuk River, which means it would not adequately satisfy the project purpose and need. DOT&PF explored various port development options (although not at the mouth of the Kobuk River) and found the costs on the west coast of Alaska to be high.[8] Because the alternative would not connect to an existing port and fared poorly on other criteria, it was deemed unnecessary to delineate a precise route and calculate other metrics. This route was determined to be duplicative of the DMTS route on its eastern half (but was not as good as the DMTS route on several metrics, when considering the full route) and would not connect to an existing port on its western terminus. Primarily because of the purpose and need issues, and without sufficient other redeeming qualities, this alternative is not being carried forward for detailed analysis in the EIS.

Key factors the BLM considered in not carrying this alternative forward for detailed analysis were the following:

- Purpose and Need – Logical Termini: Port does not exist at the mouth of the Kobuk River and therefore this alternative does not satisfy the purpose and need.
- Duplication: Similar to the DMTS route but would have worse soils and greater floodplain impacts compared to other alternatives.
- Not practical: Requires speculation that mining companies would find it practical given the long water-borne distance and shallow drafts in a short hauling season.

Cape Blossom Route – Road

Type: Road Area: Western (Kotzebue) Length (miles): 250

This alternative would access the coast at Cape Blossom, just south of Kotzebue on Kotzebue Sound. The screening criteria showed poor results, with relatively many large river crossings and poor access to material sites (average distance would be 20 miles). No port exists at Cape Blossom today. A 2012 DOT&PF assessment of port needs at Cape Blossom resulted in an estimated additional cost of $255 million for a port facility there. A small port exists nearby at Kotzebue, and an 11-mile road is under construction between Kotzebue and Cape Blossom (as of 2018). The existing port at Kotzebue is a small, privately owned facility where ore export would be infeasible given the port's location in town. The reason is due to the lack of existing facilities to accommodate seasonal storage of ore and a lack of space on the land side of the port to construct such facilities. In addition, the requirement to transport ore through town by truck or possibly conveyer would cause community impacts. In fact, the community's desire to build a road to Cape Blossom is to provide access to a port location that's deeper than the shallow port conditions in Kotzebue.

The lack of an existing port at Cape Blossom, the small and shallow port at Kotzebue without shore-side capacity, and the construction feasibility and cost issues cumulatively weighed against this alternative. This alternative is not being carried forward for detailed analysis.

[8] Port construction cost estimates range from $215M to $260M (in 2011 dollars) and are included in Ambler Mining District Access Draft Conceptual Port Cost Evaluation Report (February 2012).

Key factors the BLM considered in not carrying this alternative forward for detailed analysis were the following:

- Purpose and Need – Logical Termini: Port does not exist at Cape Blossom and therefore this alternative does not satisfy the purpose and need. Adequate port facilities do not exist at Kotzebue; the additional construction required in Kotzebue is so extensive BLM determined it would be akin to building a new port. Therefore, at either Cape Blossom or Kotzebue, this alternative does not satisfy the purpose and need.
- Economic Feasibility (in 2018 dollars): The total project cost would be approximately $1.22 billion, which includes both the road and port construction. The road cost would be $947 million, which is 2.5 times more than the applicant's proposed route ($356 million). The additional cost of port development (approx. $275 million) pushes this alternative over $1 billion.
- Environmental Factor – Caribou Habitat: Would impact 8,290 acres, which would be 2,429 acres (41% or 1.4 times) more than the applicant's proposed route (5,861 acres). This alternative impacts an intermediate level of NHD stream crossings (260) and NHD riparian acreage (158 acres). There is a lack of substantive environmental benefits in other metrics compared to other alternatives, which might otherwise warrant this alternative's continuing analysis.
- Practicality: The alternative requires speculation that an adequate port would be built and therefore this alternative does not have a logical terminus.

Cape Blossom Route – Rail

Type: Rail Area: Western (Kotzebue) Length (miles): 250

This alternative would access the coast at Cape Blossom, just south of Kotzebue on Kotzebue Sound. No port exists there today, but a small port exists nearby at Kotzebue and an 11-mile road is under construction between Kotzebue and Cape Blossom. The screening criteria for this alternative showed poor results, with many relatively large river crossings and low access to material sites (average distance was estimated at 20 miles). The construction cost was among the highest of the alternatives. A 2012 DOT&PF assessment of port needs at Cape Blossom resulted in an estimated additional cost of $255 million for a port facility. This alternative requires speculation that a suitable port would be constructed. The lack of an existing port at Cape Blossom, the relatively small and shallow port at Kotzebue (as described above for the Cape Blossom road route), and the construction and costs issues cumulatively weighed against this alternative.

The alternative is not being carried forward for detailed analysis. The same key factors applicable to the road version of this route apply to the rail route. The total project would be $1.74 billion (in 2018 dollars), nearly 5 times more than the applicant's proposed route (approx. $356 million). Rail and port costs would be approximately $1.47 billion and $275 million, respectively.

Selawik Flats Route – Road

Type: Rail Area: Western (Nome) Length (miles): 250

The Selawik Flats Route would connect to the existing Nome-Council Road and, via that road, to an existing port at Nome. The Nome-Council Road is an approximately 73-mile-long seasonal road. It is likely that the road would require upgrades to make it operable for regular year-round mining support traffic, and that would be an additional cost. A shallow port exists at Nome today. This shallow port is located within the community, is busy during the summer season and would not have capacity to support a substantial export of ore, nor does not have immediately adjacent space available to stockpile ore seasonally. Ore export is infeasible given the port's location in town and the lack of space on the land side of the port for seasonal storage of ore and the requirement to transport ore through town by truck or possibly conveyer. A 2012 DOT&PF assessment of port needs at Nome resulted in an estimated additional cost of $255 million for an adequate port facility, based on similar costs for the Cape Darby Route. A deep water port has been proposed at Nome but its construction cannot be said to be reasonably foreseeable. For these reasons, BLM determined that this alternative does not have a logical terminus.

In general, the alternative showed middle of the range values comparatively on the screening criteria, with limited material sites, multiple large bridges, and intermediate geotechnical rating, all of which is reflected in relatively high costs—more than $1 billion. Along with the Cape Darby routes, it appears the Selawik Flats Route would have among some of the greatest impacts of all alternatives to the natural environment in all categories. The preponderance of factors weighing against it means this alternative is not being carried forward for detailed analysis.

Key factors the BLM considered in not carrying this alternative forward for detailed analysis were the following:

- Purpose and Need – Logical Termini: An adequate port does not exist at Nome and therefore this alternative does not satisfy the purpose and need.
- Economic Feasibility (in 2018 dollars): The total project cost would be approximately $1.33 billion, which includes both the road and port construction. The road cost would be $1.06 billion, which is nearly 4 times more than the applicant's proposed route ($356 million). Port construction costs would be $275 million.
- Environmental Factor – Caribou Habitat: Would impact 10,934 acres, which is 5,073 acres (87% or 1.9 times) more than the applicant's proposed route (5,861 acres). This alternative has one of the highest amounts of impacts to caribou habitat of any of the routes, along with the Cape Darby and Nome routes.
- Environmental Factors: This alternative would involve the greatest number of known anadromous fish stream crossings of any of the alternatives (18 streams). There is a lack of substantive environmental benefits in other metrics compared to other alternatives, which might otherwise warrant this alternative's continuing analysis.
- Practicality: The alternative requires speculation that an adequate port would be built and therefore this alternative does not have a logical terminus.

Selawik Flats Route – Rail

Type: Rail Area: Western (Nome) Length (miles): 250

The Selawik Flats Route for rail has all the same issues as discussed above for the road. When DOT&PF examined the Selawik Flats Route, DOT&PF gave the road and rail routes the same length, ending the routes at Council. A rail route, even more than a road route, would require an extension of rail construction to Nome. Following the existing Nome-Council Road route, this would be an additional extension of approximately 73 miles, or approximately 22 percent. It is not clear that the same route could be followed through the hilly terrain between Council and the coast, because of grade requirements, and it is not clear that the route along the coast would be sufficiently protected from sea ice. Regardless, this would represent substantial added cost, on top of an already expensive construction cost of $1.72 billion.

This alternative is not being carried forward for detailed analysis. The same key factors applicable to the road version of this route apply to the rail route. Additionally, the project would cost at least $1.99 billion (in 2018 dollars), which would include $275 million for port construction. This is more than 5.5 times the applicant's proposed route ($356 million).

Cape Darby Route – Road

Type: Road Area: Western (Norton Sound) Length (miles): 340

This alternative would share a long portion of its alignment with the Selawik Flats Route across the base of the Seward Peninsula and would access the coast at Cape Darby on Norton Sound. BLM determined this alternative would not satisfy the purpose and need because it would not connect to an existing port of any kind. Cape Darby has been a proposed deep water port site, but there is no indication a port actually would be built there. Without a reasonably foreseeable port, the alternative was considered to have no logical terminus at its western end. Moreover, a draft 2012 DOT&PF assessment of port needs at Cape Darby resulted in an estimated additional cost of $255 million for a port facility. This alternative requires speculation that a suitable port would be constructed. In addition, the Cape Darby Route, along with the Selawik Flats Route, would have among the greatest area of impact to caribou habitat and anadromous fish streams as well as high costs for construction. Of the environmental factors measured during screening, this route had higher caribou habitat impacts and crossed more anadromous fish streams than other alternatives. Therefore, this alternative is not being carried forward for detailed analysis.

Key factors the BLM considered in not carrying this alternative forward for detailed analysis were the following:

- Purpose and Need – Logical Termini: A port does not exist at Cape Darby and therefore this alternative does not satisfy the purpose and need.
- Economic Feasibility (in 2018 dollars): Total project cost would be $1.32 billion, which includes $1.06 billion for the road and $275 million for port construction. Total project cost of this alternative is more than 3.5 times more the applicant's proposed route, which would cost $356 million.
- Environmental Factors – Caribou Habitat: Would impact 11,203 acres, which would be 5,342 acres (91% or 1.9 times) more than the applicant's proposed route (5,861 acres). Like the Selawik Flats (road) Route and Nome Route, this is one of the alternatives that impacts the greatest amount of caribou habitat compared to all other alternatives. There is a lack of substantive environmental benefits in other metrics compared to other alternatives, which might otherwise warrant this alternative's continuing analysis.
- Practicality: The alternative requires speculation that a port would be built and therefore this alternative does not have a logical terminus.

Cape Darby Route – Rail

Type: Rail Area: Western (Norton Sound) Length (miles): 340

This alternative would be identical to the Cape Darby road route, described above, but would be built as a railroad. BLM decided it was not a reasonable alternative to carry forward for further analysis for the same reasons—the lack of a logical terminus at the western end means the alternative would not satisfy the project purpose and need, and it would have very high construction costs and environmental impacts compared to other alternatives. Of the environmental factors measured during screening, this route had higher caribou habitat impacts and crossed more anadromous fish streams than other alternatives.

This alternative is not being carried forward for detailed analysis. The same key factors applicable to the road version of this route apply to the rail route. Additionally, the project would cost $2.0 billion (in 2018 dollars), which includes $1.06 billion for rail construction and $275 million for the additional cost of port construction.

Variations on Selawik Flats/Cape Darby Route – Road

Type: Road Area: Western Length (miles): 250–340, based on Cape Darby/Selawik

This alternative route came from scoping, but its location was not specified during scoping. The concept was vague and had insufficient detail to delineate a specific route. DOT&PF already engineered routes in this general corridor and found technically feasible routes in the Selawik Flats and Cape Darby routes. The BLM received this concept during scoping, which appeared to be suggesting there might be slight routing variations on the DOT&PF studied routes that would provide access to other mining districts, thereby improving road usage and potential economic return. Examination of other mining districts along the general routes of the Selawik Flats and Cape Darby routes indicated the DOT&PF routing already provided adequate access to the mining districts in the vicinity (side road connections would be needed, but these connections are not any different than the connections that would be needed at the Amber Mining District). BLM's assessment was that there would be no need for any substantial route modification to provide access to these other districts. Therefore, the suggested variations were considered duplicative of the DOT&PF routes previously examined and additional refinement of this concept for screening would not be necessary. Moreover, the purpose and need is to provide access to the Ambler Mining District, not to provide access to these other mining areas. Based on these considerations, it was determined there was no need to carry a variation forward as a separate alternative for analysis because the suggested routing was substantially similar to the Selawik and Cape Darby routes.

Key factors the BLM considered in not carrying this alternative forward for detailed analysis were the following:

- Purpose and Need: As with the Selawik Flat and Cape Darby routes, an adequate port does not exist and therefore this alternative does not satisfy the purpose and need.
- Practicality - Environmental Factors: A variation on the Cape Selawik and Cape Darby routes would likely have similar environmental and cost factors, which contributed to the dismissal of those routes.
- Duplication: Further refining this concept for screening was determined not necessary as the Cape Selawik and Cape Darby routes already provide adequate access to these mining areas and were fully screened.
- Practicality: The alternative requires speculation that a port would be built and therefore this alternative does not have a logical terminus.

Nome Route (a Selawik Flats variant) – Road

Type: Road Area: Western (Nome) Length (miles): 338

This alternative was added for consideration during the alternatives development and screening phase, and expands on a particular scoping comment BLM received requesting consideration of a specific variant of the Cape Darby and Selawik Flats routes going westward from the mining district. In August 2018, the BLM received electronic files depicting this 388-mile road. Like the Selawik Flats route, this alternative would connect to the existing Nome-Council Road and, via that road, to an existing shallow port at Nome. The Nome-Council Road is an approximately 73-mile-long seasonal road. As with the Selawik Flats route, it is likely that the road would require upgrades to make it operable for regular year-round mining support traffic, and that would be an additional cost.

The BLM calculated the environmental metrics for this route, which impacts the greatest amount of caribou habitat compared to any other alternative (11,738 acres). While this alternative likely has not received the same level of preliminary or conceptual design as other alternatives, the route appears to go through mountainous terrain; presumably the alternative could be re-routed to avoid steep topography.

However, if it is re-routed to avoid the steep terrain, it may begin to look similar to the other Cape Darby or Selawik Flat routes.

Key factors the BLM considered in not carrying this alternative forward for detailed analysis were the following:

- Purpose and Need – Logical Termini: An adequate port does not exist at Nome and therefore this alternative does not satisfy the purpose and need.
- Economic Feasibility: While costs were not calculated, this alternative is anticipated to be more expensive than other nearby routes (Cape Darby or Selawik Flats) due to the steeper terrain. Costs for those 2 routes were estimated as more than1 billion dollars, plus the cost of port construction.
- Environmental Factor – Caribou Habitat: This alternative impacts the highest amount of caribou habitat (11,738 acres)
- Practicality: The alternative requires speculation that an adequate port would be built and therefore this alternative does not have a logical terminus.

Elliott Highway Road Route

Type: Road   Area: Southern Length (miles): 370

This alternative would extend from the existing Elliott Highway westward and across the Yukon River, then northward to Gates of the Arctic National Preserve, then west and north around the “boot” of the Preserve. This is the longest road route examined, and it would require a large bridge over the Yukon River. For these reasons it was the most expensive of the road routes examined. It has generally intermediate values for environmental impacts, with intermediate levels for caribou habitat and anadromous fish stream impacts. The geotechnical ranking was quite poor, indicating challenging construction. Its ongoing operations and maintenance costs were also noted as quite high. While there was no single value that weighed heavily against this alternative, there was little to distinguish it positively.

From a common sense practicality standpoint, the route would effectively parallel the Dalton Highway for about half its length (it runs nearly north south from a point just east of the Gates of the Arctic National Preserve to the Tanana area). This north-south segment would be a duplication of an existing road, the Dalton Highway, but with unnecessary environmental impact and cost. Moreover, it also is duplicative of an alternative suggested during scoping (the Communities Route), which runs on a diagonal, and thus has a shorter constructed length (64 miles) and costs less. The Elliott Highway route would also have more caribou habitat impacts, cross more anadromous fish streams, and cross slightly more NHD streams affecting slightly more riparian habitat than the communities alternative. Thus while it is similar to the communities route, it is not as good as the communities alternative. There is also a lack of substantive environmental benefits in other metrics compared to other alternatives, which might warrant this alternative’s continuing analysis. Considering this combination of factors, BLM determined this alternative is not being carried forward for detailed analysis.

Key factors the BLM considered in not carrying this alternative forward for detailed analysis were the following:

- Economic Feasibility (in 2018 dollars): Cost would be $1.09 billion, which would be more than 3 times the applicant’s proposed route ($356 million). This is most expensive and longest of the road routes examined.
- Duplicative: Is similar to the existing and parallel Dalton Highway for approximately half its length but is not as good due to environmental impacts (e.g., caribou and anadromous stream crossings).

- Duplicative: Would be similar to the Communities Route but with 64 additional miles of construction, $375 million more in construction costs, and greater impacts to caribou habitat, anadromous and other streams, and riparian habitat.

Road to Kiana/Barge (Kobuk River)

Type: Road Area: Western Length (miles): 149 (plus up to 110 water miles)

This alternative would extend from the Ambler Mining District westward along the DMTS route alignment as far as Kiana, and would divert (7 miles) to the Kobuk River near Kiana. Instead of using barges at the ocean to lighter loads to ocean-going vessels, this alternative would use barges starting approximately 60 miles upriver. This road route is the same as the first half of the DMTS route except for the western 7 miles near Kiana. It would have similar issues but, at half the length (149 miles of road construction), would cost less to construct and would have fewer impacts than the DMTS route. Shallow-draft river-going barges (less than 5 feet draft[9]) are used to lighter fuel and freight from Kotzebue to communities along the Kobuk River drainage (e.g., Noorvik, Kobuk and Kiana). Often the Kobuk River is too shallow even for these barges, and at these times, fuel and other freight are flown to these communities. Consequently, barging ore and supplies on this route would not be technically feasible, especially when considering additional costs due to potential delays given the short operating window. Comments from the Northwest Arctic Borough at the first Alternatives Development meeting confirmed that the Kobuk is too shallow to be a reliable barging route. The concept of dredging raised environmental concerns for the cooperating agencies (Allakaket and Northwest Arctic Borough). Because it would not support transportation of ore, supplies, and heavy equipment, it also would not satisfy the purpose and need. Considering this combination of factors, BLM determined this alternative is not being carried forward for detailed analysis.

Key factors the BLM considered in not carrying this alternative forward for detailed analysis were the following:

- Purpose and Need: Would not meet purpose and need because it would not feasibly and practically be able to support mining exploration and development activities. No adequate port exists so this alternative would not have a logical terminus.
- Technical Feasibility: Not technically feasible. Barges are not reliable given the shallow water conditions in the Kobuk River. Rivers near the Ambler Mining District are too shallow for barges hauling the kinds of materials anticipated, which would require dredging.
- Practicality: Changing climate conditions require speculation that water levels will remain constant over time, introducing further technical feasibility issues and making barge modes not practical based on the necessary speculation.

Parks Highway Rail Route

Type: Rail Area: Southern Length (miles): 420–450

This alternative would connect to the existing Alaska Railroad line west of Fairbanks with the Ambler Mining District by a generally direct route (diagonally in a southwest/northeast direction from the Ambler Mining District). The route overlaps with the Elliott Highway Road Route. At the southern end, variations would connect with the existing railroad north and south of the Tanana River, with the southern option requiring a crossing of the Nenana, Kashwitna, Tanana, and Yukon rivers. At the northwestern end, one

[9] Of note, much larger barges with a draft of 23 feet are used at Red Dog Mine, and would be considered a more likely type of vessel needed to support a feasible operation.

variation would skirt Gates of the Arctic National Preserve and one would cross the "boot" of the Preserve at approximately its narrowest point. This alternative did not perform well in the screening criteria, with lengths of 420 to 450 miles, a poor geotechnical value, and costs of $2.14 to $2.72 billion for construction and up to 10,000 feet of major bridge construction. Its access to construction material was good, but anadromous fish stream impacts would be among the highest of the alternatives. Of the environmental factors measured during screening, this route had similar caribou habitat impacts as other alternatives and crossed more anadromous fish streams but had some of the higher impacts to other environmental features.

A potential benefit of this alternative initially was thought to be the somewhat less likelihood of people using street vehicles, all-terrain vehicles, or snowmobiles to access the land along the route. However, the rail concept includes a single lane maintenance road alongside the tracks, so the possibility of public trespass would remain.

Key factors the BLM considered in not carrying this alternative forward for detailed analysis were the following:

- Economic Feasibility (in 2018 dollars): Would cost between $2.07 and $2.21 billion, which would be approximately 6 times more than the applicant's proposed route ($356 million) depending on the alignment. This is the most expensive of the proposed alternatives.
- Technical Feasibility: Has the worst geotechnical ranking of the routes studied by DOT&PF and the most difficult river crossings.
- Practicality: The rail alternative concepts may result in a redundant infrastructure (requiring both an access road and rail) and similar trespass concerns if an adjacent service road is constructed to provide access along the rail line.
- Environmental Factors: This route has some of the highest environmental impacts. Depending upon the route, up to 17 anadromous fish streams would be crossed; up to 343 NHD streams would be crossed, which is the highest of any alternative; and up to 183 acres of NHD riparian area would be impacted.

6.4.2. Alternatives Retained for Further Analysis

Alternative road and rail routes carried forward for additional analysis:

- AIDEA Proposed Route (road; GAAR North)
- AIDEA Proposed Alternative Route (road; GAAR South)
- Communities Route (road; from scoping)

AIDEA Proposed Route (GAAR North)[10]

Type: Road Area: Eastern Length (miles): 211

This alternative is the applicant's proposed route, and authorization for this route crossing BLM lands is the proposed action. The route runs from MP 161 of the Dalton Highway almost due west to the Ambler Mining District, crossing Gates of the Arctic National Preserve. The alternative generally was within the "acceptable" range regarding all of the screening criteria. Under Effectiveness (Purpose and Need), the total distance to an existing port was noted as 936 miles, a high number but one that AIDEA appeared to be comfortable with and the majority of which (approximately 725 miles) would be utilizing existing transportation infrastructure. Other criteria indicate a road would be constructible and less expensive than

[10] Note that going forward, this alternative is known as "Alternative A: AIDEA Proposed Route (GAAR North) to the Dalton Highway."

other alternatives. Considering all criteria, BLM is carrying this alternative forward for detailed analysis in the EIS.

AIDEA Proposed Alternative Route (GAAR South)[11]

Type: Road Area: Eastern Length (miles): 228

This alternative shares much of its length with the AIDEA Proposed Route and screened similarly. Its results, like the Proposed Route, were generally positive in screening. It was noted as substantially similar to other routes. However, despite similarities, it was retained at this time because it provides a distinctly different route across Gates of the Arctic National Preserve and dovetails with the alternatives the National Park Service is evaluating across the Preserve in a parallel Economic and Environmental Assessment process required under ANILCA Section 201(4)(b). Considering all criteria, BLM is carrying this alternative forward for detailed analysis in the EIS.

Communities Route (Tanana-Hughes-Hogatza-Kobuk)[12]

Type: Road Area: Southern Length (miles): 306

This alternative would extend from the Elliott Highway across the Yukon River on the same route as the Elliott Highway alternative, but would head northwest toward Hughes, Hogatza, and Kobuk and enter the Ambler Mining District from the south. This alternative was developed based on a scoping comment that named the communities but did not otherwise specify a route. The route was developed at a cursory level based on an overview of aerial photographs and maps, including generalized topography and land status. The route has had no engineering beyond determination that an alignment substantially similar to that shown in this document likely could be constructed in the corridor. However, it was noted that if this alternative advanced through the screening process, additional engineering would be necessary.

The Communities Route is longer than most road routes, at 306 miles. Extrapolating from similar routes, it appears it would have reasonable access to construction materials but likely also would cross geotechnically poor soils and would have multiple large and challenging river crossings, including the Yukon River. Its southern route would cross relatively little caribou habitat. The length of the road and some of the construction challenges suggest an intermediate construction cost of approximately $775 million, plus the cost of a crossing of the Yukon River (approx. $153 million) (in 2018 dollars). This route would be shorter and less costly than the Elliott Highway route. In addition, public comments during scoping meetings in Shungnak, Kobuk, and Hughes showed some public support for the road and potential benefits to communities that could be derived from it.

In considering all criteria, including meeting the purpose and need and environmental factors, BLM is carrying this alternative forward for detailed analysis. This alternative would have logical termini – by connecting into the road and rail network it provides year-round access to existing ports. Its caribou habitat impacts (5,126 acres) and anadromous stream crossings (7) are among the lowest compared to the other alternatives evaluated (while its overall stream crossings and riparian acreage are among the highest). This alternative completes a range of reasonable alternatives in that it connects to the Dalton Highway considerably farther south of the proposed alternative (i.e., it spans a full range of geography) and will provide a comparison against the impacts of AIDEA's proposed route. BLM notes, however, that additional engineering would be necessary to bring this alternative up to the level of others. Additionally, while the currently drawn route is proposed to pass through a portion of Koyukuk National Wildlife

[11] Note that going forward, this alternative is known as "Alternative B: AIDEA Alternative Route (GAAR South) to the Dalton Highway."

[12] Note that going forward, this alternative is known as "Alternative C: Diagonal Route to the Elliott Highway."

Refuge, efforts will be made to realign this route outside this ANILCA Conservation System Unit. At that time, it likely may be necessary to reapply the screening criteria to the refined alternative.

2019 Update: The engineering refinement to bring the Communities Route up to the level of design of the AIDEA alternatives is complete. The AIDEA proposed route and AIDEA proposed alternative route are labeled Alternatives A and B, and the refined Communities Route is labeled Alternative C, as noted in the Section 7.1. Refinements to the “C” alignment to make its level of design comparable to the AIDEA alternatives included the following:

- Avoided the Koyukuk National Wildlife Refuge by routing to the north. Near the refuge boundary was a large cultural resource district and the steep topography of Indian Mountain east of Hughes. The road route therefore was refined to a line east and north of Indian Mountain and to cross the Koyukuk River north of Hughes
- Avoided potential impacts to water bodies and the free flow of a major river, its salmon habitat and river navigation, and avoided substantial bridge costs by re-routing the alignment through the Ray Mountains rather than across the Yukon River. This involved traversing the Tozitna Area of Critical Environmental Concern (for fish habitat), but overall BLM felt this a preferable alignment.
- Avoided impacts of new road construction by tying into the existing Kobuk-Bornite road as part of the Alternative C alignment, after discussion with NANA Corporation.
- Avoided Native Allotments by minor realignment. However, the alignment crosses a non-Allotment private parcel in the Big Salt River valley, where the parcel encompasses the full width of the valley and is not avoidable without seeking another valley.
- Tied into the Dalton Highway in an area that did not require crossing or otherwise conflicting with the Trans-Alaska Pipeline System.
- Generally refined the alignment to ensure it met design standards for grades and curves and minimized wetland impacts and other natural and human environment impacts.

In addition, DOWL HKM on AIDEA’s behalf, ensured that material sites were located and sized reasonably using the same assumptions as Alternatives A and B. DOWL also provided the same kinds of data for the refined alignment of Alternative C as AIDEA/DOWL had provided for Alternatives A and B, including wetland mapping and numbers of bridges and culverts of different sizes. Overall, the intention was to refine the alternative and gather data for it on a level approximately equivalent to the other alternatives.

Based on the refined alignment and data collected, Alternative C was re-screened. See the final row in Appendix C of this document.

This alternative would have similarities to the route but would start north of the Yukon River and traverse west through the Ray Mountains and then head generally northwest toward Hughes, Hogatza, and Kobuk and enter the Ambler Mining District from the south. This alternative was developed based on scoping comments that named several communities but did not otherwise specify a route.

Alternative C is longer than most road routes, at 332 miles. It appears it would have reasonable access to construction materials but likely also would cross geotechnically poor soils and would have multiple large and challenging river crossings. Its southern route would cross relatively little caribou habitat. The length of the road and some of the construction challenges suggest an intermediate construction cost of approximately $775 million (in 2018 dollars). Public comments during scoping meetings in Shungnak, Kobuk, and Hughes showed some public support for the road and potential benefits to communities that could be derived from it.

In considering all criteria, including meeting the purpose and need and environmental factors, BLM is carrying this alternative forward for detailed analysis. This alternative would have logical termini – by connecting into the road and rail network it provides year-round access to existing ports. Its riparian acreage is among the lowest of the alternatives (76) evaluated, while caribou habitat impacts (7,889 acres) and anadromous stream crossings (10) are intermediate among the alternatives evaluated. Overall stream crossings are among the highest compared to the other alternatives evaluated. For a discussion of the environmental data used see footnote 4. Inclusion of this this alternative in the EIS ensures that a full range of reasonable alternatives will be evaluated. This alternative spans a wide-ranging geography in that it connects to the Dalton Highway considerably farther south of AIDEA's proposed alternatives and would provide a comparison against the impacts of AIDEA's proposed routes, including disclosing the impacts of an alternative that avoids crossing any Conservation System Units. Moreover, this route would traverse a different physical and ecological environment with a variety of ecotypes; thereby providing a comparison against impacts on the southern foothills of the Brooks Range under alternatives A and B.

7. Conclusion and Next Steps

7.1. Screening Results Summary

BLM conducted a 2-phase screening based on the criteria presented in Section 4: first for transportation modes, independent of routes or locations of facilities; and second for specific routes and locations based on the modes carried forward for additional screening. The criteria were applied to the range of alternatives described in Section 5. BLM considered all available information (e.g., the matrices, scoping comments, cooperating agency input, and applicant material) during screening. The analysis is presented in Section 6 and is detailed in the matrices in Appendices B and C of this document. The results are summarized below.

Modes eliminated from further consideration:

- Seasonal ice road
- Elevated rail
- Standard aircraft
- Dirigible
- Barge
- Pipeline

Modes moving forward for further screening:

- Road
- Rail (includes narrow gauge and standard rail)

Alternative road and rail routes eliminated from further consideration based on route-specific screening:

- Original Brooks East Route (road; previous DOT&PF alternative)
- Kanuti Flats Route (road; previous DOT&PF alternative)
- Rail to Dalton Highway along AIDEA Proposed Route (from scoping)
- DMTS Port Route (road; previous DOT&PF alternative)
- DMTS Port Route (rail; previous DOT&PF alternative)
- Road to Kiana/Barge on Kobuk River (road; from scoping)
- Route along Kobuk River to Tidewater (road; from scoping)
- Cape Blossom Route (road; previous DOT&PF alternative)
- Cape Blossom Route (rail; previous DOT&PF alternative)

- Selawik Flats Route (road; previous DOT&PF alternative)
- Selawik Flats Route (rail; previous DOT&PF alternative)
- Cape Darby Route (road; previous DOT&PF alternative)
- Cape Darby Route (rail; previous DOT&PF alternative)
- Variation of Selawik/Cape Darby to access other mining resources (road; from scoping)
- Elliott Highway Route (road; previous DOT&PF alternative)
- Parks Highway Rail Route (rail; previous DOT&PF alternative)

Alternative road routes recommended for being carried forward for additional analysis[13] based on route-specific screening:

- AIDEA Proposed Route (road; GAAR North)
- AIDEA Alternative Route (road; GAAR South)
- Communities Route (road; from scoping)

Moving forward, these 3 alternatives will be known as, respectively:

- Alternative A: AIDEA Proposed Route (GAAR North) to the Dalton Highway
- Alternative B: AIDEA Alternative Route (GAAR South) to the Dalton Highway

Alternative C: Diagonal Route to the Elliott Highway

These alternatives will be analyzed, along with a No Action alternative, in the EIS.

Figure 5 illustrates the alternatives being carried forward for detailed analysis on a single map.

2019 Update—Public Access Road: Questions about potential public use of the road had been a substantial theme in scoping comments. The BLM considered the access question in finalizing the alternatives for analysis in the EIS. That is, the BLM considered the type of road proposed—constructing a road that would be open to the general public rather than limiting it primarily to industrial mining traffic. The BLM determined that the road alternatives would not be considered public-access-road alternatives, because AIDEA did not request a public road. AIDEA's ROW application expressly requests the ROW for an "industrial-only road," for which access "would be controlled and primarily limited to mining-related industrial uses, although some commercial uses may be allowed under a permit process." The BLM determined that public access would not be consistent with the statement of purpose and need and that the road as proposed would not be safe for general public use, given the isolated conditions, narrow road/bridge design, and large industrial truck traffic. Therefore, the 3 alternatives will be analyzed in the EIS as industrial access roads.

7.2. Next Steps

BLM delivered a draft of this document to cooperating agencies for review and comment in June 2018. Comments received were addressed, and this document was revised as appropriate based on that cooperating agency input.

Because the area of inquiry is geographically vast and the alignments long, the level of information currently known for each alternative is still limited. The BLM expects to continue gathering data and refining alternatives to ensure they are assessed based on equal data. It is considered likely that further understanding of construction costs, phasing of construction, the needs of the entire transportation system

[13] Note that while both road and rail modes moved forward from the first level screening, no specific rail routes moved forward for further analysis following the second level screening of individual specific routes.

to support ore transport and transfer between transportation modes, and environmental impacts will be developed and could lead to further refinement and screening of alternatives.

A reconnaissance-level engineering effort for the Alternative C Diagonal Route to the Elliott Highway is needed to adequately compare the alternatives. Ground-proofing of assumptions, additional field studies, and other engineering evaluation may be required to provide adequate data to bring this alternative up to a level adequate for NEPA analysis. At that time further consideration of minimizing and avoiding sensitive resources should be undertaken (e.g., determining if it is feasible to avoid the Koyukuk National Wildlife Refuge).

Assuming the applicant continues to fund the effort, the alternatives will be further evaluated in a Draft EIS, in which the purpose and need for the action will be explained in greater detail; the alternatives will be refined, mapped, and explained in greater detail; the affected environment will be described, including the physical, natural, and social/economic elements of the human environment; and all environmental impacts will be disclosed and analyzed. The public will have an opportunity to review the Draft EIS and comment on it in writing and in formal public meetings before BLM issues a Final EIS and a Record of Decision. A specific alternative will not be authorized until the Record of Decision is signed.

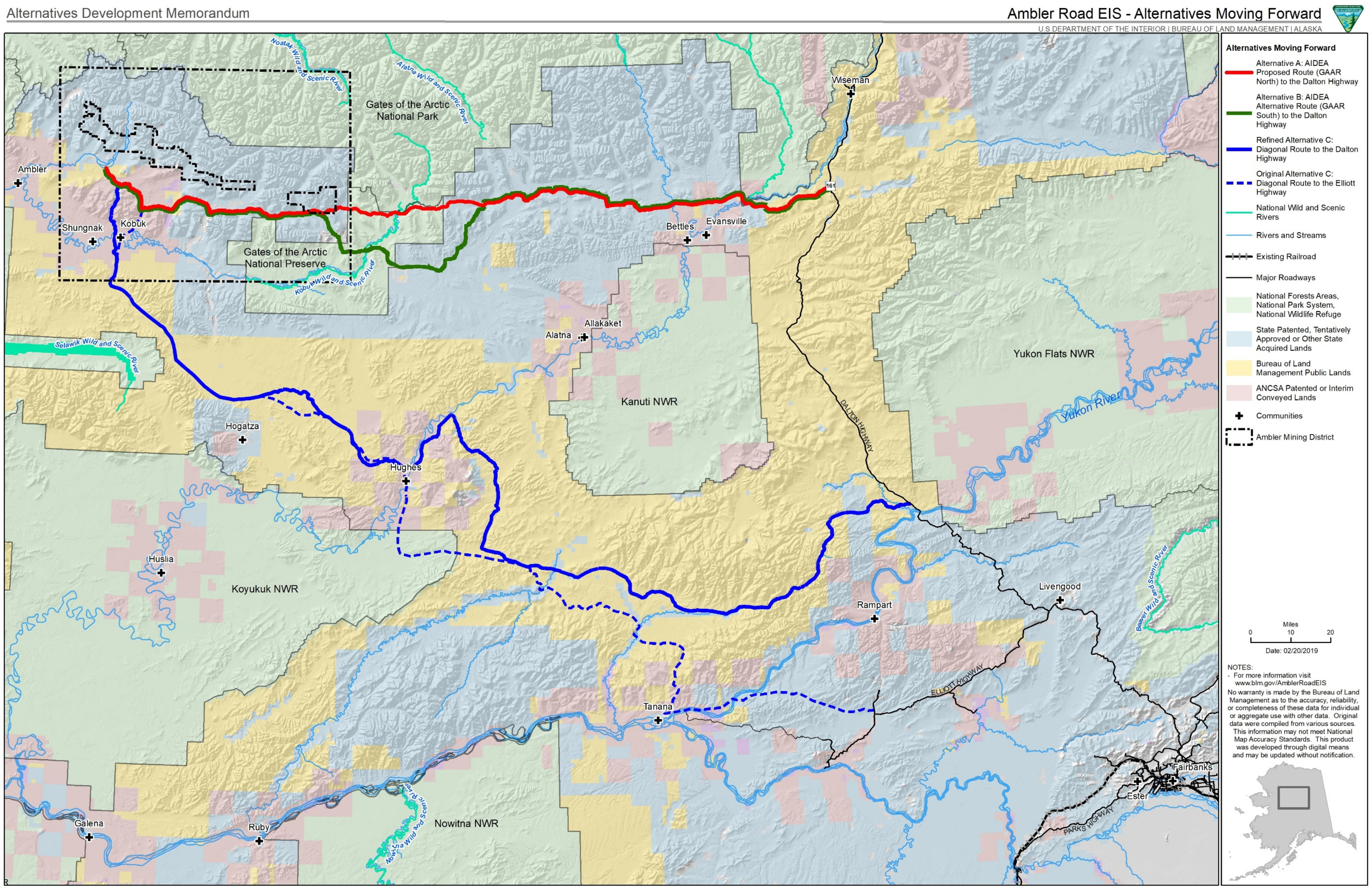

Figure 5. Alternatives carried forward for additional analysis

Source: Map prepared by HDR based on the screening results in this document.

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Appendix A. Scoping Comments on Alternatives

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Appendix A
Scoping Comments on Alternatives

This appendix contains approximately 129 “substantive” scoping comments (taken from the master list of compiled comments in the Scoping Summary Report) that were coded as relating to alternatives, based on particular key words. Comments were extracted directly from the text of the public and agencies’ submitted comments and have not been edited or corrected. Each comment’s unique comment ID number from the Scoping Summary Report master comment list is also provided.

Unique Comment Number	Keyword(s)	Scoping Comment
58	Alternatives (alternative to roads)	We must ask are there reasonable alternatives to the road and mine: AIDEA is interested in developing the Ambler Road as part of its mission to “...increase job opportunities and otherwise encourage the economic growth of the state, including the development of its natural resources...,” that is to mine. Alternatives BIA must consider are not different road routes, but different projects other than mining in Ambler and a state-funded 211 mile road through precious wilderness. KBCS believes that there are stronger alternatives to developing the Ambler Mining District: development of solar energy industry, wind energy industry, hydro power. A cost-benefit analysis of similar levels of investment in alternative energy industry is needed.
59	Alternatives (consider DOTs previous alts analysis)	The state requests the BLM make a good faith effort to incorporate the ADOT analysis to the extent practical in the alternative identification and analysis of the AMDIAP EIS. This prior transportation analysis by ADOT can reasonably be expected to provide relevant information and significant efficiencies to the BLM and cooperating agencies in their alternative analysis in the EIS.
60	Alternatives (LEDPA/USACE authority)	The Wetlands Analysis along AMDIAP Should Be Limited. As discussed above at page 4, the USACE’s overall jurisdictional authority with respect to the AMDIAP ROW is limited by ANILCA’s mandate. First, with respect to the route through the GAAR, while USDOI and USDOT should certainly consult with USACE in the preparation of the EEA and the selection and approval of one of the two proposed routes through GAAR, under ANILCA Title II USACE has no wetlands permitting authority inside GAAR and therefore no power to overrule or modify any decisions made by USDOI and USDOT. Second, with respect to the route outside the GAAR, for the selected route to meet LEDPA it must be the most practicable and environmentally protective route that also aligns/intersects with USDOI’s and USDOT’s prior-selected and -approved route through GAAR; in accord with this LEDPA standard, the USACE must expeditiously provide input to BLM identifying alternative routes, if any, to AIDEA’s proposed route that meet LEDPA and link up with the route selected and approved by USDOI and USDOT through the GAAR.

Unique Comment Number	Keyword(s)	Scoping Comment
61	Alternatives (Rail): Rail, Blimp, Dirigible, West, South, Barge, Conveyor, Air	I encourage BLM and NPS to examine narrow gauge rail as an alternative transportation option to the proposed road. Many of the deleterious social and environmental impacts of road development could be mitigated by using rail to haul the ore to the Dalton Highway, offloading it to trucks there. While the heyday of narrow gauge is past, it is still in use today and is still a viable alternative in situations that are too steep for traditional rail. A well known example is the White Pass railroad from Skagway to Whitehorse. When the Alaska DOT first started its analysis of access options to service the proposed mine a decade or so ago, it only examined traditional rail, which it found to be too expensive and challenging given the distances and terrain. The agency did not explore the possibility of narrow gauge. Given the huge consequences of punching a road through this fantastic wilderness, I believe all potential alternatives should be thoroughly investigated.
62	Alternatives (rail; less public access potential)	Another approach could be to build a railroad line (preferably westward, but this could also go to the Dalton Highway). While a train would be less able to stop and avoid interference with an individual caribou, it would reduce the likelihood of public access, outside hunters, and bootleggers, and it would be more economically efficient.
63	Alternatives (rail; screening analysis, cost)	As far as a range of alternatives goes I do not feel adequate consideration has been given to an alternative of rail access from the south. Alaska DOT considered numerous alternatives from all directions including rail access, but their estimated costs did not reflect the total costs of having to drive concentrate from mines to Fairbanks or all the way to the coast on any of these road alternatives. It seems to me, if there is going to be road access, the costs of having to transport concentrate over a 30-40 year period needs to be figured into the equation for the price of this road. In other words, a train can haul a lot more loads of concentrate, for a much lower price than one hundred huge trucks traveling 220 miles plus an additional 550 miles to Anchorage.(Or offloading in Fairbanks to the train.) The direct impacts of this kind of heavy use on not only the proposed road, but also the Dalton, Elliott & Parks Highways needs to be considered.
64	Alternatives (rail; screening analysis, cost)	Additionally some kind of comparison analysis needs to be done on costs to transport mineral concentrate by truck vs rail. Then these costs should be figured into these alternative forms of transport. Indeed it may be far less costly over the long run to build a more expensive railroad (initially) than the far cheaper road alternative. So actual cost comparisons & direct, indirect & cumulative impacts must be considered for all forms of transport, not just road options.

Unique Comment Number	Keyword(s)	Scoping Comment
65	Alternatives (range): Rail, Blimp, Dirigible, West, South, Barge, Conveyor, Air	Once a mining operational plan is reviewed and approved by all appropriate regulators, a wide range of transportation options should be evaluated including: - all means of transport including, railroad, boat, barge, aircraft or road; and - all options and routes for the mining product to get to market, including to the west to Kotzebue, over land to the southwest to Nome as well as to the east to the Dalton Highway.
66	Alternatives (range): Rail, Blimp, Dirigible, West, South, Barge, Conveyor, Air	A number of alternatives to the proposed action should be evaluated in the DEIS. The DEIS should evaluate a reasonable range of alternatives, not just the proposed action with its variation through the Gates of the Arctic Preserve and the No Action. Other alternatives should be fully evaluated to provide the public with a full, reasonable range of alternatives. The longterm costs and benefits should be considered for each alternative, not just the short-term costs to build a road. Other access alternatives should include a railroad, which connects directly to the Alaska Railroad near Fairbanks: the possible use of large dirigibles; a southerly road route that connects more directly to the southerly route through Gates of the Arctic National Preserve and may need to skirt south of the Kanuti National Wildlife Refuge. A railroad would cost more initially than a road connecting to the Dalton Highway; however, a railway could reduce impacts to subsistence, control public access, reduce ore hauling and handling costs, result in less fugitive dust, and result in fewer passes and disturbances to wildlife. Dirigibles, if feasible, would greatly reduce all impacts on the ground. A more southerly road route may avoid some of the naturally occurring asbestos. If other alternatives are not considered, then cogent reasons must be presented for their dismissal. Cost alone is not sufficient for their dismissal, and neither is legal access. Condemnation or new legislation could correct legal access, but would need to be identified in the DEIS. The environmentally preferable alternative should be identified, which need not be the least costly and often is not. The most desirable alternative in terms of overall environmental and economic effects should be identified. This would be the federal agencies' preferred alternatives.
67	Alternatives (range): Rail, Blimp, Dirigible, West, South, Barge, Conveyor, Air	The State of Alaska has not fully explored the other more economically viable options to ship the copper ore to market due to reduced annual maintenance cost, such as railroad access to Norton Sound and or a winter ice road to a port on the lower Kobuk River or Hotham Inlet. There has been no discussion of the Mining Industry investing in and use of the Lockheed Martin PRL Logistics freighting blimp. There are transportation options that would be far cheaper over the long term.

Unique Comment Number	Keyword(s)	Scoping Comment
68	Alternatives (range): Rail, Blimp, Dirigible, West, South, Barge, Conveyor, Air	The Council emphasizes the environmental impact statement should include the analysis of non-road alternatives to access the proposed mining site, including though not limited to the use of rail to deliver ore to a Bering Sea port.
69	Alternatives (range): Rail, Blimp, Dirigible, West, South, Barge, Conveyor, Air	The DEIS must evaluate access to the Ambler Mining District by other, less impacting modes of transportation—railroad, aircraft, barge, boat, etc.
70	Alternatives (range): Rail, Blimp, Dirigible, West, South, Barge, Conveyor, Air	In recent years there’s been renewed interest in dirigibles for transport in remote areas where there is no existing infrastructure for surface transport, such as the Central Brooks Range. With dirigibles, there would be no need for construction, operation, maintenance and reclamation of a road, and there would be far fewer impacts to the region and its people, and likely much lower cost for transport.

Unique Comment Number	Keyword(s)	Scoping Comment
71	Alternatives (range): Rail, Blimp, Dirigible, West, South, Barge, Conveyor, Air	Efforts to construct this road are ill conceived and premature. The plan fails to consider airships as viable, low-cost alternatives, one that avoids the damaging features of building and maintaining roads in the Arctic. However, it is illogical and destructive of existing and future resources to construct a 200-mile-long road corridor to access and develop the Ambler District when an alternative is clearly superior. Airships now in production offer the lifting capacity required to move heavy equipment to mining ventures. Backhauls transport ore to road link or sea terminal. In road-less regions of Canada and Russia, resource planners and developers are collaborating with logistics companies that operate airships. Roads are no longer necessary to achieve development goals. Airships make roads obsolete. The cost of transporting heavy equipment and ore with airships is equivalent to road construction minus damage to the environment. If the Ambler District is destined for development, it must partner with airship aviation. For safety and financial concerns, the air route to the mine site should be from the west. Linking to already existing mining infrastructure at Red Dog reduces the operation's footprint and costs while a shorter route increases safety. The Northwest Arctic Borough, the state and Teck Resources can devise a plan that integrates hanger facilities, equipment, fuel staging and ore dump. The cost of using the road to the port can be determined through stakeholder negotiations. In support of an airship alternative, please review the following material. It contains 15 items, mostly press and video accounts of airship companies, lifting capacities, airworthiness, timelines, regional activities and costs.
72	Alternatives (range): Rail, Blimp, Dirigible, West, South, Barge, Conveyor, Air	The DEIS should consider a railroad alternative that ties into the existing infrastructure in Fairbanks. Though initially much more expensive, haul costs of heavy mining equipment and ore would be far less expensive over the long term. Ore would not have to be transferred from trucks to RR cars in Fairbanks. Once loaded ore could be transported directly to port in Seward or elsewhere for shipment to processing facilities. Furthermore, this alternative would control public access and result in much less adverse impact to subsistence resources and uses than a road, which would certainly be opened to the public in time, as was the Dalton Highway to the North Slope.

Unique Comment Number	Keyword(s)	Scoping Comment
73	Alternatives (range): Rail, Blimp, Dirigible, West, South, Barge, Conveyor, Air	For many years now, Red Dog Mine has successfully mined ore in the Northwest Arctic Borough, stockpiling ore in the winter, and shipping the ore out via water in the summer. A similar approach could be utilized for the Ambler Mining District. Alternate considerations could include improving the Kobuk River for navigation up to Ambler, or constructing a much shorter road to Kiana, where barge access is available into the fall. According to the American Waterways Association, a single barge can carry as much freight as 523 18-wheelers. Shipping via waterway also consumes less fuel per ton-mile, which significantly reduces emissions compared to other modes of transportation. Finally, this alternative would significantly contribute to the economic development of the upper Kobuk villages through installation of new and much-needed infrastructure while simultaneously maintain the remote nature and feel of the area.
74	Alternatives (range); routes	The EIS scoping announcement does not identify alternatives that will be considered. During the planning process several alternative routes have been evaluated for consideration. These alternate eastern access routes are not alternatives to the proposed action but merely subsets of the proposal. Different alignment routes will have similar impacts but with likely variation in number of stream crossings, wetlands filled, and habitats lost. There are a number of alternatives that must be considered and evaluated in the Draft Environmental Impact Statement (EIS). Alternatives to the proposed action should, at a minimum, consider the following along with associated environmental impacts and potential mitigating measures. No Action; No Mining Activity for 15 to 25 years; Unlimited Public Access; Western Access
75	Alternatives (range; alternative to roads), public access concern	Pre-scoping information does not provide any indication of the range of alternatives that may be considered in the EIS. Only two alternate routes are identified on the accompanying map, both of which cross National Preserve lands. We recommend that a full range of alternatives be presented in the draft EIS. For example, a route down the Kobuk River to tidewater should be analyzed because it would not connect with the Dalton Highway, and thus reduce or eliminate impacts by urban hunters and other public activities coming in from the existing road system. A railroad alternative, with various routes, should also be included because it too would likely reduce impacts associated with road access to this remote area.
76	Alternatives (range; economics)	Trading one resource for another: Not unrelated to economic tests, the scoping should broadly address alternatives to the proposed road as well as alternatives to large mines in the Ambler district at all. Alternatives should not be excluded based solely on estimates that they are not the cheapest for the state or the miners. Nor should the EIS team accept assertions regarding the economics of individual alternatives, including the mines themselves, at face value.

Unique Comment Number	Keyword(s)	Scoping Comment
77	Alternatives (route from Haul Road); purpose and need	In evaluating the 2016 SF299 application, the Department of the Interior (BLM) determined that the crossing of GAAR triggers the ANILCA Title XI process for the segment of the route located outside GAAR. However, since the affected BLM lands are public lands managed under the Federal Land Policy and Management Act of 1976 (FLPMA) and not a CSU under ANILCA, the state believes the authority for BLM to issue a right-of-way for the segment of the proposed road that crosses BLM managed lands comes from FLPMA. While the BLM's FLPMA ROW must be evaluated under NEPA and the environmental impact statement must include a no-action alternative pursuant to 40 CFR 1502.14(d) and 43 CFR 46.415(b)(1), in ANILCA Congress specifically directed the Secretary of the Interior to allow access from the Pipeline Haul Road (i.e., the Dalton Highway) to the Ambler mining district. Nonetheless, the AMDIAP EIS and alternatives analysis will help to inform BLM's selection of the exact location and appropriate terms and conditions for the BLM ROW across BLM lands.
78	Alternatives (route through GAAR)	That document should be the sole and dispositive document concerning GANP and BLM should not - and cannot - duplicate NPS's efforts through additional analysis of this area in the EIS. We note that NPS has similar mis-statements. On the NPS webpage, it states: "This NPS webpage is focused on developing a permit for access across about 20 miles of NPS lands and should not be confused with the larger EIS for the entire 211-mile project currently underway under BLM leadership."
79	Alternatives (route through GAAR; No action alternative)	I know both proposed routes - the "North Route" and the "South Route" - very well; i.e. the detailed topography and resources. I have been flying over these routes for the past 37 years. The best route is No Route; but of the two proposed routes through the Preserve - in order to encounter fewer environmental social and economic impacts on preserve resources·: **The best route is the North Route.
80	Alternatives (route through GAAR; recreation)	Kobuk River: From the Alatna River crossing the proposed route heads up Helpmejack Creek. Here it splits into a southerly route and a more northern route. This is a very hard decision if the route need to pass through the National Preserve at all. I am not sure why the State needs to cross this "Boot" in the Gates of the Arctic National Preserve anyway. The State selected an entire section of townships south of the "Boot" to avoid this route if ANILCA hadn't given them permission to pass through the Preserve. I understand there is less gravel along this more southerly route. I also understand there are other concerns about the Pah River Flats.

Unique Comment Number	Keyword(s)	Scoping Comment
81	Alternatives (route through GAAR; recreation)	In this area the more northerly alternative route across "The Boot", ascends the headwaters of Helpmejack Creek, then descends Kichalakaka Creek, directly across the river from designated wilderness within the Gates of the Arctic National Park. The actual crossing of the Kobuk is right below the junction of the upper Kobuk & the outlet of Walker Lake. This is a very important grizzly & black bear feeding area. Salmon congregate here. Industrial traffic here, less than a mile away from the wilderness boundary of the Gates of the Arctic National Park would be a travesty. Additionally, when this road eventually gets opened up to the public, which it will, the Park Service will have difficulty preventing folks with four wheelers from driving the easy three miles across designated wilderness to the southern shore of Walker Lake.
82	Alternatives (routes connecting to GAAR route)	Under these circumstances, for a proposed route outside GAAR to meet LEDPA, it must be the most practicable and environmentally protective route that also aligns/intersects with the selected and approved route through GAAR. Any route that does not align/intersect with the final selected route through the GAAR is necessarily impracticable as it would not allow surface access through the GAAR to the Ambler Mining District from the Dalton Highway as Title II requires. In accord with this LEDPA standard, the USACE must expeditiously provide input to BLM identifying alternative routes, if any, to AIDEA's proposed route that meet LEDPA and link up with the route selected and approved by USDOI and USDOT through the GAAR. Allowing BLM to deny approval of AMDIAP outside the GAAR eviscerates the mandatory approval provisions in Section 201(4) and runs roughshod over Congress's directive that the Secretary "shall permit" access to the Ambler Mining District.
83	Alternatives (routes)	3. Construction of a road from the Ambler Mining District east to the Dalton Highway makes no sense. Hauling ore concentrate from the mine to the Dalton Highway still leaves the ore hundreds of miles from a shipping port on the sea. A road or railroad built the shorter distance from the Ambler District west to the seaport at Red Dog makes far more sense.
84	Alternatives (routes, road south)	Additionally I do not believe a road alternative from the south via Tanana, Hughes, Hagotza to Kobuk was given sufficient consideration. AIDEA professes that this proposed road would help the villages along the route & yet none of the villages are accessed by this road. AIDEA has stated that even though they are arranging financing for this road for the international mining companies, all these villages would have to find their own financial resources to build roads that would access this road to be of any use to these villages. Most of the villages along the proposed route are against the proposed road.

Unique Comment Number	Keyword(s)	Scoping Comment
85	Alternatives (routes, winter-only)	An alternative of no permanent road needs to be considered. An alternative of a winter-only route and its comparable costs needs to be considered. The idea that this road, if built will be removed is disingenuous. An alternative of a winter road, which would not need bridges, but instead uses ice bridges, should be considered. In this case it would be possible to put this road to bed when the mines are depleted. A winter road only would have far fewer impacts & is more likely to be accepted by the local public, especially if it were used to bring supplies into the villages. Of course the routing would need to be changed, since none of the village are anywhere close to the road as the route stands now.
86	Alternatives (routes; design)	If a road were to be constructed to the Dalton Highway, the northern route should be considered more seriously than the southern route. Simply put, it is shorter, crosses fewer waterways, and goes across steeper lands that would reduce access from the road to our hunting areas.
87	Alternatives (screening analysis; cost)	It appears that the initial feasibility study eliminated alternative routes largely based on construction cost. While this is an important factor, there are many social and environmental costs that must also be considered in an environmental impact statement. These routes should be re-evaluated to ensure that no reasonable alternative has been eliminated from consideration.
88	Alternatives Development	BLM must conduct review of AMDIAP using Title II from the Alaska National Interest Lands Conservation Act (ANILCA). ANILCA will be used to evaluate access possibilities, determine the best route for any corridor, and outline the best terms and conditions for any permits.

Unique Comment Number	Keyword(s)	Scoping Comment
89	Alternatives: Rail, Blimp, Dirigible, West, South, Barge, Conveyor, Air	The DEIS should consider a railroad alternative that ties into the existing infrastructure in Fairbanks. Though initially much more expensive, haul costs of heavy mining equipment and ore would be far less expensive over the long term. Ore would not have to be transferred from trucks to RR cars in Fairbanks. Once loaded ore could be transported directly to port in Seward or elsewhere for shipment to processing facilities. Furthermore, this alternative would control public access and result in much less adverse impact to subsistence resources and uses than a road, which would certainly be opened to the public in time, as was the Dalton Highway to the North Slope. Evaluate the use of the Kobuk Wild River as a route to transport ore out of the area and associated impacts. Evaluate a route from Nome or Kotzebue rather than from the east. The State of Alaska has claimed that historic roadways exist from the Kobuk River south, entirely avoiding the National Preserve, and from Hughes to Tanana. This is one of several southerly routes that avoid massive impacts on migrating caribou, and have additional advantages. This route would largely avoid impacts of bisecting the migration route of the Western Arctic Caribou herd and the effects that would have on the character of the Gates of the Arctic National Park and on regional subsistence uses.
90	No Action	Justification for approving the ROW permit differ by Agency and should be explained in the DEIS: While NPS is governed by Section 204 of ANILCA for the Gates of the Arctic National Preserve portion of the proposed road, BLM is not. BLM, in fact, has discretion to approve or not approve a ROW permit for the Ambler Road; and BLM does NOT need to approve this ROW if it is not economically feasible or for other reasons. We hope that BLM's eventual decision to approve or not approve the permit for the portion of the road that would cross BLM lands will be based on proper application of BLM statutes and policies, including the Federal Land Policy and Management Act (FLPMA; https://www.blm.gov/or/regulations/files/FLPMA.pdf) and not based on the mistaken belief that BLM is somehow REQUIRED under ANILCA to allow the road, which it is not.
91	No Action	Alternatives to developing a road for the use of private mines are plenty. Instead of tearing into untouched land, the U. S. can continue to use mines in the lower 48. There are disturbed areas that continue to produce such as the numerous mines in Arizona and Nevada.

Unique Comment Number	Keyword(s)	Scoping Comment
92	No Action	Another alternative is to put the money that would go into the road toward developing Alaska's agricultural output. Investing in the state's food resources will cut the costs and logistics of transporting food north. The state could put the proposed road money into scientific research of the Brooks Range, the Koyukuk and Kobuk Rivers. Perhaps there are undiscovered species or sub-species of life not found in any other mountain range in the state. The Spark family, from the Yukon-Kuskokwim delta area, has grown a successful business of personal beauty products made from tundra plants, Arxotica. Perhaps elements from the Brooks Range and Kobuk valley that are sustainable hold promise for entrepreneurship. Alaska's tourism industry continues to grow. What if the state put the road money toward a wilderness or hunting guide certification program? Guided trips into the Brooks Range, whether for climbing or river running, are potential sources of jobs for those familiar with the region.
93	Routes	AIDEA's proposed route connects to other infrastructure already existing in the State of Alaska - the Dalton Highway, the Alaska Railroad and year-round, ice-free ports located in South Central Alaska.
94	Routes	If the true intent is to develop resources in the Ambler mining district and limit public access from urban Alaska (Fairbanks, Anchorage) then the EIS must consider a western access. The potential of a western access is not significantly longer in miles but achieves the stated objective of limiting access to mine related activities. It makes good sense to encourage use of similar industrial facilities at a single export port.
95	Routes	(Allakaket Tribal Council Passed Resolution 2013-43, whereas): The Brooks Range east Corridor option is being examined for constructing and maintaining overland access to the Ambler Mining District and Kobuk Mineral Belt because it is the least expensive route and there are six other routes under consideration that should be used instead
96	Routes	A road to the Kobuk River might create opportunities for additional commercial transportation as well as recreational activities. Those impacts need to be evaluated, including consideration of the Congressional purposes of "wilderness recreation" for the Preserve as well as the Park, and "undeveloped" character of the Preserve and Park.

Unique Comment Number	Keyword(s)	Scoping Comment
97	Routes	alternative road alignments may be possible and provide additional opportunities/challenges: +Road west to the Kotzebue Sound – would be a short route, however, access a seasonally available port only, but would avoid the long haul of concentrates to Seward, Anchorage, or wherever (a matter of economics); I believe that this route was studied by DOTPF, but found to be troublesome for land status, other reasons, whatever they were(?); the alternative should be presented and discussed to include additional resource development, environmental impacts, other opportunities and economics o Road southwest to a more year-round port at Nome or Norton Sound near Koyuk – this would be a huge investment and probably not obviously economic; I'm not sure that this was studied by DOTPF, but maybe should have been; the additional resource opportunities here could be enormous and be more available on a year-round basis; +Other – the proposed route avoids, to the extent possible, villages in the area; this seems to be counter-productive for those residents despite their intent to remain remote and inaccessible; a discussion of issues relative to road access should be included.
98	Routes	I believe a better alternative could be a western route from the coast like the Red Dog Mine, investing in local village infrastructure like education and job training and investing in local tourism, a sustainable industry already functioning in celebration of public lands, clean water, clear air, and wild spaces.
99	Routes	As discussed in the Ambler Road project's Revised SF299 Consolidated Application, "[o]nly one potential alternative completely avoids conservation system units," the Elliott Highway Corridor. TWS believes this alternative should be included by BLM in its EIS analysis as it may provide conservation benefits that would exceed the potentially higher cost of this route.
100	Routes	Evaluate the use of the Kobuk Wild River as a route to transport ore out of the area and associated impacts.
101	Routes	Evaluate a route from Nome or Kotzebue rather than from the east.
102	Routes	Consider a more southerly route that ties directly into the NPS southerly alternative in the Gates of the Arctic National Preserve. A better route exists there with regard to soils, asbestos and rock material. River crossings may be fewer, but bigger. A more southerly route could also avoid areas with naturally occurring asbestos.
103	Routes	Within the Brooks East alternative, options that reduce impacts to the Gates of the Arctic National Park and Preserve should be considered, including eliminating proposed borrow sites, airfields, and fuel/chemical storage tanks.
104	Routes	Evaluate a route from Nome or Kotzebue rather than from the east.

Unique Comment Number	Keyword(s)	Scoping Comment
105	Routes	The Council emphasizes the environmental impact statement should include the analysis of non-road alternatives to access the proposed mining site, including though not limited to the use of rail to deliver ore to a Bering Sea port.
106	Routes	Gates of the Arctic National Preserve and Kobuk Wild River. The route will cross 20 miles of these places. The route should NOT go through these areas. These areas need to remain undeveloped in order to protect the resources of the area which are important to the state of Alaska. And these resources go beyond the immediate area. Congress created these places in order to preserve the remote and undeveloped condition for the best interest of the nation. An industrial road is totally inappropriate for these special areas.
107	Routes	Routes should be considered that follow a southern route from Tanana and Hughes north to the Ambler mineral belt, to avoid the extreme impact on the Western Arctic Caribou herd from the east-west route you have identified. The State of Alaska has already asserted RS 2477 Highways that cover almost the entire route south from the Mineral Belt to Hughes and to Tanana and to Fairbanks. Failing to even include this route in your alternatives contradicts the laws the involved federal and state agencies are required to follow, particularly Title VIII of the Alaska National Interest Lands Conservation Act (“ANILCA”). Private land routes south of the Koyukuk Park Unit should also be mapped, described and analyzed. Again, the only way for the public engaged in this review or the decision makers of considering the best route are to present alternatives.
108	Routes	Consider a more southerly route that ties directly into the NPS southerly alternative in the Gates of the Arctic National Preserve. A better route exists there with regard to soils, asbestos and rock material. River crossings may be fewer, but bigger. A more southerly route could also avoid areas with naturally occurring asbestos.
109	Routes	Your proposal fails to address the way your transportation route force the National Park Service (NPS) at the Kobuk Preserve Unit to consider a dangerous, wilderness-threatening, route along the National Wilderness boundary and the National Park boundary. Your single route gives the impression of trying to create a political environment that would make an NPS route further south look politically ridiculous by forcing a long detour away from the dangerous wilderness-threatening route. Creating this perception undermines the credibility of your objectivity, and compromises the legitimacy of the ROW decision across the Kobuk Preserve Unit. The social and economic implications of creating a process that undermines the confidence of the public in the Bureau of Land Management and the National Park Service and the applicant, “AIDEA”, should be thoroughly evaluated.

Unique Comment Number	Keyword(s)	Scoping Comment
110	Routes; Modes	If the true intent is to develop resources in the Ambler mining district and limit public access from urban Alaska (Fairbanks, Anchorage) then the EIS must consider a western access. ADEA is proud of their achievement for the DeLong Mountain Transportation System (DMTS), which includes an industrial access road from the Red Dog Mine to the DMTS port. The potential of a western access is not significantly longer in miles but achieves the stated objective of limiting access to mine related activities. It makes good sense to encourage use of similar industrial facilities at a single export port.
111	Routes; Range of Alternatives	The Revised SF299 at Table 4 does not include a scoring entry, but states that only the highest scoring railroad corridor is presented. The table appears to rank the corridor alternatives in the order viewed most favorably by the applicant, from the lowest score to the highest and least desirable. Unless the wording is an error, this is the worst and unacceptable of the four alternatives to include in the table. In any event, all of the listed alternatives and the rejected railroad corridors must be evaluated in the EIS to enable full public disclosure and a complete environmental analysis for the decision-maker to weigh in reaching the decision.
112	Alternatives (range)	The Project Fails to Consider a Range of Reasonable Management Alternatives. BLM should consider management alternatives that include alternative modes of travel (including rail), as well as alternative route locations. . . . BLM should consider more than one route and take-off point on the Dalton Highway. Additional crossings of the Gates of the Arctic National Preserve to the two under consideration should be identified and considered.
113	Alternatives (range): Rail, Blimp, Dirigible, West, South, Barge, Conveyor, Air	We recommend the EIS include a range of reasonable alternatives, which meet the stated purpose and need for the project and are responsive to the issues iden6tified during the scoping process and through tribal consultation. This will ensure the EIS provides agency decision makers and the public with information, which defines the issues and identifies a clear basis for the choices made among the range of alternatives as required by NEPA. The Council of Environmental Quality recommends all reasonable alternatives be considered, even if some of them are outside the capability r the jurisdiction of the agency preparing the EIS for the proposed action (40 CFR 1502.14(c). A robust range of alternatives will include options for avoiding significant environmental impacts.

Unique Comment Number	Keyword(s)	Scoping Comment
114	Alternatives (screening analysis)	The EIS should "rigorously explore and objectively evaluation all reasonable alternatives" (40 CFR 1502.14(a). This includes identifying the specific criteria that were used to (1) develop the range of reasonable alternatives, (2) eliminate certain alternatives, and (3) select the agency preferred alternative. The EPA is aware a detailed analysis of eight potential corridors was previously conducted for the proposed action in 2011 by the DOT&PF. If the BLM chooses to rely on this analysis as a starting point for the development and screening of alternatives for the EIS, it is important a reasonable range of alternatives be carried forward for analysis in the EIS, as required by NEPA.
115	Alternatives (screening analysis); Routes	We recommend consideration of a westerly route, such as a connection to the Delong Mountain Transportation System. In addition, we recommend the EIS provide a clear discussion of the reasons for the elimination of alternatives that are not evaluated in detail.
116	Alternatives; Routes	Better solutions to this project would be instead of building a road from the Dalton highway, we consider the following actions: 1. Listening and collectively addressing the multiple local regional and national villages and organizations that do not want a road through this region of Alaska 2. Consider the economic impacts to the state of Alaska should they have to maintain this road. As a former and future Alaska resident, I do not want to be burdened in our current economy with infrastructure that satisfies a small percentage of industrial capitalism that is largely not going to be shared within the state of Alaska anyway. 3. Invest instead in local, village infrastructure, education and training so that a road is not necessary for mining. 4. Consider a rail connection from south instead of a road with trucking, thus increasing our already climatically changing arctic environment, furthering the loss of fragile permafrost environments. 5. Consider a western route from the coast, similar to the Red Dog Mine 6. Invest instead, in local and regional tourism that supports a sustainable tourism industry focused on public lands, clean water, clean air, and wild spaces.
117	Routes	Consider a more southerly route that ties directly into the NPS southerly alternative in the Gates of the Arctic National Preserve. A better route exists there in consideration of soils, asbestos and rock material. River crossings may be fewer, but more manageable and controllable. A more southerly route could also avoid areas with naturally occurring asbestos.

Unique Comment Number	Keyword(s)	Scoping Comment
118	AIDEA Application/Data Gaps	Application has data gaps, including the extent and level of use of the proposed road. E.g. How many ore trucks per day or hour would be traveling the road during the height of migration? What are the existing 'best available technology' standards for conducting and rendering open pit copper mining without destroying the subsistence sheefish (Stenodus leucichthys) and salmon fishery? What is the nature, scope, scale and impact of operations on the road necessary to support the thousands of employees involved in mining operations? [Lacking such information, it is impossible to identify alternatives or propose mitigation when the project outlines are so incomplete.]
119	Alternatives (air): Rail, Blimp, Dirigible, West, South, Barge, Conveyor, Air	if this project pans out economically, is to consider a fleet of currently available rigid airships or dirigibles for resource extraction and supply.
120	Alternatives (air); Rail, Blimp, Dirigible, West, South, Barge, Conveyor, Air	The Alaska State Airport System is now well developed. Extension of the Dahl Creek airstrip would allow cargo jet aircraft to transport the mineral resource - while leaving the arctic tundra/taiga ecosystem intact. Heavy lift air ships-with their recent and progressive technological development- would be a practical and economical alternative for the transport of ore concentrate to a saltwater port Varialift airships and Lockheed Martin airships are two aircraft companies worthy of investigation.

Unique Comment Number	Keyword(s)	Scoping Comment
121	Alternatives (screening analysis; routes)	A. Alternative routes to the west from the Ambler Mining District would provide significant comparative benefits and lesser impacts than previously stated and should be given further detailed consideration. Between 2010 and 2012, the Alaska Department of Transportation & Public Facilities (DOT&PF) undertook a "reconnaissance analysis" of eight distinct corridors, including both routes heading east toward the Dalton Highway and west toward either Kotzebue Sound or Norton Sound. Ambler Mining District Industrial Access Project Corridor SF299 Supplemental Narrative (June 2016), p. 8. This analysis culminated in a Summary Report dated May 2012, which identified the Brooks East corridor as the most feasible alternative and determined that routes to the west would have greater environmental impacts and would otherwise be unfeasible. Ambler Mining District Access Summary Report AKSAS 63812 (DOWL HKM, 2012). This analysis, however, failed to sufficiently consider certain significant factors and entirely failed to address others. BLM's review and decision making process should give further detailed consideration to certain western route alternatives, particularly the Cape Darby and Selawik Flats routes and refinements to those routes that would result in both improved benefits and reduced impacts, as described below. DOT&PF's preliminary access corridor alternatives selection process focused on perceived environmental impacts with secondary consideration of direct capital and maintenance costs.
122	Alternatives (screening analysis; routes)	While technical aspects related to road construction were included, they were not given much weight, and certain critical factors were not considered. Additional factors that were not considered, but that should be assessed as part of BLM's review and decision making process, include the following: · Mine operating cost as impacted by the complete logistics chain. This is a function of the real cost per ton of freight delivered to the Ambler Mining District from point of origin and cost per ton of concentrate or product delivered to smelter or buyer. The "scoring" system utilized to compare access corridor alternatives, as presented in the 2012 Ambler Mining District Access Summary Report, identified the Brooks East Corridor as the least cost alternative. However, this assessment does not include the complete transportation network and fails to account for 600 miles of existing additional road or road/rail required to access a port facility at Anchorage or Valdez from the Brooks East Corridor terminus at the Dalton Highway. In addition, the Dalton, Elliot and Parks highways would all have increased maintenance costs associated with Ambler Mining District development traffic. The alternative use of the Alaska Railroad would add an additional logistics element but would also reduce traffic on the Parks Highway. To fairly evaluate the alternatives, the cost per ton for freight and product delivered from source to customer should be compared.

Unique Comment Number	Keyword(s)	Scoping Comment
123	Alternatives (screening analysis; routes)	Facilitation of additional development outside of the Ambler Mining District. The earlier access corridor comparisons did not factor potential to improve the viability of other mineral districts. The west corridors to the Seward Peninsula could provide access to the numerous mining districts (Koyuk District, Fairhaven District, Kougarok District, Council District, Nome District and Port Clarence District), all having known potential for resource development. Each of these districts could benefit from port and road infrastructure. By comparison, the Brooks East Corridor has limited potential to spur development of other mineral resource districts. The project proponent, AIDEA, is a public corporation of the State of Alaska, created "in the interests of promoting the health, security, and general welfare of all the people of the state, and a public purpose, to increase job opportunities and otherwise to encourage the economic growth of the state, including the development of its natural resources, through the establishment and expansion of manufacturing, industrial, energy, export, small business, and business enterprises and other facilities . . . ." Alaska Statutes 44.88.010(b). Any review of the various route alternatives should include an assessment and comparison of the extent to which a road project will help achieve these objectives and stimulate the development of natural resources in areas outside of the Ambler Mining District.
124	Alternatives (screening analysis; routes)	While the stated "purpose of this project is to support mineral resource exploration and development in the Ambler Mining District in northwest Alaska," unlike the Brooks East route, a western route would enable AIDEA not only to meet the proposed project's purpose and need but also support mineral resource exploration and development in other mining districts in the state. Ambler Mining District Industrial Access Project Corridor SF299 Supplemental Narrative, p. 14. Relationship to state or regional long-term transportation and infrastructure plans. The corridor comparison did not include an assessment of how each corridor alternative would contribute to state or regional long-term transportation and infrastructure plans. West corridors may contribute more to long-term plans. For example, a deep-water port facility in the Cape Darby area would presumably provide significant benefit to communities in the region and provide a long-sought deep-water port in the north Bering Sea. In addition, the long planned "Road to Nome" could potentially share infrastructure with the Cape Darby Corridor Alternative.

Unique Comment Number	Keyword(s)	Scoping Comment
125	Alternatives (screening analysis; routes)	Transportation safety and risk. The corridor comparison did not look at the risk associated with transporting fuel, mineral process chemicals, or mineral concentrate over the various route options and distances associated with each. The Brooks East Corridor would presumably require transport overland by truck and possibly rail for roughly 850 miles, whereas the Cape Darby Alternative would only require 340 miles of overland transport. BLM's review must look at transportation safety and risk-related impacts not only associated with use of the proposed road itself, but also with use of connecting infrastructure, such as the Dalton Highway in the case of the Brooks East Corridor. An eastern route connecting with the Dalton Highway, like the proposed Brooks East route, will significantly increase mine-related traffic on the highway, including from heavy industrial vehicles. Safety, risk, maintenance, and other issues relating to this increased traffic must be carefully assessed. · Impacts of stream crossings on salmon and sheefish habitat. The Corridor Evaluation Criteria assumed that any stream crossing negatively impacts salmon or sheefish habitat. This is not a correct assumption. Stream crossings can be designed and constructed with no significant impacts to habitat. · Road design criteria. The Corridor Evaluation Criteria did not address the advantages that would be associated with being able to adapt the road design criteria to the unique transport requirements of a heavy-haul mine access road, rather than adapting mine transportation operations to existing infrastructure.
126	Alternatives (screening analysis; routes)	As stated in the Ambler Mining District Access Design Criteria Memorandum, sec 2.1.2, dated September 2011, "Since several of the access corridors connect to existing rural roadways, vehicles using the new corridor must also be consistent with criteria governing existing highways." If the mine access road corridor did not include existing highway access and had its origin at a port location, such as Cape Darby, the road could be designed for the most efficient and cost effective means of transport, allowing transport of large and/or heavy equipment as well as oversize modules. This would be expected to result in operational cost savings and reduced environmental impacts.

Unique Comment Number	Keyword(s)	Scoping Comment
127	Alternatives (screening analysis; routes)	In summary, Doyon believes that the "high level" review of the process utilized to select the Brooks East Corridor as the preferred access to the Ambler Mining District, and to potentially exclude any western routes from further detailed consideration, failed to sufficiently address, and in some cases failed to address entirely, significant considerations and criteria typically included in an evaluation of access options to a new mine development project. Western routes, and particularly the Cape Darby and Selawik Flats Corridors and route modifications to those routes that would further reduce impacts as noted in our comments, should be further evaluated in detail as part of BLM's review and decision making process. This review should include serious consideration of relevant factors, including, but not limited to, the following: economics of corridor options as a function of the complete logistics chain; opportunities to access other resource areas; corridor fit with overall state transportation and infrastructure plans; transport chain risk assessment; and cost and operational benefit of dedicated heavy haul road from port to mine.
128	Design	With projected daily traffic totaling up to 80 trucks, and factoring in taxpayer expenses for construction and maintenance, are there state or Federal regulations that would require the haul road to be a two-lane road for its entire length, or would a one-lane road with several passing areas be feasible? Tracking software would ensure efficient traffic flow, while substantially decreasing construction and maintenance expenses, as well as lessening the environmental impact.
129	Design (climate change, permafrost)	The public is given to understand that the road structure will have to be built up 6 to 12 feet. How will the future permafrost melting affect the calculation of the appropriate road foundation?
130	Design (culverts)	All culverts are expected to be 36" wide or greater, yet an earlier document stated 36" width will be used "where icing is likely" and the Revised Consolidated Application Section 4 lists virtually all culverts (182 of 188) as slated to be less than 36". This suggests that the project proponents are interested in installing culverts even smaller than 36" width, when even that width may not be sufficient; note not only evidence from the Dalton Highway, but as recently as December 2017 a 48"-wide culvert failed in Cordova, closing the Copper River Highway. As of late 2017, tribes in Washington state were pursuing a court case against the state over blocked culverts – if the Supreme Court takes the case and upholds the findings of lower courts, Washington state may need to spend $2.4 billion to replace over 900 "high priority" culverts. This is an ongoing and predictable issue that will require good engineering initially, and constant maintenance.

Unique Comment Number	Keyword(s)	Scoping Comment
131	Design (culverts/fish passage)	The EIS needs to independently determine the appropriate size and type of culvert (e.g. embedded) for each of the alternative corridor stream crossings, and determine the realistic cost. It is highly likely that the cost is underestimated – that more large culverts will be needed. What will be the impact if fish passage is blocked during a single migration or outmigration? During multiple migrations? Are there streams for which blockage could have population level effects? “Blockage” could include everything from a culvert half-filled with ice when the stream is actually flowing, mud and debris in the culvert, culverts that are “perched” above the stream during certain times of year, culverts that channel water so it flows very fast and makes it difficult for small fish to outmigrate. If a salmon run is blocked for a significant amount of time, it not only affects the salmon consumers, it decreases the nutrient load (marine derived nutrients) in the stream, which could have ripple effects in the local ecosystem.
132	Design (culverts/fish passage)	Fish movement will be impacted. Culverts are known to be continuing hazards to fish movement throughout the state, and there are expected to be 2,900 culverts on the full length of the proposed road and 319-544 along the Gates of the Arctic section. Of these, virtually all are slated to be small culverts – 36” in diameter or less than 36” diameter. Both seem to contradict the statement that embedded fish culverts will be installed. It is difficult to believe that of over 2,900 stream crossings, 2,869 of them are less than 4’ wide in all seasons. Even where streams are less than 3’ wide, including at flood stage, if they contain fish, fish-friendly culverts need to be put in place.
133	Design (culverts/fish passage)	The ADFG maintains a webpage that shows, among other locations, the number of culverts along the Dalton Highway that are blocked with debris, iced up, perched above waterways, and in other manners obstructing fish movement. The ADFG estimates that 21% of Dalton Highway culverts would likely block fish passage, 19% might, and 19% had no survey; only 42% were expected to have no impact on fish passage, similar to the Kenai and MatSu (44%). The Bristol Bay Watershed Assessment estimates 30-61% of culverts are impassable to fish at any one time. What would failure at specific streams mean for specific fish populations?
134	Design (culverts/fish passage)	Mitigation Response to Impacts (on aquatic and water resources within the access alignment): The establishment of culverts that will really enable fish passage must be considered. Keeping the culverts free of debris must be figured into the yearly operational budgets. This is extremely important.

Unique Comment Number	Keyword(s)	Scoping Comment
135	Design (culverts/fish passage)	The focus of the applicant may be more on culvert design that will hold up under ore truck traffic. The suggestion for overflow culverts is a good one.37 The EIS should determine which crossings should have embedded fish passage culverts, whether and where they should be wider than 36”, whether some culverts should be upgraded to bridges, and provide a potential cost range of implementing overflow culverts at several locations as part of the EEA.
136	Design (culverts/fish passage, bridges)	In addition to the large bridge crossings, the AIDEA has proposed 12-15 medium (50-140 foot span) and 3 small (<50 foot span) bridges, along with 24-34 moderate/major culverts (4-20 foot diameter) and 2,869-3,155 minor culverts (3 foot diameter). Many of these culverts will be used to maintain water connectivity, but others will be needed to maintain fish passage. If a water body is fish bearing then ADF&G Fish Habitat permits will be required for their construction and longterm maintenance to ensure unimpeded passage for all species and all appropriate life stages of fish. This may include periodic removal of beaver dams and other woody debris.
137	Design (culverts/fish passage/bridges)	...making sure that any streams and rivers crossed have well designed and non-restrictive engineered bridges/culverts, or similar. It is well documented that this is a shortcoming of many past projects both in Alaska and throughout the country when it comes to roads crossing rivers and streams that support anadromous fish, there are multitudes of examples of poorly designed water crossings failing to provide the expected free passage of fish to their feeding and spawning sites.
138	Design (engineering costs)	For mining class loads (very similar to heavy oilfield service equipment), this road project will be expensive to construct in an environmentally sound manner. Without specific knowledge of the engineering data available, and with only the knowledge of the number of major stream crossings (18) and topography of the route, I can assure you that $2 million a mile is overly optimistic. It would not surprise me to see that cost double or even mushroom beyond the $1 billion mark. Most major stream crossings will be bridged and the thousands of small streams and drainage paths will require high-cost culverts (particularly if fish are present) to support industrial loads.

Unique Comment Number	Keyword(s)	Scoping Comment
139	Design (more design needed to identify impacts)	The project as proposed is not complete. The most minimal review is not possible considering the vague and inconsistent description of this project. A good – actually a bad – example is the proposal for a three-phased roadway. The construction of anything short of a fully designed facility, meeting all the tests of all the many federal permit needs including those from Corp of Engineers Permits to US Coast Guard permits for bridge/stream crossings, entirely compromises and betrays this project. There is no way to estimate the cost of the project until we know how the numerous streams will be crossed. We cannot evaluate the effect on the fisheries, the water, the stream ecosystems, the effect on land animals and birds on from the impact on water and fishery ecosystems until we know if this "Pioneer Road" will be fully mitigated, with mitigating design like culverts, use of materials other than spreading gravel through river habitat. We know for example that the spawning area of fisheries in the Koyukuk River and tributaries, the John River and Tributaries, the Alatna River and tributaries, the Kobuk River and tributaries are extremely important to the character-defining bear species in this country. But in this proposal we cannot assess how the design will affect that fish habitat.
140	Design (more design needed to identify impacts)	The project is simply not ready for environmental evaluation or ready to be certified to receive a Right Of Way. It is crucial that your environmental review list all the legal standards of section 106 of the Historic Preservation Act to consider this cultural landscape, all the considerations of the sustainability of the local subsistence way of life as required by ANILCA Title VIII and section 201(4)(d), all the levels of environmental protection required by ANILCA Title XI and Title II section 201(4) and section 1313 are completely identified and the project measured to assure compliance. Although section 201(4) does authorize a ROW, the law does NOT waive existing park law preventing impairment of land or water beyond the specific ROW use. How can the project managers estimate the cost of the project without this information and better-defined design needs? The National Park Service cannot begin selecting a ROW corridor for its portion of this project until BLM brings the level of information and analysis to the point that the NPS has some basis for its decisions. The BLM and the NPS work must be sequential, not simultaneous, to allow for proper decisions.
141	Design (permafrost)	Removing the protective layer of natural vegetation in the Arctic, rapidly increases the thawing of permafrost. How will increased thawing of permafrost and associated impacts to this thawing to areas along the corridor be addressed?
142	Design (pull outs)	The road design should consider providing periodic pullouts or large, flat areas to serve as staging areas for other potential mineral exploration projects or other industrial-type activities along the corridor.

Unique Comment Number	Keyword(s)	Scoping Comment
143	Design (road grade)	Additionally, the design of the road should consider reducing steep grades and curves that could contribute to tip-overs and spills.
144	Design (road grade)	As proposed, the proposed roadway presents challenging slopes, often as steep as 9% grade. Assess the difficulty of maintaining such a gravel roadway as proposed, the secondary impacts through erosion and degradation likely from such a design, and the challenge of the removal and complete restoration of such a roadway.
145	Design (road width)	For alternatives with roads, analysis should look at whether road widths can be reduced safely to reduce environmental impacts and reduce the amount of wetlands filled.
146	Design (ROW width)	The EIS should take a strong look at the desired ROW width of 250' to 400' wide. This is may be much wider than is needed, with consequentially greater impacts to land, wetlands, and waterways.
147	Design (ROW width)	The right-of-way width applied for is excessive at 250' ranging to 400' in some cases. The road prism will occupy a small portion of the right-of-way except in cases where the terrain dictates a wider area. The excessive width unjustifiably removes land from alternative uses and permits AIDEA to engage in further developments that will not be subject to environmental review and to deprive the agencies owning the servient estate of compensation for sales or leases. Where state lands with material sites underlie the right-of-way, AIDEA will avoid compensating the state DNR the 50 cents per cubic yard that it normally is paid for sales to public agencies. The right-of-way should be reduced to that necessary to contain the road prism and to maintain the road. Anything wider must be thoroughly justified.
148	Design (soils)	Studies on soil types, which will affect the design and cost of the road, are incomplete.
149	No Action; Routes	The proposed Ambler Road concerns me because of its potential effects on wildlife and fisheries the very source that sustains the local people. As well as environmental degeneration to the Gates of the Arctic National Park and Persevere. An industrial access road through the Brooks Range could negatively impact the water quality and health of the Alatna and Kobuk river ecosystems that will effect the sheefish, chum, and king salmon in the area. This can directly impact the subsistence lifestyles of the native peoples. Alaska is known around the world as one of the last wild place on earth, and we should be doing all we can to keep this image, as it is important to the tourism economy of the region. I believe a better alternative could be listening to local villagers who do not want the road in their region and investing in local village infrastructure such as job training and opportunities. Other alternative exist, such as using a western route from the coast like the Red Dog Mine, and or rail connection from the south.

Unique Comment Number	Keyword(s)	Scoping Comment
150	Project Components/ Project Description	To properly evaluate environmental and social impacts, BLM must know anticipated levels of traffic on the road, as well the new airstrips being contemplated. Aircraft may have negative impacts on wildlife and subsistence in a broad geographic area, depending upon flight patterns, and this information is critical to determining impacts.
151	Project Components/ Project Description	Road construction activities such as borrow mining, airfield construction, gravel storage areas, and soil laydown areas are likely to warm the underlying soils ("heat sinks") and result in irreversible thawing. The potential environmental and economic impacts need to be considered. This is mentioned with regards to water accumulation along the industrial road, but not for accessory infrastructure activities.
152	Project Components/ Project Description	A number of environmental impact issues come into play for this proposed project. These are not limited to: scenic values (this road would traverse the foothills of the scenic Central Brooks Range and in some places only a few miles south of designated wilderness), wetlands, fugitive dust (particularly asbestos in western portions of the route) , gravel borrow sites, fish, wildlife (especially the Western Arctic Caribou Herd), subsistence uses, vegetation removal and indirect effects, water quality, sound/noise, Wild River effects (Alatna and Kobuk), cultural resources and historic sites, public access and recreation uses, and public health and well-being. Potential mitigating measures for all perceived impacts should be identified and described. Potential effects should be described for various phases of the access project, including construction, operations and maintenance, and removal/reclamation. Direct and indirect effects on each impact issue should be analyzed in the DEIS.
153	Project Components/ Project Description (mine types)	The development scenario needs to include type of mines, which minerals (gold, silver, lead, copper, etc).
154	Project Components/ Project Description (project area)	What exactly is the project area for the purposes of NEPA?
155	Project Components/ Project Description (ROW Termini at AMD)	The proposed ROW does not go to the Ambler Mining District. What further impacts would occur when those connections are made? What further review and permitting would take place? This needs to be addressed in DEIS.

Unique Comment Number	Keyword(s)	Scoping Comment
156	Project Components/ Project Description/ Cumulative	the proposed phased in development of a road starting with a pioneer road sounds like a risky idea. The environmental review should consider the entire project through completion as well as any phases that might be considered. A partially completed road would not serve the mining companies as planned and could leave the gate open for many different negative impacts on environment, local communities as well as wildlife.
157	Project Components/ Project Description/ Cumulative	AIDEA proposes to build a pioneer road that would flood seasonally, impacting hydrology and wildlife, and causing safety hazards. Because the phased approach under consideration would result in greater adverse environmental impacts than building the road in just one phase, the EIS needs to analyze the impacts of an alternative with the two-lane road built in a single phase.
158	Project Components/ Project Description/ Cumulative	BLM must analyze the impacts of all 41 gravel mines, ice roads, and impacts from ongoing construction efforts during the gradual “build-out” contemplated.
159	Project Components/ Project Description/ Cumulative	Dishonest cost accounting. The proposed phased buildout of the road is a farce designed to conceal costs. The proposed narrow "pioneer" road with a thin embankment would trigger immediate permafrost degradation and very high maintenance costs. The 2nd phase of widening the road and bringing the embankment up to proper thickness would require replacement of all of the thousands of culverts that will be needed because the route is mostly located on wet sideslopes with permafrost. This cost is not accounted for in the estimates.
160	Project Proponent: ROW Management /Permit	The ROW permit should be non-transferrable. The need to transfer the ROW creates the question that the mine and road are not sustainable. A new operator would not have participated in the development of the necessary terms and protections and remediations. A new holder of the ROW needs to go through the permit process to consider new environmental conditions, what was learned from the failure of the previous ROW holder.
161	Project Proponent: ROW Management /Permit	The ROW needs to provide access only to direct purposes for Ambler Mineral belt access only. The project proposal claims the use of the ROW will be limited to Mineral belt access only. The only way to keep that promise is to extend no more of an interest in the permit than direct Ambler mining purposes only.
162	Project Proponent: ROW Management /Permit	To assure the most responsive, arms-length management and compliance with the terms and conditions of the ROW, the applicant should be changed from AIDEA to the mining and transportation company actually doing the work. Only in that way can the project viability and compliance be assured. This is clearly most consistent with the intent of ANILCA envisioning the operator as the applicant. Given Alaska’s fiscal situation, this would make more economic sense.

Unique Comment Number	Keyword(s)	Scoping Comment
163	Project Proponent: ROW Management /Permit	Alternately consider assigning the ROW to the mineral operations companies as applicants, in lieu of AIDEA.
164	Project Proponent: ROW Management /Permit	AIDEA is not the proper holder of the ROW. BLM and the National Park Service are improperly outsourcing the management of the ROW to a finance corporation. Red Dog is the evident model for this project, and that is one reason this project description is a failure. AIDEA is not the proper instrumentality to hold the ROW permit. If the BLM, the National Park Service, the State of Alaska, and Native Corporation land owners and others cannot work directly with the mining and transportation companies, the very high environmental standards this land and the resources require will fail. Agencies need a hands-on relationship with the truckers and the mining company to have rapid communication and immediate response in such remote and sensitive country. The requirement that a consortium of mining companies and transportation companies – as happened with Alyeska and the Alaskan Pipeline – needs to be part of the ROW permit conditions.
165	Routes; Purpose and Need; Project Cost	The EIS should also analyze new options, including but not limited to a) fly-in mine operation with pipelines going east or west to move ore concentrate and fuel, b) fly-in mine operation with dirigibles for re-supply c) railroad along the current Brooks East corridor, including 50-year costs and reclamation d) road and railroad options from Fairbanks to Port MacKenzie e) road and railroad options from Fairbanks to Seward f) access via the Kobuk river and g) operations using only an ice road (e.g. seasonal mining, or year round mining with crews brought in by plane and cargo shipped in and out seasonally). The Kobuk River or “ice road” options would not be significantly different from the plans for Donlin, which would fly crews in to the mine site and bring materials in seasonally by barge. These options should consider the economic costs over a 50-year life (construction, maintenance, labor, fuel, etc.), reclamation costs, and environmental impacts (construction, sensitive wildlife and migratory bird areas, areas crossed that would be sensitive to spills, environmental impacts of maintenance such as salting or sanding, etc.). Some of these options would have higher initial construction costs but lower reclamation costs.

Unique Comment Number	Keyword(s)	Scoping Comment
166	Design; Aquatic Resources	The proposed Ambler Road alignment is primary east to west, and perpendicular to the natural hydrologic flow of waters from the Brooks Range, such that culverts, bridges, and the roadway may cause changes to the physical, chemical, and biological characteristic of the existing, undisturbed, landscape conditions. Determining whether the proposal complies with Guidelines, the Corps must assess potential impacts on the aquatic ecosystem, including substrate, suspended particulates/turbidity, water, current patterns and water circulation, and normal water fluctuations. Information regarding culverts and bridge crossings should be included to evaluate these impacts.
167	Design; Permafrost	Potential impacts to permafrost should be included in the analysis. In order to assess impacts to permafrost wetlands, a range of roadbed design alternatives should be analyzed, as permafrost conditions under the proposed road could have direct and indirect impacts to physical and chemical and biological conditions of the aquatic ecosystems.
168	Purpose and Need	A practicable alternative is defined as one that would fulfill the proposal's overall purpose after considering cost, existing technology, and logistics. Defining the project purpose is the responsibility of the Corps; however, applicant input is considered in making this determination. The project overall purpose as defined by the Corps will be provided for determining a reasonable range of alternatives as part of the scoping phase of this project.
169	Methodology; Traditional Cultural Practices	Failing to consider alternatives may ignore the possibility that there are no good routes. But the greater loss to the Secretary of Interior in the decision process is the benefit of the analysis of the local people. All possible alternatives should be assessed by the people with the greatest knowledge of this country and the validity of this proposal: the local, rural people who have lived here for generations.
170	Project Components/ Project Description	If built the road would require construction camps, air strips, and other development that could adversely affect wildlife and certainly the remote character of the landscape. These additional impacts must be considered in any environmental review.
171	Project Components/ Project Description	An alternative that must be considered is one in which the road as proposed is constructed and no mineral exploration or development occurs for some significant amount of time.

Unique Comment Number	Keyword(s)	Scoping Comment
174	Agency Roles/Decisions (wetlands permits)	As the preparation of this EIS will also serve to satisfy the NEPA requirements of the CWA 404 permit issued by the U.S. Army Corps of Engineers, we recommend: 1) an analysis of the proposed project's compliance with the 404(b)(1) guidelines be conducted concurrently with the EIS; 2) the EIS range of alternatives be informed by the range of alternatives developed for the analysis; and 3) the final EIS clearly demonstrate the selection of the least environmentally damaging practicable alternative. For clarification, NEPA requires the evaluation of reasonable alternatives to the propos4ed action, whereas the Guidelines require the analysis of practicable alternatives. The alternatives analysis required by the Guidelines is not limited to the alternatives evaluated under NEPA.
177	AIDEA Application/ Data Gap	The Revised Permit Application lists several alternative routes that were considered, but eliminated by AIDEA. 14 There is a brief discussion of air and water options, which were both excluded without a complete analysis. 15 The EIS should fully explore the eight different route alternatives, rail options, air options, and water transport options if barging is reasonable. For any alternatives considered in detail, AIDEA should provide a wetlands delineation using the Cowardin Classification of Wetlands and Deepwater Habitats. BLM should consider an alternative which eliminates AIDEA's phased approach, and requires AIDEA to build the Phase III road at the outset. BLM should consult with local communities to determine a route which will have the least impact on subsistence in the region. BLM is not limited to the routes considered and eliminated by AIDEA, and is legally obligated to explore and evaluate reasonable alternatives in its EIS.
244	Local Government/ Tribes (Alternatives)	Allakaket Tribal Council Passed Resolution 2013-43 A RESOLUTION OPPOSING TIIE BUILDING OF A YEAR-ROUND ROAD TO ACCESS THE AMBLER MINING DISTRICT AND KOBUK MINERAL BELT USING THE BROOKS EAST CORRIDOR STARTING AT PROSPECT CREEK
251	No Action	It is my strongest, overall recommendation that the EIS process be terminated immediately. This would save the federal government a lot of money, and the public a lot of time. But if an EIS process continues, a No Action Alternative will clearly be the only prudent public policy decision.

Unique Comment Number	Keyword(s)	Scoping Comment
283	Tribal/ Government to Government Coordination; Accessibility of Process; AK Native Concerns; Local Resolutions; Traditional Knowledge	Tribal alternative: Cumulative impacts and adaptive management. The context of the Ambler road project (a third pioneering vehicular road that would traverse the traditional lands of multiple TCC Tribes) warrants serious consideration of an integrated Tribal Alternative. A full-blown alternative based on genuine rural-village community-outreach, meaningful Tribal consultation and traditional knowledge data-gathering with Alaska Native entities would more appropriately address environmental justice concerns of the several, disadvantaged communities potentially affected by the project. A Tribal Alternative would include baseline data and interdisciplinary analysis on historic and contemporary demographics of affected villages, the affected environment relating to socioeconomic and socioecological factors, health impacts including human and behavioral health, community infrastructure (housing, roads, trails and public utilities), public and community health services, employment and workforce development (parallel to Section 29 employment clause of the TAPS authorization), public and community education, public safety, wildland economies and food security, land management including conservation of resources that support the wild food economies and cumulative impacts. The development of a Tribal Alternative would coalesce direct, indirect and cumulative impacts to the communities most affected by the project. A Tribal- based alternative could be structured to address those impacts while developing a complimentary adaptive management strategy to monitor anticipated and inadvertent impacts. An adaptive management program designed and implemented with local residents would use formal scientific data gathering and traditional ecological knowledge. The Tribal Alternative model would assume an organizational structure for data gathering, impact analysis and mitigation measures carried out in close coordination with preparers of the EIS and resource staff of the lead and other cooperating agencies. The development of a Tribal Alternative may best be accomplished by organizing a coalition of Tribal government and ANCSA native corporation representatives into a cooperating agency to work closely with the NEPA team of agency officials. Tribal representatives would function as experts possessing special expertise on intrinsic knowledge about their communities and be a supplemental third-party contractor. A coalition of regional Tribal representatives acting in the role of a cooperating agency with third party contracting support may be a more cost-effective, productive and meaningful way to engage Tribes in the EIS process compared to the village outreach model used thus far for community engagement.

Unique Comment Number	Keyword(s)	Scoping Comment
463	Routes; Range of Alternatives; Purpose and Need	The application states that no non-surface transportation options are feasible. Barge transport is sporadic and dependent on variable river levels, thus is unreliable. Air transport is very expensive and cost prohibitive, particularly for bulk materials like ore concentrates. Mining equipment is bulky and heavy. Depending on the product or equipment proposed for transport, air transport is either unrealistic or impossible. Numerous studies corroborate that mining in Alaska is generally marginal, any best, with rare exception. Red Dog is an example of the unique successful exception and it benefits from being close to relatively inexpensive sea transportation and is able to produce 7-10% of the world's zinc. The Ambler Mining District is remote and holds no such advantages. The only way that any mines in this region could possibly be constructed and operated is if the proposed road is constructed and maintained. Therefore, to be legally sufficient, the EIS must thoroughly analyze several reasonable mining alternatives.
468	Project Cost	In 2012, NovaCopper was envisioning copper, zinc, and lead concentrates would be trucked to Fairbanks and shipped by rail to Seward.6 In the 2013 Arctic PEA, they made no mention of shipping by rail, and instead said concentrates would be trucked to Port MacKenzie, near Wasilla.7 No explanation has been given for the change. There is no cost estimate for sending ore to Port MacKenzie by rail, and no estimate of the cost to truck ore concentrate from the Brooks Range to Port MacKenzie, although estimates were provided on the cost to move ore concentrate by truck/rail combination to Seward. Truck to Fairbanks $120/ton; Ship by rail to Seward $34.41/ton; Port transfer costs $16.47/ton; Total $170.88/ton; Alaska law allows 80,000 lbs (40 tons) on the road. If the state would allow 40-ton concentrate trucks on the road, and if 370,000 tons of concentrate is to be trucked per year,9 this would be 9,250 trucks per year, or 50 trucks a day passing a single point on the road (coming and going, or 25 trucks per day one way). If 370,000 tons of concentrate per year are shipped, this is $63.2 million in trucking costs. Transportation costs at Red Dog run $82-$85 million per year.10

Unique Comment Number	Keyword(s)	Scoping Comment
469	Project Cost	Although it is more expensive to build a railroad than a road, it is cheaper to move freight by rail than by truck. The EIS should analyze the full costs of shipping ore for the proposed 50 years of the project, to include not only the initial cost of the road or railroad options, but also the maintenance of each and the total cost to move freight. The cost of trucking should include fuel and tires. Comparisons should include cost and labor opportunities of rail versus road (e.g. number of truck drivers needed annually versus number of additional railroad personnel). This is not out of scope; a fair comparison of alternative roads or railroads needs to consider full labor opportunities and full costs not only to the project proponent (AIDEA, mining companies) but to the State of Alaska (DOT, DEC, ADFG will regulate the project, clean up spills, and clean out culverts) and Boroughs (potential increased support businesses, potential increased port personnel, potential increased traffic volume, etc.).
502	Gates of the Arctic National Park/Preserve, Wilderness	The right of way crosses Gates of the Arctic National Preserve. I don't believe that a road is compatible with the purposes for which the Park and Preserve were established. The idea of being able to drive within a few miles of Walker Lake is an insult to everything Alaska stands for. The proposed right of way crosses at least one Wild and Scenic River. The Kobuk River is one of the crown jewels of the Wild and Scenic River system in Alaska. It seems unlikely to me that a road crossing would be compatible with the management plan for this river. The southern route alternative crosses the Kobuk River downstream from the section protected by the Wild and Scenic Rivers Act, so is much to be preferred to the northern route. It also gives Walker Lake a wider berth, which is a good thing. It looks like the road crosses the North Fork of the Koyukuk River as well, though the resolution of the map that I have access to is not good enough for me to be sure. The North Fork is another Wild and Scenic River, all the way to it's confluence with the Middle Fork and should be managed for wilderness values.
583	Permitting	Under the 404(b)(1) Guidelines, when a proposal is not "water dependent," meaning that it does not need to be located in or near special aquatic sites, such as wetlands, to serve its basic purpose, it is presumed that there are practicable alternatives available with less impacts to waters of the U.S. that would be would be less environmentally damaging, unless documented otherwise. The overall project purpose is used for determining practicable alternatives under the 404(b)(1) Guidelines. The overall project purpose must be specific enough to define a permit applicant’s needs, but not so restrictive as to preclude all discussion of alternatives. The Corps must evaluate practicable alternatives that meet the overall project purpose

Unique Comment Number	Keyword(s)	Scoping Comment
588	Content of EIS (Least Environmentally Damaging Practicable Alternative)	The US Army Corps should assess alternatives, including the No Action Alternative, as the Least Environmentally Damaging Practicable Alternative with an emphasis on least environmentally damaging.
628	Caribou (impacts analysis)	Western Arctic Caribou Herd The proposed road is within the migration corridor of the Western Arctic Caribou Herd (WAH) which is a significant subsistence resource in the region. Roads and other disturbances have been known to influence migration patterns of caribou (Wilson et al. 2016, Beauchesne et al. 2013, and Leblond et al. 2013), and have the potential to increase the efficiency of predators. (Whittington 2011). In the draft EIS, ADF&G would expect to see direct and indirect impacts from the AMDIAP identified, including: - An evaluation of current WAH movement corridors and connectivity between seasonal ranges. - A discussion of mitigation efforts that will be made to minimize disturbances to the WAH during all phases of the road project including surveying, construction, operation and maintenance. - A discussion of the mitigation efforts and or structures that will be used to maximize caribou movements across the road and minimize avoidance of the road. - The final road route should consider the best alternatives available to minimize caribou deflection through the utilization of topography, vegetation and the potential for small scale road routing (i.e. bends and curves) as a mitigation tool. - Consider the relevant potential impacts to caribou by increased predator efficiency in the project area - Quantify the potential for vehicle caused caribou mortality.

Unique Comment Number	Keyword(s)	Scoping Comment
725	Cost-Benefit	AIDEA's application provides a biased view of economic benefits to the state and local communities. The road will not connect with any communities, making claims by AIDEA that they will reap benefits of easier access and cheaper fuel and commodities patently false. BLM should evaluate the findings in the recent study done by National Parks Service. When comparing households in villages within the Ambler project area to those along the existing road system in Alaska, subsistence harvest was greater in villages located off the existing road system. If subsistence harvest of those villages near the proposed road changed to mirror those villages on the current road system, it was estimated that the cost to replace those subsistence resources would be roughly equivalent to 33% of the average annual income in these villages. BLM must consider the economic benefits of the No Action alternatives to both local communities and state taxpayers. Pursuant to the Federal Lands Policy Management Act, if BLM is unable to grant a ROW that does "no unnecessary damage to the environment," then it must select the No Action alternative. Therefore, BLM should closely analyze this alternative in the draft EIS, and not merely pay it lip service.
799	Recreation (visual, socioeconomics)	Middle Fork of the Koyukuk: This is one of the heaver used sections of river in the Central Brooks Range, because of its road access from Coldfoot & other locations. Under the existing alternative anyone floating the Middle Fork of the Koyukuk would be in almost continuous view of trucks and traffic along their float. Dust would be visible. The quite nature or this section of the Middle Fork would be disturbed. Studies need to be done to determine how many people float this section of river annually. What guiding businesses would be affected? How would they be affected? Would recreation use on this section of river be reduced? What kind of economic impacts would this have on their businesses. Would anyone want to float this section of the Middles Fork of the Koyukuk with pretty much continuous truck traffic as close as a half mile away?
802	Recreation (Wild & Scenic River)	Equally disturbing however, is the fact that most people that float the Kobuk start at Walker Lake. If the more southerly alternative route crossing "The Boot" is selected, floaters will have their "wild river experience" interrupted ten miles farther down the river where the road will parallel the river for several miles before floating under the bridge to continue on with their "wilderness" experience. These impacts need to be addressed in the scoping process. From a recreational &wilderness standpoint this Wild & Scenic River should not be disturbed until well below the Pah River, where most floaters pull out. This proposed road should not enter the upper Kobuk until it gets below the Pah River.

Appendix B. Modes Screening Data

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Screening Criterion	I. Effectiveness, Meets Purpose and Need. a. Year-round surface transportation access?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Logical termini?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Support hauling mining equipment/heavy loads?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? a. Constructed Length (miles)	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? a. Distance to Transportation Network (mi) (distance to existing port site)	I. Technical Feasibility a. Constructability? (proven construction methods and minimized construction risks) i. Topography	I. Technical Feasibility a. Constructability? (proven construction methods and minimized construction risks) i. Poor Soils?	I. Technical Feasibility a. Constructability? (proven construction methods and minimized construction risks) i. Difficult River Crossings?	I. Technical Feasibility a. Constructability? (proven construction methods and minimized construction risks) i. Access to construction materials?	I. Technical Feasibility a. Existing Technology i. Generally accepted design criteria for the intended mode of transportation and intended uses?	I. Economic Feasibility a. Construction costs reasonable compared to other alternatives?	I. Economic Feasibility a. O&M costs reasonable compared to other alternatives?	I. Practicality a. Requires speculative assumptions or remotely foreseeable circumstances?	I. Practicality a. Practical or not practical using common sense?	I. Duplicative a. Substantially similar to another route?	I. Duplicative a. Similar to (but not as good as) an alternative with similar routing or other key characteristics?	Screened out or moved forward for further consideration?
Air (general air method)	No, not surface access (not favorable)	Depends on route	No (not favorable)	Depends on route/ airport location	Depends on route/ airport location	Not an issue (acceptable)	Not an issue (acceptable)	Not an issue (acceptable)	Depends on route/ airport location	No. Aircraft generally do not support hauling the kinds of loads and equipment (not favorable)	Yes, airport construction cost would generally be reasonable compared to other modes. (acceptable)	No, the numbers of flights needed to haul the fuel and materials would not be reasonable (because of the small load capacity) (not favorable)	Yes. Because aircraft are not suitable for the kinds of hauling needed, it would be highly speculative to believe mines would be able to develop. (not favorable)	Not Practical. Aircraft are not practical for hauling the heavy loads and kinds of equipment needed. (not favorable)	Depends on route/ airport location	Depends on route/ airport location	Screened out
Air (blimp/dirigible carrier)	No, Not Surface Access (not favorable)	Depends on route	Untested in arctic conditions. (less than favorable or uncertain)	Depends on route/ airport location	Depends on route/ airport location	Not an issue (acceptable)	Not an issue (acceptable)	Not an issue (acceptable)	Depends on route/ airport location	No. Heavy lift dirigibles supporting mining in the arctic do not have generally accepted design criteria. (not favorable)	Unknown (less than favorable or uncertain)	Unknown (less than favorable or uncertain)	Yes. Requires speculation that an untested mode, in dark, harsh arctic environment would be safe and reliable. (not favorable)	Not Practical. An untested mode in the unique environment in the project area is not reasonable using common sense. (not favorable)	Depends on route/ airport location	Depends on route/ airport location	Screened out
Rail -DMTS Port route -Cape Blossom route -Selawik Flats route -Cape Darby route -Parks Hwy route -Route along AIDEA's proposed road route	Yes (acceptable)	Depends on route	Yes (acceptable)	Depends on route	Depends on route	Depends on route	Depends on route	Depends on route	Depends on route	Yes. Standard design criteria are available. The mode is well established in arctic conditions. (acceptable)	Depends on route	Depends on route	Depends on route	Depends on route	Depends on route	Depends on route; may be duplicative to regular-sized track width (less than favorable or uncertain)	Forwarded on for additional screening (acceptable)
Rail (narrow gauge)	Yes (acceptable)	Depends on route	Yes (acceptable)	Depends on route	Depends on route	Depends on route	Depends on route	Depends on route	Depends on route	Yes (acceptable)	Depends on route	Depends on route	Depends on route	Depends on route. Not practical for connecting to established ARRC line. Rolling stock cannot be freely interchanged. (less than favorable or uncertain)	Depends on route	Depends on route	Forwarded on for additional screening (acceptable)

Screening Criterion	I. Effectiveness, Meets Purpose and Need. a. Year-round surface transportation access?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Logical termini?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Support hauling mining equipment/heavy loads?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? a. Constructed Length (miles)	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? a. Distance to Transportation Network (mi) (distance to existing port site)	I. Technical Feasibility a. Constructability? (proven construction methods and minimized construction risks) i. Topography	I. Technical Feasibility a. Constructability? (proven construction methods and minimized construction risks) i. Poor Soils?	I. Technical Feasibility a. Constructability? (proven construction methods and minimized construction risks) i. Difficult River Crossings?	I. Technical Feasibility a. Constructability? (proven construction methods and minimized construction risks) i. Access to construction materials?	I. Technical Feasibility a. Existing Technology i. Generally accepted design criteria for the intended mode of transportation and intended uses?	I. Economic Feasibility a. Construction costs reasonable compared to other alternatives?	I. Economic Feasibility a. O&M costs reasonable compared to other alternatives?	I. Practicality a. Requires speculative assumptions or remotely foreseeable circumstances?	I. Practicality a. Practical or not practical using common sense?	I. Duplicative a. Substantially similar to another route?	I. Duplicative a. Similar to (but not as good as) an alternative with similar routing or other key characteristics?	Screened out or moved forward for further consideration?
Rail (elevated)	Yes (acceptable)	Depends on route	Yes (acceptable)	Depends on route	Depends on route	Depends on route	Depends on route	Depends on route	Depends on route	No. This is only a concept and has never been built in arctic conditions. (not favorable)	No (Cost per mile approx $105-130 million) (not favorable)	Unknown (less than favorable or uncertain)	Yes. Requires speculation that an untested mode, in dark, harsh arctic environment would function. (not favorable)	Not Practical. High cost and unproven technology in arctic conditions. (not favorable)	Depends on route	Depends on route	Screened out
Road -AIDEA's proposed route -AIDEA Alternative route -DMTS Port route -Cape Blossom route -Selawik Flats route -Cape Darby route -Variation of Selawik Flats/Cape Darby route to access other mining resources -Route along Kobuk River to tidewater -Road Barge Kobuk River -Elliot Hwy route -Kanuti Flats route -Communities route	Yes (acceptable)	Depends on route	Yes (acceptable)	Depends on route	Depends on route	Depends on route	Depends on route	Depends on route	Depends on route	Yes. Standard design criteria are available. The mode is well established in arctic conditions. (acceptable)	Depends on route	Depends on route	Depends on route	Depends on route	Depends on route	Depends on route	Forwarded on for additional screening (acceptable)
Road (seasonal winter ice road)	No, not year-round (not favorable)	Depends on route	No. Changing climate makes this mode unreliable. (not favorable)	Depends on route	Depends on route	Depends on route	Depends on route	Depends on route	Depends on route	No (not favorable)	Depends on route	No. Ice roads require new construction each winter. (not favorable)	Yes. Requires the assumption that winter climate conditions (which are changing rapidly in the arctic) would remain stable.	No. Reconstructing an ice road each winter at the lengths needed is not practical using common sense. (not favorable)	Depends on route	Depends on route	Screened out

Screening Criterion	I. Effectiveness, Meets Purpose and Need. a. Year-round surface transportation access?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Logical termini?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Support hauling mining equipment/heavy loads?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? a. Constructed Length (miles)	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? a. Distance to Transportation Network (mi) (distance to existing port site)	I. Technical Feasibility a. Constructability? (proven construction methods and minimized construction risks) i. Topography	I. Technical Feasibility a. Constructability? (proven construction methods and minimized construction risks) i. Poor Soils?	I. Technical Feasibility a. Constructability? (proven construction methods and minimized construction risks) i. Difficult River Crossings?	I. Technical Feasibility a. Constructability? (proven construction methods and minimized construction risks) i. Access to construction materials?	I. Technical Feasibility a. Existing Technology i. Generally accepted design criteria for the intended mode of transportation and intended uses?	I. Economic Feasibility a. Construction costs reasonable compared to other alternatives?	I. Economic Feasibility a. O&M costs reasonable compared to other alternatives?	I. Practicality a. Requires speculative assumptions or remotely foreseeable circumstances?	I. Practicality a. Practical or not practical using common sense?	I. Duplicative a. Substantially similar to another route?	I. Duplicative a. Similar to (but not as good as) an alternative with similar routing or other key characteristics?	Screened out or moved forward for further consideration?
Water (barge/boat) - Improve/dredge Kobuk River	No, not year-round (not favorable)	Depends on route	Depends on route. However, changing climate could affect water levels and reliability. (less than favorable or uncertain)	Depends on route	Depends on route	Depends on route	Depends on route	Depends on route	Depends on route	Barges can haul heavy materials. However, the river systems may be too shallow. Depends on the routes.	Depends on route	Depends on route	Yes. Requires the assumption that winter climate conditions (which are changing rapidly in the arctic) would remain stable. (not favorable)	Depends on route	Depends on route	Depends on route	Screened out
Winter ice -Ice road to lower Kobuk River	No, not year-round (not favorable)	Depends on route	No. Changing climate makes this mode unreliable. (not favorable)	Depends on route	Depends on route	Depends on route	Depends on route	Depends on route	Depends on route	No (not favorable)	Depends on route	No. Ice roads require new construction each winter. (not favorable)	Yes. Requires the assumption that winter climate conditions (which are changing rapidly in the arctic) would remain stable. (not favorable)	No. Reconstructing an ice road each winter at the lengths needed is not practical using common sense. (not favorable)	Depends on route	Depends on route	Screened out
Pipeline	Yes (acceptable)	Depends on route	No. This is only conducive for hauling fuel or potentially slurry. It may be a part of an overall corridor, but it does not support hauling equipment and supplies. (not favorable)	Depends on route	Depends on route	Depends on route	Depends on route	Depends on route	Depends on route	Yes, for hauling slurry or fuel.	Depends on route	Depends on route	Yes (not favorable)	No (not favorable)	Depends on route	Depends on route	Screened out

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Appendix C. Routes Screening Data

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Screening Criterion	**I. Effectiveness, Meets Purpose and Need. a. Year-round surface transportation access?**	**I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Logical termini?**	**I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Support hauling mining equipment/ heavy loads?**	**I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Constructed Length (miles)**	**I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Distance to Transportation Network (mi) (distance to existing port site)**	**I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Topography**	**I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Poor soils? (peat prone/ wetland soils and permafrost)**	**I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Difficult River Crossings? (number of large bridges, greater than 140 ft; and/or total length of large bridges in feet)**	**I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Access to construction materials? (gravel) (percent of corridor with material sites within 10 miles)**	**I. Technical Feasibility. a. Existing Technology i. Generally accepted design criteria for the intended mode of transportation and intended use?**	**I. Economic Feasibility. a. Construction costs reasonable compared to other alternatives?**	**I. Economic Feasibility. a. O&M costs reasonable compared to other alternatives?**	**I. Practicality. a. Includes speculative assumptions or remotely foreseeable circumstances?**	**I. Practicality. a. Practical or not practical using common sense?**	**I. Practicality. a. Unacceptable Environmental Factors**	**I. Duplicative. a. Substantially similar to another route?**	**I. Duplicative. a. Similar to (but not as good as) an alternative with similar routing or other key characteristics?**	**Screened out or moved forward for further consideration as a reasonable alternative?**
AIDEA Proposed Route (rd). GAAR North [Alternative A]	Yes. Route is year-round. Port is year-round. (acceptable compared with other alternatives)	yes (acceptable compared with other alternatives)	yes (acceptable compared with other alternatives)	211 (acceptable compared with other alternatives)	939 (distance from AMD to Port of Seward) (less than favorable or uncertain compared with other alternatives)	Can be designed to avoid steep topography (acceptable compared with other alternatives)	Assumed similar geotechnical scoring as Original Brooks East Route (acceptable compared with other alternatives)	11 *(SF299-Jun2016, p2)* (acceptable compared with other alternatives)	Assumed similar to Original Brooks East Route score *(SF299-Jun2016, p2: incl. # and acres of mat'l sites, but diff. than metric included in DOT-2011 Summ Report)* (acceptable compared with other alternatives)	yes (acceptable compared with other alternatives)	$356 Million (all costs in this column escalated to 2018 dollars; costs are screening-level) (acceptable compared with other alternatives)	$8-10 Mllion/year (acceptable)	Includes no speculative assumptions/ foreseeable circumstances. However, assumes adequate capacity/loading facilities at Port of Alaska or other existing port location in Southcentral AK. (acceptable compared with other alternatives)	Appears practical. (acceptable)	• Caribou habitat: 5,861 acres • Anadromous fish streams: 5 • NHD stream crossings: 181 • NHD "riparian" acreage: 86.28 (in this column, caribou and fish stream data calculated in June 2018 using GIS based on a 250-ft wide corridor; calculated in July 2018: number of streams crossed based on *USGS National Hydrology Dataset [NHD]* and riparian area calculated based on a buffer of NHD lines that intersected a 250-foot ROW, see also table footnote) (acceptable compared with other alternatives)	AIDEA's proposed route	AIDEA's proposed route	Moved forward for further analysis

Screening Criterion	I. Effectiveness, Meets Purpose and Need. a. Year-round surface transportation access?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Logical termini?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Support hauling mining equipment/ heavy loads?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Constructed Length (miles)	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Distance to Transportation Network (mi) (distance to existing port site)	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Topography	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Poor soils? (peat prone/ wetland soils and permafrost)	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Difficult River Crossings? (number of large bridges, greater than 140 ft; and/or total length of large bridges in feet)	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Access to construction materials? (gravel) (percent of corridor with material sites within 10 miles)	I. Technical Feasibility. a. Existing Technology i. Generally accepted design criteria for the intended mode of transportation and intended use?	I. Economic Feasibility. a. Construction costs reasonable compared to other alternatives?	I. Economic Feasibility. a. O&M costs reasonable compared to other alternatives?	I. Practicality. a. Includes speculative assumptions or remotely foreseeable circumstances?	I. Practicality. a. Practical or not practical using common sense?	I. Practicality. a. Unacceptable Environmental Factors	I. Duplicative. a. Substantially similar to another route?	I. Duplicative. a. Similar to (but not as good as) an alternative with similar routing or other key characteristics?	Screened out or moved forward for further consideration as a reasonable alternative?
AIDEA Alternative Route (rd) GAAR South [Alternative B]	Yes. Route is year-round. Port is year-round. (acceptable compared with other alternatives)	yes (acceptable compared with other alternatives)	yes (acceptable compared with other alternatives)	228 (acceptable compared with other alternatives)	956 (distance from AMD to Port of Seward) (less than favorable or uncertain compared with other alternatives)	Can be designed to avoid steep topography (acceptable compared with other alternatives)	Assumed similar geotechnical scoring as Original Brooks East Route (acceptable compared with other alternatives)	11 *(SF299-Jun2016, p2)* (acceptable compared with other alternatives)	Assumed similar to Original Brooks East Route score (acceptable compared with other alternatives)	yes (acceptable)	Data not available but construction cost assumed reasonable based on this route being proposed by the applicant and its similarity to the other AIDEA proposed road route (GAAR North) (acceptable compared with other alternatives)	$9-11M /yr (acceptable)	Includes no speculative assumptions/ foreseeable circumstances. However, assumes adequate capacity/loading facilities at Port of Alaska or other existing port location in Southcentral AK. (acceptable compared with other alternatives)	Appears practical. (acceptable)	• Caribou habitat: 6,382 acres • Anadromous fish streams: 6 • NHD stream crossings: 190 • NHD "riparian" acreage: 95.36 (acceptable compared with other alternatives)	Similar to AIDEA's proposed route	Similar to AIDEA's proposed route	Moved forward for further analysis
Original Brooks East (previous DOT&PF alternative)	Yes. Route is year-round. Port is year-round. (acceptable compared with other alternatives)	yes (acceptable compared with other alternatives)	yes (acceptable compared with other alternatives)	220 (acceptable compared with other alternatives)	923 (distance from AMD to Port of Seward) (less than favorable or uncertain compared with other alternatives)	Can be designed to avoid steep topography (acceptable compared with other alternatives)	Received 'best' Geotech ranking ("6") *(DOT-2011 Geotech memo, p.66 based on length, foundation and permafrost conditions, mat'l site availability, lower score is better; all alts scores range from 6-26)* (acceptable compared with other alternatives)	13 /5,000ft *(DOT-2011 Summ Report, pIII)* (acceptable)	100% *("100%" of the corridor has mat'l sites within 10 miles, per DOT-2011 Summ Report, pIII)* (acceptable compared with other alternatives)	yes (acceptable compared with other alternatives)	$473M (acceptable compared with other alternatives)	$8.5-11M/yr (acceptable compared with other alternatives)	Includes no speculative assumptions/ foreseeable circumstances. However, assumes adequate capacity/loading facilities at Port of Alaska or other existing port location in Southcentral AK. (acceptable compared with other alternatives)	Not practical; Right of way could not be acquired (Village Corp whose land would be needed is on record against the route). Was also screened out in part due to community input for avoiding communities (Evansville/Bettles) (not favorable compared with other alternatives)	• Caribou habitat: 5,611 acres • Anadromous fish streams: 7 • NHD stream crossings: 173 • NHD "riparian" acreage: 101.07 (acceptable compared with other alternatives)	Similar to AIDEA's proposed route	Similar to AIDEA's proposed route but not as good because of community impact concerns. (not favorable compared with other alternatives)	Screened out

Screening Criterion	**I. Effectiveness, Meets Purpose and Need. a. Year-round surface transportation access?**	**I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Logical termini?**	**I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Support hauling mining equipment/ heavy loads?**	**I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Constructed Length (miles)**	**I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Distance to Transportation Network (mi) (distance to existing port site)**	**I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Topography**	**I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Poor soils? (peat prone/ wetland soils and permafrost)**	**I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Difficult River Crossings? (number of large bridges, greater than 140 ft; and/or total length of large bridges in feet)**	**I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Access to construction materials? (gravel) (percent of corridor with material sites within 10 miles)**	**I. Technical Feasibility. a. Existing Technology i. Generally accepted design criteria for the intended mode of transportation and intended use?**	**I. Economic Feasibility. a. Construction costs reasonable compared to other alternatives?**	**I. Economic Feasibility. a. O&M costs reasonable compared to other alternatives?**	**I. Practicality. a. Includes speculative assumptions or remotely foreseeable circumstances?**	**I. Practicality. a. Practical or not practical using common sense?**	**I. Practicality. a. Unacceptable Environmental Factors**	**I. Duplicative. a. Substantially similar to another route?**	**I. Duplicative. a. Similar to (but not as good as) an alternative with similar routing or other key characteristics?**	**Screened out or moved forward for further consideration as a reasonable alternative?**
Kanuti Flats Road Route (previous DOT&PF alternative)	Yes. Route is year-round. Port is year-round. (acceptable compared with other alternatives)	yes (acceptable compared with other alternatives)	yes (acceptable compared with other alternatives)	240 (acceptable compared with other alternatives)	943(distance from AMD to Port of Seward) (less than favorable or uncertain compared with other alternatives)	Can be designed to avoid steep topography (acceptable compared with other alternatives)	Geotech ranking ("11") *(DOT-2011 Geotech memo, p.66, lower score is better; all alts scores range 6-26)* (less than favorable or uncertain compared with other alternatives)	14/5,440ft *(DOT-2011 Summ Report, pIII)* (acceptable compared with other alternatives)	75% *(DOT-2011 Summ Report, pIII)* (acceptable compared with other alternatives)	yes (acceptable compared with other alternatives)	$562M (acceptable compared with other alternatives)	$9-11.5M/yr (acceptable compared with other alternatives)	Includes no speculative assumptions/ foreseeable circumstances. However, assumes adequate capacity/loading facilities at Port of Alaska or other existing port location in Southcentral AK. (acceptable compared with other alternatives)	Appears generally practical but not as practical as similar (duplicative) routes. (less than favorable or uncertain compared with other alternatives)	• Caribou habitat: 6,343 acres • Anadromous Streams: 11 • NHD stream crossings: 238 • NHD "riparian" acreage: 123.88 (less than favorable or uncertain compared with other alternatives)	Similar to AIDEA's proposed route	Similar to AIDEA's proposed route but not as good. Caribou and Anadromous Stream impacts worse. Community impact concerns. (less than favorable or uncertain compared with other alternatives)	Screened out
Rail to Dalton Hwy along AIDEA Proposed road route (identified during scoping)	Route is year-round. Port is year-round. (acceptable compared with other alternatives)	yes (acceptable compared with other alternatives)	yes (acceptable compared with other alternatives)	211 (acceptable compared with other alternatives)	939(distance from AMD to Port of Seward) (less than favorable or uncertain compared with other alternatives)	Can be designed to avoid steep topography (acceptable compared with other alternatives)	similar to AIDEA's proposed route (acceptable compared with other alternatives)	11 Assumed same # as AIDEA Proposed Route (acceptable compared with other alternatives)	100% *(DOT-2011 Summ Report, pIII)* (acceptable compared with other alternatives)	yes (acceptable compared with other alternatives)	$1.05Billion (not favorable compared with other alternatives)	$9M/year (acceptable compared with other alternatives)	Requires transfer of material/equipment from train to truck at Dalton Hwy intersection and the west end. Not practical. Requires speculation that locomotives and other equipment could even be shipped up the Dalton Highway to support this isolated rail. (not favorable compared with other alternatives)	Not Practical. Would require multiple transfers of material/equipment between train and truck at Dalton Hwy intersection and other locations (such as the at the mine site/west end of road and in Fairbanks) (not favorable compared with other alternatives)	• Caribou habitat: 5,861 acres • Anadromous fish streams: 5 • NHD stream crossings: 181 • NHD "riparian" acreage: 86.28 (acceptable compared with other alternatives)	Similar to AIDEA's proposed route	Similar to AIDEA's proposed route but is a unique mode (rail).	Screened out

Screening Criterion	**I. Effectiveness, Meets Purpose and Need. a. Year-round surface transportation access?**	**I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Logical termini?**	**I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Support hauling mining equipment/ heavy loads?**	**I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Constructed Length (miles)**	**I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Distance to Transportation Network (mi) (distance to existing port site)**	**I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Topography**	**I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Poor soils? (peat prone/ wetland soils and permafrost)**	**I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Difficult River Crossings? (number of large bridges, greater than 140 ft; and/or total length of large bridges in feet)**	**I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Access to construction materials? (gravel) (percent of corridor with material sites within 10 miles)**	**I. Technical Feasibility. a. Existing Technology i. Generally accepted design criteria for the intended mode of transportation and intended use?**	**I. Economic Feasibility. a. Construction costs reasonable compared to other alternatives?**	**I. Economic Feasibility. a. O&M costs reasonable compared to other alternatives?**	**I. Practicality. a. Includes speculative assumptions or remotely foreseeable circumstances?**	**I. Practicality. a. Practical or not practical using common sense?**	**I. Practicality. a. Unacceptable Environmental Factors**	**I. Duplicative. a. Substantially similar to another route?**	**I. Duplicative. a. Similar to (but not as good as) an alternative with similar routing or other key characteristics?**	**Screened out or moved forward for further consideration as a reasonable alternative?**
DMTS Port route (rd) (previous DOT&PF alternative)	Partial. Route is year-round. The port would be seasonal. (less than favorable or uncertain compared with other alternatives)	No. The DMTS port site exists and functions for mineral export and is owned by the applicant. However capacity is too limited and would require additional construction akin to building a new port. (not favorable compared with other alternatives)	yes (acceptable compared with other alternatives)	260 (acceptable compared with other alternatives)	260(distance from AMD to existing DMTS port) (acceptable compared with other alternatives)	Can be designed to avoid steep topography (acceptable compared with other alternatives)	Geotech ranking ("17") *(DOT-2011 Geotech memo, p.66, lower score is better; all alts scores range 6-26)* (less than favorable or uncertain compared with other alternatives)	19/8,440ft *(DOT-2011 Summ Report, pIII)* (not favorable compared with other alternatives)	70% *(DOT-2011 Summ Report, pIII)* (acceptable compared with other alternatives)	yes (acceptable compared with other alternatives)	Between $1.02B and $1.07B (subtotals: road cost: $793M port cost: $232M-$280M) (not favorable compared with other alternatives)	$10-12.5M/year (acceptable compared with other alternatives)	DMTS port exists but is seasonal (3-4 months) and does not have the capacity or sufficient facilities. Requires speculation construction akin to a new port would need to occur. (not favorable compared with other alternatives)	Not practical due to likely port requirements akin to constructing a new port. Added cost to the applicant not reasonable using common sense. (not favorable compared with other alternatives)	• Caribou habitat: 8,030 acres • Anadromous fish streams: 13 • NHD stream crossings: 269 • NHD "riparian" acreage: 150.96 (less than favorable or uncertain compared with other alternatives)	Similar to DMTS RR route.	Unique mode on this route	Screened out
DMTS Port route (rail) (previous DOT)	Partial. Route is year-round. The port would be seasonal. (less than favorable or uncertain compared with other alternatives)	No. The DMTS port site exists and functions for mineral export and is owned by the applicant. However capacity is too limited and would require additional construction akin to building a new port. (not favorable compared with other alternatives)	yes (acceptable compared with other alternatives)	260 (acceptable compared with other alternatives)	260 (distance from AMD to existing DMTS port) (acceptable compared with other alternatives)	Can be designed to avoid steep topography (acceptable compared with other alternatives)	Geotech ranking ("17") *(DOT-2011 Geotech memo, p.66, lower score is better; all alts scores range 6-26)* (less than favorable or uncertain compared with other alternatives)	19/8,440ft *(DOT-2011 Summ Report, pV)* (not favorable compared with other alternatives)	70% *(DOT-2011 Summ Report, pV)* (acceptable compared with other alternatives)	yes (acceptable compared with other alternatives)	Between $1.61B and $1.66B (subtotals: rail cost: $1.46B port cost: $232M-$280M) (not favorable compared with other alternatives)	$11.5M/year (acceptable compared with other alternatives)	DMTS port exists but is seasonal (3-4 months) and does not have the capacity or sufficient facilities. Requires speculation construction akin to a new port would need to occur. (not favorable compared with other alternatives)	Not practical due to likely port requirements akin to constructing a new port. Added cost to the applicant not reasonable using common sense. (not favorable compared with other alternatives)	• Caribou habitat: 8,030 acres • Anadromous fish streams: 13 • NHD stream crossings: 269 • NHD "riparian" acreage: 150.96 (less than favorable or uncertain compared with other alternatives)	Similar to DMTS road route	Unique mode on this route.	Screened out

Screening Criterion	I. Effectiveness, Meets Purpose and Need. a. Year-round surface transportation access?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Logical termini?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Support hauling mining equipment/ heavy loads?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Constructed Length (miles)	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Distance to Transportation Network (mi) (distance to existing port site)	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Topography	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Poor soils? (peat prone/ wetland soils and permafrost)	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Difficult River Crossings? (number of large bridges, greater than 140 ft; and/or total length of large bridges in feet)	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Access to construction materials? (gravel) (percent of corridor with material sites within 10 miles)	I. Technical Feasibility. a. Existing Technology i. Generally accepted design criteria for the intended mode of transportation and intended use?	I. Economic Feasibility. a. Construction costs reasonable compared to other alternatives?	I. Economic Feasibility. a. O&M costs reasonable compared to other alternatives?	I. Practicality. a. Includes speculative assumptions or remotely foreseeable circumstances?	I. Practicality. a. Practical or not practical using common sense?	I. Practicality. a. Unacceptable Environmental Factors	I. Duplicative. a. Substantially similar to another route?	I. Duplicative. a. Similar to (but not as good as) an alternative with similar routing or other key characteristics?	Screened out or moved forward for further consideration as a reasonable alternative?
Road to Kiana area then barge via Kobuk River (Scoping)	Partial. Road is year-round. Port/barge is seasonal (less than favorable or uncertain compared with other alternatives)	No. Port site not available. (not favorable compared with other alternatives)	No. The lightering barges used at Red Dog operate with depth of 7 meters (23 feet) at the Port. Shallow-draft barges (less than 5-feet) are used in the Kobuk River for moving fuel and freight to communities such as Noorvik, Kobuk and Kiana. Often the Kobuk River is too shallow for these river-going barges; at these times, fuel and other freight are flown to these communities. (not favorable compared with other alternatives)	149 (acceptable compared with other alternatives)	269 (149 road miles +120 water miles) (acceptable compared with other alternatives)	Road is the same as the DMTS route between Ambler Mining District and Kiana. (acceptable compared with other alternatives)	Road is the same as the DMTS route between Ambler Mining District and Kiana. (less than favorable or uncertain compared with other alternatives)	Data not available	Road is the same as the DMTS route between Ambler mining district and Kiana. (acceptable compared with other alternatives)	Road is the same as the DMTS Route between Ambler Mining District and Kiana. Shallow drafts in the river would not support lightering ore and other heavy equipment. (not favorable compared with other alternatives)	Road construction costs would be less than the DMTS road route, but would need barges also. (acceptable compared with other alternatives)	Road O&M cost less than the DMTS road route, but barge O&M not known. (acceptable compared with other alternatives)	The waterborne distance is long and the hauling must occur in a short summer season. Not practical. (not favorable compared with other alternatives)	Not practical. It is highly unlikely that barging ore and supplies on this route would be feasible, especially considering additional costs due to delays given the short operating window and the unreliability of river depths, the differing drafts/designs of barges on the ocean and in the river, and the importance of the Kobuk for subsistence. (not favorable compared with other alternatives)	• Caribou habitat: 4,497 acres • Anadromous fish streams: 10 • NHD stream crossings: 130 • NHD "riparian" acreage: 71.73 (less than favorable or uncertain compared with other alternatives)	Partly similar to DMTS route	Unique combination of road and barge modes	Screened out

Screening Criterion	I. Effectiveness, Meets Purpose and Need. a. Year-round surface transportation access?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Logical termini?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Support hauling mining equipment/ heavy loads?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Constructed Length (miles)	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Distance to Transportation Network (mi) (distance to existing port site)	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Topography	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Poor soils? (peat prone/ wetland soils and permafrost)	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Difficult River Crossings? (number of large bridges, greater than 140 ft; and/or total length of large bridges in feet)	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Access to construction materials? (gravel) (percent of corridor with material sites within 10 miles)	I. Technical Feasibility. a. Existing Technology i. Generally accepted design criteria for the intended mode of transportation and intended use?	I. Economic Feasibility. a. Construction costs reasonable compared to other alternatives?	I. Economic Feasibility. a. O&M costs reasonable compared to other alternatives?	I. Practicality. a. Includes speculative assumptions or remotely foreseeable circumstances?	I. Practicality. a. Practical or not practical using common sense?	I. Practicality. a. Unacceptable Environmental Factors	I. Duplicative. a. Substantially similar to another route?	I. Duplicative. a. Similar to (but not as good as) an alternative with similar routing or other key characteristics?	Screened out or moved forward for further consideration as a reasonable alternative?
Route west from AMD along Kobuk River to tidewater (scoping)	Partial. Route is year-round. Port is seasonal (less than favorable or uncertain compared with other alternatives)	No. Port site not available at mouth of the Kobuk. (not favorable compared with other alternatives)	yes (acceptable compared with other alternatives)	Not calculated. Does not meet P&N. Not reasonable because it does not connect to a feasible port site.	Not calculated. Does not meet P&N. Not reasonable because it does not connect to a feasible port site. (less than favorable or uncertain compared with other alternatives)	Can be designed to avoid steep topography (acceptable compared with other alternatives)	Similar to DMTS route but routing is in floodplain/flats. Would have worse soil conditions. (not favorable compared with other alternatives)	No specific route defined. Data not available.	Similar to DMTS route but routing is in floodplain/flats. Likely has less access to construction materials. (not favorable compared with other alternatives)	yes (acceptable)	Cost anticipated to be higher than DMTS road route (based on map inspection) because of construction in the flats (farther from construction materials) with poorer soils in more wetlands / floodplain. (not favorable compared with other alternatives)	Not calculated. Does not meet P&N. Not reasonable because it does not connect to a port	The waterborne distance is long and the hauling must occur in a short summer season. Requires assumption that mining companies could make that short season work given the long water route. Not practical. (not favorable compared with other alternatives)	The waterborne distance is long and the hauling must occur in a short summer season. Not practical. (not favorable compared with other alternatives)	Not calculated. Best engineered route is similar to DMTS Route as far as Kiana.	Similar to DMTS route	Similar to DMTS route	Screened out
Cape Blossom (rd) (previous DOT)	Partial. Route is year-round. The port would be seasonal. (less than favorable or uncertain compared with other alternatives)	No. Port does not yet exist. Speculative - terminus site at Cape Blossom has been identified as a potential deep-water port site. (not favorable compared with other alternatives)	yes (acceptable compared with other alternatives)	250 (acceptable compared with other alternatives)	Does not provide surface access to existing port site. (less than favorable or uncertain compared with other alternatives)	Can be designed to avoid steep topography (acceptable compared with other alternatives)	Geotech ranking ("15") *(DOT-2011 Geotech memo, p.66, lower score is better; all alts scores range 6-26)* (less than favorable or uncertain compared with other alternatives)	24/9,250ft *(DOT-2011 Summ Report, pIII)* (not favorable compared with other alternatives)	10%; limited material sites *(DOT-2011 Summ Report, pIII)* (not favorable compared with other alternatives)	yes (acceptable compared with other alternatives)	$1.22B (subtotals: road cost: $947M port cost: $275M) (not favorable compared with other alternatives)	$10-12M/yr (acceptable compared with other alternatives)	Requires speculation that the port site would be developed (not favorable compared with other alternatives)	Not Practical. Does not provide surface access to existing port site. (not favorable compared with other alternatives)	• Caribou habitat: 8,290 acres • Anadromous fish streams: 3 • NHD stream crossings: 260 • NHD "riparian" acreage: 157.54 (less than favorable or uncertain compared with other alternatives)	Not substantially similar to another route; however, route shares some of the Cape Darby and Selawik Flats route	Not applicable.	Screened out

Screening Criterion	I. Effectiveness, Meets Purpose and Need. a. Year-round surface transportation access?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Logical termini?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Support hauling mining equipment/ heavy loads?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Constructed Length (miles)	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Distance to Transportation Network (mi) (distance to existing port site)	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Topography	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Poor soils? (peat prone/ wetland soils and permafrost)	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Difficult River Crossings? (number of large bridges, greater than 140 ft; and/or total length of large bridges in feet)	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Access to construction materials? (gravel) (percent of corridor with material sites within 10 miles)	I. Technical Feasibility. a. Existing Technology i. Generally accepted design criteria for the intended mode of transportation and intended use?	I. Economic Feasibility. a. Construction costs reasonable compared to other alternatives?	I. Economic Feasibility. a. O&M costs reasonable compared to other alternatives?	I. Practicality. a. Includes speculative assumptions or remotely foreseeable circumstances?	I. Practicality. a. Practical or not practical using common sense?	I. Practicality. a. Unacceptable Environmental Factors	I. Duplicative. a. Substantially similar to another route?	I. Duplicative. a. Similar to (but not as good as) an alternative with similar routing or other key characteristics?	Screened out or moved forward for further consideration as a reasonable alternative?
Cape Blossom (rail) (previous DOT)	Partial. Route is year-round. The port would be seasonal. (less than favorable or uncertain compared with other alternatives)	No. Port does not yet exist. Speculative - terminus site at Cape Blossom has been identified as a potential deep-water port site. (not favorable compared with other alternatives)	yes (acceptable compared with other alternatives)	250 (acceptable compared with other alternatives)	Does not provide surface access to existing port site (less than favorable or uncertain compared with other alternatives)	Can be designed to avoid steep topography (acceptable compared with other alternatives)	Geotech ranking ("15") *(DOT-2011 Geotech memo, p.66, lower score is better; all alts scores range 6-26)* (less than favorable or uncertain compared with other alternatives)	24/9,250ft *(DOT-2011 Summ Report, pV)* (not favorable compared with other alternatives)	10%; limited material sites *(DOT-2011 Summ Report, pv)* (not favorable compared with other alternatives)	yes (acceptable compared with other alternatives)	$1.74B (subtotals: rail cost: $1.47B port cost: $275M) (not favorable compared with other alternatives)	$11M/yr (acceptable compared with other alternatives)	Requires speculation that the port site would be developed (not favorable compared with other alternatives)	Not practical. Does not provide surface access to existing port site. (not favorable compared with other alternatives)	• Caribou habitat: 8,290 acres • Anadromous fish streams: 3 • NHD stream crossings: 260 • NHD "riparian" acreage: 143.0 (less than favorable or uncertain compared with other alternatives)	Not substantially similar to another route; however, route shares some of the Cape Darby and Selawik Flats route	Not applicable.	Screened out
Selawik Flats (rd) (previous DOT)	Partial. Route is year-round. The port would be seasonal. (less than favorable or uncertain compared with other alternatives)	No. Deep water port does not yet exist. Speculative - connects to Nome-Council Road and on to Nome where a deep-water port is proposed. (not favorable compared with other alternatives)	yes (acceptable compared with other alternatives)	330 (less than favorable or uncertain compared with other alternatives)	402 distance from AMD to existing Nome port (acceptable compared with other alternatives)	Can be designed to avoid steep topography (acceptable compared with other alternatives)	Geotech ranking ("13") *(DOT-2011 Geotech memo, p.66, lower score is better; all alts scores range 6-26)* (less than favorable or uncertain compared with other alternatives)	21/7,470ft *(DOT-2011 Summ Report, pIII)* (less than favorable or uncertain compared with other alternatives)	57%; limited material sites; *(DOT-2011 Summ Report, pIII)* (less than favorable or uncertain compared with other alternatives)	yes (acceptable compared with other alternatives)	$1.33B (subtotals: road cost: $1.06B port cost: $275M) (not favorable compared with other alternatives)	$13-16M/yr (less than favorable or uncertain compared with other alternatives)	Requires speculation that port modifications would need to occur and deep port constructed. (not favorable compared with other alternatives)	Largely impractical given the length, cost, port issues, and environmental factors. (less than favorable or uncertain compared with other alternatives)	• Caribou habitat: 10,934 acres • Anadromous fish streams: 18 • NHD stream crossings: 257 • NHD "riparian" acreage: 143.37 (not favorable compared with other alternatives)	Route shares a substantial amount with the Cape Darby route	Not applicable.	Screened out

Screening Criterion	I. Effectiveness, Meets Purpose and Need. a. Year-round surface transportation access?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Logical termini?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Support hauling mining equipment/ heavy loads?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Constructed Length (miles)	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Distance to Transportation Network (mi) (distance to existing port site)	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Topography	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Poor soils? (peat prone/ wetland soils and permafrost)	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Difficult River Crossings? (number of large bridges, greater than 140 ft; and/or total length of large bridges in feet)	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Access to construction materials? (gravel) (percent of corridor with material sites within 10 miles)	I. Technical Feasibility. a. Existing Technology i. Generally accepted design criteria for the intended mode of transportation and intended use?	I. Economic Feasibility. a. Construction costs reasonable compared to other alternatives?	I. Economic Feasibility. a. O&M costs reasonable compared to other alternatives?	I. Practicality. a. Includes speculative assumptions or remotely foreseeable circumstances?	I. Practicality. a. Practical or not practical using common sense?	I. Practicality. a. Unacceptable Environmental Factors	I. Duplicative. a. Substantially similar to another route?	I. Duplicative. a. Similar to (but not as good as) an alternative with similar routing or other key characteristics?	Screened out or moved forward for further consideration as a reasonable alternative?
Selawik Flats (rail) (previous DOT)	Partial. Route is year-round. Port is seasonal. (less than favorable or uncertain compared with other alternatives)	No. Deep water port does not yet exist. Speculative - connects to Nome-Council Road and on to Nome where a deep-water port is proposed. (not favorable compared with other alternatives)	yes (acceptable compared with other alternatives)	330 (less than favorable or uncertain compared with other alternatives)	402 distance from AMD to existing Nome port (acceptable compared with other alternatives)	Can be designed to avoid steep topography (acceptable compared with other alternatives)	Geotech ranking ("13") *(DOT-2011 Geotech memo, p.66, lower score is better; all alts scores range 6-26)* (less than favorable or uncertain compared with other alternatives)	21/7,470ft *(DOT-2011 Summ Report, pV)* (less than favorable or uncertain compared with other alternatives)	57%; limited material sites *(DOT-2011 Summ Report, pV)* (less than favorable or uncertain compared with other alternatives)	yes (acceptable compared with other alternatives)	$1.99B (subtotals: road cost: $1.72B port cost: $275M) (not favorable compared with other alternatives)	$15M/yr (less than favorable or uncertain compared with other alternatives)	Requires speculation that port modifications would need to occur and deep port constructed. (not favorable compared with other alternatives)	Largely impractical given the length, cost, port issues, and environmental factors. (less than favorable or uncertain compared with other alternatives)	• Caribou habitat: 10,934 acres • Anadromous fish streams: 18 • NHD stream crossings: 257 • NHD "riparian" acreage: 143.37 (not favorable compared with other alternatives)	Route shares a substantial amount with the Cape Darby route	Not applicable.	Screened out
Nome Route (rd) (suggested by Doyon post-scoping)	Partial. Route is year-round. Port is seasonal. (less than favorable or uncertain compared with other alternatives)	No. Deep water port does not yet exist. Speculative - connects to Nome-Council Road and on to Nome where a deep-water port is proposed. (not favorable compared with other alternatives)	yes (acceptable compared with other alternatives)	388 (less than favorable or uncertain compared with other alternatives)	460 distance from AMD to existing Nome port (acceptable compared with other alternatives)	Questionable. Route goes through very mountainous terrain. (less than favorable or uncertain compared with other alternatives)	Data Not Available	Data Not Available	Data Not Available	yes (acceptable compared with other alternatives)	Cost data not available. Anticipated to be as high or potentially higher than other nearby routes (Cape Darby or Selawik Flats) due to steeper terrain (not favorable compared with other alternatives)	Data Not Available	Requires speculation that port modifications would need to occur and deep port constructed. (not favorable compared with other alternatives)	Largely impractical given the length, cost, port issues, and environmental factors. (less than favorable or uncertain compared with other alternatives)	• Caribou habitat: 11,738 acres • Anadromous fish streams: 13 • NHD stream crossings: 171 • NHD "riparian" acreage: 151.7 (not favorable compared with other alternatives)	Similar to Cape Darby and Selawik Flats routes	Similar to Cape Darby and Selawik Flats routes. Mountainous terrain is problematic.	Screened out

Screening Criterion	I. Effectiveness, Meets Purpose and Need. a. Year-round surface transportation access?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Logical termini?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Support hauling mining equipment/ heavy loads?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Constructed Length (miles)	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Distance to Transportation Network (mi) (distance to existing port site)	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Topography	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Poor soils? (peat prone/ wetland soils and permafrost)	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Difficult River Crossings? (number of large bridges, greater than 140 ft; and/or total length of large bridges in feet)	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Access to construction materials? (gravel) (percent of corridor with material sites within 10 miles)	I. Technical Feasibility. a. Existing Technology i. Generally accepted design criteria for the intended mode of transportation and intended use?	I. Economic Feasibility. a. Construction costs reasonable compared to other alternatives?	I. Economic Feasibility. a. O&M costs reasonable compared to other alternatives?	I. Practicality. a. Includes speculative assumptions or remotely foreseeable circumstances?	I. Practicality. a. Practical or not practical using common sense?	I. Practicality. a. Unacceptable Environmental Factors	I. Duplicative. a. Substantially similar to another route?	I. Duplicative. a. Similar to (but not as good as) an alternative with similar routing or other key characteristics?	Screened out or moved forward for further consideration as a reasonable alternative?
Cape Darby (rd) (previous DOT)	Partial. Route is year-round. The port would be seasonal. (less than favorable or uncertain compared with other alternatives)	No. Deep water port does not yet exist. Speculative - terminus site been identified as a potential deep-water port site. Accessing other mining districts not supported by purpose and need. (not favorable compared with other alternatives)	yes (acceptable compared with other alternatives)	340 (less than favorable or uncertain compared with other alternatives)	Does not provide surface access to existing port site (not favorable compared with other alternatives)	Can be designed to avoid steep topography (acceptable compared with other alternatives)	Geotech ranking ("12") *(DOT-2011 Geotech memo, p.66, lower score is better; all alts scores range 6-26)* (less than favorable or uncertain compared with other alternatives)	25/7,890ft *(DOT-2011 Summ Report, pIII)* (less than favorable or uncertain compared with other alternatives)	58%; limited material sites *(DOT-2011 Summ Report, pIII)* (less than favorable or uncertain compared with other alternatives)	yes (acceptable compared with other alternatives)	$1.32B (subtotals: road cost: $1.06B port cost: $275M) (not favorable compared with other alternatives)	$13-16M/yr (less than favorable or uncertain compared with other alternatives)	Requires speculation that the port site would be developed (not favorable compared with other alternatives)	Not Practical. Does not provide surface access to existing port site. (not favorable compared with other alternatives)	• Caribou habitat: 11,203 acres • Anadromous fish streams: 14 • NHD stream crossings: 280 • NHD "riparian" acreage: 236.12 (not favorable compared with other alternatives)	Route shares a substantial amount with the Selawik Flats route	Not applicable.	Screened out
Cape Darby (rail) (previous DOT)	Partial. Route is year-round. The port would be seasonal. (less than favorable or uncertain compared with other alternatives)	No. Deep water port does not yet exist. Speculative - terminus site been identified as a potential deep-water port site. Accessing other mining districts not supported by purpose and need. (not favorable compared with other alternatives)	yes (acceptable compared with other alternatives)	340 (less than favorable or uncertain compared with other alternatives)	Does not provide surface access to existing port site (not favorable compared with other alternatives)	Can be designed to avoid steep topography (acceptable compared with other alternatives)	Geotech ranking ("12") *(DOT-2011 Geotech memo, p.66, lower score is better; all alts scores range 6-26)* (less than favorable or uncertain compared with other alternatives)	25/7,890 ft *(DOT-2011 Summ Report, pV)* (less than favorable or uncertain compared with other alternatives)	58%; limited material sites *(DOT-2011 Summ Report, pV)* (less than favorable or uncertain compared with other alternatives)	yes (acceptable compared with other alternatives)	$2.0B (subtotals: rail cost: $1.73B port cost: $275M) (not favorable compared with other alternatives)	$15M/yr (less than favorable or uncertain compared with other alternatives)	Requires speculation that the port site would be developed (not favorable compared with other alternatives)	Not Practical. Does not provide surface access to existing port site. (not favorable compared with other alternatives)	• Caribou habitat: 11,203 acres • Anadromous fish streams: 14 • NHD stream crossings: 280 • NHD "riparian" acreage: 236.12 (not favorable compared with other alternatives)	Route shares a substantial amount with the Selawik Flats route	Not applicable.	Screened out

Screening Criterion	**I. Effectiveness, Meets Purpose and Need. a. Year-round surface transportation access?**	**I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Logical termini?**	**I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Support hauling mining equipment/ heavy loads?**	**I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Constructed Length (miles)**	**I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Distance to Transportation Network (mi) (distance to existing port site)**	**I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Topography**	**I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Poor soils? (peat prone/ wetland soils and permafrost)**	**I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Difficult River Crossings? (number of large bridges, greater than 140 ft; and/or total length of large bridges in feet)**	**I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Access to construction materials? (gravel) (percent of corridor with material sites within 10 miles)**	**I. Technical Feasibility. a. Existing Technology i. Generally accepted design criteria for the intended mode of transportation and intended use?**	**I. Economic Feasibility. a. Construction costs reasonable compared to other alternatives?**	**I. Economic Feasibility. a. O&M costs reasonable compared to other alternatives?**	**I. Practicality. a. Includes speculative assumptions or remotely foreseeable circumstances?**	**I. Practicality. a. Practical or not practical using common sense?**	**I. Practicality. a. Unacceptable Environmental Factors**	**I. Duplicative. a. Substantially similar to another route?**	**I. Duplicative. a. Similar to (but not as good as) an alternative with similar routing or other key characteristics?**	**Screened out or moved forward for further consideration as a reasonable alternative?**
Variation of Selawik Flats/Cape Darby routes to access other nearby mining resources (scoping)	Partial. Route is year-round. The port would be seasonal. (less than favorable or uncertain compared with other alternatives)	No. Deep water port does not yet exist. Speculative - terminus site been identified as a potential deep-water port site. Accessing other mining districts not supported by purpose and need. (not favorable compared with other alternatives)	yes (acceptable compared with other alternatives)	Not calculated. Does not meet P&N. No logical termini. (not favorable compared with other alternatives)	Not calculated. Does not meet P&N. No logical termini. (not favorable compared with other alternatives)	Can be designed to avoid steep topography (acceptable compared with other alternatives)	depends on route, though likely 12 (similar to Cape Darby) or 13 (similar to Selawik) (less than favorable or uncertain compared with other alternatives)	No specific route defined. Data not available.	No specific route defined. Data not available.	yes (acceptable compared with other alternatives)	Similar to Cape Darby or Selawik Flats routes. See costs above (not favorable compared with other alternatives)	Similar to Cape Darby and Selawik Flats routes. See cost above (less than favorable or uncertain compared with other alternatives)	Requires speculation that the port site would be developed (not favorable compared with other alternatives)	Not Practical. Does not provide surface access to existing port site. (not favorable compared with other alternatives)	Likely similar impact at Cape Darby and Selawik Flats routes. (not favorable compared with other alternatives)	Substantially Similar to Cape Darby and Selawik Flats route. (not favorable compared with other alternatives)	Substantially Similar to Cape Darby; Selawik Flats route. Variations to the routes but would add length and impacts yet accessing other mining areas not supported by P & N. (not favorable compared with other alternatives)	Screened out
Parks Hwy Rail Route (4 variants) (previous DOT)	**Yes. Route is year-round. Port is year-round. (acceptable compared with other alternatives)**	**yes (acceptable compared with other alternatives)**	**yes (acceptable compared with other alternatives)**	**420-450 (not favorable compared with other alternatives)**	**851-881 distance from AMD to existing Port of Seward (less than favorable or uncertain compared with other alternatives)**	**Can be designed to avoid steep topography (acceptable compared with other alternatives)**	**Geotech ranking score range: 19-26 *(DOT-2011 Geotech memo, p.66, lower score is better; all alts scores range 6-26)* (not favorable compared with other alternatives)**	Ranges from 13 to17 / 7,470ft-10,670 ft *(DOT-2011 Summ Report, pV)* (not favorable compared with other alternatives)	96% *(DOT-2011 Summ Report, pIII)* (acceptable compared with other alternatives)	yes (acceptable compared with other alternatives)	$2.07-2.21B (not favorable compared with other alternatives)	$18.5-20M/yr (not favorable compared with other alternatives)	no (acceptable)	Uncertain: May not be practical given the length, cost, and environmental factors if other better alternatives exist. May result in a redundant infrastructure if an adjacent service road is constructed to provide access along the rail line. (less than favorable or uncertain compared with other alternatives)	• Caribou habitat: 5,403 to 6,153 acres • Anadromous fish streams: 11 to 17 • NHD stream crossings: 259 to 343 • NHD "riparian" acreage: 161.84 to 182.81 (not favorable compared with other alternatives)	Unique route / mode.	Unique route / mode.	Screened out

Screening Criterion	**I. Effectiveness, Meets Purpose and Need. a. Year-round surface transportation access?**	**I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Logical termini?**	**I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Support hauling mining equipment/ heavy loads?**	**I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Constructed Length (miles)**	**I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Distance to Transportation Network (mi) (distance to existing port site)**	**I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Topography**	**I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Poor soils? (peat prone/ wetland soils and permafrost)**	**I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Difficult River Crossings? (number of large bridges, greater than 140 ft; and/or total length of large bridges in feet)**	**I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Access to construction materials? (gravel) (percent of corridor with material sites within 10 miles)**	**I. Technical Feasibility. a. Existing Technology i. Generally accepted design criteria for the intended mode of transportation and intended use?**	**I. Economic Feasibility. a. Construction costs reasonable compared to other alternatives?**	**I. Economic Feasibility. a. O&M costs reasonable compared to other alternatives?**	**I. Practicality. a. Includes speculative assumptions or remotely foreseeable circumstances?**	**I. Practicality. a. Practical or not practical using common sense?**	**I. Practicality. a. Unacceptable Environmental Factors**	**I. Duplicative. a. Substantially similar to another route?**	**I. Duplicative. a. Similar to (but not as good as) an alternative with similar routing or other key characteristics?**	**Screened out or moved forward for further consideration as a reasonable alternative?**
Elliott Hwy Road Route (previous DOT)	Yes. Route is year-round. Port is year-round. (acceptable compared with other alternatives)	yes (acceptable compared with other alternatives)	yes (acceptable compared with other alternatives)	370 (less than favorable or uncertain compared with other alternatives)	996 distance from AMD to existing Port of Seward (less than favorable or uncertain compared with other alternatives)	Can be designed to avoid steep topography (acceptable compared with other alternatives)	Geotech ranking ("21") *(DOT-2011 Geotech memo, p.66, lower score is better; all alts scores range 6-26)* (not favorable compared with other alternatives)	12/7,360ft *(DOT-2011 Summ Report, pIII)* (less than favorable or uncertain compared with other alternatives)	84% *(DOT-2011 Summ Report, pIII)* (acceptable compared with other alternatives)	yes (acceptable compared with other alternatives)	$1.09B (not favorable compared with other alternatives)	$14-18M/yr (not favorable compared with other alternatives)	no (acceptable compared with other alternatives)	Uncertain: May not be practical given the length, cost, and environmental factors if other better alternatives exist. (less than favorable or uncertain compared with other alternatives)	• Caribou habitat: 6,330 acres • Anadromous fish streams: 13 • NHD stream crossings: 288 • NHD "riparian" acreage: 155.56 (less than favorable or uncertain compared with other alternatives)	Unique route / mode, though shares some portions with the Communities Route.	Shares some portions with the Communities route, but longer. (less than favorable or uncertain compared with other alternatives)	Screened out
Communities Route: Tanana-Hughes-Hogatza-Kobuk (road) (scoping) [Alternative C]	Yes. Route is year-round. Port is year-round. (acceptable compared with other alternatives)	yes (acceptable compared with other alternatives)	yes (acceptable compared with other alternatives)	306 (less than favorable or uncertain compared with other alternatives)	932 distance from AMD to existing Port of Seward (less than favorable or uncertain compared with other alternatives)	Can be designed to avoid steep topography (acceptable compared with other alternatives)	Similar to Parks Hwy RR / Elliott Hwy. (not favorable compared with other alternatives)	Similar to Parks Hwy RR or Ellliott Hwy. (not favorable compared with other alternatives)	Similar to Elliott Hwy and Parks Hwy RR routes (acceptable compared with other alternatives)	yes (acceptable compared with other alternatives)	$867M (subtotal: road cost: $775M Yukon River Bridge Crossing: $150M) (less than favorable or uncertain compared with other alternatives)	$12-15M/yr (less than favorable or uncertain compared with other alternatives)	no (acceptable compared with other alternatives)	Compared to other alternatives, scoping comments from Kobuk, Shungnak, and Hughes showed some support of a road, which makes connecting the route to these communities appear practical. However, length and cost may be less practical if better alternatives exist. (less than favorable or uncertain compared with other alternatives)	• Caribou habitat: 5,126 acres • Anadromous fish streams: 7 • NHD stream crossings: 281 • NHD "riparian" acreage: 249.69 (less than favorable or uncertain compared with other alternatives)	Shares portions of Elliott Hwy Route. Overall, unique route.	Unique route / mode.	Initially moved forward for further analysis, but refined. Not carried forward on its original alignment. See next row.

Screening Criterion	I. Effectiveness, Meets Purpose and Need. a. Year-round surface transportation access?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Logical termini?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Support hauling mining equipment/ heavy loads?	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Constructed Length (miles)	I. Effectiveness, Meets Purpose and Need. a. Feasibly and practically able to support mining exploration and development activities? i. Distance to Transportation Network (mi) (distance to existing port site)	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Topography	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Poor soils? (peat prone/ wetland soils and permafrost)	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Difficult River Crossings? (number of large bridges, greater than 140 ft; and/or total length of large bridges in feet)	I. Technical Feasibility. a. Constructability? (proven construction methods and minimized construction risks) i. Access to construction materials? (gravel) (percent of corridor with material sites within 10 miles)	I. Technical Feasibility. a. Existing Technology i. Generally accepted design criteria for the intended mode of transportation and intended use?	I. Economic Feasibility. a. Construction costs reasonable compared to other alternatives?	I. Economic Feasibility. a. O&M costs reasonable compared to other alternatives?	I. Practicality. a. Includes speculative assumptions or remotely foreseeable circumstances?	I. Practicality. a. Practical or not practical using common sense?	I. Practicality. a. Unacceptable Environmental Factors	I. Duplicative. a. Substantially similar to another route?	I. Duplicative. a. Similar to (but not as good as) an alternative with similar routing or other key characteristics?	Screened out or moved forward for further consideration as a reasonable alternative?
Alternative C Refined	Yes. Route is year-round. Port is year-round. (acceptable compared with other alternatives)	yes (acceptable compared with other alternatives)	yes (acceptable compared with other alternatives)	332 (less than favorable or uncertain compared with other alternatives)	882 distance from AMD to existing Port of Seward (less than favorable or uncertain compared with other alternatives)	Can be designed to avoid steep topography (acceptable compared with other alternatives)	Similar to Parks Hwy RR / Elliott Hwy. (not favorable compared with other alternatives)	14 large bridge crossings (acceptable compared with other alternatives)	Similar to Elliott Hwy and Parks Hwy RR routes (acceptable compared with other alternatives)	yes (acceptable compared with other alternatives)	$775 (less than favorable or uncertain compared with other alternatives)	$13-16M/yr (less than favorable or uncertain compared with other alternatives)	no (acceptable compared with other alternatives)	Compared to other alternatives, scoping comments from Kobuk, Shungnak, and Hughes showed some support of a road, which makes connecting the route to these communities appear practical. However, length and cost may be less practical if better alternatives exist. (less than favorable or uncertain compared with other alternatives)	• Caribou habitat: 7,889 acres • Anadromous fish streams: 10 • NHD stream crossings: 249 • NHD "riparian" acreage: 76 (uncertain compared with other alternatives)	Unique route / mode.	Unique route / mode.	Moved forward for further analysis

Note: Text in parenthesis describing favorability as compared to other alternatives is not intended to be a ranking, but rather to draw attention for discussion purposes. *Italic text represents source documents.*

Footnote: Scoping comment suggested variation across Kobuk River: Move the Kobuk River crossing(s) downstream of Pah River confluence

Footnote for cost criterion: For the economic feasibility criterion, costs for alternatives were derived largely from the DOT&PF effort in 2011-2012 and the applicant's materials. For alternatives not considered previously and did not have original costs calculated, costs were extrapolated from these existing data sources. Older costs were escalated to 2018 dollars. Growth rates were based on the Bureau of Labor Statistics Urban Alaska Consumer Price Index. Escalation rates used were as follows: from 2011 to 2018: 10.1%; from 2012 to 2018: 7.7%; and from 2016 to 2018: 1.8%. Also, some numbers have been rounded.

Footnote for environmental factors: NHD riparian data was used as 'proxy' for wetlands data, because available wetlands data was determined inaccurate in August 2018. Riparian area was calculated based on a buffer of NHD lines that intersected the 250-foot ROW, as follows: Artificial Route – Code: 58800 – 500ft width; Perennial Route – Code: 46006 – 50ft width; Intermittent Route – Code: 46003 – 20ft width; Canal/Ditch Route – Code: 33600 – 10ft width.

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Appendix H

Indirect and Cumulative Impacts Associated with the Ambler Road

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Tables

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Acronyms

AADT	Annual Average Daily Traffic
ACEC	Area of Critical Environmental Concern
ADEC	Alaska Department of Environmental Conservation
ADNR	Alaska Department of Natural Resources
AIDEA	Alaska Industrial Development and Export Authority
ANCSA	Alaska Native Claims Settlement Act
ANILCA	Alaska National Interest Lands Conservation Act
ASTAR	Arctic Strategic Transportation and Resources
BLM	Bureau of Land Management
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DMTS	Delong Mountains Transportation System
DOT&PF	Alaska Department of Transportation and Public Facilities
DWT	dead weight tons
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FFS	Final Feasibility Study
GAAR	Gates of the Arctic National Park and Preserve
GHG	greenhouse gases
HHH	Hodzana Hills Herd
LNG	Liquefied Natural Gas
MMA	Minimum Annual Assessment
MP	Milepost
NAAQS	National Ambient Air Quality Standards
NAB	Northwest Arctic Borough

NEPA	National Environmental Policy Act
NPR-A	National Petroleum Reserve-Alaska
PAH	polycyclic aromatic hydrocarbon
PEA	preliminary economic assessment
PFS	Pre-feasibility Study
PGE	platinum group element
REE	rare earth element
RFA	reasonably foreseeable actions
RMH	Ray Mountains Herd
RNA	Research Natural Area
ROW	right-of-way
TAPS	Trans-Alaska Pipeline System
TMF	tailings management facility
WAH	Western Arctic Herd
YKCA	Yukon-Kuskokwim Census Area

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1. Introduction

This report discloses the indirect and cumulative impacts associated with the Ambler Road based on reasonably foreseeable development caused by the road, taking into account past and present actions and other reasonably foreseeable actions. According to the federal Council on Environmental Quality (CEQ), indirect effects "are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems" (40 Code of Federal Regulations [CFR] 1508.8). The Bureau of Land Management (BLM) considers mine development and changes to community access to be reasonably foreseeable, should a road be constructed. CEQ defines cumulative effects as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7). Figure 1-1 illustrates the relationship of past, present, and reasonably foreseeable actions and how these actions combine with the direct and indirect effects of the proposed action that result in cumulative impacts.

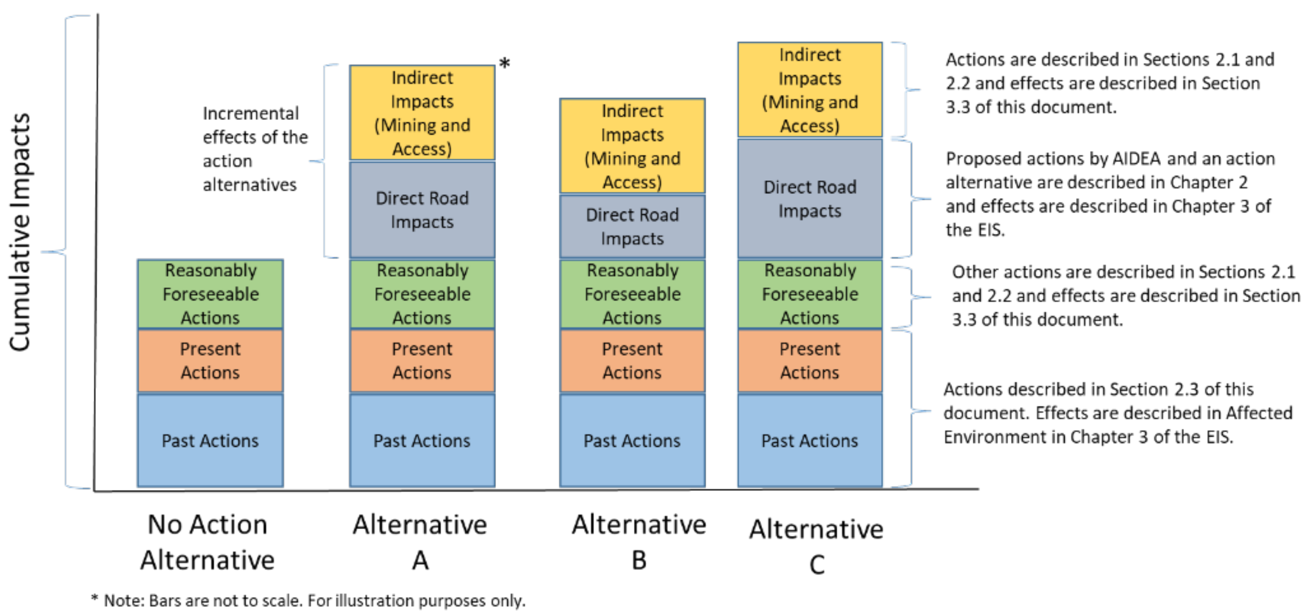

Figure 1-1. Graphic illustration of cumulative impacts

2. Reasonably Foreseeable Actions

The Alaska Industrial Development and Export Authority (AIDEA) has proposed a road for access to the Ambler Mining District (District), with the assumption that providing access will indirectly lead to mining exploration and development. This Environmental Impact Statement (EIS) is not in response to a mining proposal. Therefore, direct impacts are those that occur at the time and place of road construction. Direct impacts are attributable to the footprint the road would make on the land in the project area and include the anticipated use of the road. The BLM considers mining exploration and mine development reasonably foreseeable if the road were built. Therefore, this analysis treats impacts resulting from mining exploration and development anticipated to occur off the road and later in time as indirect effects. Mining effects are also considered as cumulative effects.

AIDEA has provided detail regarding the proposed road, but no similar detail exists for mining proposals. To evaluate the indirect and cumulative effects of reasonably foreseeable development, the BLM convened a team of agency and private sector National Environmental Policy Act (NEPA) and mining professionals, and consulted with AIDEA and companies that anticipate mining in the District, to gather information to inform development of a reasonable mining scenario. This scenario presents a forecast of mining development and activity and other reasonably foreseeable development in the area in the decades following its completion. This document discloses the anticipated indirect and cumulative effects of that development.

Construction and operation of an all-season, industrial access road to the District would open the area to mining activities. The hypothetical baseline scenario provided in this report is an estimate of the levels of mining-related activities based on current information about the deposits and typical scenarios for mining development in Alaska. To avoid underestimating effects, the hypothetical scenario represents a high-production rate and favorable market prices.

2.1. Mining Development Scenario in the Ambler Mining District

This chapter lays out the reasonably foreseeable mining development scenario anticipated to result from development of the Ambler Road (road). Indirect effects based on this scenario are described in Section 3, Indirect and Cumulative Impacts.

2.1.1 Overview

The District is located in the Northwest Arctic Borough (NAB) along the southern foothills of the Brooks Range in north-central Alaska. Map 1 illustrates the location of the District relative to the industrial access road alternatives and other mining activities in the region. The District area has long been recognized as containing a variety of valuable mineral resources, and these resources have been explored or evaluated for more than a century (DOWL 2016). The primary identified mineral resources include copper, lead, zinc, silver, and gold (DOWL 2016). Development of a mine is primarily dependent on the economic feasibility of the endeavor, which includes several factors:

- **Technical analysis:** extent of the mineral deposit, purity of the mineral, ability to extract the mineral ore
- **Financial analysis:** market analysis, availability and location of the potential work force, access for mine exploration and development (via airplane, boat, or road), mineral extraction methods
- **Legal analysis:** land ownership, mining claim status
- **Environmental analysis:** environmental impacts, permitting, reclamation

Economic feasibility is still being determined for specific mine developments, but it is anticipated that with development of the industrial access road, mine development in the District would proceed. As stated in AIDEA's purpose and need for the project, the construction of an industrial access road is consistent with AIDEA's mission to increase job opportunities and otherwise encourage the economic growth of the state, including the development of its natural resources (DOWL 2016). Specifically, AIDEA's purpose for this project is to support mineral resource exploration and development in the District. The road would provide surface transportation access to the District to allow for expanded exploration, mine development, and mine operations at mineral prospects throughout the District. AIDEA indicates that surface transportation access would help to bring the high-value mineral resource areas into production (DOWL 2016).

AIDEA also lists multiple public benefits related to the project purpose, including direct employment for road construction and operation, indirect employment related to mining, revenues paid by mining companies to local and state governments and Alaska Native corporations, and commercial access opportunities for nearby communities associated with proximity to a road (DOWL 2016).

2.1.2 Description of Geology

A description of the geology in the District is found in the *Analysis of Management Situation Central Yukon Resource Management Plan* (BLM 2016).

2.1.3 Past Mineral Exploration and Development Potential

The District has been explored for mineral potential since the 1950s and contains one of Alaska's major mineral belts (Grybeck et al. 1996). NovaCopper U.S., Inc. (now Trilogy Metals, Inc. [Trilogy] or Ambler Metals LLC[1]), Valhalla Mining, LLC (Valhalla), and Teck Resources, Inc. (Teck), have staked more than 160,000 acres of mining claims in the District. There are 4 major mineral deposits within the District: Arctic, Bornite, Sun, and Smucker, which are shown on Map 2. These 4 deposits have the potential to provide copper, zinc, lead, silver, and gold ore (Cardno 2015). The anticipated mineral resource in the District is 221,900,000 tonnes[2] of ore (Cardno 2015; Trilogy 2018a, 2018b). Table 2-1 highlights the potential mineral resources for each of the 3 companies that have staked the majority of claims in the District.

Table 2-1. Estimated resources for 4 major deposits in the District

Deposit	Owner	2018 mineral resource (million tonnes)	Ore concentrates
Arctic	Ambler Metals (formerly Trilogy Metals, Inc.)	43	Cu, Zn, Pb, Ag, Au
Bornite	Ambler Metals (formerly Trilogy Metals, Inc.)	182	Cu, Co
Sun	Valhalla Mining, LLC	11	Cu, Zn, Pb, Ag, Au
Smucker	Teck Resources, Inc.	11.6	Cu, Zn, Pb, Ag, Au

Source: Trilogy 2018a, 2018b; Lasley 2018.
Notes: Cu=copper; Zn-zinc; Pb=lead; Ag=silver; Au=gold. The "mineral resource" column indicates data available, whether "indicated," "inferred," or both. Percentages of valuable minerals within the ore vary. All deposits are in the exploration stage, with various amounts of data gathered and made public. In general, most is known about the Arctic deposit and less about the others. These numbers do not indicate a determination has been made that the resources are economically minable or that these numbers represent the maximum extent of the resource that may be minable at each deposit. Exploration continues in the area.

The Arctic Project is 1 of 2 Ambler Metals (formerly Trilogy) projects that constitute the Upper Kobuk Mineral Project. The Arctic Project is located on the east side of Subarctic Creek, approximately 170 miles east of Kotzebue, 22 miles northeast of the village of Kobuk, and 160 miles west of the Dalton Highway. In total, the Arctic Project is approximately 114,500 acres and is the most advanced mining project in the District. An estimated 43 million tonnes of valuable minerals have been identified at the Arctic Mine, including copper, zinc, lead, gold, and silver. The project proposes a single open-pit mine, a

[1] In February 2020, Trilogy Metals Inc. and South32 Limited announced the completion of the formation of a 50/50 joint venture company named Ambler Metals LLC ("Ambler Metals"). Ambler Metals will be working to advance the Upper Kobuk Mineral Projects, including the Arctic and Bornite Projects.
[2] Tonnes is an industry term for metric tons and is equivalent to 2,204.6 pounds. In comparison, a U.S. ton (also referred to as a short ton) is the equivalent of 2,000 pounds.

conventional grinding mill and-flotation circuit complex with a production rate (mill input rate) of 10,000 tonnes of ore per day over a 12-year anticipated lifespan (Trilogy 2018a).

The Bornite Project is the other Upper Kobuk Mineral Project and occurs on land owned by NANA Regional Corporation (NANA). The Bornite Project is located approximately 15 miles southwest of the Arctic Project on a 241,000-acre site. It consists of 2 mineralized zones: Ruby Creek and South Reef. Exploration has determined that Ruby Creek resources may be extracted through open-pit mining, while South Reef resources may be extracted using underground mining methods. For purposes of this evaluation and for simplicity, all of the Bornite Project is assumed to be an open pit mining operation because not enough is known about the underground portion and examining the mine as an open pit provides a more conservative estimate of surface and ground-disturbing impact. The Bornite Project is estimated to contain approximately 182 million tonnes of primarily copper resources (Trilogy 2018b).

The Sun Project was recently acquired by Valhalla, and is located approximately 35 miles east of the Arctic Project (Freeman 2018). The Sun deposit is 36,800 acres in size and includes the Main Sun Deposit, S.W. Sun Deposit, and a number of other prospects totaling 230 State of Alaska 160-acre claims. The 11 million tonnes of mineral resources include silver, copper, lead, zinc, and gold.

The Smucker Project is owned by Teck, and is located 25 miles west of the Arctic Project. The property includes 27 State of Alaska claims. Resources include copper, lead, zinc, silver, and gold. Early estimates indicate that the Smucker deposit contains about 11.6 million tonnes of mineral resources in the form of copper, zinc, lead, silver, and gold. The Smucker deposit is still in the early stages of exploration (Cardno 2015).

The following studies and resources further document the mineral potential of the project area:

- Other studies regarding minerals in the project area include a mineral investigation report for the Koyukuk Mining District (Kurtak et al. 2002), a study of resource potential for critical minerals in Alaska in 2016 (Karl et al. 2016), and a summary report on leasable mineral occurrence and development potential (BLM 2016).
- Outside the District, there is potential for additional mining development to occur along the 3 alternative routes. This would include access to the mining claim clusters near the Zane Hills and Ray Mountains for Alternative C and other locations along all 3 alternative routes, as shown in Volume 4, Maps, Map 2-2. The BLM notes bituminous coal occurrences along Alternatives A and B in the Upper Koyukuk Basin (resource quantity is not available) and sub-bituminous coal occurrences along Alternative C in the Rampart Field (estimated resources: 50 million short tons; BLM 2018a).
- Maps 3 through 8 identify potential for rare earth elements (REEs), placer gold, platinum group elements (PGEs), carbonate-hosted copper, sandstone-hosted uranium, and tin-tungsten-molybdenum deposits, respectively. These areas could also be potentially accessed from the industrial access road for further exploration and development.

The information above informed BLM's reasonably foreseeable development scenario; however, these studies and maps did not rise to reasonably foreseeable development because little to no active activity has been undertaken. See Section 2.1.5, Reasonably Foreseeable Action Scenario, for information on the reasonably foreseeable development scenario.

2.1.4 No Action Scenario

Under the No Action Alternative, an access road to provide transportation to the District would not be provided. Without the access road, it is assumed that the development of the mines in the District would not occur. While the District contains sizable deposits for development, the lack of a road makes development of mines cost-prohibitive. Under the No Action Alternative, exploration of the deposits and additional staking of claims would continue as possible alternatives to the proposed road were evaluated.

2.1.5 Reasonably Foreseeable Action Scenario

The hypothetical baseline scenario projects an estimated level of activity in the District that would occur under any of the build alternatives. The activities evaluated are typical of those associated with mining in northern Alaska. Table 2-2 provides an estimated timeline for the major steps in exploring and developing a mine. While these timeframes are mine-specific and may vary, the timeframes provided are included for context and to project a potential schedule for development of the District as it relates to the construction and operation of the proposed road.

Table 2-2. Typical timeframes for mine exploration and development

Project phase	Typical timeframe	Projected activities
Prospecting and staking	2 years	Geological data and map reviews, airborne geophysics, non-invasive exploration. Completed for the initial 4 projects.
Exploration	2–6 years	Subsurface investigations that include drilling and bulk sampling. This phase can continue for many years and be concurrent with multiple feasibility studies. The timeframe shown assumes an aggressive exploration schedule. Exploration has been largely completed for the 4 projects.
Feasibility studies and permitting	6–8 years	Prepare increasingly rigorous feasibility studies, enter into the NEPA process, and obtain permits for mine development.
Development	2–4 years	Development of the mining facility to bring the mine into production.
Production	5–35 years	Mine lifespans vary depending on the extent of the deposits and market conditions. The Arctic Project has indicated a minimum lifespan of 12 years[a]. Production of each mine would vary, but is estimated between 5 and 35 years based on production rates anticipated for the Arctic Project and applied to the total anticipated mineral resource in the District [b].
Closure and reclamation	2–5 years	Closure of the mine, including removing equipment and some roads, and reclamation of the area.
Long-term monitoring and management	50+ years	Following closure and reclamation, the site is monitored until physical and chemical stability is achieved, and typically includes post-closure water management and treatment. This timeframe varies and can be perpetual. The relatively small amounts of fuel, personnel, and supplies needed for the monitoring effort are assumed to be delivered by air during this period.

[a] Trilogy 2018a
[b] Wood 2019

Method and Assumptions for Hypothetical Development Scenario Projections

The hypothetical development scenario provided in this report is an estimate of the levels of mining-related activities that are anticipated based on current information about the deposits and typical scenarios for mining development of base metal deposits in northern regions of Alaska.

The timeframe used for the hypothetical development scenario is approximately 50 years, which correlates to the requested term of the right-of-way (ROW) authorization for the proposed road. This timeframe accounts for the time required to construct the main access road and, assuming positive feasibility, bring mining operations online, mine the deposit, and close and reclaim the mines. Given the probable deposit sizes in the District, and realistic mining rates, it is reasonable to expect that the lifecycles of the larger deposits fit within the proposed lifespan of the road.

Additional assumptions to support the hypothetical development scenario are as follows:

- Industry would aggressively explore the District.
- Economic conditions would be strong enough to support development in the District.
- The 4 most advanced projects, Arctic, Bornite, Sun, and Smucker, would be developed and would consist of 4 separate mines.
- Production activities at each deposit would continue year-round for approximately 5 to 35 years, depending on deposit sizes and world markets. Mining activities (exploration, feasibility studies and permitting, development, production, closure, and reclamation) would be staggered as mine development at all 4 projects is unlikely to occur on the same timeline.
- Mine operators would share roads where feasible and as documented in agreements, but other major components mostly would be separate for each mine, such as airports, treatment facilities, storage facility, or maintenance facilities.
- The proposed road would be the primary access to the District and no other major access roads would be required. Access roads would be expected to individual project sites.
- Fuel for equipment operation would be transported to the respective mine sites over the Ambler Access Road.
- All potentially productive areas would be open to mineral entry except those closed by law, regulation, or executive order. Highly prospective lands in Native ownership would be available for lease.
- The road would be constructed in 3 phases: Phase 1, a pioneer road primarily for winter use, followed immediately by Phase 2, a 1-lane road for year-round use, and a decade later by Phase 3, a 2-lane, year-round road. While some aspects of mine development could occur without the road, this hypothetical baseline scenario assumes that mine development would not occur until after the Phase 1 pioneer road construction is constructed.
- The hypothetical baseline scenario mine uses existing active mines of a similar nature in Alaska. All disturbance estimates would be increased or decreased by different terrain, deposit size, ore grade, mine development requirements, and energy and transportation requirements.
- The analysis is based on publicly available information.
- Long-term monitoring of the mines would not require road access via the road. Monitoring would continue beyond the lifespan of the road. The relatively small amounts of fuel, personnel, and supplies needed for the monitoring effort are assumed to be delivered by air.

Hypothetical Baseline Scenario

Prospecting and Staking

Prospecting is the first step in mine development. Geological data and maps are reviewed to identify areas that have the potential to contain mineral resources. On government land, once an area is identified, a company stakes rights to mine in a specific location (also referred to as a mineral location claim). Typically, these first 2 steps do not involve subsurface investigations. Four major mineral deposits within the District have been prospected and staked: Arctic, Bornite, Sun, and Smucker, which are shown in Map 2. The ownership of these deposits includes (Cardno 2015):

- The Arctic Project is owned by Ambler Metals (formerly Trilogy). The Arctic Project consists of 1,358 contiguous state and federal patented claims located on approximately 112,000 acres.
- The Bornite Project occurs on land owned by NANA. The Bornite Project is located on a 241,000-acre site.

- The Sun Project is owned by Valhalla. The Sun deposit is 36,800 acres in size and a total of 230 State of Alaska 160-acre claims.
- The Smucker Project is owned by Teck. The project includes 27 State of Alaska claims.

While these 4 major mineral deposits within the District were determined to be reasonably foreseeable to be developed into mines with implementation of the proposed road, there are other mineral deposits that were not considered reasonably foreseeable because their development was more speculative. Sunshine is one such polymetallic deposit that contains copper, zinc, lead, and silver. While other deposits may not yield the quantities estimated in the 4 existing projects, they could become potential satellite mines as the full extent of the District is explored and developed (NovaCopper 2012). Further exploration is needed to determine the extent and economic viability of developing these additional areas. Because development of these additional areas is highly speculative, they are not included in the detailed development scenario in this EIS and cumulative impacts from such development are assessed only in broad terms.

Exploration

Once an area has been prospected (using sediment sampling, airborne geophysics, or outcrop analysis), the owner of the staked claims begins exploration of the area. This is primarily subsurface exploration using drilling and sampling to confirm the presence of a deposit and determine its size, shape, characteristics, and mineral grade. Due to the expense, trenching and drilling is generally limited to the area needed to sufficiently identify the deposit to support the costs of development. After sufficient drilling and trenching has been completed, the owner of the claim completes a delineation of the anticipated extent of the ore deposit within the claim and prepares a preliminary economic assessment (PEA) for development. While an ore body may be present, if it does not appear to be of sufficient quantity and quality, it does not make sense to develop the mine. If the PEA shows promising economics, the owner of the claim will enter into the Feasibility Studies and Permitting process.

Feasibility Studies and Permitting

Prior to mine development, each proposed mine prepares a Feasibility Study. Typically, a Pre-feasibility Study (PFS) is completed first, followed by a Final Feasibility Study (FFS) for large-scale projects. The Feasibility Study defines the extent and type of mining to be conducted, including construction, operation, and reclamation, as well as the capital and operating costs. These studies are often used to assist in establishing financing for mine development.

In addition, easements for access and use of the land, or permits and approvals from a federal entity (e.g., Clean Water Act Section 404 permit), will require preparation of an accompanying NEPA document. The NEPA document provides an assessment of the existing conditions and resources at the proposed mining facility and the potential effects to those resources. Mitigation measures to avoid or minimize those effects are included and a description of the proposed reclamation post-operation is provided. These documents are evaluated by the agency(ies) prior to approval for the mining operation, and include agency and public outreach.

In addition, the mine must receive all necessary approvals and permits from the various resource agencies before mine construction may begin. Moreover, prior to any proposed mining action, the company would be required to provide Financial Assurance to the State for the Reclamation and Closure of the mine. While AIDEA has indicated that the Ambler Road construction would not begin until sufficient lease agreements had been signed between AIDEA and mining companies to pay for the road, the road could be completed in advance of other mines having their own approvals.

Of the 4 most advanced projects in the District, only the Arctic Project has developed a PFS, published by Trilogy in 2018. The PFS provides information on the development of the mine that has been incorporated into this hypothetical development scenario. Other representative mines (e.g., Kensington, Red Dog, Pogo) in operation in Alaska are typical of the size and methods that would be expected in the District for the 4 known projects and have also been used in development of the hypothetical baseline development scenario. While the following sections provide a qualitative description of mine development and closure and reclamation (Section 2.1.5, Reasonably Foreseeable Action Scenario), quantitative information from typical mines can be found in the Kensington Gold Project Final Supplemental EIS (USFS 2004), Pogo Gold Mine Final EIS (EPA 2003), Red Dog Mine Extension Aqqaluk Project Final Supplemental EIS (EPA 2009), and *Kobuk-Seward Peninsula Resource Management Plan* (BLM 2005). Information from these documents is incorporated by reference into this report.

Development

Development of each mine assumes that the proposed road would be completed. Accessory roads from the main access would also be constructed. After completion of the road, additional equipment and supplies and workforce necessary to fully develop the mine could be more efficiently transported. The District would likely develop using 2 mining methods: open pit and underground mining. Open pit is the most likely method to be used in the District, but the Bornite Project has indicated the use of underground mining methods for the South Reef site.

Open Pit Mining

Open pit mining is a typical surface mining technique of extracting rock and ore from the surface, resulting in an open pit. This style of mining is best for ore found near the surface, where the overburden is relatively thin or the use of tunnels may be structurally unsafe. Arctic Project preliminary designs provide a typical example of the layout of an open pit mine, as shown in Figure 2-1 and Figure 2-2. The mine is slowly enlarged until the ore is exhausted or it is no longer economically feasible to mine the deposit. The layout of an open pit mine includes construction of bench areas set at 4- to 60-meter intervals that are used in the removal of ore and waste rock. The walls of an open pit mine are angled to aid in stabilization of the soils and minimize rock falls. A haul road is also constructed along the side of the pit to form a gradual ramp for equipment and trucks to enter and exit the mine.

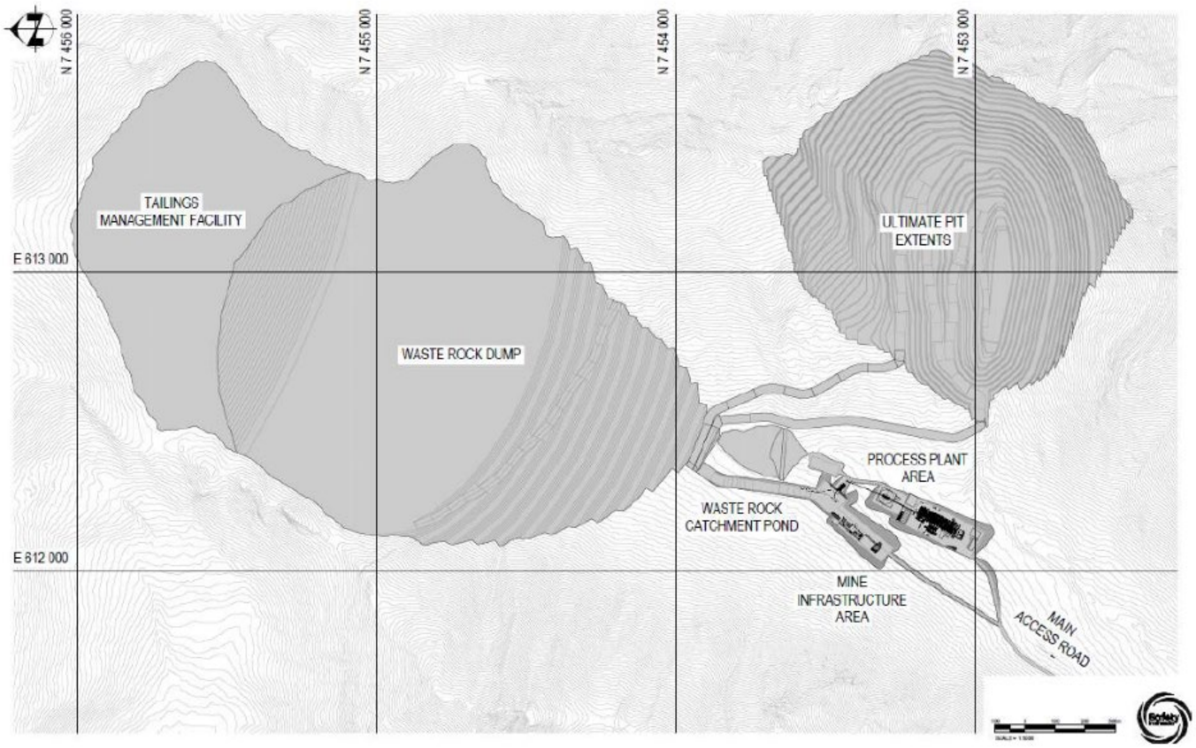

Figure 2-1. Arctic Project proposed mine layout
Source: Trilogy 2018a; adapted from Figure 18-2: proposed site layout

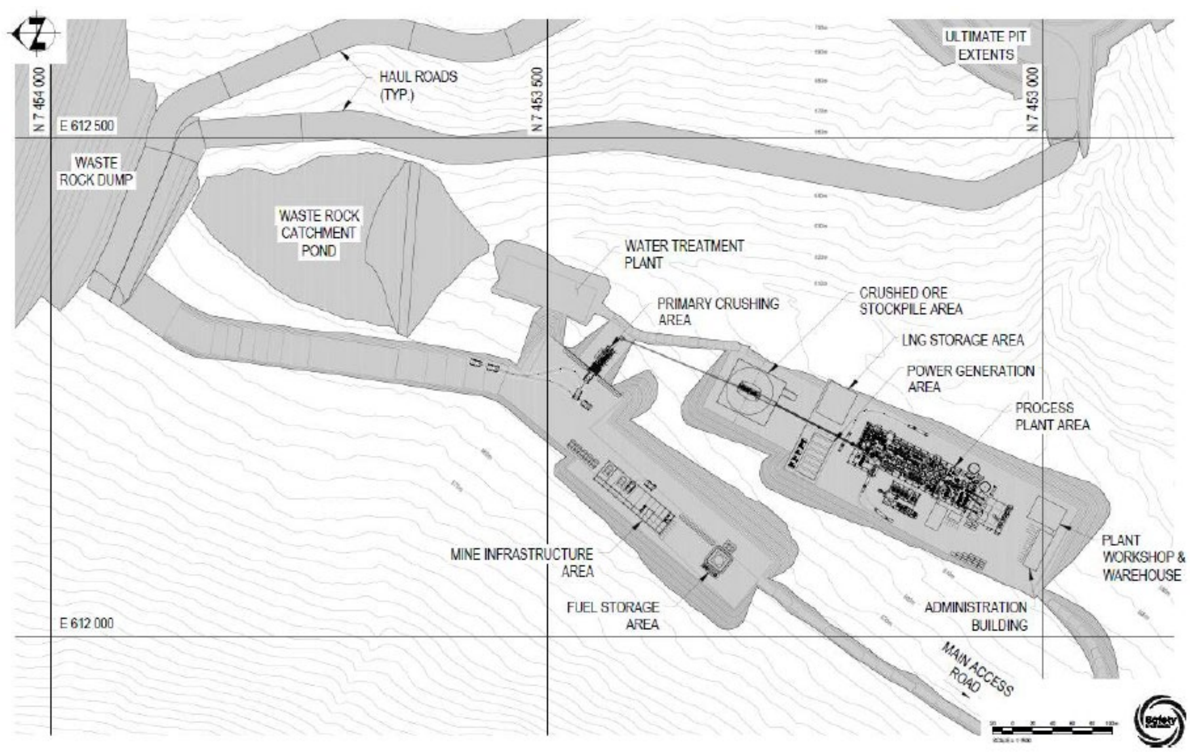

Figure 2-2. Arctic Project proposed ore processing facility
Source: Trilogy 2018a; adapted from Figure 18-1: proposed location of the processing plant and other buildings

Underground Mining

Underground mining consists of digging tunnels and shafts to access ore deposits. A typical example of the layout of an underground mine would be similar to the open pit scenario, but instead of an open pit there is an underground ore body. Underground mining is typically done for ore that is located deeper, with a thick overburden, and the surrounding rock is considered “hard rock” that is structurally sound enough for tunnels and shafts. The ore and waste rock are extracted and brought to the surface for processing. The tunnels and shafts are slanted to allow for equipment access and extraction and are typically sized to accommodate a 40-ton haul truck (approximately 11 feet wide and 12 feet high). Workers may also use the tunnels and shafts, but an elevator may be installed to provide access to deeper parts of the mine. A key to safety is ventilation shafts to allow contaminated air to escape and fresh air to be drawn in. These can also be used in cases of emergency as ingress and egress points.

Production

The production phase is the timeframe during which the ore is extracted from the mine and processed to produce a mineral concentrate for shipment and sale. The processing rate would vary by mine, but could range from 10,000 to 15,000 tonnes of ore per day. The Arctic Project is expected to have a production rate of 10,000 tonnes of ore per day (Trilogy 2018a). The anticipated mineral resource in the District is about 248 million tonnes of ore (Cardno 2015; Trilogy 2018a) comprised of copper, zinc, lead, silver, and gold. Production of each mine would vary and the actual amounts of ore processed could differ from the totals shown in Table 2-1, but is estimated between 5 and 35 years based on production rates anticipated for the Arctic Project and applied across the District (Wood 2019), and based on AIDEA’s request for a 50-year term for the road ROW authorization. The Arctic Project has indicated a minimum lifespan of 12 years (Trilogy 2018a). The Red Dog Mine, north of the District, began operations in 1989 and is expected to continue production through 2031 (43 years; Teck 2018).

Blasting

Blasting is necessary to efficiently break rock in the mine to manageable sizes for hauling to the mill. It is typically done using explosives comprised of a mixture of ammonium nitrate, fuel oil, and emulsion blasting agents. A plan is developed to identify appropriate locations for blasting that will yield the highest returns. This is based largely on the geology of the rock and whether it is a hard rock type such as granite or a soft rock such as sandstone. Once the locations are evaluated and marked in the field, a drill is used to create a hole for placement of the explosive and fuse. Blasting is conducted following mine safety and health regulations.

Overburden and Waste Rock Disposal

Overburden and topsoil are the uppermost layers removed before the ore is encountered. Open pit mines generally generate more overburden and topsoil removal than underground mines. These materials could potentially be used during mine closure and reclamation. As such, they are generally stockpiled separately from waste rock.

Waste rock is the material removed to expose the ore body prior to mining and may have an ore content that is not economically recoverable. For underground mines, the waste rock is hauled to the surface for storage, use, or disposal. If the waste rock is suitable, it may be reused to create foundations, drainage, or embankment material at the mine site. During mine reclamation or during the backfill process in underground mining, the waste rock may be used as part of the backfill process. Waste rock that is reusable is stockpiled in designated areas. For open pit mining, waste rock stockpile areas are likely adjacent to the pit. Any soils encountered that are suitable for plant growth are separated and stockpiled for later use as a growth medium during reclamation. During mine reclamation, the waste rock stockpiles are likely regraded to a 3 to 1 slope, covered with growing medium, and seeded.

Unsuitable waste rock is taken to a nearby permanent disposal site. To the extent practical, stockpile and disposal sites are located away from streams, wetlands, or other sensitive areas. Rock in the District likely will include some that could produce acid rock drainage. Any waste rock determined to contain acid rock or other hazardous material is stored separately in appropriate containment to prevent contact with workers or the surrounding environment. Permanent disposal of the potentially hazardous waste rock, and treatment of drainage discharges from such rock, must meet all permit requirements.

Equipment

Most mining equipment is diesel-powered and consists of large and small equipment, depending on the task. Technological advancements are being made that allow for the potential use of liquefied natural gas (LNG)-powered haul trucks. As the bottom of the open mining pit is lowered or an underground mine is deepened, additional equipment is required to reflect increased overburden stripping volumes and longer cycle times for removal of materials. Each mine includes a service shop for equipment maintenance. Each piece of equipment is maintained routinely to ensure high performance and minimize equipment failures that could result in safety or environmental risks (e.g., spills). Mobile equipment is serviced at the service shop, while track-bound equipment (i.e., shovels, excavators, drills, dozers) is serviced in the field using spill prevention measures. Auxiliary equipment to support mine maintenance and mine operation is required over life of the mine. This equipment generally includes cranes, forklifts, service trucks, pickup trucks, crew buses, and similar equipment.

Table 2-3 shows the typical equipment expected at each mine required for mine production, regardless of whether it is open pit or underground. Aircraft for transportation for non-production or maintenance activities, such the transport of people, goods, or equipment to and from the mine from nearby towns, are not included.

While equipment needs are similar, the specific model of equipment would differ slightly to accommodate the environment of an open pit versus underground mine. For example, with space more available in an open pit scenario, a larger and taller wheel loader could be used for open pit mining. This larger loader would not be practical in the confined space of an underground mine. A compact loader capable of navigating smaller spaces that is shorter and narrower would be used for underground mining. The Arctic Project PFS includes a list of anticipated equipment (including specific models) and quantities for the proposed open pit mining operation. Specifications are included in Table 2-3.

Table 2-3. Estimated equipment to be used at each mine for production purposes

Equipment Unit	Use	Arctic Project PFS proposed equipment
Drill	Drill rigs that are used to drill blast holes.	178 mm/45 klb Production Drill 5 inch Top Head Hammer Track Drill
Shovel	Used to load blasted waste rock or stripping rock into the haul trucks.	300 t/17 m3 Hydraulic Face Shovel
Loader	Mobile shovels that can be deployed for specific waste stripping.	125 t/12 m3 Front End Loader
Excavator	Primary method for loading blasted ore rock into haul trucks.	30 t/12 m3 Hydraulic Excavator 68 t/4 m3 Hydraulic Excavator 35 t m3 Hydraulic Excavator

Equipment Unit	Use	Arctic Project PFS proposed equipment
Haul trucks	Transport the ore and waste rock within the mine facility; larger trucks are used for waste stripper and smaller truck for mining the ore.	131 t Haul Truck 91 t Haul Truck 40 t Articulated Truck
Track and wheel dozers	Maintain pit floors, dumps, and stockpile areas, and build roads.	70 t/430 kW Track Dozer 50 t/370 kW Rubber Tired Dozer
Graders	Haul road maintenance.	27 t/221 kW Motor Grader
Water trucks	Spray a layer of water to suppress dust, especially on haul roads and for watering the drills and for fire patrol.	34,000 L Water Truck
Fuel / Lube trucks	Provide fuel and lube supplies to primarily shovel and other tracked field equipment.	40 t Articulated Fuel/Lube Truck
Sand truck	Used primarily in winter to provide traction to roads or high-use areas.	40 t Articulated Sand Truck
Snow plow	Clearing of snow for access.	Equipment type not listed in PFS
Explosive trucks	Used to deliver a bulk emulsion product down the borehole for blasting.	2 MMU bulk explosive trucks

Source: Trilogy 2018a
Note: kW = kilowatt; klb = thousand pounds; L = liter; m3 = cubic meter; mm = millimeter; MMU = mobile manufacturing unit; PFS = Arctic Mine Pre-feasibility Study; t = ton

Ore Processing

Ore processing is the method by which target minerals are separated from surrounding material. Figure 2-3 illustrates the typical steps in the process and is not specific to a particular ore. Processing differs for each ore, but in general includes crushing, grinding, flotation, thickening, and filtration. Each mine could have a separate processing facility located near the open pit or ore shaft to minimize transportation costs. It is possible that a mine, especially a satellite mine, would use the processing facility of another for similar ore content. For purposes of the hypothetical scenario, it is assumed that each of the Arctic and Bornite projects would have its own processing facility and that the Sun and Smucker projects would use those facilities as appropriate.

Ore from the mine is hauled to a primary crushing plant to reduce the maximum particle size to approximately 6 inches. The crushed material is conveyed using either a haul truck or conveyor belt to a stockpile before being ground in the grinding plant. The grinding plant uses semi-autogenous grinding mills and ball mills to further reduce the particle size to the consistency of facial powder. As the material is ground, it is typically directed to a hydrocyclone that separates the oversize material from fine material. Oversize material is rerouted through the grinding process until it reaches the proper size range.

Once the grinding process is complete, the fine material is fed into a flotation process. The flotation process differs slightly for each ore; however, the purpose is to separate the ore minerals, such as copper, from the barren material using a water slurry treated with specific chemicals that separates out the desired ore hydrophylically. Once separated, the ore floats to the top of the slurry and is easily skimmed off and collected. The mineral concentrate then flows through additional flotation tanks to further remove impurities and increase the mineral grade of the concentrate. The flotation process is designed to keep most of the chemicals used in the process within the flotation tanks or remove them with the flotation concentrate. The chemicals added during flotation will be in process water, concentrate, and tailings. As an example, the Arctic Project anticipates that the flotation process would include a talc pre-float followed by a bulk copper-lead flotation and zinc flotation, followed by a separation of the copper and lead. Most of the metals would likely be copper and lead concentrates (Trilogy 2018a).

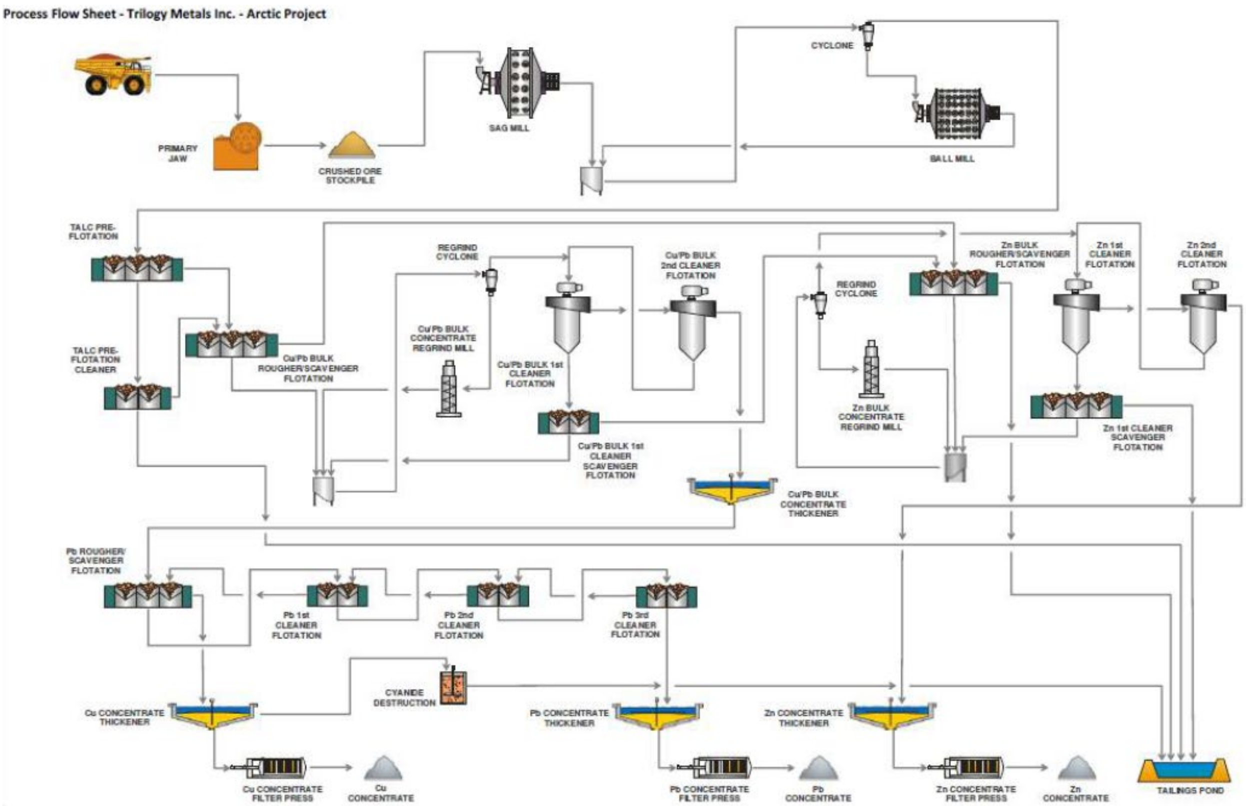

Figure 2-3. Ore processing steps for the Arctic Project mine

Source: Trilogy 2018a; adapted from Figure 17-1; simplified process flowchart.

Once the concentrated ore has finished the flotation process, it is dewatered and placed in specialized, sealed transport containers for shipment to an existing, off-site processing facility. The containers used are approved for use in trucks, rail, or ship, depending on the transport type and final destination.

Tailings Disposal

Tailings are the material that remains after the concentrated ore has been removed from the flotation process. Tailings are generally thickened with additives to create a slurry that allows solids to settle easily. Once solids are separated, the tailings can be moved to a disposal area or reused as backfill material during mine closure.

Tailings are used to backfill areas of an underground mine once all the ore in a specific section has been removed. Typically, the tailings are mixed with a cement-like mixture to create a paste that can be easily placed inside the mine via a pipeline. The pipe includes secondary containment in the event of a pipeline failure. Backfilling of the mine provides additional stability and increased safety for continued mining activities and following reclamation. Similarly, the tailings can be used in backfilling the open pit mine during reclamation.

For tailings that are not reused, the slurry is moved through a pipeline, with a casing for spill containment, to a tailings management facility (TMF). The TMF design is location- and mine-specific, and many factors are evaluated to determine the appropriate facility design. These include geotechnical information to determine the stability of a given location, proximity to the processing facility and pit, area available to develop the TMF, costs, and environmental concerns.

Using the Red Dog Mine and Arctic Project PFS as examples, the TMF likely would include a lake behind an earthen dam, designed and constructed in accordance with applicable regulations. However, there are other forms for the TMF, such as paste tailings and dry stack that are used at the Pogo Mine (EPA 2003) and Greens Creek Mine (USFS 2003), respectively. The dam can be constructed in part using waste rock generated from the mining process. In simple terms, the slurry is pumped into the containment area behind the dam to allow solids and water to separate. The solids settle to the bottom, which allows the water on top to be reclaimed as processing water at the mill. The dam height is often raised over the life of the mine to provide more capacity in the TMF. Designs often include diversion channels to keep surface water runoff from entering the TMF. During the reclamation process, the amount of water behind the dam is reduced to the extent practicable, but the TMF remains in place for the long term. Water from behind the dam and mined areas is likely to be considered acid rock drainage, based on the geology of the area (see Chapter 3, Affected Environment and Environmental Consequences, Section 3.2.1 [Geology and Soils], of the EIS), and is likely to need treatment during and after the life of the mining operation.

Mine Water Management

Mining activities encounter water, whether in the mine itself, from intersecting groundwater, or from stormwater and meltwater runoff. Water is generally classified as mine drainage, contact surface water, non-contact surface water, or process water. Mine waters are handled differently depending on whether they are non-contact or contact waters:

- Mine drainage includes surface water and groundwater encountered during excavation and mining activities that outflow from the mine. Mine drainage has interacted with the exposed mineralized rock wall surfaces in the mine and as a result may contain pollutants. Mine drainage is typically captured and either used in the mineral processing or directed to a water treatment facility. At the facility, it is filtered and then treated to remove pollutants to meet surface water discharge permit limits. Proposed surface water mine drainage discharge would be regulated under an Alaska Pollutant Discharge Elimination System Permit managed by the Alaska Department of Environmental Conservation (ADEC). Any proposed groundwater mine drainage or mine drainage not discharging to surface water would be regulated under a Waste Management Permit (Alaska Statute [AS] 46.03 and 18 Alaska Administrative Code [AAC] 15, 60, 70, and 72) managed by the ADEC.
- Non-contact water is stormwater and meltwater that does not come into contact with the mining operations. This water is collected separately and allowed to settle sediments before being discharged back into a stream or infiltrate to groundwater.
- Contact water is stormwater and meltwater runoff that comes in contact with the mining operations, such as waste rock or tailings, and as a result may contain pollutants. Contact water is minimized through best management practices, including runoff controls. Contact water is typically captured and directed to a water treatment facility where sediments are settled out of the water, and it is filtered and then treated to remove pollutants to meet discharge permit limits.
- Process water is the water used and generated during the ore processing at the mill. While the water is derived from either a groundwater or surface water source originally, once the mill is operational, the water in the TMF is reclaimed, treated, and used as process water to minimize the overall water needs for the mine. Prior to being reused in the facility, the process water is collected and treated to remove sediments and pollutants to meet discharge permit limits. In its role as a cooperating agency, the Environmental Protection Agency (EPA) indicated that some volume of process water may be discharged if it is commingled (stored) with an allowable source like mine drainage or net precipitation. Then, only the volume of the allowable source may be discharged.

An important impact of a mining operation is the drawdown of the water table, using pumps, in order to access ore at depth. Such water typically would be treated as non-contact water. If it was determined to be contact water, it would be further treated, as described above. This drawdown of water results in a large cone of depression in the groundwater table, which can lower the water table well below natural stream or lake levels and substantially reduce flow into streams. The effects of water drawdown on fish and amphibians are described in Section 3.4.2, Fish and Amphibians. Mine-induced alterations to the exchange patterns of surface and groundwater also has the potential to create additional pathways for dispersal of potential contaminants.

Sanitary Wastewater

Each mine would maintain a permitted sanitary wastewater treatment plant near the facility to handle sanitary wastewater. Further evaluation is necessary to determine if a septic system would be feasible. Septic systems collect sanitary wastewater in a central septic system that discharges to a leach field. If the groundwater table is too high, it may not be feasible to discharge to a leach field. Treated wastewater would then be discharged into either the tailings impoundment or another permitted alternative.

Water Supply

Each mine requires fresh water for domestic use and ore processing. Water needs would vary by the size of the mining operations. To meet the necessary water demands in the District, each mine would be required to obtain water rights to access groundwater and/or surface waters to meet water supply needs. The Red Dog Mine Final EIS and Arctic Project PFS provide representative examples of the water supply needs anticipated for the District (EPA 2009; Trilogy 2018a).

Each mine would treat the water to remove any pollutants prior to use. During construction, before the permanent water supply and treatment facility were operational, water would be treated through a portable treatment plant prior to use. As described for Mine Water Management, treatment would meet permit requirements for discharge and use.

Power Supply and Fuel Use

Each mine would have differing power requirements, but is expected to include either LNG or diesel generators to provide power to the process area, with underground lines used to supply power from the process area to other areas of the mine. A selective catalytic reduction system or similar best available technology would be included in the design for the diesel generators, as required by the ADEC air quality permit. The power supplies would be operated and emission sources controlled according to ADEC's air quality permit requirements.

Each mine would provide on-site storage for diesel, LNG, and gasoline, with secondary containment. Best management practices typically would include concrete-lined, bermed areas, or double-walled tanks for storage. Diesel would be the primary fuel used on site for vehicles, equipment, and power generators. Gasoline would be used for small engine equipment. Certain vehicles and overall power generation for the facility would use LNG. Each mine would prepare a Spill Prevention Control and Countermeasures plan for specific operations. An estimate of power needs was projected for the Arctic Project and provides a quantitative analysis of the potential power needs (Trilogy 2018a).

Reclamation and Closure

Reclamation and closure occur once the mine is no longer producing ore. Typically, the process to formally reclaim and close a mine site takes 2 to 5 years following the termination of production. Reclamation may also take place concurrently with ongoing mining as areas are mined out or if mining waste stockpile storage areas are full and ready to be reclaimed and closed. Reclamation also applies to activities that are undertaken on an interim basis. Interim reclamation would be done to reduce erosion potential by stabilizing road cuts and stockpiles, and other disturbances resulting from exploration, as well as construction and operation of the mine facility. Interim reclamation typically involves the use of seeding and mulching. Reclamation and closure of each mine would need to meet the State of Alaska's requirements for reclamation established under AS 27.19 and 11 AAC 97. This includes a requirement for financial assurance that the reclamation will be completed. Reclamation and closure plans, if approved by the state, are reviewed at a minimum of every 5 years.

The overall closure objective is to establish stable chemical and physical conditions at the mine site. Reclamation usually entails the following activities:

- For an underground mine, the mine facility would be backfilled to stabilize the soils within the mine to prevent erosion or collapses. Fencing and signage would be placed to deter trespassers and limit wildlife access to the area for safety.
- For an open pit mine, the pit walls and backfill would be stabilized as appropriate. As proposed for the Arctic Project, water would be allowed into the pit to create a "pit lake." Water from the pit lake would be treated and discharged to meet permit requirements. An emergency spillway would be constructed in the event of an overflow. Fencing and signs would be placed to deter trespassers and limit wildlife access to the area for safety.
- All waste rock dumps would be regraded to stabilize the slopes, covered with an engineered soil cover, and seeded. Waste rock runoff would also be routed to the pit lake for treatment.
- Tailings impoundments may be closed by such means as maintaining a shallow water cover, dewatering, and covering with an engineered cover. Runoff water or seepage would be collected and routed to the pit lake for treatment and discharge.
- Buildings and equipment would be dismantled and removed. It is possible that concrete foundations would remain in place and be covered, such as is proposed for the Arctic Project (Trilogy 2018a). Rock pads for building structures and equipment would be re-graded.
- Access roads, hauls roads, and rock fill pads would be removed, regraded, and reseeded to restore these areas.
- A landfill for non-hazardous materials would likely be placed in the area used for the waste rock disposal. Materials from the closure and reclamation process would be placed in this landfill. The landfill would then be graded and reseeded to restore the area.
- If not economical to remove or sell at closure, mobile or stationary equipment would be stripped of electronics and batteries, and fluids drained and placed in an approved landfill for final disposal.
- Hazardous waste materials would hauled to a licensed disposal facility in a sealed container, while non-hazardous waste would be placed in the landfill.

Structures required for long-term monitoring, as described in the next section, would not be removed during the closure and reclamation process.

Long-Term Monitoring and Management

Long-term monitoring, and associated management and treatment of water, soils, and vegetation, is required to maintain water quality and determine whether reclamation goals are met. Long-term monitoring varies, but could extend 50 or more years beyond the life of the mine and could be perpetual. Long-term financial assurance for conducting the long-term monitoring would be established by each mine for the monitoring activities.

As described in the Arctic Project PFS (Trilogy 2018a), shorter duration post-reclamation monitoring could occur for up to 10 years and include:

- Visual inspection for soil stability annually for 3 consecutive years and less frequently thereafter for up to 10 years.
- Annual inspection of the soil covers over the waste rock dump and TMF to ensure that the physical integrity of the cover is maintained.
- Inspection roughly every 3 years to confirm suitability of the revegetation efforts.

Water quality monitoring and water management is the longest of the post-reclamation requirements. This monitoring and management could be required in perpetuity, and frequency and duration will be determined during the permit process.

With the need to conduct long-term monitoring, the water treatment facility and ancillary power generation for it would remain. An access road to the facility would also remain for inspection and maintenance of the facility. Seasonal housing and required power generators for housing would be established using materials already on site, as practicable. It is assumed that the Ambler Road would no longer be required and that access to the mines for water treatment and long-term monitoring would occur by air, with some delivery by barge if needed. The local road system between Kobuk/Dahl Creek Airstrip and the mines are assumed to remain. It is possible the mining companies would request that portions of the Ambler Road within the District that provide direct access to the mines (e.g., toward Sun and/or Smucker mines) be retained under mining company control and not closed and reclaimed when AIDEA closes the rest of the road.

Employee Housing and Crew Shifts

Employee housing for each mine would be provided at a camp that is self-contained with its own power supply, water treatment plant, sanitary treatment facility, and garbage disposal at a landfill. Each mine could have up to 3 different camps for exploration, construction, and operation.

Exploration camps are generally smaller and are used to house employees during exploration of the deposit. These camps are often located closer to a nearby road or access point for easier transport of employees, goods, and equipment. These camps can also be used during the construction phase.

A temporary work camp would be created during construction near an access point similar to that described for the exploration camp. The construction camps proposed for the Arctic Project use both the Bornite Exploration Camp (houses 70 people) and a separate work camp (houses 200 people; Trilogy 2018a). After construction, the temporary work camps would likely be removed. Construction crews would typically work 6 weeks on and 2 weeks off.

For operations, a permanent work camp would be established closer to the mine and processing facility. The permanent camp would likely be constructed as soon as access allowed so that it could be used as a construction camp as well. The Arctic Project anticipates that the permanent work camp would house 450 people and is sized to accommodate the peak accommodation requirements during construction (Trilogy 2018a). Once the mine became operational, workers would rotate on a 2-week-on, 1-week-off schedule. On rotation day, workers would be bussed to the local airstrip for flights to either local villages or Fairbanks. The Arctic Project has projected that, during operations, there would be 3 rotating crews working 12-hour shifts. The crews would overlap between shifts to maintain optimal operations of the mine. The daylight shift would include more staff than the night shift as most operations at the mine, including general maintenance and blasting, would take place during daylight hours (Trilogy 2018a).

Transportation

Employees, supplies, and equipment require different transportation methods depending on the stage of development. Exploration is currently underway at the 4 projects in the District. During the exploration phase, access from a major city for the transport of supplies, equipment, and people is via nearby airstrips. Except for Bornite, roads from the airstrip to the other deposits are not available, so transport of employees and equipment are delivered to the sites via helicopter or along dirt trails during summer and ice roads during winter. As construction of each mine progresses, equipment and supplies would be transported primarily using the proposed road; however, the transport of employees to and from Fairbanks (the likely transportation hub for employees departing from and arriving at the general region) to each of the project sites would continue via airplane, as it is likely the most economical means of transporting people. Employees from local villages would either take scheduled flights to the Fairbanks hub to get to work or possibly would be picked up by a mining company flight.

Once the proposed road is constructed, continuing exploration activities would use the road. Traffic associated with initial activities would likely be to 10 to 15 trucks per week from May 1 to October 15. After the road is constructed, access roads to work camps, airstrips, and the overall mining facilities would be constructed, but transport of employees would still primarily occur using the airstrips. Closure and reclamation would remove the majority of infrastructure from the District, but established airstrips and some local roads could remain to provide access to each mine for long-term monitoring.

Air Transport

The Bornite Project currently uses the state-owned airstrip at Dahl Creek and a smaller airstrip near the deposit (Trilogy 2018b). These would likely continue to be used during development and production phases of the project. The Arctic Project is anticipating using the Dahl Creek airstrip, as the proposed mining operation location is topographically unsuitable for an airstrip. While the Dahl Creek airstrip currently supports exploration efforts, it would require upgrades in order to support the use of Dash 8 aircraft or an equivalent aircraft for transporting mine crews, equipment, and supplies during construction and operation. Anticipated upgrades include lengthening the runway and adding a lighting system and an automated weather observation system (Trilogy 2018a). The Dahl Creek airstrip is connected via the Dahl Creek Road to Kobuk, which has its own state airport. The road connects Kobuk, the Bornite deposit, and the established airstrip at the deposit.

The Smucker and Sun projects would also use their own airstrips. The Smucker Project is located near the western edge of the District, and no existing airstrips are present near the deposit. The Sun Project is located in the eastern part of the District and has its own airstrip, although it may require updates to accommodate construction and operation activities.

Projected flights to and from the 4 mining projects have not been published. Using the weekly fixed-wing schedule for the Red Dog Mine published in the Final Supplemental EIS (EPA 2009), an approximation of the weekly flights relative to the expected direct employment numbers during operation of each of the 4 mining projects is estimated in Table 2-4. Included in the flights is 1 weekly flight to deliver or pick up freight and materials, and 3 additional flights for employees or visitors that are not specific to a crew change. Flights for construction activities for mine development would be similar to those for operation.

Table 2-4. Estimated weekly fixed-wing flights for the 4 mining projects

Project	Direct jobs during operation	Number of weekly fixed-wing flights for freight deliveries or other transport	Number of weekly fixed-wing flights for crew changes	Total number of weekly fixed-wing flights
Arctic	217	4	4–5	8–9
Bornite	157	4	3–4	7–8
Sun	66	4	1–2	5–6

Project	Direct jobs during operation	Number of weekly fixed-wing flights for freight deliveries or other transport	Number of weekly fixed-wing flights for crew changes	Total number of weekly fixed-wing flights
Smucker	55	4	1–2	5–6

Source: UA 2019; HDR 2019b

Transport of Concentrate

Once ore is processed and ore concentrate packaged, the concentrate would be transported along the access road and ultimately to a port for export. With the 3 access road alternatives, the selected transportation corridor from the District would connect to the surface transportation system in Alaska's Interior: the Dalton Highway. Generally speaking, the logistics train that would serve to supply the District begins with transport from marshalling yards in Canada or on the west coast of the United States by container barge to tidewater ports in Alaska such as Seward, Whittier, Anchorage, or Port MacKenzie. From there, the containers would be transferred to rail and hauled to Fairbanks, transferred again to truck trailer, and then hauled along the Dalton Highway and Ambler Access Road to the mine site. Currently, the use of a pipeline to transport processed ore or provide fuel is not anticipated and not considered in the hypothetical baseline scenario. Mineral concentrates would be loaded into specialized (sealed) intermodal bulk shipping containers, trucked to Fairbanks, hauled by rail to tidewater ports in Southcentral Alaska, and then unloaded into bulk carrier vessels for ocean transport to the smelter. With this containerized system, which is not used at Red Dog Mine, metal releases from the transport of ore concentrate would not be expected if the container systems were well maintained.

Truck Transport and Vehicular Traffic. The Arctic Project has projected production input of 10,000 tonnes per day of raw ore. Output is estimated as 550,000 short wet tons of concentrate per year, or 1,507 short wet tons[3] per day. AIDEA has noted that each truck would transport 2 trailers (doubles), each trailer carrying an ore container with a 30-tonne capacity (33 short wet tons) along the proposed road. For the Dalton Highway, the trucks would transition to 1 trailer with 1 container. A staging area is assumed at the eastern end of the Ambler Road for staging and reassembling trailers. With up to 4 mines operating around the clock, the staging area would be expected to have continual activity (e.g., moving trucks, trucks idling, backup bells). One or more similar staging areas would occur at the mine end of the road. Projecting the same technique described above to other mines, and adding ancillary traffic—from fuel deliveries to road security patrols to commercial deliveries for communities—Table 2-5 provides approximate total traffic levels on the proposed road and public highways farther south. The estimate includes traffic related to mining in the District, operations and maintenance of the road and its associated communications system, and deliveries to communities. It does not include road construction or reclamation equipment or associated construction traffic, potential trips associated with emergencies or fighting of wildfires, or potential agency/land manager trips. Table 2-5 estimates the number of trucks anticipated for transport of the mineral ore from the 4 mining projects to Fairbanks.

Projecting the same technique described above to other mines, and adding ancillary traffic—from fuel deliveries to road security patrols to commercial deliveries for communities—Table 2-5 provides approximate total traffic levels on the proposed road and public highways farther south. The estimate includes traffic related to mining in the District, operations and maintenance of the road and its associated communications system, and deliveries to communities. It does not include road construction or reclamation equipment or associated construction traffic, potential trips associated with emergencies or fighting of wildfires, or potential agency/land manager trips.

[3] A short wet ton is equivalent to a short ton (2,000 pounds) but refers to the weight of materials that are still "wet," in slurry or paste form.

Table 2-5. Mine characteristics and resulting traffic generated by the 4 mining projects during production

Item	Arctic	Bornite	Sun	Smucker
2018 resource (tonnes)	43 million	182 million	11 million	11.6 million
Product recovered in concentrate	Cu, Zn, Pb, Ag, Au	Cu, Co	Cu, Zn, Pb, Ag, Au	Cu, Zn, Pb, Ag, Au
Mill throughput (tonnes/day)	10,000	14,250	5,000	5,000
Production rate (short wet tons/day)	1,507	784	548	548
Mine life (years)	12	35	6	5
Annual/daily concentrate production (short wet tons)	550,000 / 1,507	286,000 / 784	200,000 / 548	200,000 / 548
Ore concentrate containers filled per day for transport	46	24	16	16
Daily double-trailer trips: Ambler Road (total of full outbound and empty return)	46	24	16	16
Daily single-trailer trips: Dalton Highway (total of full outbound and empty return)	92	48	32	32
Annual mill and maintenance supplies (short tons)	11,000	9,000	6,000	6,000
Mill and maintenance daily trips	2	2	2	2
Daily fuel and other supply trips	12	12	6	6
Daily incidental trips	2	2	2	2
Daily trip total: Ambler Access Road	62	40	26	26
Daily trip total: Dalton Highway	108	64	42	42

Source: Trilogy 2018a, 2018b; Wood 2019; HDR 2019a; UA 2019
Notes: Ag = Silver; Au = Gold; Cu = Copper; Pb = Lead; Zn = Zinc
Alaska Highway System legal load limit of 40 tons for tractor-trailer unit, 20 tons for single-trailer. Concentrates are loaded into sealed 30 metric-tonne (33 short-ton) containers for truck transport to Fairbanks. Concentrates are hauled in double trailers on the proposed road, then in single trailers on Dalton Highway. It is important to distinguish between containers filled and trips on a road; trips include the empty backhaul trip. Bornite uses the same amount of supplies and fuel as Arctic, but fewer mill reagents. Sun and Smucker mills are half the size of Arctic mills, and use half the supplies and fuel, or use Arctic mill. A trip is a vehicle passing an observer in either direction. Travel in each direction is considered a separate trip. Traffic not included: Ambler Access Road construction/road maintenance and operations vehicles; commercial community deliveries; land management agency traffic; emergency/fire suppression traffic; and any concurrent mining exploration traffic.

Using the traffic information from Table 2-5 and scheduling for development and construction of the proposed road and mines in the District, a projection of traffic by phase is provided in Table 2-6. The range of traffic given is from the low Annual Average Daily Traffic (AADT) in the time period to the high AADT in that time period.

Table 2-6. Traffic projections for Ambler Road and Dalton Highway

Road Phase	Assumed time period	AADT on Ambler Road[a]	Additional AADT on Dalton Hwy[a, b]
Phase 1	2025–2026	7–57	7–57
Phase 2	2027–2036	58–118	58–179

Road Phase	Assumed time period	AADT on Ambler Road[a]	Additional AADT on Dalton Hwy[a, b]
Phase 3	2037–2051	104–168	160–238
Phase 3[c]	2052–2071	83, tapering to 3	123, tapering to 3

Source: Wood 2019; HDR 2019a; and internal calculations for the EIS
[a] AADT is Annual Average Daily Traffic and indicates traffic passing an observer in either direction. Ore concentrate is assumed to be hauled 24 hours/day.
[b] AADT on Dalton Hwy is higher than on the proposed road, because 1 truck is assumed to haul 2 ore container trailers on the proposed road, but only 1 ore container trailer on the public highway, so the number or ore trucks doubles.
[c] Phase 3 is broken into 2 time periods. The break point is after production at 3 of the 4 main mines is assumed to be finished and traffic decreases.

Rail Transport. Once the trucks reach Fairbanks, the containers would be removed from the trailers and compiled into a unit train for transport to the ports in Southcentral Alaska. Table 2-7 summarizes the estimated rail traffic to haul the processed ore for the 4 mining projects from Fairbanks to a port. A unit train is a train that transports a single commodity directly from producer to consumer. Each rail car is capable of holding of 2 containers in a single-stack configuration (versus a double-stack configuration). A unit train of approximately 75 cars is typical for Alaska and would result in the each unit train carrying 150 containers. Using the 1,507 short wet tons per day production capacity of the Arctic Project, there would be approximately 1 train southbound every 2–3 days, as shown in Table 2-7.

Table 2-7. Estimated rail traffic to haul processed ore for the District from Fairbanks to a port

Project	Production rate per day (short wet tons)	Number of containers required for 1 day of production (outbound only)	Weekly frequency of 75-car-unit trains (both directions)
Arctic	1,507	46	4.3
Bornite	784	24	2.2
Sun	548	16	1.5
Smucker	548	16	1.5

Source: Wood 2019; HDR 2019b

Vessel Transport. Upon arrival at a port, the containers would be removed from the rail cars and stored temporarily in a container yard if a ship were not already berthed at the port. Ambler Metals (formerly Trilogy) has indicated that the likely port of choice would be the Port of Alaska at Anchorage. While land-side modifications may be necessary (e.g., creating container staging areas, adding a specialized crane to dump containers into the ship), no in-water construction is anticipated to take place at the port as an indirect consequence of the action alternatives. In-water modification likely would not be necessary at the Seward and Whittier ports, but may be necessary at Port MacKenzie, if those ports were chosen by the mining companies. Table 2-8 estimates the anticipated vessel traffic that would occur for the 4 mining projects. Ore is generally transported in a Panamax or Handymax-sized ship. An average carrying capacity of 50,000 dead weight tons (DWT; DWT are equivalent to tonnes) accounts for the majority of the ships in the Panamax and Handymax size ranges. Using 50,000 DWT as an average load capacity (55,116 short tons), a port would need storage capacity for a minimum of 1,670 containers in the container yard as well as capacity to hold loaded and empty unit trains to account for rail scheduling timelines. If the volume of containers being delivered to ports exceeds the storage capacity of the container yards, additional container yards may need to be constructed, other ports used, or delivery schedules altered to meet the needs of container storage. Resolution of this issue is undetermined, and impacts cannot be defined at this time.

Table 2-8. Estimated monthly vessel traffic for the District

Project	Production rate per day (short wet tons)	Number of ships per month	Number of ships per year
Arctic	1,507	0.82	9.8
Bornite	984	0.43	5.1
Sun	548	0.29	3.4
Smucker	548	0.29	3.4

Source: Wood 2019; HDR 2019b

Existing ports at Anchorage, Seward, and Whittier have businesses and residential areas nearby. Among the issues that may need to be examined in future EISs for mining operations are air quality and health effects from the ship and train traffic and from any dust that may escape during the ore loading process (ore concentrate would be wet, and the cranes contemplated would not open the sealed ore concentrate containers until they were inside the hull of the ship; these measures typically would result in negligible dust). Other issues that may need to be examined more closely are the noise and visual effects of the additional port operations, and effects to automobile traffic. If selected, Port MacKenzie in particular may require examination of in-water work and new vessel traffic patterns on marine mammals in Cook Inlet. All of these would be dependent on the port(s) selected and the details of the operations proposed by the mining companies, and would be examined in their respective NEPA and permitting analysis.

Projected Timeline for Hypothetical Baseline Scenario

Using the projections from the Arctic Project's timeline, anticipated construction and operational crew shifts, employment numbers, and production output, a general projection of the life of the Arctic Project can be developed. The other 3 projects would be anticipated to follow a similar development pattern. For purposes of the hypothetical baseline scenario, the Arctic Project would be developed first, followed closely by Bornite and later by Smucker and Sun in succession, which would likely use the mills at Bornite and Arctic. Table 2-9 provides the schedule for development of the District.

Table 2-9. Assumed mine development timing for the District

Events Sequence	Start	End
Amber Road EIS Record of Decision	2019	2019
AIDEA completion of business agreements with mine(s), state approvals, and financing	2020	2021
Ambler Road Phase 1 Design (AIDEA issue design and construction contracts, and complete design)	2022	2023
Ambler Road Right-of-Way Authorization (50-year term)	2022	2071
Ambler Road Construction, Phase 1, pioneer road	2023	2025
Ambler Road Construction, Phase 2, 1-lane road	2025	2027
Arctic Mine production	2028	2039
Bornite Mine production	2030	2064
Ambler Road Construction, Phase 3, 2-lane road	2035	2037
Sun Mine production	2040	2045
Smucker Mine production	2046	2051

Events Sequence	Start	End
Other mines, production	2040	2063
Last mine closure and reclamation	2065	2068
Ambler Road closure and reclamation[a]	2068	2071

Source: UA 2019; Wood & Wood 2019; DOWL 2016; BLM analysis
[a] Road closure and reclamation is part of AIDEA's proposed action (see Chapter 2, Alternatives, Section 2.4.3 (Features Common to All Alternatives) and DOWL 2016 for additional information).

Hypothetical Baseline Scenario Surface Disturbance

The potential for surface disturbance has been estimated for the 4 mines in the District (Table 2-10). Using the development footprint provided for the Arctic Project (Figure 2-1 and Figure 2-2), including access roads, an approximate acreage of surface disturbance was calculated (Trilogy 2018a). A similar footprint was used for the other 3 mines in the District. These approximate areas are shown on Map 10. Factors affecting the size of a proposed mine include the amount of ore to be mined, the depth to the ore and the thickness of orebody, the amount of waste and tailings to be disposed of, the distance to powerlines, the distance to employee housing, and the local topography. Only gross estimates of disturbance can be developed. These estimates are based on existing operations elsewhere and generally reflect a moderate stripping ratio of overburden to ore for surface mining, or depth from surface for underground operations. These are order of magnitude estimates, meaning they may be 50 percent higher or lower as the result of unknown or unforeseen circumstances. Variance from these estimates does not reflect on efficiency or management, but is the result of mining and transportation conditions inherent in a given deposit.

Table 2-10 describes the potential surface disturbance resulting from the projects in the District. Current and future exploration activities are anticipated to result in 5 to 15 acres of disturbance in the District. Currently, the Arctic Project has reported 5 acres of disturbance for exploration (Trilogy 2017b). Surface disturbance from exploration is not reflected in the table. No estimate was made of gravel needs required by the individual projects. Local material sources would be used wherever possible, including the use of excavated mine site material.

Table 2-10. Hypothetical surface disturbance within the District

Project	Resources (million short tons)	Mining method	Production disturbed acres
Arctic	43	Open pit	1,327
Bornite	182	Open pit	1,223
Smucker	11.6	Open pit Underground	837 282
Sun	11	Open pit	837[Te]

Source: Trilogy 2018a, 2018b

2.2. Indirect Road Access Scenarios

AIDEA proposes that communities would be allowed to use the road for delivery of commercial goods. However, interested communities would need to develop any secondary access means on their own (i.e., they are not proposed to be developed by AIDEA). AIDEA is also proposing to include fiber optic communications to support roadway use. Connecting to this fiber optic network by the mines and some communities is reasonably foreseeable. This section lays out reasonably foreseeable access and community development scenarios associated with AIDEA's proposal to allow commercial deliveries and establishment of a fiber optic line. Indirect effects of these scenarios are described in Chapter 3.

2.2.1 General Public Access

AIDEA filed an application for a ROW to construct a private industrial access road from the Dalton Highway, crossing multiple land ownerships, including federal public lands managed by the BLM and the National Park Service, to the District. AIDEA's ROW application expressly requests the ROW for an "industrial-access road," for which access "would be controlled and primarily limited to mining-related industrial uses, although some commercial uses may be allowed under a permit process." AIDEA also acknowledges the potential for government use, such as BLM use for mobilization of equipment and personnel for fire suppression actions or other fire management in the planning area.

For these reasons, the BLM is not considering issuance of a ROW for a public road, and a public road is not among the alternatives being considered for analysis in the EIS. The proposed road would be closed to the general public.[4] AIDEA, in comments on the Draft EIS and in published material on its project website, indicates the following combination of legal and contractual requirements that would keep the road from being open to the general public:

- The request is that the landowners (mostly federal and state government) grant only limited-access ROW; the EIS Record of Decision and federal permit stipulations can restrict road uses.
- It is likely that private landowners such as Native corporations would require the road to be closed to the public where the ROW crossed their lands.
- Any proposal to open the road to the public would require all landowners to agree.
- The road ROW (land rights) would be owned by a private corporation, not the general state or federal government.
- The entity seeking to own and manage the road as a public road, including the State of Alaska, would be required to buy out AIDEA's interest in the road.
- There would be restrictions on road use in the contractual terms financing construction and operation.
- Endorsements in insurance policies for the road would be based on restricted road use.
- The identified road users (mine owners/operators) ultimately responsible for paying back road construction costs through road-use fees want road use limited for safety reasons.

Modifying a restricted access industrial road to one capable of supporting public access would require a new ROW application and authorization process and renegotiation of easements, financing, and insurance. Such a road would have a different purpose and need. No such application has been submitted. For these reasons, general public access is not reasonably foreseeable and thus a public access road is not considered to be a factor contributing to indirect or cumulative impacts. Any application to convert an approved, restricted industrial access road to a public road across federal public lands would require additional NEPA, Alaska National Interest Lands Conservation Act (1980; ANILCA) Section 810, and National Historic Preservation Act analyses, including appropriate public involvement and consultation with federal, tribal, state, and local government entities.

[4] Many comments on the Draft EIS questioned the ability of the BLM and AIDEA to keep the Ambler Road private and based their comments on the opening of the Dalton Highway to the general public after nearly 20 years of its northern end being open to industrial traffic only. The situations differ. The Alaska Supreme Court in 1994 ruled that the right-of-way (ROW) grant from the federal government to the State of Alaska was for a "public road," and that this "public road" intent was echoed in the Declaration of Policy in Alaska law related to the Dalton Highway (AS 19.40), and that the DOT&PF had powers to govern use of the road (close it, or open it to the public). See Turpin v. North Slope Borough, 879 P.2d 1009 (Alaska 1994). The Ambler Road ROW grant is proposed specifically to be for limited access and not open to the public, and it would not be under the control of DOT&PF. Therefore the Dalton Highway does not establish applicable precedent.

The Alaska Department of Natural Resources (ADNR), in its role as a cooperating agency for the project, has stated that it must separately evaluate questions related to use of the road and restrictions on use and cannot commit at this time regarding road use and restrictions where the road would cross State of Alaska lands.

AIDEA has proposed that public access would be restricted by means of a staffed gate facility near the eastern end of the road and another near the western end. The gate facilities would be staffed 24 hours per day for the life of the road. AIDEA proposes to hire others to provide road security and maintenance. Security personnel and authorized drivers would be in continual radio contact as they traversed the road and would report unauthorized use of the road.

Crossing of the proposed road by the general public would be allowed for traditional overland transportation (i.e., snowmobile, dog team, on foot). AIDEA may specify certain areas for safe crossing. Use of the road by the general public for purposes other than to cross would not be allowed. Area residents and landowners would have the ability to take delivery of goods by commercial carrier as described in Section 2.2.2, Commercial Access Scenario.

2.2.2 Commercial Access Scenario

AIDEA's application indicated that some commercial deliveries may be allowed via the road. This section describes the reasonably foreseeable scenario for commercial deliveries using the proposed alternatives. This section also describes the assumptions used to develop the scenario based on intentions stated by AIDEA. The text provides details about the proximity of communities, mining claims, and private property to the alternatives as a basis for developing assumptions about how communities or other landowners might use the road for "commercial deliveries." Refer to Map 9 for locations of communities, private lands, mining claims, and existing/historic travel routes in relation to the alternatives.

Background from AIDEA

AIDEA has proposed in its application that some commercial deliveries may be allowed under a permit process. AIDEA's application states:

> Other permitted traffic at times could include commercial deliveries of goods for local communities or commercial transport for local residents and emergency response authorized through access permits. Only commercially licensed drivers would be allowed on the road. The traffic level for these local community and emergency response operations would likely total less than one truck or bus per week. No additional work outside the approved ROW would occur to accommodate this. – *Revised SF299, June 2016, p. 5*
>
> Although the proposed road would have controlled access, local communities would have the potential to hire commercial transportation providers to deliver fuel or freight to staging areas where the communities could access it, probably in the winter. Alternatively, local residents could instead form their own companies to provide these services. – *Revised SF299, June 2016, p. 16*

An April 2019 presentation by AIDEA to the BLM at a cumulative effects workshop for this project also indicated that agencies (with a permit) could have limited access on the road (e.g., for monitoring or management activities). One slide indicted that the road would have a "limited access designation" and listed state and federal landowners, regional Alaska Native corporations, and "others TBD" as the groups apparently intended to have limited access.

An April 16, 2019, letter from AIDEA to BLM stated AIDEA's belief that land managers have the authority to limit use of the road, such as ADNR has done with Pogo Mine Road. AIDEA stated that the Ambler Road would be intended as an industrial access road and specified that their proposal is that "individual miners and recreational miners would not be authorized to use the road" under AIDEA's ROW grant.

Commercial Deliveries Scenario

All Alternatives

The following assumptions apply to analysis of all alternatives:

- Use of the road would be by authorization only, by drivers who had road-specific training and who were equipped with 2-way very-high-frequency radios. Almost all use would be by those with commercial drivers' licenses. Exceptions would be agency access or during emergencies.
- AIDEA's road operator would have authority to allow drivers access under limited terms—vehicles associated with large-scale mines in the District, commercial trucks making deliveries of goods for community residents or landowners along the road, and landowning agency vehicles, including those of Alaska Native regional corporations that own land adjoining the road. Agency access is likely to include those that need access for permit-compliance inspections related to the road and mines, land management, land use planning, scientific research, and, if necessary, firefighting. Alaska State Troopers on official business likely would be authorized. Community emergency medical personnel would be included for emergency response and medical evacuation. Transport of the general public, either by commercial vehicle or public transit, would not be included in the authorization. Commercial vehicles delivering goods or fuel for communities would be subject to insurance requirements and road-use fees/tolls set by AIDEA or its road operator. The cost to drive the road for commercial deliveries has not been determined at this time.
- Owners of the land crossed by the road could decide whether to authorize other individual users under separate decision-making processes. For example, if another mine were proposed outside the District, access could be allowed, but authorization would have to come through the underlying landowner(s) and not from AIDEA or its road operator. Landowners issuing such authorization would do so in consultation with AIDEA and its road operator, though AIDEA concurrence would not be required, and all drivers would be required to follow AIDEA road safety and operations requirements.[5]
- Landowners could issue a separate authorization for a boat landing, storage shed or warehouse, bulk fuel storage tank, or connecting road or driveway that might aid the transfer of commercial deliveries to communities or private lands. These would be separate environmental analyses and public interest decisions.

In general, the opportunities for less-expensive transportation of goods and people to and from a study area community increase with the proximity of the community to the road. The distance of a particular study area community from the proposed road would differ across the action alternatives. Table 2-11 shows the approximate straight-line distance between the study area communities and the roadway alignment under each action alternative.

[5] As a practical matter, government landowners have the ability and sometimes a requirement to authorize access across public lands by trail, road, or overland at any time. Native corporation landowners also have this ability. In practical terms, it may make sense if an Ambler Road were in place to authorize new use of the then-existing road rather than authorize a separate parallel access road. The intent of these bullet points is to illustrate the limits of what AIDEA would be able to authorize on its own versus what could be authorized by the underlying landowner through its standard permitting processes.

Table 2-11. Distance of study area communities from the proposed road under the action alternatives (in miles)

Community	Alternative A	Alternative B	Alternative C
Alatna	35	35	37
Allakaket	34	34	39
Bettles	8	8	77
Evansville	8	8	78
Hughes	68	55	3
Huslia	92	92	47
Ambler	22	22	22
Kobuk	9	9	2
Shungnak	15	15	5
Rampart	105	105	18

All action alternatives would be similar in their proximity to communities at the western end of the road. Maps 10 and 11 illustrate the potential future transportation network between these communities and the 3 alternatives as described below:

- **Kobuk:** Alternatives A and B are expected to connect directly to the existing 15-mile road that connects Bornite to Kobuk. Bornite is an active mining prospect; it is reasonable to assume that an existing tractor trail would be improved to road standards approximately 2.5 miles to make the connection, which in turn would connect the proposed road to Kobuk. Alternative C would use the alignment of the existing 15-mile road and would connect directly with Kobuk's local road system.
- **Shungnak:** Shungnak lies about 12 river miles down the Kobuk River from Kobuk (8 overland miles in winter).[6] These additional distances for delivery of goods by boat or snowmobile would apply to all build alternatives.
- **Ambler:** Ambler lies about 38 river miles downstream from the road's end at the Ambler River (approximately 26 miles along the river valley in winter). This compares to 62 river miles or 32 miles overland (winter) from Kobuk.

It is reasonably foreseeable that, once the road is open to commercial deliveries:

- Kobuk would see direct deliveries to the community, which would likely include regular delivery of bulk fuel, groceries, and large loads (e.g., construction materials).
- Shungnak would benefit by transporting road-delivered goods by boat or snowmobile from Kobuk, but these would likely be smaller loads.
- Ambler would desire to get goods by boat or snowmobile, but this would occur less frequently than at Shungnak because of distance.

Alternatives A and B

In addition to the access cited above, Alternatives A and B would likely provide improved commercial deliveries to other communities. In the following text, where Alternatives A and B overlap, the mileposts

[6] The term "river miles" accounts for bends in the river and is an approximation of the mileage by boat. The term "overland miles" or indications of winter use is based loosely on topography or known existing winter trails and almost always does not follow the bends in the rivers but cuts across them, resulting in shorter winter distances between points.

given are based on Alternative A. The following communities are nearest to the Alternatives A and B alignment:

- Bettles/Evansville lies about 24 river miles south of road Milepost (MP) 45 via the John River, or 8.5 overland miles south of either road MP 38.5 or 45.
- Alatna and Allakaket lie about 85 river miles south of road MP 45 via the John and Koyukuk rivers. Potential winter overland routes could be about 57 miles from road MP 90, via the Alatna River valley, or 52 miles from road MP 39.5, via Evansville and Bettles.

It is reasonably foreseeable that once the road is open to commercial deliveries:

- The Bettles/Evansville community would desire to re-route the winter road (ice road) they build most years to the Dalton Highway to instead access the proposed road (about 1/3 the length). This would also continue to benefit Alatna and Allakaket. The communities may need to contribute to road maintenance costs, and a separate authorization from land managers would be required. It is not likely the road would be authorized for use by the general public, but it is reasonably foreseeable that it would be authorized for commercial deliveries, which is in keeping with AIDEA's application.
- The ability to pick up commercial deliveries by boat at the road may be desired by Bettles/Evansville, but this would likely involve less freight than winter access. Alatna and Allakaket are sufficiently distant that boat access would be anticipated to be rare.

The Alternatives A and B alignment comes close to several areas that would be anticipated to desire some access for commercial deliveries. The Alternatives A and B alignment would:

- Pass between a collection of state mining claims located 1–3 miles north and south of the road route at about road MP 5 to MP 11.
- Pass south of mining claims near Wild Lake and Flat Creek, about 30 miles up the Wild River, and other claims at Crevice Creek, about 29 miles up Timber Creek and John River. Access for both would originate in the MP 37–39 area via known winter trails (Revised Statute [RS] 2477 routes).
- Pass south of the south end of Iniakuk Lake, about 1.5 miles from road MP 89. The Iniakuk Lake Wilderness Lodge and perhaps other private property owners on the lake are likely to desire occasional commercial delivery of building materials, fuel, or food supplies for transport over snow.
- Pass south of 3 Native Allotment parcels near Mauneluk River and Avaraat Lake, within about 1 mile of road MP 130 and 133. A material site, which would be accessible by road, is adjacent to 1 of the properties.
- Pass north of the north end of Narvak Lake, about 3.5 miles from road MP 157.5. Peace of Selby Wilderness Lodge is located near the north end of the lake, and a Native Allotment parcel is located near the south end of the lake.
- Pass north of a Native Allotment parcel on the Mauneluk River, about 2.5 miles downstream of road MP 174.
- End 3–4 miles from 2 Native Allotment parcels fronting on both the Ambler River and Lake Anirak. Multiple other allotments occur downstream, mostly nearer to Ambler.
- Where Alternatives A and B split, only Alternative A would pass north of Nutuvukti Lake, where a Native Allotment is located about 1 mile from road MP 133.
- Only Alternative B would pass north of Norutak Lake, about 0.5 mile from the north end of the lake, near road MP 131, where there are 3 Native Allotment parcels that appear to be currently undeveloped.

It is reasonable to assume that there would be demand by these mining claim holders and landowners for commercial deliveries of supplies, mostly for transport over snow from the road to the final destination.

Over the 50-year life of the proposed road, in addition to Kobuk, it is reasonable to assume that Bettles/Evansville, Shungnak, and/or Ambler would pursue additional permanent roads connecting to the road (Alternative A or B). Bettles/Evansville is on the opposite side of the Koyukuk River and would require a large, expensive bridge of 600 feet or more, so this road is assumed to develop as a replacement winter road or a permanent road that terminates across the river, requiring a boat to make the last connection. While the connecting road may be authorized as a public road, it is assumed that the public would not be authorized to use the proposed road; these roads are reasonably foreseeable as roads for commercial deliveries.

Alternative C

In addition to Kobuk, Shungnak, and Ambler, discussed above for all alternatives, the following communities are nearest to the Alternative C alignment:

- Tanana lies 33 miles south of road MP 76 via an existing Tanana-Allakaket winter trail, an RS2477 route in the Ptarmigan Creek valley.
- Hughes lies fewer than 4 miles south of road MP 197.
- Alatna and Allakaket lie about 71 miles north of road MP 105 via an existing Tanana-Allakaket winter trail, an RS2477 route, and 51 river miles from MP 179 on the Koyukuk River.
- Huslia lies about 207 river miles southwest of road MP 279 (Hughes area) along the Koyukuk River and about 63 overland (winter) miles south of road MP 247 along the Koyukuk and Hogatza river drainages. Also, it is reasonable to assume that a direct road connection to Hogatza's existing mining road network would develop, and thus access to Hog Landing near the confluence of the Hogatza and Koyukuk rivers would occur. Huslia lies more than 100 river miles from Hog Landing via the mainstem Koyukuk River (85 via Cutoff Slough), but lies about 37 overland (winter) miles from Hog Landing.
- Rampart is close in straight-line miles but is located on the opposite side of the Yukon River. Given terrain and the river, it is likely that Rampart would not take deliveries from the proposed road.

It is reasonably foreseeable that once the proposed road is open to commercial deliveries:

- Hughes would desire deliveries year round.
- Alatna and Allakaket would likely continue to depend primarily on air service and the late-winter road to Bettles for deliveries, but would occasionally take delivery by boat or snowmobile from Alternative C.
- Tanana, which has road access to a point across the Yukon River and about 8 miles upstream, likely would not arrange for deliveries via the Alternative C alignment.
- Huslia, which normally has summer barge service, would likely not seek deliveries via the proposed road. The Hog Landing road would provide relatively close winter access, but it presumably is maintained for summer use by barges and not for winter. Occasional delivery by road and boat may occur in summer when a delivery is needed, outside the regular Huslia barge schedule.

In addition, the Alternative C alignment would:

- Pass through a large private parcel near road MP 20.
- Pass south of a set of multiple mining claims in the Ray River valley, located about 8 miles from road MP 23. Because of topography, any road connection would be longer. It is worth noting that some of these claims lie a similar distance from the Dalton Highway, and no road has been developed to them.
- Pass south of a large block of mining claims in the Spooky Valley area, about 11 miles from road MP 63 from up Gishna Creek.

- Pass east of the Utopia airstrip and its associated 10-mile road system supporting the U.S. Air Force's Indian Mountain Long Range Radar Station, about 7 miles from road MP 155.
- Pass near multiple Native Allotment parcels along the Koyukuk River at and upstream of Hughes.
- Pass north of a large block of mining claims near Hogatza. It would be about 8 miles from the proposed road MP 250 to tie into an existing road. The existing 35-mile Hogatza-area road system links mining claims, an airstrip, and Hog Landing near the confluence of the Hogatza and Koyukuk rivers.
- Pass close to multiple Native Allotment parcels near Kobuk, north and south of the Kobuk River.

It is also reasonably foreseeable that:

- The Hogatza mining area could seek a direct connection to the proposed road and, even without an all-season road, would deliver some equipment for overland transport in winter. These would be by separate authorization.
- Other mining claimants may seek direct connection or wish to use the road for delivery of some equipment in winter.
- The Air Force likely may wish to have use the road for access by radar station maintenance personnel and for delivery of equipment.
- Some Native Allotment owners may also seek commercial deliveries of relatively small loads for transport to their sites for final delivery by boat or snowmobile.

Over the 50-year life of the road, it is reasonably foreseeable that Hughes would pursue a direct, year-round road connection to the community along the east side of the Koyukuk River and would receive regular commercial deliveries, including bulk fuel, groceries, and relatively large loads (e.g., construction materials). The other communities may see intermittent deliveries of relatively small loads that would be transported from the road by snowmobile or boat.

2.2.3 Fiber Optics Communications and Related Issues

AIDEA has applied for placement of a fiber optic communications line for Internet and telephone service along the proposed road. This is intended first to serve the road maintenance stations and operations along the length of the road. AIDEA notes that District customers and communities also are likely to desire connection to the fiber optic line. It is reasonable to assume that residents of the area would desire connection if it would result in better Internet connection (greater bandwidth and speed) for equal or less cost than currently available via satellite. Over the 50-year life of the proposed road, the following are considered reasonably foreseeable:

- Alternatives A, B, and C may result in fiber optic connection to Kobuk and Shungnak (the 2 already are connected by power transmission line).
- Alternatives A and B, in addition, may result in fiber optic connection to Bettles/Evansville.
- Alternative C, in addition, may result in fiber optic connection to Hughes and to a mining operation at Hogatza and possibly to the military's Long Range Radar site on Indian Mountain.

Construction of spur line connections to AIDEA's proposed fiber optic line would be projects that are separate from AIDEA's Ambler Road Project and would need to be paid for by communications companies or others outside of AIDEA. These projects would require additional authorization from agencies that manage lands the fiber optic spur line would cross.

2.3. Past, Present, and Other Reasonably Foreseeable Actions

This chapter identifies past, present, and other reasonably foreseeable future actions that establish the basis for the cumulative effects analysis. The method for determining the cumulative impacts of the proposed project is based on *Considering Cumulative Effects under the National Environmental Policy Act* (CEQ 1997) and Chapter 6.8.3 (Cumulative Effects) of the BLM NEPA Handbook (BLM 2008a). It includes:

- Definition of spatial (geographic) and temporal (timeframe) boundaries of the analysis.
- Identification of past, present, and reasonably foreseeable actions (RFAs) within the spatial and temporal boundaries and their potential environmental effects on resources directly or indirectly affected by alternatives.

2.3.1 Geographic Scope and Time Frame for Cumulative Impacts Analysis

The spatial scope for analysis of cumulative effects is considered the same as the affected environment for each resource and is shown on maps in the EIS for each resource. Generally, the area in question is the proposed road corridor for each alternative and the area described in Sections 2.1 (Mining Development Scenario in the Ambler Mining District) and 2.2 (Indirect Road Access Scenarios) for the mining scenario. For some resources, such as subsistence and wildlife, the areas are much larger because of the range of the affected subsistence hunters and of species such as fish and caribou.

The timeframe for the cumulative impacts analysis is the same for all resources and includes past, present, and future actions. The temporal boundary extends back to when the area's human activities were primarily traditional uses by indigenous people. Mining exploration activities have occurred in the region stretching back to the late 1800s. The period for road impacts analysis extends through 2072, which encompasses the 50-year life of the proposed BLM ROW; however, water treatment at potential mines could extend the cumulative impacts much longer. See the assumed development schedule in Table 2-8.

2.3.2 Past and Present Actions

The following lists past and present actions that have shaped baseline conditions presented in the Affected Environment sections of the EIS. Baseline conditions are a combination of natural conditions and conditions created by the past and present actions. The actions may be considered collectively as past and present actions—that is, actions of increased access and human activity and increased land management that create trends. The trends have formalized land ownership and management for both development and conservation and for managing human activity. Past and present actions include:

- Placer and hard rock mineral exploration and mining development, including gold rushes in Nome, Klondike/Yukon Territory, and Interior Alaska, that brought people from outside Alaska to and through the study area in the late 1800s and early 1900s, and specific exploration and staking of claims in the District and other parts of the study area.
- Collective actions of government, businesses, and individuals that resulted in a transition in rural Alaska communities from traditional subsistence economies to partial cash economies, with associated cultural changes, including shifts in sovereignty, housing, heating, food, sanitation, education, transportation, communication, and health. These trends could potentially extend into the future.
- Use of historic travel routes by area residents and explorers, originally by dog sled, but over time by larger or faster equipment (e.g., snowmobiles, cat trains, ice roads); clearing of some routes; invoking of RS2477 rights of way by the State of Alaska. Such transportation uses are expected to continue into the future.

- A myriad of actions on a global scale that emit greenhouse gases (GHG) and contribute to climate changes and to associated noticeable effects on the ground in the project area, including permafrost degradation or warming and seasonal changes (e.g., shorter winters).
- Recreational exploration of the Brooks Range and area rivers, along with recent efforts to expand Interior Alaska tourism (e.g., Explore Fairbanks marketing efforts; former Governor Bill Walker's delegation to China) and popularization of Alaska's wildlife, wilderness areas, and aurora borealis, leading to further recreational use and to land conservation. This growing recreation trend could continue into the future.
- Adoption of land legislation and land use and plans, including:
  - Alaska Statehood Act of 1959, resulting in large areas of federal land being transferred to the new state.
  - Alaska Native Claims Settlement Act (1972), resulting in formal land ownership of large tracts by Alaska Native regional and village corporations.
  - ANILCA, resulting in the creation of national parks, national wildlife refuges, wild and scenic rivers, and other conservation system units in the project area and statewide.
  - Land and resource management plans by large-scale landowners.
- Transportation changes, including:
  - Construction of the Trans-Alaska Pipeline System (TAPS), the Dalton Highway, the Alaska Railroad, and the Tanana Road, and the opening of the Dalton Highway to the public.
  - Construction of roads and airports in rural Alaska communities. Additional road and airport work would likely continue.
  - Establishment of barge/boat services on rivers and streams, and widespread use of motorized personal boats. Such boat use is expected to continue into the future.
- Oil and gas exploration and development on the North Slope, starting in earnest in the 1960s and 1970s. Current developments include the Willow, Nanushuk, Greater Mooses Tooth I and II, and Liberty (offshore) projects.

In 2018, ADNR requested priority conveyance of BLM-managed lands to the State of Alaska in the area AIDEA has proposed for the road, near the intersection of Alternatives A/B and the Dalton Highway at MP 161. The conveyance would be part of Alaska's selections under the Alaska Statehood Act. The lands are currently withdrawn by Public Land Order 5150 as part of the TAPS corridor and are not eligible for state selection until and unless the Public Land Order is revoked or modified. ADNR, as a cooperating agency for this EIS, requested that the state's top-filing on these lands be disclosed in the EIS. The BLM has determined that such conveyance is not reasonably foreseeable, so this is not listed as a past, present, or reasonably foreseeable action; however, it is acknowledged as an ADNR request.

2.3.3 Other Reasonably Foreseeable Actions

This section describes other RFAs regardless of the agency (federal or non-federal) or person who undertakes such other actions. Per BLM guidance (BLM 2008), RFAs are not limited to those that are approved or funded; however, the BLM is not required to speculate about future actions. The following are RFAs identified within the temporal and geographic boundaries of the analysis:

- **North Slope Development.** Further Arctic oil and gas development in new areas: Potential locations include the Arctic National Wildlife Refuge Coastal Plain, National Petroleum Reserve-Alaska (NPR-A), and offshore. Construction of a natural gas pipeline and production of natural gas also is possible. Any of these would affect Dalton Highway use. Development in any of the 3 geographic areas or development of natural gas infrastructure is not reasonably foreseeable at this time, but new development in 1 or more of these areas is considered reasonably foreseeable by 2072. Over the same period, it is reasonably foreseeable that some existing North Slope oil fields will close and that jobs will be lost in those areas. The entire TAPS could close (Magill 2012), but this is not considered reasonably foreseeable. In addition to oil and gas development, the State of Alaska and North Slope Borough are partnering on an Arctic Strategic Transportation and Resources (ASTAR) project that could connect most borough communities and the Red Dog Mine and provide access for oil and hard rock mineral exploration and development. State funds ($7.7 million) were obligated in 2017 and currently are being spent on background data collection and planning.

- **Extension and Eventual Closure of Red Dog Mine.** Red Dog Mine originally was slated to close by 2031, but currently is undergoing permitting for a road extension and underground exploration program estimated to last 4 years. Whether that exploration results in further long-term mining is unclear. However, within the 50-year life of the proposed road, Red Dog Mine would be expected to close, accompanied by reduction in regional jobs and borough income.
- **Climate Change Actions and Responses.** Actions related to climate change, including actions globally that result in emissions of GHG (primarily actions that result in the burning of fossil fuels) and in-state actions in response to climate change, such as relocations of facilities due to permafrost melting or water level changes, and TAPS and Dalton Highway projects related to addressing permafrost issues. These are simply examples; few specific projects are reasonably foreseeable. A specific project that is reasonably foreseeable at this time is related to repairs of a fiber optic cable trench parallel to the Dalton Highway where permafrost has melted.
- **Dalton Highway Improvements.** Actions to widen and otherwise improve the Dalton Highway, including the Alaska Department of Transportation and Public Facilities' (DOT&PF's) current MP 109–144 project to bring this 35-mile segment to current standards and widen it.

The BLM acknowledges that other non-physical actions also are likely to influence human uses of land in northwest Alaska. For example, the Central Yukon Field Office currently is working on a new management plan for BLM-managed lands between the Brooks Range and Yukon River, and the Anchorage Field Office is working on a Squirrel River Special Recreation Management Area plan for lands near the lower Kobuk River. Similarly, the National Park Service, U.S. Fish and Wildlife Service, and State of Alaska are likely to update their land management plans over the life of the Ambler Road Project, affecting all government lands across the region. While these plans would affect how people may use the lands for recreation, subsistence, hunting and fishing, transportation, and commercial ventures, it is not reasonably foreseeable how land management will change based on those updates at this point in time.

3. Indirect and Cumulative Impacts

3.1. Effects of Reasonably Foreseeable Actions—Applicable to All Alternatives

As described in Section 2.3.3 (Other Reasonably Foreseeable Actions), certain future activities would occur regardless of the outcome of the Ambler Road Project, including under the No Action Alternative. Table 3-1 presents the 4 RFAs from Section 2.3.3 and summarizes their potential impacts on resources in the project area. This includes transient resources in the project area, such as waters that flow through it and caribou that migrate through it.

These are impacts that are assumed to occur under the No Action Alternative and Alternatives A, B, and C. Under the No Action Alternative, these are the primary impacts that would occur, as no road would be built and little to no mine development would be anticipated. Under the action alternatives, these impacts are part of the baseline (along with past and present actions). Section 2.3 (Past, Present, and Other

Reasonably Foreseeable Actions) evaluates the past and present actions and the other reasonably foreseeable actions described in Table 3-1, and includes the mining actions and community access actions induced by the opening of the Ambler Road. Together, the impacts of these past, present, and RFAs and the incremental additional impacts of the road are the cumulative impacts of Alternatives A, B, and C.

Table 3-1. Effect of reasonably foreseeable actions on project area resources for all alternatives

Resource category	Arctic development	Red Dog Mine extension/closure	Climate change	Dalton Highway improvements
Geology and Minerals	No contributing effect in the project area.	No contributing effect in the project area.	No contributing effect in the project area.	No contributing effect in the project area.
Soils and Permafrost	Contributes to localized soil disturbance and permafrost degradation by building access roads and pads.	No contributing effect in the project area.	Could contribute to permafrost degradation.	May contribute to localized permafrost degradation along the highway.
Sand and Gravel Resources	No contributing effect in the project area.	No contributing effect in the project area.	May require use of sand and gravel resources for construction of response projects.	Requires use of sand and gravel resources for construction.
Hazardous Waste	No contributing effect in the project area.	No contributing effect in the project area.	No contributing effect in the project area.	Could result in spills during construction and operation.
Paleontological Resources	No contributing effect in the project area.	No contributing effect in the project area.	Melting permafrost would impact resources. Response could include documenting these resources.	Could impact resources from excavation or fill.
Water Resources	Little to no contributing effect in the project area.	No contributing effect in the project area.	Could contribute to changes in hydrology.	Could impact stream/rivers that continue through the Amber Road study area.
Air Quality and Climate	Contribute GHG during extraction and during end-use of petroleum products. See Climate Change column.	Closure would contribute slightly to reduction in GHG emissions. No substantial contributing effect in the project area.	Actions that emit GHG could contribute to shorter, milder winters and changing weather patterns.	Could contribute to localized air quality impacts during construction along the Dalton Highway and may attract more traffic, contributing to GHG emissions.

Resource category	Arctic development	Red Dog Mine extension/closure	Climate change	Dalton Highway improvements
Noise	No contributing effect in the project area.	No contributing effect in the project area.	No contributing effect in the project area.	Contributes to localized noise impacts during construction along the Dalton Highway.
Vegetation and Wetlands	Little or no contributing effect in the project area.	No contributing effect in the project area.	Projects that emit GHG could contribute to changing vegetation communities.	Highway widening would affect vegetation and wetlands within watersheds that drain through the Ambler Road study area.
Fish and Amphibians	Little or no contributing effect in the project area.	No contributing effect in the project area.	Projects that emit GHG could contribute to changes to hydrology, water quality/temperature, and riparian vegetation, which could contribute to effects on fish.	Could impact fish habitat in streams that continue through the Ambler Road study area.
Birds	Little or no contributing effect in the project area.	No contributing effect in the project area.	Projects that emit GHG could contribute to changes to hydrology, water quality, and vegetation, which could contribute to effects on birds and their habitat.	Highway widening would contribute to effects on bird habitat at the eastern edge of the project area.
Mammals	Would increase disturbance and habitat effects on the Western Arctic caribou herd. Additional Dalton Highway traffic could affect caribou travel.	Closure and substantially reduced activity on road could reduce conflicts with and disturbance to the Western Arctic caribou herd.	Projects that emit GHG could contribute to changes to hydrology, water quality, and vegetation, which could contributes to effects on mammals and their habitat.	Construction would reduce wildlife habitat, and activity would disturb animals. Potential increased traffic could affect caribou and other animal movements.
Land Ownership, Management and Special Designations	No contributing effect in the project area.	No contributing effect in the project area.	Little or no contributing effect in the project area.	No contributing effect in the project area.

Resource category	Arctic development	Red Dog Mine extension/closure	Climate change	Dalton Highway improvements
Transportation and Access	Would maintain and likely increase traffic levels on the Dalton Highway. ASTAR and oil and gas development could extend industry and public roads across the North Slope Borough.	No contributing effect in the project area.	Would likely make it harder to maintain winter trails. Could make it harder to maintain river navigation. Could result in transportation infrastructure needing more maintenance.	Would contribute to safety and accommodating increased traffic/demand. Construction impacts could contribute to traffic delays.
Recreation and Tourism	Increased industrial traffic and increased recreation/tourism traffic could conflict on Dalton Highway, Elliot Highway, and Steese Highway.	No contributing effect in the project area.	No contributing effect in the project area.	Would contribute to safety and to accommodating increased traffic/ demand.
Visual Resources	Little contributing effect in the project area. A new parallel pipeline could add to industrial character of Dalton Highway corridor.	No contributing effect in the project area.	Projects that emit GHG could contribute to vegetation changes over time; minor visual effects.	Would contribute minor visual changes.
Socioeconomics and Communities	Could increase job options in the region or forestall oil job losses. Could contribute to poorer health in communities if subsistence caribou harvest affected.	Closure would reduce regional employment. Reduction in jobs in the project area could reduce food security in local communities.	Melting permafrost, reduced ice, changes in subsistence resource availability, and rising water levels could undermine community infrastructure, change winter transportation, affect public health, and require cultural adaptation. Response projects could inject funding/jobs into communities.	Construction may offer some job opportunities in the region.

Resource category	Arctic development	Red Dog Mine extension/closure	Climate change	Dalton Highway improvements
Environmental Justice	Could increase jobs for EJ communities, or forestall job losses.	Extension would extend jobs, and closure would reduce jobs in the region, affecting EJ communities.	Climate changes, rising water levels, changes in subsistence resource availability, and permafrost/ice cover changes affect EJ communities.	Little contributing effect in the project area.
Subsistence Uses and Resources	Could affect caribou movements, which in turn could affect availability caribou for harvest.	Closure would reduce conflicts with and disturbance to the Western Arctic caribou herd.	Projects that emit GHG could contribute to vegetation and climate changes that could affect availability of and access to berries, wood, and game. Effects on subsistence could affect public health in project area communities.	Little contributing effect in the project area.
Cultural Resources	No contributing effect in the project area.	No contributing effect in the project area.	Projects that emit GHG could contribute to melting permafrost, which can impact resources (e.g., through increased stream bank erosion).	Construction could affect cultural resources.

Note: GHG = Greenhouse Gas; EJ = Environmental Justice

3.2. No Action Alternative

Under the No Action Alternative, there would be no Ambler Road construction. As a result, there would be no major induced development within the District, so there would be little to no beneficial or adverse impacts from mining.

Cumulative impact is the incremental impact of an action when combined with other past, present, and reasonably foreseeable future actions. Since no road would be built under the No Action Alternative, there would be no incremental impact to accumulate with other impacts. However, the impacts of the RFAs outlined in Table 3-1 would occur.

Table 3-1 is essentially a no-action analysis, describing effects expected to occur even if the BLM decided not to issue a ROW authorization for the Ambler Road. As noted in the table, many of the RFAs would likely result in little or no effect in the Ambler Road project area. Actions that affect climate change or in response to a changing climate would be most likely to continue to affect conditions in the study area. Actions to improve the Dalton Highway corridor likely would be an ongoing series of projects that would incrementally use relatively scarce area resources (gravel) and eliminate or change relatively small additional amounts of vegetation, wetlands, and water courses that serve as habitats (e.g., when highway curves were realigned).

Some specific and potentially prominent impacts could affect caribou, subsistence, and socioeconomics. The synergistic effects of arctic development, Dalton Highway additions, climate change actions, and Red Dog Mine changes could affect caribou calving and wintering grounds, the caribou life cycle, and movement patterns of caribou, potentially threatening the population or altering access to and use of caribou as a subsistence resource. Arctic development and extension of the Red Dog Mine could provide a steady supply of relatively high-paying jobs, some of which likely would be taken by residents of the Ambler Road study area. Eventual closure of the Red Dog Mine and likely closure of some oil fields on the North Slope would reduce such jobs. The closure of Red Dog Mine, in particular, would affect residents of the western part of the Ambler Road project area. This is because the Red Dog Mine is on NANA land and provides substantial employment assurances to NANA shareholders and pays the corporation a steady annual income that has been used to improve villages in the region. The mine also makes substantial payments in lieu of taxes to the NAB that have benefited the people of the region. Neither the village improvement funds nor the payments in lieu of taxes would occur after mine closure, which could result in loss of substantial funds to the region. Table 3-1 provides information about effects in other resource categories.

3.3. Action Alternatives—Physical Environment

This section describes how the Ambler Road Project's action alternatives would add to or change the effects noted in Table 3-1 that are expected to occur under the No Action Alternative. While the effects of past actions are known, the reasonably foreseeable actions are principally not formal proposals at this time, so the analysis in the remainder of this document is necessarily based on reasonably foreseeable scenarios and not on detailed plans or proposals.

3.3.1 Geology and Soils

The reasonably foreseeable mine development scenario presented above would result in the removal of minerals, including in particular copper and gold, from the District for transport to market. This would be anticipated to occur under all action alternatives as long as market conditions remain favorable. This is the primary impact sought by AIDEA by the proposal of this project.

The mines, industrial access road, and associated facilities would transect areas with existing geological hazards as well as unfavorable soil and subsurface conditions. These include corrosive subsurface minerals; liquefiable soils; and organic-rich, ice-rich, poorly drained, or thaw-sensitive permafrost soils. Geotechnical investigations conducted during the design phase would identify these issues, and the mines, roads, and associated facilities would be designed and constructed to avoid and minimize their risks using appropriate and standard design practices. Soil and geological hazards may be addressed by modifying alignments, choosing appropriate cut and fill geometry, implementing slope and/or embankment stabilization measures, using wider and thicker embankments on thaw-sensitive permafrost to reduce thaw settlement, and developing designs to resist seismic hazards.

Industrial mining and authorized commercial uses of the selected alternative are anticipated to spur the construction of additional access roads and facilities. Such development would result in additional localized changes to area geology, topography, and subsurface soils. Disturbances to the soil thermal regime would exacerbate permafrost thawing in the area. Engineering design measures, including careful selection of connection locations to the project road and maintenance procedures can reduce, but should not be considered completely effective at avoiding, changes to the soil regime. Some permafrost may melt and result in changes and impacts.

Additional road construction and mine development may disturb naturally occurring asbestos (NOA) and acid-bearing rock in the area. Use of NOA materials in construction would expose workers during both construction and operations. Asbestos fibers are a known health risk if disturbed or released into the air (see Chapter 3, Section 3.2.7 [Air Quality and Climate], in the EIS). State of Alaska material use guidance and standards addresses the use of NOA materials on projects but do not address mining activities such as rock crushing and blasting. The development and operations of the mines would be regulated by multiple laws and authorities, including the Clean Air Act and Safe Drinking Water Act; federal agencies with asbestos regulations, including OSHA and the Mine Safety and Health Administration (MSHA); and state agencies, including ADEC.

Spur roads and mine development plans would expand the geographic scope of ground disturbance and dust deposition. In addition, actions that cause or exacerbate erosion may release or wash NOA into streams or other waterbodies.

Some local communities are anticipated to connect to the fiber optic line that has been proposed within the road bed. Trenching to bury fiber optic lines could have adverse localized impacts on soils and permafrost. Recent fiber-optic cable installation along the Dalton Highway has caused permafrost degradation and the development of thaw ponds. Above-ground connections or best practice installation practices would minimize impacts of community connections.

3.3.2 Sand and Gravel Resources

Indirect and cumulative impacts include the changes of topography, drainage, and thermal regime due to material site and access road development. These changes may lead to permafrost warming or thaw, which may affect road performance and maintenance. Impacts can be reduced, although not avoided, if locations of material sites and access roads are chosen and designed based on site-specific geotechnical explorations to mitigate these potential indirect impacts.

Indirect future actions, such as additional ground-disturbing road construction and mine development, may cause additional disturbance to NOA and acid-bearing rocks in the area. State of Alaska material use guidance and standards addresses the use of NOA materials on projects but do not address mining activities such as rock crushing and blasting. The development and operations of the mines would be under the auspices of multiple laws, including both the Clean Air Act and Safe Drinking Water Act, federal agencies with asbestos regulations including OSHA and MSHA, and state agencies, including ADEC.

3.3.3 Hazardous Waste

Reasonably foreseeable development actions would increase the potential and nature of spills in the project study area and along the supply route. Development and operations of large-scale mining operations in the District would likely include the transportation of liquefied natural gas by tanker truck, in addition to diesel fuel and other petroleum products. Spills from mining-related traffic are accounted for in Chapter 3 of the EIS. Spills and leaks from mine-site equipment and from tailings facilities would be additive and have potential to be larger because some container sizes would be larger.

It is not possible to state with specificity the spill impacts from mining because no specific mining proposal has been made. However, the risk of spills and impacts from spills would be anticipated to be similar to the risks addressed in USACE's Donlin Gold EIS (USACE 2018; see Section 3.24, Spill Risk). That EIS evaluated spill risk associated with diesel fuel, LNG, mercury or cyanide used in ore processing, and mine tailings stored behind a tailings dam. These are appropriate examples of the types of spills and impacts that could occur in similar mining operations. Chemicals would be stored on site as part of any developed mine and used as part of the ore extraction and concentration process. This would result in the presence and storage of toxic chemicals on site at the mine. Spills during transportation and storage/use of hazardous materials are more likely to occur the more such materials are shipped, transferred, and handled. Given the scale of mining that is likely to be undertaken and the relatively large number of trucks hauling fuels, other materials, and ore over nearly 50 years (see Table 2-5), a small percentage of truck traffic operating part of the year in winter weather and darkness is likely to be involved in crashes, mechanical malfunctions, or loading/unloading errors, and these could result in release of hazardous materials. The likelihood of substantial environmental effects is considered low, but there is a small risk that the effect could be substantial, for example, if a large volume of toxic material spilled directly into flowing water of an anadromous fish stream and escaped before a response could be mounted.

Any contaminants released to the environment through any activity made possible by the road, including but not limited to large-scale mining, would be addressed in coordination with the ADEC and the Environmental Protection Agency (EPA). The action taken to remediate environmental impacts of the release would be site specific, protective of human health and the environment, and consistent with all environmental laws and regulations. ADNR Office of Project Management and Permitting typically coordinates large mine permitting. ADNR Division of Mining, Land and Water, Dam Safety and Construction Unit, would review dam design and operation for state certification, and ADEC would issue permits to authorize the disposal of tailings, waste rock, and wastewater, and ensure compliance with applicable water quality standards. Regardless, tailings dam failures occur and could have major adverse effects to water quality, fish and wildlife habitat, and fish and wildlife mortality, as well as human mortality.

3.3.4 Paleontological Resources

Ground-disturbing activities from past and present activities may have affected paleontological resources in the project area in areas of mineral exploration or community infrastructure construction for airports or local roads. Reasonably foreseeable future actions that could affect paleontological resources include mine and road development in the project area and Dalton Highway improvements. Scientifically significant paleontological resources on federal lands are protected under the Paleontological Resources Perseveration Act. Activities with the potential to adversely affect paleontological resources are typically required to have professional inventories filed with the BLM before specific development projects begin (BLM 2018a). These include requirements to minimize or eliminate adverse impacts on paleontological resources. Mine and road development on state-owned lands would be required to coordinate with the state land manager, as stipulated under the Alaska Historic Preservation Act (AHPA, AS 41.35) which specifically covers fossils. The effects of climate change could influence the rate or degree of permafrost melting, resulting in exposure or damage to paleontological resources, contributing to potential cumulative impacts. The No Action Alternative would have no potential cumulative impacts on paleontological resources.

3.3.5 Water Resources

Past actions are those that have resulted in changes to and have given rise to the existing state of the quantity and quality of the water resources of the project area. Those actions include past placer mining occurring both in and outside of river channels; transportation developments including trails, roads, pipelines, and the general increase in use of petroleum-based fuels; consolidation of Native populations into larger hub communities with the establishment of organized schools; improvements in remote community water supply and wastewater treatment; and world-wide increases in CO_2 from the increase in use of fossil fuels, which could contribute to climate changes. In general terms, past actions have had local impacts on water resources with respect to project area stream channel morphology and water quality, but they are in a fairly pristine state.

The present actions as described in the body of the EIS are those that would arise from the development of the proposed road. These include impacts to surface and groundwater drainage patterns, connectivity, water levels, and velocity. While the impacts would be long term and possibly permanent, they would also be local, associated with the roadway embankment and its crossings. Water quality impacts would be local (erosion, turbidity) and generally episodic, such as rainfall events washing road dust into streams, ice breakup causing local flooding, or spills of hazardous materials.

The greatest indirect impacts would arise from potential development of the individual mining prospects. Mine development would include impact types that are similar to those associated with road development in terms of changed surface and groundwater flow patterns, establishment of large infrastructure pads, and removal of vegetation and overburden soils. In addition, hard rock mining often involves moving massive amounts of rock (open pit), which disrupts the natural surface and groundwater interaction and requires removal of water from the mine to be stored in tailings ponds for reuse and treatment. Water supply and use for the mining of rock, processing of ore, and maintenance of facilities combined with potable water requirements, may impact water quantity of water sources and requires treatment of toxic mine water, sometimes in perpetuity (Hughes et al. 2016; Limpinsel et al. 2017; Woody et al. 2010). A study of water quality compliance found that while all mines reviewed predicted compliance with water quality standards, 76 percent exceeded water quality pollution limits as a result of mining. Adverse impacts to water quality were found to be common at mine sites and most often caused by failed mitigation (Kuipers et al. 2006; Maest et al. 2005; Woody et al. 2010). If discharged water did not meet intended water quality standards, impacts to the health of fish, birds, and other animals and to humans using the water could occur, as described in other sections in this appendix and Chapter 3 of the EIS. Groundwater levels and permafrost within mined areas would be permanently disrupted. The Bornite mine may present the most water resources impacts because it lies directly in the Beaver Creek drainage basin.

Impacts to water quality can occur because of minerals concentrations that occur in contact water, the increase of dust from mining operations, potential spills or release of ore concentrates, chemicals used in processing ore, fuels, and process water in addition to wastewater from operations of facilities and camps. Standard mine operations, including some typical measures for mine water use and treatment, are described in Section 2.1.5. (Reasonably Foreseeable Action Scenario; e.g., Mine Water Management and Water Supply subsections). Impacts of water needs and use from the mine facilities would be similar to those of construction camps and maintenance stations, except for a longer term and a larger population.

AIDEA has proposed that communities would be allowed to use the road for commercial deliveries. Therefore, other indirect impacts include the potential development of new access roads to tie into the Ambler Road for delivery of commercial goods and fuel supplies. Improvements to the Dalton Highway would also contribute to water quality impacts. These roads would have the same types of impacts as the development of the proposed road in terms of water resources. The connection of Alternative A or B to Bettles/Evansville would most likely be an ice road during winter, as is currently built, but only 1/3 the length, potentially reducing impacts. Direct connections would likely be made from Alternative A, B, or C to Kobuk, and from Alternative C to Hughes. Lesser potential exists for development of additional road access to other communities (Shungnak, Ambler, Alatna/Allakaket). Navigable river and winter trail/snowmachine access to the Ambler Road Alternatives for commercial goods delivery would have lesser impacts than permanent roads.

Past actions have impacted water resources, but only minimally, except perhaps along the Dalton Highway and TAPS corridor, and most impacts are local to streambeds and the riparian zone, which experience natural adjustments due to floods and icing events almost annually. Any of the action alternatives for construction and operation of the proposed road would impact surface and groundwater drainage patterns, connectivity, water levels, and velocity. While the impacts would be long term and possibly permanent, they would also be local, associated with the roadway embankment and its crossings. Water quality impacts would be more noticeable, but generally local to the roadway embankment and crossings, except for spills, which have the potential to travel longer distances downstream. Indirect impacts from mine development would also be local to the mine development sites, but could be greater in terms of water quantity (water use), extent of impacts due to changes in drainage patterns, and potential water quality impacts from mine operations. These same types of impacts are likely to occur on the Dalton Highway as the result of mining-related traffic and the day-to-day maintenance and long-term highway upgrades that DOT&PF is likely to deem warranted, in part, as a result of the additional traffic. Alternatives A and B traffic would affect 100 more miles of the Dalton Highway than Alternative C traffic. All alternatives would increase risk of spills in waterways and induce additional maintenance and construction efforts along the Dalton Highway that would affect waterways (e.g., widening or realigning highway curves requiring new culverts or lengthening of existing culverts), but Alternative C would affect 100 fewer miles of existing roadway.

Impacts to marine waters from spills (liquid or dust) could occur during loading of the ore concentrate at the export location. A fuel or hydraulic fluid spill could also occur during loading of the vessel. The severity of the spill would be dependent on the location, type, and quantity of material entering marine waters. Given currents and tidal effects, minor spills may dissipate rapidly, while others could create greater impacts on local fish and invertebrate populations. The effects of spills in marine waters on aquatic organisms would be similar to those described in Section 3.4.2, Fish and Amphibians. Regarding spills, see also Section 3.3.3, Hazardous Waste.

Impacts to permafrost and natural drainage patterns will continue to occur over the life of the project and mine operation. Many unknowns exist as a result of changing active layer thickness from thawing permafrost and the way in which that affects drainage patterns. The speed of that change is dependent on many factors, including ice content, native soil materials, potential temperature rise, changes in snow accumulation during winter, and precipitation during summer. Conner and Harper (2013) discuss the different states of permafrost (sporadic, discontinuous, and continuous) and methods to maintain the integrity of infrastructure in a changing climate. Alternative C would cross areas of discontinuous permafrost, and these areas would likely see changes first. Cumulatively, Alternative C would have the most water resources impacts due to its length and the earliest permafrost effects to the stability of the roadway.

3.3.6 Acoustical Environment (Noise)

Cumulative effects from noise are unique because noise above ambient levels occurs only when a noise-generating action is occurring, and the distance between a noise source and the receiver influences noise intensity. Louder noises tend to dominate noise levels; therefore, the cumulative effect of other noise sources may be masked by the loudest noise source. All action alternatives would elevate noise above ambient levels in the study area. When this increase in sound level is assessed cumulatively with effects of past and present activities and reasonably foreseeable developments such as Dalton Highway improvements and associated growing traffic, there would be an incremental increase in noise levels. Intermittent noises (e.g., blasting at material sites, road cuts, and mine sites) may occur concurrently with other projects, or may increase the overall frequency of disturbances to noise-sensitive areas and receptors.

3.3.7 Air Quality and Climate

The proposed project is located in a remote area that is designated mainly as attainment or unclassifiable for criteria pollutants for which EPA has established National Ambient Air Quality Standards (NAAQS) under 40 CFR 81.302 and for which the State of Alaska has establish Alaska Ambient Air Quality

Standards (AAAQS). The area does not contain many sources of emissions other than dust from surface wind erosion, emissions from wildfires, emissions from on- and off-road vehicle travel, and emissions from community sources such as generators, heating equipment, and vehicles. Remote activities such as on- and off-road travel result in air quality impacts that are comparatively less than fugitive emissions from fires in the area. The cumulative impacts in the area as a result of wildfire may be partially mitigated from activities such as wildfire management practices (e.g., fire suppression, prescribed fire, mechanical or chemical treatments to fuels, prevention of human-caused fires). Cumulatively, potential impacts on air quality would result from the proposed project, recreational use, mineral exploration and development activities, construction of other roads, and transport along roadways. No activities that would require air quality permitting would be permitted if they would be likely to exceed the NAAQS or AAAQS. Therefore, these activities combined are unlikely to exceed regional air quality standards. Increased vehicle traffic through Fairbanks would contribute emissions, potentially increasing $PM_{2.5}$ concentrations and furthering the non-attainment status of the area for that pollutant.

The air quality impacts associated with reasonably foreseeable mining activities would be analyzed on a case-by-case basis as part of each site's own permitting process and would be subject to appropriate measures to reduce impacts unique to each proposal. The project area would be considered to be in an attainment area, and for major sources of emissions that a mine could trigger, EPA could require a prevention of significant deterioration permit. The EPA has stated its concerns in comments on the Draft EIS that the foreseeable mining activity could cause substantial impacts to regional air quality and air quality related values such as visibility and plant/wildlife welfare. An evaluation of project impacts on ambient air quality standards would be required, including analysis of soils, vegetation, and visibility impacts. Permitting and analysis of mines would be expected to help reduce the potential to exceed air quality standards, as emission control technology review would be required.

The Donlin Gold Mine is a recent conventional example of a mine reviewed for air quality impacts (USACE 2018). The potential for increased emissions from mining due to vehicular traffic, fugitive, and stationary emission sources was analyzed. Main components of the operation infrastructure evaluated included mining and milling facilities, waste rock dumps, haul roads, tailings facility, generators, boiler, and a waste incinerator. The construction and closure impacts on applicable air quality standards were predicted through air dispersion modeling methods not to exceed NAAQS. Operational impacts were estimated to be above thresholds requiring more stringent permits, such as a Title V Operating Permit (required under the Clean Air Act for "major" sources of air pollutants), and to trigger GHG reporting; however, the impacts were anticipated to be below regulatory standards. Impacts from mines in the District will be site-specific and permitted specifically to proposed operations and potential emissions to avoid exceeding air quality standards.

Air quality impacts are anticipated from North Slope oil and gas development, the expansion of Red Dog Mine for its operating life through closure, Dalton Highway construction, and climate change as a result of increased fuel combustion. Impacts from each of these actions may be substantive in their localized areas, but they are far enough away from the proposed road and indirect mine development that they are not anticipated to be additive within the project area.

Any of the action alternatives, in combination with past, present, and foreseeable activities, is expected to increase air emissions, including GHGs, in the region and the state. The only discernable cumulative differences among the alternatives would be attributable to the direct impacts, primarily associated with the length of any given alternative. While the air quality impacts of any action alternative would be highly localized and often short term, and would not be predicted to be above applicable air quality standards, cumulatively the project would contribute GHGs to the atmosphere. Climate change, which is connected to GHG emissions, is not anticipated to affect air quality in the project area, but would have far-reaching effects (as discussed in other sections) that likely would affect the project area. Mining project and road project effects of the types discussed in the EIS that can hasten permafrost thaw, coupled with the effects of a generally warming climate on permafrost, likely would cumulatively release methane and further contribute to climate change. Current CH_4 emissions from melting permafrost are estimated at about 1 percent of global methane budget, but are anticipated to grow to be the second largest anthropogenic source of GHGs by mid-century (Walter Anthony et al. 2018; NASA 2018; Schaefer et al. 2014).

3.4. Action Alternatives—Biological Resources

3.4.1 Vegetation and Wetlands

Vegetation, Wetlands, Rare Plants, and Ecosystems and Non-native Invasive Plants

Indirect impacts to wetlands and vegetation would be expected to occur outside of the 328-foot (100-meter) primary corridor of direct impact, mostly due to changes in hydrology and thermal regime caused by the road structure. These changes would be likely to occur, even with culverts, and would be likely to occur within several years of road construction. To a lesser extent, impacts to wetland function at greater distance also could occur due to NNIS causing changes to the wetland vegetation community. Cumulative impacts in wetland function would be likely in regards to habitat since road dust, road infiltration, and embankment erosion are certain to occur along the road and impact natural water chemistry and metals uptake by vegetation, which would go directly into the food chain and decrease aquatic species' ability to use wetlands for habitat.

The cumulative effects analysis area for vegetation and wetlands, including NNIS and rare plants and ecosystems, includes the extent of the project area as shown in Volume 4, Maps 3-8 and 3-9. The anticipated impacts of the action alternatives on wetlands and vegetation are described in Chapter 3, Section 3.3.1 (Vegetation and Wetlands), of the EIS.

More broadly, Past and present actions that have impacted wetlands and vegetation within this area include (1) construction of the Dalton Highway and other roads and airports in rural Alaska communities, which has resulted in fill within the footprints, alteration beyond the footprints, and the spread and establishment of NNIS near developments; (2) passage of ANILCA, resulting in establishment of Gates of the Arctic National Park and Preserve (GAAR) in the analysis area, which has allowed for the protection of wetlands and vegetation; (3) wildfires; (4) wildfire suppression; and (5) effects from climate change. Due to the observed rapid warming in Alaska, the rate of permafrost degradation has been increasing, resulting in changes to wetland and upland vegetation types underlain by it. Wildfires have also increased over the past decades. However, for the majority of the project area, wildfires have had limited suppression, which has been mostly focused around communities in the area. Rare plants and ecosystems have been subjected to the same impact conditions as wetlands and vegetation, acknowledging that these resources are less abundant spatially (past and present information on rare plants and ecosystems is limited).

RFAs associated with AIDEA's proposed action that would impact vegetation and wetlands include the advanced mining development scenario, indirect road access scenario, and other actions located throughout the vicinity of the project area.

Of all RFAs, mining and its associated activities have the potential to cause the greatest indirect impacts to wetlands and vegetation in the area. Under the anticipated mining scenario, 4 large-scale mines would be developed for the extraction of minerals such as copper, lead, zinc, silver, gold, cobalt, and molybdenum. Open pit and underground mining would result in loss of vegetation and wetlands within development footprints, and alteration of vegetation and wetlands beyond development footprints from disturbance of surface and groundwater flow, lowering of the water table from dewatering activities, and fugitive dust from heavy metals and accessory roads. Although the exact number of acres of vegetation and wetlands that would be lost or altered is unknown because specific mine proposals have not been made. However, the potential magnitude of impact and alteration is anticipated to be in the thousands of acres, not including accessory roads. In addition, hundreds of thousands of acres of mining claims exist in the advanced mining scenario, which could result in more loss and alteration than initially predicted if more claims are developed. Additional mining claims exist outside of the District, which could also be developed, although less likely. Impacts to wetlands within mine footprints would be considered permanent impacts; however, vegetation may be reestablished in some areas over time, due to expected reclamation requirements, although it is unlikely vegetation would be able to recover to its pre-project condition. Revegetation will not be possible at all locations, where mine-created pit lakes, tailing impoundments, and some concrete foundations would remain permanent fixtures.

As has been shown at Red Dog Mine, fugitive dust from heavy metals can travel thousands of feet to several kilometers in distance, particularly if strict mitigation measures are not employed or practiced. This can result in increased or complete loss of lichen and moss (Neitlich et al. 2017). Heavy metal dust can persist in the soil for many decades (Neitlich et al. 2017), resulting in adverse impacts to the surrounding vegetation and habitat. Additionally, mosses, lichen, and vegetation can accumulate heavy metals in their tissue (Wegrzyn et al. 2016; Brumbaugh et al. 2011; Ford and Hasselbach 2001), which could have impacts to overall vegetation health and could pose risks to wildlife, fish, and subsistence users as these metals enter the food chain. Fugitive dust impacts would occur around the mine footprints, due to blasting, loading, ore stockpiles, crushing activities, waste piles and exposed mill tailings (ABR 2007) as well as along the entire truck haul route along the Dalton Highway to Fairbanks. Spills of ore concentrate due to trucking accidents and inadequately sealed ore containers could result in further contamination. In addition, mining tailings and settling ponds associated with the mines could potentially lead to contamination of surface water and groundwater, leading to pollution and other impacts to vegetation, wetlands, and other aquatic resources (Woody et al. 2010). The development of these mines and accessory roads would also result in an increased risk of spread and establishment of NNIS in the surrounding environment, which could alter vegetation and wetland community composition. Rare plants and ecosystems would be subjected to the same impact conditions from mine development as wetlands and vegetation.

The indirect road access scenario would allow for community access to AIDEA's proposed action for the commercial deliveries to communities. Routes and roads established off the AIDEA's proposed road as well as the increase in traffic from commercial goods is expected to increase the spread of NNIS. The development of community roads or routes to AIDEA's proposed action and in some cases could result in a loss or alteration in vegetation and wetlands, especially if permanent roads are built. In addition, impacts to rare plants and ecosystem types, such as geothermal springs, could occur due to increased human access to the locations near them. Human-caused wildfires are likely to increase along those routes or community roads used in summer. In addition, federal agencies generally extinguish wildfires that are not natural starts on respective federal lands, due to policy and land management plan objectives, which would also lead to increased suppression and could contribute to changing the natural fire regime of the area. Actual suppression efforts would be determined by the respective jurisdictional agency managing a wildfire on non-federal lands.

RFAs not associated with AIDEA's proposed action that would impact vegetation and wetlands, including rare plants and ecosystems and NNIS, include improvements made along the Dalton Highway and climate change. The further development of the Dalton Highway would likely result in further fill and alteration of wetlands and vegetation due to expansion. Expansion of the highway may also allow for increased traffic, which could result in more spreading of NNIS from vehicles.

Climate change could continue to result in warming temperatures, permafrost thaw, changes to the fire regime, and changes to fire-driven vegetation succession, which could result in a positive feedback that further accelerate changes to the ecology of the area. Climate change can drive permafrost thaw and deepening of the active layer, which can result in thermokarst features. As a result, areas adjacent to thermokarst features could drain, which could result in a conversion of wetland and upland communities. Early snowmelt from rising global temperatures can also lead to decreased albedo, which could also result in drier lands or smaller waterbodies (USACE 2018). Climate change is also resulting in reduction in the size of lakes and ponds, conversion of wetland types, alteration of plant composition, loss of lichen habitat, and increased wildfires (EPA 2017). Research has shown that climate change related factors are contributing to an increase in shrub expansion, increased tall shrub biomass in some locations, and alteration to tundra structure and function (Myers-Smith et al. 2011). Climate change has also been shown to create favorable conditions for the establishment of NNIS due to climate change induced stress in ecosystems creating pathways of invasion (Masters and Norgrove 2010). Thus, climate change would be expected to intensify and accelerate any human-caused changes to the project area resulting from the reasonably foreseeable developments associated with AIDEA's proposed action.

The cumulative effects from development of mines, indirect road access, AIDEA's proposed action, as well as other reasonably foreseeable developments would compound the magnitude of all previously discussed impacts in Section 3.3, Action Alternatives—Physical Environment. Cumulative effects would occur from the combined impacts of these projects. Thousands of acres of wetlands and vegetation would be impacted by these projects. Alteration to wetlands and vegetation from fugitive dust, changes to soil characteristics, changes to hydrology, thawing of permafrost, and increases in NNIS to the area would result in widespread changes to wetlands and vegetation across the project area from these projects, which would be further compounded by the effects of climate change. Associated wetland functions and ecosystem services could also be lost or altered due to the development of these projects. The development and operation of mines and AIDEA's proposed action could result in contamination to surrounding environment due to fugitive dust from trucks hauling ore or spills from trucking accidents, leading to further loss or alteration of vegetation and wetlands. The loss or alteration of rare or high-value wetland types combined with climate change-induced changes to wetlands could degrade and reduce them from the area. These projects would also result in loss and alteration of tundra types, which are uncommon in the project area, which could also be further impacted by climate change-induced affects, and could increase the introduction and spread of NNIS. Some of these impacts to wetlands and vegetation would be permanent, forever changing the project area. As such, the impact on vegetation and wetlands from AIDEA's proposed action, reasonably foreseeable future actions and ongoing climate change is expected to have substantial cumulative and long-term impacts to wetlands and vegetation, including rare plants and ecosystems. While the indirect mining impacts would be similar, cumulative impacts to wetlands and vegetation would be greatest from Alternative C because it would result in greater impact to wetlands and vegetation than the other action alternatives. In addition, Alternative C is the longest of the alternatives, which would potentially allow NNIS to spread a greater distance. However, its impacts are not concentrated in a single ecoregion like Alternatives A and B.

Wildfire Ecology and Management

The cumulative effects analysis area for wildfire ecology and management includes the extent of the project area as shown in Volume 4, Map 3-14. The anticipated impacts of the action alternatives on wildfire ecology and management are described in Section 3.4.1, Vegetation and Wetlands.

Past and present actions that have impacted wildfire ecology and management within this area include construction of the Dalton Highway and development of roads and airports in rural Alaska communities, which have resulted in an increase in human-caused wildfires and changes to the natural fire regime. Climate change has also resulted in increased wildfire activity in the area (BLM 2018b). Wildfires have also become more prevalent in tundra vegetation types where, historically, wildfires were less frequent and smaller (Joly et al. 2012; BLM 2018b). Warmer temperatures in Alaska caused by climate change have created earlier dry conditions for fuels to burn, and longer fire seasons. For the majority of the project area, wildfires have had limited suppression, which has been mostly focused around communities in the area. The vast majority of the acreage burned in the area are from lightning-caused fires, which are a part of the natural ecology of the area and is a primary driver of succession in boreal forest (Joly et al. 2012). Human-caused wildfires are less common in the area and tend to be smaller, due to suppression, and generally localized to the areas with communities and roads (BLM 2016).

RFAs that may affect wildfire ecology and management within the analysis area include the advanced mining development scenario, indirect road access scenario, and other actions throughout the vicinity of the project area.

Mining and its associated activities have the potential to cause an increase in both more frequent human-caused wildfires and wildfire suppression. Once mine infrastructure and associated accessory roads are in place, there would be a shift in fire management in these areas from Modified[7] and Limited management to Critical or Full for the protection of human life, property, and hazardous chemicals. The likely increase in human-caused fires would contribute to further alteration of the natural fire regime.

The indirect road access scenario would allow for community access to AIDEA's proposed action for the purpose of delivery of commercial goods. Human-caused wildfires are likely to increase along those routes or community roads that become established, due to the increase in human activity in these areas. Human-caused wildfires in these areas may lead to more suppression efforts, depending on the jurisdictional agency managing the resource where the wildfires occur. Although many of these communities generally have Critical management options, surrounded by Full management, then further surrounded by Modified options, the addition of community roads or routes could potentially extend some of these higher protection management options.

RFAs not associated with AIDEA's proposed action that could impact wildfire ecology and management include improvements made along the Dalton Highway, Arctic oil development, and climate change. The further development of the Dalton Highway and Arctic oil development would likely result in an increase in human use of the Dalton Highway, which in turn could result in an increase of wildfire starts and suppression efforts.

Climate change could result in changes to the land and ecology of the area, as discussed above. Alaska fire records indicate that large wildfires are becoming more frequent (BLM 2018b). Climate change is also expected to increase frequency, size, and severity of wildfires (EPA 2017). Burning of organic soils during wildfires has been shown to accelerate permafrost degradation, particularly during severe fires where all or nearly all the organic layer is burned (Yoshikawa et al. 2002). After wildfires, soils have been found to be warmer and have a drier moisture regime for many years to decades (Yoshikawa et al. 2002; Harden et al. 2006). Yoshikawa et al. (2002) also found reductions to surface albedo, post-fire. The natural ecology of the area, which drives vegetation composition and successional stage could be altered as a result of an increase in wildfire changes and an increase in wildfire severity. More frequent and severe wildfires can increase permafrost thaw and result in expansion of thermokarst bogs (Gibson et al. 2018). Under climate warming conditions, summers are predicted to be warmer and drier, which is expected to increase the amount of boreal forest and tundra vegetation burned (Joly et al. 2012). However, it should be noted that future precipitation regime changes and the associated effects on wildfire regimes are difficult to predict (AMS 2016). According to Joly et al. (2012), this could have

[7] Federal and state agencies, in cooperation with Alaska Native entities, employ 4 wildfire management options: Critical, Full, Modified, and Limited (AICC 2019).

severe impacts to lichen tundra types, as lichen can take a long time to recover. Wildfire impacts can also have impacts to riverine wetlands and aquatic habitats, due to wildfire causing increased stream temperatures, and increased nutrient loading, erosion, and sedimentation in streams. Additionally, increased wildfires are expected to further increase invasions of NNIS (Carlson et al. 2016).

The cumulative effects from development of mines, indirect road access, AIDEA's proposed action, as well as other reasonably foreseeable developments would compound the magnitude of all previously discussed impacts in Section 3.3, Action Alternatives—Physical Environment. Impacts from these actions would include increase in wildfire starts, change in the natural fire regime, change in the natural wildfire ecology of the area, increased wildfire suppression, and changes to management options. The number of wildfires would increase, due to more human-caused wildfires and more natural lightning-caused due to warm temperatures and longer fires seasons. Wildfire suppression would be increased in areas surrounding the proposed actions and would be required for any human-caused wildfire. The greater length of Alternative C could result in more frequent small wildfires or more severe large wildfires as compared to Alternatives A and B. More wildfires would also contribute further to GHGs and climate change impacts, creating a positive feedback of events in the environment, including further degradation of permafrost, wetlands, and vegetation. More severe wildfires resulting from increased suppression combined with climate change factors could also impact riverine wetlands and aquatic habitats. Vegetation composition in the area is driven by wildfire and would be greatly impacted by the compounding effects of changes to the natural fire regime from developments and climate change. Tundra vegetation types, including Alpine and Arctic Tussock Tundra and Alpine Dwarf Shrub Tundra, are less common in the project area and as such may have the greatest impacts from cumulative effects of changes to wildfire ecology.

Mitigation measures such as fuel reduction efforts, controlled burn activities, and fast response fire suppression actions would not eliminate wildfire changes but may minimize the occurrence and severity of anticipated wildfire changes associated with future mine development projects or other RFAs. These measures may require federal appropriations or funding commitments through permitting to occur.

3.4.2 Fish and Amphibians

Previous mining development, primarily activities related to placer gold mining, has affected aquatic habitat in portions of the project area. Brown et al. (2012) identify potential threats and concerns from development in the Koyukuk Drive drainage. The following text is an excerpt from Brown et al. (2012):

> Development impacts to whitefish resources in the Koyukuk River drainage could come in several different forms including mineral extraction, riverbed gravel mining, and roads. Placer gold mining in the drainage began in the late 1800s, primarily in the upper drainage tributaries of the Alatna, John, Wild, North Fork Koyukuk, Middle Fork Koyukuk, and South Fork Koyukuk rivers (Brown 2007b). Miners initially accessed the region by paddlewheel steamboats and other smaller boats during the summer months and overland from the Yukon or Chandalar River drainages using dog teams or on foot in the winter months (Buzzell 2007). Additional large-scale placer mining operations began in the Indian and Hogatza River drainage in the 1930s and 1940s (Smith 1939; Boswell 1979). The Hogatza River placer mine is located in a western tributary named Bear Creek, where a large floating dredge was employed to efficiently mine the entire valley (Figure 14). As recently as the early 1980s, this dredging operation was discharging highly turbid water and impacting the streambed with fine sediments as far as 40 km downstream from the mine, as documented by Webb (1983b). Presumably the mine has improved its settling pond system to bring its water discharges more in line with State water quality standards, as detailed by Lloyd (1987). Numerous placer gold mining

> operations continue within the Koyukuk River drainage, primarily in the upper reaches of the Middle Fork Koyukuk River drainage and in the Bear Creek region of the Hogatza River drainage (Szumigala et al. 2001, 2008). Despite the unavoidable disruption of stream substrate that occurs with placer mining operations, none are directly threatening known whitefish spawning habitats at this time.
>
> During construction of the Dalton Highway and the Trans-Alaska Oil Pipeline in the 1970s, a large amount of riverbed gravel was removed from upper drainage tributaries of the Koyukuk River including Prospect Creek, Jim River, Middle Fork Koyukuk River, and Dietrich River (Woodward-Clyde Consultants 1980). More recent (1990 to present) riverbed gravel mining operations have taken place in the main-stem Koyukuk River drainage at Allakaket (ADL 415878), Hughes (ADL 414384), and Huslia (ADL 400510). During an aerial survey in late September, which is spawning season for inconnu, Alt (1970) reported seeing spawning aggregations of inconnu in the vicinity of Hughes and Allakaket, as well as up the Alatna River near Siruk Creek. Presumably these inconnu were spawning in these areas. *It is possible that streambed gravel removal activities at Allakaket and Hughes have already reduced inconnu spawning habitat in the region.* If inconnu spawning activity in the Koyukuk River drainage is as widely distributed as Alt's (1970) aerial survey data suggest, the riverbed gravel removal activities identified above may not have had a serious impact on the population. Riverbed gravel removal from spawning habitats, however, is a potential threat to whitefish populations, particularly if their spawning habitats are more limited in geographic size. We know of no plans to extract gravel from any of the known whitefish spawning habitats, but, these habitats should be considered when planning riverbed gravel extraction projects in the future.

Aside from the few gravel roads near communities and those used during past and current mine exploration, the project area is largely devoid of roads. Infrastructure is limited, and seasonal fish movement is generally not impeded within the project area. Construction of the TAPS, the Dalton Highway, and more recently, the fiber optic lines adjacent to the highway, has impacted habitat quality and limited fish passage in several large rivers and smaller tributary streams at the eastern edge of the project area. This existing infrastructure has affected habitat in numerous rivers that flow into drainages within the project area, but at locations farther upstream in the drainage. For example, the Dalton Highway crosses the Yukon River and runs adjacent to the Ray River just east of Alternative C, and crosses several of its tributaries. The highway has affected habitat where it crosses and runs adjacent to Fish Creek, Bonanza Creek, Prospect Creek, and the Jim River, all of which are tributaries to the South Fork Koyukuk River, and crosses the South Fork Koyukuk River near the eastern extent of the project area, just south of where Alternative A and B would connect to the Dalton Highway. The highway runs adjacent to the Middle Fork Koyukuk River at a point about 5 miles farther north. In its fish passage inventory database[8], the Alaska Department of Fish and Game (ADF&G) identifies several culverts that limit or preclude fish passage along the Dalton Highway (ADF&G 2020).

Alaska has been experiencing warmer air and water temperatures, changing precipitation patterns, and altered stream flows; increased permafrost thaw and fire regimes; loss of sea-ice, changes in ocean salinity and increased coastal erosion as a result of climate change (Wrona et al. 2006; Clark et al. 2010). Permafrost thaw results in increased nutrient, sediment, and carbon loading in rivers and lakes (Wrona et al. 2006; Vonk et al. 2015). Frozen soils in the Arctic contain large stores of mercury, in addition to

[8] The Fish Passage Inventory Database contains data on more than 2,500 stream crossings assessed for fish passage by ADF&G since 2001. The information is available online to the public via the Fish Resource Monitor interactive mapping application.

organic matter (Schuster et al. 2011). Continued warming and permafrost thaw will likely promote or accelerate the mobilization of bioavailable methylmercury into aquatic habitats and the food chain[9] (Schuster et al. 2011). Changes to the interrelated temperature and hydrologic regimes of Alaska's freshwater in response to warmer conditions, predicted to be substantial within the life of the road, would affect the timing of life history events (e.g., spawning, emergence) and the ability of habitat to support some species, and will ultimately change species distribution and affect the productivity of individual stocks and species populations (Clark et al. 2010; Mauger et al. 2016). Warming water temperatures could limit the distribution of fish that require cold thermal regimes, such as whitefish species and Alaska blackfish, due to a decrease in the availability of suitable habitats (Clark et al. 2010). Others, including some Pacific salmon, may be capable of expanding distributions farther north (Clark et al. 2010). In some systems, warmer conditions may increase fish production for some species, but may create conditions unsuitable to support others (Clark et al. 2010; Mauger et al. 2016). Warmer winters may cause Pacific salmon to hatch earlier in the season, potentially before adequate food sources would be available (Clark et al. 2010). The loss of habitat (e.g., decrease, or lack of, water) during critical life stages that would result from the loss of glaciers and snowpack would adversely affect Arctic grayling and other species, and potentially affect the success of Pacific salmon spawning in large glacial river systems (Clark et al. 2010). In more extreme cases, prolonged warm water coupled with low water levels may lead to mass salmon die-offs (Mauger et al. 2016). Warming water temperatures could also increase disease vectors (Clark et al. 2010), increase fish vulnerability to disease (Fryer and Pilcher 1974; Kocan et al. 2004), and reduce swimming performance (Mauger et al. 2016). Fish response to climate change would vary by species and type of habitat affected, among other factors (Reist et al. 2006).The anticipated impacts of the action alternatives on fish and amphibians are described in Chapter 3, Section 3.3.2 (Fish and Amphibians), of the EIS in consideration of AIDEA's design features (Chapter 2, Section 2.4.4). Mitigation measures that BLM may require AIDEA to commit to on BLM-managed lands are identified in Appendix N, Potential Mitigation. RFAs associated with AIDEA's proposed action that would impact fish and amphibians include climate change, the advanced mining development scenario, indirect road access scenario, and other actions located throughout the vicinity of the project area. Several coal and other hard rock mining claims occur in the project area. Construction of an industrial road to the Ambler Mineral Belt region could yield future hard rock and coal mine proposals. Because development of these additional areas is speculative, a detailed development scenario is not included in this EIS and cumulative impacts from such development are assessed only in broad terms.

There are four potential large scale mining projects in the project area identified for analysis of potential impacts to aquatic resources. Ambler Metals (formerly Trilogy) has funded multi-year aquatic biomonitoring studies in streams located near the Arctic and Bornite prospects (Bradley 2017, 2018; Clawson 2019; Trilogy 2018a). The Arctic and Bornite prospects are located within the Shungnak River drainage upstream from its mapped extent of anadromous fish habitat (Johnson and Blossom 2019; Clawson 2019). While there is a series of rapids in a canyon just upstream from this point, ADF&G has indicated that the rapids are not necessarily a barrier and that chum salmon may occur farther upstream (Giefer 2018). Upstream from the canyon, the Shungnak River supports self-sustaining populations of Arctic grayling, Dolly Varden, round whitefish, slimy sculpin, longnose sucker, and Alaska blackfish (Clawson 2019). If developed, tailings management for the Arctic Project would be constructed within the valley of Subarctic Creek near its headwaters (Trilogy 2018a). Subarctic Creek is a tributary to the Shungnak River that supports multiple age classes and life stages of Dolly Varden, Arctic grayling, and sculpin (Bradley 2018; Clawson 2019). Dolly Varden spawning has been confirmed in the upper reaches of Subarctic Creek (Clawson 2019). The Bornite Mine would be located primarily within the Ruby Creek drainage and potentially extend into the Jay Creek drainage (Map 10). Ruby Creek supports Dolly

[9] Methylmercury, known to be the most poisonous among the mercury compounds, is created when inorganic mercury circulating in the general environment is dissolved into freshwater and seawater (Hong et al. 2012).

Varden, Arctic grayling, round whitefish, longnose sucker, and slimy sculpin, and Jay Creek supports Dolly Varden (Bradley 2018; Clawson 2019).

Additional infrastructure to support the Arctic Mine would likely be necessary along the Shungnak River and within the Ambler lowlands, which is the divide between the Shungnak and Kogoluktuk rivers (Trilogy 2018a). Riley Creek, a tributary to the Kogoluktuk River, was identified as a possible location for a tailings facility (Clawson 2019). Riley Creek supports sculpin and potentially both anadromous and resident Dolly Varden populations (Clawson 2019). The Kogoluktuk River, which supports Pacific salmon and several other subsistence species, flows into Kobuk River just downstream of habitat that supports large concentrations of spawning sheefish (Taube and Wuttig 1998; Scanlon 2009:7) (Volume 4, Maps 3-17 and 3-18). The Sun Project would be located in the Beaver Creek drainage. Beaver Creek supports Pacific salmon and several other subsistence species (Johnson and Blossom 2019). Beaver Creek flows directly into the productive Kobuk River sheefish spawning grounds. The Smucker Project would be located farther to the west, within the Ambler River drainage. The Smucker prospect is situated within the Kalurivik Creek drainage just east of Cross Creek (Map 10). Fish sampling records were not found for Kalurivik Creek, but based on review of topography and fish presence data available for similar areas, this drainage likely supports both anadromous and resident fish.

.Mining and its associated activities have the potential, if not properly managed, to substantially impact habitat structure and function and could also affect fish species at the population level, as described below. Proper management would minimize, but not eliminate, the potential for impacts to individual fish as well as population-level effects on fish. Often the most severe mining-related impacts to habitat occur in remote areas located near extremely productive fish habitat (Sengupta 1993 as cited in Limpinsel et al. 2017). Hard rock mining often involves moving massive amounts of soil and rock, which disrupts the natural surface and groundwater interaction and associated hyporheic[10] processes, reduces extensive amounts of aquatic habitat, can seriously impact water quality, decrease water quantity, reduce biodiversity and carrying capacity, and require treatment of toxic mine water (Woody et al. 2010; Hughes et al. 2016; Limpinsel et al. 2017).

The 4 most advanced, large-scale mining projects would target copper, lead, zinc, silver, and gold, and perhaps, to a lesser degree, cobalt and molybdenum. Hundreds of smaller claims exist throughout the study area, and if the road were built further development would be more likely to occur. Direct and indirect chemical stressors such as mining-related pollution, acid mine drainage, and the release of toxic materials have the potential to impact the health and the survival of fish populations and other aquatic species (Limpinsel et al. 2017). Toxic metals that bioaccumulate in fish tissue can lead to fish mortality, increased susceptibility to disease, and reduced growth rates, and can pose health risks to human consumers (Peplow and Edmonds 2005; Hughes et al. 2016). Sheefish, in part because they mature at an older age and prey on other fish (Brown et al. 2012), could be particularly vulnerable to toxic bioaccumulation from pollutants that enter rivers via road runoff, including mercury and various polycyclic aromatic hydrocarbons (PAHs) (Matz et al. 2017). Mine-related disruptions to soil and water can substantially impact water quality and alter stream flows (Woody et al. 2010). As a mine is excavated, pumps are used to remove mine water and allow access to the ore. Removal of natural groundwater (which typically is held and treated as non-contact or contact water as indicated in Section 2.1.5, Reasonably Foreseeable Action Scenario, and may be discharged far from the source) creates a cone of depression in the groundwater table, which can lower the water table well below natural stream or lake levels and considerably reduce flow into streams, the hyporheic zone, and wetlands (Woody and Higman 2011; Hughes et al. 2016). The hyporheic zone is the region of sediment and porous space beneath and alongside a stream bed that provides the linkage between surface and groundwater systems and riparian

[10] The hyporheic zone is the region of sediment and porous space beneath and alongside a stream bed that provides the linkage between surface and groundwater systems and riparian and floodplain habitat.

and floodplain habitat. The importance of the hyporheic zone to the health and survival of fish cannot be overstated. It is used for spawning and egg incubation for many fish species in the study area that are major targets of subsistence harvest. After eggs hatch, larvae may move both down and laterally into the hyporheic zone to absorb yolk sacs (Woody and Higman 2011). The porous sediments of the hyporheic zone along stream banks also help to regulate changes in water levels and even prevent flooding (Hancock 2002[11]). Hyporheic zones are important in stream nutrient cycling and the regulation of temperature and water quality, and provide unique habitats for fish and aquatic invertebrates[12]. Depending on the location and scale of operation, dewatering has the potential to substantially reduce groundwater flows into important spawning, egg incubating, and wintering habitats relied upon by salmon, sheefish, whitefish, and other important subsistence species. Mine-induced alterations to the exchange patterns of surface and groundwater has the potential to create additional pathways for dispersal of potential contaminants. Eliminating wetlands and altering the natural water regime can lead to reduced low-flow stability in summer, fall, and winter; increased frequency and magnitude of peak flows in the season of thaw; and potentially alteration of stream thermal regimes (McDonough et al. 2014).

It is difficult to quantify the impact that future mines may have on fish and aquatic habitat, given that specific mine proposals and associated mitigation measures are not available. Further, baseline water quality and fish distribution data are not available for many areas where development may occur. In an effort to examine impact predictions, researchers reviewed several EISs for hard rock mines in the United States and compared predicted water quality conditions to actual water quality conditions during and after mine operation (Kuipers et al. 2006). The study found that impacts to water quality were common at mine sites and most often caused by failed mitigation (Kuipers et al. 2006). For the 25 modern mines in the United States selected for detailed case study, 100 percent of mines predicted compliance with water quality standards, but 76 percent of mines exceeded water quality standards as a direct result of mining, and 64 percent of mines employed mitigation measures that failed to prevent water contamination (Maest et al. 2005; Kuipers et al. 2006; Woody et al. 2010). Predictions made about surface and groundwater quality impacts without considering the effects of mitigation appear to be more accurate than those that take mitigation into account (Kuipers et al. 2006; Jennings et al. 2008).

While NEPA analyses have not yet been completed for the potential mines in the District, Ambler Metals (formerly Trilogy) has completed a PFS for the Arctic Project and has funded multi-year aquatic biomonitoring studies at the Arctic and Bornite prospects (Trilogy 2018a). Results of water quality, fish, aquatic invertebrate, and periphyton sampling and fish tissue analysis are presented in Bradley 2017, Bradley 2018, Trilogy 2018a, and Clawson 2019.

In its technical report for the PFS, Ambler Metals (formerly Trilogy) indicated that selenium concentrations are predicted to be high in process water and waste rock runoff at the Arctic Mine and that water treatment is unlikely to remove appreciable amounts of selenium (Trilogy 2018a). Selenium has emerged as a contaminant of concern in mining industries as its disturbance to both aquatic and terrestrial ecosystems has become more evident (Etteieb 2020). While selenium is a naturally occurring chemical element that is nutritionally essential to fish and aquatic life at small amounts, it is toxic at levels only slightly higher (Young et al. 2010; EPA 2016). While high concentrations of Selenium can cause acute toxicity in fish, the most harmful effects to aquatic life result from chronic exposure of lower concentrations through bioaccumulation[13] (EPA 2016; Etteieb 2020). To protect against chronic exposure,

[11] Hancock (2002) provides an easy to understand description of hyporheic zone function and summarizes potential impacts from human development.
[12] Groundwater exchange in hyporheic zones can help keep fish eggs from freezing in Alaska during the coldest part of winter and provide winter habitat (State of Alaska Cooperating Agency Team Technical Comments on Ambler Road DEIS 2019).
[13] Consumption of fine particulate organics and some inorganics by primary consumers, typically invertebrates and small fish, is the primary pathway for Selenium entry into aquatic food webs (Young et al. 2010).

the EPA (2016) developed the *Aquatic Life Ambient Water Quality Criterion for Selenium – Freshwater, 2016* based on selenium concentrations in fish tissue and in the water column. The treatment of mine water that contains selenium is challenging due primarily to its complex chemistry and speciation (Etteieb 2020). Given the challenges in treating mine effluents with harmful levels of selenium, often a combination of monitoring and treatment methods are used as preventative measures to reduce concentrations, and subsequently, impacts to aquatic life and potentially human life (Etteieb 2020).

As of 2018, Ambler Metals (formerly Trilogy) proposed to manage selenium by discharging the combined effluent directly into the Shungnak River via an 11-kilometer pipeline (Trilogy 2018a). Trilogy (2018a) predicted that water quality in Shungnak Creek below the discharge point would meet water quality criteria after a mixing zone, although the length of the mixing zone or levels of selenium concentrations are not identified. Discharging high levels of selenium into the Shungnak River could have detrimental effects to aquatic life. Ambler Metals (formerly Trilogy) acknowledged that obtaining a permit to approve the discharge of selenium into the Shungnak River is a regulatory risk for their project (Trilogy 2018a). Ambler Metals (formerly Trilogy) recommended several additional studies be conducted at the potential Arctic Mine site (Trilogy 2018a). Among these is evaluating the size of the mixing zone that would be necessary on the Shungnak River to meet stream selenium water quality limits (Trilogy 2018a). Diffuse mining-related pollution in streams, due in part to altered water tables, contributes to the loading of metals and other potentially harmful constituents (Younger 2000 in Limpinsel et al. 2017). The introduction of metal and mineral-rich runoff, specifically from acid mine drainage, can impact the ecology of entire watersheds (Limpinsel et al. 2017). Acid mine drainage is toxic to fish, algae, zooplankton, and aquatic invertebrate populations at the ecosystem, metabolic, and cellular levels (Limpinsel et al. 2017).

Subsistence harvesters using the Kobuk River watershed depend on healthy fish and wildlife populations. If acid mine drainage were to affect fish in the watershed, humans that consume affected fish could be exposed to toxins concentrated in fish tissues (National Environmental Justice Advisory Council[14] [NEJAC] 2002). Researchers suggest that proximity to water increases the risk factor of potential water quality impacts, especially for mines with moderate to high acid drainage or contaminant leaching potential (Kuipers et al. 2006). Based on review of other mines in the United States, a recent study suggests that standard waste rock mixing and segregation practices that are employed as mitigation measures to minimize potential impacts may not prevent impacts to water resources where acid generating materials are present (Kuipers et al. 2006). The mining industry has spent large sums of money to prevent, mitigate, control, and stop the release of acid mine drainage using the best available technologies, yet acid mine drainage continues to be one of the greatest environmental liabilities associated with mining, especially in pristine areas (Jennings et al. 2008). However, the ADNR, in its role as a cooperating agency for this EIS, noted that, under 11 AAC 97.240, an operation must reclaim mine waste in a manner that either prevents acid mine drainage or prevents the off-site discharge of acid mine drainage.

The number of serious tailings dam failures have increased markedly since the 1960s; researchers report 72 tailings dam failures in the United States between 1960 and 2000 (ICOLD 2001 as cited in Hughes et al. 2016) and 33 major mine tailings dam failures between 1960 and 2000 (EPA 1995 as cited in Hughes et al. 2016). After several dams failed in Alaska during the 1970s, the state adopted laws to regulate the construction of dams in Alaska. Compliance with the ADNR's Alaska Dam Safety Program[15] would

[14] The National Environmental Justice Advisory Council is a Federal Advisory Committee to the US EPA.
[15] The mission of the Alaska Dam Safety Program is to protect life and property in Alaska through the effective collection, evaluation, understanding and sharing of the information necessary to identify, estimate, and mitigate the risks created by dams.

presumably be required prior to receiving authorizations to construct and operate a tailings dam[16] in Alaska[17] (ADNR 2017). The *Guidelines for Cooperation with the Alaska Dam Safety Program* details those requirements (ADNR 2017).

Toxic dust from open pits, roads, and processing facilities can result in the contamination of aquatic habitat and contribute to the bioaccumulation of toxins, such as PAHs and heavy metals, in fish tissue. PAHs can be found in gasoline and diesel vehicle exhaust, fuel spills and leaks, and in dust shed during vehicle wear (Wang et al. 2016). Organisms are then exposed to these contaminants via uptake from sediments by aquatic microbes, plants, and benthic-living and filter-feeding invertebrates (Poteat and Buchwalter 2014). These compounds are toxic to fish, amphibians, and aquatic invertebrates and are known to bioaccumulate through trophic levels (Fisher 1995). Fish and amphibians consume the lower trophic level organisms, and the toxins then remain in the environment and bioaccumulate up trophic levels over time (Fisher 1995). Consumption of fish contaminated with PAHs may constitute human health risks if populations are exposed to hazardous levels, which can vary by duration of exposure, concentration of PAHs, and amount and type of food consumed (European Commission 2002; Wickliffe et al. 2014).

Several mines have employed mitigation measures in an effort to minimize potential impacts from toxic dust. Studies show that even with the use of hydraulically sealed lids, truck rinsing procedures, and several other minimization measures, ore concentrates can be transported up to 2.5 miles (4 kilometers) from the Red Dog Mine haul road and low levels much farther (Hasselbach et al. 2005; Neitlich et al. 2017). Toxins released into the environment would enter aquatic habitats and bioaccumulate in fish tissues, as discussed above. While mitigation measures would help to minimize the severity of impacts, total avoidance of impacts to fish habitat from toxins generated during mining operations may not be possible. Of particular concern is the potential Sun mine site’s location within the Beaver Creek drainage, which flows directly into the Kobuk River sheefish spawning grounds.

The Alatna River is the most important spawning area for sheefish and other whitefish species in the upper Koyukuk River drainage (Brown 2009). If any one of the 4 most advanced, large-scale mines were developed, there would be an influx of people in this region. To accommodate for this change, additional commercial flights could be added at lower costs, which may make recreation more inviting in this area. An increase in recreational fishing has the potential to affect subsistence harvest. While access aside from industrial use is not being considered, fishing pressure could impact the sheefish population and availability of this species for subsistence harvest if that were to change in the future. Reasonably foreseeable routes and roads established off of the proposed road as well as the increase in traffic from commercial goods may expand the fugitive dust zone and increase sedimentation and the potential for spills. Additionally, mine haul roads, such as the reasonably foreseeable spur roads in the Kobuk River watershed, can impact fish habitat via fugitive dust, contamination of roadside vegetation with heavy metals, and road runoff (Trombulak and Frissell 2000). Road construction that increases levels of fugitive dust or disturbs river channel stability has the potential to negatively impact sheefish spawning and rearing habitat, particularly in association with the Sun prospect, which drains into known sheefish spawning habitat in the Kobuk River. Juvenile sheefish may also experience decreased feeding success as a result of increased turbidity from road dust and declines in invertebrate abundance. Fugitive dust may also cause early snowmelt (Walker and Everett 1987), which could result in an increase in soil

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16 Alaska Dam Safety Program regulates any dam that impounds 50 acre-feet or more and is 10 feet high; is 20 feet high; or would threaten lives and property if failed (DNR 2003).

17 Alaska Statute 46.17.020 requires the ADNR to employ a professional engineer to “supervise the safety of dams and reservoirs” in Alaska.

temperatures, rapid decomposition of organic matter, and potentially hypoxia in shallow water bodies and pools in wetlands.

Development of mines as a result of any action alternative would lead to increased traffic on the existing road system between the Dalton Highway turnoff and the Alaska Railroad yard in Fairbanks (see Table 2-5). Increased traffic in these areas would increase the potential for contaminants by way of roadway runoff and accidental spills into streams crossed, including the accidental spills of toxic, mine-related chemicals, ore, or wastes. Indirect impacts to fish could result from road maintenance, such as grading, snow plowing, and de-icing, potentially introducing additional toxins or sediment into streams and wetlands. Upgrades to existing culverts and bridges along the Dalton Highway may improve habitat and passage conditions in the affected stream systems.

Construction of any of the action alternatives would reduce connectivity to and degrade the quality of habitat that supports salmon, sheefish, broad and humpback whitefish, burbot, Arctic grayling, Northern pike, Alaska blackfish, and several other fish species as a result of modifying drainage patterns and installing conveyance structures in more than 1,000 streams[18] across more than 200 miles of the project area. Appendix E, Chapter 3 Biological Resources Tables and Supplemental Information, Table 16, identifies fish species that may be affected. Several studies show that habitat downstream of culverts contains more fine sediment, less dissolved oxygen, and increased water temperatures as compared to habitat in streams crossed by bridges. Tanner (2008) found that spawning occurred in areas of the Selawik River with low slopes and high sinuosity, areas that are particularly susceptible to sediment accumulation and loss of bed stability as a result of road construction. A recent study of fish assemblages and habitat at industrial road crossing sites in the boreal forest found that culverts often create changes in species composition and fish density both upstream and downstream (Maitland et al. 2016).

To reduce the likelihood and severity of potential impacts to fish and aquatic life, AIDEA has committed to using stream simulation design principles per USFS guidelines (2008) for all culverts placed in streams that support resident or anadromous fish. While physical habitat alteration within a given stream may be fairly localized, the project would affect more than 1,000 mapped streams, so impacts would be widespread. AIDEA's design commitments (Chapter 2, Section 2.4.4, of the EIS) would minimize, but not eliminate, adverse impacts to fish and aquatic habitat. While AIDEA proposes to provide fish passage for all perennial streams and those well-defined ephemeral streams determined to support fish, the road embankment would change overland flow, change surface and groundwater flow patterns, in some cases would cut off and/or reduce access to wetland and low-lying off-channel habitats (e.g., seasonally flooded areas) that may support rearing and feeding fish seasonally (Forman and Alexander 1998; Trombulak and Frissell 2000; Daigle 2010; Creamer 2019).

As discussed in Chapter 3, Section 3.3.2 (Fish and Amphibians), of the EIS, AIDEA assumes that all perennial rivers and streams provide fish habitat and that some well-defined ephemeral streams likely provide fish habitat (see AIDEA's SF299). AIDEA proposes to provide fish passage at all crossings of perennial and well-established ephemeral channels that support fish using stream simulation design principles (Chapter 2, Section 2.4.4; Appendix E, Table 17). AIDEA made an estimate at the application stage of the number of major, moderate, and minor culverts that would be needed for the project. The moderate culverts, major culverts, and bridges proposed would likely satisfy State of Alaska's fish passage requirements; however, additional site-specific information may be necessary during the

[18] Based on spatial review of alternatives' crossings of streams in the National Hydrography Dataset, AWC and streams mapped by DOWL and assumed by AIDEA to support fish habitat (received GIS data in 2019). Wetland and stream mapping produced by DOWL (2014) was based on aerial photograph interpretation, site photographs, Light Detection and Ranging 2-foot contours, and 1:24,000 scale hydrologic stream data. DOWL (2014) cautions that densely vegetated habitats precluded the identification of some small drainages (less than 12 feet wide). Additional field data collection would be necessary to document all streams.

permitting stage to refine design. The majority of culverts in AIDEA's application are identified as minor culverts (i.e., 3 feet or less in diameter). AIDEA proposes to use minor culverts to cross perennial streams and ephemeral streams, maintain hydrologic continuity between wetlands, and facilitate cross-drainage. In some cases, 3-foot-diameter culverts may not be large enough to provide fish passage, particularly given that stream simulation design would be used for all fish passage culverts, per AIDEA's design commitment (Chapter 2, Section 2.4.4). However, ADF&G would likely require that additional surveys be conducted at stream crossings, particularly where fish data are lacking, to inform culvert design during permitting.[19] At the construction stage, AIDEA will be required to use culverts designed appropriately for the drainage and to meet fish passage requirements where necessary, even if their application stage estimate was different. Without regional-specific data regarding distribution of fish species, AIDEA assumes that fish are present in all waterbodies, in the absence of data showing they are not present. Assuming that culverts are designed and maintained to allow fish passage during natural migration periods, impacts from conveyance structures may be fairly localized within a given stream but widespread across the region since the road would traverse hundreds of small and large fish streams. If culverts did not maintain hydrology and fish passage, adverse impacts to fish species abundance, distribution, and potentially populations would result. Properly employed design features (Chapter 2, Section 2.4.4, of the EIS) and potential mitigation measures (as described in Appendix N) would minimize, but not eliminate, potential impacts to fish and amphibians related to road construction, operation, and maintenance.

Gravel mining in floodplains would negatively affect aquatic habitat and may affect egg survival rates in nearby spawning habitats. Management plans for the existing Indian River and Hogatza River Areas of Critical Environmental Concern (ACECs)[20] indicate that material sites should not be located in the active floodplain of any stream within these ACECs. Appendix N outlines a potential mitigation measure to prevent material extraction within an active floodplain on BLM-managed lands. On lands outside of BLM jurisdiction, prohibiting location of material sites in active floodplains would minimize impacts to fish habitat from gravel mining and reduce the project's cumulative impact to fish and aquatic life. The road and associated infrastructure has the potential to degrade habitat quality and may affect populations of salmon, whitefish, and other species in this region. The potential for the road to accelerate the predicted rate of climate-driven permafrost degradation, which would further degrade downstream water quality, potentially inhibit fish movement, and may alter species distribution and abundance, is also of concern (Evengard et al. 2011; Moquin and Wrona 2015; O'Donnell et al. 2017). Constructing and maintaining roads and other infrastructure built on thawing permafrost is poorly understood (Ljunggren and Rocha 2011 as cited in Limpinsel et al. 2017). However, with appropriate thermal modeling prior to road construction, and the compliance of a Stormwater Pollution Prevention Plan, some impacts from permafrost degradation and associated effects may be reduced.

Climate change is predicted to continue impacting freshwater fish habitat availability, quality, and connectivity within and beyond the project area. The action alternatives and RFAs may further exacerbate ongoing changes to the landscape (see Chapter 3, Section 3.3.2 [Fish and Amphibians], in the EIS), such as accelerating permafrost thaw, reducing fish habitat quality, and changing water temperature regimes. Impacts to freshwater fish populations as a result of climate change appear inevitable, and outcomes such as range shifts, thermal stress, reduced survivorship, reduced production, and local extirpation are possible (Reist et al. 2006; Wrona et al. 2006; Wassmann et al. 2010). Thawing permafrost would potentially result in roadway embankment damage or changes in culvert inverts or alignments during the

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[19] The Fishway Act (AS 16.05.841) requires ADF&G authorization for activities within or across a stream, including ephemeral streams, used by fish if such an activity may impede the efficient passage of resident or anadromous fish.

[20] The *Resource Management Plan and Record of Decision for the Central Yukon Planning Area* (BLM 1986) identifies areas having values requiring levels of protections above those normally afforded under public land management. Indian River and Hogatza river tributaries (combined watershed of Clear, Caribou, and Bear creeks) were designated in the plan for the protection of aquatic habitat.

life of the project. Roads built on thawing permafrost could collapse and potentially increase the likelihood of accidents and impacts associated with spills (Limpinsel et al. 2017). However, regular maintenance would minimize the potential for such impacts. Reduction in habitat connectivity between streams and wetlands due to installation of culverts and climate-induced fluctuations in water levels can negatively impact fish species at all life stages and reduce foraging success and production (Prowse et al. 2006). Arctic freshwater ecosystems are complex, and predicting the exact ways in which the road would impact the landscape and developing mitigation strategies to ameliorate the impacts are especially challenging given the data currently available.

Construction of the road would lead to the development of large-scale hard rock mines near habitat that is essential for Chinook, chum, and coho salmon; sheefish, broad and humpback whitefish, Arctic grayling, and several other species that are integral to the subsistence practices throughout this region. Mining and its associated activities have the potential to cause significant impacts to habitat structure, quality, and function, particularly if mitigation measures were to fail. Hard rock mining would disrupt natural surface and groundwater interactions and processes, may reduce essential fish habitat, likely decrease water quantity and has the potential to degrade water quality, reduce biodiversity, fish production, and may require treatment of toxic mine water in perpetuity (Woody et al. 2010; Hughes et al. 2016; Limpinsel et al. 2017). Toxic metals that bioaccumulate in fish tissue can lead to fish mortality, increased susceptibility to disease, reduced growth rates, and pose health risks to human consumers (Hughes et al. 2016). Agencies with jurisdiction would propose mitigation measures to avoid and minimize water quality impacts; however, that does not ensure that the measures would be fully effective. In addition, typical mitigation measures are dependent on continual monitoring, maintenance, and compliance, which can be difficult to enforce.

Several of the prospects within the Ambler Mineral Belt are located on tributaries that drain directly into or downstream of the Kobuk River sheefish spawning grounds. Given the proximity of the road and other foreseeable future actions to the Kobuk River sheefish spawning grounds and the large numbers of sheefish that migrate to and spawn in this limited habitat, sheefish may be more vulnerable to population-level effects than other species. Eleven sheefish spawning locations are documented in Alaska, and 2 (the Kobuk and Alatna rivers) would be at risk of potentially serious impact in the event of an accidental spill or failed mitigation, for example. In Northwest Alaska, the entire sheefish population spawns in 2 locations, the Kobuk River spawning grounds and the Selawik River drainage. The Kobuk River spawning grounds, located in the study area, support "the largest population of spawning sheefish in northwestern Alaska (Taube and Wuttig 1998; Scanlon 2009:7). The importance of this habitat for the Kobuk River sheefish population, and ultimately to the communities that depend on this species, cannot be overstated. Of the 4 most advanced mine projects, Smucker is located farthest away from the Kobuk River spawning grounds, within the Ambler River drainage. The Sun Project is located in the Beaver Creek drainage, which flows directly into the Kobuk River sheefish spawning area. The Arctic and Bornite projects are located in the Shungnak River drainage, which drains into the Kobuk River downstream of known sheefish spawning habitat. Mining-related water quality impacts near sheefish spawning habitat would have the potential to devastate or severely affect the Kobuk River sheefish population, particularly if mitigation measures were to fail. The road east of the Ambler Mining District could also negatively affect the Alatna River whitefish spawning grounds, as well as several essential fish habitat streams that support Pacific salmon.

The road, reasonably foreseeable future development, and climate change would affect individual fish in localized areas and have the potential to affect the resilience and strength of fish populations across the region. Cumulatively, the project has the potential to cause very substantial, long-term impacts to fish and aquatic life that could lead to very substantial impacts on subsistence use practices in the region, even with mitigation measures in place. Sheefish and other whitefish species may be most vulnerable to such impacts since large numbers of fish spawn in relatively small, geographically distinct areas. However, water quality impacts have the potential to cause major changes in distribution and abundance Pacific salmon and other important fish species in this region. The Chinook salmon population has been declining for decades for unknown causes, and restrictions on Chinook salmon harvest have resulted in increased harvest of chum salmon in the Yukon River basin (McKenna 2015; Larson et al. 2017). In 2019, thousands of adult salmon died, prior to spawning, in streams throughout Alaska, likely due to the warmer than normal water temperatures (Westley 2019; Quinn-Davidson 2019).[21] Scientists estimate that thousands of adult salmon in the Koyukuk River died from heat stress prior to spawning in 2019 (Westley et al. 2019; Quinn-Davidson 2019). While Pacific salmon species are resilient, it is difficult to assess at what point individual impacts may tip the balance and cumulatively stress fish to the point of causing population-level affects or cumulatively affecting species' resilience. Further, Pacific salmon are an important prey species for bears and other carnivores, as well as other fish species, through the direct consumption of migrating adults, deposited eggs, carcasses, and juvenile fish (Gende et al. 2002). The decomposition of their carcasses also provides marine-derived nutrients to the aquatic and terrestrial environments throughout the landscape, supporting primary production in lakes and streams, and riparian vegetation growth (Cederholm et al. 1999; Schindler et al. 2003). Thus, reduction in salmon populations leading to a decline of available marine derived nutrients could have broad-scale impacts on the ecosystem throughout the project area.

3.4.3 Birds

The potential impacts of the action alternatives on birds are described in Chapter 3, Section 3.3.3 (Birds), of the EIS. The past and present actions that have affected birds throughout the cumulative effects analysis area are described in Section 2.3.2 (Past and Present Actions), and the current condition of birds and bird habitat is described in Chapter 3, Section 3.3.3 (Birds), of the EIS and BLM 2016. No past or present actions in the analysis area have resulted in notable impacts on birds. Small-scale community development, subsistence activities, placer mining, recreation, construction and use of the Dalton Highway, and construction of TAPs have removed or altered habitat for birds in the region. Climate change has also potentially affected bird habitat and bird behavior in the analysis area through minor changes in land cover, seasonal weather patterns, timing of breeding and nesting, survival, and changes in species assemblages. Climate change and other anthropogenic perturbations have likely influenced migratory birds on their wintering grounds or along their migratory flyways, and may subsequently affect species diversity and abundance in the analysis area. However, in general, the analysis area is currently in a condition devoid of influence by anthropogenic disturbances that affect birds in a measurable way. The establishment of national parks, preserves, and wildlife refuges in the project area helped to conserve intact habitat for local bird populations.

RFAs that may affect birds within the analysis area are described in Section 2, Reasonably Foreseeable Actions. Development of the advanced mining scenario and community road access would have the greatest impacts on birds and their habitat. Other RFAs described in Section 2.3.3 (Other Reasonably Foreseeable Actions) could also affect birds.

The development of the District and community access roads would result in habitat loss, alteration, and fragmentation of avian breeding, nesting, foraging, staging, and stopover habitat. Habitat impacts due to the mines is anticipated to be thousands of acres, not including access roads (Table 2-10). Secondary access roads connecting communities could range from a few miles to over 100 miles in length (Table 2-11). The mines, mining roads, and secondary access roads would increase habitat fragmentation

[21] Heat stress during spawning migration has the potential to cause substantial prespawn mortality of adult fish (Gilhousen 1990; USGS 2020). Climate models have for years predicted that water temperatures in Alaska would warm to unhealthy temperatures for salmon, so for those reasons the salmon deaths in 2019 were not a surprise (Westley et al. 2019).

exponentially. The fragmentation of habitat would further create anisotropic barriers to movement (Belisle and St. Clair 2001) and remove usable habitat for birds, which could force range shifts, increase competition for resources, and increase predation rates (Angelstam 1986, NCASI 2008). Fragmentation can also create habitat for species that prefer forest edges or generalist species that use anthropogenic infrastructure.

Disturbance and displacement impacts on birds due to RFAs would be similar in nature to those described in Chapter 3, Section 3.3.3 (Birds), of the EIS. Impacts to birds from any of the action alternatives in combination with the any of the cumulative actions that include construction, mining activities (including machinery use and blasting), road use, and air traffic would be both additive and synergistic to any of the action alternatives. Arctic oil development, expansion of the Red Dog mine, and improvements to the Dalton Highway would result in similar impacts as the action alternatives, resulting in additive cumulative impacts and interacting synergistically with avian species that use habitat in the project, particularly migratory species. The impacts of climate change on birds will also interact synergistically with the action alternatives as described below. Most of the RFAs would occur on non-federal lands, where BLM special status species policy (BLM 2008b) and Alaska statewide land health standards (BLM 2004) would not apply. Vegetation removal activities would result in injury and mortality of birds and destruction of nests. In addition, the introduction of contaminants and hazardous substances to the soil and waterbodies, including the presence of tailings ponds, would increase avian mortality, particularly among waterbirds, shorebirds, and larids.

Climate change is expected to continue to affect bird populations across their ranges, but will be most pronounced in the Arctic. Within the project area, the effects of climate change are anticipated to include higher average temperatures, increased intensity of weather events, changes in the wildfire regime, shifts in vegetation distribution, increase in insect abundance, increase in pathogens, a change in the abundance of predators, shifts in trophic cascades, and changes in ecosystem function and ecosystem services (Marcot et al. 2015; Mallory and Boyce 2018). The effects of these changes on birds will generally be negative, but would be variable depending on individual species' life history. Marcot et al. (2015) projected that about 52 percent of bird species would experience an increase in medium- and high-use habitats, while 45 percent would experience a decrease. Of particular concern is the decline in the habitat of small mammals that form the prey base for raptors.

The indirect and cumulative impacts on birds from development of the District, development of secondary access roads, and other development and activities in the analysis area would be additive to and synergistic with the action alternatives. Habitat loss and alteration due to the reasonably foreseeable development of the District could more than equal that from the road and exponentially increase fragmentation of avian habitat. Disturbance and displacement from mining activity would be in addition to disturbance due to road construction and use. Warming Arctic conditions combined with other cumulative actions and may increase wildfires, change the abundance and distribution of forage and nesting habitat, or increase the prevalence and intensity of weather events. The accumulation of impacts on birds would be similar regardless of the action alternative selected. As described above, RFAs not associated with AIDEA's proposal would affect birds and bird habitat in the analysis area. The impacts of climate change on birds, described above, would occur equally under the action alternatives and No Action Alternative.

3.4.4 Mammals

Caribou

The cumulative effects analysis area for caribou includes the entire range of the Western Arctic Herd (WAH), Ray Mountains Herd (RMH), and Hodzana Hills Herd (HHH). The potential impacts of the action alternatives on caribou are described in Chapter 3, Section 3.3.4 (Mammals), of the EIS. The past and present actions that have affected caribou throughout the analysis area are described in Section 2.3 (Past, Present, and Other Reasonably Foreseeable Actions), and the consequences of those actions are described in Chapter 3, Section 3.3.4 (Mammals), of the EIS and BLM 2016. Notable past actions that have affected WAH caribou include North Slope oil exploration and extraction, particularly in the northeast NPR-A, including construction of the TAPS and Dalton Highway; passage of ANILCA, resulting in establishment of national parks and national wildlife refuges throughout the analysis area; construction and operation of the Red Dog Mine and the DeLong Mountain Transportation System; reindeer herding on the Seward Peninsula; increased sport hunting; and climate change. The WAH population grew rapidly from the 1970s to early 2000s, but has declined over the last 10 to 15 years (Appendix A, Figures, Figure 3-1). Traditional knowledge from local residents suggests there have been dramatic changes in caribou distribution over the last 50 or more years (WAH Working Group 2015, 2016). Since the 1980s, declines in overall lichen abundance have occurred due to caribou overgrazing, wildfire, and climate change (Joly et al. 2006, 2007; BLM 2019).

In contrast, few past and present actions have affected the RMH and Hodzana Hills Herd (HHH). Wildfire, climate change, and fluctuations in predator abundance have likely affected RMH and HHH caribou, but the magnitude and extent of these effects have not been studied. Construction of the TAPS and Dalton Highway have likely affected the distribution of RMH and HHH over time. Only Alternatives A and B would directly affect HHH caribou and only Alternative C would directly affect RMH caribou, as described in Chapter 3, Section 3.3.4 (Mammals), of the EIS.

RFAs that may affect caribou within the analysis area are described in Section 2, Reasonably Foreseeable Actions. These include the mining development scenario, indirect road access scenario, and other actions located throughout the range of the WAH. For example, new oil and gas development in the NPR-A, expansion of the Red Dog Mine, and small-scale development in communities of the North Slope and Northwest Alaska boroughs could affect WAH caribou outside of the project area. Impacts in this area could affect caribou during calving, post-calving, or summer. Habitat impacts in these ranges could have greater impacts than similar amounts of habitat loss in other range types. Disturbance, particularly during calving and post-calving can affect survival and productivity.

The development of mines within the District and secondary access roads would result in habitat loss, alteration, and fragmentation of WAH caribou migratory and winter range. Habitat impact due to the anticipated mines is predicted to be thousands of acres, not including access roads (Table 2-10). Secondary access roads connecting communities could range from a few miles to over 100 miles in length (Table 2-11). The mines, mining roads, and secondary access roads would increase habitat fragmentation exponentially. Noise impacts similar to those discussed in Chapter 3, Section 3.4.4 (Visual Resources), in the EIS would be expected to occur and contribute the habitat fragmentation. The fragmentation of habitat would further remove usable habitat for caribou during migration and winter, which could force range shifts, increase competition for resources, or increase predation (NCASI 2008).

Active mines include large vehicles, machinery, blasting, and humans on foot, all of which may disturb caribou and result in displacement. In Newfoundland, caribou avoided areas within 2.5 miles (4 kilometers) of an active mine (Weir et al. 2007). Boulanger et al. (2012) observed decreased probability of occurrence out to 8.6 miles (14 kilometers) from an active mine in the Northwest Territories. In Quebec and Labrador, caribou avoidance of an active mine ranged from no displacement up to 14.3 miles (23 kilometers; Plante et al. 2018). Migrating caribou would encounter a network of active roads and industrial development that does not exist elsewhere in their range. It is much more likely that a system of roads would jeopardize long-distance migration than any single road (Joly et al. 2018). Increasing road density in the Kuparuk field resulted in avoidance and changes in distribution of the Central Arctic Herd on the Arctic Coastal Plain during calving. Areas of high road density resulted in up to 86 percent declines in caribou density in those areas (Nellemann and Cameron 1998), and subsequent crowding in other areas. Also on the Arctic Coastal Plain caribou reduced their use of habitat close to development during calving and during post-calving (Johnson et al. 2019). There is concern that multiple intersecting roads may create a corralling effect on caribou, which could delay their movement, increase stress levels, or prevent access to suitable habitat (NSB 2014).

Contamination of local browse and waterbodies with hazardous mining waste, mining dust, or other contaminants due to spills, accidents, or non-point source leaks could occur, despite potential mitigation measures to prevent spills and procedures to clean up contaminated soils and water, and would be harmful to caribou. Traffic on mining access roads would increase collision potential. Changes in hunting activity may either reduce pressure or increase pressure in areas of increased density away from the District.

Climate change is proceeding at an accelerating pace in the Arctic. In northwestern Alaska, climate change and associated changes in weather patterns and temperatures are affecting disturbance (fire) regimes, land cover, insect abundance, disease prevalence, invasive species, and predator abundance (Mallory and Boyce 2018). Effects of climate change have been observed and are anticipated to increase rapidly throughout the century (Joly et al. 2006; Joly and Klein 2011). Tundra fires are expected to increase in size and frequency due to climate change. Burned areas generally shift from lichen to graminoid cover and persist for many years. Warmer temperatures will accelerate this transition and could result in regional declines in preferred winter forage for WAH caribou (Jandt et al. 2008). Joly et al. (2012) predicted a decrease in high-quality winter forage approaching 30 percent in WAH winter range due to climate change induced fires. An intensification of winter weather events (including increased snow depth) and increase in icing events may prevent access to forage and reduce fitness (Joly and Klein 2011; Mallory and Boyce 2018). An increase in early successional habitats combined with shifts in shrub cover could increase moose abundance as much as 19–24 percent (Joly et al. 2012). An increase in moose abundance would be followed by an increase in predators, such as wolves, which could in turn affect caribou populations. Warmer temperatures may also enhance insect populations that stress and irritate caribou and increase prevalence of disease vectors (Joly 2017; Mallory and Boyce 2018).

The indirect and cumulative impacts from development of mines within the District, development of secondary access roads, and other development or activities elsewhere in the WAH range would be additive to and synergistic with the action alternatives. Habitat loss and alteration due to the reasonably foreseeable development of the District could equal or exceed that from the road itself (Table 2-10) and increase fragmentation of migratory and winter range. Impacts on caribou similar to those described above would occur from additional roads. However, the resulting road networks would increase the magnitude of impacts on caribou, and mining activities would result in a greater intensity of disturbance and displacement. These activities would occur in addition to habitat loss and human activities in WAH summer range or elsewhere on their migratory range. Finally, climate change would act synergistically with other cumulative actions and may increase wildfires, alter predator-prey dynamics, change browse availability and distribution, or increase the prevalence of harsh winter weather events.

Alternative C is the only alternative that would directly affect RMH caribou. Four clusters of State mining claims are noted in the Ray Mountains (see Volume 4, Map 3-25). Under Alternative C, the development of these mining claims would be more likely to occur than under other alternatives, because the road would make these claims more accessible. However, because there are not applications for mining permits on these claims, their development is possible but the nature of any development is more speculative. If these claims in the Ray Mountains were to develop during the lifetime of the Ambler Road, the developments would result in cumulative impacts on RMH caribou. Due to the small population and restricted range of the RMH, development on this large number of claims (14,820 acres) could affect the long-term viability of the herd.

The RFAs identified in Section 2.3.3 (Other Reasonably Foreseeable Actions) and Table 3-1 would affect caribou and caribou habitat in the analysis area. The RFAs that would result in land disturbing activities would act additively and synergistically with the action alternatives and result in similar impacts to those described above and in Chapter 3, Section 3.3.4 (Mammals), of the EIS. The impacts of climate change on caribou, described above, would occur equally under the action alternatives and No Action Alternative.

Other Large Herbivores

The cumulative effects analysis area for other large herbivores includes the project area and the ore transportation route south on the Dalton Highway to Fairbanks and via train to a port in Southcentral Alaska. The potential impacts of the action alternatives on other large herbivores are described in Chapter 3, Section 3.3.4 (Mammals), of the EIS. The past and present actions that have affected large herbivores throughout the analysis area are described in Section 2 (Reasonably Foreseeable Actions), and the current condition of large herbivore populations and their habitat are described in Chapter 3, Section 3.3.4 (Mammals), of the EIS and BLM 2016. Notable past actions that have affected moose include: construction of the Dalton Highway and railroads from interior to Southcentral Alaska; passage of ANILCA, resulting in establishment of national parks and national wildlife refuges throughout the analysis area; establishment of ACECs intended to conserve and study large herbivores; establishment of the Koyukuk River Moose Hunter's Working Group; State of Alaska predator control measures; increased sport hunting; and climate change. The same past actions have affected Dall sheep and muskox. The Ray Mountains may have been historically occupied by Dall sheep, but they are not currently present (BLM 2016). Muskox reintroduction on the Seward Peninsula and Cape Thompson was an important past action for that species (BLM 2016).

RFAs that may affect large herbivores within the analysis area are described in Section 2 (Reasonably Foreseeable Actions) and Table 3-1. These include the mining development scenario, indirect road access scenario, and other actions, such as reintroduction of Dall sheep (BLM 2016) or expansion of muskox range in areas potentially affected by the action alternatives or cumulative actions. The development of the District and secondary access roads would result in habitat loss, alteration, and fragmentation of ungulate habitat. Habitat loss due to the mines is predicted to be thousands of acres, not including access roads (Table 2-10). Secondary access roads connecting communities could range from a few miles to over 100 miles in length (Table 2-11). The mines, mining roads, and secondary access roads would increase habitat fragmentation exponentially. The fragmentation of habitat would further remove usable habitat for moose and other large herbivores during winter, which could force range shifts, increased competition for resources, or increased predation (NCASI 2008). Moose may also be attracted to disturbed areas and habitat edges where early successional vegetation is plentiful.

Active mines include large vehicles, machinery, blasting, and humans on foot, all of which may disturb moose and result in displacement. Moose would encounter a network of active roads and industrial development that does not exist elsewhere in their range. Contamination of local browse and waterbodies with hazardous mining waste, mining dust, spills, or other mining accidents could occur, despite potential mitigation measures to prevent spills and procedures to clean up contaminated soils and water, and would be harmful to moose. Traffic on mining access roads would increase collision potential. Increased traffic on the Dalton Highway and increased railroad traffic from Fairbanks to Southcentral Alaska may lead to increased moose mortalities along these transportation routes. Changes in hunting activity may either reduce pressure or increase pressure in areas of increased density away from the District.

Unlike the action alternatives, development of the District would likely affect alpine habitat where Dall sheep may be present. Habitat loss in alpine habitats could have a greater impact on alpine obligates like Dall sheep due to naturally limited and fragmented habitat patches. It is possible that some individuals from nearby muskox herds could enter the District; however, impacts to this species would likely be minimal as the mines would be located at the periphery of its range.

Effects of climate change are proceeding at an accelerated pace in the Arctic. In northwestern Alaska, climate change and associated changes in weather patterns and temperatures are affecting disturbance (fire) regimes, land cover, insect abundance, disease prevalence, invasive species, and predator abundance (Mallory and Boyce 2018). Effects of climate change have been observed and are anticipated to increase rapidly throughout the century (Joly et al. 2006; Joly and Klein 2011). Tundra fires are expected to increase in size and frequency due to climate change. Following fires, early successional vegetation provides quality browse for moose. Warmer temperatures would cause a shift in shrub cover to higher elevations and an expansion of moose range. However, the same upward shift in vegetation would reduce available habitat for Dall sheep. An intensification of winter weather events (including increased snow depth) and increase in icing events may prevent access to forage and reduce fitness for all herbivores (Joly and Klein 2011; Mallory and Boyce 2018). An increase in early successional habitats combined with shifts in shrub cover, could increase moose abundance as much as 19–24 percent (Joly et al. 2012). An increase in moose abundance would be followed by an increase in predators, such as wolves. Warmer temperatures may also enhance insect populations and increase prevalence of disease vectors (Joly 2017; Mallory and Boyce 2018).

The indirect and cumulative impacts from development of the District, development of secondary access roads, and other development or activities throughout the analysis area would be additive to and synergistic with the action alternatives. Habitat loss and alteration due to the reasonably foreseeable development of the District could equal or exceed that from the road itself (Table 2-10) and exponentially increase fragmentation of ungulate habitat. Impacts on moose similar to those described above would occur from additional roads. However, the resulting road networks would increase the magnitude of impacts on moose, and mining activities would result in a greater intensity of disturbance and displacement. The mines could encroach on Dall sheep alpine habitat and approach the periphery of muskox range. Climate change would act synergistically with other cumulative actions and may increase wildfires, change browse availability and distribution, or increase the prevalence of harsh winter weather events. Climate change would be additive to the development of mines by reducing suitable habitat for Dall sheep. Reintroduction of Dall sheep to the Ray Mountains has been discussed (BLM 2016). Alternative C could directly impact Dall sheep if they were present, or the presence of a road and its impacts on sheep may preclude reintroduction by the ADF&G.

Large Carnivores

The cumulative effects analysis area for large carnivores includes the project area and the ore transportation route south on the Dalton Highway to Fairbanks and via train to a port in south-central Alaska. The potential impacts of the action alternatives on large carnivores are described in Chapter 3, Section 3.3.4 (Mammals), of the EIS. The past and present actions that have affected large carnivores throughout the analysis area are described in Section 2 (Reasonably Foreseeable Actions) of this document and are reflected in discussion of the Affected Environment in Chapter 3, Section 3.3.4 (Mammals), of the EIS and BLM 2016. Notable past actions that have affected large carnivores include construction of the Dalton Highway and railroads from Interior to Southcentral Alaska; passage of ANILCA, resulting in establishment of national parks and national wildlife refuges throughout the analysis area; establishment of ACECs intended to conserve and study large herbivores; establishment of the Koyukuk River Moose Hunter's Working Group; State of Alaska predator control measures; increased sport hunting and trapping; and climate change.

RFAs that may affect large carnivores within the analysis area are described in Section 2 (Reasonably Foreseeable Actions) and Table 3-1. These include the mining development scenario, indirect road access scenario, and other actions. The development of the District and secondary access roads would result in habitat loss, alteration, and fragmentation of bear and wolf habitat. Development of the mines, in contrast to Alternatives A and B, would remove alpine habitat where wolverines are more common and would remove potential grizzly denning habitat. Habitat impacts due to the mines is predicted to be thousands of acres, not including access roads (Table 2-10). Secondary access roads connecting the communities most likely to pursue access would be a few miles long (Table 2-11). The mines, mining roads, and secondary access roads would increase habitat fragmentation exponentially. The fragmentation of habitat would lead to displacement, which could force range shifts into lower quality habitat or could increase intraspecific competition for prey and territory (NCASI 2008).

Active mines include large vehicles, machinery, blasting, and humans on foot, all of which may disturb large carnivores and result in displacement. Carnivores would encounter a network of active roads and industrial development that does not exist elsewhere in their range. Tolerance of human activity varies among species, but wolves and wolverines are particularly sensitive to industrial activity. Contamination of local waterbodies or land with hazardous mining waste (especially due to a large spill or tailings breach) or mining dust could occur and would be harmful to all local wildlife, including the carnivores' prey species as described above. A spill or breach, especially into a waterbody, would affect fish and aquatic species and the effects would ripple through the predator-prey ecosystem. Traffic on mining access roads would increase collision potential. Increased traffic on the Dalton Highway and increased railroad traffic from Fairbanks to Southcentral Alaska may lead to increased mortalities along these transportation routes. Changes in hunting activity may either reduce pressure or increase pressure in areas of increased density away from the District.

Climate change is proceeding at an accelerated pace in the Arctic. In northwestern Alaska, climate change and associated changes in weather patterns and temperatures, are affecting disturbance (fire) regimes, land cover, insect abundance, disease prevalence, invasive species, and predator-prey dynamics (Mallory and Boyce 2018). Effects of climate change have been observed and are anticipated to increase rapidly throughout the century (Joly et al. 2006; Joly and Klein 2011). As described above, an increase in early successional habitats combined with shifts in shrub cover, could increase moose abundance as much as 19–24 percent (Joly et al. 2012). This would increase wolf and bear prey availability. An intensification of winter weather events may reduce fitness in wolf populations (Mallory and Boyce 2018). Warmer temperatures may also enhance insect populations and increase prevalence of disease vectors (Joly 2017; Mallory and Boyce 2018).

The indirect and cumulative impacts from development of the District, development of secondary access roads, and other development or activities throughout the analysis area would be additive to and synergistic with the action alternatives. Habitat loss and alteration due to the reasonably foreseeable development of the District could equal or exceed that from the road itself (Table 2-10) and exponentially increase fragmentation of carnivore habitat. Similar impacts on large carnivores as described above would occur from additional roads. However, the resulting road networks would increase the magnitude of impacts on carnivores and mining activities would result in a greater intensity of disturbance and displacement. The mines would encroach on wolverine alpine habitat and potential grizzly bear denning habitat. Climate change would act synergistically with other cumulative actions and may increase wildfires, change prey abundance and distribution, or increase the prevalence of harsh winter weather events. The ADF&G manages populations of all species for continued viability. As indicated, populations may shift and individual may not successfully compete for habitat, but indirect and cumulative effects are not expected to put species or broad populations at risk in the study area.

Small Mammals

The cumulative effects analysis area for small mammals includes the project area and the ore transportation route south on the Dalton Highway to Fairbanks and via train to a port in Southcentral Alaska. The potential impacts of the action alternatives on small mammals are described in Chapter 3, Section 3.3.4 (Mammals), of the EIS. The past and present actions that have affected small mammals throughout the analysis area are described in Section 2 (Reasonably Foreseeable Actions) of this document and are reflected in the Affected Environment discussion in Chapter 3, Section 3.3.4 (Mammals), of the EIS and BLM 2016. Notable past actions that have affected small mammals include: passage of ANILCA resulting in establishment of national parks and national wildlife refuges throughout the analysis area; increased sport hunting and trapping; and climate change.

RFAs that may affect small mammals within the analysis area are described in Section 2 (Reasonably Foreseeable Actions). These include the mining development scenario, indirect road access scenario, and other actions (BLM 2016). Development of the District and secondary access roads would result in habitat loss, alteration, and fragmentation of small mammal habitat. Habitat impacts due to the mines is predicted to be thousands of acres, not including access roads (Table 2-10). Secondary access roads connecting communities could range from a few miles to over 100 miles in length (Table 2-11). The mines, mining roads, and secondary access roads would increase habitat fragmentation. The fragmentation of habitat would further remove usable habitat for small mammals, which could force displacement, increased competition for resources, or increased predation (NCASI 2008).

Active mines include large vehicles, machinery, blasting, and humans on foot, all of which may disturb small mammals and result in displacement. Small mammals would encounter a network of active roads and industrial development. Contamination of local browse and waterbodies with hazardous mining waste or mining dust could occur and would be harmful to some small mammals. Traffic on mining access roads would increase collision potential. Increased traffic on the Dalton Highway and increased railroad traffic from Fairbanks to Southcentral Alaska may lead to increased small mammal mortalities along these transportation routes.

Climate change is proceeding at an accelerated pace in the Arctic. In northwestern Alaska, climate change and associated changes in weather patterns and temperatures, are affecting disturbance (fire) regimes, land cover, insect abundance, disease prevalence, invasive species, and predator-prey dynamics (Mallory and Boyce 2018). Effects of climate change have been observed and are anticipated to increase rapidly throughout the century (Joly et al. 2006; Joly and Klein 2011). An intensification of winter weather events may reduce fitness in small mammal populations (Mallory and Boyce 2018). Warmer temperatures may also enhance insect populations and increase prevalence of disease vectors (Joly 2017; Mallory and Boyce 2018).

The indirect and cumulative impacts from development of the District, development of secondary access roads, and other development or activities throughout the analysis area would be additive to and synergistic with the action alternatives. Habitat loss and alteration due to the reasonably foreseeable development of the District could equal or exceed that from the road itself (Table 2-10) and exponentially increase fragmentation of small mammal habitat. Similar impacts on small mammals as described above would occur from additional roads. However, the resulting road networks would increase the magnitude of impacts on small mammals and mining activities would result in a greater intensity of disturbance and displacement. The mines would encroach on the alpine habitat of Arctic ground squirrel, hoary marmot, and pika, which would be additive with climate change and impacts to alpine habitat under Alternative C. Alternative C would traverse more truly alpine habitat than Alternatives A or B. Climate change would act synergistically with other cumulative actions and may increase wildfires, change predator abundance and distribution, or increase the prevalence of harsh winter weather events. While individuals would be most affected and populations may shift, the viability of species and broad area populations are not expected to be at risk.

Marine Mammals

It is anticipated that containerized ore would arrive at a Southcentral Alaska port facility (likely the Port of Alaska) by train from Fairbanks and the material would be offloaded directly into ships. While land-side modifications may be necessary (e.g., creating container staging areas, adding a specialized crane to dump containers into the ship), no in-water construction is anticipated to take place at the port as an indirect consequence of the action alternatives. The amount of ore shipment is anticipated to result in up to 2 additional vessel trips to the port per month based on operation of 4 mines (Table 2-8). For context, vessels currently call at the port approximately 8 days per month. Marine mammals can be affected by vessel traffic through direct strikes and noise; however, all vessels would follow established marine transit routes where vessel traffic is a common and regular activity. All marine mammals, including Endangered Species Act-listed species that may occur in or near the port, are habituated to marine vessel traffic.

3.5. Action Alternatives—Social Systems

3.5.1 Land Ownership, Use, Management, and Special Designations

The following subsections present indirect effects on land use and land management of the mining scenario and the other actions noted in Section 2 (Reasonably Foreseeable Actions), and they describe any cumulative impact of those actions when combined with the proposed Ambler Road.

Past and present actions make up the land ownership and land management affected environment described in the EIS—the land ownership patterns principally settled through the Alaska Statehood Act, Alaska Native Claims Settlement Act (ANCSA), and ANILCA, and land management described in state and federal management plans. These, coupled with past mineral exploration, have led to this road project. Indirect impacts regarding land are changes induced by the presence of a road.

The proposed project would affect principally land use and not ownership or management. The road would induce future actions as described Section 2.3 (Past, Present, and Other Reasonably Foreseeable Actions), particularly mining at several mines within the District. The proposed project would change the demand for industrial land uses associated with mineral development, and more exploration and mining activity is likely. In the District and in a narrow band along the road, industrial land uses would displace some existing subsistence and recreation uses. Residential and commercial uses in surrounding communities could expand based on employment and support service opportunities. This would depend on how access between each community and the Ambler Road is handled. Additional development (changed land uses) along the Dalton Highway, such as highway support services like gas stations and restaurants, may occur. Some Native allotments and other private lands located near the selected alternative may be more likely to develop and could be developed commercially (e.g., new fly-in lodge).

Subsequent mining activity along alternative road routes but outside the District may be induced by the promise of improved access to claims or just by the ability to take commercial deliveries of supplies along the road. Under Alternatives A and B, there are mining claims in the valleys north of the alignment in the southern Brooks Range. Under Alternative C, there are mining claim clusters near the Zane Hills and Ray Mountains and at Hogatza. There are also clusters of mining occurrences and prospects near Hughes. The BLM notes that there are subbituminous coal occurrences along this alternative in the Rampart Field.

Special Designation Lands. The Alternative C alignment is located relatively close to several existing ACECs and Research Natural Areas (RNAs), as shown in Volume 4, Map 3-26. The Spooky Valley RNA and existing Hogatza River ACEC have greater likelihood of indirect effects than others, because these are areas that have mining claims that would be relatively easy to extend a road into under Alternative C. RNAs are withdrawn from all forms of appropriation and would need to be modified to allow any other entity the land rights necessary to build a road. Indirect effects to special designation lands are not anticipated under Alternatives A and B.

Cumulative Impact. The road project combined with the mining projects and the other reasonably foreseeable actions noted in Section 2.3.3 (Other Reasonably Foreseeable Actions), would cumulatively impact land use and, in some cases, land ownership. Areas of land without substantial human uses currently, cumulatively would be converted to industrial and transportation uses. The large patterns of land ownership would remain unchanged. Land use intent for state lands at the District, as expressed in the Northwest Area Plan, would be satisfied, but the conversion to industrial uses of the road corridor and district would alter existing land uses in the process.

3.5.2 Transportation and Access

Roads

The magnitude, duration, and spatial extent of the indirect and cumulative impacts largely depend on the location and extent of mining activity that occurs as a result of the proposed project. Development of the mines would lead to increased traffic (60 to 75 percent increase at its peak during the operational period of the mines) on the proposed road as well as on the existing road system between the Dalton Highway turnoff and the Alaska Railroad yard in Fairbanks (see Table 2-5). Alternatives A, B, and C would entail 452, 469, and 472 miles of trucking distance, respectively, from the District (Ambler River road terminus) to Fairbanks.

This increase in traffic would likely result in an increased number of crashes over the project's 50-year lifespan. The increased traffic will also increase the amount of maintenance needed on these roads, particularly for Alternatives A and B, under which trucks would use 100 miles more of the Dalton Highway than under Alternative C. Assuming road maintenance costs are proportional to increases in traffic, maintenance costs on the existing road system segments used by Ambler mining-related vehicles would increase by approximately 60-75 percent at the peak of traffic. Additional maintenance is likely to be funded by DOT&PF and may impact DOT&PF's ability to fund other projects and would further strain already constrained road budgets. The existing traffic volumes are below the capacity of the 2-lane road, so the added trips would have a minor impact on the Dalton and Elliott Highways. Increased truck traffic will likely have a greater impact on the roads between the Elliott Highway turnoff and the Alaska Railroad yard, such as the Steese Expressway. In general, the roads nearer to Fairbanks population center already are busier. The project would result in greater truck traffic in the existing mix of passenger vehicles and trucks. No improvements to these roads are anticipated. Dalton Highway improvements are reasonably foreseeable due to existing needs. Further oil development also would likely spur Dalton Highway projects. Closure of the Red Dog Mine could result in reclamation of the Delong Mountains Transportation System (DMTS; road), removing a road from the overall inventory of roads in the region. However, it is not a public road, is not connected to the road network, and would have little impact on transportation.

The concentrate trucking is likely to occur 24 hours a day, while other traffic is more likely to occur between 7am and 7pm. Locations near the road are likely to experience more road noise (see Section 3.3.6, Acoustical Environment (Noise)). An ore-trailer staging area near the intersection of the proposed road and the Dalton Highway would be used to break double-trailer rigs from the mines into single trailer rigs for transport to the rail yard. This area would likely have a higher than normal volume of turning traffic that could conflict with other traffic.

The development of mines is expected to result in the development of additional roads in the area surrounding the mines. These roads would not have public access and would not be expected to impact the existing transportation system.

Construction

Mine construction equipment will be transported from Fairbanks to the mine sites. These loads may be oversize and/or overweight. Transportation of these loads will require permits and will temporarily impact traffic. These loads would generally be restricted from traveling in the Fairbanks area during heavy commuter traffic times to reduce the impact to highway users. These loads may also have escort trucks to provide warnings to oncoming traffic and improve safety. Once on the Ambler Road, these loads would have no impact on the existing transportation system. If other construction projects occurred simultaneously, then the existing transportation system could be affected, causing short-term congestion. These impacts are also anticipated during road closure and reclamation.

Spur Roads

All action alternatives have the potential for the development of spur roads to the local communities. Kobuk would be connected under Alternative C, and a connection is certain to develop from the existing Kobuk-Bornite road to Alternatives A or B. Development of other connector roads is less certain. It is more likely that additional winter trails would be developed. Traffic associated with the spur roads would be limited, as only permitted, commercial-drivers would be allowed on the Ambler Road and the populations of connected communities are small. The cost of constructing and maintaining these spur roads is likely to be high given the challenging soil conditions and other factors. Some communities farther away from the alignments, such as Allakaket or Alatna, may find it cost-prohibitive to construct a connection to the proposed access road.

All action alternatives have the potential for spur roads to Ambler, Kobuk, and Shungnak. Alternative C would join the Kobuk road system less than 2 miles from town. Kobuk is less than 15 miles from Alternatives A and B. Kobuk already has a road to the Bornite mine and a road to the Dahl Creek Landing Strip, ensuring that the proposed road would provide additional surface access to Kobuk. Shungnak is approximately 5 miles from Alternative C and 16 miles from Alternatives A and B. There is boat access and trail access between Kobuk and Shungnak so any commercial deliveries access to Kobuk will likely benefit Shungnak as well. Ambler is approximately 25 miles from all action alternatives. Ambler would be connected to the western terminus of the Ambler Road via the Ambler River and is connected to Shugnak by winter trail and river. Given the distance, it is possible but less likely that the proposed road will result in a change in transporting goods to Ambler.

Alternatives A and B have more potential for a spur road to Bettles and Evansville (approximately 8 miles). However, as a winter road between these communities and the Dalton Highway already is built most winters, the development of a new spur road is hard to estimate. Furthermore, an initial alignment examined by DOT&PF early on that passed near Bettles and Evansville was dismissed from consideration due to community objections of the road going near or through those communities. Alternative C is more likely to result in a spur road to Hughes (3 miles).

If a spur road or even 4-wheeler trail is built or good winter trail is available, freight delivery to the villages will change, lowering the cost of goods. This would have a positive benefit. These spur roads could also change how fuel is delivered to the villages. Rather than relying on a delivery by fuel barge or plane, which typically only occurs once or twice a year, a village could switch to, or supplement with, fuel transported by truck. Whether truck delivery would result in substantial cost-saving depends on many factors.

While the potential for development of other unpermitted spur roads exists, it is limited because in almost all instances such roads would be illegal and because the proposed Ambler Road would be a controlled access road. Residents/landowners would not be able to use the road themselves. The Dalton Highway in the project area has not developed a "herringbone" of illegal roads, despite being open to the general public. Nonetheless, there is some potential for unpermitted roads and trails to occur off the Ambler Road.

Rail

Transportation of construction materials and ore concentrate will increase rail traffic between Fairbanks and Southcentral Alaska. Refer to rail traffic projections in Table 2-7. It is believed that the Alaska Railroad can accommodate this additional rail traffic. The increased rail traffic will result in minimal increase in traffic delay at at-grade rail crossings. It is also expected to have a minimal impact on the accident frequency at existing rail crossings. Assuming the Port of Alaska at Anchorage were the final destination, the rail distance would be approximately 356 miles. Other rail-accessible ports are within about 50 to 100 miles of Anchorage.

Marine

Mining activity will likely result in approximately 22 ships per year departing from 1 or more Southcentral ports; refer to vessel projections in Table 2-8. At the port, full and empty concentrate containers will have to be stockpiled and loaded and unloaded from trains and then emptied into the ship. This activity will result in increased activity at the port, which will likely generate noise and increase light emission in the area surrounding the port. Depending which port mining companies select, there may be additional impacts associated with the project as the port may need additional land-side infrastructure or additional cleared space to support concentrate shipping. Ambler Metals (formerly Trilogy) indicated the Port of Alaska in Anchorage as the port to which concentrate would be transported (Trilogy 2018a). It is anticipated that the Port of Alaska can accommodate the additional marine activity because it receives ships only 2 days per week, leaving the other days available to handle increased demand.

Aviation

The airstrips developed for the road project and for the mines would be for project and private use and not intended for public use. They are unlikely to impact aviation in the area. Construction and operation of the mines will result in an increase in regional air traffic. Most of this air traffic is assumed to originate in Fairbanks or Anchorage. See Table 2-4 for an estimate of air traffic for the 4 main mine sites. During construction of the access road, AIDEA has indicated aircraft operation levels would depend on the selected contractor's plans for construction, but there would be at least weekly flights (1 to 2 flights per week) to each construction camp (Davis 2019). During roadway operations, AIDEA indicated an estimated 1 to 2 flights per week per maintenance station (Davis 2019). The number of flights would be higher for Alternative C than the other action alternatives because it has more maintenance stations.

Additional mining activity is likely to result in the improvement to the Dahl Creek Airport as well as the development or expansion of additional airstrips. Workers likely would have a 2-week-on, 1-week-off schedule and would likely be flown from the area to local villages or Fairbanks. There would be an increase in regional air traffic especially between Fairbanks International Airport and airstrips in the District. The existing facilities at Fairbanks International Airport are likely to be able to accommodate this increase in traffic. This increase in air traffic will have negative impacts (such as noise) on communities located on the flight path. There may be additional aviation related impacts depending on how workers from local villages are transported to the mines. Flights from the mines to each village could result in increased air traffic. The ability for the existing airport in each village to support the flight depends on the size of plane used. Alternatively, local mine workers may take a commercial flight from their village to Fairbanks, where they would change planes for a flight to the mine. In this circumstance, there would be minimal change in air traffic to the village, but there would be slightly more demand for commercial flights, which may influence cost and availability, making it more difficult or more expensive for villagers to travel, especially on short notice.

If freight deliveries were made using the proposed road instead of by air cargo, air carriers may experience a loss of revenue. This may impact the cost and/or availability of passenger and cargo air travel.

Transporting goods and personnel to the mine may increase the need for commercial air service. Private sector air carriers may expand their operations to accommodate the additional demand. The airstrips are likely to be available to support emergency situations such as a wildfire or search and rescue efforts.

Small-scale mining likely will still occur in the project area. For miners who don't have access, or cannot afford to use the Ambler mining road given potential permit stipulations based on other approved admittances on the roadway, parallel transportation routes may be developed to access small-scale mines. These roads are likely to be constructed to a lower standard than the proposed road. Small-scale mining would also increase traffic on the existing transportation system as part of mine/road construction and operation. The impacts on the existing transportation system are expected to be within the capacity of the system.

The proposed project is likely to exacerbate the shortage of drivers with Commercial Driver's Licenses. This may have a negative impact on other industries as they may be unable to employ enough drivers. It may also lead to hiring people from outside Alaska. After road closure and reclamation, there would be more drivers with Commercial Driver's Licenses who could work in other industries.

Closure

After the road closure, traffic volumes on the Dalton Highway and other existing roads will be reduced but is unlikely to return to current traffic volumes. Aviation, rail, and marine activity would also be reduced but unlikely to return to existing activity levels. Freight delivery to local villages would no longer be available, which would impact the cost of living in these communities. During the 50-year lifespan of the project, increase activity is likely occur due to other development in the area and to population increases.

3.5.3 Recreation and Tourism

The EIS (Chapter 3, Section 3.4.3, Recreation and Tourism) reflects the results of past actions, namely the creation of conservation system units, which have attracted attention for recreation and tourism, and the Dalton Highway, which has created an avenue for public access and sightseeing. The EIS describes the impacts of the Ambler Road, particularly introduction of bridges across rivers used for boating that are otherwise undeveloped and provide a natural recreational environment. Past actions have resulted in a growth trend in recreation and tourism on the Dalton Highway, in the Brooks Range, and at a lower level along other major rivers. The primary future actions that would contribute to effects to recreation are the openings of multiple mines in the District. Development of mines near the western end of the road would have the same kinds of impact to backcountry recreational use as noted in Chapter 3 for the road, but in a broader and less linear fashion. The District would be active for 50 years and altered by open, terraced mining pits, tailing ponds, and spur roads. Monitoring activity by aircraft and road vehicles could occur in perpetuity, making large parts of the District generally unattractive for backcountry recreation. The Ambler River is anticipated to be bridged for access to Smucker Mine, further impacting recreational river trips in the area.

Comment on the Draft EIS indicated concern that the road and mines would impact a growing tourism industry in the area and would affect the future of that industry. Economists and tourism specialists note an "Alaska difference" provided by the attraction of large intact ecosystems in the state (Colt and Fay 2017). "The global supply of wilderness is decreasing while the demand for Alaska nature based tourism is growing," and over time it is likely that Alaska will be able to extract ever greater economic value from tourism related to such landscapes (Colt et al. 2002 and Dugan et al. 2009, cited in Colt and Fay 2017). The effect of the road cumulatively with the mines and other potential transportation and industrial developments would diminish the area available for this type of tourism growth in north-central Alaska. As an example, if reasonably foreseeable oil development occurs on the north side of the Brooks Range in the Arctic National Wildlife Refuge as proposed, that development could result in impacts to several common nature-based float trips in the eastern Brooks Range, and Ambler Road Alternatives A and B would affect most of the common nature-based float trips in the central Brooks Range. Together with the past effects of TAPS and the Dalton Highway on floatable rivers in the TAPS corridor, the number of Brooks Range river trips possible without passing under a bridge or seeing a road, pipeline, or other development would be substantially reduced.

For all alternatives, the mining companies are assumed to seek permits to create an ore-trailer staging area near the intersection of the Ambler Road with the Dalton Highway within the BLM Special Recreation Management Area. This would be where double-trailer rigs would be broken into single trailer rigs for hauling on the public roads. This is assumed to be an area large enough to stage multiple trucks and trailers and to allow multiple double trailers to pull through without backing. It likely would include ancillary facilities such as 1 or more heated buildings, a generator, fuel supply, and outdoor lights. During peak production years, this trailer assembly area likely would have literally continuous idling and movement of diesel trucks 24 hours a day, and continual sounds of backup bells. Such a staging area is implicit in the concept of using double trailers on the Ambler Road and single trailers on the Dalton Highway. Near MP 161 (Alternatives A and B), such a facility could conflict with use of Chapman Lake for wildlife viewing, depending on final placement of the staging area. Near MP 59.5 (Alternative C), such a staging area would not conflict with known recreation uses.

Tourists/recreationists on the Dalton Highway would be affected by increased truck traffic associated with the mines. Large trucks can be intimidating to some recreational drivers, and difficult to pass. With multiple mines operating, traffic on the Dalton Highway could be more than 50 percent greater than current levels. Dust on the Dalton Highway would be harder to avoid. Noise would be more continuous along the roadsides. Waysides, toilets, and other facilities shared by recreationists and others would be more crowded and likely would be inadequate for the increased traffic. Without improved or additional waysides, toilets, and other facilities, recreationists likely would feel the experience deteriorated from current conditions. The BLM manages rest areas along the Dalton Highway and may incur additional costs to maintain these facilities. Dalton Highway traffic impacts from Livengood to the Alternative A/B intersection would occur over 161 miles. Such impacts to the Alternative C intersection would occur over 59.5 miles.

Cumulative impacts of the road project added to other projects would occur principally because the road would induce development of the mines. The road and the mines together would substantially alter the recreation environment along the southern Brooks Range, with somewhat greater effect under Alternatives A and B than under Alternative C.

3.5.4 Visual Resources

Past actions have resulted in the visual environment described above, with gradual incursion over more than 100 years of visible cut trails and expanded communities. Construction of the pipeline and Dalton Highway resulted in major visual changes in the 1970s. In 1980, creation of conservation system units protected and to a certain extent promoted the natural visual environment of the designated lands. The impacts of the Ambler Road alternatives would continue a trend of new lines across the project area.

The mining scenario laid out earlier in this appendix would result in 4 or more new mines with associated roads and airstrips in the mountains north of Kobuk and south of GAAR. Several open pits mines that each could be 0.75 mile across and with tailings areas up to 1.5 miles long and 0.75 mile wide, along with traffic dust, lights, and buildings enough to house several hundred to more than 1,000 workers would change the visual environment of the area, introducing the engineered, stair-stepped mining pits, and unnatural and contrasting forms (buildings, embankments), lines (roads and vertical towers), and colors. This area is used principally by local residents and some river floaters (e.g., Ambler River) and is seen by people in aircraft flying for transportation or tourism. The numbers who might see the mines is not high, but many of those who would see them likely would be sensitive to the changes.

The visual impacts of the Ambler Road would be important by themselves, regardless of alternative. Combined with past impacts (particularly the Dalton/TAPS corridor) and the reasonably foreseeable mining development, impacts in the project area would be greater. The impacts would be similar among the alternatives except that Alternative A would impact more GAAR and National Wild and Scenic River System lands along the road route, which are managed to preserve natural views and are particularly sensitive to such changes. Alternative B also would impact visually sensitive land management areas—the Preserve and the Wild and Scenic River—but would be out of sight of the designated federal wilderness area. Alternative C, particularly, would impact less sensitive areas. See greater discussion in Chapter 3, Section 3.4.4 (Visual Resources), of the EIS.

3.5.5 Socioeconomics and Communities

The District has major mineral exploration and development potential. It is characterized as one of the world's largest undeveloped copper-zinc mineral belts. Access to the region could spur the development of existing mining projects such as the Arctic, Bornite, Sun, and Smucker projects. Furthermore, access to the region likely would spur additional mineral exploration within the District. Cardno (2015) conducted an economic analysis for the Ambler Mining Region, and the University of Alaska Center for Economic Development (UA 2019) provided an updated estimate of the economic impacts from mine development in 2019. Information summarized below is taken from these reports.

The study area for this analysis includes the Yukon-Koyukuk Census Area (YKCA) and NAB, with particular focus on the communities located relatively close to the proposed access road that are not connected to the statewide road system year-round. YKCA study area communities include Bettles, Evansville, Allakaket, Alatna, Huslia, and Hughes, while NAB study area communities include Kobuk, Shungnak, and Ambler.

The construction and operation of the access road would provide employment and income opportunities within the region. In addition to access road development, this economic impact analysis assumes that the major District mineral projects currently in the exploratory phase would develop due to road access and evaluates how this development would affect employment, income, and tax revenue.

This analysis evaluates access road construction impacts over an estimated 4-year construction period, as well as access road annual operations impacts. It evaluates the employment and income effects from the construction and operation of the 4 mining projects. In addition to evaluating the employment and income effects of access road and mine construction, this analysis also considers the state and local revenue generated due to mine development in the District, Native corporation revenue from gravel sales, and potential changes to resident and commodity transportation patterns and costs in study area communities.

Construction and Operation Costs for the Mines

The costs for construction and operation of the mines were calculated based on the extent of the deposits and proposed plans for development of each mine. The information for the Arctic and Bornite projects is based on more advanced development plans than are available for the Sun or Smucker projects. Table 3-2 summarizes the construction cost estimate totals both as an overall total and an in-state total. The economic inputs for operation of the 4 projects are presented in Table 3-3.

Table 3-2. Summary of project construction costs for the 4 projects (2020 dollars)

Project	Total expenditures	In-state expenditures
Arctic	$827.1 million	$199.48 million
Bornite	$2.14 billion	$516.48 million
Smucker	$212.68 million	$51.3 million
Sun	$414.11 million	$99.88 million

Source: UA 2019 (based on IMPLAN modeling).

Table 3-3. Summary of economic inputs for the 4 projects (2020 dollars)

Inputs	Arctic	Bornite	Smucker	Sun
Life of mine resource value	$10.4 billion	$13.2 billion	$1.1 billion	$1.6 billion
Operating life (years)	12	21	5	6
Annual revenues	$866,454,417	$626,519,511	$218,834,200	$261,535,679
Annual direct labor costs	$31,646,523	$22,883,101	$7,992,736	$9,552,372
Annual direct operations employment	217	157	55	66

Source: UA2019 (based on IMPLAN modeling).

Employment and Income

Mining activity in the District would support direct, indirect, and induced job growth. Ambler Metals (formerly Trilogy) estimated that approximately 400 permanent jobs would be provided during operations of the Arctic Mine (Trilogy 2018a). Trilogy's PFS estimated the labor force for processing-plant operations and maintenance would be 163 (Trilogy 2018a). The study indicates additional labor would be needed for administration, surface support services, and mining services such as drilling, blasting, loading, hauling, stockpile construction, road building and maintenance, and pioneering and clearing work to support continuous operations 24 hours per day, 365 days per year. To support the labor needs, Ambler Metals (formerly Trilogy) plans a permanent camp to provide room and board for 450 and a temporary camp during construction to house an additional 200 for the Arctic Mine (Trilogy 2018a). Cardno (2015) estimated the direct jobs attributable to operations of the Arctic Mine at 482. Based largely on the Arctic Mine, direct employment at Bornite, Sun, and Smucker was estimated at 324, 374, and 354 jobs, respectively (Cardno 2015). Total job growth is expected to be many times greater than just the activity occurring in the District. In addition to the direct jobs, the mining activity would also support indirect and induced jobs due to off-site economic activity. For total average annual jobs (direct, indirect, and induced jobs) attributable to the 4 mines, Cardno (2015) estimated 3,187 jobs and UA Center for Economic Development (2019) estimated 3,931 jobs. The following paragraphs present further detail from the UA (2019) report. Table 3-4 provides a summary of the estimated employment and income impacts associated with the construction of each major District mining project. All results shown are annual averages, assuming that the construction phase lasts 3 years for Arctic and Bornite, and 2 for Sun and Smucker. Arctic would have the largest employment effects during both construction and operations, creating an average of 799 total jobs for each year of construction and 1,663 jobs for each year of operations; refer to Table 3-5. The 2019 UA economic report assumed an employment breakdown for non-residents, NAB/YKCA residents, and other Alaska residents for each mine, with non-NAP/YKCA residents filling 19 percent of jobs, NAB/YKCA residents 20 percent, and non-local Alaskans getting the remaining 61 percent. For operations, the 25 percent of mining jobs assumed to go to non-residents were already factored out of the analysis. The resident mining jobs are estimated to be 30 percent held by NAB/YKCA residents and 70 percent other Alaska residents. During the construction phase, it is anticipated that 92 NAB/YKCA residents would be employed each year.

Table 3-4. Summary of average annual economic effects of mining project construction (statewide) (2020 dollars)

Project	Labor income ($) direct	Labor income ($) indirect and induced	Labor income ($) total	Employment (jobs) direct	Employment (jobs) indirect and induced	Employment (jobs) total
Arctic	47,557,121	17,859,830	65,416,951	461	338	799
Bornite	184,700,512	69,363,316	254,063,828	1,792	1,312	3,104
Sun	35,717,177	13,413,400	49,130,577	346	254	600
Smucker	18,343,876	6,888,947	25,232,823	178	130	308

Source: UA 2019 (based on IMPLAN modeling)

Table 3-5 provides a summary of the estimated employment and income impacts associated with the operation of the 4 mining projects. Arctic and Bornite are the 2 largest prospects, and would generate larger employment impacts than Sun and Smucker. They also have longer estimate lifespans at 12 and 21 years,[22] respectively. The development of these 2 mines makes Sun and Smucker more likely to be developed, since the larger mines justify the investment in access roads and other infrastructure that benefit the District as a whole. The statewide operational employment effects of the mines is estimated to be 3,931 jobs.

The experience of the Red Dog Mine operated by Teck in the NAB suggests that mineral development could increase jobs and personal income in the NAB/YKCA communities, particularly if there are job training programs as well as local hire preferences. During the operations phase it is anticipated that 92 regional residents will be employed each year at the mines.

Table 3-5. Summary of average annual economic effects of mining project operations (statewide) (2020 dollars)

Project	Labor income ($) direct	Labor income ($) indirect and induced	Labor income ($) total	Employment (jobs) direct	Employment (jobs) indirect and induced	Employment (jobs) total
Arctic	31,646,523	95,749,592	127,396,115	217	1,446	1,663
Bornite	22,883,100	87,137,262	110,020,362	157	1,296	1,453

[22] The economic analysis is based on the UA CED (2019) analysis and does not match in every detail the scenario presented in Section 2.1.5, Reasonably Foreseeable Action Scenario. For example, Bornite is assumed by UA CED to have a 21-year life and in Section 2.1.5 to have a 35-year life.

Project	Labor income ($) direct	Labor income ($) indirect and induced	Labor income ($) total	Employment (jobs) direct	Employment (jobs) indirect and induced	Employment (jobs) total
Sun	9,552,372	26,279,700	35,832,072	66	404	469
Smucker	7,992,735	18,367,958	26,360,693	55	291	346

Source: UA 2019 (based on IMPLAN modeling)

Incorporated in these statewide income and employment figures are benefits to the trucking industry generally, to the Alaska Railroad Corporation that is expected to carry the ore containers from Fairbanks to a port such as the Port of Alaska in Anchorage, to the port itself, to Anchorage and Fairbanks companies that transfer containers between transportation modes, and to air transportation that is likely to carry workers back and forth from Fairbanks or villages to the mining district. In general, the Fairbanks and Anchorage economies would benefit. According to the Port of Alaska's comments on the Draft EIS, this activity would generate outbound freight revenue that could be used to fund needed port improvements. These improvements would benefit all port users as well as those who purchase goods brought into Alaska through the Port of Alaska.

Mining-related jobs would be a long-term, temporary effect and would be lost once the mines closed. Although this would, in effect, be a reversion to existing conditions, it would be perceived as an adverse economic effect at the time unless there were a clear source of replacement employment.

State and Local Government Effects

AIDEA expects to collect sufficient payments from road users to recover the cost of road construction and operation, together with the cost of debt financing, similar to AIDEA's DMTS, which supports the Red Dog Mine (Tappen 2019). Based on information from AIDEA (Tappen 2019), 30-year bonds would be repaid through a 50-year lease agreement with mining companies. Table 3-6 illustrates an example arrangement. The major component of the lease payment would be a Minimum Annual Assessment (MAA), which is a payment amount designed to entirely cover the project's debt service by marking up the interest rate at which AIDEA is able to bond. In the DMTS agreement, the MAA rate is 6.5 percent, while AIDEA bonds have rates that range from 4.75 to 5.25 percent. Additional fees may be incorporated, as they are for the DMTS, but are not necessary for AIDEA to repay the debt. Road operations and maintenance costs are a pass-through expense paid by road users.

Table 3-6. Example Minimum Annual Assessment and resulting payments to (2020 dollars)

Example	Principal	Interest rate	Term	Total payment	Annual payment
Ambler Road Bond	$412 million	5%	30 years	$797.4 million	$26.6 million
MAA	$412 million	6.5%	50 years	$1.4 billion	$27.9 million

Source: AIDEA (Tappen 2019)

Table 3-6 shows the principal and interest for bonds issued by AIDEA and for a MAA by AIDEA for road users. The table shows that MAA payments for 50 years would provide more revenue than needed for AIDEA to repay the bonds.

Using the assumptions outlined in Table 3-6, the debt service for the Ambler Road bonds totals $797.4 million. This figure represents the project's break-even point and the minimum amount of lease payments AIDEA must collect from all road users over the project's 50-year lifespan. AIDEA expects the Ambler

Road Project to serve 1 or more operating mines in every period of its initial 50-year lifespan. Therefore, annual lease payments would completely cover annual bond payments during the 30-year repayment period.

The anticipated source of funds to finance the project is revenue bonds. AIDEA indicates there will be no use of state or AIDEA funds. Rather, revenue bonds would be sold in the bond markets to various investors, and the bonds would be rated and backed by the financial strength of the underlying project. The bonds would not bear the obligation of the State of Alaska. Excess funds are anticipated to remain within AIDEA for its projects. That is, the State of Alaska General Fund would not directly benefit from MAA payments and also would not be liable for bond payments.

However, additional revenues would accrue to the State of Alaska as mining projects came on line. The state collects revenues from the mining industry through claim rentals, production royalties, payments in lieu of labor, land rental, lease sale bonus payments, material sales, miscellaneous fees, fuel taxes, corporate income taxes, and mining license taxes. Table 3-7 provides a summary of state revenue estimated to be generated by the development of the 4 mining projects in the District. The State of Alaska is projected to receive approximately $1.1 billion over the lives of all 4 mines. Roughly half of that amount would come from Arctic, 40 percent from Bornite, and the remaining 10 percent from Sun and Smucker together.

Table 3-7. State government revenue from mine projects (2020 dollars)

Revenue item	Arctic	Bornite	Sun	Smucker	Total
State claim rental	$10,200,165	Not applicable	$3,053,324	$123,299	$13,376,788
State mining license fee	$155,961,798	$197,353,646	$23,538,211	$16,412,568	$393,266,222
State corporate income tax	$207,949,063	$263,138,195	$31,384,281	$21,883,423	$524,354,963
State royalty	$178,509,223	Not applicable	$20,361,998	$14,915,933	$213,787,154
Fuel tax	$264,000	$1,219,078	$71,721	$47,813	$1,602,612
Total	**$552,620,250**	**$460,491,841**	**$78,337,815**	**$53,335,223**	**$1,144,785,127**

Source: UA 2019

Table 3-8 provides a preliminary estimate of local government revenue estimated to be generated by the development of the 4 mining projects. Using Red Dog Mine as a comparison, there are 2 local government revenue sources worth noting for their impacts to the NAB/YKCA region. Primarily, the Payment In Lieu of Taxes that would be paid to the NAB, and the Village Improvement Fund intended to be used to support community programs, services, infrastructure, and the long-term sustainability of rural communities in the NAB/YKCA region. It is estimated that these 2 sources could contribute $193 million in local government revenue over the lives of all 4 mines.

Table 3-8. Local government revenue from mine projects (2020 dollars)

Project	Payment in lieu of taxes	Village improvement fund	Total
Arctic	$27,602,196	$28,284,693	$55,886,889
Bornite	$70,783,545	$40,057,657	$110,841,202
Sun	$10,555,441	$4,268,809	$14,824,250

Project	Payment in lieu of taxes	Village improvement fund	Total
Smucker	$8,918,501	$2,976,527	$11,895,027
Total	**$117,859,683**	**$75,587,685**	**$193,447,368**

Source: UA 2019

The operations and maintenance phase of mining development in the District would also generate economic benefits for ANCSA corporations. NANA owns the land in which the Bornite Project is located (Cardno 2015). As with the Red Dog Mine, which is also located on NANA land, the Bornite Mine likely would be developed under an operating agreement specifying that NANA shareholders receive direct and meaningful benefits from development at the mine. As landowners at the mine site, NANA would receive income through lease, surface use agreement, and royalty payments, and the mining company or NANA may fund scholarships. These proceeds would allow NANA to create economic opportunities for shareholders through the development of NANA businesses, job creation and training, enhanced education, and dividend distributions. Funds paid to the NAB and NANA would help fund education, search and rescue, community infrastructure, and other efforts in the region and could be important replacement for funds that would be lost when the Red Dog Mine closes.

Mining development would have a positive economic impact on other ANCSA corporations as well. As with all subsurface resource development projects on ANCSA Regional Corporation lands (excluding industrial minerals such as construction gravel), 70 percent of project royalties received by NANA would be shared with other regional corporations under the Section 7(i) clause of ANCSA. A further provision of ANCSA calls for distribution of a portion of these shared royalties to village corporations and individual “at-large” shareholders holding only shares of a regional corporation and not a village corporation. In addition, ANCSA corporations could potentially benefit from providing goods and services to the mining companies conducting exploration and operations in the District.

There is the potential for economic costs to the state, borough, and local communities downstream of the mines in the Kobuk watershed as well. During the operation of mines and after mine closure, tailings water would be contained behind dams at the mine sites, and water discharged would be monitored and treated for decades, possibly in perpetuity. While financial surety instruments (similar to the posting of a bond) would be in place to ensure monitoring and corrective action when necessary, it is possible over the next century or more that mining companies would go out of business or be financially unable to respond adequately when there was a problem, and that the bond would be insufficient. The monitoring and mitigation effort could be abandoned or need to be taken over by the government—a cost to the public as a whole. Untreated water discharge, leaks, or catastrophic dam failure (e.g., from earthquake or unusual high water event) could pollute the Shungnak, Kogoluktuk, or lower Ambler river and Beaver Creek, and the Kobuk River downstream of the confluences of these streams. Depending on the nature of the pollution, this could affect community use of the water for drinking, boating, and subsistence harvest of fish and wildlife. Foregoing these uses or substituting other foods or water sources temporarily or long-term would be a cost locally. Fixing the problem or cleaning up a mine site could incur large costs to the government.

Some comments on the Draft EIS indicated a sense of disproportionate effects between residents of different parts of the study area or between members of different Alaska Native corporations. “They will get the royalties; we will get the pollution” is an example. Because the Bornite mine site is on NANA lands, NANA village corporations and residents of the NANA region would stand to benefit from payments made by the mining companies. Doyon region residents would have tens or hundreds of miles of road with potential impacts, as detailed in the main body of the EIS, and would see less economic benefit. However, AIDEA would need to negotiate access across Doyon lands, so Doyon may be able to leverage some degree of compensation for the inequity.

Cost of Living

Although the access road would have controlled access during operation, the study area communities would have the potential to use the road to receive deliveries of fuel and freight. Only commercially licensed drivers would be allowed on the road for these purposes. The communities could hire commercial transportation providers or could form their own companies to provide these transportation services. In addition to commercial deliveries of goods for local communities, other permitted traffic might include emergency response authorized through access permits. The traffic level for these local community and emergency response operations would likely total less than 1 truck per week (DOWL 2016; BLM 2017).

The proposed road would directly connect to the Kobuk road system under Alternative C, and it is reasonably foreseeable that the existing Bornite-Kobuk road would be connected to Alternative A or B to support the Bornite and Arctic mines. Otherwise, the Ambler Road would not connect directly to any existing communities, and AIDEA does not propose additional work outside the approved ROW to accommodate any direct connections. At least initially, fuel or freight likely would be delivered to staging areas where the communities could access it, probably in the winter (DOWL 2016).

Over time, however, study area communities might seek and be granted permits necessary to construct spur roads that would give them year-round access to the Ambler Road. Kobuk has the most potential to benefit from the road in terms of having fuel and/or freight delivered directly to the community under any alternative via connection to the existing road system. Shungnak is several miles away from Kobuk, but it has expressed interest in constructing a road to provide access to the Bornite mine area. Ambler is approximately 30 miles from Kobuk, but it has the potential to access the proposed endpoint of the road at the Ambler River (DOWL 2016).

The costs of constructing spur roads connecting communities to the Ambler Road is uncertain, but it is likely to be relatively high because the marshy, water-saturated soil typical of much of the NAB/YKCA region represents a considerable impediment to road construction (Wiebold 2019). A rough estimate is provided by a study prepared by DOWL HKM (2012), which examined the costs of constructing and maintaining a road system in the Yukon-Kuskokwim Region. The study estimated a base cost of $2.3 million per mile for 2-lane roads and $1.8 million per mile for single-lane roads. Factoring in costs associated with river and stream crossings (bridges and culverts), maintenance camps, and turnouts, the average construction cost per mile is $3.4 million for 2-lane roads and $3.0 million for single-lane roads. Standard annual maintenance cost of $26,100 per mile is assumed for the roadways to cover costs associated with grading, plowing, dust control, minor repairs, and similar activities necessary to keep the roads safe and operational. The cost of building spur roads would most likely be borne by the State of Alaska and federal governments (Northern Economics 2013).

The opportunities for transportation of goods on the Ambler Road have been discussed with residents in the socioeconomic study area communities. Such deliveries are potential indirect and long-lasting beneficial effects to the communities (DOWL 2016) and likely would have associated effects on water, wetlands, and wildlife habitat. The following subsections discuss the potential cost of living effects of the Project in terms of potential changes in the costs of fuel, freight, and personal travel.

Transportation of Fuel

It is anticipated that the logistics of delivering fuel to socioeconomic study area communities would change for some communities under all the alternatives. Rather than seasonal barge or winter road shipments or air shipments, fuel, including diesel fuel for heating and electricity generation and gasoline for vehicles, could be transported directly via tanker truck from the Petro Star refinery in North Pole.

While many factors contribute to the cost efficiency of vehicles travelling on a roadway (e.g., speed, size of vehicle, tire type, road grade), it costs less to drive a pound of cargo than to fly a pound of cargo between 2 points. However, on a per-pound, maximum-load basis, road travel is typically less efficient than travel via barge when shipping large quantities of fuel over long distances (Northern Economics 2010). However, those communities closest to the new road (Kobuk and possibly Shungnak, under all alternatives, and Hughes under Alternative C) may switch from receiving their fuel shipments by barge to obtaining them by truck, as year-round truck delivery could reduce fuel storage and inventory costs and mitigate cash flow issues associated with community fuel purchases. Moreover, rather than being compelled to pay the price of fuel during seasonal barge deliveries, communities could take advantage of swings in fuel prices and order fuel during price drops throughout the year. Wilson et al. (2008) note that all Alaska communities on the state road system have fuel delivered by truck.

Ultimately, the cost savings that would accrue to community residents as a result of trucking heating fuel and gasoline along the Ambler Road would depend on retail price-setting practices at the community level. Retail prices depend on fuel sale operating hours and costs; safety and environmental compliance implementation levels; collections for tank-farm repair and replacement and operation and maintenance practices; the cost of debt for bulk fuel loans; and mark-ups to collect revenues for local public services, such as washaterias and community water and sewer systems (Szymoniak et al. 2010).

The Ambler Road would lower the cost to produce electricity in study area communities if the utility companies supplying electricity experience savings by purchasing larger volumes of fuel at lower unit rates and/or decreasing transportation costs for delivery. However, these savings may not directly lead to lower residential costs for electricity, as the State of Alaska subsidizes residential electricity costs in all the study are communities through the Power Cost Equalization program. On the other hand, electricity customers who are not eligible for the program, including schools and businesses, could benefit if the price to transport fuel to communities is lowered.

Over time, the Ambler Road could also potentially lower electricity costs in study area communities by facilitating the development of electrical transmission lines along the road corridor; however, maintenance of these transmission lines would be difficult when the proposed access road is reclaimed as proposed by AIDEA. It is estimated that a road corridor reduces the cost of building electrical transmission infrastructure by between 30 and 50 percent per unit mile (Northern Economics 2010). Energy savings are realized when higher cost energy in one area can be displaced with lower cost energy imported from another area via an intertie (NANA Pacific 2008). Even at a more localized level, if 2 communities are connected by a transmission line, the fixed costs of electricity generation can be shared by both communities (Szymoniak et al. 2010), as is the case with Kobuk and Shungnak today. Moreover, larger generators are more efficient than smaller generators, and increasing the demand by an intertie could lead to additional reductions in electricity costs.

In addition, road access could create opportunities for communities to replace distillate fuels for electric power and heating with alternative fuels. For example, a study by Northern Economics (2010) noted that several entities have proposed the use of liquefied natural gas (LNG) or propane to reduce the cost of energy throughout rural Alaska, particularly if the price of crude oil increases. The study concluded that trucked propane fuel could be cheaper than barged or air flown distillate fuel if a road corridor allows communities to receive regular shipments of propane.

Transportation of Freight

Trucking is less expensive than either barging or flying for freight shipments, even over long distances, because trucks can more efficiently handle small, mixed loads destined for multiple parties (Northern Economics 2010). If spur roads connected communities to the Ambler Road, as is likely for Kobuk (all alternatives), possible for Bettles/Evansville under Alternatives A/B, and likely for Hughes (Alternative C), household goods could be driven directly to study area communities from a major hub such as Anchorage or Fairbanks. In the absence of spur roads, household goods could be delivered to staging areas assuming proper handling and adequate storage is provided at each area. However, perishables and non-durable consumables would likely continue to move via the Alaska Bypass Service program. Non-dry good perishables (e.g., fresh fruits, vegetables, frozen goods) compose about 19 percent of the bypass mail volume (Northern Economics 2013). Non-perishable foods, non-food items, and most beverages, which account for the remaining 79 percent of the bypass mail volume, could be trucked. Except for oversize items, it is also likely that much of the construction equipment and materials currently transported on barges would move to truck delivery to these communities with the availability of a road. Alatna, Allakaket, Ambler, and Tanana are farther from any of the alternatives in locations where spur roads are far less likely occur and even snowmobile or boat access for taking delivery of goods likely would be rare.

Trucking freight would result in savings for the U.S. Postal Service due to the lower bypass mail volume, but it is uncertain how much it would lower the prices of household goods for community residents. Residents are already paying a rate below cost for bypass mail delivery. Moreover, the prices for final consumers is largely determined by the price mark-up practices of local retail stores.

Should a spur road to a given community be constructed, it is uncertain if the U.S. Postal Service would choose to continue bypass mail service to that community. In at least 1 instance, a road was constructed to a bypass destination, but the bypass program continued, albeit via tractor-trailer rather than air (U.S. Postal Service 2011). The U.S. Postal Service has made efforts to cut the costs of the Alaska Bypass Mail program by making greater use of surface transportation modes. Recently, for example, the U.S. Postal Service considered partnering with Lynden Transport Inc. to use tractor-trailers to deliver bypass mail during at least part of the year (Brehmer 2019).

Even if the Ambler Road resulted in lower prices for store-bought food, it is not expected that these food items would completely replace food from subsistence harvests. As discussed in Section 3.5.7 (Subsistence Uses and Resources), economic considerations only partly explain the importance of subsistence foods; local culture and identity are closely linked to a diet heavily dependent on subsistence resources. Further, it is possible that subsistence activity could increase if road access led to decreased cost of hunting and fishing supplies.

The Ambler Road is proposed to be closed to the general public. AIDEA has proposed that transport of people, whether by private vehicle (personal car), commercial van/bus or, or public transit, would be prohibited. Therefore, there is likely to be no substantial beneficial or adverse impact related to new people coming into the area or related to social interactions between communities. An exception may occur related to medical transportation of people, which could allow for somewhat less expensive transport of people by vehicle rather than by air in non-critical medical situations.

If freight deliveries were made using the proposed road instead of by air cargo, air carriers may experience a loss of revenue. This may impact the cost and/or availability of passenger and cargo air travel in area communities.

Community Services

There are other ways in which the improved accessibility provided by the proposed road could result in a healthier and safer living environment in study area communities. First, the improved accessibility would facilitate evacuations for natural disasters. Second, it would facilitate the removal of hazardous and recyclable waste from communities. The accumulation of these waste materials creates health and environmental risks for rural villages. Currently, back-haul of waste material with airfreight is often unaffordable. With a road, each community could provide economical back-haul of unsightly and potentially dangerous waste material. Third, it could reduce the costs of providing access to communities by Alaska State Troopers. An enhanced police presence and improved response time could reduce local crime.

In addition, a road connection to Kobuk, or to another community if that community built a spur road connection, could provide improved access to gravel sources for each community. Gravel access is an important cost factor in construction and maintenance of community infrastructure projects, including airports, landfills, community streets, and housing pads/subdivisions (NAB Planning Department 2008).

The direct effects of all phases of the potential mining projects on local public infrastructure and services would not be readily noticeable. The temporary and long-term camps housing mine workers would be self-contained, and they would be operated and maintained by the mining companies throughout project construction, operations and maintenance, and closure, reclamation, and monitoring.

The indirect impact of the potential mining projects on local public goods and services is difficult to predict given the conflicting potential effects of mining project construction and operations on the population sizes of NAB/YKCA communities. On the one hand, the revenues that the NAB and NANA would receive as a result of mining development in the District would likely have the same positive impact on local public infrastructure and services as revenues from the Red Dog Mine have had. NANA and borough revenues could be used to support social services throughout the borough (DOWL 2016). In addition, the jobs and economic stability that the mining projects would create could ease population reductions in NAB/YKCA communities by stemming out-migration. Stemming outward migration would help ensure that an adequate level of public facilities, such as utilities, schools, and health clinics, is maintained in the communities.

On the other hand, some mine employees from NAB/YKCA communities may not continue to reside in the region after they are hired. Mining has high average wages and allows workers to live where they prefer and commute to the work site on a rotating schedule (DOWL 2016). About half the NANA shareholders recruited to work at Red Dog decided to move their families and live outside the NAB for lifestyle and/or economic reasons (Tetra Tech 2009)[23]. These shareholder employees rotate out at the end of their work shifts to homes primarily in Anchorage (Bradner 2011). Teck provides transportation between the mine and these alternative places of residence, and steady employment has given workers the financial means to relocate (Tetra Tech 2009). Should employment opportunities in remote mining projects in the District lead to depopulation of some NAB/YKCA communities, the effect on the range and level of local public services and facilities could be negative which, in turn, could prompt further out-migration. It is difficult to predict the number of NAB/YKCA residents employed by mining projects in the District that would choose to reside outside the region during their employment with the projects.

Also difficult to forecast are the effects of mining development in the District on the overall economic and social well-being of individuals and families in NAB/YKCA communities. Rotating shifts at a remote mining project would involve long periods away from home, which have been blamed for marital discord

[23] In comments on the Draft EIS, NANA Corp. indicated that data show the opposite—that workers in the NANA Region who hold mining jobs stay in their local community. However, the comment did not include the source of the data.

and family dysfunction (Tetra Tech 2009). Moreover, income from employment in mining projects could be spent in ways that are beneficial or adverse. In general, benefits arise where increased income leads to improved lifestyles, living conditions, and health risk behaviors of individuals and their families. Income that is spent in ways that worsen lifestyles, living conditions, and health risk behaviors is considered unfavorable. To the extent that these and other negative social problems occur, they could be mitigated by improving health and social services program in communities.

Rural Lifestyle

Many comments received during the public comment period expressed concern over how the project would further change the way of life for people living in the Alaska Native communities. Citing the cultural practices of their ancestors, subsistence activities that sustain them, and traditions that get passed from generation to generation, the commenters frequently described how these qualities of life have changed since the late 60s/early 70s when the Dalton Highway and TAPS were built. They describe their history of living on the land, how they feel connected to it, and how they rely on its resources. They also describe a decline in resource availability and relate it to the introduction of roads, mines, pipelines, and competition from sportsmen in recent years. Some comments expressed the changes as having been brought on by people from “outside” (i.e., people who come to this part of Alaska take the resources and leave the communities with unmitigated and long-lasting effects). The effects of climate change on resources were also cited as having an effect on life in the villages. Commenters described the peace, quiet, beauty, and wildness of the land and expressed concern that those qualities of the land are in jeopardy from increased human presence and activities.

The BLM acknowledges that the Alaska Native communities potentially affected by the project have experienced impacts from past transportation and resource extraction projects, as well as current land use policies that allow recreation uses and economic development in areas that are also used by rural residents for subsistence activities and traditional practices. The BLM evaluated the project impacts on subsistence resources and subsistence activities in Appendix L, Subsistence Technical Report. Appendix L, Section 6.4.1 in particular, describes the cultural impacts that occur over time as a result reduced subsistence use:

> If residents stop using portions of the project area for subsistence purposes, either due to avoidance of development activities or reduced availability of subsistence resources, the opportunity to transmit traditional knowledge to younger generations about those traditional use areas would be diminished. While communities would likely maintain a cultural connection to these areas and acknowledge these areas as part of their traditional land use area, the loss of direct use of the land could lead to reduced knowledge among the younger generation of place names, stories, and traditional ecological knowledge associated with those areas. There would also be fewer opportunities for residents to participate in the distribution and consumption of subsistence resources, ultimately affecting the social cohesion of the community. Any changes to residents’ ability to participate in subsistence activities, to harvest subsistence resources in traditional places at the appropriate times, and to consume subsistence foods could have long-term or permanent effects on the spiritual, cultural, and physical well-being of the study communities by diminishing social ties that are strengthened through harvesting, processing, and distributing subsistence resources, and by weakening overall community well-being.

The cumulative effects of increased human presence and use of the land in remote areas on the physical, biological, and human environments are represented in this appendix. The BLM recognizes that, as opportunities for access and development increase in remote regions of Alaska, the lifestyle and culture of Alaskan Native communities in those regions also change. The isolated communities will continue to experience encroachment in areas that they have relied on for cultural and traditional practices. The BLM must weigh the benefits of the project against all impacts, including impacts to Alaska Native and rural communities and their way of life. The BLM appreciates and will consider the comments it received from the rural communities on the Draft EIS to inform its decision to select an alternative.

Public Health

Increased economic activity could enhance the ability for communities to support local infrastructure investments, such as water and sewer improvements, with related health benefits.

Potential commercial access could improve goods and services distribution, resulting in a mixture of positive and negative impacts. For example, access to cheaper building materials could make constructing or maintaining water, sewer, or other health-related infrastructure less expensive. Improved commercial access could lower distribution costs for clinic supplies. However, it would also facilitate increases in substance abuse due to easier importation of alcohol and tobacco products. Improvements in road and air infrastructure (i.e., new landing strips associated with road construction and maintenance) would facilitate redundancy for emergency evacuation for health-related emergencies or during disasters for communities (see Section 2.2, Indirect Road Access Scenarios). There would be potential health improvements due to access to fiber optic cable infrastructure because faster and more stable internet/telecommunications would facilitate telemedicine.

Increased economic benefits of job access at potential mines may decrease the number of food-insecure households. For example, improved incomes may allow for purchase of better snowmobiles and hunting/fishing supplies, which would facilitate subsistence activities. Potential indirect and cumulative impacts to access, quantity, and quality (real or perceived) of subsistence foods could occur, related to (1) increased competition for resources (induced access), (2) impacts to fish and game populations or locations, (3) concern about pollutants from mining affecting drinking water and target harvest species, and (4) difficulties with scheduling time off work for subsistence activities. Impacts to subsistence harvesting could have cascading effects on long-term non-communicable disease rates (e.g., diabetes). See Chapter 3, Section 3.4.7 (Subsistence Uses and Resources), of the EIS for information on which communities are likely to experience subsistence impacts.

A fly-in-fly-out workforce at the mines could have mixed effects on community cohesion (e.g., employed adults may relocate to urban areas but send remittances back to the villages) with health-related effects from psychological stress. Increases in communicable diseases related to in-migration and increased incomes are a concern and often associated with the “boom and bust” cycle. Increases in vaccine-preventable diseases are possible in association with large construction work camps. Kobuk, and possibly Shungnak and Ambler, would see the most potential for indirect and cumulative health effects from the proposed road and mining in the District because of their proximity to the mines and likely access of mine workers to and from the mines via the Dahl Creek airstrip. For more discussion, see the Health Impact Assessment (NewFields 2019).

Areas targeted for mining likely contain NOA, and disturbing the ground for development of mines could release dust containing asbestos. In general, the types of potential impact would be similar to those described in the geology, air quality, and socioeconomics/Public Health sections in Chapter 3 of the EIS but in different locations. The dust is most likely to be hazardous to mining employees who work where the dust is concentrated, and OSHA regulations may govern the mining workplace to help protect workers. Fine particles of asbestos may remain airborne longer than visible dust and may drift off site but would be dispersed in the atmosphere with distance from the mine sites and would be much less likely to affect people passing nearby or to affect the nearest communities, which would be many miles away. While road builders may use NOA materials in the road embankment and contain the asbestos beneath a capping layer, mining companies may not be able to contain mining dust during excavation of open pit mines and transport and disposal of many tons of material.

Tailings, or the mineral material left after the marketable minerals are extracted from ore, typically contain hazardous levels of metals that would be contained behind dams at the open pit mine sites. Dams and water quality would be monitored during mine operations and for decades, possibly in perpetuity, after mine closure. The intention is that the mining companies would be responsible for monitoring and any corrective action needed, and financial surety instruments, such as a bond, likely would be in place to ensure that this work could be done even if the mining company were to fail in the future. There are risks to public health in the Kobuk River drainage of discharged water not being properly treated, or of leaks from impounded tailings water, or of catastrophic dam failure (e.g., from an extraordinary high water event or an earthquake). The risks are related to ingestion of pollutants through downstream domestic water uses or contaminated fish and wildlife, and reduction of subsistence food sources if fish, birds, or wildlife were made ill or died.

Climate change is likely to thaw permafrost, releasing mercury that has been frozen in the soil. This could result in higher mercury levels in water and in wildlife. Permafrost areas are estimated to contain nearly twice as much mercury as the rest of the world combined (Sneed 2018), and mercury is known to bio-accumulate in muscle tissue of fish, other wildlife, and humans, and can cause damage to the nervous system and other bodily functions, particularly to fetuses (World Health Organization 2017). The road project, combined with the mining projects and global climate change, would likely hasten thawing of permafrost where soils were disturbed, adding in a small way to the health risk of mercury in wildlife and in a human subsistence diet. As noted above, metals such as mercury and selenium also could be released to the Kobuk River drainage from mining operations in the District.

Other Reasonably Foreseeable Actions

Little additional socioeconomic impact in the Ambler project area is expected as a result of other actions. Arctic oil development and changes at Red Dog Mine could somewhat alter the availability of jobs in the extended region, in particular the closure of Red Dog Mine. The Ambler mine jobs discussed above would work to offset the lost Red Dog jobs and the funds that flow to through NANA and NAB to the region. Continued climate change could further stress poor communities in the region by affecting flooding, permafrost, and infrastructure as well as altering access to traditional subsistence resources. While these are poorly defined, they would be cumulative with the Ambler Road and District projects. Dalton Highway improvements likely would be minor and would have little socioeconomic impact in area communities.

3.5.6 Environmental Justice

Past and present actions that have affected the areas of potential environmental justice concern are included in Appendix F, Chapter 3 Social Systems Tables and Supplemental Information, Table 14, include mining development (e.g., Red Dog Mine), infrastructure projects, scientific research, recreation and tourism, sport hunting and fishing, and government hunting and harvesting regulations.

As discussed in Chapter 3, Section 3.4.7 (Subsistence Uses and Resources), of the EIS and Section 3.5.7 (Subsistence Uses and Resources), of this appendix, the construction and operation of the proposed road, together with the mining development that the road would support, is expected to result in a reduction in subsistence resource abundance and availability. This reduction would have a disproportionately high and adverse impact on minority and low-income populations because of their economic, cultural and social dependence on subsistence resources. Changes in subsistence resource abundance resulting from climate change could contribute to changes in resource availability caused by road construction and mining development, thus further reducing their availability to minority and low-income populations.

Some potential adverse public health impacts of road construction and mining development may be concentrated in areas of potential environmental justice concern (see Chapter 3, Section 3.4.5

[Socioeconomics and Communities], of the EIS). A number of these effects, such as a possible increase in the number of food-insecure households and increases in psychosocial stress at either a household or individual level, may be related to decreased access to subsistence resources. Other potential adverse public health effects that may disproportionately affect minority and low-income populations due to their proximity to the proposed road and mining development include increased exposure to NOA materials.

These adverse impacts would at least be partially offset by benefits that would accrue to minority and low-income populations as a result of construction and operation of the proposed road and mines, including increased employment opportunities, expanded public services, and reductions in the cost of living due to changes in the logistics of delivering fuel and freight in some communities with high minority and low-income populations, provided the road allowed for commercial delivery of fuel supplies. As described in Chapter 3, Section 3.4.5 (Socioeconomics and Communities), of the EIS and Section 3.5.5 (Socioeconomics and Communities) of this appendix, road and mine construction and operation would provide opportunities for workforce training and development and employment for NAB/YKCA communities, most which have high minority and low-income populations. Those document sections also indicate that proposed mines located on land owned by NANA (e.g., Bornite Mine) may be developed under an operating agreement specifying that NANA shareholders receive direct and meaningful benefits from development at the mine and that this could sow seeds of resentment among some study area residents. However, in addition, the revenue the NAB and NANA would receive from mining development could be used to support public infrastructure and services in the region, which would be a long-term benefit to local communities. Construction of the proposed road could also reduce the costs of transporting goods to some NAB/YKCA communities and provide increased access to emergency and health care services.

3.5.7 Subsistence Uses and Resources

The cumulative impacts to subsistence resulting from the proposed road, other reasonably foreseeable developments, and climate change could result in reduced harvesting opportunities for local residents and alterations in subsistence harvesting patterns. See also Appendices L (Subsistence Technical Report) and M (ANILCA Section 810 Preliminary Evaluation) for a discussion of indirect and cumulative impacts to subsistence. Past and present actions that have affected subsistence uses and resources within the study region include mining development (including the Red Dog Mine), infrastructure projects, scientific research, recreation and tourism, sport hunting and fishing, government hunting and harvesting regulations, establishment of wildlife refuges and national parks, and environmental changes resulting from climate change. Construction of the TAPS and Dalton Highway have affected subsistence access and resource availability for communities in the eastern portion of the project area, with many residents believing that the highway and pipeline have resulted in changes to caribou migration across the region. The Red Dog Mine, including the DeLong Mountain Transportation System and port site, has introduced contamination concerns for local residents, particularly Kivalina residents who are situated downstream from the mine, and have affected resource distribution and migration for resources such as caribou and marine mammals possibly resulting in decreased harvests of these resources over time (EPA 2009). Increased sport hunting and fishing in the region and associated air traffic have resulted in increased competition for local subsistence users in addition to disturbance and displacement of subsistence resources such as caribou. The establishment of GAAR in the 1980s also affected access to and use of traditional harvesting areas for residents of nearby communities within the northeastern portion of the project area (Watson 2018). Impacts of climate change include changes in the predictability of weather conditions such as the timing of freeze-up and breakup, snowfall levels, storm and wind conditions, and ice conditions (e.g., ice thickness on rivers and lakes), all of which affect individuals' abilities to travel to subsistence use areas when resources are present in those areas. In addition, subsistence users may experience greater risks to safety when travel conditions are not ideal. Changes in resource abundance or distribution resulting from climate change could also affect the availability of those resources to subsistence users or may cause subsistence users to travel farther and spend more time and effort on subsistence activities.

Other influences that have been noted specifically as marking substantial shifts in subsistence use patterns in the area were the fur trade with Russians that brought the use of firearms, circa 1838; a Nulato massacre of 1851; the Gold Rush period beginning in 1898; the introduction of the outboard motor by the 1930s; western missionaries and education that contributed to the end of the semi-nomadic subsistence patterns by the 1950s; and construction of TAPS by the 1980s (Watson 2018). Some of these represent broad patterns of change and events far from any given subsistence community. Similarly, the Ambler Road may not result in visible changes near any given community or even in many common subsistence use areas, but it is likely to change patterns of use and, therefore, of interactions between individuals in a community and between communities.

Construction and operation of the Ambler Road would likely result in changes to resource abundance, resource availability, and user access for many of the subsistence study communities. The project would introduce a large industrial road corridor into an area that was previously undeveloped and used primarily for subsistence and recreational purposes. Under any alternative, 12 communities have subsistence resource use areas impacted by the project corridor(s), and a majority of these communities are rural, low-income, non-road-connected communities that rely on subsistence to support their mixed economy. The Ambler Road would introduce impacts to resource abundance and resource availability for key resources such as sheefish, whitefish, salmon, and caribou, while also reducing (rather than facilitating) access to traditional harvesting areas. One of the proposed mines (Sun) and Alternatives A and B would be located upstream of sheefish spawning habitat and could damage that habitat and impact subsistence resources for downstream communities. Under any alternative, the road may increase access to and reduce costs of commercial goods for certain communities; however, few local jobs directly associated with the road (e.g., maintenance and operation) will be available after construction, and relatively lucrative mining jobs are more likely to go to NANA shareholders and to residents of the closest communities (Kobuk, Ambler, Shungnak), because 2 of the largest mines are on NANA land or subject to NANA agreements. Such jobs, which allow both for relatively high income and for chunks of time off that may be used for subsistence activities, are less likely to go to Doyon shareholders whose subsistence areas would be equally affected. Those communities in the Doyon region with fewer job benefits coupled with distance from the new road would be further affected because they would not benefit from reduced costs of supplies and fuel; only communities close to the road, such as Bettles/Evansville (Alternatives A and B) and Hughes (Alternative C) have potential to see benefits from reduced costs of fuel, goods, and groceries, including fuel, fishing and hunting tools, snowmobiles and boats that help in the subsistence harvest. Other subsistence communities in the Doyon region would experience the impacts of the road crossing their subsistence use areas but would be too far from the road to benefit from the reduced costs of subsistence activities. In addition, NANA region communities would benefit by dividends bolstered by payments from the mines. Impacts to resource availability and user access will be most pronounced for communities that do not experience increased income associated with the road (i.e., road or mining jobs) and/or do not experience benefits of the road related to lowered costs of subsistence supplies/equipment, food, or other goods. These communities would have less opportunity to purchase or invest in fuel and equipment to adjust to changes in access and resource availability. The comparative lack of economic benefits for certain communities, such as those farther removed from the road alignments, could make those communities more vulnerable to social and subsistence impacts, particularly those associated with disruption of subsistence activities. Without the economic benefits of development, communities are more vulnerable to the impacts of the same development and less able to adapt to environmental and social changes resulting from the development.

Those communities close to the road that end up connecting by spur road or trail, or just by snowmobile or boat, could experience a change in the balance between the subsistence economy and cash economy. A study on the economic benefits and subsistence impacts of public-use roads found that communities located along public roads were associated with a decreased of approximately one-third in subsistence harvests, with little to no benefit in terms of increased personal incomes (Magdanz et al. 2016). The study looked at communities on public roads and thus is not directly comparable to the proposed road corridor, which would be a private, industrial-use corridor. RFAs within the region that could contribute to subsistence impacts include development of the District (Arctic, Bornite, Sun, and Smucker projects); use of the Ambler Road for commercial access; use of the Ambler Road for commercial use by local communities and Native Allotment owners; and secondary access roads connecting the Ambler Road to other mining areas and claims, Air Force lands, and local communities. Dalton Highway improvements are expected to be minor changes to an existing road and likely would not have substantial new effects on subsistence.

The Ambler Road will facilitate additional mining and other development throughout the study region, which will contribute to impacts on subsistence resource abundance, resource availability, and user access for subsistence users across the region. Mining development will result in the physical removal of traditional subsistence hunting and harvesting areas for the study communities in addition to decreased access to these areas through security/access restrictions and through user avoidance of development areas. The overall area available for subsistence use will likely shrink over time due to the increasing presence of infrastructure and human activity within traditional use areas.

Construction of additional access roads to mines, communities, and other locations will contribute to fragmentation of habitat for resources such as caribou and moose, which would remove usable habitat for these resources and in the case of caribou could cause changes in range distribution. Impacts to migrating caribou increase with density of roads and infrastructure (see Chapter 3, Section 3.3.4 [Mammals], of the EIS). Mining activities would cause further disturbance to wildlife through the presence of mine pits and noise and disturbance from heavy machinery, blasting, and human activity. Mine development and additional road construction would also contribute to further contamination and alteration of waterways, which may cause substantial impacts to spawning grounds and other habitat for non-salmon fish (sheefish and other whitefish) and salmon that are key subsistence species across the region. Mining and further road development could have population-levels effects on certain fish species, particularly if mine activities result in contamination or impact to Kobuk River sheefish spawning grounds. Fish and other wildlife may be adversely impacted by toxins, such as PAHs, that enter the environment as a result of road construction and mining activity. These compounds are toxic to fish, amphibians, aquatic invertebrates, and other wildlife, and are known to bioaccumulate through trophic levels (Fisher 1995). Consumption of fish and wildlife contaminated with PAHs may constitute human health risks if populations are exposed to hazardous levels, which can include duration of exposure, concentration of PAHs, and amount and type of food consumed (European Commission 2002; Wickliffe et al. 2014).

The potential for increased access into the project area resulting from local and non-local use of the project road and ROW (regardless of legality) may increase competition in the region for certain resources and decrease harvesting success for local hunters. Secondary access roads developed by communities would likely be used, at least by local residents, for subsistence harvesting activities and could create harvesting corridors and increase competition within those areas. When the road is reclaimed, portions of the remaining cleared ROW would likely become a route for local and non-local hunters traveling by off-highway vehicles, at least in areas between major bridges. If the reclaimed road alignment increases access into the region, state and federal regulators may respond by introducing stricter hunting and harvesting regulations, which would affect availability of resources to local communities. To the extent there is increased competition and decreased resource availability, the existence of the corridor may result in residents having to travel farther and spend more time, money, and effort to harvest resources such as moose and caribou.

The potential for increased access into the region was a key concern voiced by residents during both scoping and traditional knowledge studies associated with the Ambler Road (Watson 2014; BLM 2018a). Many residents do not believe that the road will remain private and point to previous private access roads that eventually opened to the public (e.g., the Dalton Highway). While large mines would likely have policies regarding hunting and fishing by workers, smaller mining outfits or individuals may allow these activities if the road were open to individual and recreation mining claims. According to Guettabi et al. (2016), increased access resulting from the road and/or ROW would likely reduce harvest success for local hunters, particularly for moose (see Appendix L for more detailed discussion). However, this conclusion is based on an assumption that the road would eventually be opened to public access, and therefore the study is not directly comparable to this project because the currently proposed road is an industrial access-only road. Increased access to the area resulting solely from unauthorized use of restricted roads and/or ROWs would likely not have the same level of impacts on harvesting success. According to the WAH Working Group (2017), communities within the region have already experienced increased competition in traditional hunting areas, with greater numbers of hunters concentrated within smaller areas. Sport hunting is a key issue within the region for subsistence harvesters, and public access to the area via a road or ROW would contribute to these impacts.

Communities in the study region currently have high levels of unemployment and low income with high costs of living; despite these factors, many of the study communities have remained stable and resilient through a mixed economy that revolves around subsistence hunting and harvesting (Guettabi et al. 2016). Construction of the proposed road and associated mining development would result in increased employment opportunities and income for residents of some of the subsistence study communities. Residents may invest the income from construction, operation, and mining jobs into supplies and equipment (e.g., snowmachines, outboards, fuel, ammunition) to support subsistence activities. In addition, the ability to use the road to transport commercial goods, including subsistence supplies and equipment, may also reduce certain costs associated with subsistence. However, at this time, there is no guarantee that this benefit is certain for any community. In addition, benefits associated with increased employment and income would be most likely to occur for NANA shareholders and communities due to agreements between mining companies on NANA lands regarding local hire policies. Thus, interior communities such as Alatna, Allakaket, Bettles, and Evansville may experience subsistence impacts (e.g., reduced resource availability and access to traditional harvesting areas) without the counter benefits of increased income and employment associated with mine development.

Those individuals who obtain long-term employment associated with the proposed road or associated mining developments may experience reduced time to engage in subsistence activities, although they may continue to invest monetarily in and support subsistence activities for others in the community. Those with mining jobs may move away from their communities, as some have done in association with the Red Dog Mine, to larger urban centers. A shifting of subsistence roles may occur in certain cases, where particularly active harvesters (e.g., super-harvester households) may no longer have time to provide subsistence foods and may rely on others to fill the subsistence roles they once held. Larger disruptions to subsistence ties could come with high costs to social, cultural, and economic well-being, particularly to the more vulnerable low income, unconnected, and low-harvest households (Kofinas et al. 2016). Over time, particularly if the road becomes public and communities in the region become road-connected, the availability of goods, increased income and employment opportunities, and decreased harvesting opportunities could result in an overall decrease in subsistence harvests among the study communities.

Ultimately, the cumulative impacts to subsistence resulting from the Ambler Road, other reasonably foreseeable developments, and climate change could result in reduced harvesting opportunities for local residents and alterations in subsistence harvesting patterns. A recent analysis comparing road-connected communities to non-road-connected communities showed that road-connected communities have substantially lower subsistence harvests than non-road-connected communities (Guettabi et al. 2016). As noted above, this study's road-connected communities were located on publicly-accessible roads in more densely populated areas, and therefore the study is not directly comparable to this project because the currently proposed road is an industrial access-only road.

The currently proposed road would be an industrial-access road. However, the inclusion of commercial delivery of goods for local pickup would introduce elements and impacts similar to those analyzed by Guettabi et al. (2016), resulting in introduction of incremental increased access to and decreased costs of goods such as food and equipment. Therefore, while the Ambler Road may not reduce subsistence harvests to levels seen along other road-connected communities in the state, the combination of reduced resource availability, decreased user access, increased income (for some communities), and increased access to commercial goods (for some communities), will likely alter subsistence harvesting patterns across the region and affect overall subsistence harvests for certain communities. Decreased harvests among the study communities could have wide-ranging effects due to the potential impacts on sharing networks within the region in addition to networks that extend to other regions (Kofinas et al. 2016). Sharing is a key value across the study region that is central to subsistence. Decreased harvests could disrupt existing sharing networks to other communities and regions if residents are unable to share as widely or frequently as they are accustomed.

Cumulative impacts of Alternatives A and B related to resource abundance and availability would likely be greater than those under Alternative C, as they would be more likely to affect resource availability of migrating caribou to the subsistence study communities, particularly during the fall months, and are most likely to have population-level effects on sheefish and whitefish, all key subsistence species among the study communities. Such impacts would restrict subsistence resource abundance and availability for communities that harvest fish along lower segments of the Kobuk River, outside of the actual project area. Impacts related to user access along the road corridors would be similar across all alternatives and would affect a similar number of study communities, albeit not the same set of communities.

When subsistence users' opportunities to engage in subsistence activities are limited, then their opportunities to transmit knowledge about those activities, which are learned through participation, are also limited. If residents stop using portions of the project area for subsistence purposes, either due to avoidance of development activities or reduced availability of subsistence resources, the opportunity to transmit traditional knowledge to younger generations about those traditional use areas would be diminished. While communities would likely maintain a cultural connection to these areas and acknowledge these areas as part of their traditional land use area, the loss of direct use of the land could lead to reduced knowledge among the younger generation of place names, stories, and traditional ecological knowledge associated with those areas. There would also be fewer opportunities for residents to participate in the distribution and consumption of subsistence resources, ultimately affecting the social cohesion of the community. Any changes to residents' ability to participate in subsistence activities, harvest subsistence resources in traditional places at the appropriate times, and consume subsistence foods could have long-term or permanent effects on the spiritual, cultural, and physical well-being of the study communities by diminishing social ties that are strengthened through harvesting, processing, and distributing subsistence resources, and by weakening overall community well-being.

3.5.8 Cultural Resources

Cultural resources include archaeological, historical, and architectural resources; structures; travel corridors; or places of religious, spiritual, or cultural significance to tribes, including Traditional Cultural Properties (TCPs), Sacred Sites, traditional use areas, cultural landscapes, and geographic features. The mining scenario would result in the development of several large mining projects in the District. These projects would include actions such as infrastructure development and the excavation of open pit mines over large areas. The projects would have a high potential for direct and indirect impacts to cultural resources, although the specific locations and timeframes for individual projects are unknown at this time because a specific mine proposal has not been received by the BLM. Few previous cultural resources investigations within the District have occurred. Additional mining impacts to cultural resources could result from development of mining projects outside the District along all action alternatives.

As a result of climate change, environmental effects such as permafrost melt could result in relocation or modification of facilities and infrastructure associated with the Ambler Road and mining projects. Such actions may result in direct and indirect impacts to cultural resources.

Dalton Highway improvement projects and modifications such as widening or realignment may result in direct and indirect impacts to cultural resources. Increases in industrial traffic may result from future arctic oil development and continued mining development. Combined increases in traffic resulting from mining projects and oil development may cumulatively result in a greater quantity of Dalton Highway improvement needs, increasing the probability for direct and indirect impacts to cultural resources.

An additional reasonably foreseeable action is the closure of Red Dog Mine in the 2030s. No additional impacts to cultural resources are anticipated from the closure of the Red Dog Mine.

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Maps

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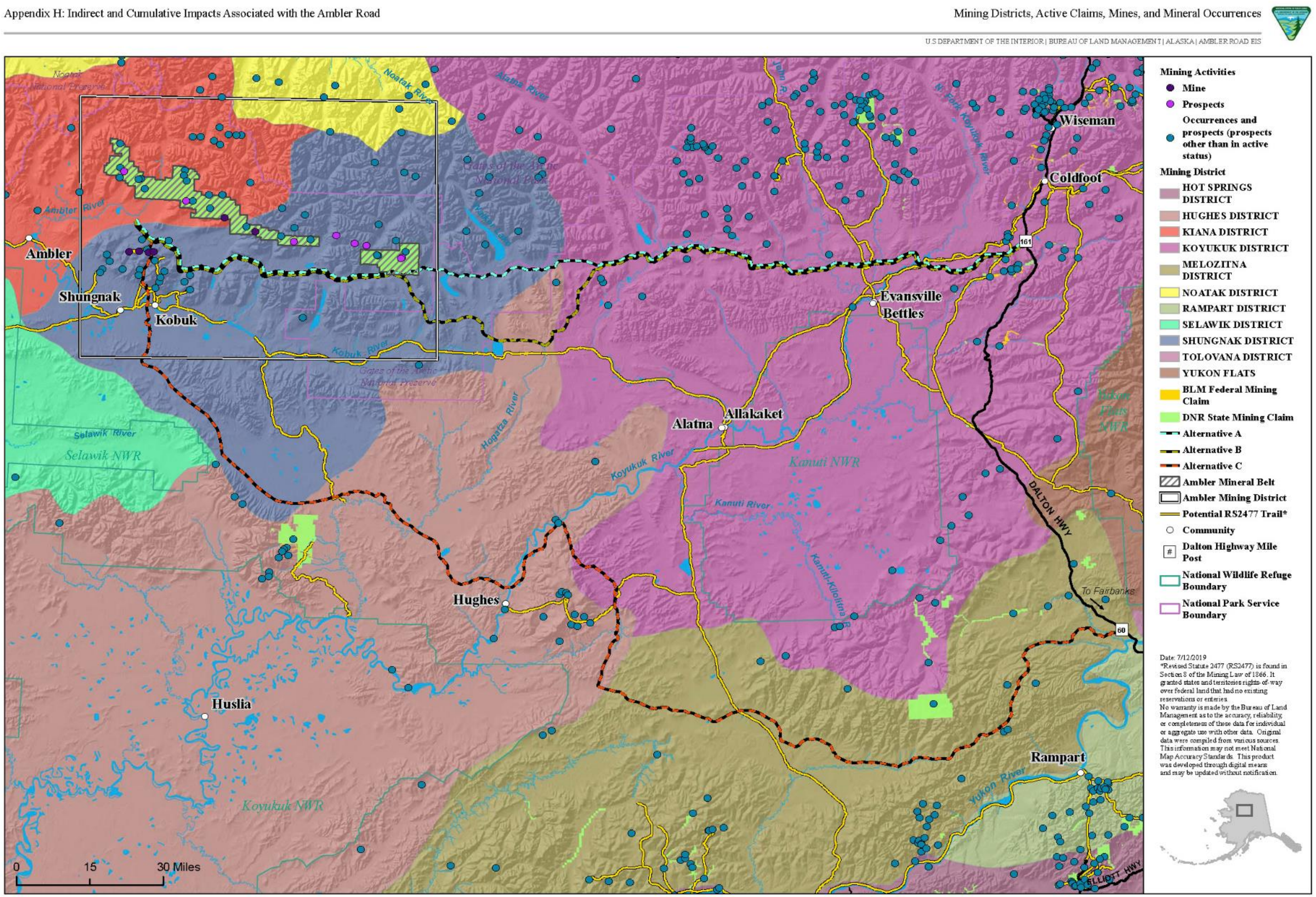

Map 1. Mining districts, active claims, mines and mineral occurrences

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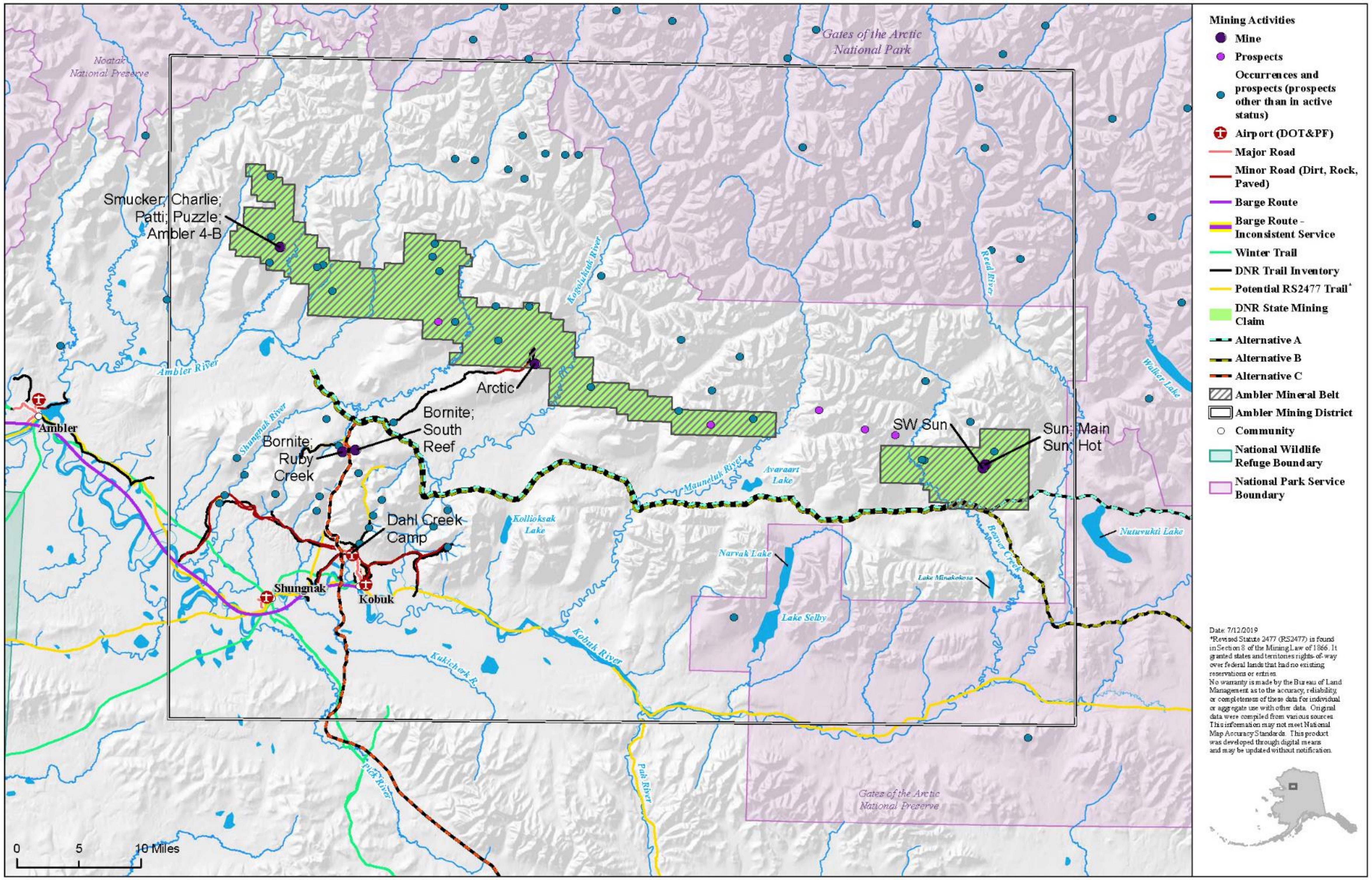
Appendix H: Indirect and Cumulative Impacts Associated with the Ambler Road

Hypothetical Baseline Development Scenario Location of the Four Mine Development Projects

U.S DEPARTMENT OF THE INTERIOR | BUREAU OF LAND MANAGEMENT | ALASKA | AMBLER ROAD EIS



Map 2. Hypothetical baseline development scenario – location of the 4 mine development projects

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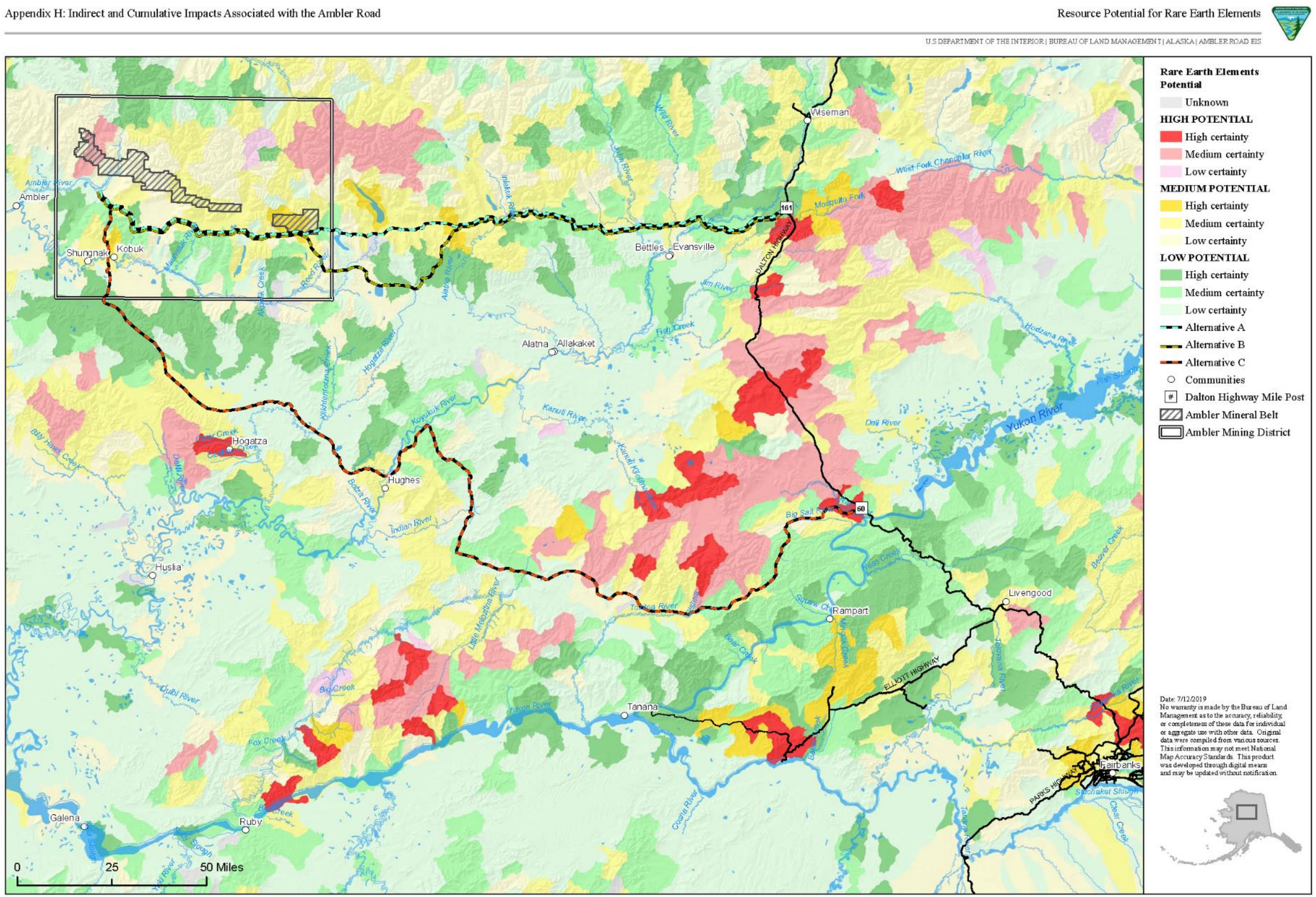

Map 3. Resource potential for rare earth elements

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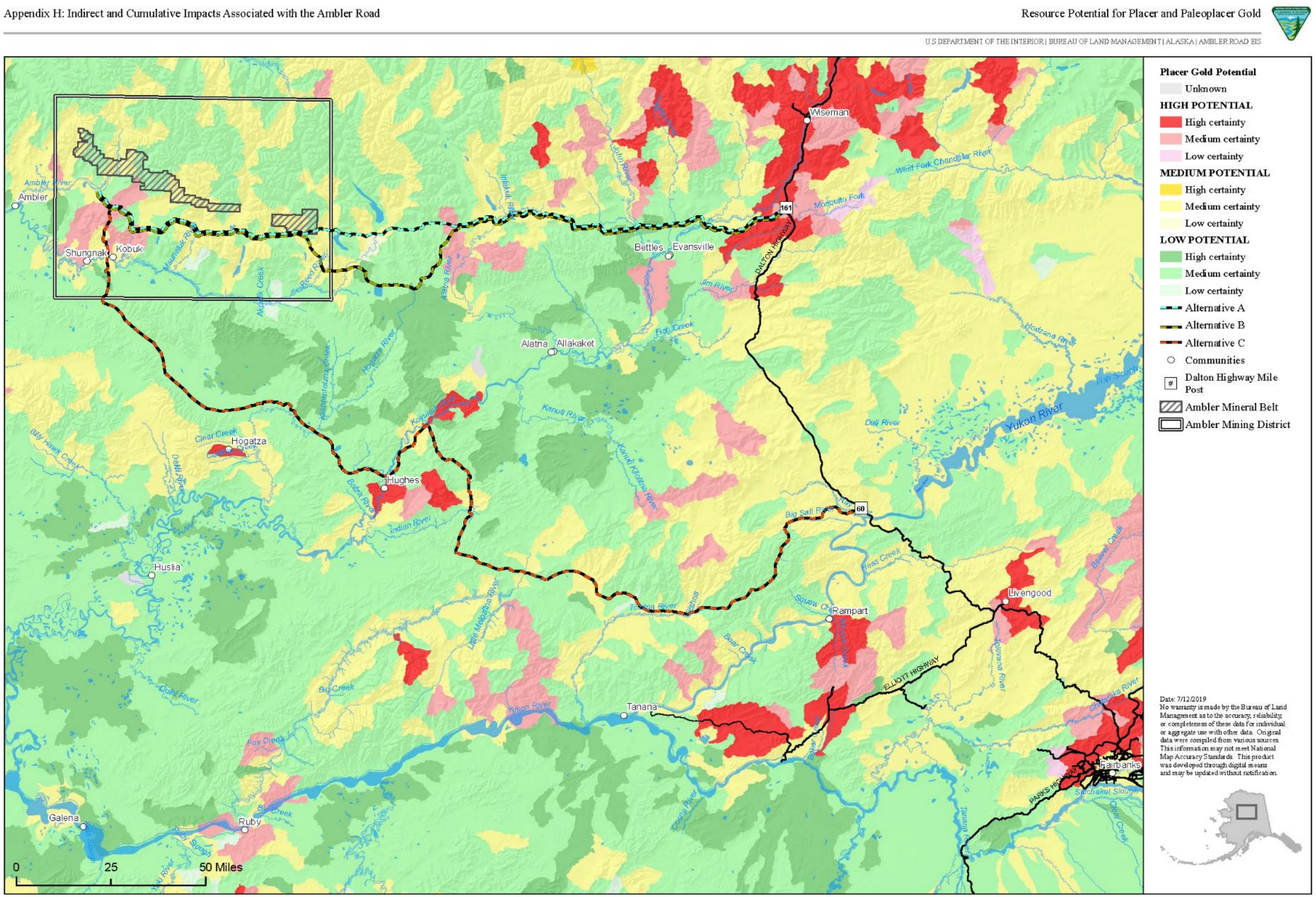

Map 4. Resource potential for placer and paleoplacer gold

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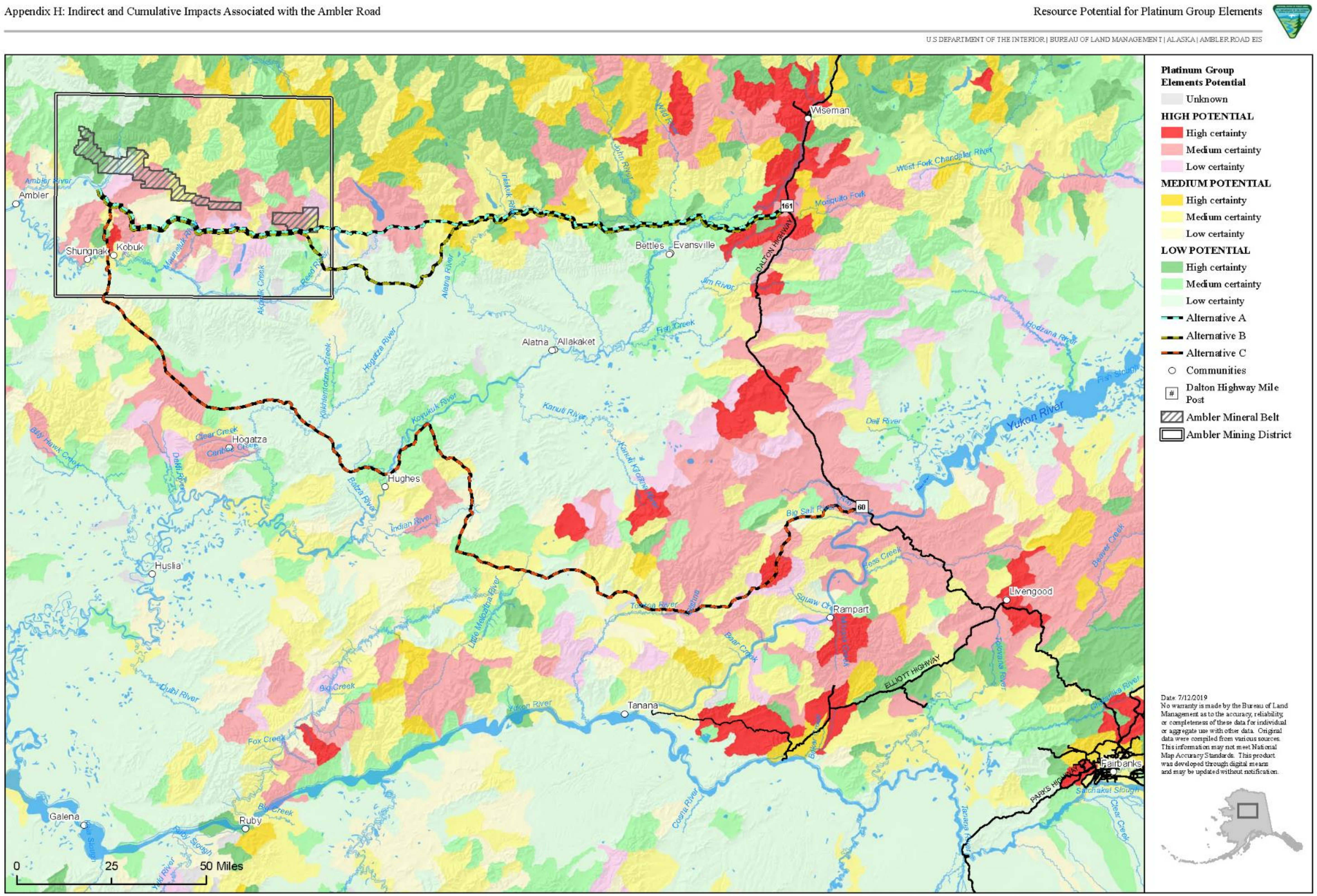

Map 5. Resource potential for platinum group elements

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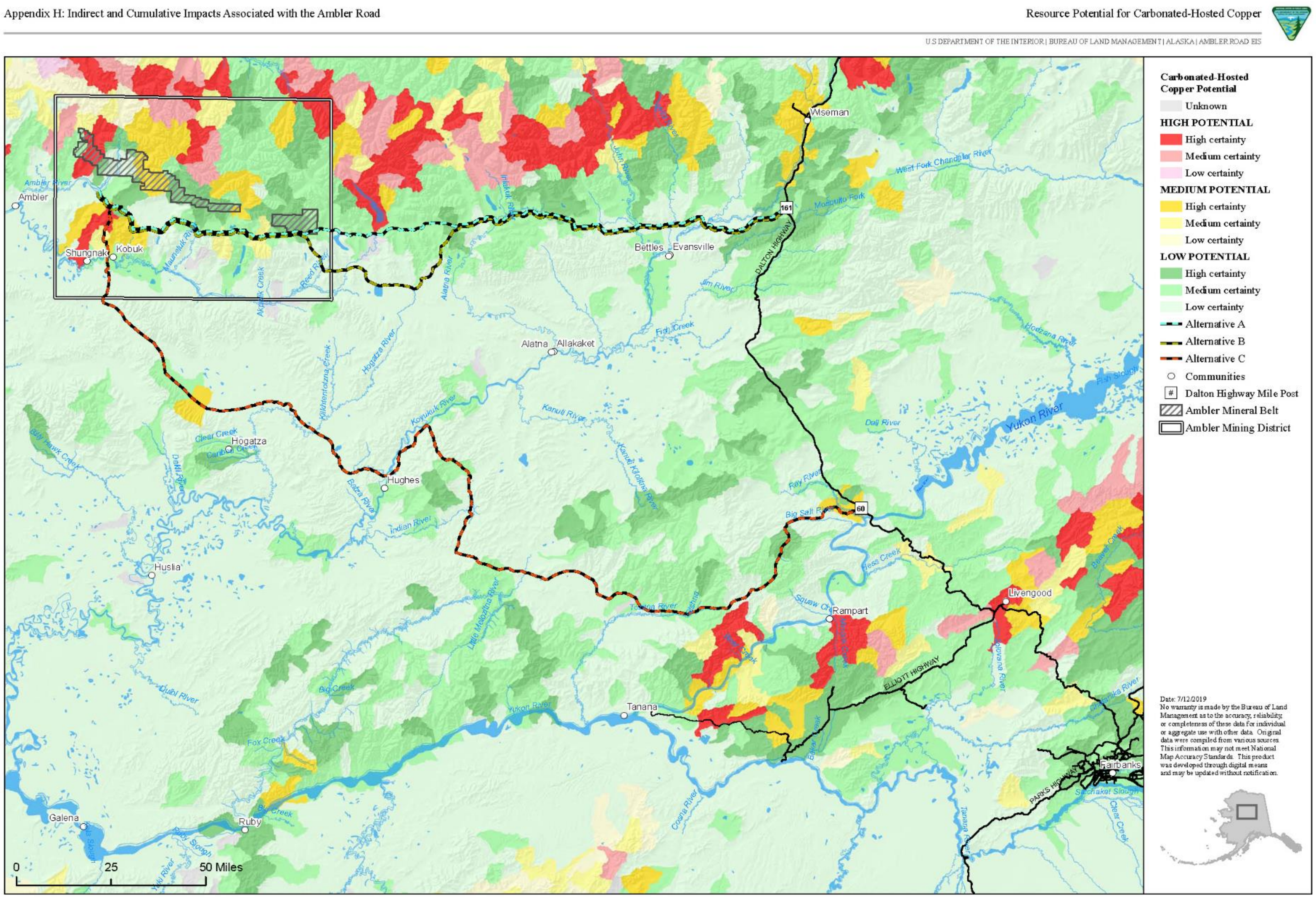

Map 6. Resource potential for carbonated-hosted copper

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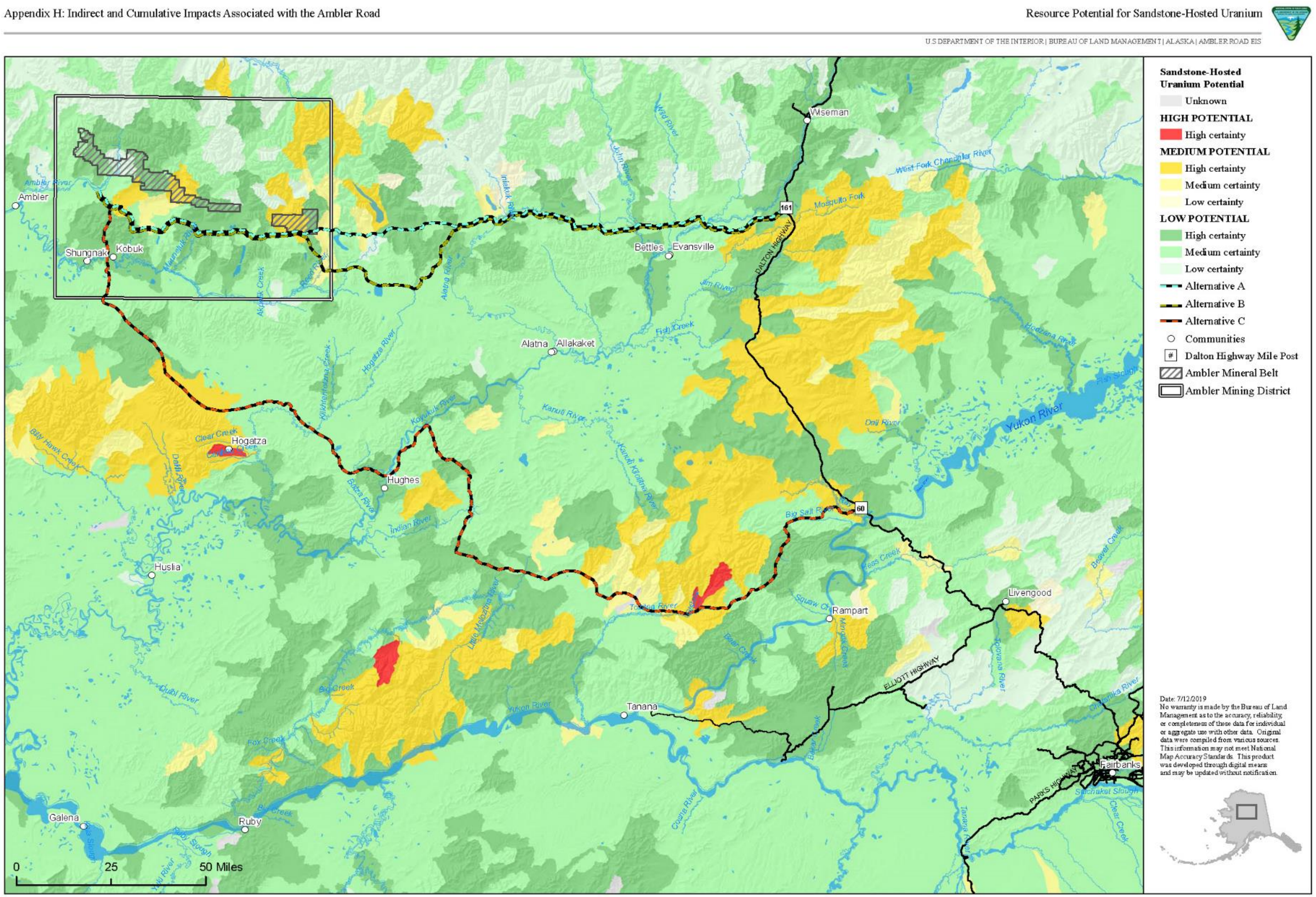

Map 7. Resource potential for sandstone-hosted uranium

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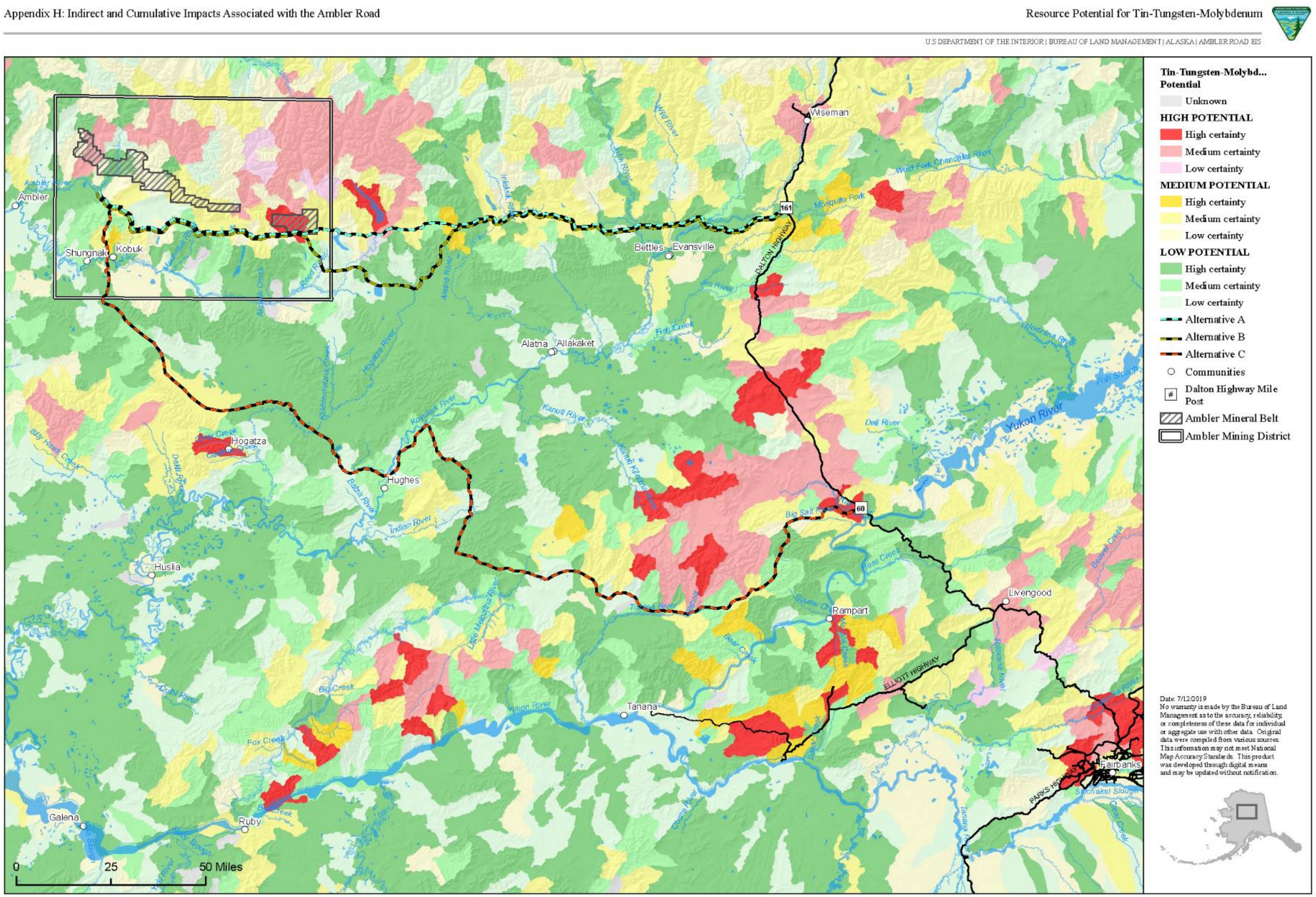

Map 8. Resource potential for tin-tungsten-molybdenum

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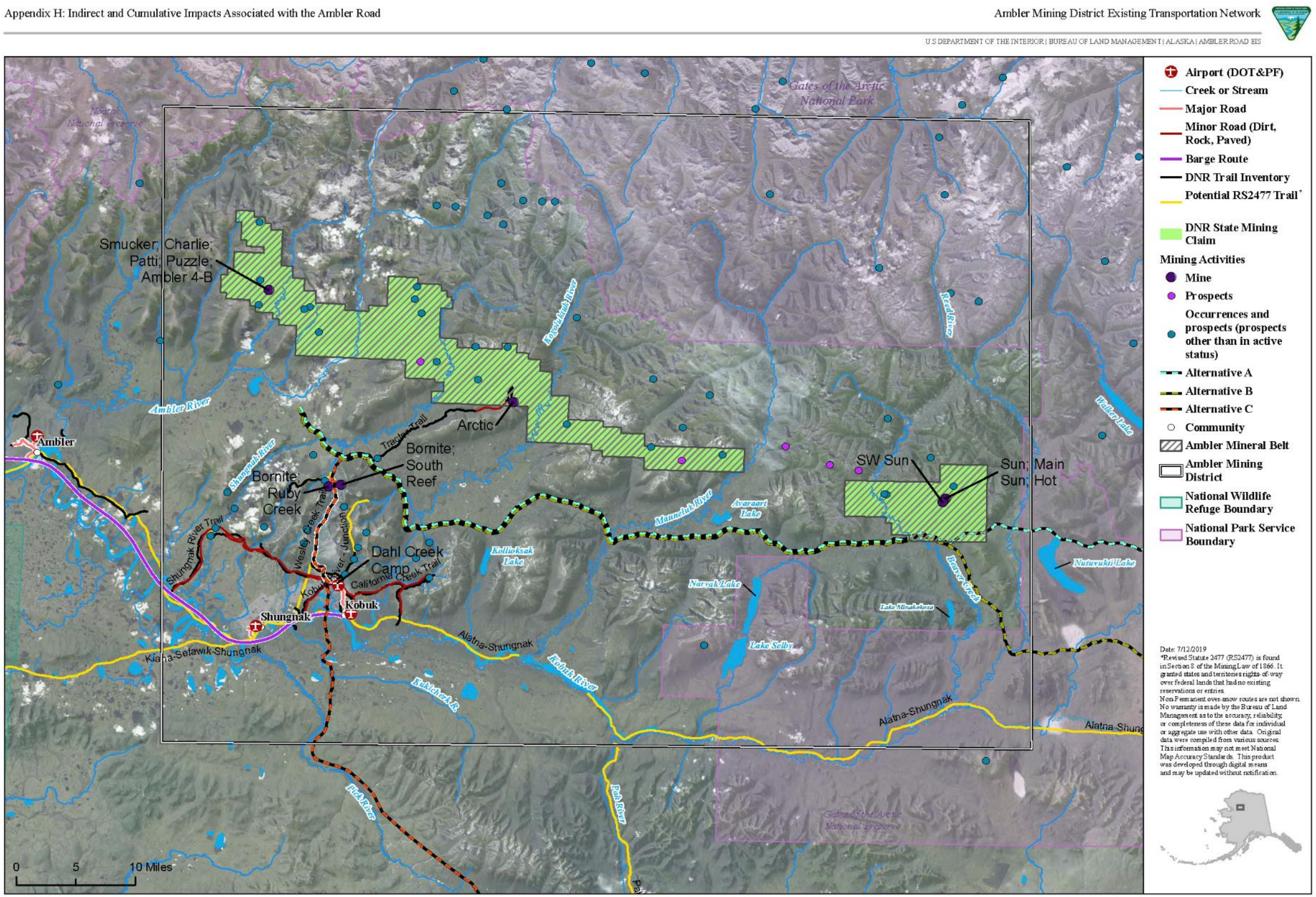

Map 9. Ambler Mining District existing transportation network

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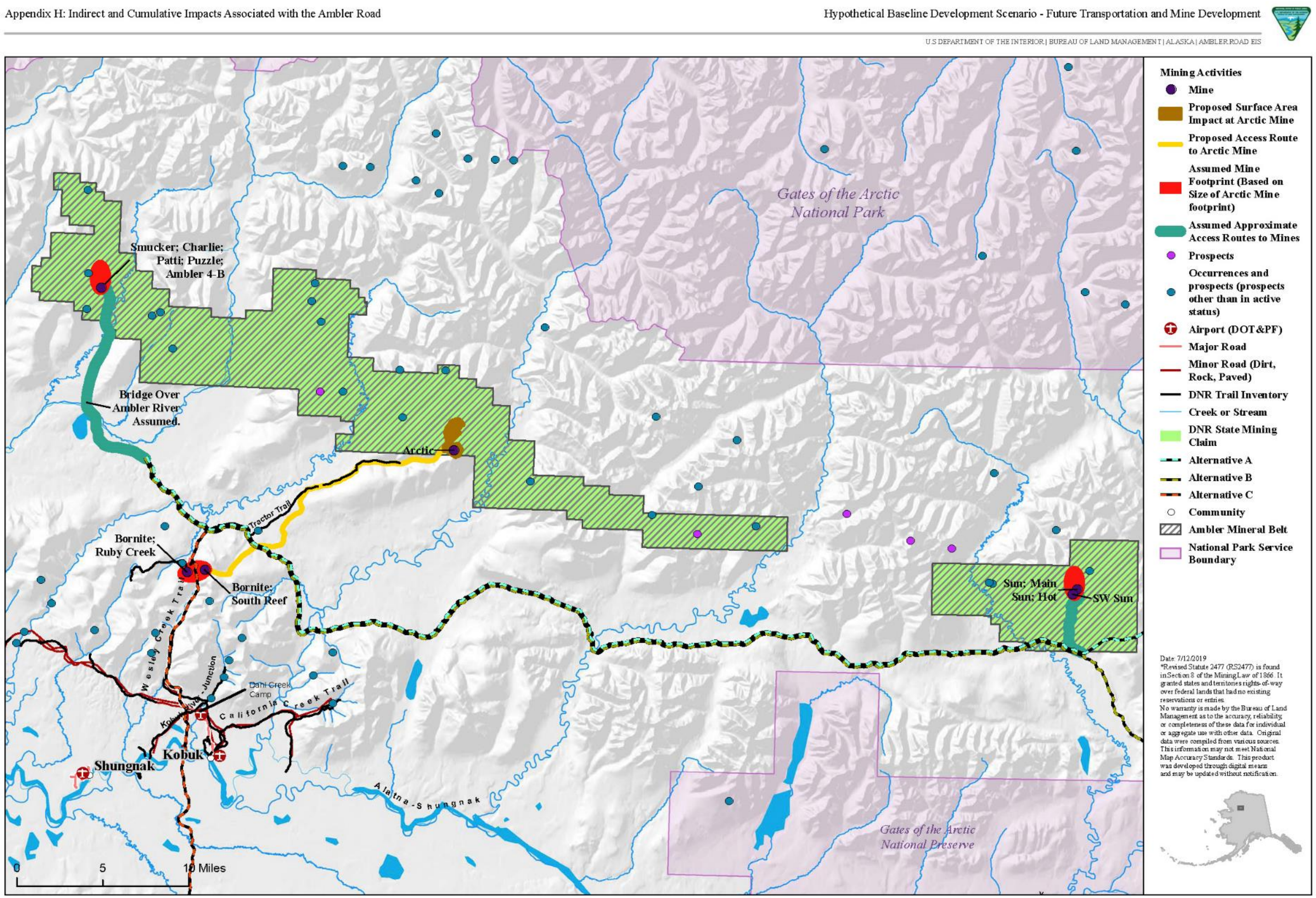

Map 10. Hypothetical baseline development scenario – future transportation and mine development

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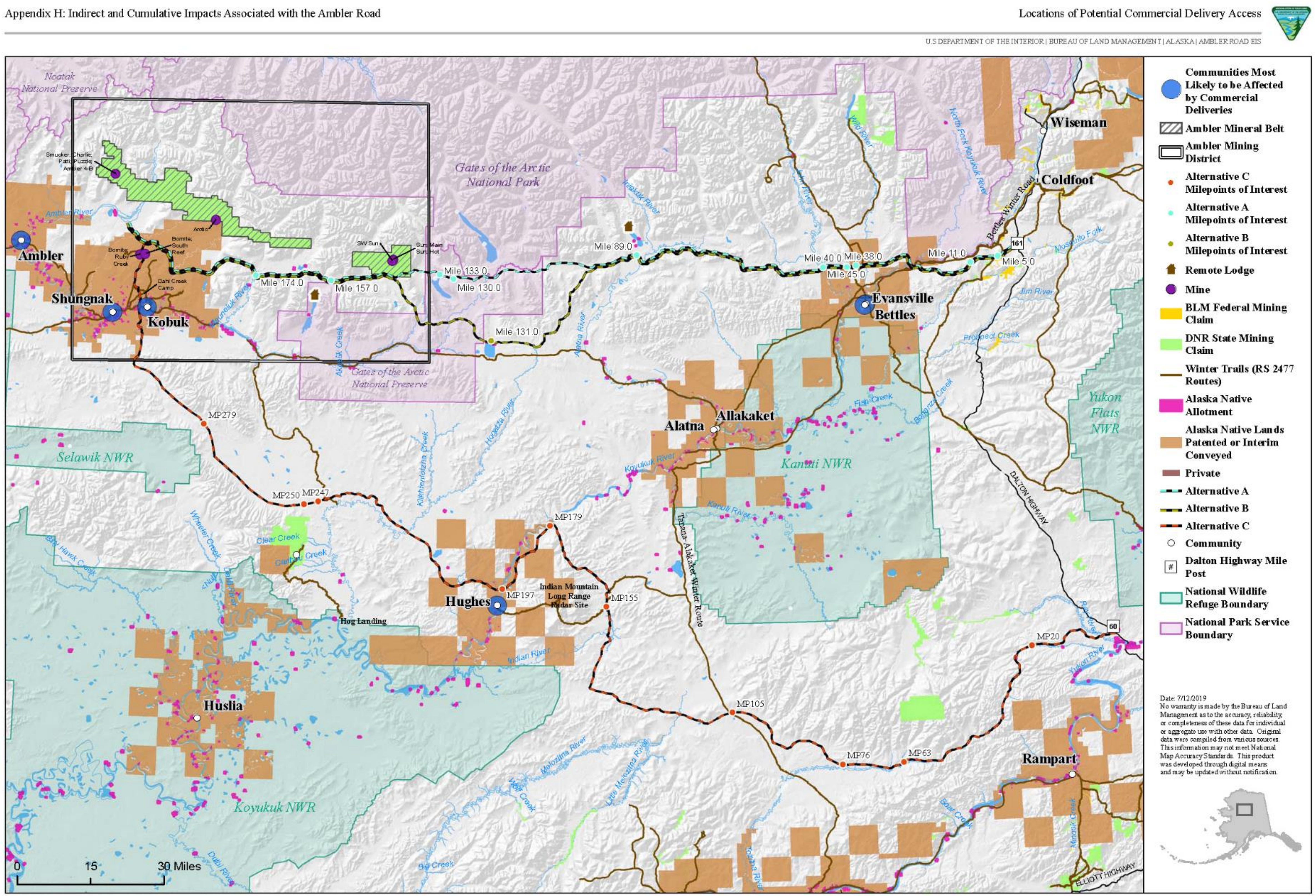

Map 11. Locations of potential commercial delivery access

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Appendix I:

Collaboration and Consultation

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Table of Contents

Tables

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1. Preparers

Table 1 is a list of team members involved in the preparation of this Environmental Impact Statement (EIS), the organizations where they work, and their roles in its development.

Table 1. List of preparers

Organization	Name	Role
BLM	Tim LaMarr	Authorized Officer
BLM	Tina McMaster-Goering	Project Manager
BLM	Serena Sweet	Alaska State Office Planning; EIS Oversight
BLM	Tim Hammond	Quality Control/Quality Assurance, Mitigation
BLM	Bill Hedman	Land Use/Land Management
BLM	Cindy Hamfler	Geographic Information Systems
BLM	Erin Julianus	Subsistence Uses and Resources, Terrestrial Mammals
BLM	Brian Ubelaker	ANILCA Section 810 Evaluation
BLM	Erica Lamb	Soil Resources, Water Resources, Hydrology, Air Quality, Wetlands
BLM	Joseph Galluzzi	Geology and Minerals
BLM	Crystal Glassburn	Cultural and Paleontological Resources, National Historic Preservation Act Section 106
BLM	Melody Debbenham	Hazardous Materials
BLM	Mike McCrumb	Hazardous Materials
BLM	David Esse	Fish and Aquatic Species
BLM	Bob Karlen	Fish and Aquatic Species
BLM	Jennifer McMillan	Vegetation and Wetlands, Special Status Species
BLM	Thomas St. Clair	Fire Management
BLM	Laurie Thorpe	Project Management/Review, Invasive Species
BLM	Kathy VanMassenhove	Realty Specialist
BLM	Robin Walthour	Realty Specialist
BLM	Sheri Wilson	Land Ownership
BLM	Kelly Egger	Recreation and Tourism, Visual Resources, Wilderness Characteristics, Noise, Wild and Scenic Rivers
BLM	Randy Goodwin	Noise, Visual, Air Quality, Wilderness Characteristics, Wild and Scenic Rivers, Recreation and Tourism
BLM	Deke Natgaboren	Noise, Visual, Air Quality, Wilderness Characteristics, Wild and Scenic Rivers, Recreation and Tourism
BLM	Melissa Hovey	Air Quality
BLM	Stewart Allen	Socioeconomics
BLM	Craig McCaa	Public Affairs
BLM	Lesli Ellis-Wouters	Communications Chief
BLM	Vanessa Rathbun	Section 508 Compliance
BLM	Karen Laubestein	Technical Editing
HDR	John McPherson	Project Manager
HDR	Mark Dalton	Principal-in-Charge; Quality Assurance/Quality Control
HDR	Tobin Lilly	Geographic Information Systems
HDR	Katherine Wood	Public Outreach Facilitator
HDR	Linda Smith	Physical Environment Team Lead
HDR	Suzann Speckman	Biological Environment Team Lead
HDR	John Wolfe	Social Systems Team Lead

Organization	Name	Role
HDR	Robyn Miller	Cultural and Paleontological Resources; National Historic Preservation Act Section 106
HDR	Nate Jones	Birds, Terrestrial Mammals
HDR	Leandra Cleveland	Indirect and Cumulative
HDR	Ashley Hovis	Vegetation and Wetlands
HDR	Erin Cunningham	Fish and Aquatic Species
HDR	Jon Zufelt	Water Resources
HDR	Alissa Sanchez	Air Quality
HDR	Laurie Cummings	Land Use and Transportation
HDR	Leslie Robbins	Social Impact Analysis
HDR	Tina Adair	Technical Editing
HDR	Elizabeth Grover	Technical Editing, Document Management, Section 508 Compliance, Comment-Response Management
HDR	Sasha Prewitt	Decision File/Administrative Record Lead, ePlanning Lead, Section 508 Compliance
NEI	Michael Fisher	Economics/Socioeconomics
NEI	Don Shug	Economics/Socioeconomics
SRBA	Stephen Braund	Subsistence
SRBA	Liz Sears	Subsistence
SRBA	Paul Lawrence	Subsistence
NewFields	Gary Krieger	Health Impact Analysis
NewFields	Marci Balge	Health Impact Analysis
EHS Alaska	Robert French	Asbestos
Shannon and Wilson	Peppi Croft	Soils and Geology
Shannon and Wilson	Steve Adamczak	Soils and Geology
Wood & Wood Technical Services	John Wood	Mining Engineer/Mining Scenario Development

Notes: ANILCA = Alaska National Interest Lands Conservation Act; BLM = Bureau of Land Management; EIS = Environmental Impact Statement; NEI = Northern Economics, Inc.; SRBA = Stephen R. Braund & Associates

2. Public Scoping

Table 2 provides the date, location, and number of attendees for each scoping meeting held for the project.

Table 2. Public scoping meeting, dates, locations, and attendance

Date	Location	Attendance
November 13, 2017	Allakaket	28
November 14, 2017	Anaktuvuk Pass	16
November 15, 2017	Alatna	19
November 16, 2017	Fairbanks	90
November 17, 2017	Wiseman	5
November 20, 2017	Anchorage	41
December 5, 2017	Ambler	14
December 6, 2017	Kotzebue	10
December 8, 2017	Shungnak	18
December 8, 2017	Kobuk	20
December 11, 2017	Hughes	19

Date	Location	Attendance
December 12, 2017	Huslia	29
December 12, 2017	Evansville/Bettles	8
January 16, 2018	Anchorage and via phone	38
January 18, 2018	Anchorage and via phone	13

3. Draft EIS Public Hearings

Table 3 provides date, location, and number of attendees for each Draft EIS public hearing held for the project.

Table 3. Draft EIS public hearing dates, locations, and attendance

Date	Location	Attendance
September 10, 2019	Anchorage	64
September 12, 2019	Washington, DC	27
September 16, 2019	Kotzebue	26
September 17, 2019	Ambler	37
September 18, 2019	Kobuk	34
September 19, 2019	Shungnak	34
September 20, 2019	Noorvik	49
September 23, 2019	Fairbanks	96
September 24, 2019	Huslia	16
September 25, 2019	Hughes	32
September 26, 2019	Tanana	37
September 27, 2019	Evansville/Bettles	24
September 30, 2019	Stevens Village	11
October 2, 2019	Anaktuvuk Pass	23
October 4, 2019	Anchorage and via phone	17
October 8, 2019	Noatak	17
October 10, 2019	Kiana	14
October 11, 2019	Buckland	16
October 11, 2019	Selawik	8
October 22, 2019	Alatna via phone	2
October 22, 2019	Allakaket	29
October 23, 2019	Wiseman/Coldfoot	18

Table 4 provides a list of tools used to advertise the public meetings on the Draft EIS and subsistence-related hearings to receive comments on the Draft EIS and the project's potential to impact subsistence resources and activities. Table 4 also includes dates and descriptions of the tools used.

Table 4. Draft EIS public hearing advertising tools, dates, and descriptions

Tool	Date(s)	Description
Federal Register	August 30, 2019	Notice of Availability
Project Website	August 23, 2019	Draft EIS and ANILCA Section 810 Subsistence Evaluation posted
ePlanning	August 23, 2019	Draft EIS and Section ANILCA 810 Subsistence Evaluation posted
Fliers	Various	Informational fliers posted in the communities

Tool	Date(s)	Description
Email	August 23, 2019	Notice of Availability of Draft EIS and ANILCA Section 810 Subsistence Evaluation for public review
BLM Press Release	August 23, 2019	Alaska's Ambler 'Road to Resources' Project Analysis Available for Public Comment
BLM Facebook Posts	August 23, 2019 August 26, 2019 August 30, 2019 September 24, 2019 September 26, 2019 September 27, 2019 September 30, 2019 October 1, 2019 October 3, 2019 October 4, 2019 October 8, 2019 October 10, 2019 October 11, 2019 October 18, 2019 October 21, 2019 October 23, 2019 October 29, 2019	Notice of Availability and Notice of Public Hearings Public hearing reminders
Anchorage Daily News Online Ad	August 27 through September 11, 2019	Notice of Public Hearings
Anchorage Daily News Display Ad	August 27, 2019 September 6, 2019	Notice of Availability and Notice of Public Hearings
Anchorage Daily News Legal Ad	August 28, 2019	Notice of Availability and Notice of Public Hearings
Washington Post Legal Ad	August 28, 2019	Notice of Availability and Notice of Public Hearings
Alaska Public Media	August 29, 2019 September 9, 2019	Statewide radio advertisement for the public hearings
Fairbanks News-Miner Online Ad	August 28, through October 23, 2019	Notice of Public Hearings
Fairbanks News-Miner Print Ad	August 29, 2019 September 9, 2019 September 20, 2019	Notice of Availability and Notice of Public Hearings
Fairbanks News-Miner Legal Ad	August 29, 2019	Notice of Availability and Notice of Public Hearings
Arctic Sounder Display Ad	August 29, 2019	Notice of Availability and Notice of Public Hearings
The Nome Nugget Display Ad	August 29, 2019	Notice of Availability and Notice of Public Hearings
Kotzebue Broadcasting	August 29, 2019	Public announcement of the meetings
BLM Press Release	September 26, 2019	Comment Period Extended for Proposed Ambler Road Draft Analysis
What's Up Listserv	September 26, 2019	Public announcement of the comment period extension
National Park Service News Release	September 27, 2019	Comment Period Extended for National Park Service Draft Environmental and Economic Analysis for the Proposed Ambler Road across Preserve Lands
ePlanning	September 29, 2019	Public hearing/meeting materials posted

Notes: ANILCA = Alaska National Interest Lands Conservation Act; BLM = Bureau of Land Management; EIS = Environmental Impact Statement

Table 5 provides a list of earned media that contributed to the notifications to the public about the hearings and comment period of the Draft EIS. The table includes the organization, date, and title.

Table 5. Earned media

Organization	Date	Title
Alaska Journal of Commerce	August 30, 2019	BLM issues first review of Ambler Road project
North of 60 Mining News	August 30, 2019	BLM requests public input on Ambler Road
Fairbanks Daily News-Miner	September 1, 2019	BLM releases Draft EIS for Ambler Road Project
KUAC 89.9	September 3, 2019	Ambler Road Out for Comment
Must Read Alaska	September 11, 2019	Ambler Road concerns include booze, village women, and environment
Newsweek	September 13, 2019	National Parks Conservation Association Warns Alaska's Mining 'Road to Ruin' could Change Forever one of the Last Great Wild Landscapes on the Planet
Fairbanks Daily News-Miner	September 15, 2019	Move ahead on Ambler Road
Fairbanks Daily News-Miner	September 17, 2019	Not this road, not at this time
Kotzebue Public Broadcasting	September 23, 2019	At Kotzebue Hearing on Ambler Road EIS, Testifiers Critique process over Project
Webcenter 11.com	September 23, 2019	Bureau of Land Management holds public comment on Ambler Road
Fairbanks Daily News-Miner	September 24, 2019	Conservationists, hunters denounce Ambler road plan
KTUU	September 26, 2019	BLM grants public comment extension for Ambler Road, but some say it's not enough
Fairbanks Daily News-Miner	September 27, 2019	Comment period extended on Ambler road draft EIS
Cision PR Newswire	September 30, 2019	Bureau of Land Management Extends Draft Environmental Impact Statement Comment Period for Ambler Road
Kotzebue Public Broadcasting	September 30, 2019	BLM extends comment period on Ambler Road draft EIS
Junior Mining Network	September 30, 2019	Trilogy Metals: Bureau of Land Management Extends Draft Environmental Impact Statement Comment Period for the Ambler Road
North of 60 Mining News	October 4, 2019	Thou shall build road to Ambler District
Frontiersman	October 5, 2019	Plan to build road to Ambler Mining District nearing final approval
Arctic Sounder	October 7, 2019	BLM extends comment period for Ambler road project
Arctic Sounder	October 11, 2019	Residents question process in meeting on road
northern.org	October 12, 2019	Paving Tundra Film Screening & Ambler Road Info Session
KTVA	October 12, 2019	Willow filmmaker debuts movie opposing road to Ambler Mining District
Anchorage Press	October 16, 2019	Ambling Toward Ambler Road
Frontiersman	October 21, 2019	Concerns raised about proposed road to Ambler Mining District
Anchorage Daily News	October 24, 2019	Don’t we have better ways to spend money than on the Ambler road?

Notes: BLM = Bureau of Land Management; EIS = Environmental Impact Statement

4. Government–to-Government

Table 6 presents the dates, locations, and attending agencies and other entities involved in government-to-government consultation meetings.

Table 6. Government–to-government consultation meetings

Date	Location	Attendance
December 8, 2017	Ambler	Ambler Tribal Council, BLM
May 9, 2018	Alatna	Alatna Village Council, BLM, HDR (BLM contractor)
May 10, 2018	Noorvik	Noorvik Native Community, BLM, HDR (BLM contractor)
June 26, 2018	Alatna	Alatna Village Council, BLM, NPS
September 28, 2018	Hughes	Hughes Traditional Council, BLM, HDR (BLM contractor)
March 27, 2019	Hughes	Hughes Traditional Council, BLM, HDR (BLM contractor)
September 24, 2019	Huslia	Huslia Traditional Council, BLM, HDR (BLM contractor)
September 25, 2019	Hughes	Hughes Traditional Council, BLM, HDR (BLM contractor)
September 26, 2019	Tanana	Tanana Traditional Council, BLM, HDR (BLM contractor)
September 27, 2019	Evansville	Evansville Traditional Council, BLM, HDR (BLM contractor), NPS, Evansville Incorporated
September 30, 2019	Stevens Village	Stevens Village Tribal Council, BLM, HDR (BLM contractor)
October 2, 2019	Anaktuvuk Pass	Anaktuvuk Pass Tribal Council, BLM, HDR (BLM contractor), NPS
October 8, 2019	Noatak	Noatak Traditional Council, BLM, HDR (BLM contractor), DOI, ADNR
October 22, 2019	Allakaket	Allakaket Traditional Council, BLM, HDR (BLM contractor)
January 7, 2020	Fairbanks via phone	Kobuk Traditional Council, BLM, NPS, USACE

Notes: ADNR = Alaska Department of Natural Resources; BLM = Bureau of Land Management; DOI = Department of Interior; NPS = National Park Service; USACE = U.S. Army Corps of Engineers

5. Section 106

Table 7 presents the dates, locations, and attending agencies and other entities involved in Section 106 consultation meetings.

Table 7. Section 106 consultation meetings

Date	Location	Attendance
January 17, 2018	Anchorage and via phone	AIDEA/DOWL; ATC; BIA; BLM; ADNR; City of Ambler; City of Kotzebue; City of Shungnak; DOT&PF; Doyon, Limited; Evansville, Inc.; HDR (BLM Contractor); NPS; SHPO; TCC
March 26, 2019	Fairbanks and via phone	ACHP, BLM, HDR (BLM Contractor), NPS, SHPO
April 26, 2019	Anchorage and via phone	ACHP, AIDEA/DOWL, BLM, ADNR, HDR (BLM contractor), DOI SO, SHPO, NPS, USACE
May 21, 2019	Fairbanks and via phone	ACHP, ATC, Alatna Village Council, AIDEA/DOWL, BLM, Doyon, Evansville, HDR (BLM contractor), HTC, Huslia Traditional Council, NANA Corporation, NNC, NAB, Gan-A-Yoo, K'oyitl'ots'ina Limited, NPS, NVS, SHPO
June 27, 2019	Anchorage and via phone	BLM, AIDEA/DOWL, HDR (BLM contractor), NPS, SHPO, ACHP
August 6, 2019	Anchorage and via phone	ADNR, BLM, SHPO, AIDEA/DOWL, HDR (BLM contractor), NPS

Date	Location	Attendance
September 5, 2019	Fairbanks and via phone	BLM; AIDEA/DOWL; Allakaket and Alatna representative; NANA; NPS; USACE; ACHP; Doyon; Evansville, Inc.; Noorvik Native Community; NAB; SHPO; HDR (BLM contractor)
October 2, 2019	Anaktuvuk Pass	City of Anaktuvuk Pass, BLM, HDR (BLM contractor)
October 22, 2019	Allakaket	City of Allakaket, BLM, HDR (BLM contractor), ADNR, NPS
October 24, 2019	Fairbanks and via phone	BLM, ADNR, Dinyea, Evansville, HDR (BLM contractor), USACE, NPS, ACHP, AIDEA, DOWL, SHPO
November 21, 2019	Anchorage and via phone	ACHP, AIDEA/DOWL, Allakaket and Alatna representative, BLM, HDR, NAB, NPS, SHPO

Notes: ACHP = Advisory Council on Historic Preservation; ADNR = Alaska Department of Natural Resources; AIDEA = Alaska Industrial Development and Export Authority; ATC = Allakaket Tribal Council; BIA = Bureau of Indian Affairs; BLM = Bureau of Land Management; DOI SO = Department of the Interior Solicitor's Office; DOT&PF = Alaska Department of Transportation and Public Facilities; HTC = Hughes Traditional Council; KTC = Kobuk Traditional Council; NAB = Northwest Arctic Borough; NNC = Noorvik Native Community; NPS = National Park Service; NVS = Native Village of Shungnak; SHPO = State Historic Preservation Officer; TCC = Tanana Chiefs Conference; USACE = U.S. Army Corps of Engineers

6. Other Stakeholders

Table 8 presents the dates, location, and attending agencies and other entities involved in other stakeholder consultation meetings.

Table 8. Other stakeholder consultation meetings

Date	Location	Attendance
December 14, 2017	Anchorage	Western Arctic Caribou Herd Working Group, BLM, ADNR, NAB, NPS, USACE
March 13, 2018	Fairbanks	Tanana Chiefs Conference Convention, BLM
March 14, 2018	Fairbanks	Tanana Chiefs Conference Convention, Allakaket Tribal Council members, BLM
July 9, 2018	Barrow	NAB, NSB, BLM
July 18, 2018	Fairbanks	Doyon, Limited; BLM
December 20, 2018	Anchorage	NANA Corporation, BLM
July 11, 2019	Fairbanks	Doyon, Limited; BLM
October 4, 2019	Anchorage and via phone	Western Arctic Caribou Herd Working Group, BLM, ADNR, NAB, NPS, USACE

Notes: BLM = Bureau of Land Management; ADNR = Alaska Department of Natural Resources; NAB = Northwest Arctic Borough; NPS = National Park Service; NSB = North Slope Borough; USACE = U.S. Army Corps of Engineers

7. Cooperating Agency

Table 9 presents the dates, locations, and attending agencies and other entities involved in cooperating agency meetings.

Table 9. Cooperating agency meetings

Date	Location	Attendance
December 6, 2016	Anchorage, Fairbanks, and via phone	ADNR, BLM, DOI SO, FHWA, HDR (BLM contractor), NPS, USACE, USCG
April 11, 2017	Anchorage, Fairbanks, and via phone	ADNR, BLM, DOI SO, FHWA, NPS, SOA ANILCA, SOA DOL, USACE, USCG
May 9, 2017	Anchorage, Fairbanks, and via phone	ADNR, BLM, DOI SO, NPS, SOA ANILCA, SOA DOL, USACE, USCG

Date	Location	Attendance
June 13, 2017	Anchorage, Fairbanks, and via phone	ADNR, BLM, NPS, SOA DOL, USACE
July 11, 2017	Anchorage, Fairbanks, and via phone	ADNR, BLM, NAB, NPS, USACE, USCG
August 8, 2017	Anchorage, Fairbanks, and via phone	ADNR, BLM, DOI SO, FHWA, NPS, USACE, USCG
September 12, 2017	Anchorage, Fairbanks, and via phone	ADNR, BLM, DOI SO, NAB, NPS, SOA ANILCA, SOA DOL, USACE
October 17, 2017	Anchorage, Fairbanks, and via phone	ADNR, AIDEA, BLM, EPA, HDR (BLM contractor), NPS, NAB, USACE, USCG
December 19, 2017	Anchorage, Fairbanks, and via phone	ADEC, ADNR, BLM, DOI SO, HDR (BLM contractor), NPS, NAB, SOA ANILCA, SOA DOL, USACE, USCG
January 9, 2018	Anchorage, Fairbanks, and via phone	ADF&G, ADNR, BLM, FHWA, HDR (BLM contractor), NPS, SOA ANILCA, SOA DOL, USACE
February 13, 2018	Anchorage, Fairbanks, and via phone	ADEC, ADNR, BLM, HDR (BLM contractor), NPS, SOA ANILCA, SOA DOL, USACE
March 12, 2018	Anchorage, Fairbanks, and via phone	ATC, BLM, HDR (BLM contractor), SOA ANILCA, SOA DOL, USACE
April 10, 2018	Anchorage, Fairbanks, and via phone	ADEC, ADF&G, ADNR, ATC, BLM, DOI SO, HDR (BLM contractor), SOA ANILCA, SOA DOL, NPS, USACE, NAB
June 12, 2018	Anchorage, Fairbanks, and via phone	ADEC, ADNR, ATC, BLM, DHSS, DOT&PF, FHWA, HDR (BLM contractor), NNC, NAB, NPS, SOA DOL, USACE
July 10, 2018	Anchorage, Fairbanks, and via phone	ADF&G, ATC, BLM, DOI SO, EPA, FHWA, HDR (BLM contractor), NAB, NPS, SOA ANILCA, SOA DOL, USACE
August 14, 2018	Anchorage, Fairbanks, and via phone	ADNR, ATC, BLM, DEC, DHSS, EPA, FHWA, HDR (BLM contractor), NPS, USACE
September 11, 2018	Anchorage, Fairbanks, and via phone	ADEC, ADF&G, ADNR, ATC, AVC, BLM, DHSS, DOI SO, EPA, HDR (BLM contractor), NAB, NPS, SOA DOL, USACE
October 10, 2018	Anchorage, Fairbanks, and via phone	ADF&G, ADNR, ATC, BLM, EPA, HDR (BLM contractor), NAB, NPS, SOA ANILCA, USACE
November 13, 2018	Anchorage, Fairbanks, and via phone	ADEC, ADF&G, ADNR, ATC, BLM, DHSS, DOI SO, EPA, NPS, SHPO, SOA DOL, USACE
February 12, 2019	Anchorage, Fairbanks, and via phone	ADEC, ADNR, BLM, DHSS, DOI SO, DOT&PF, EPA, HDR (BLM contractor), NAB, NNC, NPS, SHPO, USACE
March 12, 2019	Anchorage, Fairbanks, and via phone	ADEC, ADF&G, ADNR, ATC/AVC, BLM, DOI SO, HDR (BLM contractor), NAB, NPS, SHPO, USACE
April 16, 2019	Anchorage, Fairbanks, and via phone	ADNR, BLM, DHSS, DOI SO, DOT&PF, EPA, HDR (BLM contractor), NAB, NPS, SHPO, USACE
May 14, 2019	Anchorage, Fairbanks, and via phone	ADEC, ADNR, ATC/AVC; BLM, DHSS, DOI SO, DOT&PF, EPA, HDR (BLM contractor), HTC, NAB, NNC, NPS, USACE
June 11, 2019	Anchorage, Fairbanks, and via phone	ADEC, ADNR, ATC/AVC, BLM, DHSS, DOI SO, EPA, HDR (BLM contractor), HTC, NewFields (BLM contractor), NAB, NNC, NPS, USACE
July 09, 2019	Anchorage, Fairbanks, and via phone	ADEC, ADNR, ATC/AVC; BLM, DHSS, DOT&PF, EPA, HDR (BLM contractor), NewFields (BLM contractor) NAB, NPS, USACE
August 13, 2019	Fairbanks, and via phone	ADNR, ATC/AVC, NNC, BLM, DOI SO, DHSS, FHWA, EPA, HDR (BLM contractor), NewFields (BLM contractor), NAB, NPS, SHPO, USACE

Date	Location	Attendance
September 23, 2019	Fairbanks, and via phone	ADF&G, ADNR, BLM, DHSS, DOI SO, EPA, HDR, NewFields (BLM contractor), NAB, NPS, SHPO, USACE, USFWS
November 12, 2019	Anchorage, Fairbanks, and via phone	ADNR, ATC, AVC, BLM, DHSS, DOI SO, HDR, NewFields (BLM contractor), NAB, NPS, SHPO, USACE, USFWS
December 10, 2019	Fairbanks and via phone	ADNR, ATC, AVC, BLM, DOI SO, EPA, HDR, NAB, NPS, NNC, USACE
January 14, 2020	Fairbanks and via phone	ADNR, ATC, AVC, BLM, DHSS, DOI SO, EPA, HDR, NPS, SHPO, USACE, USCG
February 27, 2020	Fairbanks and via phone	ADEC, ADF&G, ADNR, ATC, AVC, BLM, EPA, HDR, NPS, NAB, USACE, USCG

Notes: ADEC = Alaska Department of Environmental Conservation; ADNR = Alaska Department of Natural Resources; AIDEA = Alaska Industrial Development and Export Authority; ADF&G = Alaska Department of Fish and Game; ANILCA = Alaska National Interest Lands Conservation Act; ATC = Allakaket Tribal Council; AVC = Alatna Village Council; BLM = Bureau of Land Management; DHSS = Alaska Department of Health and Social Services; DOI SO = Department of the Interior Solicitor’s Office; DOL = Department of Law; DOT&PF = Alaska Department of Transportation and Public Facilities; EPA = Environmental Protection Agency; FHWA = Federal Highway Administration; HTC = Hughes Traditional Council; NAB = Northwest Arctic Borough; NNC = Noorvik Native Community; NPS = National Park Service; SHPO = State Historic Preservation Officer; SOA = State of Alaska; USACE = U.S. Army Corps of Engineers; USCG = U.S. Coast Guard

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Appendix J:

Section 106 Programmatic Agreement

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PROGRAMMATIC AGREEMENT

BY AND AMONG THE

BUREAU OF LAND MANAGEMENT,

ALASKA STATE HISTORIC PRESERVATION OFFICER, AND

ADVISORY COUNCIL ON HISTORIC PRESERVATION

REGARDING THE

AMBLER MINING DISTRICT INDUSTRIAL ACCESS ROAD,

ALASKA

Executed the [day] of [Month], 2020

Expires 2045

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WHEREAS, the Department of the Interior, Bureau of Land Management (BLM) may issue a right-of-way (ROW) grant authorization across federal lands for an all-season, private industrial access road, to the Ambler Mining District, pursuant to the Federal Lands Policy and Management Act of 1976 (43 United States Code [USC] 1701); and

WHEREAS, the Alaska Industrial Development and Export Authority (AIDEA) is the applicant and has proposed to construct, operate, maintain, and eventually remove the road and related features (Project). The Project will include construction of bridges, material sites, maintenance stations, airstrips, and related ancillary features, and will be built in Phases, beginning with a seasonal, single-lane, gravel pioneer road (Phase I), which will be upgraded in Phase II, and expanded into a 2-lane gravel road in Phase III. AIDEA anticipates the road will have a life of approximately 50 years, at which point the road will be removed and reclaimed; and

WHEREAS, the BLM has determined through consultation with the Alaska State Historic Preservation Officer (SHPO) that the Project is an Undertaking and subject to compliance with Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended (54 USC 300101 et seq.), and the implementing regulations found at 36 Code of Federal Regulations (CFR) 800; and

WHEREAS, Section 106 requires federal agencies to take into account the effects of their Undertakings on historic properties[1] and afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment, prior to any federal authorization or expenditure of federal funds. Furthermore, Section 106 requires consultation with Tribes, other agencies, local governments, interested parties, and the public, for the purpose of seeking, discussing, and considering the views of other participants, and, where feasible, seeking agreement with them regarding matters arising in the Section 106 process; and

WHEREAS, the BLM has prepared an Environmental Impact Statement (EIS) for the Project pursuant to the National Environmental Policy Act of 1969 (NEPA), as amended (42 USC 4321 et seq.), with a Record of Decision anticipated in early 2020, and has identified a preliminarily preferred route for the Project, Alternative A/B. Alternative A is a 211-mile-long alignment, originating at Milepost 161 of the Dalton Highway, and extending west to the Ambler Mining District. Alternative B is a 228-mile-long alignment with the same origination and terminus points as Alternative A, but it crosses Gates of the Arctic National Preserve (GAAR) at a more southerly point. Maps of the alternatives are found in Attachment A and discussed in detail in the EIS (DOI-BLM-AK-F030-2016-0008-EIS); and

WHEREAS, the Alaska National Interest Lands Conservation Act 201(4)(b) states that the Secretaries of the Interior and Transportation shall permit access for surface transportation purposes across GAAR, managed by the National Park Service (NPS). Portions of Alternatives A and B would cross GAAR, making the Project an Undertaking, and therefore, subject to the NHPA and is an Invited Signatory; and

WHEREAS, the U.S. Army Corps of Engineers (USACE) has jurisdiction over activities that would discharge dredge or fill material into waters of the U.S., including wetlands, and has determined that the Project will require a permit, pursuant to Section 404 of the Clean Water Act (33 USC 1251 et seq.), making the Project an Undertaking and, therefore, subject to the NHPA and is an Invited Signatory; and

WHEREAS, the BLM, in agreement with all participating agencies, has agreed to carry out lead federal agency responsibilities for Section 106, pursuant to 36 CFR 800.2(a)(2); and

[1] The term "historic properties" is consistent with 36 CFR 800.16(l)(1) and is defined as any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP). This includes artifacts, records, and remains that are related to and located within such properties, and includes properties of traditional religious or cultural importance to Tribes or other entities, and that meet the NRHP criteria.

WHEREAS, the BLM, in consultation with the Consulting Parties, established the Undertaking's Area of Potential Effects (APE), pursuant to 36 CFR 800.4(a) and 36 CFR 800.16(d), which encompasses direct, indirect, and cumulative effects on historic properties for the permitted alternative. The APE is described in Attachment B; and

WHEREAS, the Signatories and Invited Signatories, collectively "PA Signatories," recognize that future mining activities within the Ambler Mining District may be a reasonably foreseeable result of this Project; however, no mining activities are proposed or known at this time. The PA Signatories agree that any potential effects on historic properties that may result from future mining activities will be subject to independent Section 106 review as appropriate. The PA Signatories agree to share information on historic properties collected for this Undertaking to the extent practicable, and in accordance with relevant confidentiality restrictions, at such time; and

WHEREAS, as of December 2019, the Alaska Heritage Resources Survey (AHRS) database[2] lists 15 known resources located within the Direct APE and 64 known resources within the Indirect APE for Alternative A; and 10 known resources within the Direct APE and 43 known resources within the Indirect APE for Alternative B. A table of these resources is provided in Attachment C; and

WHEREAS, the BLM has determined that the Undertaking may have an adverse effect on historic properties, pursuant to 36 CFR 800.5. There are total of 18 known AHRS resources within the Direct APE and 87 additional known AHRS resources within the Indirect APE that may be adversely affected by the Undertaking (this includes resources in both the A and B Alternatives) and include prehistoric and historic archaeological resources, trails, camps, and mining features. Of these resources, only 1 has been determined eligible for listing in the National Register of Historic Places (NRHP), while the remaining 104 known resources have not been evaluated, listed in Attachment C; and

WHEREAS, the Permittee has proposed to construct the Project in Phases, and each Phase will consist of individual Components, Stages, and Segments[3], and the BLM has determined that effects to historic properties cannot be fully accounted for prior to issuance of the EIS Record of Decision. Therefore, this Programmatic Agreement (PA) was developed in consultation with the Consulting Parties to establish an alternative process for implementing Section 106 in a phased approach, pursuant to 36 CFR 800.14(b); and

WHEREAS, the SHPO has participated in the development of this PA and is a Signatory, pursuant to 36 CFR 800.6(c)(1)(ii); and

WHEREAS, the ACHP has participated in the development of this PA and is a Signatory, pursuant to 36 CFR 800.6(c)(1)(ii); and

WHEREAS, the BLM recognizes that the Federal Government has a unique legal relationship with Tribes set forth in the U.S. Constitution, and the PA outlines the process by which the BLM will complete a good

[2] The AHRS database is maintained by the Alaska Office of History and Archaeology, and includes buildings, objects, structures, archaeological and historic sites, districts, shipwrecks, travel ways, traditional cultural properties, landscapes, and other places of cultural importance.

[3] Project Phases include a Pre-Construction Phase, a pioneer road (Phase I), an all-seasons road (Phase II), and a 2-lane all-seasons road (Phase III) as well as Operations and Maintenance and Reclamation Phases. See Attachment G for more detailed descriptions. Components are defined as types of ancillary feature, such as bridges or materials sites. Segments are defined as geographical sections of the Project. Stages are defined as the specific construction activities that would occur for each construction Phase or Component.

faith effort to consult with Tribes[4] to identify concerns about historic properties, to advise on the identification and evaluation of historic properties, including those of traditional religious, spiritual, or cultural importance, to articulate views on the Undertaking's effects on such properties, and to participate in the resolution of adverse effects, pursuant to 36 CFR 800.2(c)(2)(ii); and

WHEREAS, the BLM invited 78 Tribes, listed in Attachment D, to participate in the Section 106 process as Consulting Parties, and Alatna Village Council; Allakaket Village Council; Dinyea Corporation; Doyon, Limited; Evansville, Incorporated; Evansville Village; Gana-A'Yoo, Limited; Hughes Village Council; Huslia Village Council; K'oyitl'ots'ina, Limited; NANA Regional Corporation; Native Village of Ambler; Native Village of Kobuk; Native Village of Noatak; Native Village of Selawik; Native Village of Shungnak; Native Village of Stevens; Native Village of Tanana; Noorvik Native Community; and the Village of Anaktuvuk Pass have consulted with the BLM during development of the PA and may sign as Concurring Parties; and

WHEREAS, the BLM consulted with private landowners for lands within the APE for Alternatives A and B, including Doyon, Limited; NANA Regional Corporation; and Evansville, Incorporated; and these entities participated in PA development. In addition, the BLM consulted with the Bureau of Indian Affairs regarding 2 allotments (AKFF 018439D, AKFF 018992C) located within the APE for Alternatives A and B, and another 3 allotments (AKFF 017613A, AKFF 017613B, AKFF 017614A) located within the APE for Alternative B; and

WHEREAS, the BLM has made a good faith effort to consult with local governments and other interested parties pursuant to 36 CFR 800.2(c)(3) and 36 CFR 800.2(c)(5), and the City of Allakaket, the Northwest Arctic Borough and Tanana Chiefs Conference have participated in the development of this PA as Consulting Parties and may sign as Concurring Parties; and

WHEREAS, the BLM has coordinated Section 106 and NEPA, pursuant to 36 CFR 800.8 and consistent with guidance from the Center for Environmental Quality and ACHP *Handbook for Integrating NEPA and Section 106*, and has provided opportunities for the public to comment on, discuss, or share information or concerns about the Undertaking during public scoping and comment periods for the EIS and has considered all comments received; and

WHEREAS, the BLM has consulted with AIDEA (Permittee) on the development of this PA pursuant to 36 CFR 800.2(c)(4), and the Permittee has agreed to carry out Stipulations in this PA and is an Invited Signatory; and

WHEREAS, the Alaska Department of Natural Resources is a landowner and to address its obligations to protect state-owned historic, prehistoric, or archaeological resources as provided under Alaska Statute (AS) 41.35, has participated in the development of this PA and is an Invited Signatory; and

NOW THEREFORE, the BLM, the SHPO, and the ACHP agree that the Project shall be implemented in accordance with the following stipulations in order to take into account the effect of the Undertaking on historic properties.

STIPULATIONS

The BLM shall ensure that the following stipulations are carried out:

[4] Throughout this document, the term "Tribe" or "Tribes" is consistent with the definition found at 36 CFR 800.16(m) and refers to a tribe, band, nation, or other organized group or community, including a native village, regional corporation or village corporation, formed pursuant to Section 3 of the Alaska Native Claims Settlement Act (43 USC 1602).

I. STANDARDS

A. The BLM shall ensure that all work carried out pursuant to this PA meets the Secretary of the Interior (SOI) Standards for Archaeology and Historic Preservation (found at http://www.nps.gov/history/local-law/arch_stnds_9.htm), taking into account the suggested approaches to new construction in the SOI's Standards for Rehabilitation.

B. The BLM shall ensure that all work carried out pursuant to this PA shall be done by or under the direct supervision of historic preservation professionals who meet the SOI's Professional Qualifications Standards. The BLM and the Permittee shall ensure that contractors retained for services pursuant to the PA meet these standards.

C. The BLM recognizes that Tribes or other groups may have special expertise regarding places of traditional religious, spiritual, or cultural significance, or Traditional Cultural Properties (TCPs), but these individuals or groups may not meet the standards in I.A and I.B. However, the BLM will equally consider and incorporate special expertise into decisions regarding the implementation of this PA, consistent with 36 CFR 800.2(c)(2).

II. ADMINISTRATIVE STIPULATIONS

A. This PA shall apply to the Project and all of its Phases, Components, and Stages, including those not known at this time, not defined in the EIS, or not specified in the permits, permit applications, or other Project documents, so long as the activities occur within the jurisdiction of a state or federal agency.

B. The BLM, the NPS, the USACE, and State shall enforce the terms of this PA within each agency's scope and shall incorporate this PA and its terms into any decision document, permit, or authorization they issue. Each shall notify the others within 5 business days if any of them becomes aware of an instance of possible non-compliance with the terms and conditions of this PA or permit conditions as they relate to this PA. If this occurs, the BLM shall ensure that measures are taken to resolve non-compliance issues, consistent with its legal authorities, and will consult with the other PA Signatories, as needed.

C. The PA Signatories recognize that certain information about historic properties or archaeological resources are protected from public disclosure under the NHPA (54 USC 307103), the Archaeological Resources Protection Act (ARPA; 43 CFR 7.18), and Alaska State law, as required by Public Law 96-95, AS 40.25.120(a)(4), and Policy and Procedure No. 50200. Parties to this agreement shall ensure that all actions and documentation prescribed by this PA are consistent with the non-disclosure requirements of these laws.

D. Any of the PA Signatories may seek qualified independent expert consultation through a contractor, in order to fulfill the responsibilities under this PA, provided the contractor meets Stipulation I, Standards.

E. Email will be an acceptable form of communication between the Consulting Parties and is an appropriate method of "notification" or "in writing" where it is called for in this PA, unless otherwise described. If a Consulting Party does not have access to email or consistently available internet service, then the BLM will ensure that other forms of communication are made available. All the Consulting Parties should immediately notify the BLM if a point of contact within their organization changes and provide updated information. The BLM will maintain an updated list of current contact names, organizations, and email addresses as a component of Attachment E, Cultural Resource Management Plan. Updates to the contact list will not require an amendment.

F. In the event that another federal agency, not initially a party to this PA, receives an application for funding/license/permit for the Undertaking, as it is described in this PA, that agency may fulfill its Section 106 responsibilities by stating in writing that it concurs with the terms of this PA and by notifying the Signatories that it intends to do so. Such agreement shall be evidenced by execution of a Signature Page and filing it with the ACHP, and implementation of the terms of this PA.

G. This PA will not supersede or replace any guidelines, stipulations, or requirements in the BLM national PA (nPA) and associated Alaska Protocol[5]; or the PA on Protection of Historic Properties During Emergency Response and associated Alaska Implementation Guidelines[6].

III. AGENCY ROLES AND RESPONSIBILITIES

A. The BLM, the NPS, the USACE, and State shall attach this PA or its stipulations to any agency-specific permits or authorizations for the Project. Those agencies shall ensure that requirements of this PA have been met for the Undertaking under their respective jurisdictions. Failure by the Permittee to comply with the stipulations could result in suspension, modification, or revocation of permits or authorizations.

B. The BLM, the NPS, the USACE, and State shall ensure that no ground disturbance, including brush clearing, geotechnical surveys, or any other activity associated with the Project that may affect historic properties, takes place within a Project Segment, Stage, or Component until identification, evaluation, and on-site measures for resolution of adverse effects have been completed for that Segment, Stage, or Component. The NPS, the USACE, and State will inform the BLM in writing once the stipulations within each agency's scope, as outlined in this PA, have been satisfied by the Permittee. The BLM will then provide written notice to the Permittee that Section 106 requirements have been satisfied for that Segment, Stage, or Component.

C. The BLM, the NPS, the USACE, and State shall consult, at a minimum, during the Annual Meeting to ensure that each agency independently satisfies its respective regulatory requirements under 36 CFR 800 and AS 41.35.200(a). If any PA Signatory fails to comply with the PA, the BLM shall implement the procedures outlined in Stipulation XVI, Dispute Resolution.

IV. PERMITTEE RESPONSIBILITIES

A. If the Project is permitted, this PA and all its requirements will be binding on AIDEA as the Permittee, and any successors, heirs, or assigns. AIDEA and any successors, heirs, or assigns shall include a provision requiring compliance with the PA in any contract of sale or transfer of ownership or management of the Project.

B. The Permittee shall be responsible for funding and implementing, either directly or through qualified contractors, the work necessary to ensure compliance with the terms of this PA. This work will be completed on behalf and at the direction of the BLM.

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[5] BLM nPA: https://www.blm.gov/sites/blm.gov/files/National%20Programmatic%20Agreement.pdf
Protocols for Alaska: https://www.blm.gov/sites/blm.gov/files/AK%20Protocol.pdf

[6] Emergency Response PA: https://www.nrt.org/sites/2/files/Programmatic_Agreement_on_Protection_of.pdf
Alaska Guidelines: http://dnr.alaska.gov/parks/oha/oilspill.htm

C. The Permittee shall ensure that any persons conducting or supervising cultural resources work on their behalf hold all appropriate federal or state permits and/or authorizations for that work, and meet Stipulation I, Standards, for the applicable discipline.

D. The Permittee shall ensure all necessary federal, state, and private landowner permits and/or authorizations are obtained for conducting archaeological survey, excavation, and monitoring, consistent with the permitting process for the applicable agency and/or landowner. Applicable permits include Permits for Archaeological Investigations from the BLM and/or the NPS, the Alaska State Cultural Resource Investigation Permit from the State, and authorizations from the Northwest Arctic Borough; NANA; Doyon, Limited; Evansville, Limited; and/or other private landowners.

E. Prior to the initiation of ground disturbing activities for each Project Phase, the Permittee shall provide a technical design plan for that Phase (Phase Plan) to the BLM that contains detailed descriptions of the locations of all Segments and Components, detailed descriptions of the planned work Stages, and anticipated work schedules for all activities that will occur during that Phase. The Plan must contain detailed maps and a GIS deliverable with the spatial locations of the planned work. The BLM will distribute Phase Plans to Consulting Parties for informational purposes and will append them to Attachment G, Project Plans. Each Phase Plan will contain all information known at that time for that Phase; however, changes to the technical designs, methods, or schedules may be incorporated into the Annual Work Plan (VII.B.i), rather than necessitating a revision of the Phase Plan.

F. The Permittee may carry out the stipulations of this PA in a phased approach for identification and evaluation per 36 CFR 800.4(b)(2), based on Project Segments, Stages, and Components, but will not initiate any ground disturbance, or other types of activities that could adversely affect historic properties, before inventory, evaluation, assessment, and on-site measures for resolution of adverse effects has been completed for that Segment, Stage, or Component. Prior to commencement of any activities that could affect historic properties, the Permittee must receive written notice from the BLM that Section 106 requirements have been satisfied for that Segment, Stage, or Component.

G. The Permittee shall develop a tribal liaison/representative program in collaboration with Tribes. The program may be a component of other Project-wide efforts (subsistence advisory committees or similar) but must provide an opportunity for Tribal representatives to participate in and share information for cultural resource management activities. To the extent practicable, the Permittee will make opportunities available for Tribal liaisons/representatives to accompany cultural resource personnel during fieldwork and/or monitoring activities. The Permittee will provide a description of the program and identify Tribal liaisons/representatives and roles for the upcoming year in the Annual Work Plan (VII.B.i); the Permittee will report on all activities under the program as part of the Annual PA Report (XV.B). The BLM will ensure the program is reviewed as part of the Annual Meeting (XV.A) and will require the Permittee to make adjustments to the program as necessary, to ensure adequate opportunities are provided for Tribal participation and input during cultural resource management activities.

H. The Permittee, and any contractors hired on their behalf, will not retain sensitive information[7] that Tribes or Consulting Parties authorize them to collect, except as required for compliance with the terms of the PA and Cultural Resources Management Plan (CRMP), Attachment E. Sensitive information includes information covered under Section 304 of the NHPA (54 USC 307103), ARPA (43 CFR 7.18), or AS 40.25.120(a)(4).

I. The Permittee shall create a password-protected file sharing platform to allow PA Signatories to easily share data associated with implementation of the PA. All reports and deliverables shall be transferred to the BLM, other PA Signatories, and/or Consulting Parties through this platform. Access will be restricted consistent with the terms of the PA. If a Consulting Party does not have access to email or consistently available internet service, then the BLM will ensure that other forms of delivery are made available.

J. The Permittee shall ensure that any Project personnel found vandalizing, moving, or taking cultural materials, or violating any portion of ARPA (16 USC 470aa) or AS 41.35.200, will be subject to appropriate disciplinary action up to and including immediate termination. In each instance, the Permittee shall consult with the BLM, the SHPO, and the landowner/manager to determine whether a report to appropriate law enforcement authority is warranted.

K. The Permittee is responsible for gaining access to private property for the purposes of implementing this PA and will notify the BLM when access has been granted. In cases where the Permittee cannot gain access, identification efforts on that property may be deferred until access is gained. If a private landowner refuses entry, the BLM, the SHPO, and AIDEA will consult on a case-by-case basis and consider alternative survey methods. The Permittee will be responsible for ensuring efforts are commensurate with cultural resource management industry standards and meet a good faith intent for carrying out inventory, evaluation, assessment of effects, and resolution of adverse effects on all private property consistent with the terms of this PA; failure to meet the good faith standard for inventory could result in suspension, modification, or revocation of permits or authorizations.

V. CONSULTATION

A. The BLM shall use the Secretary's *Standards and Guidelines for Federal Agency Preservation Programs* as a guide for consultation. Consultation means the process of seeking, discussing, and considering the views of other participants, and, when feasible, seeking agreement with them regarding matters arising in the Section 106 process. Additional details regarding consultation are provided in the CRMP, Attachment E.

B. The BLM shall conduct government-to-government consultation with Tribes located near the permitted route, or with Tribes that have traditionally used that area in the past. The BLM will use Handbook 1780-1, *Improving and Sustaining BLM-Tribal Relations*, as a guideline for Tribal consultation. The BLM will consult with Tribes to identify places that may be of traditional religious, spiritual, or cultural importance to them. The BLM, in consultation with the SHPO and Tribe(s), shall determine whether those places are historic properties, whether there would be an adverse effect from the Undertaking, and, if so, appropriate measures to resolve the adverse effect(s). Information shared by Tribes that is of a culturally sensitive nature will be respected and treated in a confidential manner. The

[7] Sensitive information is defined as including information about the location, character, or ownership of a historic property if disclosure to the public may cause a significant invasion of privacy, risk harm to the historic property, or impede the use of a traditional religious site by practitioners (54 USC 307103).

BLM will consult early in the identification process with Tribes to determine what is considered sensitive information, and the means by which that information will be collected, shared, and returned and/or destroyed, consistent with Stipulation II.C. The BLM will continue to consult on a government-to-government basis with Tribes throughout the duration of this PA. Further details on Tribal consultation are provided in the CRMP, Attachment E.

C. The BLM shall ensure the SHPO receives all technical reports, in keeping with the SHPO's mission to identify and maintain inventories of cultural resources and historic properties per Section 101 of NHPA (54 USC 302301) and AS 41.35.070. The SHPO will retain location information about all cultural resources and historic properties, including properties of religious, spiritual, or cultural significance to Tribes; however, at the request of one or more Tribes, the SHPO will treat information regarding specific historic properties of traditional religious, spiritual, or cultural significance as sensitive information subject to Section 304 of the NHPA, 36 CFR 800.11(c), and/or applicable state laws.

D. The BLM shall consult with the Permittee regularly or at the Annual Meeting (XV.A) to share information, gathered during consultation with Tribes or other entities, that may be relevant to the Permittee's responsibilities under this PA. This includes, but is not limited to, information relevant to training curriculum, information relevant to inventory efforts, requests to participate in monitoring activities, requests to accompany crews in the field, and requests to participate in Tribal liaison activities.

E. The BLM shall ensure that the Consulting Parties are kept informed on the Undertaking and implementation of this PA and shall provide opportunities for review and comment on all pertinent documents. The BLM's consultation will, at a minimum, include distribution of the Annual PA Report (XV.B) to Consulting Parties via email and facilitation of the Annual Meeting (XV.A).

F. The BLM shall consult with and provide information to the public, pursuant to 36 CFR 800.2(d). The BLM and the Permittee will post the Annual PA Report (XV.B), with confidential information redacted as necessary, on their respective websites for the Project. The Permittee will mention the availability of the Annual PA Report in newsletters or similar forms of communication that are sent to the public and other interested parties.

G. The BLM delegates responsibilities to the Permittee for consultation with private landowners, unless the landowner requests to consult with the BLM, at which point the BLM will assume consultation responsibilities to the extent requested by the landowner. The Permittee will notify landowners that consultation with the BLM is an option.

VI. CULTURAL RESOURCES MANAGEMENT PLAN

A. The BLM, in consultation with the PA Signatories, has prepared a Cultural Resources Management Plan to guide compliance with the stipulations in this PA and is included as Attachment E. At the time of PA execution, all sections of the CRMP are considered complete, except for Chapter 6, Historic Property Treatment and Mitigation, and guidance for the Operations and Maintenance Phases and Reclamation Phase of the Project. The BLM shall ensure that content is developed and incorporated into the CRMP in accordance with the following timeline:

i. 12 months following PA execution, the BLM will submit standard mitigation guidance for archaeological sites, historic trails, and other property types that are common in the APE (Chapter 6 of the CRMP).

ii. No later than 1 year prior to the Project transitioning into the Operations and Maintenance Phase, the CRMP will contain finalized guidance for that Phase, which may include a streamlined Section 106 and/or Alaska Historic Preservation Act review process.

iii. No later than 1 year prior to the Project transitioning into Reclamation, on any portion of the Project, the CRMP will contain finalized guidance for reclamation activities, which may include streamlined Section 106 and/or Alaska Historic Preservation Act review processes.

B. The BLM will facilitate monthly consultation meetings with the other PA Signatories, and other Consulting Parties that provide written notification they wish to participate, for drafting the remaining CRMP guidance, either via phone or in person, or as determined necessary by the PA Signatories. The BLM will provide the PA Signatories with revisions to the CRMP at least 15 working days prior to any meetings. The BLM will incorporate comments received and provide updated drafts to the PA Signatories. The first review and last review will be a 30-day[8] period.

C. The BLM will solicit comments from Consulting Parties at the beginning of each new content development process (steps VI.A.i through VI.A.iii) and provide each draft final CRMP to Consulting Parties for a 30-day review and comment period and will consider all timely comments received. The CRMP will be finalized when the SHPO, the BLM Central Yukon Field Office Manager, and the NPS GAAR Superintendent sign Exhibit F of the CRMP. The BLM will distribute the final CRMP to the Consulting Parties and incorporate it as the finalized version of Attachment E.

D. Amendments or addendums to the CRMP will follow Stipulation XVII.B.ii, Amendments and Addendums.

VII. ALTERNATIVE FOUR STEP PROCESS

A. The BLM shall use the following phased process for the Undertaking, to complete inventory, evaluation, assessment of effects, and resolution of adverse effects, consistent with 36 CFR 800.3-800.6, and will direct the Permittee to gather sufficient data to fulfill documentation standards consistent with 36 CFR 800.11, in a manner that will accommodate the Permittee's phased construction and development of the Project.

B. Reporting Process – The Permittee will provide the following plans and reports for compliance with the Alternative Four Step Process, and will ensure they are commensurate with cultural resource management industry standards and meet a good-faith intent for carrying out inventory, evaluation, assessment of effects, and resolution of adverse effects in a phased approach. See also the steps outlined in Stipulation XIV, Document Submission and Review, and Attachment F, Reporting Table:

i. Annual Work Plan – The Permittee will provide the BLM with an Annual Work Plan, no later than March 1 of each year, or at least 60 days prior to fieldwork initiation for the first year. The BLM will submit the Annual Work Plan to Consulting Parties at least 15 days prior to the Annual Meeting (XV.A). The Annual Work Plan will contain detailed information about the anticipated work for the upcoming year, where it will occur, how it will be phased within Project Segments, Stages, and/or Components, and how the Permittee will meet the PA

[8] Unless otherwise noted, days refers to calendar days throughout this document.

requirements. Other submissions with the Annual Work Plan may include updates to the Phase Plan (IV.E), Historic Themes (VII.C.ii.a), Ethnographic Resources (VII.C.iii), the Monitoring Plan (X.D), and Contractor Training curriculum (XI.B). The Plan must contain detailed maps and a GIS deliverable with the spatial locations of the planned work. Consulting Parties will have a 30-day review and comment period for the Annual Work Plan, which will follow the steps described in Stipulation XIV, Document Submission and Review. The BLM and the SHPO must approve of the Annual Work Plan before it can be implemented; any work that will occur under NPS jurisdiction will also require approval by the NPS.

ii. Interim Report for Indirect APE – Within 30 days following completion of fieldwork each year, the Permittee will submit an Interim Report for the Indirect APE to the BLM, providing a brief description of cultural resources identified in the Indirect APE during that reporting period. Within 5 days of receipt, the BLM will submit the Interim Report to the Consulting Parties for a 15-day review period to seek comments on which resources within the Indirect APE should be evaluated for the NRHP. The BLM will consult with the SHPO, and the NPS as appropriate, within 7 business days following the 15-day review to consider all timely comments received, and then will direct the Permittee to make recommendations of eligibility, assessment of effects, and measures for resolution of adverse effects for specific resources in the Indirect APE, which the Permittee will include in the Annual Fieldwork Report (VII.B.iii).

iii. Annual Fieldwork Report – The Permittee will submit a Fieldwork Report to the BLM within 90 days following completion of fieldwork each year that will fulfill documentation standards consistent with 36 CFR 800.11. The Report will contain 1) a description of inventory efforts completed since the last report, including monitoring results; 2) NRHP eligibility recommendations; 3) finding of effect recommendations for resources that may be eligible; and 4) recommended resolution measures for resources that may be adversely affected. The Report must contain detailed maps and a GIS deliverable with the spatial locations of the completed work. The BLM will distribute the Annual Fieldwork Report to Consulting Parties for a 45-day review and comment period, which will follow the steps listed in Stipulation XIV, Document Submission and Review. The BLM and the SHPO must approve of the Annual Fieldwork Report before it will be considered complete; relevant portions of the report for cultural resources under NPS jurisdiction will also require approval by the NPS.

a. Within 15 days following the 45-day Consulting Party review, the BLM will consider any timely comments received and will submit Determinations of Eligibility (DOEs), assessment of effects, and proposed mitigation measures to the SHPO, consistent with 36 CFR 800.4-6. If no response is received from the SHPO within 30 days, the BLM shall move forward with their determinations and findings. The BLM's documentation will cite the Project design date/version used to assess adverse effects.

b. If the BLM, through consultation with other Consulting Parties during the 45-day report review period, determines that adequate information has not been provided for a DOE or finding of effect, the BLM will require the Permittee to provide additional information or conduct additional fieldwork as necessary. After the Permittee has gathered the additional information, the Permittee will submit it as a report addendum to the BLM, which the BLM will distribute to Consulting Parties for another 30-day review. The BLM will take into consideration any timely comments received and will provide a DOE, assessment of effects, and proposed mitigation measures to the SHPO within 15 days. If no response is received, the BLM shall move forward with their determination.

c. If the BLM and the SHPO do not agree on NRHP eligibility of a resource, the BLM shall forward all documentation to the Keeper of the National Register, pursuant to 36 CFR 63.2(d), for an official determination.

d. If a Consulting Party objects to a finding of effect within the 45-day review period, and provides reasons for the disagreement, the BLM shall either consult with the objecting party or forward the finding and supporting documentation to the ACHP for comment, consistent with 36 CFR 800.5(c)(2).

e. The BLM may determine that evaluation of a historic property(ies) may be necessary outside of the annual report cycle. In these instances, the same review process will be followed but may be reduced to a 15-day review and comment period for Consulting Parties, and a 7-day period for the BLM to incorporate timely comments received and submit to the SHPO. If no response is received from SHPO within 30 days, the BLM shall move forward with their determination(s) and finding(s).

iv. Treatment Plans – Within 120 days following Stipulation VII.B.iii.a, the conclusion of the SHPO's 30-day review of DOEs and assessment of effects, the Permittee will develop proposed property-specific Treatment Plans and submit them to the BLM. The Treatment Plans will contain detailed information on treatment measures, a schedule for when the measures will be implemented, and a schedule for when deliverables will be finalized and distributed. The BLM will distribute the Treatment Plans to the Consulting Parties for a 30-day review and comment period, which will follow the steps outlined in Stipulation XIV, Document Submission and Review. The Permittee, or contractors hired on their behalf, will implement the Treatment Plans, following approval of the Plans by the BLM and the SHPO; Treatment Plans for historic properties under NPS jurisdiction will also require approval by the NPS.

a. The BLM may determine that development of a Treatment Plan will require additional time beyond the timelines described above, due to the need for additional consultation, unique characteristics of the property, or other factors. In these instances, the BLM, in consultation with Consulting Parties, will determine what steps must be taken for the Permittee to develop and implement appropriate mitigation measures. Subsequent Treatment Plan reviews will include a 30-day review and comment period, and will follow the steps outlined in Stipulation XIV, Document Submission and Review.

v. Final Implementation Report – The Permittee will submit a Final Implementation Report for each historic property to the BLM, within 180 days after implementation of the Treatment Plan is complete, or within a timeframe specified in the Treatment Plan. The Final Implementation Report will be a comprehensive record of all activities that occurred at that historic property, from inventory through implementation of treatment measures, and will describe all completed steps, analyses, methods, and results, including collections and datasets generated. The BLM will provide the Report to the Consulting Parties for a 30-day review and comment period, which will follow the steps outlined in Stipulation XIV, Document Submission and Review. The BLM and the SHPO must approve of all Final Implementation Reports before they will be considered complete; Final Implementation Reports for historic properties under NPS jurisdiction will also require approval by the NPS.

vi. Technical Reports – The BLM, in consultation with the other PA Signatories, may determine that technical reports are necessary to summarize the results of background research, fieldwork activities, and laboratory analyses in order to fully understand Project effects to historic properties, or may be useful as mitigation measures for broad-scale effects. Technical Reports should not require extensive efforts to gather new information, but rather ftbe a compilation of existing information. The BLM will consult with the other PA Signatories at the Annual Meeting to consider whether a technical report(s) may be needed, and if so, what content it should contain and subsequent review process. The Permittee will be responsible for compiling the report(s) and submitting to the BLM. The BLM will provide the report to Consulting Parties for at least a 30-day review period, which will follow the steps outlined in Stipulation XIV, Document Submission and Review. The BLM and the SHPO must approve of Technical Reports before they can be considered finalized.

C. Inventory Process – Based on a Data Gap analysis for the Project[9], the cultural resources that are likely to be encountered during inventory, and may meet the definition of historic properties, fit into 3 broad categories: archaeological resources, historic resources, and ethnographic resources. Through consultation, the BLM determined that a reasonable and good faith effort, pursuant to 36 CFR 800.4(b)(1), requires separate inventory[10] methods to account for archaeological, historic, and ethnographic resources, which will include background archival research as well as pedestrian survey, consistent with the SOI's Standards for Identification. The BLM shall ensure that inventory for archaeological, historic, and ethnographic resources occurs as follows:

i. Archaeological Resources – The Permittee shall employ a qualified contractor to create a Geographic Information System (GIS) model of prehistoric and protohistoric archaeological resource potential within the APE for the permitted alternative. The model will categorize areas within the APE for the potential presence of prehistoric and protohistoric archaeological resources. The Permittee will provide the model, summary documentation regarding the variables used to create it, and how the model will be tested during implementation to the BLM within 6 months after the PA is executed. The BLM will distribute the model and documentation to the other PA Signatories for a 30-day review and comment

[9] Ford et al. 2018. Ambler Road Environmental Impact Statement: Cultural Resources Data Gap Analysis Report. Prepared by HDR, for the Bureau of Land Management, Central Yukon Field Office, Fairbanks, Alaska.

[10] The term "inventory" is used throughout this document to refer to all efforts to compile information on historic properties, including consultation, archival research, and fieldwork. The term "survey" refers to inventory efforts that are field based only.

period. The BLM shall require the Permittee to make changes and modifications as necessary, based on comments received. Annually throughout Phase I of the Project, or as determined necessary by the PA Signatories, the model will be refined based on new data obtained through fieldwork and/or updated environmental datasets. Based on model results, pedestrian survey will be required for portions of the APE, per Stipulation VII.D. Additional details are provided in the CRMP, Attachment E.

ii. Historic Resources – The Permittee will employ qualified contractors to develop Historic Theme reports relating to historic period resources, such as (but not limited to) traditional subsistence economy; traditional hunting, trapping, and guiding economies; traditional trade networks; historic exploration and travel corridors; and prospecting and mining. The purpose of the Historic Themes is to gather information on historic-era resources or places associated with historic events that may be present within the APE, and to identify areas that are high potential and require pedestrian survey. The documentation efforts will include a comprehensive summary of available data sources and will include GIS mapping of any relevant spatial information. Additional details are provided in the CRMP, Attachment E, including a list of potential data sources (Chapter 4.1.2).

a. The Permittee will submit the Historic Theme reports to the BLM 60 days prior to initiation of the first season of fieldwork, and any updates to the Themes with the Annual Work Plan each year thereafter. The BLM will share the reports with Consulting Parties for a 30-day review and comment period, which will follow the steps outlined in Stipulation XIV, Document Submission and Review. The BLM and the SHPO must approve of the Historic Themes.

b. The Permittee, or contractors hired on their behalf, will conduct pedestrian survey in areas identified in the Historic Themes as high potential for historic resources, per Stipulation VII.D.i.

c. Historic Themes may be further developed as Historic Contexts for NRHP eligibility considerations, consistent with Stipulation VII.E.

iii. Ethnographic Resources – The BLM shall make a good faith effort to provide Tribes, local governments, and other communities with an opportunity to identify ethnographic resources, including places of traditional religious or cultural importance, within the APE, consistent with Stipulation V, Consultation. Ethnographic resources are likely present but are generally only identifiable by the community sharing the values, traditions, beliefs, or social institutions associated with such places, but could also be identified through archival research or other means. The BLM shall consider the nature and location of ethnographic resources identified, and determine through consultation with the party(ies) that identified the resource and the SHPO if additional work, in the form of oral interviews, research, GIS mapping, site visits, or other culturally-appropriate methods, are necessary to document the ethnographic resource(s). Additional details are provided in the CRMP, Attachment E.

a. As necessary, the BLM shall gather sufficient information to complete a determination of NRHP eligibility for identified resources if it is identified as a sensitive resource, or shall direct the Permittee to gather information and make a recommendation of NRHP eligibility for the BLM to consider, if the resource is not considered sensitive. The Permittee shall integrate the results of the ethnographic investigation into the Annual Fieldwork Report, unless the resource needs to be treated confidentially.

b. At the time of PA execution, the following Tribes and local governments have indicated areas of cultural importance and/or ethnographic resources that may be affected by 1 or more alternative, and for which the BLM will consult further:

Alatna Village Council
Allakaket Village Council
City of Allakaket
City of Anaktuvuk Pass
Dinyea Corporation
Evansville Village
Evansville, Incorporated
Hughes Village Council
Huslia Village Council
Native Village of Kobuk
Native Village of Noatak
Native Village of Selawik
Native Village of Stevens
Native Village of Tanana
Northwest Arctic Borough
Noorvik Native Community
Village of Anaktuvuk Pass

D. Survey – As a component of the inventory process and consistent with 36 CFR 800.4, the BLM shall ensure the Permittee, or contractors hired on their behalf, complete a reasonable and good faith effort for pedestrian survey and testing within the APE. This will include survey and/or testing in areas that are likely to contain archaeological, historic, and ethnographic resources, but will not require 100 percent survey coverage of the APE. To determine where survey is required, the Permittee will incorporate the archaeological model (VII.C.i), Historic Theme reports (VII.C.ii.a), and ethnographic information (VII.C.iii) to categorize the APE as high, medium, and low potential for the presence of cultural resources (see additional details in Attachment E, CRMP). The level of effort for survey will vary based on the APE categorization but will use standard field methods described in Chapter 4 of the CRMP. This effort, collectively, will be known as the Survey Strategy[11]. The Permittee will provide a detailed description of the Survey Strategy as part of the Annual Work Plan (VII.B.i), and will update and refine it annually to incorporate the results of the previous year's inventory efforts and/or any new or updated datasets. The BLM will provide the Permittee with information that is relevant to the inventory process on a regular basis, or at least by December 30 of each year, so that the Permittee can incorporate it into the Survey Strategy. Based on the Survey Strategy, the Permittee, or

[11] The term "Survey Strategy" is used throughout the document to refer to required field efforts to identify archaeological, historic, and ethnographic resources within the APE. The Survey Strategy will be developed by compiling multiple data sources for those resources, which will then be used to classify the APE into areas of high, medium, or low potential for cultural resources.

contractors hired on their behalf, will complete pedestrian survey and testing in the APE according to the following requirements:

i. High Potential: Defined as landforms adjacent to wetlands, riparian areas, watershed confluences, lakes, streams, Revised Statute 2477 trails, villages, and AHRS sites, or identified as high potential through consultation, research, and or/field evaluation. Pedestrian survey and testing is required for 100 percent of high potential areas within the Direct APE. If the Field Crew Chief determines that subsurface testing within these areas is not necessary, he/she will document how and why that determination was made.

ii. Low Potential: Defined as areas that are wetlands, perennially inundated, areas of tussock tundra, or slopes over 25 degrees, unless identified as a high potential through consultation, research, and/or field evaluation. Pedestrian survey and testing is required for 10 percent of low potential areas within the Direct APE. Otherwise, areas that are identified as low potential will not require pedestrian survey or subsurface testing. If the Field Crew Chief determines that subsurface testing within these areas is not necessary, he/she will document how and why that determination was made.

iii. Medium Potential: Areas not defined as either low potential or high potential. Pedestrian survey and testing is required for 50 percent of medium potential areas within the Direct APE. If the Field Crew Chief determines that subsurface testing within these areas is not necessary, he/she will document how and why that determination was made.

iv. Previously Surveyed Areas: The Permittee will not be required to conduct pedestrian survey and testing in areas of the APE that have been previously inventoried in the past 10 years via methods that are commensurate with, or meet, the PA Stipulations and CRMP Guidelines. However, it may be necessary for the Permittee or their contractors to revisit known resources to collect adequate data for NRHP eligibility recommendations. The Permittee will evaluate previous pedestrian surveys and provide recommendations on whether those areas need to be revisited as part of the Survey Strategy.

v. Indirect APE: Survey for subsurface resources in the Indirect APE is not required, unless there are reasonably foreseeable adverse effects from the Undertaking. Survey for surface resources may be required; however, the BLM cannot make informed decisions on the extent of the effects until Project design plans, footprints, construction methods, and schedule are finalized and submitted as Phase Plans (IV.E) and/or Annual Work Plans (VII.B.i). Potential direct, indirect, or cumulative effects may occur from increased access along or across the proposed road corridor, soil erosion or deposition downstream of water crossings and bridges, or other visual, audible, or atmospheric factors. Additional inventory and/or monitoring may be required, particularly in areas vulnerable to erosion, including water crossings, downstream of water crossings, hillside cuts, and trail or access crossings. The Permittee will provide new or updated Project plans to the BLM as part of the Annual PA Report (XV.B) and the PA Signatories will review and consider whether the Permittee will be required to complete additional inventory and/or monitoring within the Indirect APE during the Annual Meeting (XV.A).

E. **Evaluation Process:** Per 36 CFR 800.4(c) and 36 CFR 60.4, the BLM shall ensure that the Permittee, or contractors hired their behalf, evaluate all identified cultural resources within the Direct APE and Indirect APE to determine if they are eligible for the NRHP. Evaluation will follow 36 CFR 63, NPS Bulletin 15, *How to Apply the National Register Criteria for Evaluation,* and/or other appropriate guidelines, and will consider both individual and district-level eligibility. Resources of a similar nature may be evaluated as a multiple property listing or as a district to create more efficiencies in the process. The Permittee will provide all recommendations of eligibility to the BLM as part of the Annual Fieldwork Report (VII.B.iii). The BLM will submit final DOEs to SHPO following Stipulation VII.B.iii.a. Additional details on evaluation are provided in Attachment E (CRMP). Cultural resources that are not eligible for the NRHP will no longer be subject to the terms of this PA.

F. **Assessment and Resolution of Adverse Effects:** The BLM shall ensure adverse effects to historic properties are assessed per 36 CFR 800.5 and resolved through avoidance, minimization, or mitigation, per 36 CFR 800.6. To the extent practicable, the Permittee will develop or modify Project design and construction methods to avoid historic properties. For historic properties that cannot be reasonably avoided, the Permittee will submit assessments of effects and recommended resolution measures to the BLM as part of the Annual Fieldwork Report (VII.B.iii).

i. The BLM shall ensure the Permittee, or contractors hired on their behalf, resolve all adverse effects that cannot be avoided or minimized through implementation of appropriate mitigation measures that are commensurate with the significance of the historic property and the Project's effect on the historic property. Proposed mitigation measures will be submitted to the BLM as part of the Annual Fieldwork Report (VII.B.iii) and approved mitigation measures will be fully developed as Treatment Plans (VII.B.iv), which the Permittee will be required to implement, following approval of the Plans. In certain cases, the BLM may determine that additional consultation is necessary to develop appropriate mitigation measures for certain historic properties. The Permittee will provide a Final Implementation Report (VII.B.v) to the BLM when mitigation is complete for each historic property.

ii. Approved mitigation measures may include, but are not limited to, the following list (see Attachment E, CRMP for additional details).

1. Oral history interviews, placenames studies, GIS mapping, development of media, archival searches, and report preparation and publication; generally associated with properties eligible under Criterion A or B;

2. HABS/HAER/HALS documentation or rehabilitation and reporting; generally associated with properties eligible under Criterion C;

3. Data recovery and analysis, reporting, and curation of resulting collections and records; generally associated with properties eligible under Criterion D;

4. Assisting in the development of Tribal or community historic preservation plans;

5. Nominating and listing properties for the NRHP;

6. Public interpretation or public reports on regional history or prehistory;

7. Providing improvements to or maintenance for historic trails;

8. Creation of K-12 school curriculum or other projects for local schools related to the history or prehistory of the region; and

9. Cultural resource management internship opportunities.

iii. The BLM will generally consider approval of a Final Implementation Report (VII.B.v) to satisfy the requirements of 36 CFR 800.6 for each historic property. However, to account for potential Project modifications that could change the assessment of effects, the BLM shall ensure the criteria of adverse effect is applied using the most recent Phase Plan (IV.E) prior to providing the Permittee with written notification that the Section 106 requirements have been met.

G. Long-Term Considerations:

i. After the initial inventory is completed, the PA Signatories may determine that mitigation measures are needed to account for broad-scale indirect or cumulative adverse effects to regional or national history and prehistory. Within 3 years following completion of initial inventory, the BLM will consult with the PA Signatories during the Annual Meeting (XV.A) to determine if broad-scale mitigation is appropriate, and if so, to identify measures for the Permittee to implement. The PA Signatories will also consider the Project's indirect and cumulative effects in advance of the Project transitioning from one Phase to another (see Attachment G, Project Plans).

ii. If the Permittee expands, revises, or alters Project Segments, Components or footprints, and the area was inventoried more than 10 years prior, the BLM will consider whether the Permittee will be required to re-survey the area that would be affected by the changes, using methods determined appropriate by the BLM and other PA Signatories. The Permittee will provide any proposed changes in the Annual Work Plan (VII.B.i) and the BLM will consult with the Consulting Parties at the Annual Meeting (XV.A) to determine appropriate levels of effort for re-survey. Considerations should include environmental changes that occurred that could affect the identification of historic properties, resources that could have reached the 50-year threshold, new information that may be available regarding historic or traditional uses of the area, new survey methods or technology, or other factors.

iii. Reevaluation of eligibility for listing in the NRHP may be necessary for certain cultural resources. The BLM will consult every 5 years with the Consulting Parties during the Annual Meeting (XV.A), or following substantive changes to Project Components or Phases, to determine if reevaluation of certain resources is necessary.

iv. The BLM reserves the right to reevaluate the assessment of effects to historic properties if there are changes in design, construction methods, maintenance requirements, reclamation activities, or any other aspect related to the Undertaking that could adversely affect historic properties.

VIII. COLLECTION AND CURATION

A. Any materials[12] collected as a result of implementing this PA, and not subject to the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA), are the property of the applicable state or federal land-managing agency, or landowner if collected from privately owned property. On federal lands, any human remains, funerary objects, sacred objects, or objects of cultural patrimony, as defined in 43 CFR 10.2(d), will follow disposition to lineal descendants or Tribe(s), following the procedures set forth in 43 CFR 10, Subpart B.

B. Pursuant to 36 CFR 79.7(b) and applicable permit(s), the Permittee will assume all costs associated with the curation of any materials that are collected during the implementation of this PA, in perpetuity. Curation costs may include, but are not limited to, curation fees charged by approved institutions, acquisition of archival materials, shipping, cleaning, rehousing, and any other conservation action determined necessary by a qualified conservator or considered common/ethical practice by the industry.

C. The BLM and the NPS shall ensure that curation of materials collected from federal lands, and not subject to the provisions of the NAGPRA, is completed in accordance with 36 CFR 79, *Curation of Federally-Owned and Administered Archaeological Collections*. The Permittee will submit all materials from federal lands for curation at the University of Alaska Museum of the North (UAM) in Fairbanks, Alaska, but the materials will retain federal ownership. During the permitting process, the Permittee will establish a provisional curation agreement with the UAM for collections, which the Permittee will finalize prior to submission of collections to the UAM.

D. Collections made on state land will comply with AS 41.35.020. The Permittee will submit all materials from state lands for curation at the UAM, but the materials will retain state ownership. During the State Archaeological Permitting process, the Permittee will establish a provisional curation agreement with the UAM for collections, which the Permittee will finalize prior to submission of collections to the UAM.

E. The Permittee, and any contractors hired on their behalf, will be responsible for submitting all materials recovered from state and/or federal lands to the UAM within 6 months following approval of the Final Implementation Report (VII.B.v), or within 1 year following completion of the fieldwork that generated the collection if the property will not require mitigation. All collections will be curation-ready, as determined by UAM requirements. Prior to disposition, the Permittee, or any contractors hired on their behalf, will safeguard all materials from theft or damage by providing appropriate interim storage facilities and conservation actions, consistent with the requirements in 36 CFR 79.9. The Permittee shall consult with UAM staff regarding interim storage facilities and necessary conservation actions to be consistent with 36 CFR 79.9 (b)(4). Within 30 days following disposition, the Permittee will provide the BLM with all accession records and documentation associated with the transfer and curation of materials. The BLM will share the documentation with other landowners or managers, as appropriate.

F. For collections recovered from private lands, the Permittee will work with private landowners to arrange for the disposition of materials. The Permittee will provide private landowners with information on the value of curation and will assume all costs of the materials, not to exceed standards set forth in 36 CFR 79. If a landowner chooses to donate

[12] The term “materials” is consistent with the definition found at 36 CFR 79.4(a)(1), and refers to any objects, artifacts, specimens, records, or remains associated with historic properties. This includes all documentation generated during the implementation of this PA, with the exception of information that is subject to confidentiality clauses of NHPA, ARPA, and/or Alaska State law.

or loan the materials to the UAM or another repository, the Permittee will provide the BLM with documentation of the transfer within 30 days following the transfer. In the event that a landowner chooses to retain a collection, the Permittee will provide documentation of this to the BLM.

IX. INITIATION OF CONSTRUCTION ACTIVITIES AND STOP WORK ORDERS

A. The BLM shall ensure the Permittee does not initiate work on any Project Phase, Component, Stage, or Segment, until on-site actions to carry out the Alternative Four Step Process (VII) have been completed, and the BLM provides the Permittee with written notification that the Section 106 requirements have been met.

B. The BLM may also provide written notification to the Permittee, indicating that Section 106 requirements for individual Project Segments have been met, under the following conditions:

i. Activities within the Segment would not restrict subsequent rerouting of the ROW corridor and associated Components to avoid, minimize, or mitigate the Undertaking’s adverse effects on historic properties; and

ii. The BLM, in consultation with the PA Signatories, determines that all inventory has been completed and there are no historic properties within the APE for that Segment and that cultural resource monitoring or other methods will account for potential unknowns.

C. The BLM may issue a Stop Work Order if it, or any PA Signatory, determines that Stipulation VII or IX.B has not been fulfilled, or if additional information regarding a historic property(ies) becomes available after the BLM notifies the Permittee that Section 106 requirements have been met. If a PA Signatory determines this, it shall notify the BLM in writing of the issue and the BLM shall subsequently issue a Stop Work Order to the Permittee. The BLM will then consult with the appropriate PA Signatories to determine what steps must be completed to allow for the work to be reinstated.

D. Monitors have the authority to issue a Stop Work Order if there is an inadvertent discovery found during monitoring activities. See also Stipulation X, Monitoring; Stipulation XII, Inadvertent Discovery and Unanticipated Effects; and the CRMP, Attachment E.

X. MONITORING REQUIREMENTS

A. Monitoring shall be required throughout the duration of this PA but may require differing levels of effort depending on the Project Phase, Component, or Stage. The BLM shall consult with Consulting Parties about where and to what extent monitoring will occur. At a minimum, the PA Signatories will consult regarding the need for monitoring during review of the Annual Work Plan (VII.B.i) and consider it during review of the Annual Fieldwork Report (VII.B.iii). The Permittee will ensure that monitoring plans are consistent with the Alaska Office of History and Archaeology Historic Preservation Series 15, *Monitoring Guidelines*. Additional details are provided in the CRMP, Attachment E.

B. The BLM shall ensure the Permittee employs qualified Monitors and Supervisory Monitors, consistent with Stipulation I.B and the professional qualifications outlined in the Alaska Office of History and Archaeology Preservation Series No. 15 *Monitoring Guidelines*, to be present for Project work as determined necessary through consultation with the Consulting Parties. Typical considerations for monitoring include but are not limited to: all ground-disturbing work within 500 feet of the boundary of a known historic property, within 1,000 feet of anadromous river crossings, and in high potential areas where testing may not have been adequate. Monitors may also be appropriate at historic properties previously subjected to data recovery, since there is a possibility for discovery of significant features or other cultural materials in previously unexcavated areas. Post-construction monitoring may be necessary to evaluate whether effects are occurring to historic properties that were avoided, whether historic properties are being indirectly or cumulatively affected, or to complete a reasonable and good faith effort in areas that were identified as high potential to encounter cultural resources. Monitors will be authorized to issue Stop Work Orders, consistent with Stipulation IX.D.

C. The Permittee shall develop a Monitoring Plan, which will be updated annually. The Monitoring Plan will include, but not be limited to:

i. Areas to be monitored;
ii. Reporting requirements and schedule to track progress and results;
iii. Stop Work protocol for Monitors;
iv. Collection and curation protocols;
v. Hand signals for Monitors and equipment operators;
vi. Procedures and safety around heavy equipment; and
vii. Qualification standards and number of Monitors needed.

D. The Permittee shall provide a Monitoring Plan to the BLM each year as part of the Annual Work Plan (VII.B.i). The Monitoring Plan will describe how Project activities during the upcoming year will be monitored. Consulting Parties will review the Monitoring Plan concurrently with the Annual Work Plan.

E. The Permittee shall provide a Monitoring Report to the BLM each year as part of the Annual Fieldwork Report (VII.B.iii). The Monitoring Report will describe the results of the monitoring activities during the previous year. Consulting Parties will review the Monitoring Report concurrently with the Annual Fieldwork Report.

XI. CONTRACTOR TRAINING REQUIREMENTS

A. The Permittee shall provide cultural resource awareness training to all Project personnel, contractors, and subcontractors on an annual basis. The training will inform Project personnel of their responsibilities under the law, and clearly list procedures to follow in the event that previously undiscovered cultural resources are encountered. Additional details are provided in Attachment E (CRMP).

B. The Permittee is responsible for creating the training curriculum and shall make a good faith effort to seek input and collaborate with Tribes and other stakeholders to develop and teach the curriculum. Creation of the curriculum may be an iterative process. The Permittee will provide a copy of the curriculum to the BLM with the Annual Work Plan (VII.B.i), which will be shared with Consulting Parties for review and comment. The BLM will consider any timely comments received, and as necessary, require the Permittee to make changes and submit a revised version for review. The BLM and the SHPO will review the curriculum for approval, either within 15 days following the 30-day Consulting Party review, or within 15 days following receipt of any revisions. The curriculum must be approved by the BLM and the SHPO before it can be used for training purposes. The BLM will provide a copy of approved curriculum to the Consulting Parties for informational purposes.

C. It may be appropriate for contractors to receive differing levels of training depending on Project Phase or job role. The BLM will consult with the other PA Signatories at the Annual

Meeting to evaluate the effectiveness of the curriculum and determine if modifications to the curriculum should be made to improve or clarify content. The Permittee may provide training suggestions based on contractor roles and responsibilities at different stages of the Project.

D. At a minimum, the curriculum will provide information on the following topics:

i. Traditional cultural practices and subsistence uses along the Project corridor;

ii. Legal context for cultural resources protection and applicable federal, state, and local laws;

iii. Penalties for disturbing cultural resources and human remains;

iv. Cultural resources likely to be found in the Project area;

v. Monitoring procedures, including safety around heavy equipment, buffer areas, and hand signals between monitors and equipment operators;

vi. The Inadvertent Discovery of Cultural Resources Plan (Exhibit A of the CRMP, Attachment E); and

vii. The Inadvertent Discovery of Human Remains Plan (Exhibit B of the CRMP, Attachment E).

XII. INADVERTENT DISCOVERY AND UNANTICIPATED EFFECTS

A. The Permittee shall ensure that the Inadvertent Discovery of Cultural Resources (IDCR) Plan, found in Exhibit A of the CRMP, is implemented if there is an inadvertent discovery of a cultural resource(s) during any Project-related work.

B. The Permittee shall ensure all project personnel receive training on the IDCR Plan as part of Stipulation XI, Contractor Training Requirements, shall make the Plan available to all Project personnel, and shall ensure that all worksite supervisors have copies of the Plan with them at the worksite. The Permittee or their designee (such as worksite supervisors) is responsible for ensuring the following 2 steps are immediately implemented following an inadvertent discovery (refer to the IDCR Plan for full details):

i. Stop Work – as soon as it is safe to do so, work will cease in the immediate vicinity of the discovery and a 100-foot radius buffer around the discovery will be flagged or fenced off. The discovery must be secured and protected from further disturbance to the extent possible.

ii. Notify Officials – as soon as possible following discovery, and no later than 1 business day, the Permittee or their designee will notify the BLM, the SHPO, and the landowner or manager of the discovery (contacts are listed in the IDCR Plan).

C. Within 5 business days of notification, the BLM, the SHPO, the Permittee, landowner or manager will consult by telephone or other means on the nature of the discovery and potential significance and determine if any additional investigation is warranted or if other parties should be notified. The resource(s) will be treated as eligible until a full assessment of eligibility can be completed.

D. If the BLM determines through consultation with the other parties that the discovery is not significant and the SHPO concurs, the BLM shall provide the Permittee with written authorization to proceed with construction activities within 1 business day of this determination and concurrence.

E. If the BLM determines that additional investigation is warranted, the Permittee shall ensure the discovery is investigated by a professional meeting Stipulation I, Standards, to evaluate for NRHP eligibility. The field investigation and DOE report will be completed within 10 days following the BLM's determination. The BLM will consult with the SHPO, and other Consulting Parties as appropriate, on the eligibility of the discovery, within 3 business days of receipt of the DOE. The SHPO will provide a determination to the BLM within 5 business days from consultation. If no response is received within 5 business days, the BLM will move forward with their determination.

F. If the discovery is determined eligible, and the Project cannot avoid further effects or has already caused an adverse effect, the Permittee will prepare a Treatment Plan based on mitigation measures developed in the CRMP, Attachment E, and modified to fit the affected historic property. The Permittee will submit the Plan to the BLM within 5 business days of the end of the SHPO comment period. The BLM will distribute the Plan to the other Consulting Parties as appropriate, for a 5 business-day review. The BLM will take into consideration any timely comments received, and require any changes to be incorporated, before approving of the Treatment Plan. The Permittee must implement the on-site measures of the Treatment Plan and receive written notification from the BLM that on-site Section 106 requirements have been met for the discovery, prior to Project activities resuming.

contractors hired on their behalf, will complete pedestrian survey and testing in the APE according to the following requirements:

i. High Potential: Defined as landforms adjacent to wetlands, riparian areas, watershed confluences, lakes, streams, Revised Statute 2477 trails, villages, and AHRS sites, or identified as high potential through consultation, research, and or/field evaluation. Pedestrian survey and testing is required for 100 percent of high potential areas within the Direct APE. If the Field Crew Chief determines that subsurface testing within these areas is not necessary, he/she will document how and why that determination was made.

ii. Low Potential: Defined as areas that are wetlands, perennially inundated, areas of tussock tundra, or slopes over 25 degrees, unless identified as a high potential through consultation, research, and/or field evaluation. Pedestrian survey and testing is required for 10 percent of low potential areas within the Direct APE. Otherwise, areas that are identified as low potential will not require pedestrian survey or subsurface testing. If the Field Crew Chief determines that subsurface testing within these areas is not necessary, he/she will document how and why that determination was made.

iii. Medium Potential: Areas not defined as either low potential or high potential. Pedestrian survey and testing is required for 50 percent of medium potential areas within the Direct APE. If the Field Crew Chief determines that subsurface testing within these areas is not necessary, he/she will document how and why that determination was made.

iv. Previously Surveyed Areas: The Permittee will not be required to conduct pedestrian survey and testing in areas of the APE that have been previously inventoried in the past 10 years via methods that are commensurate with, or meet, the PA Stipulations and CRMP Guidelines. However, it may be necessary for the Permittee or their contractors to revisit known resources to collect adequate data for NRHP eligibility recommendations. The Permittee will evaluate previous pedestrian surveys and provide recommendations on whether those areas need to be revisited as part of the Survey Strategy.

v. Indirect APE: Survey for subsurface resources in the Indirect APE is not required, unless there are reasonably foreseeable adverse effects from the Undertaking. Survey for surface resources may be required; however, the BLM cannot make informed decisions on the extent of the effects until Project design plans, footprints, construction methods, and schedule are finalized and submitted as Phase Plans (IV.E) and/or Annual Work Plans (VII.B.i). Potential direct, indirect, or cumulative effects may occur from increased access along or across the proposed road corridor, soil erosion or deposition downstream of water crossings and bridges, or other visual, audible, or atmospheric factors. Additional inventory and/or monitoring may be required, particularly in areas vulnerable to erosion, including water crossings, downstream of water crossings, hillside cuts, and trail or access crossings. The Permittee will provide new or updated Project plans to the BLM as part of the Annual PA Report (XV.B) and the PA Signatories will review and consider whether the Permittee will be required to complete additional inventory and/or monitoring within the Indirect APE during the Annual Meeting (XV.A).

contractors hired on their behalf, will complete pedestrian survey and testing in the APE according to the following requirements:

i. High Potential: Defined as landforms adjacent to wetlands, riparian areas, watershed confluences, lakes, streams, Revised Statute 2477 trails, villages, and AHRS sites, or identified as high potential through consultation, research, and or/field evaluation. Pedestrian survey and testing is required for 100 percent of high potential areas within the Direct APE. If the Field Crew Chief determines that subsurface testing within these areas is not necessary, he/she will document how and why that determination was made.

ii. Low Potential: Defined as areas that are wetlands, perennially inundated, areas of tussock tundra, or slopes over 25 degrees, unless identified as a high potential through consultation, research, and/or field evaluation. Pedestrian survey and testing is required for 10 percent of low potential areas within the Direct APE. Otherwise, areas that are identified as low potential will not require pedestrian survey or subsurface testing. If the Field Crew Chief determines that subsurface testing within these areas is not necessary, he/she will document how and why that determination was made.

iii. Medium Potential: Areas not defined as either low potential or high potential. Pedestrian survey and testing is required for 50 percent of medium potential areas within the Direct APE. If the Field Crew Chief determines that subsurface testing within these areas is not necessary, he/she will document how and why that determination was made.

iv. Previously Surveyed Areas: The Permittee will not be required to conduct pedestrian survey and testing in areas of the APE that have been previously inventoried in the past 10 years via methods that are commensurate with, or meet, the PA Stipulations and CRMP Guidelines. However, it may be necessary for the Permittee or their contractors to revisit known resources to collect adequate data for NRHP eligibility recommendations. The Permittee will evaluate previous pedestrian surveys and provide recommendations on whether those areas need to be revisited as part of the Survey Strategy.

v. Indirect APE: Survey for subsurface resources in the Indirect APE is not required, unless there are reasonably foreseeable adverse effects from the Undertaking. Survey for surface resources may be required; however, the BLM cannot make informed decisions on the extent of the effects until Project design plans, footprints, construction methods, and schedule are finalized and submitted as Phase Plans (IV.E) and/or Annual Work Plans (VII.B.i). Potential direct, indirect, or cumulative effects may occur from increased access along or across the proposed road corridor, soil erosion or deposition downstream of water crossings and bridges, or other visual, audible, or atmospheric factors. Additional inventory and/or monitoring may be required, particularly in areas vulnerable to erosion, including water crossings, downstream of water crossings, hillside cuts, and trail or access crossings. The Permittee will provide new or updated Project plans to the BLM as part of the Annual PA Report (XV.B) and the PA Signatories will review and consider whether the Permittee will be required to complete additional inventory and/or monitoring within the Indirect APE during the Annual Meeting (XV.A).

in writing to the BLM for up to a 30-day extension on report submission deadlines. All requests will be considered, and the BLM will notify the other PA Signatories and Consulting Parties as appropriate, if a request is granted. Deadline extensions will not require an amendment.

D. The Permittee may be required by the BLM to redact versions of reports for sensitive information, such as site-specific locations and names, in order for the BLM to distribute the reports to Consulting Parties who do not fall under the applicable professional qualification standards set forth in Stipulation I, Standards, and the public.

XV. AGREEMENT TRACKING AND MONITORING

A. Annual Meeting – The BLM will facilitate an Annual Meeting among the Consulting Parties, no later than March 31 of each year, to consult on the previous year's activities and the activities scheduled for the upcoming year. Items to be discussed at the Annual Meeting may include, but are not limited to:

i. The Permittee will provide detailed descriptions or presentations on work that occurred over the past year, including the following:
   1. Construction, operations, or maintenance activities;
   2. Inventory work within the APE, including consultation, archival research, and field survey;
   3. Cultural resources identified and evaluated;
   4. Historic properties assessed for effects and resolution measures implemented (or proposed); and
   5. Monitoring results;

ii. The Permittee will provide detailed descriptions or presentations on work that will occur over the upcoming year, including the following:
   1. Any changes to Phase Plans and whether that may change inventory, evaluation, assessment, or resolution requirements, per the PA;
   2. Construction, operations, or maintenance activities and schedules;
   3. Planned Inventory work within the Direct APE;
   4. A schedule for activities;
   5. Contractor Training Curriculum, effectiveness and/or modification; and
   6. Other plans or descriptions of how the Permittee will meet PA terms and conditions;

iii. The BLM, together with the other PA Signatories, will consider:
   1. Whether each agency (BLM, NPS, USACE, State) has met its respective responsibilities under the PA and any possible issues of non-compliance;
   2. PA and CRMP effectiveness and amendments, revisions, or addendums, as necessary;
   3. The APE and revisions, as necessary;
   4. Inventory needs within the Indirect APE;
   5. Need for re-inventory, reevaluation of eligibility, or assessment of effects if Projects footprints or plans change;
   6. Monitoring needs, results, and effectiveness;
   7. The need for Project-wide mitigation to account for indirect or cumulative effects;

8. The need for Technical Reports, Construction and Operations Summary Reports, or Reclamation and Project Closure Report;
9. PA requirements that have been completed in full; and
10. Feasibility of timelines;

iv. The BLM will share non-sensitive information gathered during consultation that may be relevant to implementation of the PA and any updates to the Contact List or Maps.

B. Annual PA Report – The Permittee will provide an Annual PA Report to the BLM, no later than March 1 each year. This report will summarize all activities resulting from PA implementation over the previous year. The BLM will submit the Annual PA Report to the Consulting Parties at least 15 days prior to the Annual Meeting. Consulting Parties will have a 30-day review and comment period for the Annual PA Report, which will follow the steps described in Stipulation XIV, Document Submission and Review. After review by the Consulting Parties, the Report will be made available to the public, consistent with Stipulation (V.F). Additional details are discussed in the CRMP, Attachment E.

C. Summary Construction and Operations Reports – The BLM shall ensure the Permittee provides summary Construction and Operation Reports, to assist with tracking the implementation of the PA within 2 years following completion of construction for Phases I, II, and III, and/or every 10 years. At least 1 year before the report is due the BLM will consult with the PA Signatories during the Annual Meeting, to determine additional required report content, due date, and review schedule. The Construction and Operation Reports will, minimally, include a summary of the work that has occurred during that Phase or period, the resources found, measures implemented, changes and updates in project designs/plans, changes in management or roles, and other relevant information. Some or all of the content may be summarized from the Annual Work Plans, Annual Fieldwork Reports, Annual PA reports, or other reports and documents. The Permittee will provide the report to the BLM within the determined timeframes, and the BLM will share the report with Consulting Parties for, minimally, a 30-day review and comment period which will follow the steps described in Stipulation XIV, Document Submission and Review.

D. Summary Reclamation and Closure Report – The BLM shall ensure the Permittee provides a summary report at the conclusion of the reclamation and closure Phase of the Project. The required content and due date will be determined through consultation with the PA Signatories and will be provided to the Permittee at least 2 years before the report is due.

E. If any PA Signatory deems an additional meeting with the other PA Signatories is necessary in addition to the Annual Meeting described above, that party shall inform the BLM in writing. The BLM shall consider all requests and will inform the other PA Parties if the BLM determines that the additional meeting is necessary.

F. Any of the PA Signatories or Concurring Parties may request informal meetings with the BLM, or other parties, regarding the implementation of the PA without requiring notification of the other PA Signatories. However, no changes or decisions regarding the implementation of the PA can be made without following Stipulation XVII, Amendments and Addendums, with the exception of requests to extend report submission or review deadlines (XIV.C).

G. The BLM will ensure that no less than every 5 years, the PA is reviewed with the Consulting Parties to evaluate the efficacy and consider changes, if necessary.

H. If the Project is delayed or put on hold at any stage for more than 12 consecutive months, the Permittee will be responsible for funding all costs associated with re-familiarizing all Parties with the Project, the Section 106 process, the PA Stipulations, and any work that has already occurred under the terms of the PA. The BLM shall ensure this effort includes, but is not limited to, sending notification letters to the Consulting Parties to notify them that the Project will be moving forward and provide a brief summary of the PA implementation to date; facilitation of 1 or more meetings with Consulting Parties; and facilitation of 1 or more meetings among the PA Signatories to discuss PA implementation work to date and consider any necessary revisions to the PA and CRMP, and to ensure all parties understand their responsibilities under the terms of the PA; and any in-person consultation between the BLM and Tribes. The Permittee will provide at least 60 days advance notice to the BLM to ensure these steps can be adequately accomplished.

XVI. DISPUTE RESOLUTION

A. Should any PA Signatory object at any time to any proposed work or the manner in which the terms of this PA are implemented, the BLM shall consult with the party to resolve objection. If the BLM determines that such objection cannot be resolved, the BLM will:

i. Forward all documentation relevant to the dispute, including the BLM's proposed resolution, to the ACHP. The ACHP shall provide the BLM with its advice on the resolution of the objection within 30 days of receiving adequate documentation. Prior to reaching a final decision on the dispute, the BLM shall prepare a written response that takes into account any timely advice or comments regarding the dispute from the ACHP, PA Signatories, and Consulting Parties, and will provide the parties with a copy of the written response. The BLM will then proceed according to its final decision.

ii. If the ACHP does not provide its advice regarding the dispute within the 30-day time period, the BLM may make a final decision on the dispute and proceed accordingly. Prior to reaching such a final decision, the BLM shall prepare a written response that takes into account any timely comments received from the PA Signatories and Consulting Parties regarding the dispute and provide those parties and the ACHP with a copy of such written response.

B. The BLM's responsibility to carry out all other actions subject to the terms of this PA that are not the subject of the dispute remain unchanged.

XVII. AMENDMENTS AND ADDENDUMS

A. Any PA Signatory may request an amendment to the PA by providing the proposed changes in writing to the BLM. The BLM will notify all Consulting Parties of the proposed amendment and consult with them to reach agreement within 30 days. The amendment will be effective on the date the amendment is signed by the Signatories and filed with the ACHP. If the amendment is not signed within 60 days of receipt, the BLM will reinitiate consultation for another 30 days. If the Signatories do not agree to the amendment, the BLM will determine that the PA will stand as is.

B. PA Attachments may be amended with a streamlined process as follows, except for Attachments A, E, and G. Any PA Signatory may propose an amendment to an Attachment by submitting a request in writing to the BLM. If the BLM concurs that the amendment improves or updates the Attachment(s), the BLM will share the proposed amendment with the Consulting Parties for a 30-day review and comment period. If no comments are received at the end of the review period, the BLM will move forward with the proposed amendment and will provide Consulting Parties with a revised version of the Attachment(s).

i. The BLM may revise Attachment A, Maps, at any time without necessitating an amendment. The BLM will notify the Consulting Parties of any updates and provide the revised version of Attachment A at the Annual Meeting (XV.A).

ii. Attachment E, CRMP, may be updated without necessitating a PA amendment, but requires written approval from the BLM, the SHPO, and the NPS in a revised version of Exhibit F (Signature Page for CRMP Finalization). Any PA Signatory may propose an amendment to the CRMP by submitting a request in writing to the BLM. If the BLM concurs that the amendment improves or updates the CRMP, the BLM will share the proposed amendment with the Consulting Parties for a 30-day review and comment period. The BLM will consider all timely comments received, in consultation with the SHPO and the NPS, and incorporate changes. The BLM will send a revised version of the CRMP to the Consulting Parties following written approval. If a Consulting Party objects to the changes, the BLM will follow the steps in Stipulation XVI, Dispute Resolution.

1. The BLM may update CRMP Exhibit D (Mapbook of AHRS Sites within the APE) and Exhibit E (Contact List) at any time without necessitating written approval from the BLM, the SHPO, and the NPS. The BLM will provide any revisions to the Exhibit(s) at the Annual Meeting (XV.A).

iii. The BLM may append documents to Attachment G, Project Plans, at any time without necessitating an amendment, as long as the documents are required by and/or developed under the terms of the PA, such as Phase Plans, Annual Work Plans, Monitoring Plans, and Treatment Plans, and the addition is documented in Attachment H, Amendment and Addendum Log. Final reports do not need to be appended to the PA.

C. The BLM will document all amendments and addendums to the PA in Attachment H, Amendment and Addendum Log. The BLM will provide revised versions of the PA or PA Attachments to the Consulting Parties within 30 days of finalization, unless otherwise noted.

XVIII. TERMINATION

A. If any of the PA Signatories determine that its terms will not or cannot be carried out, that party shall immediately consult with the other PA Signatories to attempt to develop an amendment per Stipulation XVII, above. If, within 30 days (or another time period agreed to by all PA Signatories), an amendment cannot be reached, any PA Signatory may terminate the PA upon written notification to the other PA Signatories.

B. Once the PA is terminated, and prior to work continuing on the Undertaking, the BLM must either (a) execute a Memorandum of Agreement pursuant to 36 CFR 800.6 or (b) request, take into account, and respond to the comments of the ACHP under 36 CFR 800.7. The BLM shall notify the Consulting Parties as to the course of action it will pursue.

XIX. FINANCIAL SECURITY

A. The Permittee will post a financial instrument approved under the ROW regulations (43 CFR 2800) with the BLM in an amount sufficient to cover all post-fieldwork costs associated with implementing the PA, or other mitigative activities such as data recovery, curation, and report completion, as negotiated by the Permittee where they contract for services in support of this PA.

B. The BLM will determine through consultation with and concurrence from the other PA Signatories the extent and duration of additional data collection activities and analysis, taking into account the need for completing post-fieldwork activities, should the Permittee abandon the Project.

XX. ANTI-DEFICIENCY ACT

The BLM's obligations under this PA are subject to the availability of appropriated funds, and the stipulations of this PA are subject to the provisions of the Anti-Deficiency Act. The BLM shall make reasonable and good faith efforts to secure the necessary funds to implement this PA in its entirety. If compliance with the Anti-Deficiency Act alters or impairs the BLM's ability to implement the stipulations of this agreement, the BLM shall consult in accordance with the amendment and termination procedures found at Stipulations XVII and XVIII of this PA.

XXI. DURATION OF THIS PA

A. Unless otherwise amended or terminated in accordance with Stipulation XVII or XVIII, this PA will expire 25 years from the date of Execution.

B. The Project is proposed to last 50 years, but because Project design plans are not fully developed at this time, this PA cannot account for all anticipated effects. The PA Signatories recognize that an amended extension of this PA or another agreement document will be needed to ensure compliance with the NHPA throughout the Operations and Maintenance and Reclamation Phases of the Project. Therefore, at least 2 years prior to expiration, the PA Signatories will consult to determine whether a new PA will be developed or if this PA will be amended and extended.

C. The BLM and Consulting Parties will review all sections of this PA every 5 years and at shifting of Project Phases to update outdated statutes, best practices, and contact information, and to consider whether organizations who may have originally declined participation may wish to participate as a Consulting Party. If the BLM determines the PA needs to be updated, the BLM will notify the PA Signatories, Consulting Parties, and other interested parties and invite them to consult on the proposed changes. Amendments to the PA would be consistent with Stipulation XVII, Amendments and Addendums.

EXECUTION of this PA by the BLM, the SHPO, and the ACHP, and implementation of its terms, evidences that the BLM has taken into account the effects of this Undertaking on historic properties and afforded the ACHP an opportunity to comment.

This PA may be executed in counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument. The BLM may consolidate the original signature pages to produce the final copies. The BLM will distribute copies of all pages to all Consulting Parties once the PA is signed.

SIGNATURE PAGES – SIGNATORIES

**PROGRAMMATIC AGREEMENT
BY AND AMONG THE
BUREAU OF LAND MANAGEMENT,
ALASKA STATE HISTORIC PRESERVATION OFFICER, AND
ADVISORY COUNCIL ON HISTORIC PRESERVATION
REGARDING THE
AMBLER MINING DISTRICT INDUSTRIAL ACCESS ROAD, ALASKA**

SIGNATORY

U.S. DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MANAGEMENT

By:____
(Chad Padgett, State Director, BLM Alaska)

DATE:___________

SIGNATORY

ALASKA STATE HISTORIC PRESERVATION OFFICER

By:____
(Judith Bittner, State Historic Preservation Officer, Alaska State Historic Preservation Office)

DATE:___________

SIGNATORY

ADVISORY COUNCIL ON HISTORIC PRESERVATION

By:____
(John M. Fowler, Executive Director, Advisory Council on Historic Preservation)

DATE:___________

SIGNATURE PAGES – INVITED SIGNATORIES

**PROGRAMMATIC AGREEMENT
BY AND AMONG THE
BUREAU OF LAND MANAGEMENT,
ALASKA STATE HISTORIC PRESERVATION OFFICER, AND
ADVISORY COUNCIL ON HISTORIC PRESERVATION
REGARDING THE
AMBLER MINING DISTRICT INDUSTRIAL ACCESS ROAD, ALASKA**

**INVITED SIGNATORY
ALASKA INDUSTRIAL DEVELOPMENT AND EXPORT AUTHORITY**

By:____
(name, title)
DATE:___________

**INVITED SIGNATORY
ALASKA DEPARTMENT OF NATURAL RESOURCES**

By:____
(Corri A. Feige, Commissioner)
DATE:___________

**INVITED SIGNATORY
U.S. ARMY CORPS OF ENGINEERS**

By:____
(Shannon Morgan, Chief North Branch)
DATE:___________

**INVITED SIGNATORY
U.S. DEPARTMENT OF THE INTERIOR, NATIONAL PARK SERVICE**

By:____
(Greg Dudgeon, Superintendent, Gates of the Arctic National Park and Preserve)
DATE:___________

SIGNATURE PAGES – CONCURRING PARTIES

CONCURRING PARTY
ALATNA VILLAGE COUNCIL

By:______________________________
(Harding Sam, First Chief)

CONCURRING PARTY
ALLAKAKET VILLAGE COUNCIL

By:______________________________
(Elsie Bergman, First Chief)

CONCURRING PARTY
CITY OF ALLAKAKET

By:______________________________
(Crystal Bergman, Mayor)

CONCURRING PARTY
EVANSVILLE, INCORPORATED

By:______________________________
(Frank Thompson, First Chief)

CONCURRING PARTY
EVANSVILLE VILLAGE

By:______________________________
(Dave Anderson, President)

CONCURRING PARTY
NATIVE VILLAGE OF KOBUK

By:______________________________
(Henry Horner, President)

CONCURRING PARTY
NORTHWEST ARCTIC BOROUGH

By:______________________________
(Lucy Nelson, Mayor)

DEFINITIONS

ACHP (Advisory Council on Historic Preservation) – The ACHP is an independent federal agency that promotes the preservation, enhancement, and productive use of our nation's historic resources, and advises the President and Congress on national historic preservation policy. The National Historic Preservation Act (NHPA) gives the ACHP the legal responsibility to assist federal agencies in their efforts and to ensure they consider preservation during project planning.

Adverse Effect – An adverse effect is found when an Undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register of Historic Places (NRHP) in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Adverse effects may include reasonably foreseeable effects caused by the Undertaking that may occur later in time, be farther removed in distance, or be cumulative. The term is consistent with the definition found at 36 CFR 800.5(a)(1).

AIDEA (Alaska Industrial Development and Export Authority) – AIDEA is the Project proponent and Permittee. AIDEA is a public corporation of the State of Alaska, created in 1967 by the Alaska Legislature "in the interests of promoting the health, security, and general welfare of all the people of the state, and a public purpose, to increase job opportunities and otherwise to encourage the economic growth of the state…"

APE (Area of Potential Effects) – The APE geographic area or areas within which an Undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The APE is influenced by the scale and nature of an Undertaking and may be different for different kinds of effects caused by the Undertaking.

Archaeological Sensitivity Model – This is a Geographical Information System model capable of identifying resource potential for prehistoric, protohistoric, and early historic archaeological resources left behind by Native Alaskans within the Direct and Indirect APE. The Model will be developed following selection of a preferred alternative. The Model does not predict site location but will identify areas that have high, medium, or low potential for these types of sites. The results of the Model will be integrated into the Survey Strategy.

Component/Project Component – The Project would include construction of bridges, material sites, maintenance stations, airstrips, and related ancillary features, which are referred to as Components.

Concurring Party – Entities that have participated in the development of the Programmatic Agreement (PA). The refusal of any party invited to concur in the PA does not invalidate the PA.

Construction Phases – The Permittee has proposed building the Project in 3 Phases:

> <u>Phase I Construction of Seasonal Pioneer Road</u>: This Phase would overlap with the Pre-Construction Phase and will occur during years 2 to 4 of the Project. The Pioneer Road is proposed as a single-lane seasonal road with embankment width up to 28 feet and height 30 to 72 inches, 12-foot road lane, 2-foot shoulders, and 1-way operation for up to 7 months per year. This Phase would include clearing vegetation from the federal and state right of ways while other right-of-way negotiations are underway. Other activities associated with this Phase include construction of material sources, clearing and preparing construction camps, placement of radio towers, staging of equipment and labor in various areas, hauling materials and placing fill, excavating high areas, and grading. It would also include installation of culverts and bridges (including driving piles for bridge supports) as well as airstrips, maintenance facilities, and access controls.
>
> <u>Phase II Construction of All Season Roadway</u>: This Phase, occurring during years 3 to 4 of the Project (including overlap with Phase I) would involve the construction of a year-round useable

road and would include additional material extraction, hauling and placing material to expand the Phase I embankment (width and depth), and grading to final slopes. Fiber optic facilities would be trenched into the road embankment during this Phase.

Phase II Operations and Maintenance of the Constructed Phase II Roadway: This Phase, occurring from years 4 to 50, includes continued development or expansion of material sites, air operations, maintenance station operations, hauling materials and placing fill for repairs/maintenance, grading, and removal and reclamation of temporary construction camps not turned into maintenance stations.

Phase III Construction of 2-Lane Road: Phase III, if needed, would include additional clearing, additional material extraction, additional excavation where widening road in cut sections or side hilling, additional hauling and placing materials to expand the Phase II embankment (width), and additional grading. Culverts would be extended by welding extensions onto existing culverts. The expansion would create a 2-lane all-season roadway. The road widening effort would take 2 to 3 years to complete.

Consultation – The process of seeking, discussing, and considering the views of other participants, and, where feasible, seeking agreement with them regarding matters arising in the Section 106 process.

Consulting Party – Any group, entity, or person that has a demonstrated interest in the Undertaking and has participated in the PA development. This includes Tribes, agencies, local governments, nonprofit organizations, and the Permittee.

CRM (Cultural Resources Management) – CRM is the practice of cultural heritage management within a framework of federal, state, and local laws, regulations, and guidelines.

CRMP (Cultural Resources Management Plan) – A CRMP is a document drafted to guide compliance and consideration of cultural resources during implementation of a project or to assist a landowner or land manager.

Cultural Resource – Archaeological, historical or architectural resources, structures, or places that may exhibit human activity or occupation and/or may be places of religious, spiritual, or cultural significance to Tribes, or meet the criteria of a Traditional Cultural Property (TCP) (BLM Manual 8100).

Cumulative Effects – Cumulative effects result from incremental actions, that when added to other past, present, and reasonably foreseeable future actions, may adversely affect a historic property.

Curation – Refers to the process of selecting and caring for archaeological or cultural materials to be provided to a museum or landowner for future research, exhibit, or instruction. Curation procedures will follow University of Alaska Museum of the North's *Curation Guidelines* (UAM Curation Guidelines and 36 CFR 79).

Direct Effects – Direct effects include physical destruction or damage, alteration that is not consistent with 36 CFR 68, removal of a property from a historic location, change in the character of use or physical features that contribute to the historic significance, deterioration through neglect, or introduction of visual, atmospheric, or audible elements that diminish the integrity of a property's significant historic features. The term is consistent with the definition found at 36 CFR 800.5(a)(2).

DOE (Determination of Eligibility) – A DOE is an evaluation of whether a property is eligible for listing in the NRHP, following guidance provided in the National Park Service Bulletin 15 *How to Apply the National Register Criteria for Evaluation*.

Effect – See Adverse Effect.

Execution – Refers to the date the PA goes into effect and is defined as the date that the last Signatory signs the document and it is filed with the ACHP. At that point, the PA is considered executed.

Field Crew Chief – Archaeologist who oversees and coordinates an archaeological field crew in locating, collecting, recording, and interpreting data during archaeological survey and excavation. Must have at least 2 years of supervisory experience conducting archaeological fieldwork in Alaska or have partaken in a cultural resource training/shadowing program prior to taking on the Field Crew Chief role.

GAAR (Gates of the Arctic National Park and Preserve) – The northernmost national park in the U.S., GAAR protects portions of the Brooks Range. It was initially designated a national monument in 1978. After passage of the Alaska National Interest Lands Conservation Act in 1980, it was re-designated as a national park and preserve.

Historic Property – Any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious, spiritual, or cultural importance to a Tribe and that meet the NRHP criteria.

Indirect Effects – Indirect effects to historic properties are those caused by an Undertaking that are later in time or farther removed in distance but are still reasonably foreseeable.

Inventory – The term "inventory" is used throughout this document to refer to all efforts to compile information on historic properties, including consultation, archival research, and fieldwork. The term is similar to survey, but "survey" is used throughout this document to refer to inventory efforts that are field based only.

Invited Signatory – The State of Alaska, National Park Service, U.S. Army Corp of Engineers, and the Alaska Industrial Development and Export Authority are Invited Signatories to this PA. Invited Signatories have the same rights with regard to seeking amendment or termination of the PA as the Signatories.

Materials – The term "materials" refers to any objects, artifacts, specimens, records, or remains associated with historic properties, consistent with the definition found at 36 CFR 79.4(a)(1). This includes all documentation generated during the implementation of this PA, with the exception of information that is subject to confidentiality clauses of NHPA, Archaeological Resources Protection Act, and/or Alaska State law.

Monitor – Archaeologist who observes ground-disturbing/excavation activities in order to identify, recover, protect, and/or document archaeological information or materials that are unearthed during these activities. The Monitor has stop-work authority. Must have a bachelor's degree in Archaeology or closely related field, plus at least 1 year of experience conducting archaeological fieldwork in Alaska.

NHPA (National Historic Preservation Act) – The NHPA, 54 USC 300101 to 307108, is the primary federal law governing the preservation of historic resources in the U.S. The law established a national preservation program and a system of procedural protections which encourage the identification and protection of historic resources of national, state, tribal and local significance.

NRHP (National Register of Historic Places) – The NRHP is the official list of the Nation's historic places worthy of preservation. Authorized by the National Historic Preservation Act of 1966, the NRHP is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect America's historic and archeological resources.

PA (Programmatic Agreement) – A document that records the terms and conditions agreed upon to resolve the potential adverse effects of a Federal agency program, complex Undertaking or other situations in accordance with 36 CFR 800.14(b).

PA Signatories – This term is used in the PA to collectively mean the Signatories and Invited Signatories.

Permittee – The Permittee is AIDEA and any heirs, successors, or assigns.

Pre-Construction Phase – This Phase includes those activities required to complete permitting and design, such as: geotechnical investigations at bridge locations, along the corridor centerline to refine the embankment design, and at material sites along the east-end alignment; aerial imagery and LiDAR (and/or survey) for areas lacking coverage; wetland delineation on areas not field delineated; hydrology studies; and cultural resources surveys. No Components will be installed as part of this Phase. Years 1 and 2 may overlap with Phase I Construction timing.

Project – All aspects, including those not currently defined but may be defined in the future for the Ambler Mining District Industrial Access Road.

Project Field Plans – A planning tool for deployment of field crews during the entire field season, based on output for site potential value (high, medium, low) and the Survey Strategy.

Reclamation Phase – This Phase of the Project would occur at the end of the Project and would include removal of embankment, culverts, airstrips, and maintenance sites, as well as regrading and revegetation. All Components would be removed at end of reclamation.

ROD (Record of Decision) – The ROD is a statement issued by the Lead Federal Agency that informs the public of the agency's decision, the agency's rationale for it, and any mitigation measures the agency will carry out for significant impacts. The ROD will govern whether permits are issued for a project to move forward.

Section 106 – Section 106 of the NHPA of 1966 requires federal agencies to consider the effects of projects they carry out, assist, fund, permit, license, or approve throughout the country (known as "Undertakings") on historic properties. The Section 106 process requires federal agencies to identify historic properties, assess effects on those properties, and consider alternatives to resolve those effects. Section 106 gives the ACHP, interested parties, and the public the chance to weigh in on these matters before a final decision is made. The ACHP has issued regulations, 36 CFR 800, which guide how agencies should fulfill this responsibility.

Segments/Project Segments – Geographical sections of the Project (e.g., milepost 32 to 35).

Sensitive information – This is defined in the NHPA as including information about the location, character, or ownership of a historic property if disclosure to the public may cause a significant invasion of privacy, risk harm to the historic property, or impede the use of a traditional religious site by practitioners (54 USC 307103).

SHPO (State Historic Preservation Officer) – Every state and U.S. Territory has a SHPO who, with the support of qualified staff, is charged with: conducting a comprehensive survey of historic properties; maintaining an inventory of historic properties; identifying and nominating eligible properties for the NRHP; advising and assisting Federal, State and local governments in matters of historic preservation; preparing and implementing a statewide historic preservation plan; providing public information, education, training, and technical assistance; and providing consultation for Federal Undertakings under the Section 106 provision of the National Historic Preservation Act.

Signatory – The BLM, SHPO, and ACHP are Signatories to this PA. The Signatories have sole authority to execute the PA. The Signatories, along with the Invited Signatories, can amend or terminate the PA.

Stages/Project Stages - Specific construction steps or activities that would occur within each Project Phase or Component (e.g., survey, geotechnical drilling, etc.).

Supervisory Monitor – Secretary of Interior-qualified archaeologist who is present at the job site for the duration of the monitoring program. Conducts monitoring and/or supervises historic properties monitors on-site. The Supervisory Monitory has stop-work and start-work authorities. Must have a master's degree in Archaeology or closely related field, plus at least 1 year of supervisory experience conducting archaeological fieldwork in Alaska.

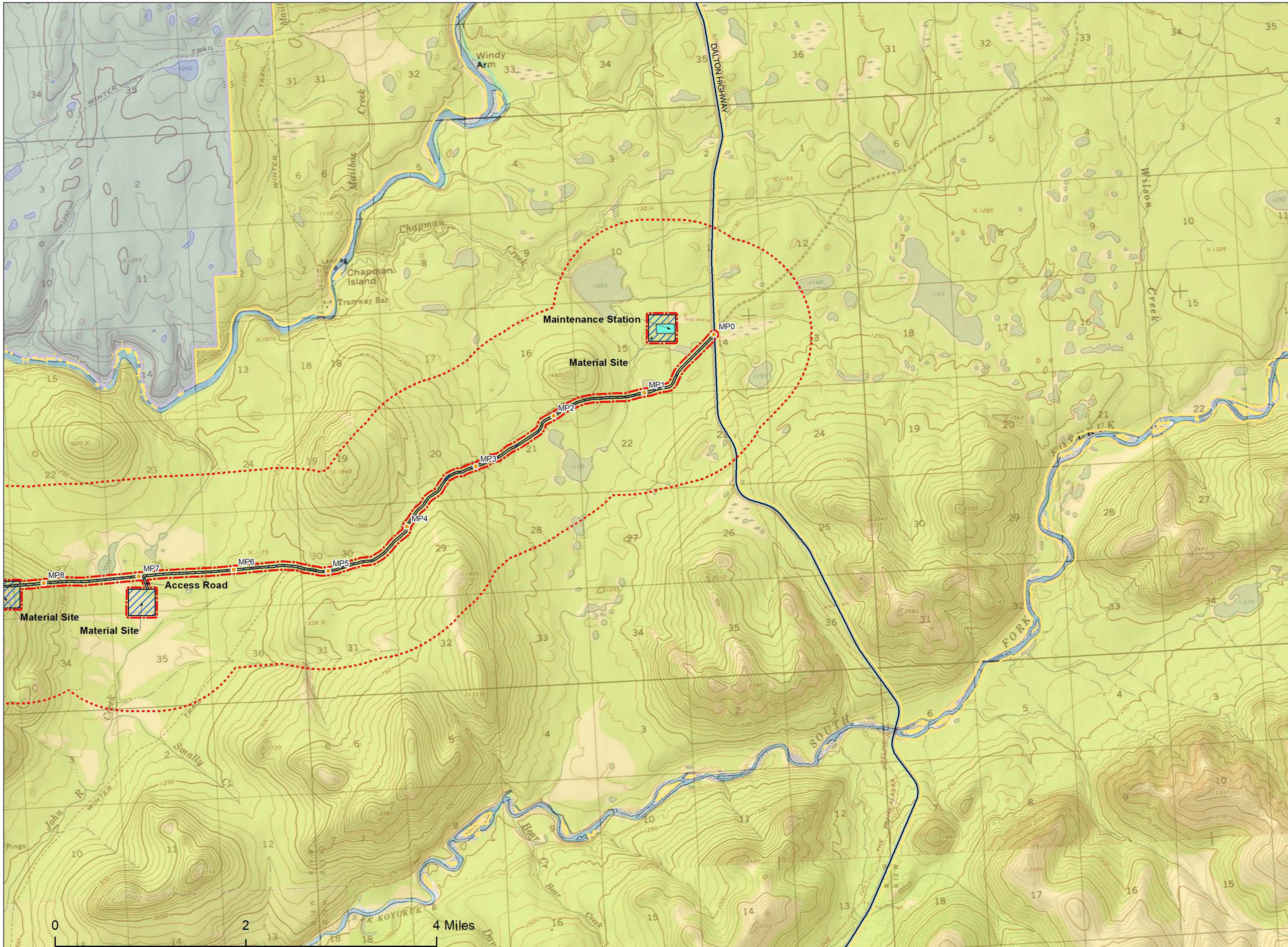
Survey – The term "survey" is used throughout this document to refer to inventory efforts that are field-based only. The term is similar to inventory, but "inventory" is used throughout this document to refer to all efforts to compile information on historic properties, including consultation, archival research, and fieldwork.

Survey Strategy – Required field inventory efforts based on a reasonable and good faith effort and incorporating specific field methods to document and record sites. The Survey Strategy will be developed by integrating multiple data sources for historic, ethnographic, and archaeological resources for the entire APE which will then be used to classify the APE into areas of high, medium, or low potential to contain archaeological and cultural material.

TCP (Traditional Cultural Property) – A place that is eligible for inclusion in the NRHP based on its associations with the cultural practices, traditions, beliefs, lifeways, arts, crafts, or social institutions of a living community. TCPs are rooted in a traditional community's history and are important in maintaining the continuing cultural identity of the community. More information on TCPs is found in the National Park Service Bulletin 38 *Guidelines for Evaluating and Documenting Traditional Cultural Properties*.

Undertaking – A project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including those carried out by or on behalf of a federal agency, those carried out with federal financial assistance, and those requiring a federal permit, license, or approval as defined at 36 CFR 800.16(y).

Attachment A – Maps

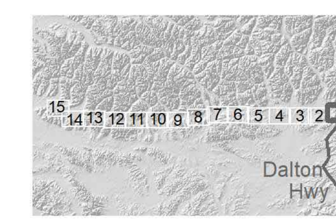


- Alternative A Footprints
- Direct APE
- Indirect APE
- Major Roadways

Administered Lands*

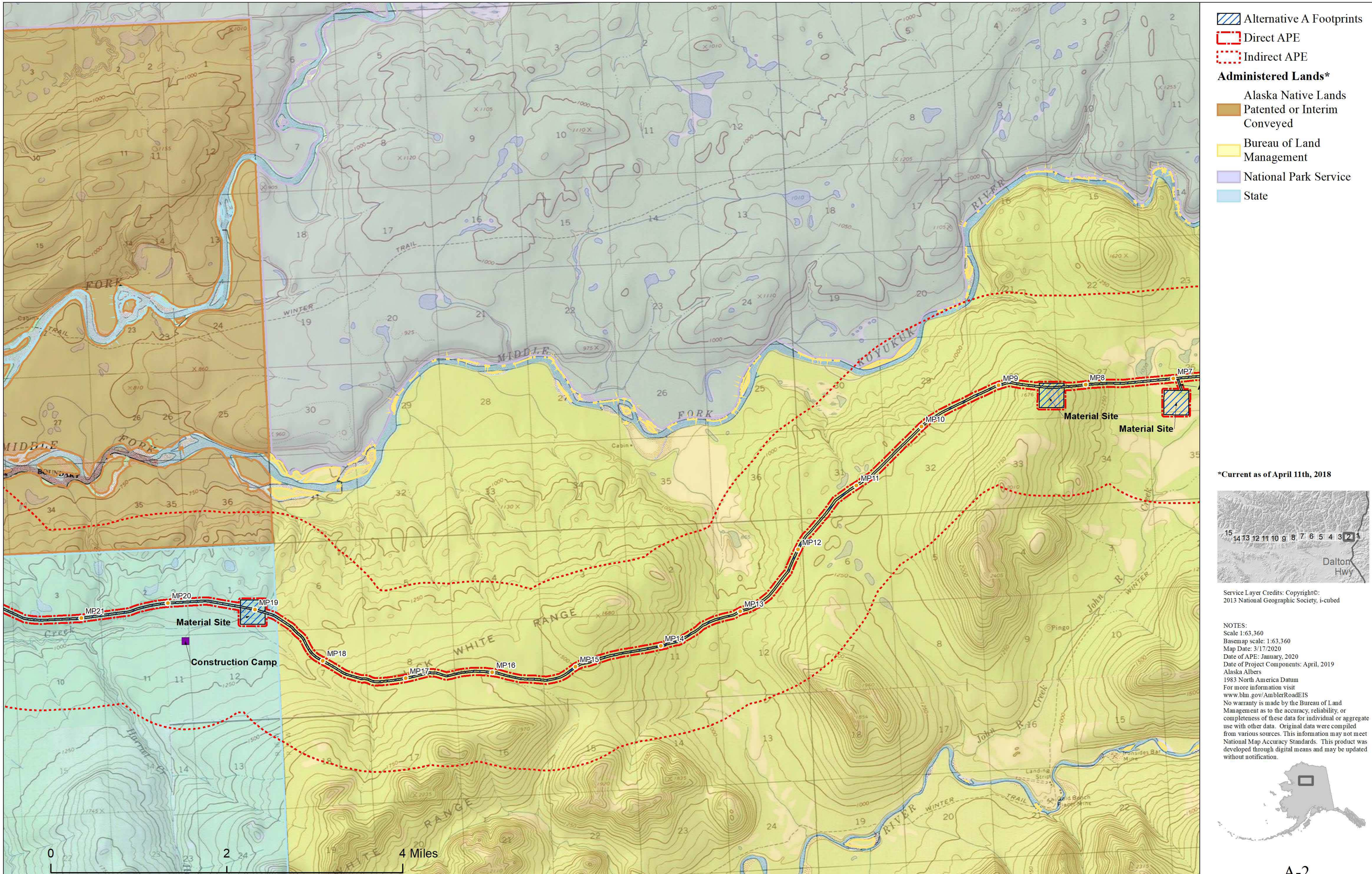
- Bureau of Land Management
- National Park Service
- State

***Current as of April 11th, 2018**



Service Layer Credits: Copyright©:
2013 National Geographic Society, i-cubed

NOTES:
Scale 1:63,360
Basemap scale: 1:63,360
Map Date: 3/17/2020
Date of APE: January, 2020
Date of Project Components: April, 2019
Alaska Albers
1983 North America Datum
For more information visit
www.blm.gov/AmblerRoadEIS
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.


Alternative A Footprints
Direct APE
Indirect APE
Administered Lands*
Alaska Native Lands Patented or Interim Conveyed
Bureau of Land Management
National Park Service
State
*Current as of April 11th, 2018
Dalton Hwy
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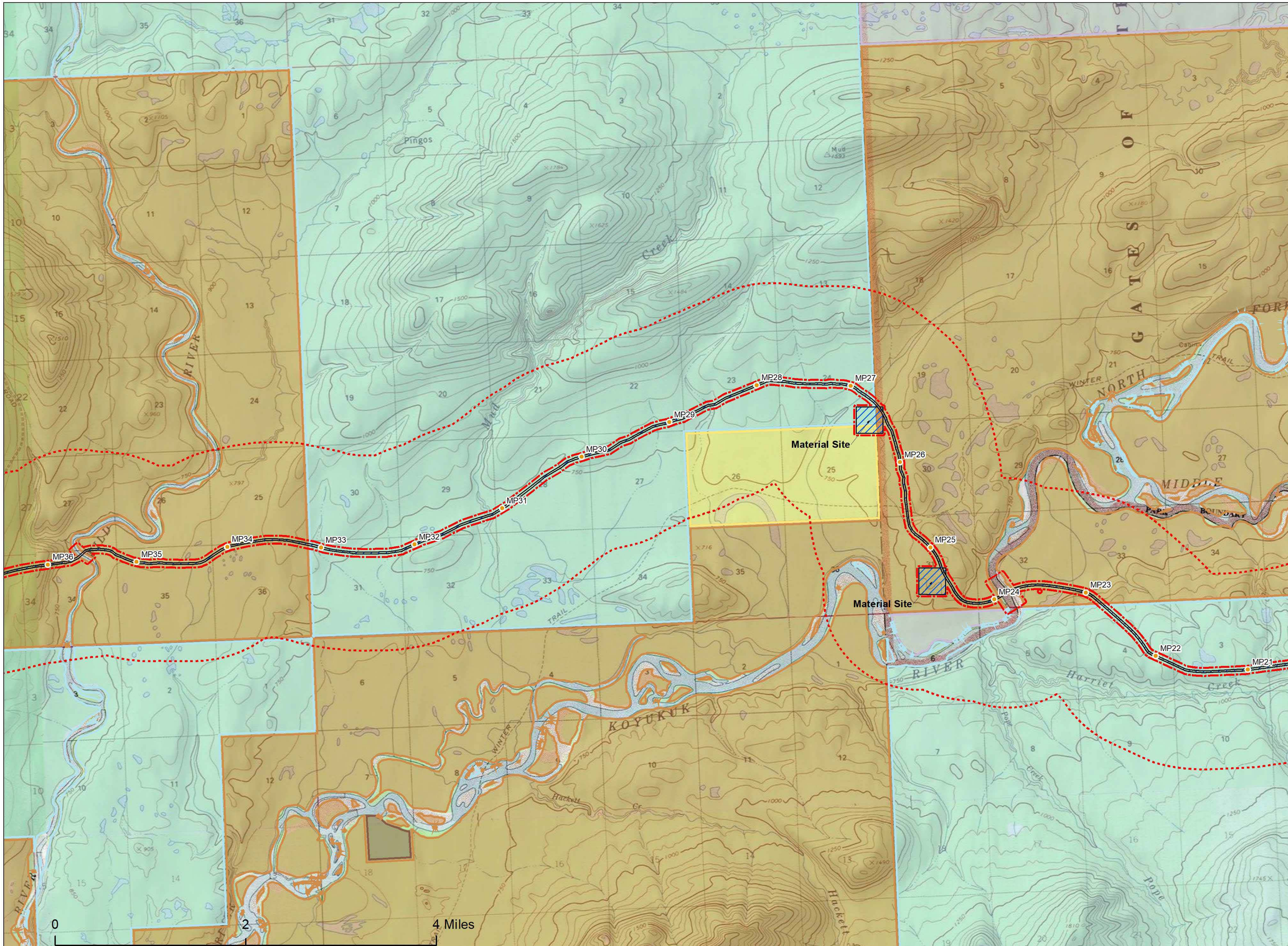
Material Site
Material Site
Material Site
Construction Camp
MP7
MP8
MP9
MP10
MP11
MP12
MP13
MP14
MP15
MP16
MP17
MP18
MP19
MP20
MP21
MIDDLE FORK KOYUKUK RIVER
WHITE RANGE
0
2
4 Miles



Alternative A Footprints
Direct APE
Indirect APE

Administered Lands*

Alaska Native Allotment
Alaska Native Lands Patented or Interim Conveyed
Bureau of Land Management
National Park Service
State

***Current as of April 11th, 2018**

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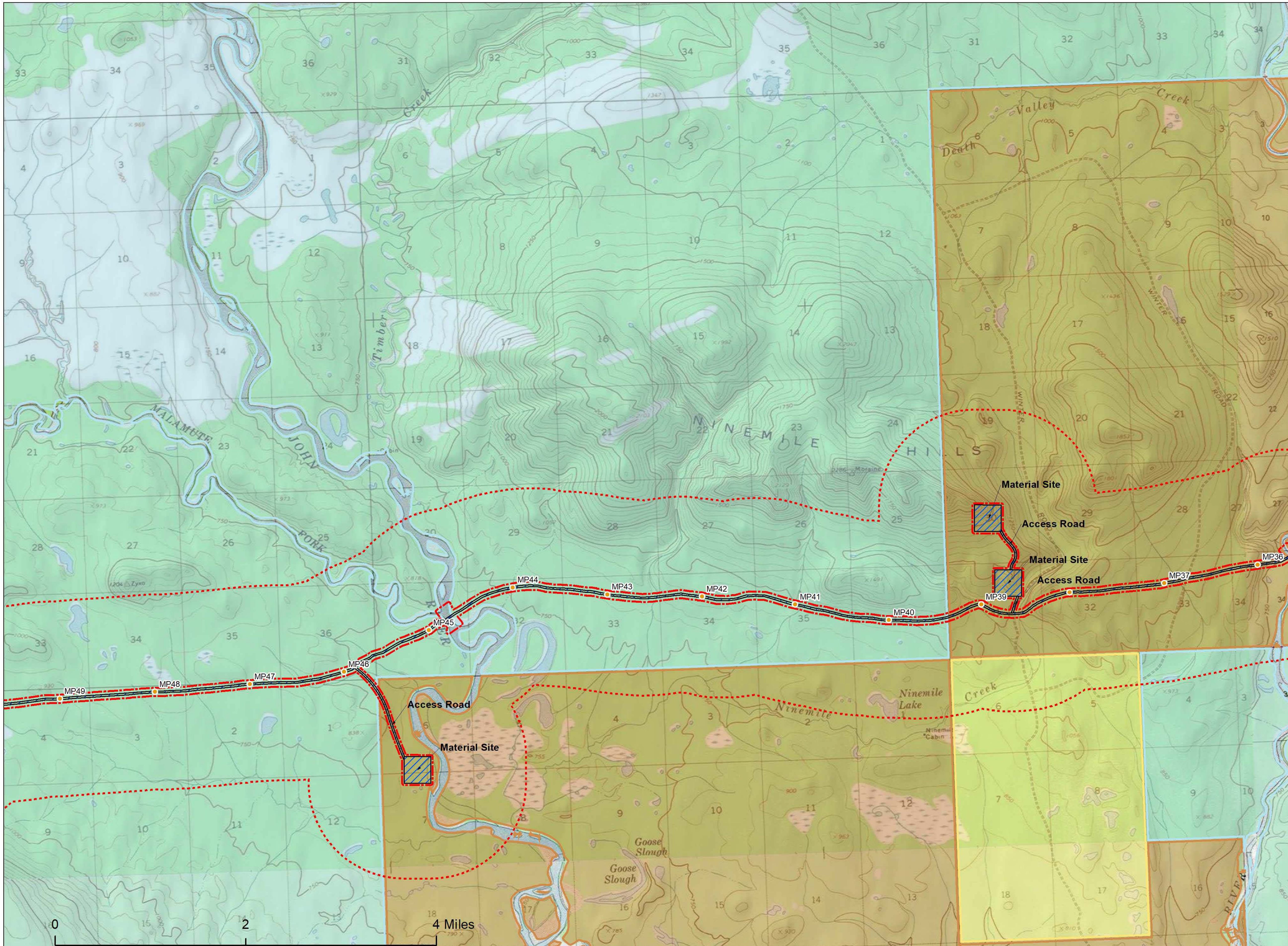

Alternative A Footprints
Direct APE
Indirect APE

Administered Lands*

Alaska Native Lands Patented or Interim Conveyed
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State

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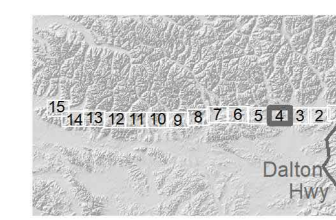

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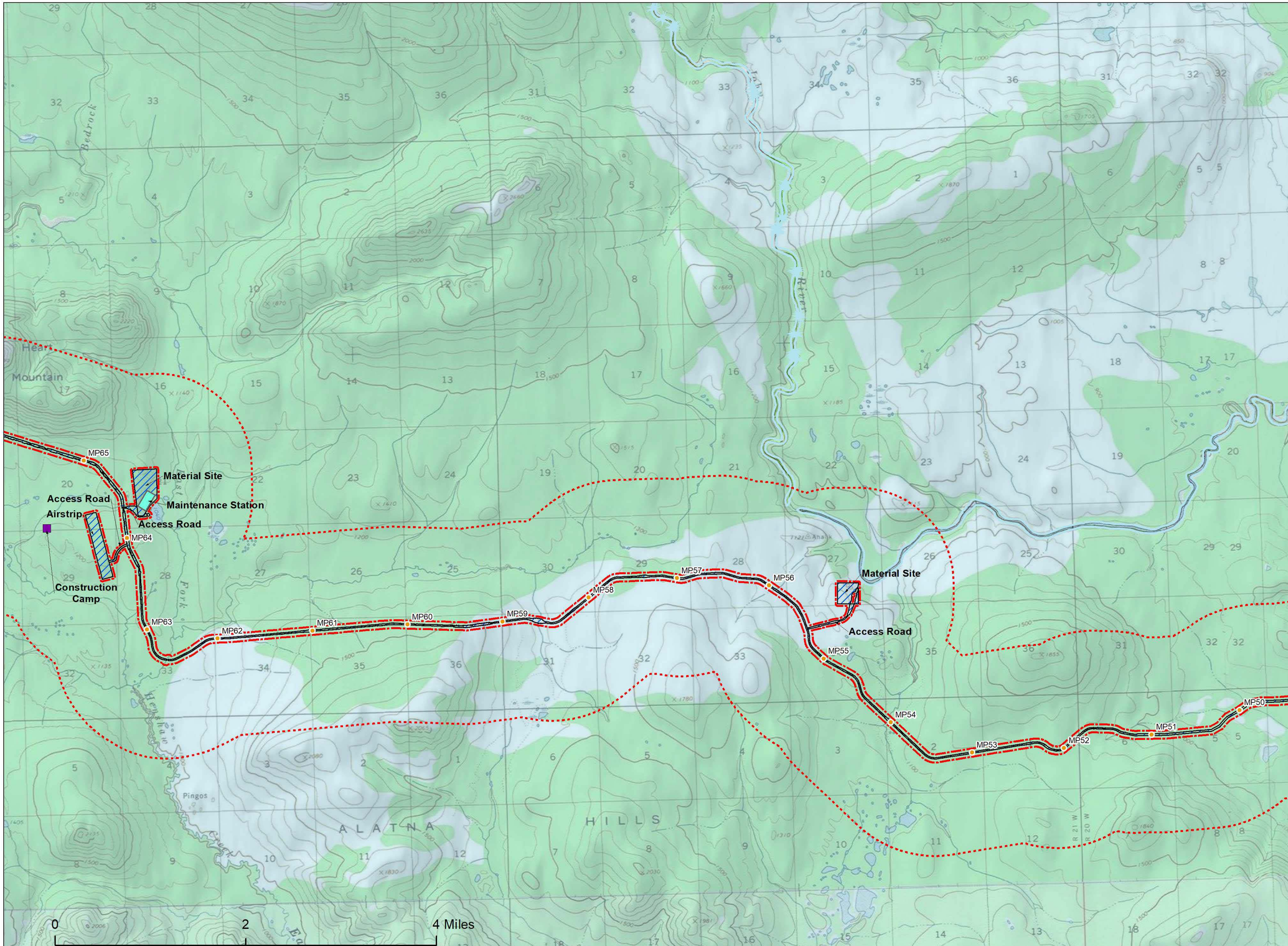
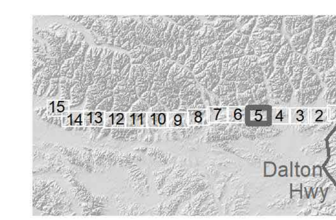


Alternative A Footprints
Direct APE
Indirect APE
Administered Lands*
State

***Current as of April 11th, 2018**



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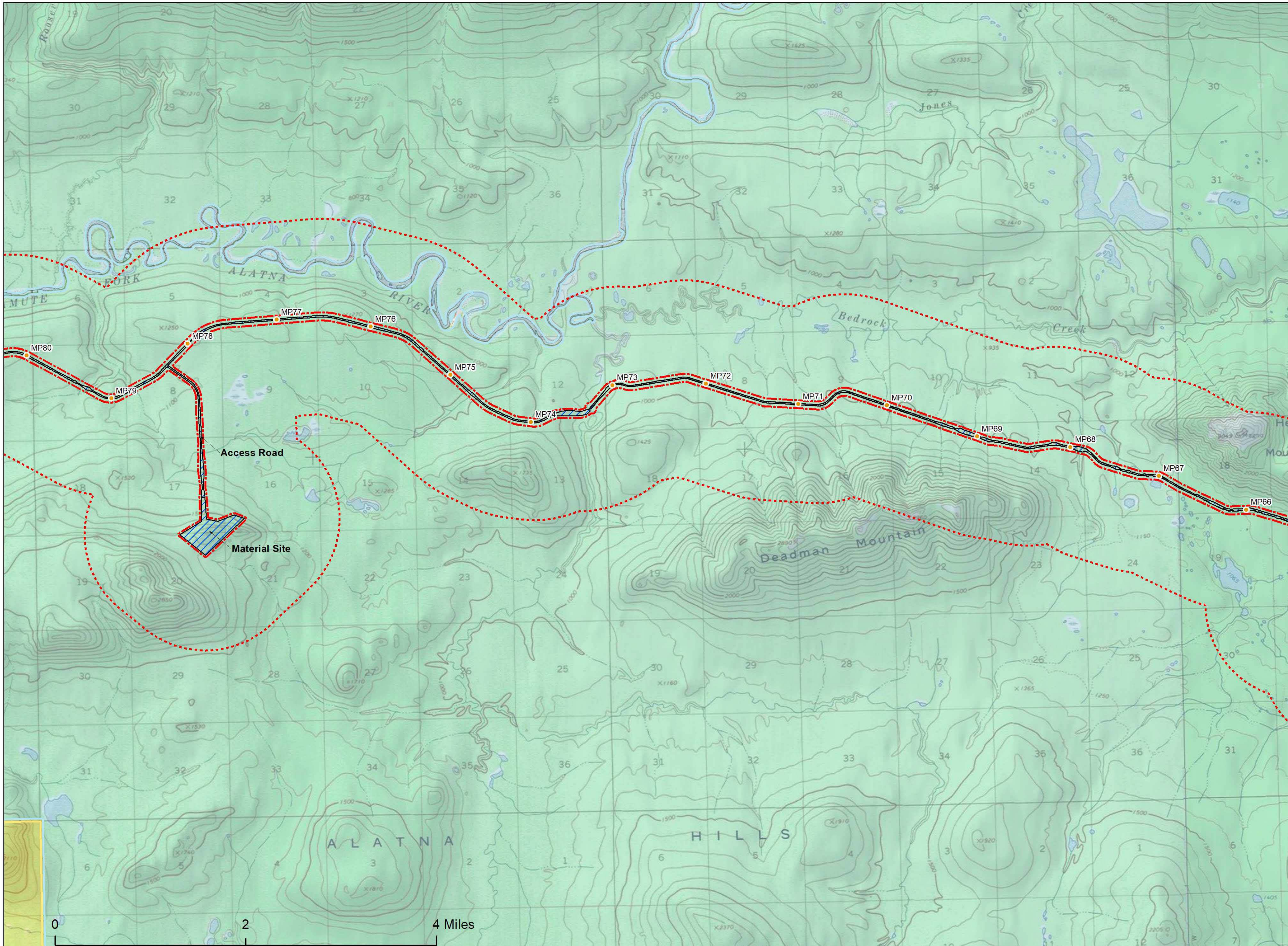
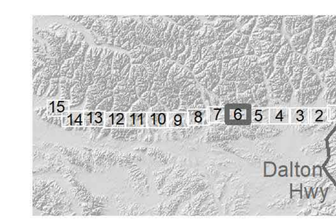


Alternative A Footprints
Direct APE
Indirect APE
Administered Lands*
Bureau of Land Management
State

*Current as of April 11th, 2018



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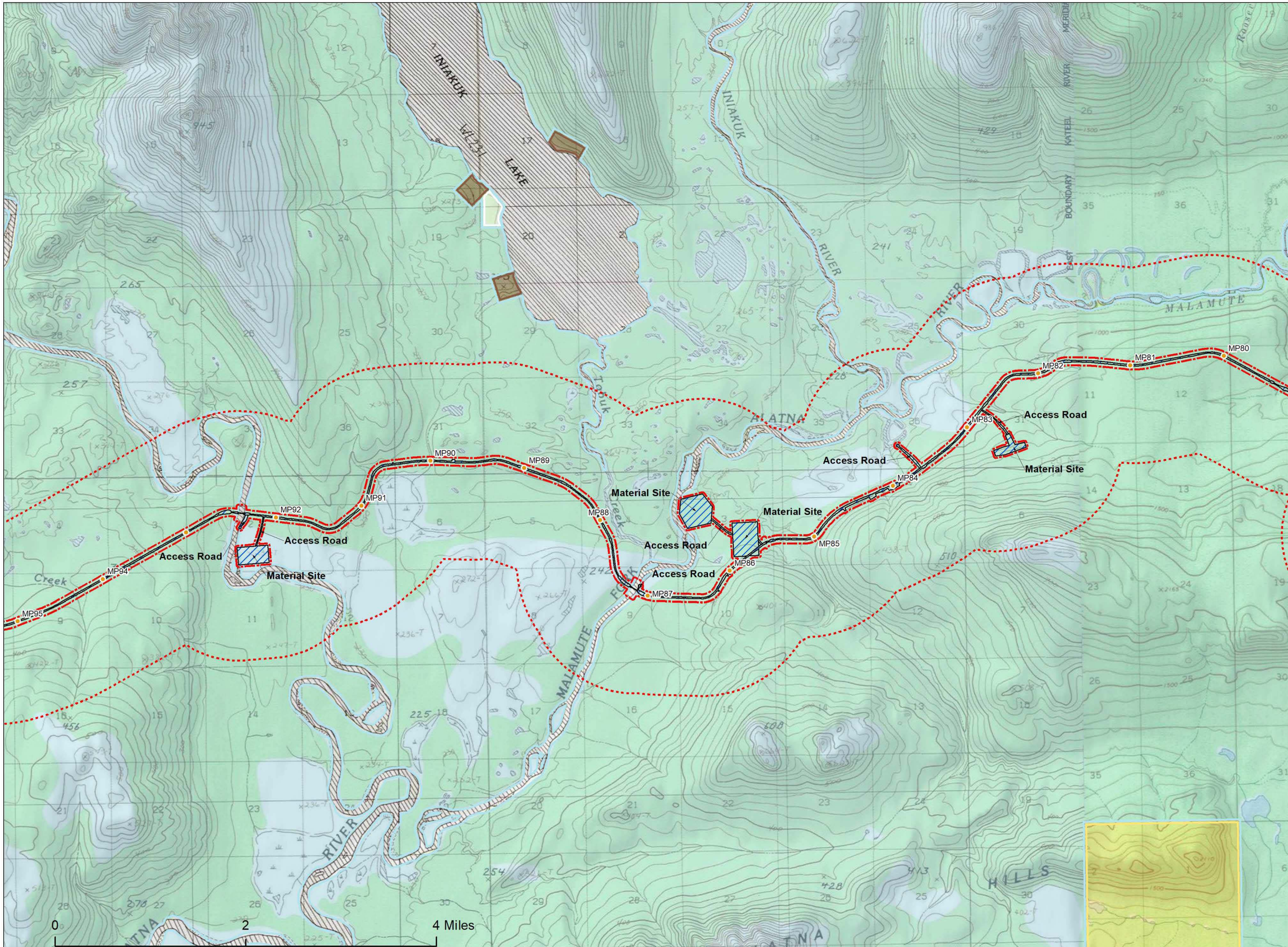
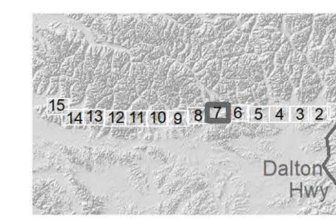


Alternative A Footprints
Direct APE
Indirect APE
Administered Lands*
Alaska Native Allotment
Bureau of Land Management
Private
State

***Current as of April 11th, 2018**



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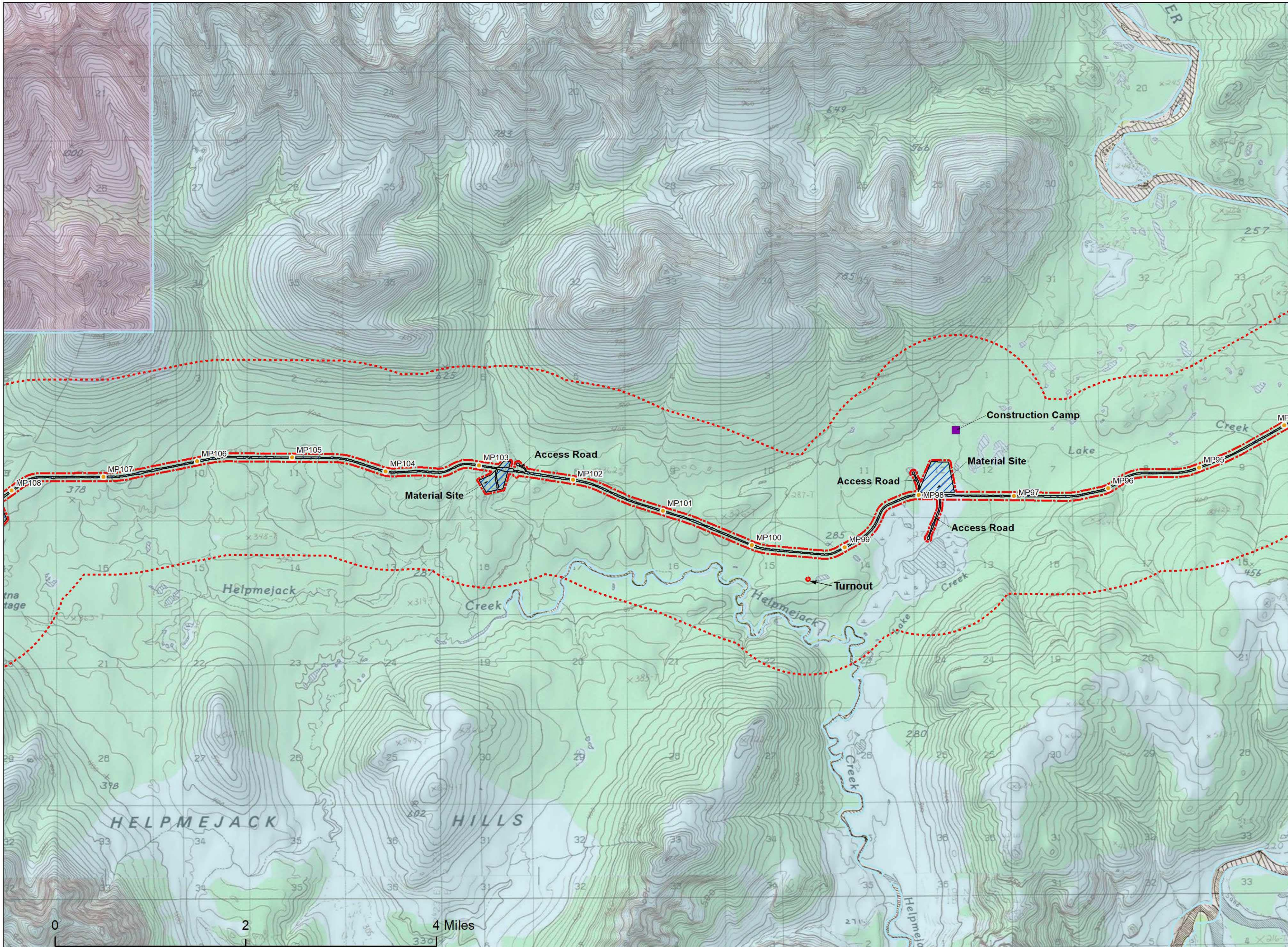
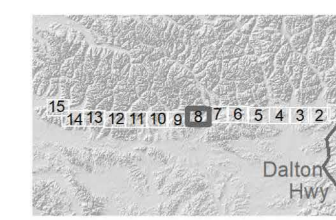


Alternative A Footprints
Direct APE
Indirect APE
Administered Lands*
National Park Service
State

***Current as of April 11th, 2018**



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NOTES:
Scale 1:63,360
Basemap scale: 1:63,360
Map Date: 3/17/2020
Date of APE: January, 2020
Date of Project Components: April, 2019
Alaska Albers
1983 North America Datum
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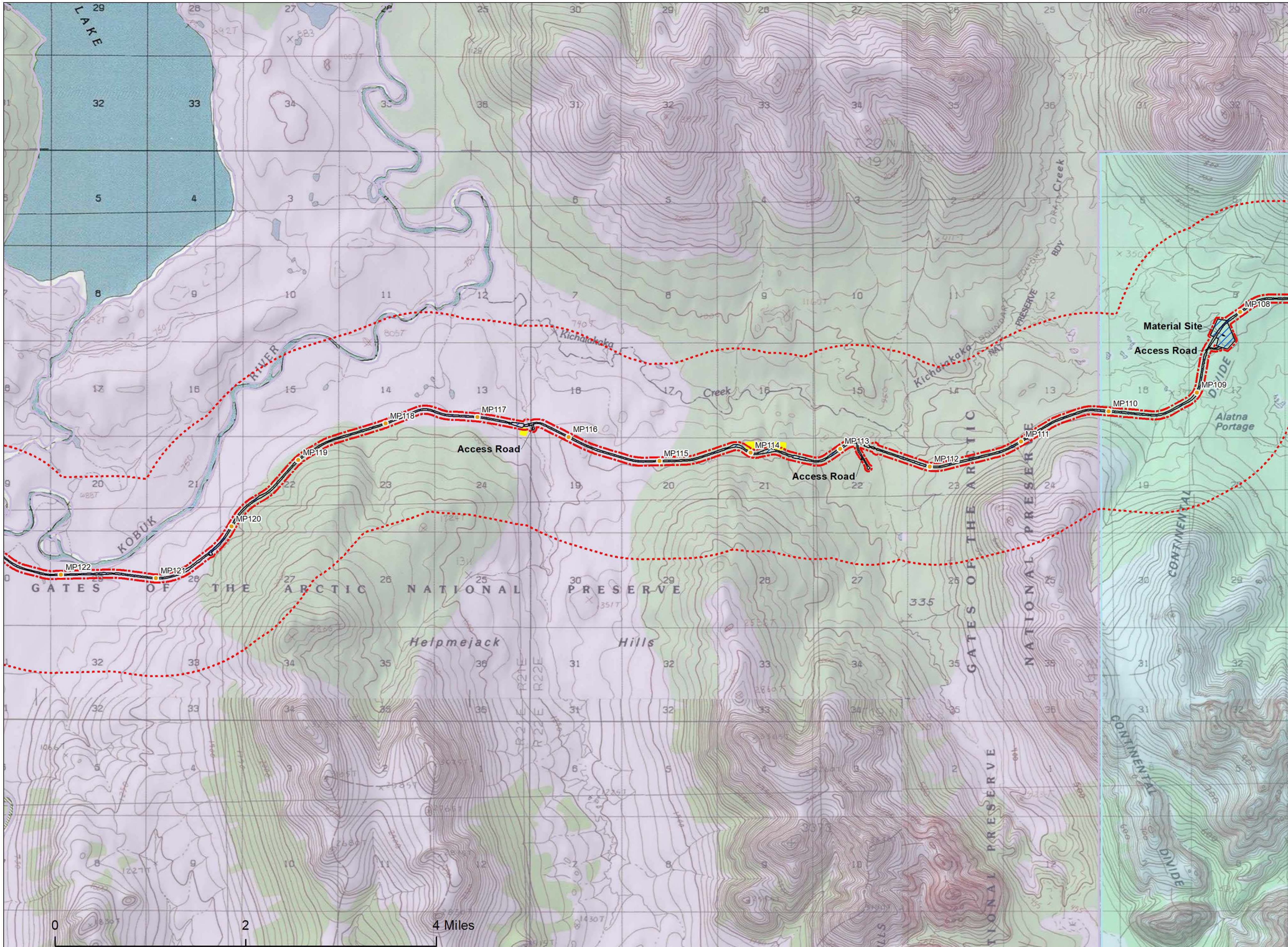
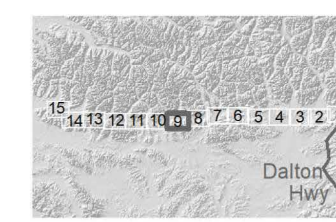


Alternative A Footprints
Direct APE
Indirect APE
2014 Ambler Pedestrian Survey

Administered Lands*

National Park Service
State

***Current as of April 11th, 2018**



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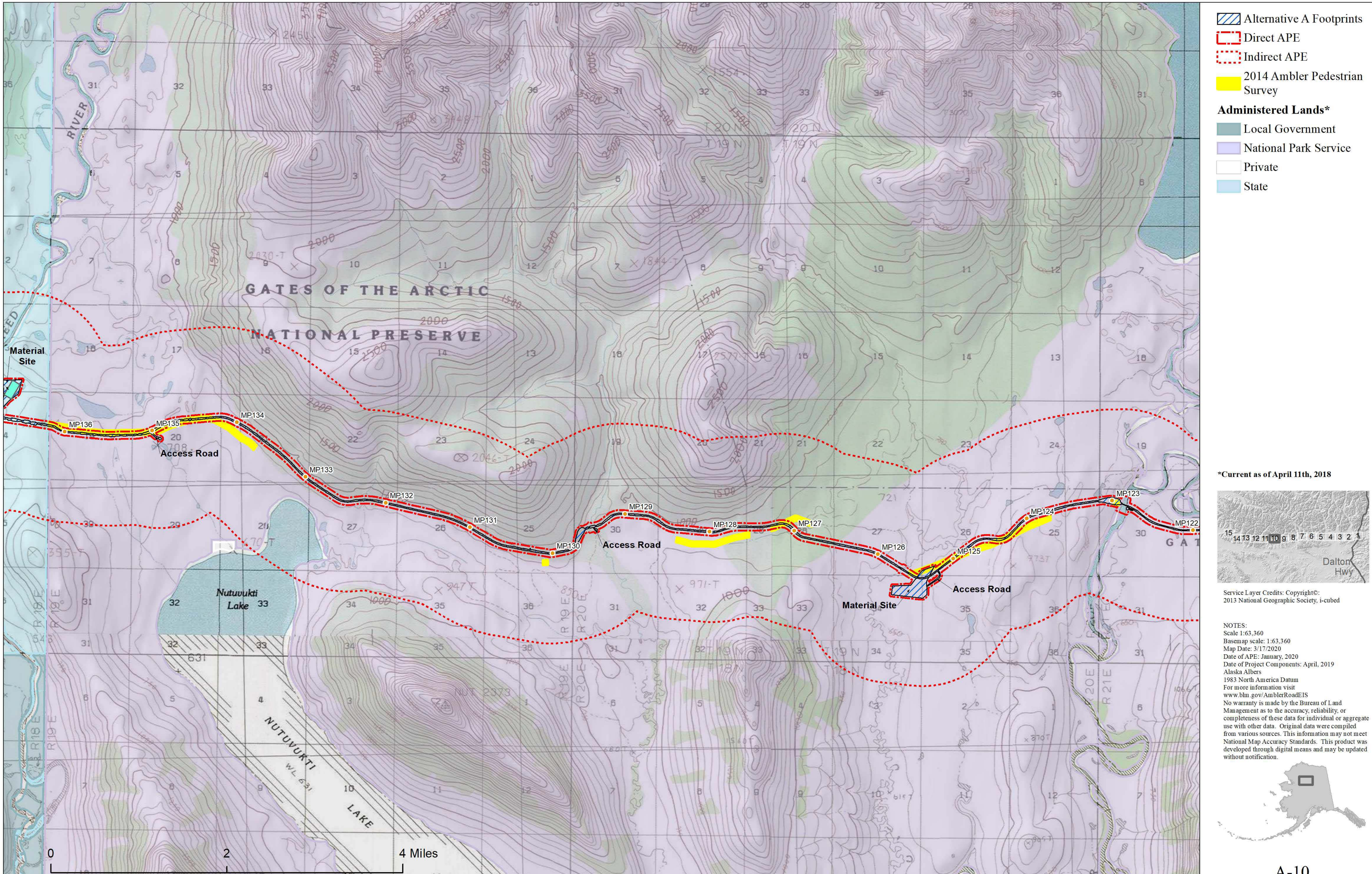

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Map Date: 3/17/2020
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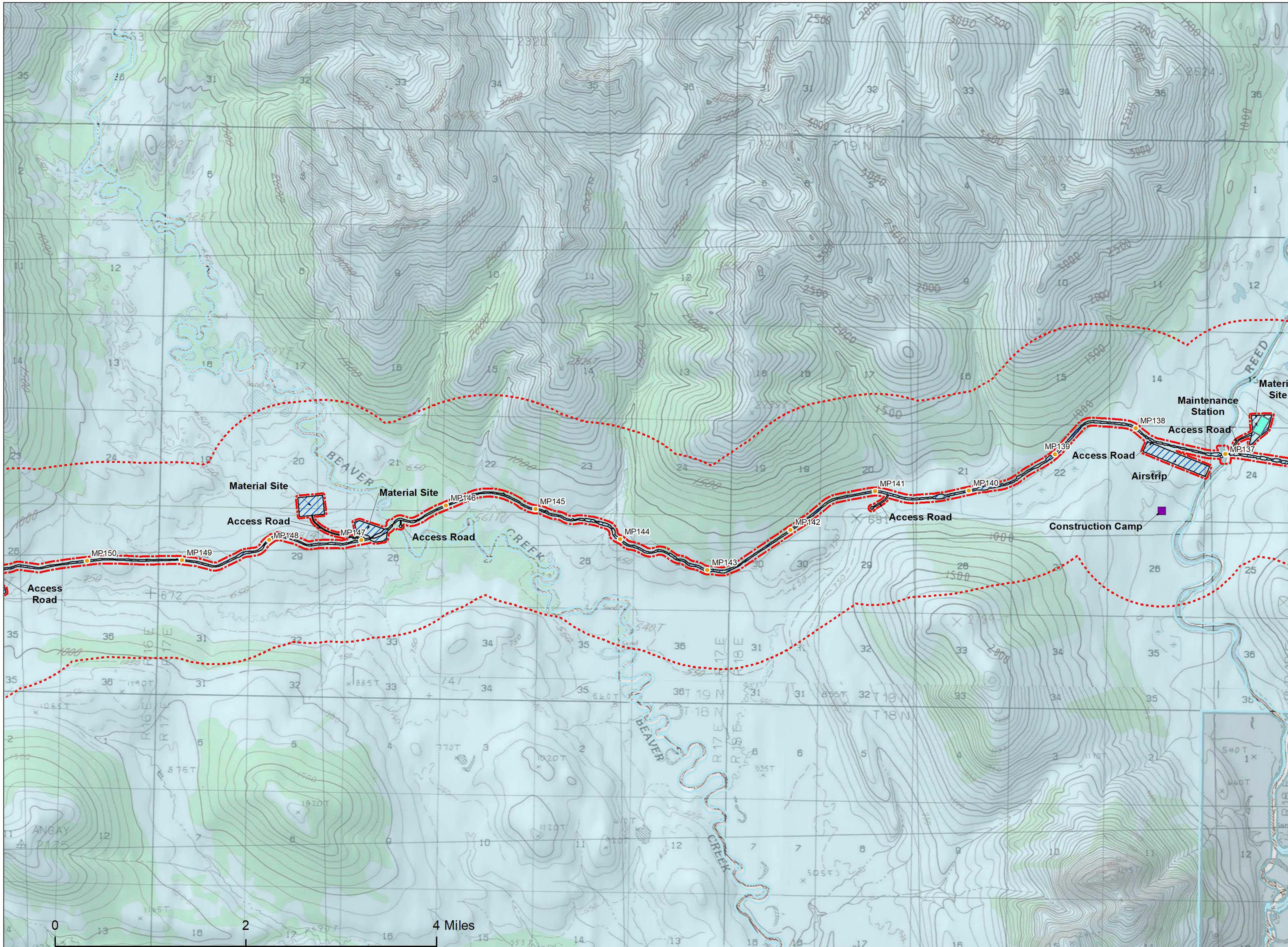
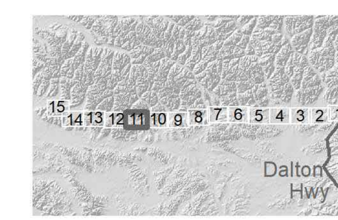


Alternative A Footprints
Direct APE
Indirect APE
Administered Lands*
Local Government
National Park Service
State

***Current as of April 11th, 2018**



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NOTES:
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Basemap scale: 1:63,360
Map Date: 3/17/2020
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1983 North America Datum
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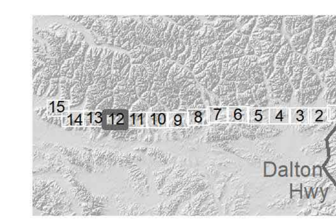
Alternative A Footprints
Direct APE
Indirect APE

Administered Lands*

Alaska Native Allotment
Local Government
National Park Service
Private
State

*Current as of April 11th, 2018



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Date of APE: January, 2020
Date of Project Components: April, 2019
Alaska Albers
1983 North America Datum
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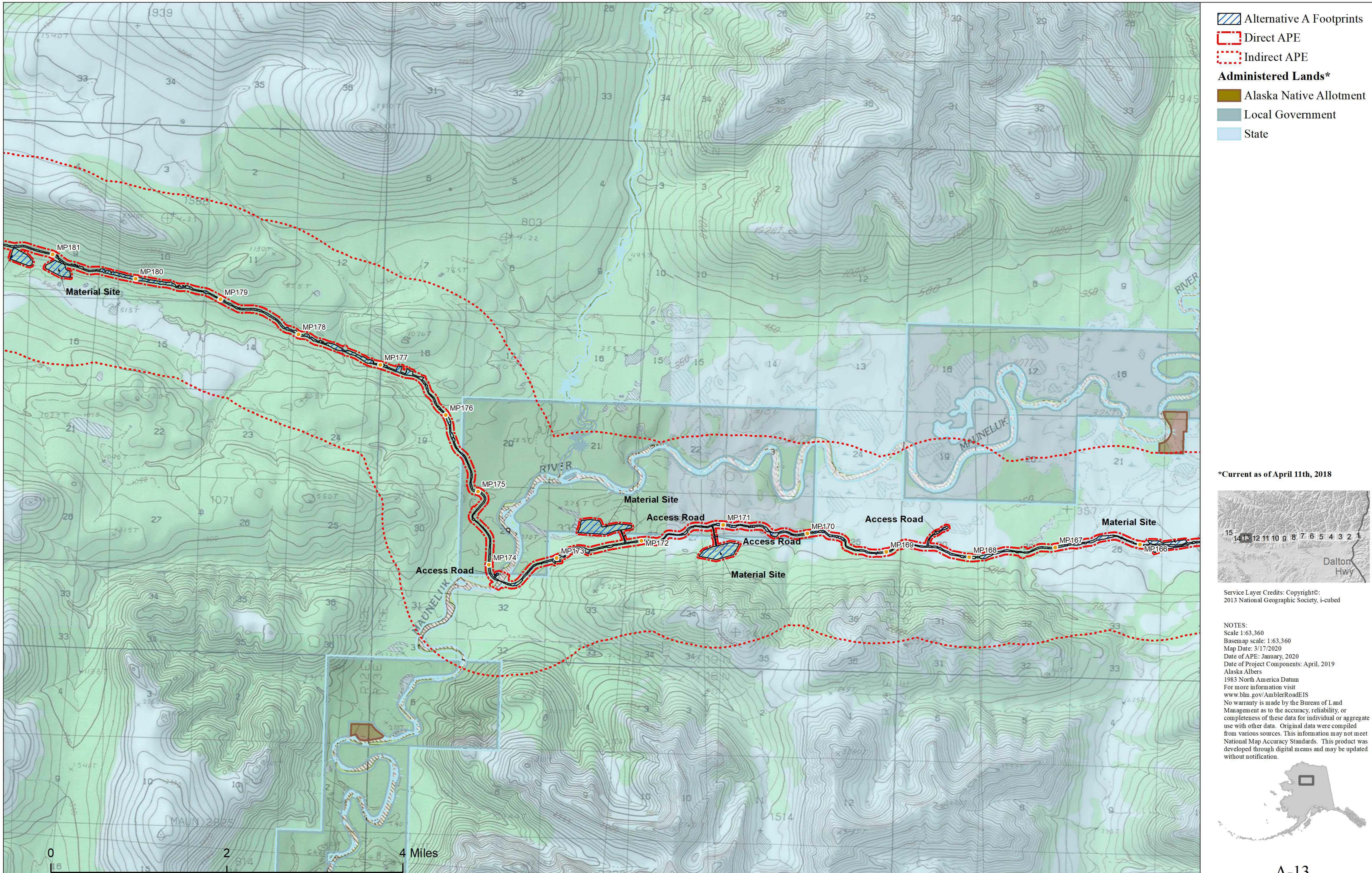
Alternative A Footprints
Direct APE
Indirect APE
Administered Lands*
Alaska Native Allotment
Local Government
State
*Current as of April 11th, 2018
MP181
MP180
MP179
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MP176
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MP172
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MP170
MP169
MP168
MP167
MP166
Material Site
Access Road
MAUNELUK
RIVER
0
2
4 Miles
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
Dalton Hwy
Service Layer Credits: Copyright©: 2013 National Geographic Society, i-cubed
NOTES:
Scale 1:63,360
Basemap scale: 1:63,360
Map Date: 3/17/2020
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Date of Project Components: April, 2019
Alaska Albers
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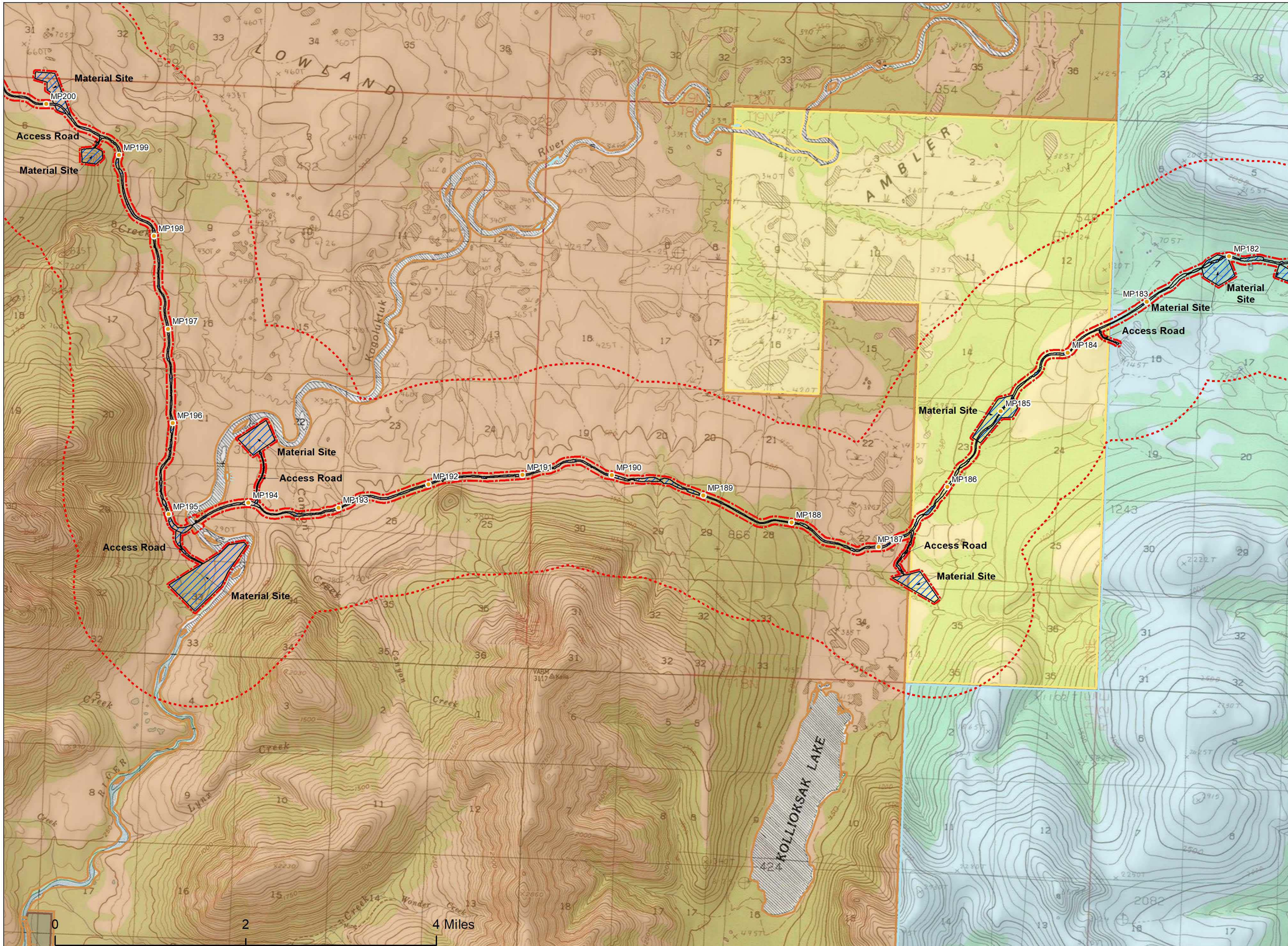
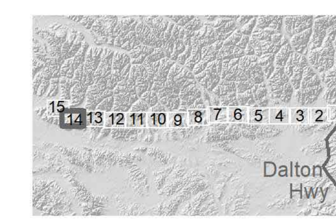


Alternative A Footprints
Direct APE
Indirect APE

Administered Lands*

Alaska Native Allotment
Alaska Native Lands Patented or Interim Conveyed
Bureau of Land Management
State

***Current as of April 11th, 2018**



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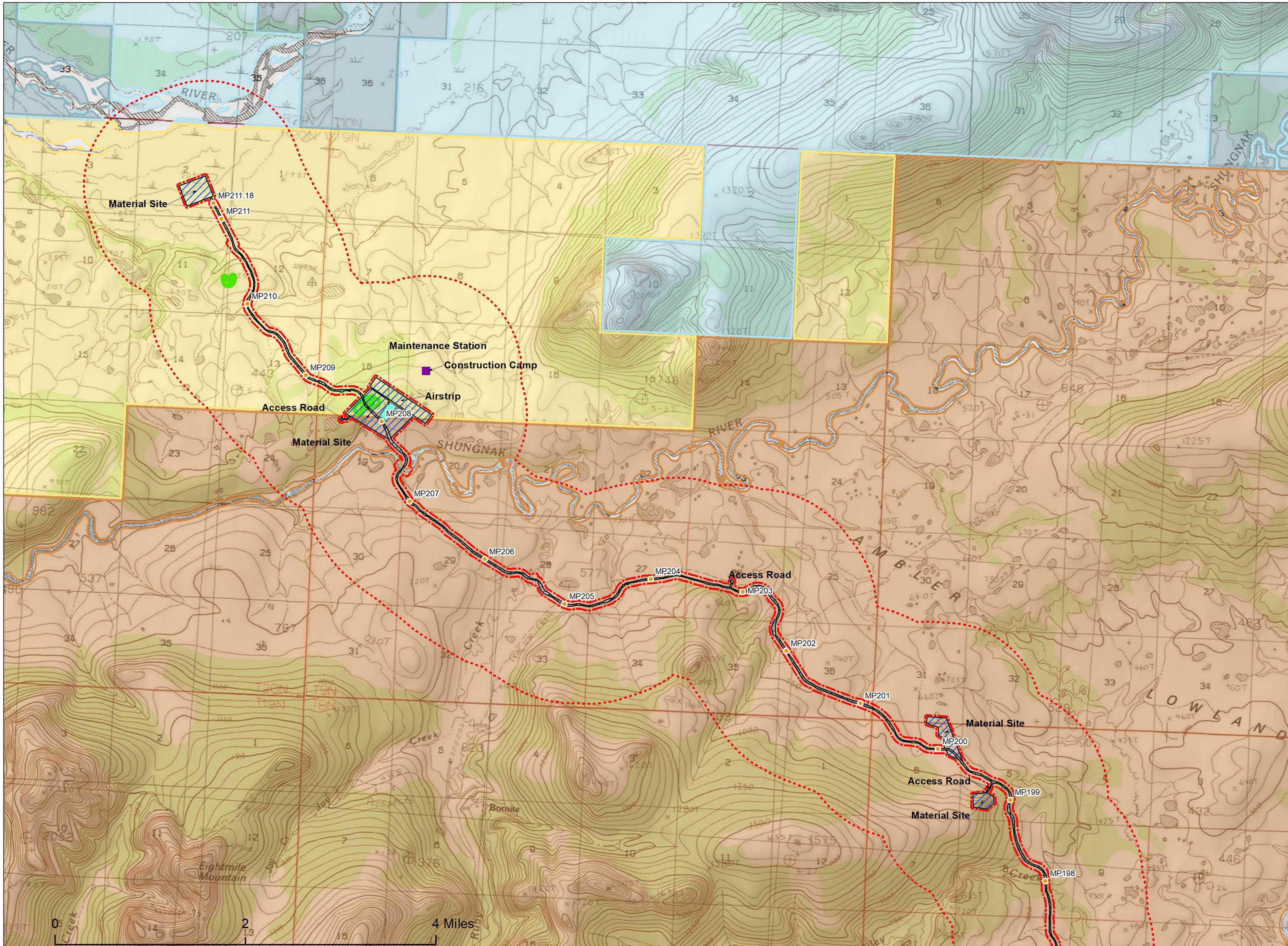
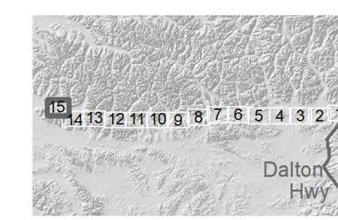


Alternative A Footprints
Direct APE
Indirect APE
2013 Ambler Pedestrian Survey

Administered Lands*

Alaska Native Lands Patented or Interim Conveyed
Bureau of Land Management
Local Government
State

*Current as of April 11th, 2018



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NOTES:
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Map Date: 3/17/2020
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Date of Project Components: April, 2019
Alaska Albers
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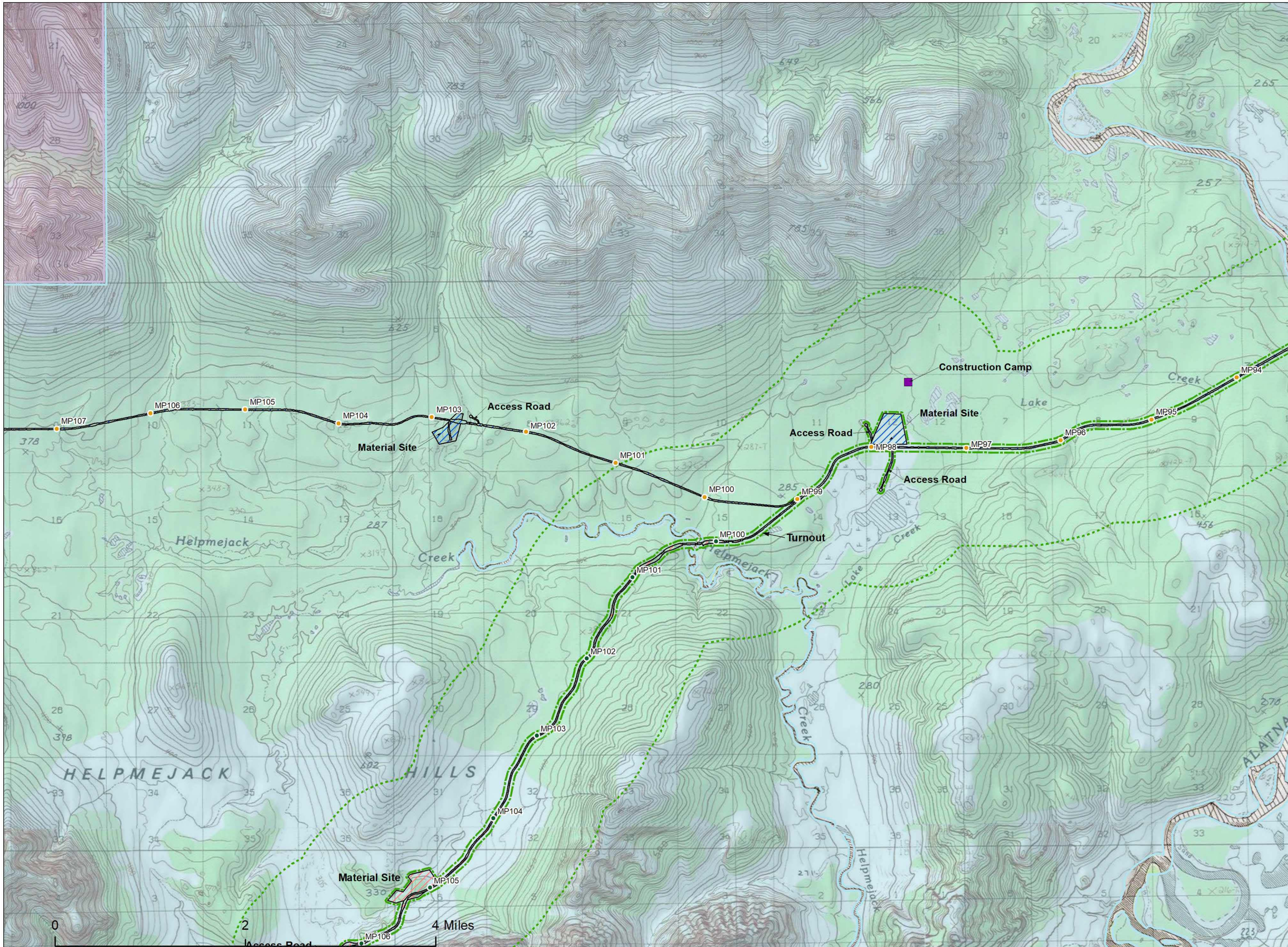
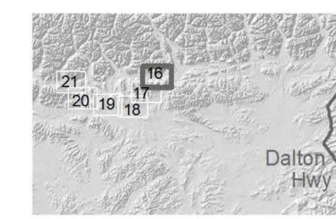


Alternative A Footprints
Alternative B Footprints
Direct APE
Indirect APE
Administered Lands*
National Park Service
State

*Current as of April 11th, 2018



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Date of Project Components: April, 2019
Alaska Albers
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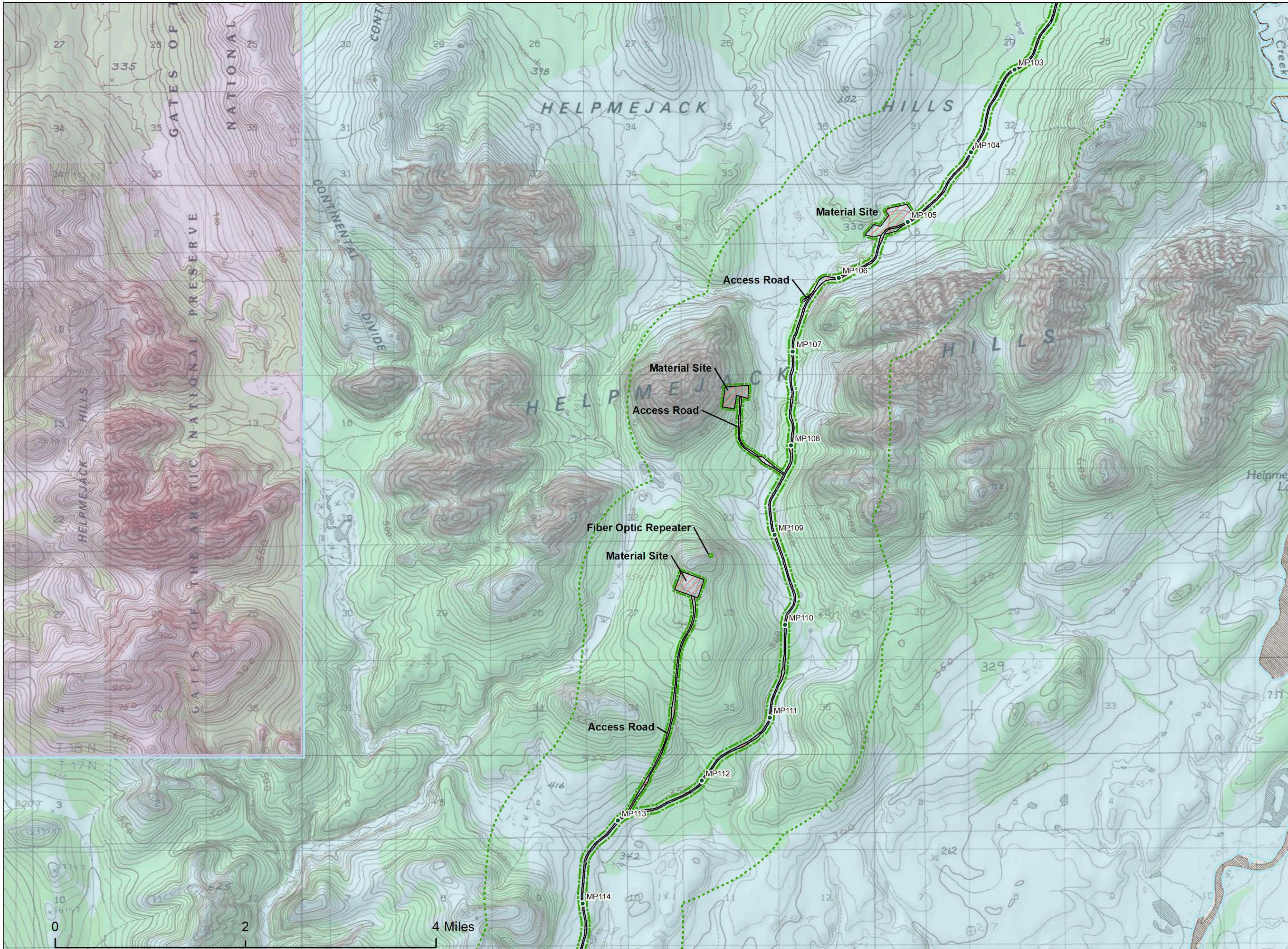
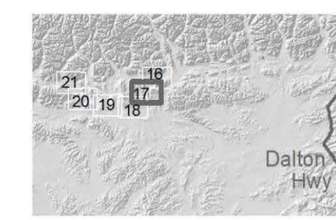


Alternative B Footprints
Direct APE
Indirect APE
Administered Lands*
National Park Service
State

***Current as of April 11th, 2018**



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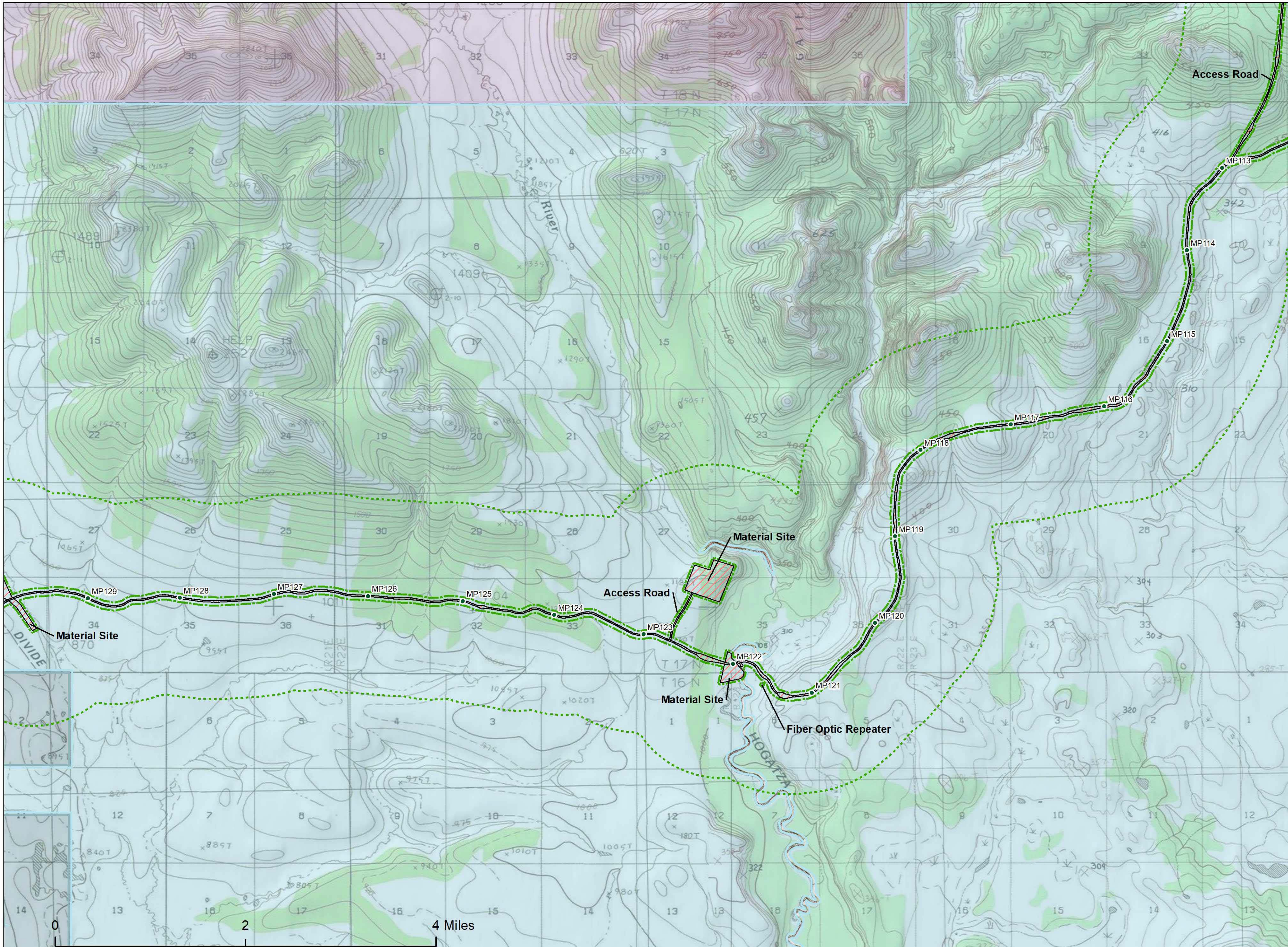
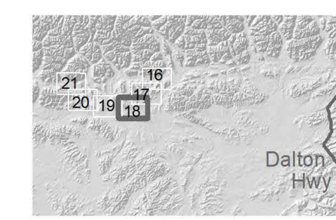


Alternative B Footprints
Direct APE
Indirect APE

Administered Lands*

Local Government
National Park Service
State

*Current as of April 11th, 2018



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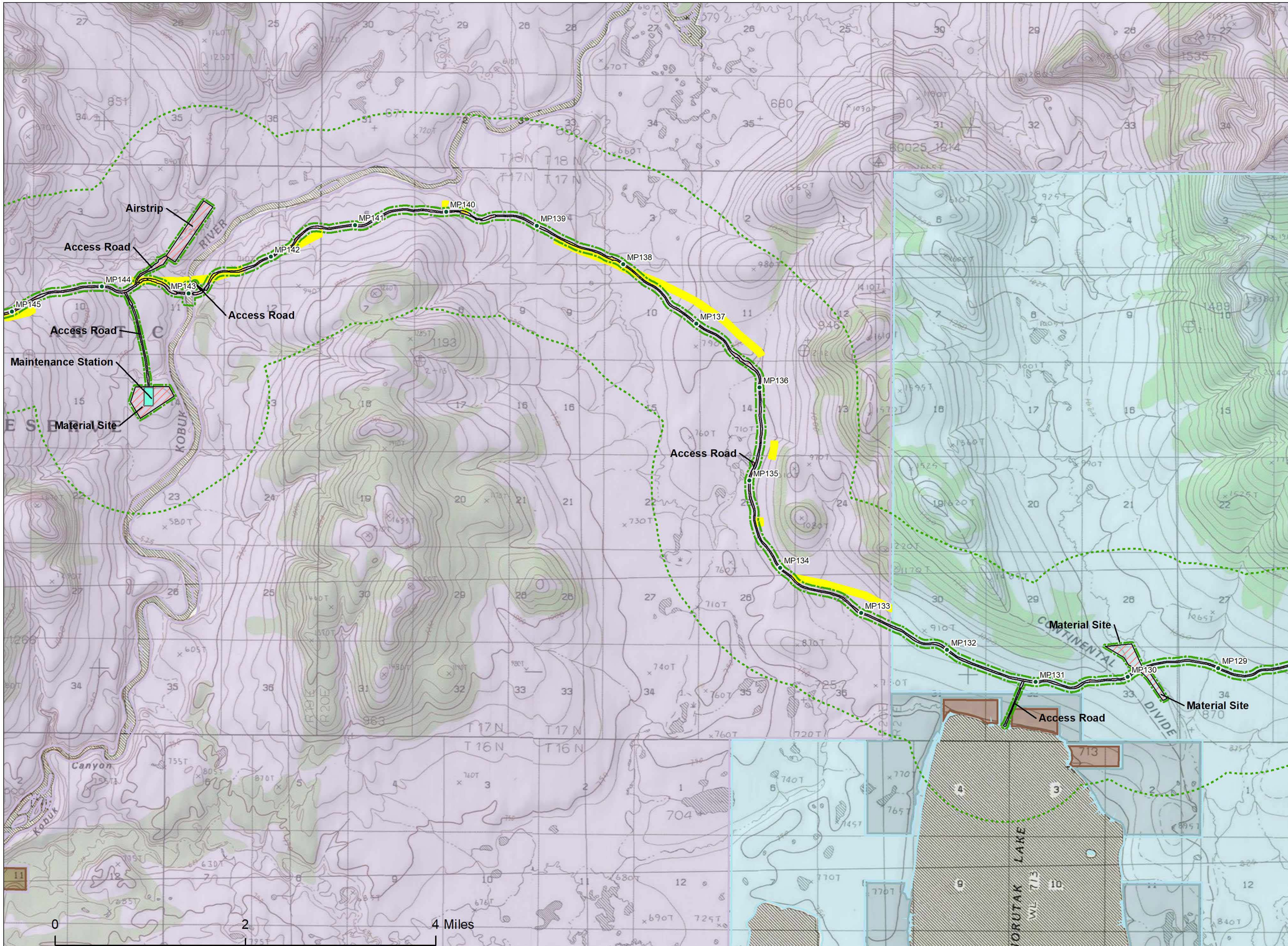

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Direct APE
Indirect APE
2014 Ambler Pedestrian Survey

Administered Lands*

Alaska Native Allotment
Local Government
National Park Service
State

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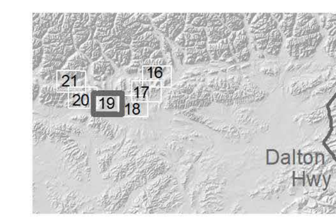

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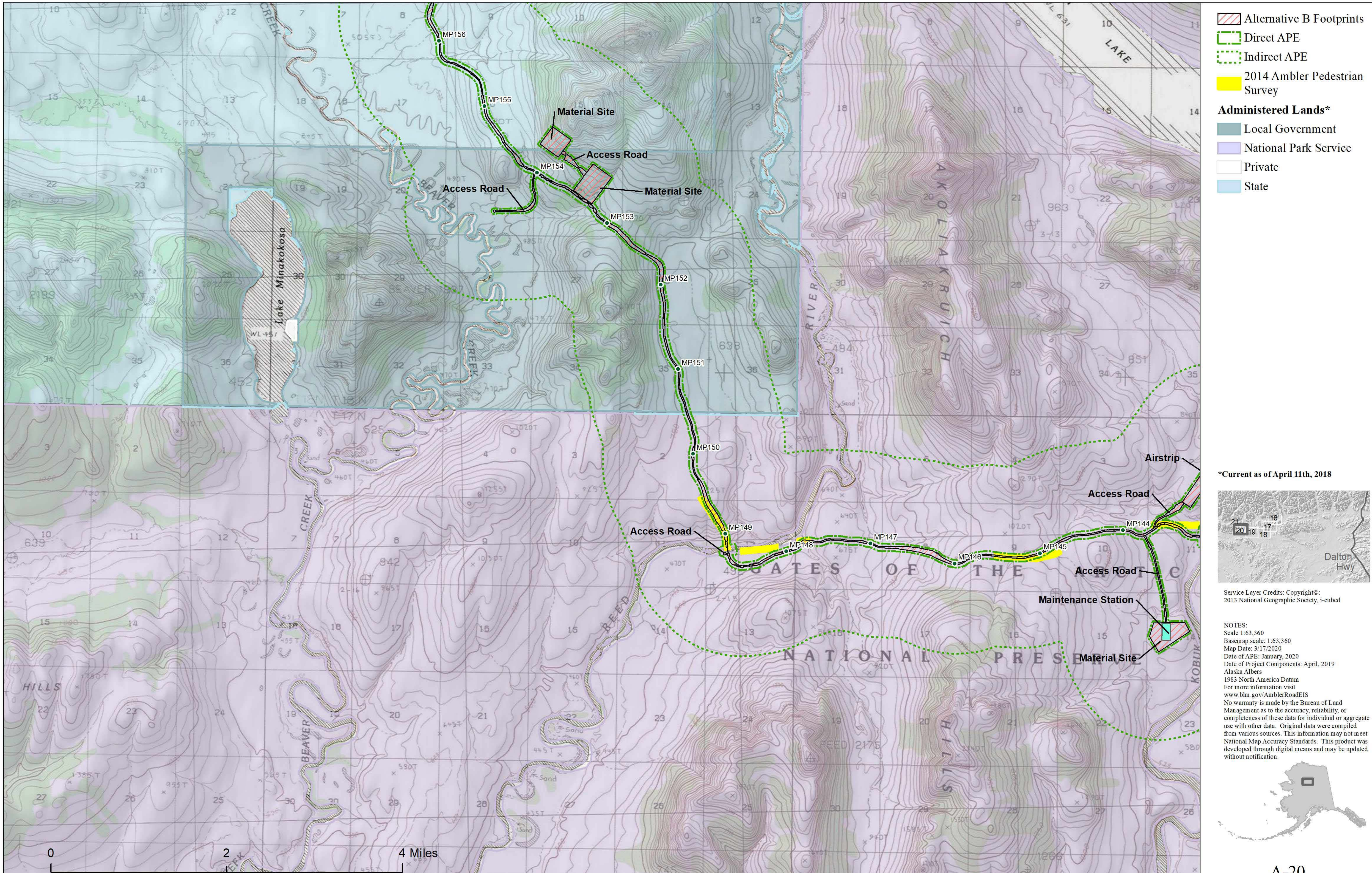

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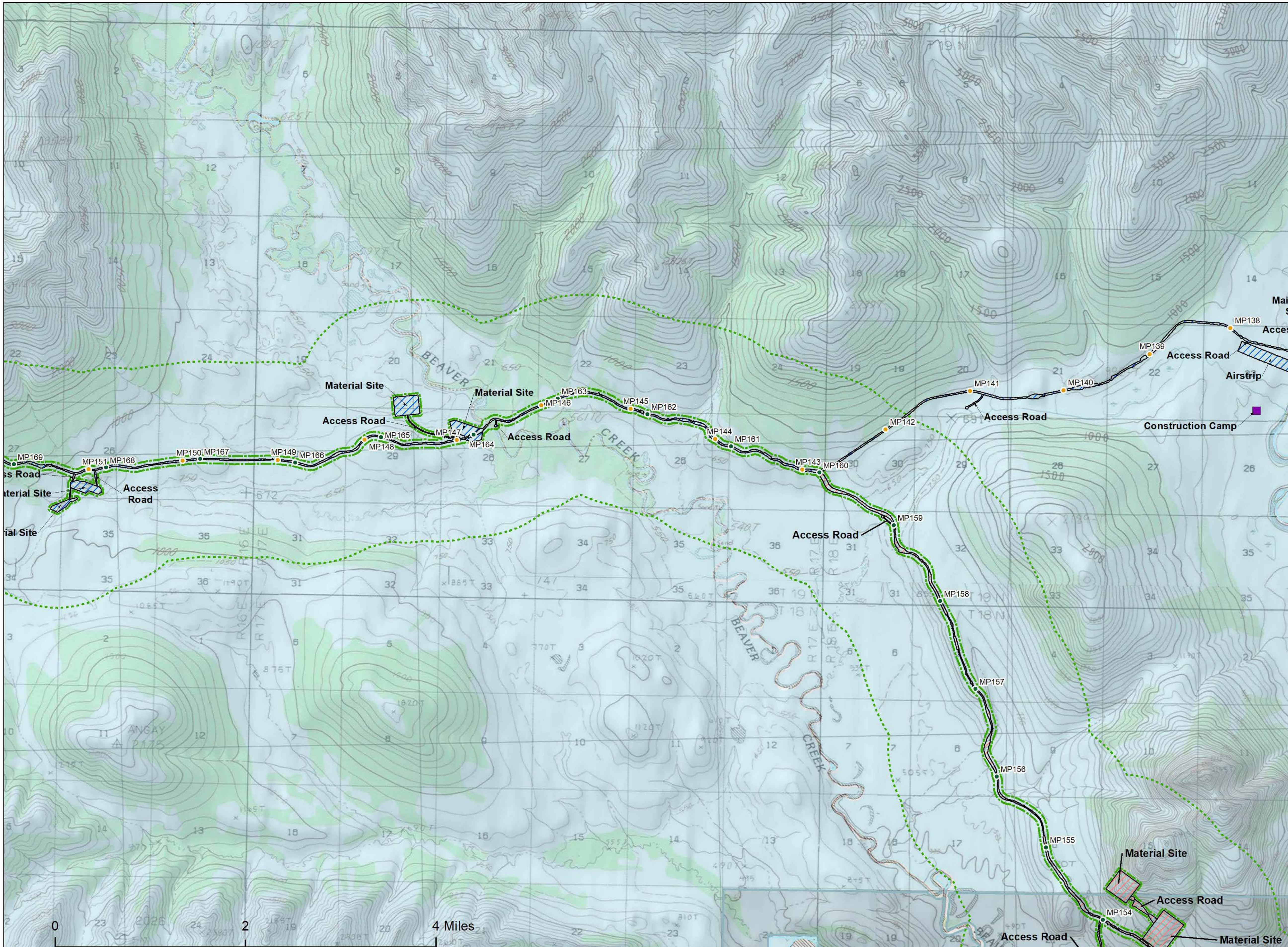
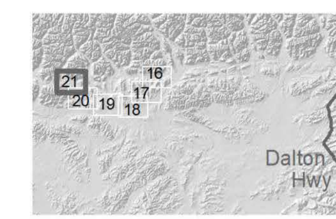


Alternative A Footprints
Alternative B Footprints
Direct APE
Indirect APE

Administered Lands*

Local Government
State

*Current as of April 11th, 2018



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Attachment B – Area of Potential Effects

Project APE (December 2019)

The Area of Potential Effects (APE)[13] consists of a 1-mile buffer on each side of the proposed corridor and around all Project Components; see Attachment A, Maps. The corridor consists of a 250-foot wide, and, in some cases (such as water crossings or steep terrain), 400-foot wide footprint. Components include vehicle turnouts, work camps, storage and staging areas, material sources, airstrips, access roads, maintenance stations, and/or any other Project features. The Bureau of Land Management (BLM), in consultation with the Consulting Parties, determined the 1-mile APE will encompass reasonably foreseeable direct, indirect, or cumulative adverse effects[14] from the Project. While some effects may be present beyond the APE in certain areas (e.g., the road may be visible for more than 1 mile away when viewed from higher ground), it is unlikely that the eligibility or significance of any historic properties would be changed, and therefore the effect would not be considered adverse. Inventory methods within the APE will vary based on the following:

> *Inventory for Direct Effects[15] (Direct APE):*
> Inventory for direct effects will include the 250-foot wide, and, in some cases (such as water crossings or steep terrain), 400-foot wide corridor, plus a 100-foot buffer on each side of the corridor. Inventory for direct effects will also encompass the footprint of all Project Components (e.g., vehicle turnouts, work camps, storage and staging areas, material sources, airstrips, access roads, and maintenance stations or any other features), plus a 100-foot buffer around the footprint.
>
> *Inventory for Indirect and Cumulative Effects[16] (Indirect APE):*
> Inventory for indirect and cumulative effects will be considered for the portion of the APE that falls outside of the Direct APE.

The BLM, in consultation with the Consulting Parties, will consider whether any changes to the APE is needed during the Annual Meeting (XV.A). Revisions to the APE could be necessary based on updated project plans; additional information about construction, maintenance, or reclamation procedures; newly identified resources or new information about historic or traditional uses of an area; new survey methods or technology; environmental factors; information from monitoring; or other factors.

---

[13] Per 36 CFR 800.16(d), an APE is “the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historical properties, if any such properties exist.”

[14] Per 36 CFR 800.5(a)(1), an adverse effect is found when an Undertaking may alter, directly or indirectly, the characteristics of a historic property that qualify it for inclusion in the NRHP. Adverse effects may include reasonably foreseeable effects caused by the Undertaking that may occur later in time, be farther removed in distance, or be cumulative.

[15] Per 36 CFR 800.5(a)(2), direct effects include physical destruction/damage, alteration not consisted with 36 CFR 68, removal of a property from a historic location, change in the character of use or physical features, deterioration through neglect, or introduction of visual, atmospheric, or audible elements that diminish the integrity. This includes effects that come from an Undertaking at the same time and place with no intervening cause, regardless of the specific type (i.e., visual, physical, auditory).

[16] Indirect effects are those caused by the Undertaking that are later in time or farther removed in distance but are still reasonably foreseeable. Cumulative effects result from incremental actions that, when added to other past, present, and reasonably foreseeable future actions, may adversely affect a historic property.

Attachment C – Previously Recorded AHRS Resources[17]

AHRS Number	Name	Period	Description	APE	Direct APE	NRHP Status	Landowner(s)
AMR-00227	Ticket Ridge Site	Prehistoric	Lithic and milled wood scatter	A/B	Yes	Unevaluated	BLM
AMR-00228	-	Unknown	Cairn	A/B	No	Unevaluated	NANA
HUG-00005	Norutak 1	Prehistoric	Ceramic and lithic scatter	B	No	Unevaluated	Allotment
HUG-00006	Norutak 7	Prehistoric	Lithic scatter	B	No	Unevaluated	Allotment
HUG-00007	Norutak 4	Prehistoric, Modern	Lithic and modern artifact scatter	B	No	Unevaluated	Allotment
HUG-00016	-	Prehistoric	Isolated lithic	B	No	Unevaluated	NPS
HUG-00024	-	Prehistoric	Lithic scatter	B	Yes	Unevaluated	NPS
HUG-00025	-	Prehistoric	Lithic scatter	B	No	Unevaluated	NPS
HUG-00028[a]	-	Prehistoric	Lithic scatter	B	Yes	Unevaluated	NPS
HUG-00029	-	Prehistoric	Lithic scatter	B	No	Unevaluated	NPS
HUG-00030	-	Prehistoric	Lithic scatter	B	No	Unevaluated	NPS
HUG-00032[b]	-	Prehistoric	Lithic scatter	B	No	Unevaluated	NPS
HUG-00033	-	Prehistoric	Lithic scatter	B	No	Unevaluated	NPS
HUG-00034	-	Prehistoric	Isolated lithic	B	No	Unevaluated	NPS
HUG-00035	-	Prehistoric	Lithic scatter	B	No	Unevaluated	NPS
HUG-00036	-	Prehistoric	Isolated lithic	B	No	Unevaluated	NPS
HUG-00037	-	Prehistoric	Lithic scatter	B	No	Unevaluated	NPS
HUG-00041	-	Prehistoric	Lithic scatter	B	No	Unevaluated	NPS
HUG-00103	-	Prehistoric	Lithic scatter	B	No	Unevaluated	NPS
HUG-00104	-	Prehistoric	Lithic scatter	B	Yes	Unevaluated	NPS
HUG-00132	Norutak 2	Prehistoric	Ceramic and lithic scatter	B	No	Unevaluated	Allotment
HUG-00133	Norutak 3	Prehistoric	Lithic scatter	B	No	Unevaluated	State
HUG-00134	Norutak 5	Prehistoric	Depression features and lithics	B	No	Unevaluated	State
HUG-00136	Norutak 8	Prehistoric	Depressions features and lithics	B	No	Unevaluated	State
HUG-00192[b]	-	Prehistoric	Subsurface lithic scatter	B	No	Unevaluated	NPS
HUG-00193	-	Prehistoric	Isolated lithic, projectile point	B	No	Unevaluated	NPS

[17] Data from the AHRS database as of December 2019; alternatives based on route alignments as of April 2019.

AHRS Number	Name	Period	Description	APE	Direct APE	NRHP Status	Landowner(s)
HUG-00195	-	Prehistoric	Isolated lithic	B	No	Unevaluated	NPS
WIS-00001	-	Prehistoric	Hearth and lithic scatter	A/B	No	Unevaluated	BLM
WIS-00002	-	Prehistoric	Lithic scatter	A/B	No	Unevaluated	BLM
WIS-00003	-	Prehistoric	Hearth and lithic scatter	A/B	No	Unevaluated	BLM
WIS-00004	-	Prehistoric	Lithic scatter	A/B	No	Unevaluated	BLM
WIS-00005	-	Prehistoric	Surface and subsurface lithic scatter	A/B	No	Unevaluated	BLM
WIS-00019	-	Prehistoric	Surface and subsurface lithic scatter	A/B	No	Unevaluated	BLM
WIS-00021	-	Prehistoric	Lithic scatter	A/B	Yes	Unevaluated	BLM
WIS-00029	-	Prehistoric	Lithic scatter	A/B	No	Unevaluated	BLM
WIS-00030	-	Prehistoric	Lithic scatter	A/B	No	Unevaluated	BLM
WIS-00043	-	Prehistoric	Isolated lithic	A/B	No	Unevaluated	BLM
WIS-00231	Chapman Lake 1	Prehistoric	Cache Pit	A/B	No	Unevaluated	BLM
WIS-00232	Chapman Lake 2	Prehistoric	Subsurface Lithic Scatter	A/B	No	Unevaluated	BLM
WIS-00345	Chapman Lake Can and Flake Site	Prehistoric and Historic	Historic and Prehistoric Artifact Scatter	A/B	No	Unevaluated	BLM
WIS-00252	Chapman #1	Prehistoric	Activity area, lithic scatter	A/B	No	Unevaluated	BLM
WIS-00408	Dalton Highway	Historic	Highway	A/B	Yes	Eligible	State
WIS-00409	Hickel Highway	Historic	Transportation, winter road	A/B	Yes	Unevaluated	Doyon, Ltd.
WIS-00414[a]	-	Prehistoric	Lithic scatter	A/B	Yes	Unevaluated	BLM
XSP-00056	-	Prehistoric	Lithic scatter	A	No	Unevaluated	NPS
XSP-00057	-	Prehistoric	Lithic scatter	A	No	Unevaluated	NPS
XSP-00058	-	Prehistoric	Lithic scatter	A	No	Unevaluated	NPS
XSP-00059	-	Prehistoric	Lithic scatter	A	No	Unevaluated	NPS
XSP-00060	-	Prehistoric	Isolated lithic	A	No	Unevaluated	NPS
XSP-00061	-	Prehistoric	Surface and subsurface lithic scatter	A	No	Unevaluated	NPS
XSP-00062	-	Prehistoric	Lithic scatter	A	No	Unevaluated	NPS
XSP-00065	-	Prehistoric	Isolated lithic	A	No	Unevaluated	NPS
XSP-00067	-	Prehistoric	Surface and subsurface lithic scatter	A	No	Unevaluated	State
XSP-00068	-	Prehistoric	Lithic scatter	A	No	Unevaluated	NPS

AHRS Number	Name	Period	Description	APE	Direct APE	NRHP Status	Landowner(s)
XSP-00069	-	Prehistoric	Lithic scatter	A	No	Unevaluated	NPS
XSP-00070	-	Prehistoric	Lithic scatter	A	No	Unevaluated	NPS
XSP-00071	-	Prehistoric	Lithic scatter	A	No	Unevaluated	NPS
XSP-00072[a]	-	Prehistoric	Isolated lithic	A	Yes	Unevaluated	NPS
XSP-00073	-	Prehistoric	Isolated lithic	A	No	Unevaluated	State
XSP-00074	-	Prehistoric	Surface and subsurface lithic scatter	A	No	Unevaluated	State
XSP-00075	-	Prehistoric	Isolated lithic	A	No	Unevaluated	State
XSP-00076	-	Prehistoric	Isolated lithic	A	No	Unevaluated	NPS
XSP-00079	-	Prehistoric	Surface and subsurface lithic scatter	A	No	Unevaluated	NPS
XSP-00080	-	Prehistoric	Surface and subsurface lithic scatter	A	No	Unevaluated	NPS
XSP-00096	-	Prehistoric	Isolated lithic	A	No	Unevaluated	NPS
XSP-00097[b]	-	Prehistoric	Isolated lithic	A	No	Unevaluated	NPS
XSP-00099[a]	-	Prehistoric	Lithic scatter	A/B	Yes	Unevaluated	State
XSP-00111	-	Prehistoric	Lithic scatter	B	No	Unevaluated	State
XSP-00112[a]	-	Prehistoric	Lithic scatter	A	Yes	Unevaluated	State
XSP-00113	-	Prehistoric	Surface and subsurface lithic scatter	A	No	Unevaluated	State
XSP-00114	-	Prehistoric	Lithic scatter	A	No	Unevaluated	State
XSP-00115	-	Prehistoric	Lithic scatter	A	No	Unevaluated	State
XSP-00117[b]	-	Prehistoric	Lithic scatter	A	No	Unevaluated	NPS
XSP-00118	-	Prehistoric	Lithic scatter	A	No	Unevaluated	State
XSP-00119	-	Prehistoric	Lithic scatter	A	No	Unevaluated	State
XSP-00126	-	Prehistoric	Surface and subsurface lithic scatter	A	No	Unevaluated	State
XSP-00127	-	Prehistoric	Lithic scatter	A	No	Unevaluated	NPS
XSP-00128	-	Prehistoric	Lithic scatter	A	No	Unevaluated	NPS
XSP-00129	-	Prehistoric	Lithic scatter	A	No	Unevaluated	State
XSP-00131	-	Prehistoric	Surface and subsurface lithic scatter	A	No	Unevaluated	NPS
XSP-00135	-	Prehistoric	Surface and subsurface lithic scatter	A	No	Unevaluated	NPS
XSP-00136	-	Prehistoric	Surface and subsurface lithic scatter	A	No	Unevaluated	State
XSP-00137[a]	-	Prehistoric	Lithic scatter	A	Yes	Unevaluated	State

AHRS Number	Name	Period	Description	APE	Direct APE	NRHP Status	Landowner(s)
XSP-00138	-	Prehistoric	Lithic scatter	A	No	Unevaluated	State
XSP-00139[a]	-	Prehistoric	Isolated lithic	A	Yes	Unevaluated	NPS
XSP-00140	-	Prehistoric	Lithic scatter	A	Yes	Unevaluated	NPS
XSP-00141[a]	-	Prehistoric	Lithic scatter	A	Yes	Unevaluated	State
XSP-00142[a]	-	Prehistoric	Lithic scatter	A	Yes	Unevaluated	NPS
XSP-00143	-	Prehistoric	Lithic scatter	A	No	Unevaluated	NPS
XSP-00144	-	Prehistoric	Lithic scatter	A	No	Unevaluated	NPS
XSP-00145	-	Prehistoric	Isolated lithic	A/B	Yes	Unevaluated	State
XSP-00147	-	Prehistoric	Lithic scatter	A/B	No	Unevaluated	State
XSP-00148	-	Prehistoric	Lithic Scatter	A/B	No	Unevaluated	State
XSP-00149	-	Prehistoric	Lithic Scatter	A/B	No	Unevaluated	State
XSP-00150	-	Prehistoric	Lithic scatter	A/B	No	Unevaluated	State
XSP-00151	-	Prehistoric	Lithic scatter	A/B	No	Unevaluated	State
XSP-00152	-	Prehistoric	Lithic scatter	A/B	No	Unevaluated	State
XSP-00153	-	Prehistoric	Isolated lithic	A/B	No	Unevaluated	State
XSP-00154	-	Prehistoric	Isolated lithic	A	No	Unevaluated	State
XSP-00407	-	Prehistoric	Lithic scatter	A	No	Unevaluated	NPS
XSP-00436	-	Prehistoric	Lithic scatter	A	No	Unevaluated	NPS
XSP-00449[b]	-	Historic	Trap	A	No	Unevaluated	NPS
XSP-00450	-	Historic	Can, cut wood	A	No	Unevaluated	NPS
XSP-00495	-	Prehistoric	Subsurface lithic scatter	A	No	Unevaluated	NPS
XSP-00496[a]	-	Prehistoric	Isolated lithic	A	Yes	Unevaluated	NPS

[a] Site geometry falls outside of the Direct APE but was buffered 500 feet to account for unknown data accuracy and lack of defined site boundaries. Buffered site geometry falls within the **Direct APE.**

[b] Site geometry falls outside of the APE but was buffered 500 feet to account for unknown data accuracy and lack of defined site boundaries. Buffered site geometry falls within the **Indirect APE.**

Attachment D – List of Parties Invited to Consult

<u>Federally Recognized Tribes (52)</u>

Alatna Village Council [a]
Allakaket Village Council [a]
Arctic Village Traditional Council
Beaver Traditional Council
Birch Creek Tribal Council
Brevig Mission Traditional Council
Buckland IRA Council
Chalkyitsik Traditional Council
Circle Traditional Council
Deering IRA Council
Denduu Gwich'in Tribal Council
Elim IRA Council
Evansville Village [a]
Fort Yukon IRA Council
Golovin-Chinik Eskimo Community
Hughes Village Council [a]
Huslia Village Council [a]
Inupiat Community of the Arctic Slope
Kaltag Traditional Council
Kiana Traditional Council
Kivalina Traditional Council
Koyukuk Traditional Council
Louden Tribal Council
Manley Traditional Council
Minto Traditional Council
Native Village of Ambler [a]
Native Village of Atqasuk
Native Village of Barrow
Native Village of Kotzebue
Native Village of Kobuk [a]
Native Village of Koyuk
Native Village of Mary's Igloo
Native Village of Noatak [a]
Native Village of Nuiqsut
Native Village of Point Hope
Native Village of Point Lay
Native Village of Selawik [a]
Native Village of Shaktoolik
Native Village of Shishmaref
Native Village of Shungnak [a]
Native Village of Stevens [a]
Native Village of Tanana [a]
Native Village of Venetie
Native Village of Wales
Native Village of White Mountain
Nenana Traditional Council
Nome Eskimo Community

Noorvik Native Community [a]
Nulato Tribal Council
Rampart Tribal Council
Ruby Traditional Council
Village of Anaktuvuk Pass [a]

ANSCA Corporations and Non-Profits (26)

Arctic Slope Regional Corporation
Baan O Yeel Kon Corporation
Bean Ridge Corporation
Beaver Kwit'Chin Corporation
Bering Straits Native Corporation
Chalkyitsik Native Corporation
Danzhit Hanlaii Corporation
Dineega Corporation
Dinyea Corporation [a]
Doyon, Limited [a]
Evansville, Incorporated [a]
Gana-A'Yoo, Limited [a]
Gwitchyaa Zhee Corporation
Kawerak, Incorporated
Kikiktagruk Inupiat Corp
K'oyitl'ots'ina Limited [a]
Koyuk Native Corp
Maniilaq Association
NANA Regional Corporation [a]
Nunamiut Corporation
Seth-De-Ya-Ah Corporation
Tanana Chiefs Conference [a]
T'ee teraan'in - Council of Athabascan Tribal Governments
Tihteet'aii, Incorporated
Toghotthele Corporation
Tozitna, Limited

State and Federal Agencies (9)

Advisory Council on Historic Preservation (ACHP) [a]
Alaska Department of Natural Resources (DNR) [a]
Alaska Department of Transportation & Public Facilities (DOT&PF) [a]
Alaska State Historic Preservation Officer (SHPO) [a]
Bureau of Indian Affairs (BIA) [a]
Environmental Protection Agency (EPA)
Federal Highway Administration (FHWA)
National Park Service (NPS) [a]
U.S. Army Corps of Engineers (USACE) [a]
U.S. Coast Guard (USCG)

City & Borough Governments (15)

City of Allakaket [a]
City of Ambler [a]
City of Anaktuvuk Pass [a]
City of Bettles

City of Buckland
City of Deering
City of Kiana
City of Kobuk
City of Kotzebue [a]
City of Noorvik
City of Selawik
City of Shungnak [a]
Northwest Arctic Borough [a]
North Slope Borough
Wiseman Community Association

Other Entities (6)

Alaska Federation of Natives
Alaska Historical Society
Alaska Industrial Development and Export Authority (AIDEA) [a]
Brooks Range Council
First Alaskans Institute
Northern Alaska Environmental Center
Simon Paneak Museum

Note: [a] = Entities that have consulted with the BLM during the Section 106 Process.

Attachment E – Cultural Resource Management Plan

Abbreviated Table of Contents – see CRMP for full Table of Contents and text:

<u>Table of Contents</u>

Attachment F – Reporting Table

The Reporting Table represents the standard due dates and content for all required report, plan, and deliverables associated with implementation of the Programmatic Agreement (PA). In certain cases, the Submittal Due Date may vary for the first year of the Pre-Construction Phase.

Report Title	Submittal Due (XIV.B.i)	Content	Review Period (XIV.B.ii)	Review Focus	Required Report Approvals (XIV.B.iv)
Phase Plan (IV.E)	Prior to initiation of each Project Phase	Detailed descriptions of the locations of all Segments and Components, descriptions of the planned work Stages, and anticipated work schedules for all activities that will occur during that Phase.	N/A	Informational Only	None
Historic Themes(s) (VII.C.ii.a)	60 days prior to fieldwork initiation	Comprehensive summary of available data sources relating to traditional fishing economy; traditional hunting, trapping, and guiding economies; traditional trade networks; historic exploration and travel corridors; and prospecting and mining.	30 days	Review of themes to ensure they are adequate to reasonably identify high potential areas for survey within the APE.	BLM SHPO (15-day approval review period)
Annual Work Plan (VII.B.i)	No later than March 1 (annually)	Detailed information about the anticipated work for the upcoming year; where it will occur; how it will be phased within Project Segments, Stages, and/or Components; and how the Permittee will meet the PA requirements. Other submissions may include updates to the Phase Plan (IV.E), Historic Themes (VII.C.ii.a), Survey Strategy (VII.D), Monitoring Plan (X.D), and Contractor Training curriculum (XI.B).	30 days	Review of all content to ensure the work will meet the PA stipulations and reasonable and good faith intent for Section 106 compliance.	BLM SHPO NPS[a] (15-day approval review period)
Contractor Training Curriculum (XI)	With the Annual Work Plan (no later than March 1 annually)	Curriculum for training Project personnel on cultural resource information and procedures.	30 days	Review of curriculum – does it adequately capture necessary information.	BLM SHPO (15-day approval review period)
Annual PA Report (XV.B)	No later than March 1 (annually)	Summary of all activities resulting from PA implementation over the past year; content should be generalized to share with the public, with confidential information redacted as necessary.	30 days	Ensure all activities are documented and adequately described to share with the public.	BLM SHPO (15-day approval review period)

Report Title	**Submittal Due (XIV.B.i)**	**Content**	**Review Period (XIV.B.ii)**	**Review Focus**	**Required Report Approvals (XIV.B.iv)**
Interim Report for Indirect APE (VII.B.ii)	30 days following completion of fieldwork (annually)	Summary of inventory efforts and resources within the Indirect APE.	15 days	Identify resources within the Indirect APE that require NRHP evaluation.	No approval required, but BLM, SHPO, and NPS[a] will consult during a 7-day period.
Annual Fieldwork Report (VII.B.iii)	90 days following completion of fieldwork (annually)	1) Comprehensive summary of inventory efforts completed since the last report, including Monitoring results; 2) recommendations of NRHP eligibility for all cultural resources located within the Direct APE and those identified during review of the Interim Report for Indirect APE; 3) finding of effect recommendations for resources that may be eligible; and 4) recommended resolution measures for resources that may be adversely affected.	45 days	Review of all content to ensure the work will meet the PA stipulations and reasonable and good faith intent for Section 106 compliance.	BLM SHPO NPS[a] (15-day approval review period)
Treatment Plans (VII.B.iv)	120 days following approval of mitigation measures	Detailed property-specific description of the treatment measures to be implemented and schedule for the activities and deliverables.	30 days	Review to ensure treatment will be commensurate with the eligibility and significance of the historic property.	BLM SHPO NPS[a] (15-day approval review period)
Final Implementation Reports (VII.B.v)	180 days following implementation of Treatment Plan (or as determined necessary)	Summary of all activities that occurred at each historic property, from inventory through implementation of mitigation treatment measures, and description of all completed steps, analyses, methods, and results, including collections and datasets generated.	30 days	Review to ensure treatment is completed for the historic property.	BLM SHPO NPS[a] (15-day approval review period)
Technical Reports (VII.B.vi)	Variable	Results of background research, fieldwork activities, lab analyses, or other information as determined by the PA Signatories.	30 days	Review of methods, results, and/or other technical aspects or consider if mitigation for broad-scale effects may be necessary.	BLM SHPO (15-day approval review period)

Report Title	**Submittal Due (XIV.B.i)**	**Content**	**Review Period (XIV.B.ii)**	**Review Focus**	**Required Report Approvals (XIV.B.iv)**
Construction and Operations Summary Report(s) (XV.C)	Within 2 years following completion of Construction for Phase I, II, and III and/or every 10 years	Summary of PA implementation, including all work that occurred during that Phase or period, resources found, measures implemented, changes and updates in project designs/plans, changes in management or roles, and/or other information as determined by the PA Signatories.	30 days	Review to ensure compliance with the PA and that indirect and cumulative effects are accounted for.	BLM SHPO (15-day approval review period)
Reclamation and Closure Report (XV.D)	TBD	TBD	TBD	TBD	TBD

[a] Requires approval by the NPS for lands and/or historic properties under NPS jurisdiction.

Attachment G – Project Plans

DESCRIPTION OF PROPOSED PROJECT PHASES (December 2019)

Pre-Construction Phase

The first step is to complete design and permitting and acquire right of way (ROW) from non-federal sources. Activities required to complete permitting and design include geotechnical investigations at bridge locations, along the corridor centerline to refine the embankment design, and at material sites along the east-end realignment; aerial imagery and Light Detection and Ranging (LiDAR) (and/or survey) for areas lacking coverage; wetland delineation on areas not field delineated; hydrology studies; and cultural resource surveys.

At this stage, permits to be acquired would include final U.S. Army Corps of Engineers wetland permit and mitigation, U.S. Coast Guard bridge permits, Alaska Department of Natural Resources material site permits, Alaska Department of Fish and Game fish stream crossing permits, state and federal ROWs, etc. The timeframe for this Phase depends on project delivery method used, whether Design-Bid-Build[18], Design-Build[19], Construction Manager at Risk[20], Construction Manager/General Contractor[21] and phasing.

If the project is broken up into "segments" (within each Phase), there could be design and permitting done on 1 segment and construction could start on that segment while design and permitting is done on other segments. Contractor input would be needed to identify appropriate segments and the sequencing of segments for permitting and construction.

Summary:

- Years: 1 to 2 – May overlap with Phase I Construction timing.
- Components: No installed Components associated with this Phase.
- Activities: May include aerial mapping/photography/LiDAR; survey (including some brush clearing); water monitoring; wetland delineation; cultural resource modeling and surveys; drilling in material sites, along alignment, and bridge locations.

Phase I Construction (Seasonal Pioneer Road)

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[18] **Design-Bid-Build** – This is the traditional delivery method for construction projects where the Owner contracts with a designer to design the project. Once design is complete, the project is put out to bid to Contractors to build as designed. Owner then enters into a construction contract with Contractor.

[19] **Design-Build** – This is an alternative delivery method for construction projects where the Owner hires a designer-contractor team to design and build the project. The Owner enters into one contract with the team to do both design and construction.

[20] **Construction Manager at Risk** – This is an alternative delivery method for construction projects where the Owner contracts separately with the designer and construction manager (CM). The CM acts as a consultant during design and as a general contractor during construction. The CM's responsibilities include procuring equipment and subcontracts and delivering the project within a fixed, negotiated price. In most states, the CM must be a licensed general contractor.

[21] **Construction Manager/General Contractor -** This is an alternative delivery method for construction projects and is very similar to the Construction Manager at Risk method. During the design phase, the construction manager provides input to the Owner and Designer regarding scheduling, pricing, phasing and other input to design a more constructible project. At approximately an average of 60% to 90% design completion, the owner and the construction manager negotiate a 'guaranteed maximum price' for the construction of the project based on the defined scope and schedule. If this price is acceptable to both parties, they execute a contract for construction services, and the construction manager becomes the general contractor.

This Phase will overlap with the Pre-Construction Phase. This Phase would include clearing vegetation from the federal and state ROWs while other ROW negotiations are underway. Activities would also include construction of material sources, clearing and preparing construction camps, placement of radio towers, staging of equipment and labor in various areas, hauling materials and placing fill, excavating high areas, and grading. It would also include installation of culverts and bridges (including driving piles for bridge supports) as well as airstrips, maintenance facilities, and access controls.

Since Phase I construction will most likely start in some portions of the Project area while pre-construction activities are still on-going in other areas, there could be some pre-construction activities (e.g., geotechnical borings, hydrology studies, cultural resource surveys) underway during this Phase.

Summary:

- Years: 2 to 4 – overlaps with Pre-Construction Phase and beginning of Phase II Construction.
- Operations: 1-lane seasonal road, embankment width up to 28 feet and height 30 to 72 inches, 12-foot road lane, 2-foot shoulders, 1-way operation for up to 7 months per year.
- Components: Construction camps, material sites, airstrips, radio towers, maintenance sites and communications equipment, access control (gates), construction equipment, and bridges, culverts, and road embankment.
- Activities: Clearing vegetation from the ROWs, construction of material sources, clearing and preparing construction camps, placement of radio towers, staging of equipment and labor in various areas, hauling materials and placing fill, excavating high areas, and grading. It would also include installation of culverts and bridges (including driving piles for bridge supports) as well as airstrips, maintenance facilities, and access controls. (Potential concurrent Pre-Construction Phase activities may include aerial mapping/photography/LiDAR, survey, water monitoring, wetland delineation, cultural resource modeling and surveys, and drilling in material sites, along alignment, and bridge locations).

Phase II Construction (All-season Roadway)

This Phase would involve the construction of a year-round useable road. This effort would entail additional material extraction, hauling and placing material to expand the Phase I embankment (width and depth), and grading to final slopes. Fiber optic facilities would be trenched into the road embankment during this Phase of construction.

Summary:

- Years: 3 to 4 – including overlap with Phase I.
- Operations: 1-lane year-round road, embankment width up to 44 feet and height 36 to 96 inches, 12-foot road lane, 4-foot shoulders, 1-way road operation.
- Components: Most already put in place during Phase I construction activities, with the addition of fiber optic line in roadway embankment and additional communication equipment at some Maintenance Stations.
- Activities: Continued development or expansion of material sources, construction camp operations, maintenance station operations, some aircraft operations, hauling materials and placing fill, excavating high areas, and grading.

Phase II Operations and Maintenance

Summary:

- Years: 4 to 50

- Operations: 1-lane year-round road, embankment width up to 44 feet and height 36 to 96 inches, 2 12-foot road lanes, 4-foot shoulders, 2-way road operations.
- Components: Use of previously constructed Components.
- Activities: Continued development or expansion of Material Sites, air operations, Maintenance Station operations, hauling materials and placing fill for repairs/maintenance, grading, and removal and reclamation of temporary construction camps not turned into Maintenance Stations.

Phase III Construction (2-Lane Road)

This Phase, if needed, would include additional clearing, additional material extraction, additional excavation where widening road in cut sections or side hilling, additional hauling and placing material to expand the Phase II embankment (width), and additional grading. Culverts would be extended by welding extensions onto the existing culverts. This expansion would create a 2-lane all-season roadway.

Summary:

- Years: 2 to 3 years for the road widening effort – could overlap with the Phase II Operations and Maintenance.
- Operations: 2-lane year-round road, embankment width up to 56 feet and height 36 to 96 inches, 2-way road operations.
- Components: Use of previously constructed Components; expansion of Material Sites; extension of fish passage culverts.
- Activities would include continued development or expansion of material sources, maintenance station operations, air operations, hauling materials and placing fill for expanded roadway, and grading.

Reclamation Phase

Reclamation at the end of the Project would include removal of embankment, culverts, Airstrips, and Maintenance Sites, as well as regrading and revegetation.

Summary:

- Years: 50 to 55
- Operations: Removal of road, no road operations.
- Components: Use of maintenance sites as construction camps, use of communications equipment during reclamation activities, restoration, regrading, and revegetation. Removal of all Components at end of reclamation.
- Activities: Equipment operations to remove fill, regrade, revegetate, restore areas affected by road embankments and associated facilities (airstrips, maintenance stations, material sites).

Attachment H – Amendment and Addendum Log

Change #	Date Revised	Stipulation or Attachment	Line or Paragraph	Revision
Example	*Dec 21, 2019*	*Attachment H*	*1*	*Original language which stated "Amendment Log" was changed to "Amendment and Addendum Log".*
1				
2				
3				
4				
5				
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7				
8				
9				
10				

Appendix K

Cultural Resources Data Gap Analysis Report
(Redacted version due to sensitive content.)

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Ambler Road Environmental Impact Statement: Cultural Resources Data Gap Analysis Report

September 2018

Prepared For:

U.S. Department of the Interior
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Central Yukon Field Office
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CONFIDENTIALITY NOTICE

Information contained in this report has been collected from a combination of publically available and restricted datasets; access to historic, prehistoric, and paleontological site location information in repositories such as the Alaska Heritage Resources Survey is closed to the general public (as required by Public Law 96-95, Alaska Statute 40.25.120(a)(4), and Policy and Procedure No. 50200). Information relating to the nature and location of certain archaeological resources is not subject to public records disclosure under state law or the federal Freedom of Information Act. On federal lands, regulations have been passed to protect the confidentiality of the nature of archaeological resources and their locations. These regulations include Section 304 of the National Historic Preservation Act (54 USC § 307103) and Section 9 of the Archaeological Resources Protection Act (16 USC § 470hh). Consequently, all cultural resources information within this report should be kept restricted and confidential.

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Appendices

Tables

Figures

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Executive Summary

The Alaska Industrial Development and Export Authority (AIDEA), a public corporation of the State of Alaska, has proposed a road from the Dalton Highway in north-central Alaska approximately 211 miles westward to the Ambler Mining District. The United States (US) Department of the Interior, Bureau of Land Management (BLM), Central Yukon Field Office, Fairbanks, Alaska, is developing an Environmental Impact Statement (EIS) under the National Environmental Policy Act (NEPA) to support the issuance of federal authorizations to construct and operate the road. Furthermore, the BLM has initiated consultation under Section 106 of the National Historic Preservation Act for the proposed Ambler Mining District Industrial Access Project (Project). BLM is the lead federal agency for both the NEPA and Section 106 processes for the Project.

In support of the BLM's NEPA and Section 106 compliance requirements, HDR conducted a cultural resources data gap analysis to assess the existing information and to identify gaps in the current data, so as to provide recommendations that will assist the BLM on moving forward with NEPA and Section 106 compliance requirements for the Project. In 2014, Northern Land Use Research Alaska, LLC (NLURA), undertook a cultural data gap analysis for the Project (Blanchard et al. 2014a). NLURA's analysis focused on AIDEA's proposed and alternate routes at that time; however, the proposed and alternative routes have changed since then. The Project study area for the current data gap analysis now includes three alternatives under consideration for NEPA analysis: Alternative A: the AIDEA Proposed Route to the Dalton Highway (Gates of the Arctic National Park and Preserve [GAAR] North); Alternative B: the AIDEA Alternative Route to the Dalton Highway (GAAR South); and Alternative C: the Route Diagonal to the Elliott Highway.

For the purposes of this data gap analysis, the Project study area was defined by two different analysis zones around the Project alternative routes. To be consistent with NLURA's 2014 data gap analysis and to allow for a broader view of the larger ethnographic landscape and potential indirect effects, the current data gap study relied upon a 10-mile study corridor as a basis for identifying previously recorded archaeological and ethnographic resources and investigations, both archaeological and ethnographic. HDR also examined a 1,000-foot corridor (500-foot buffer off centerline) around each alternative route to identify cultural resources that would likely be directly affected by the Project.

The primary data source used in the analysis was the Alaska Heritage Resources Survey (AHRS) online database and its associated research modules. Additional sources of information included the National Register of Historic Places (NRHP) database and publicly available data sources such as previously published books, articles, reports, and various other records. Staff at the National Park Service (NPS) were also contacted regarding the location of previously recorded sites and investigations on NPS lands.

The results of this data gap analysis were not unlike the findings by NLURA in 2014 (Blanchard et al. 2014a). Although several hundred AHRS sites are located within the 10-mile buffers around each of the routes, the archaeological survey coverage is low, and the majority of previous inventories occurred 10 or more years ago. Furthermore, studies focusing on ethnographic resources are limited in the Project study area and, although several AHRS sites were identified as potential ethnographic resources, further research is required. Most AHRS sites lack NRHP determinations of eligibility, which are required under Section 106 to assess Project effects on historic properties. In addition, the locations of ancillary features for all Project alternatives (e.g., material sites, landing zones) still need to be identified. This information will be required to identify all cultural resources that may be affected by the proposed Project. As this analysis was primarily focused on information contained within the AHRS database, other sources of information regarding cultural resources should be considered in future project planning.

The amount of investigation completed to date in the Project alternative corridors is insufficient for understanding the nature and range of both ethnographic and archaeological resources in the Project study area or for assessing the effects of the proposed Project on those resources. As the Project moves forward, a number of studies will need to be conducted to identify cultural resources and assess project impacts to comply with NEPA and Section 106 requirements. In an effort to meet Section 106 compliance requirements for the Project, HDR recommends that the BLM develop a Section 106 Programmatic Agreement (PA), in consultation with Section 106 consulting parties, to establish a process for consultation, review, and compliance under Section 106 for the Project. HDR also recommends that a Cultural Resources Management Plan be developed in conjunction with the Section 106 PA that provides guidance for cultural resource management activities for the Project. The BLM will need to determine the level of effort required to fill the data gaps to comply with NEPA and Section 106 through consultation with tribes, state, and federal agencies, Project proponents, and other interested parties involved with the Project.

Acronyms List

ADNR	Alaska Department of Natural Resources
AHPA	Alaska Historic Preservation Act
AHRS	Alaska Heritage Resources Survey
AIDEA	Alaska Industrial Development and Export Authority
ANCSA	Alaska Native Claims Settlement Act
ANILCA	Alaska National Interest Lands Conservation Act
APE	Area of Potential Effects
ARRC	Alaska Railroad Corporation
AS	Alaska Statute
ASTt	Arctic Small Tool Tradition
BIA	Bureau of Indian Affairs
BLM	United States Bureau of Land Management
BP	Years Before Present
cal BP	Calibrated Years Before Present
CDO	Community Database Online
CFR	Code of Federal Regulations
DOT&PF	Alaska Department of Transportation and Public Facilities
EIS	Environmental Impact Statement
GAAR	Gates of the Arctic National Park and Preserve
GIS	Geographic Information System
HDR	HDR Alaska, Inc.
KRTT	Koyukuk River Tribal Tours
LIDAR	Light Detection and Ranging
LOI	Location of Interest

MP	Milepost
MTRS	Meridian, Township, Range, Section
NANA	North Alaska Native Association
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NLURA	Northern Land Use and Research Alaska, LLC
NPS	National Park Service
NRHP	National Register of Historic Places
OHA	Office of History and Archaeology
Project	Ambler Mining District Industrial Access Project
RAC	Russian American Company
ROW	Right-of-Way
SHPO	State Historic Preservation Officer
TCP	Traditional Cultural Property
THPO	Tribal Historic Preservation Officer
US	United States
USGS	US Geological Survey

1. Introduction

1.1. Overview

The Alaska Industrial Development and Export Authority (AIDEA), a public corporation[1] of the State of Alaska whose purpose is to promote, develop, and advance the general prosperity and economic welfare of the people of Alaska and to create additional employment, has proposed a road from the Dalton Highway in north-central Alaska approximately 211 miles westward to the Ambler Mining District. The road would provide access for exploration and development of the Ambler Mining District. The United States (US) Department of the Interior, Bureau of Land Management (BLM), Central Yukon Field Office, Fairbanks, Alaska, is developing an Environmental Impact Statement (EIS) under the National Environmental Policy Act (NEPA) to support the issuance of federal authorizations to construct and operate the road. Furthermore, the BLM has initiated consultation under Section 106 of the National Historic Preservation Act (NHPA) for the proposed Ambler Mining District Industrial Access Project (Project). BLM is the lead federal agency for both the NEPA and Section 106 processes for the Project.

In an effort to examine existing data regarding cultural resources and cultural resources investigations within the proposed Project study area, HDR Alaska, Inc. (HDR), conducted a cultural resources data gap analysis.[2] This study's primary purpose is to assess the existing information and to identify gaps in the current data, so as to provide recommendations that will assist the BLM on moving forward with NEPA and Section 106 compliance requirements for the Project. In 2014, Northern Land Use Research Alaska, LLC (NLURA), undertook a cultural data gap analysis for the Project (Blanchard et al. 2014a). NLURA's analysis focused on AIDEA's proposed and alternate routes at that time. This data gap analysis re-evaluates those routes, along with one additional route identified through scoping and alternatives development, discussed in more detail in Section 1.3.1. The current analysis is considered a supplement to the 2014 NLURA cultural data gap analysis and report which is included in Appendix A.

This study is limited to literature and archival research, including an examination of the Office of History and Archaeology (OHA) Alaska Heritage Resources Survey (AHRS) database, the National Register of Historic Places (NRHP) database, along with review of various cultural resources records, maps, and documents including scholarly research in the proposed Project study area. HDR coordinated with cultural resources specialists at the National Park Service (NPS) to identify records and other documents not available elsewhere.

The following report is the result of this effort and includes information on the Project and Project study area, project setting including an environmental overview of the study area and updated information on the cultural setting, cultural resources and cultural resources studies in the Project

[1] Per Alaska Statute (AS) 44.99.020.

[2] Stephen R. Braund & Associates (SRB&A) assisted HDR with the current cultural resources data gap analysis. SRB&A conducted background research and reporting on ethnographic resources and ethnographic studies in the Project study area.

study area, identified data gaps and sources of information for identifying cultural resources, and recommendations for Project planning and cultural resources regulatory compliance.

1.2. Project Description

AIDEA submitted a consolidated application with the BLM, NPS, US Coast Guard, and US Army Corps of Engineers for rights-of-way (ROW), permits, and related authorizations for a proposed 211-mile industrial access road along the southern foothills of the Brooks Range. The proposed Project would be located along the south flanks of the Brooks Range in north-central Alaska. The start of the road would be on BLM-managed lands and would extend across State-owned lands, Gates of the Arctic National Park and Preserve (GAAR), and lands privately owned by Alaska Native corporations. The road is currently proposed for industrial use only, and would not be open for public access. The BLM will lead the analysis required by NEPA and will coordinate this with the Section 106 process, working cooperatively with other State and federal agencies. Because approximately 26 miles of the proposed road would pass through a conservation system unit, GAAR, the entire application process is subject to the provisions of Title XI of the Alaska National Interest Lands Conservation Act (ANILCA).

As proposed by AIDEA, the road would be an all-season, industrial access road. Originating at the Dalton Highway near Milepost (MP) 161 approximately 217 road miles north of Fairbanks (172 air miles), the road would cross the southern Brooks Range foothills before terminating near the Ambler Mining District on the south bank of the Ambler River. The proposed road would not be designed or open for public access, but would be limited to use as an industrial-access-only road. The project includes bridges, material sites, maintenance stations, airstrips, and related infrastructure and utilities. As proposed, the road is anticipated to have an approximately 50-year life, based on an estimate of when mineral exploration and development in the Ambler Mining District is likely to be completed. AIDEA's proposal calls for removal of the road and reclamation of the ROW upon cessation of mining activities in the Ambler Mining District.

Trucks hauling mineral exploration and development equipment, supplies, fuel, and ore concentrate would use the road. The road would be designed to accommodate large, semi-trailer trucks (American Association of State and Highway Transportation Officials WB-62). The road is proposed to be built in phases, beginning with a seasonal, single-lane, gravel pioneer road (Phase I). Phase II would upgrade the road to allow year-round industrial access. Phase III would construct a two-lane gravel industrial road. The EIS will focus its evaluation on the impacts of Phase III of the project.

1.3. Project Study Area

1.3.1 NEPA Alternative Routes

NEPA requires consideration of a full range of alternatives. BLM considered alternatives proposed by AIDEA in their application. In addition to their proposed alternative, AIDEA's application included consideration and evaluation of several routes originally investigated by the Alaska

Department of Transportation and Public Facilities (DOT&PF). BLM also considered the comments of the public and agencies received during the scoping process, including multiple comments related to alternatives, to help inform the alternatives process. The results of the alternatives development and screening process are included in the Ambler Road EIS Alternatives Development Memorandum (September 2018). Based on screening conducted in that report, the BLM retained three alternatives for further consideration under NEPA: AIDEA Proposed Route (GAAR North), AIDEA Alternative Route (GAAR South), and the Route Diagonal to the Elliott Highway. Each of these three alternative routes are exhibited in Figure 1 and briefly described below.

Alternative A: AIDEA Proposed Route (GAAR North)

Type: Road/Rail Area: Eastern Length (miles): 211

The AIDEA Proposed Route is a 211-mile-long eastern alignment (accesses Ambler Mining District from the east), with its eastern terminus at MP 161 of the Dalton Highway. It runs almost directly west to the Ambler Mining District across principally State, BLM, and Gates of the Arctic National Preserve lands.

Alternative B: AIDEA Alternative Route (GAAR South)

Type: Road Area: Eastern Length (miles): 228

The AIDEA Alternative Route is a 228-mile-long eastern alignment, with its eastern terminus at MP 161 of the Dalton Highway. It is the same as the Proposed Route except that it loops to the south to pass through Gates of the Arctic National Preserve at the narrowest possible location. This adds 20 miles to the overall route length.

Alternative C: Route Diagonal to the Elliott Highway

Type: Road Area: Southern Length (miles): 317

Because no alternative had been previously delineated, BLM undertook drafting a generalized route for this alignment. It is a southeastern alternative measuring 317 miles in length, with its southern terminus at the existing Elliott Highway. From there, the route follows the DOT&PF Elliott Highway Route westward across the Yukon River, then northwest through a corner of the Koyukuk National Wildlife Refuge to Hughes and Hogatza before ending near Kobuk.

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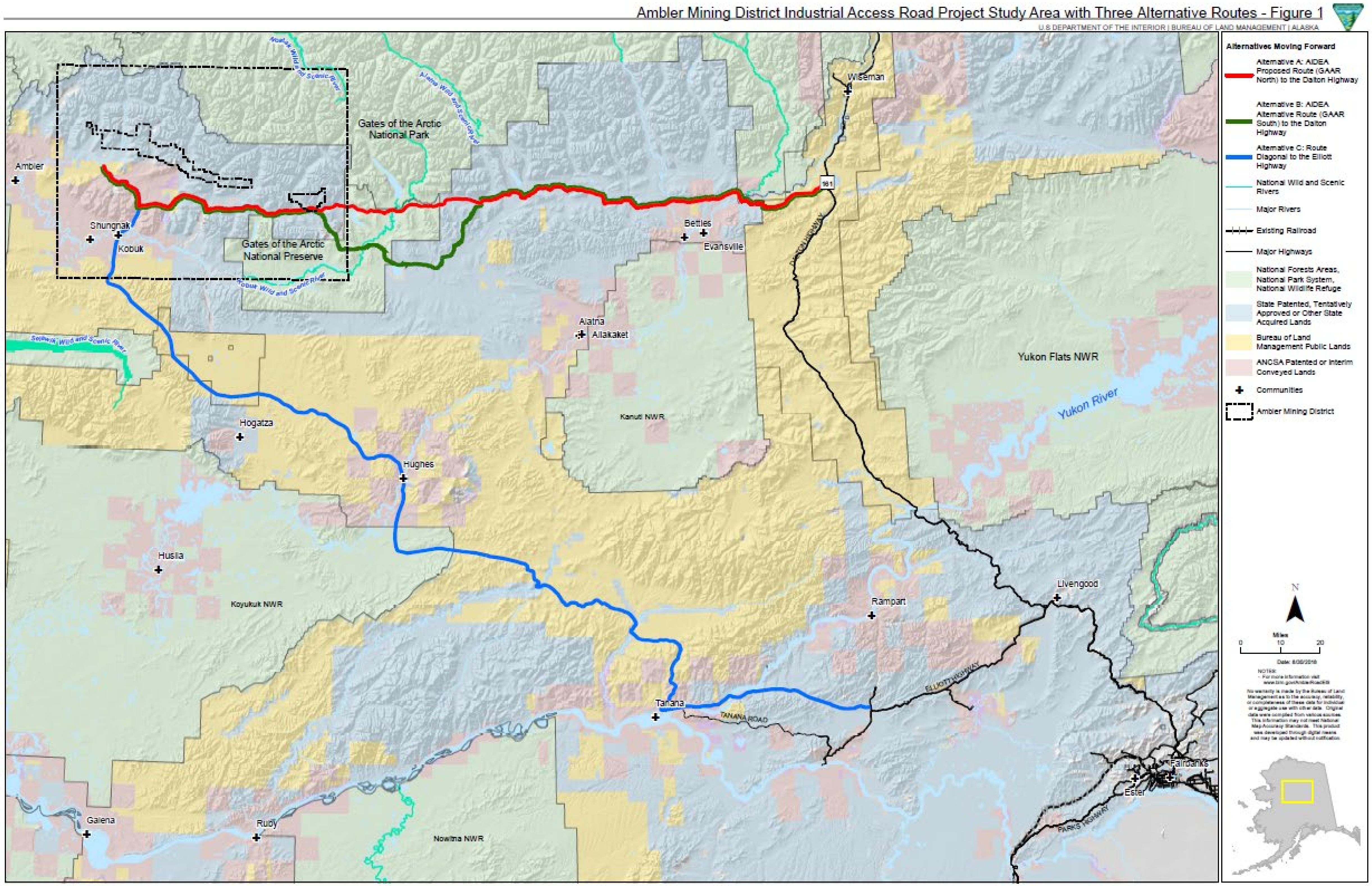

Figure 1. Ambler Mining District Industrial Access Road Project Study Area with Three Alternative Routes

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1.3.2 Study Area for Data Gap Analysis

For the purposes of this data gap analysis, HDR has defined the Project study area by different analysis zones around the Project alternative routes. To be consistent with NLURA's 2014 data gap analysis, HDR investigated previously recorded cultural resources and cultural resources studies conducted within a 10-mile corridor (five-mile buffer off centerline) around each alternative route. This approach allows for a broader view of the larger ethnographic landscape, while also examining archaeological resources that may be indirectly affected by the proposed Project. HDR also examined a 1,000-foot corridor (500-foot buffer off centerline) around each alternative route to identify cultural resources that would likely be directly affected by the Project. Furthermore, to identify communities that are likely to hold indigenous cultural values and traditional ties to areas that may be affected by the Project, HDR looked at Native Alaskan communities within 50 miles of any of the proposed routes. As most of these communities utilize large expanses of the landscape for traditional cultural practices, identifying those communities is essential in gathering information on previously unidentified cultural resources.

1.4. Regulatory Context

This Project is subject to several federal and State regulations relating to cultural resources. The Project is considered a federal undertaking subject to Section 106 of the NHPA of 1966, as amended (54 US Code 306108), and its implementing regulations (36 Code of Federal Regulation [CFR] 800). In addition, the Project must comply with NEPA, which requires consideration of impacts to cultural resources and the human environment. Furthermore, as the proposed Project would cross lands administered by the State of Alaska, the Project is also subject to the provisions of the Alaska Historic Preservation Act (AHPA).

Section 106 of the NHPA requires federal agencies to take into account the effects of their undertakings on historic properties. Section 106 defines an undertaking as "a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; and those requiring a Federal permit, license or approval" [36 CFR 800.16(y)].

A historic property is defined as "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places…this includes artifacts, records, and remains that are related to, and located within, such properties… [and] includes properties of traditional religious and cultural importance to tribes" or other entities [36 CFR 800.15(l)(1)].

As part of the process, Section 106 of the NHPA mandates that the lead federal agency consult with State or Tribal Historic Preservation Officers (SHPOs/THPOs), other federal agencies, tribal entities, local governments, the public, and other interested parties for the purpose of identifying historic properties; assess the effects of the undertaking on those historic properties; and resolve or mitigate any adverse effects to those properties.

The passage of NEPA in 1969 established as policy an environmental review process for any proposed federal actions. Sections 40 CFR 1502.15 and 40 CFR 1502.16 require descriptions of known historic and cultural resources that may be affected by proposed federal project actions and alternatives, as well as consideration of the effects to historic or cultural resources resulting from such actions and each alternative. Sections 40 CFR 1508.7 and 40 CFR 1508.14 require attention to and considerations of cumulative impacts on the environment and its associated resources, as well as direct and indirect effects on the "human environment," which is defined "comprehensively to include the natural and physical environment and the relationship of people with that environment."

The Project is also subject to the AHPA (Alaska Statute [AS] 41.35.010–41.35.240), which was enacted to locate, preserve, study, exhibit, and evaluate the historic, prehistoric, and archaeological resources of Alaska. The intent of this act is to preserve and protect these resources from loss, desecration, and/or destruction so that the scientific, historic, and cultural heritage they embody may pass undiminished to future generations. Similar to Section 106, the AHPA addresses the identification, evaluation, and treatment of cultural resources for undertakings under State jurisdiction.

1.5. Summary of Key Issues on Cultural Resources

The BLM conducted scoping meetings for the Project in an effort to solicit internal and external input on the issues, impacts, and potential alternatives that will be addressed in the EIS. The formal scoping period began on February 28, 2017, and concluded on January 31, 2018. Public scoping and cooperating agency meetings were held between November 2, 2016, and January 18, 2018. Additionally, the BLM had a government-to-government meeting with the Ambler Tribal Council in Ambler to discuss various issues and concerns regarding the Project on December 8, 2017.

The BLM also initiated Section 106 consultation for the Project and held a Section 106 meeting on January 17, 2018. The purpose of the meeting was to open dialogue with consulting parties regarding the Section 106 process for the Project. Furthermore, the meeting discussed the details of the Project, an overview of the Section 106 process, development of the Project Area of Potential Effects (APE), cultural resources studies conducted in the area to date, and known historic properties that may be affected by the proposed Project. The meeting was also an opportunity for consulting parties to provide comment and input regarding the Project and to discuss any concerns and/or information that might be pertinent to understanding the cultural or tribal concerns that should be taken into consideration as part of the Section 106 process.

Based on scoping and the initial Section 106 consultation efforts, several critical issues of concern or key issues regarding impacts to cultural resources for the Project were identified. These issues will be addressed during the NEPA and Section 106 processes and are being considered during the data gap analysis:

- What types of cultural resources would be affected by the Project?
- What will be the direct, indirect, and cumulative effects of the Project on cultural resources?
- What are the temporary versus permanent effects by the Project on cultural resources?
- How will historic properties be identified? Who conducts the identification effort and how will tribes/communities be involved?
- What is the process for assessing Project effects, and if those effects are adverse, how will they be resolved?
- How are cultural landscapes defined, and how would they be affected? How will sensitive information regarding cultural resources be kept confidential during the EIS process?
- How will consultation and outreach to villages/tribes be implemented?
- How would ethnographic information be obtained from the communities? How would you obtain their input or analyze information from their perspective?
- How are traditional cultural properties (TCPs), traditional cultural districts, sacred sites, and cultural landscapes going to be identified? How will the Project affect these resources? How are ethnographic place names tied to these resources?

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2. Project Setting

This section presents information on the environmental setting, along with the local prehistoric, ethnographic, and historic context of the Project area. Understanding the local environment and cultural history are critical in defining important events, trends, or cultural patterns by which the significance of cultural resources may be identified and evaluated. Much of the cultural setting for the Project area was discussed in NLURA's 2014 cultural data gap report and will not be repeated here. Provided below is a summary of the Project environmental and cultural setting as a supplement to the previous work by NLURA (Blanchard et al. 2014a).

2.1. Environmental Setting

The US Geological Survey (USGS) developed a physiographic classification as a means to describe the large and diverse Alaska region. This classification system provides a way to describe areas that are homogeneous topographically and also distinct from surrounding areas (Wahrhaftig 1965). The study area is a large corridor located near the northwestern and interior areas of Alaska. It is comprised of three major ecoregions as categorized by the USGS classification. All three proposed routes primarily travel through the Kobuk Ridges and Valleys ecoregion. The AIDEA Proposed and AIDEA Alternative Routes also traverse the Brooks Range ecoregion, while the Route Diagonal to the Elliott Highway runs partially through the Ray Mountains. Below is a brief overview of the environmental setting of each of the three ecoregions.

2.1.1 Ray Mountains

The Ray Mountains are within the intermontane boreal ecoregion of Alaska. This area extends north-south between the Kobuk and Yukon Rivers, and east-west between the Ray Mountains and the Sheklukshuk Range.

The Ray Mountains are compact, east-west oriented mountains comprised of metamorphic bedrock typically covered with rubble and shallow, rocky soils (Nowacki et al. 2001). The Ray Mountains are geologically separated from the Brooks Range of the north by the Kobuk-Malamute fault line (Nowacki et al. 2001). With the exception of alpine glaciers at the highest peaks, the area was largely unglaciated during the Pleistocene era.

This interior ecoregion features cold and dry winters, and warm and moist summer seasons, with thin to moderately thick permafrost being discontinuously found across the landscape (Nowacki et al. 2001). Precipitation and temperature vary across the region from east to west based on proximity to the ocean and the elevation (Gallant et al. 1995).

Occasional summer forest fires and long cold winters create a complex vegetation pattern across the region (Gallant et al. 1995). Most of the boreal landscape is forested by black spruce (Picea mariana), with warmer south-facing slopes often being dominated by mixed forests of white spruce (Picea glauca), aspen (Populus tremuloides), and birch (Betula spp.). White spruce (Picea glauca), alder (Alnus spp.), and willow (Salix spp.) are commonly found in the floodplains

(Nowacki et al. 2001). Balsam poplar (Populus balsamifera) can be found in the floodplains and some upland areas of the region. Shrub birch and Dryas-lichen tundra are extensive in the area and expand across the higher elevations (Nowacki et al. 2001).

This ecoregion features several shorter streams originating within the region and larger streams, which often originate from glaciated regions of adjacent mountain ranges (Gallant et al. 1995). The stream headwaters provide significant habitat for arctic grayling (Thymallus arcticus), and minor habitat for species of anadromous fish, including Chinook (Oncorhynchus tshawytscha), chum (Oncorhynchus keta), and coho (Oncorhynchus kisutch) salmon (Nowacki et al. 2001). Common terrestrial species in the area include: moose (Alces alces), caribou (Rangifer tarandus), gray wolf (Canis lupus), red fox (Vulpes vulpes), lynx (Lynx canadensis), and marten (Martes americana) (Nowacki et al. 2001).

2.1.2 Kobuk Ridges and Valleys

Radiating south from the Brooks Range, the sprawling Kobuk ecoregion is comprised of paralleling valleys and ridges. Historically, high-angle reverse fault movement and thick northern originating ice sheet covering the area helped to create the ridges and carve the extensive U-shaped valleys that can be seen today (Nowacki et al. 2001). Although significant portions of the study area were covered by Pleistocene glaciers, a wide swath of coastline was not (Wahrhaftig 1965). The protruding ridges are covered with rubble, while the large valleys contain glacial and alluvial sediments. The extensive lowland contains many sluggish meandering streams dotted with several lakes (Wahrhaftig 1965).

Short cool summers and very long frigid winters are characteristic of the dry continental climate of the region. Cold air originating in the Brooks Range frequently blows across the valleys. Most of the area is underlain with thin to moderately thick permafrost (Nowacki et al. 2001). The Bering tundra ecoregion of the coastal east faces similar frigid temperatures as cold air is swept on land from the Bering Sea (Nowacki et al. 2001). Historically, the region provided an ice-free corridor between Asia and North America (Nowacki et al. 2001).

Mixed forests of needleleaf and broadleaf vegetation dominate much of the mountainsides and valley bottoms (Nowacki et al. 2001). Black spruce (Picea mariana) are most commonly found across the region in well drained soils of upland areas to the poorly drained wetland bogs of the valley. White spruce (Picea glauca), and balsam poplar (Populus balsamifera) comprise much of the vegetation found across the floodplains and riverbanks. White spruce, balsam poplar, and some trembling aspen (Populus tremuloides) are found intermittently in upland forested areas, which are predominantly populated with paper birch (Betula papyrifera). The understory is comprised of willow, berries, moss, and grass (Nowacki et al. 2001). Forested areas are primarily restricted to lower-lying elevations of the west, with some short shrub species of willow (Salix spp.), birch (Betula spp.), and alder (Alnus spp.) found on the ridges (Nowacki et al. 2001).

Every year, the various lakes and streams of the valley attract millions of migratory birds to visit (NPS 2016). Common terrestrial species of the area include caribou (Rangifer tarandus), musk ox (Ovibos moschatus), gray wolf (Canis lupus), brown bear (Ursus arctos), red fox (Vulpes vulpes), moose (Alces alces), wolverine (Gulo gulo), and porcupine (Erethizon dorsatum) (NPS 2016).

2.1.3 Brooks Range

The Brooks Range study area is within the Arctic tundra ecoregion and most, if not all, of the Brooks Range was covered by Pleistocene glaciers (Wahrhaftig 1965). The Brooks Range study area is along the boundary where the southern Brooks Range ecoregion meets the Kobuk Ridges and Valleys ecoregion.

The northern extension of the Rocky Mountains includes the steep ridges of the Brooks Range. This east-west trending rugged range features peaks with elevations of 7,000–8,000 feet in the north and 4,000–6,000 feet in the south (Wahrhaftig 1965). The uplifted sedimentary rock of the range extends across northern Alaska near the Chukchi Sea to the Canadian border (Gallant et al. 1995). Terranes underlie most of the region from the Arctic Ocean to the Kobuk-Malamute fault system (Nowacki et al. 2001). The rubble and scree-covered mountains of the range are comprised of folded and faulted sedimentary deposits of the Paleozoic and Mesozoic eras (Gallant et al. 1995). The region was largely glaciated during the Pleistocene epoch, with few remnants remaining today (Hamilton 1982). Lakes are relatively sparse considering it was once such an extensively glaciated region (Gallant et al. 1995).

The dry arctic climate features frigid winters and cool short summers. Precipitation is heaviest in the south-facing peaks of the range, with air temperatures dropping rapidly with elevation gain and reaching freezing point nearly every month of the year (Gallant et al. 1995).

The steep and erodible landscape of the region creates a harsh habitat with sparse vegetation (Gallant et al. 1995). Vegetation present along lower hillsides and valleys includes a mix of shrub-sedge tussock tundra and some willow (Salix spp.) (Nowacki et al. 2001). Species below the arctic tree line on the south side of the range near the Canadian border include conifer-birch forests and some taller shrub species.

Groundwater-fed streams of the mountains offer habitat for arctic grayling (Thymallus arcticus). Several species of migratory waterfowl and songbirds frequent the area in the summer. Important terrestrial species commonly found in the Brooks Range include the gray wolf (Canis lupus), brown bear (Ursus arctos), caribou (Rangifer tarandus), and Dall sheep (Ovis dalli) (Nowacki et al. 2001). Smaller mammals include the Alaska marmot (Marmota broweri), beaver (Castor canadensis), red fox (Vulpes vulpes), and northern collared lemming (Dicrostonyx groenlandicus).

2.2. Cultural Setting

2.2.1 Prehistoric Context

NLURA's 2014 cultural resources data gap analysis for the proposed Project contained a comprehensive overview of Alaska's prehistory for the interior and northern maritime cultural traditions and complexes from the late Pleistocene up to the Contact era (Blanchard et al. 2014a). As such, a brief summary of the prehistory of the Project area is presented in the section below, including supplemental information to the earlier NLURA data gap analysis.

Interior Traditions

Understanding the cultural chronology of Alaska's interior is complicated due to a variety of factors such as archaeological research of the vast and sparsely populated area of land being generally limited to development (e.g., infrastructure corridors), limited deeply stratified sites, and poor organic preservation from the acidic soils of the boreal forest (Potter 2016). Because interior archaeological sites tend to be small, surficial lithic scatters with limited stratigraphy, site classification and dating is often done by tool technology comparisons. Technological comparisons have relied on a small number of buried and stratified sites across a broad area. These comparisons are what archaeologists have used to understand cultural chronology in Alaska, and are limited in their ability to inform us on the past. Archaeologists do not agree on a single theoretical perspective to define Alaskan prehistory. However, prehistoric people have been present in Alaska for at least 14,000 years, and there are several generally accepted archaeological traditions and complexes, which are discussed in the following chronology.

<u>Late Pleistocene and Early Holocene</u>

West (1996), Holmes (2001), and Potter (2011) offer views of a single broad technological tradition during the late Pleistocene and early Holocene. West (1981) focused on early relationships between Siberia and Alaska, grouping all sites with microblade technology into a Beringian Tradition that included the "Dyuktai" archaeological tradition of Siberia; his classification spans sites that date from roughly 12,000 to 8,000 years ago. Holmes (2001, 2008, and 2011) reserves the term Beringian to describe sites older than 11,500 calibrated years before present (cal BP). He differentiates the Beringian Tradition from the American Paleoarctic tradition or Denali complex, which Holmes (2008:70) considers to be an "Alaskan prodigy." Others (e.g., Cook 1996, Goebel et al. 1991, Hoffecker 2011, and Hoffecker et al. 1993) have interpreted the tool typology of Alaska's early sites as evidence of multiple traditions including the Chindadn Complex circa 12,500 to 10,600 years ago, and the American Paleoarctic Tradition circa 10,600 to 5,000 years ago, which includes the Denali Complex.

Key elements of Paleoarctic tools include wedge-shaped microblade cores, bifacial points, large bifacial cores and tools, burins made on flakes, end scrapers, and microblades. The presence or absence of microblades in early sites has caused some differentiation in site classification. Some of the oldest components at Dry Creek and Broken Mammoth, sites located in the interior of Alaska, lack microblades and wedge-shaped cores. The term Nenana Complex has been used to signify these early non-microblade sites, while the term Denali Complex has been used to describe sites of this period that contain microblades (Powers and Hoffecker 1989, Pearson and Powers 2001, Goebel et al. 2003, and West 1981). However, the presence or absence of microblades is not necessarily a rigid dating methodology as microblades have been found at the Swan Point site in a component that dated to 13,900 cal BP (Holmes et al. 1996, Holmes 2011).

Thus, the basis for considering the Nenana and Denali Complexes as two separate traditions based on age and the presence of microblades has been called into question. The lack of microblade technology in some early sites is possibly correlated to the sites' particular function, or may be the result of a limited artifact sample (Potter 2005).

Paleoarctic sites identified to date tend to be small lithic scatters that reflect the mobility of the people, such as small, ephemeral hunting camps (Potter 2016). These early sites spanned large areas, are often located on high, dry ground overlooking river and stream confluences or lake margins (Potter 2005), and show a preference for large game animals, although small game and waterfowl are also sometimes present in these sites (Holmes 2001). Seasonality and resource availability also seem to play a role in site locations during the Paleoarctic period. Sites associated with spring and fall occupations are located in lowland areas adjacent to wetlands and large rivers where migrating waterfowl and mammals could be harvested, such as the Broken Mammoth site and the Gerstle River site (Potter et al. 2013). Sites associated with mid to late summer occupations have been found along large rivers, such as the Upward Sun River site where salmon were a part of the subsistence economy, as well as highland locations, such as Carlo Creek where caribou and Dall sheep were processed (Potter et al. 2013).

Middle Holocene

There is scant evidence of the cultural record in interior Alaska between approximately 8,000 and 6,000 years ago (Holmes 2008). Following this cultural hiatus, archaeological sites show a sharp distinction from the earlier "Asiatic" sites of the Beringian and Denali/American Paleoarctic period. This new tradition, which begin to appear approximately 6,000 years ago, is termed the Northern Archaic Tradition. This mid-Holocene tradition is most noted for its bifacially flaked side-notched projectile points, but sites of this tradition sometimes include other diagnostic types like microblades, burins, and bifacially flaked knives and lanceolate points (Holmes 2001, Rasic and Slobodina 2008). The notched points for which this tradition is known are found widely across Alaska between approximately 6,000 and 5,000 years ago, illustrating a sudden and far-reaching occurrence of this tool technology (Esdale 2008).

The Northern Archaic Tradition was originally thought to illustrate a human adaptation to a warming climate at the end of the Younger Dryas (Dixon 1985). Anderson (1968) first defined the Northern Archaic Tradition at Onion Portage in the Kobuk Valley. Anderson (1988) later noted a strong correlation between the Northern Archaic Tradition and the boreal forest (Esdale 2008, Mason and Bigelow 2008). However, Northern Archaic sites are not confined to the boreal forest. Many of Northern Archaic sites have been found in upland and northern tundra settings, where caribou was a significant resource that was supplemented with waterfowl and small game (Anderson 1968, Lobdell 1995, Mason and Bigelow 2008). In northwest Alaska, Northern Archaic sites have been found at Cape Krusenstern, Cape Espenberg, and along the Kobuk River (Giddings and Anderson 1986, Anderson 1968, 1988).

<u>Late Holocene</u>

Tool technology during the Late Holocene shows a change from large bifacial points to smaller "Kavik" stemmed points and barbed or un-barbed antler or bone arrowheads (Shinkwin 1979). This technological shift from earlier chipped stone tool technology to slate, wood, bone, and eventually copper material is associated with the Athabascan Tradition (Dixon 1985, Holmes 2008). Athabascan sites begin to appear in the archaeological record at approximately 1,700 years ago and continue into the historic era at numerous locations. During this time, bow and arrow hunting replaced atlatl and dart technology (Hare et al. 2004, VanderHoek et al. 2007).

Athabascan sites often include the remains of timber and earthen houses, sweat houses, hearths, and storage and cache pits. Athabascan sites often show widespread trading. Trade items introduced non-local materials such as copper, which were used to make tools and ornamental objects. Euroamerican trade goods such as iron and glass became part of the Athabascan material culture beginning approximately 300 years ago.

Maritime Traditions

The end of the Younger Dryas, approximately 12,000 years ago, marks the end of the Pleistocene ice age, resulting in rising sea levels that inundated the Bering Land Bridge over time. Sometime prior to 4,500 years ago, and possibly as early as 7,000 years ago, one or more migrations of people from Siberia migrated eastward to the Alaskan arctic and Bering Sea region. Evidence of these migrations is scant, and rising sea levels across the Bering Land Bridge have likely eroded or inundated coastal sites that may have been occupied prior to 4,500 years ago.

<u>Late Holocene</u>

In northwest Alaska, distinct changes in stone tool manufacture occurred at approximately 4,500 years ago, marking the beginning of the Arctic Small Tool Tradition (ASTt). First defined by Irving (1962, 1964), ASTt sites have do not have an identifiable North American precursor, spread quickly across the high arctic, and extended south to the Aleutians and near coastal areas possibly as far as Kodiak Island (Davis and Knecht 2006, Giddings and Anderson 1986, Reanier and Kunz 2010).

The ASTt is characterized by exceptionally well made, tiny, bifacial tools and projectile points, and some (Giddings and Anderson 1986) consider this tradition to represent material culture ancestral to modern Eskimo populations. ASTt sites are not strictly maritime oriented, and have been identified both inland and at the coast, with numerous sites having been identified in the Brooks Range, the North Slope, the Seward Peninsula, and along the northern coast from Norton Sound to the Beaufort Sea (Tremayne 2015). The ASTt period also correlates with the first evidence of maritime resource harvesting, including seals (Tremayne 2015). In northwest Alaska, four phases of ASTt have been identified, including the Denbigh Flint Complex (4,500–2,500 years before present [BP]), Choris (2,800–2,200 BP), Norton (2,400–1,800 BP), and Ipiutak (1,900–1,200 BP) (Giddings and Anderson 1986). Differences in the material cultural between the four phases is apparent in the art, pottery, maritime tool technology and settlement patterns along the coast. There are relatively small differences in the terrestrial hunting technology and settlement pattern in interior regions during these phases.

The Northern Maritime Tradition is the immediate archaeological antecedent to ethnographic and modern Yupik and Inupiaq Eskimo culture. Northern Maritime Tradition sites are distinguished from earlier Ipiutak assemblages by distinctive artifact styles and a technology that emphasized the extraction of marine resources, including whales (Anderson 1984). Northern Maritime Tradition sites illustrate large coastal societies with distinctive art and ritual items. The Northern Maritime Tradition in northwest Alaska has been subdivided into three subphases: Birnirk, Western Thule, and Kotzebue (Collins 1964).

Birnirk sites date from approximately 1,600 to 1,000 BP. Characteristic Birnirk artifacts include curvilinear stamped pottery, ground slate tools, and ivory artifacts decorated with incised line styles (Anderson 1984). Around 1,000 BP, Western Thule culture developed out of Birnirk culture, with material items described as “an elaboration of items developed in Birnirk times” (Anderson 1984:92). Western Thule houses at Cape Krusenstern are multi-room, with large central rooms and sleeping platforms “four times the area of the platforms of Birnirk houses” (Giddings and Anderson 1986:110). From approximately 600 BP and continuing to the time of European contact, a local cultural variant known as the Kotzebue complex developed around Kotzebue Sound. Kotzebue complex sites were identified by Giddings at excavation of sites later termed “Old” and “Middle” Kotzebue (Giddings 1952, Vanstone 1954). Such sites are well represented throughout Kotzebue Sound, and contain evidence of a balanced subsistence round that included sea mammals, caribou, and fish (Giddings and Anderson 1986).

2.2.2 Historic Context

The 2014 NLURA data gap report (Blanchard et al. 2014a) provided an extensive overview of the protohistoric and historic era of the greater Ambler Road study area. Periods and themes covered in the 2014 data gap report include the protohistoric period of the coastal Seward Peninsula Iñupiat, the Kobuk River Iñupiat, the Mountain Iñupiat, and the Noatak River Iñupiat, as well as a discussion of the protohistoric Koyukon River Athabascans, and the impacts of contact and settlement on Native life. The 2014 data gap report also discusses early European trade and exploration, regional mining settlements of the nineteenth and twentieth centuries, and government and corporate development. Therefore, the aim of this current historical context is to supplement the historic context developed by NLURA, providing an expanded context for trading, exploration, and settlement along the Yukon River and its tributaries.

Russian Exploration and Trade along the Yukon

The historic period in Alaska began with Bering and Chirikov’s 1728 expedition to the Bering Strait region. Following their second voyage in 1741–1742 that reached as far as the Gulf of Alaska, independent Russian traders began fur trading in the Aleutian Islands, expanding eastward in ensuing years. By 1799, the Russian American Company (RAC) had established a monopoly on the fur trade in Alaska, establishing trading posts of various sizes at numerous coastal locations along Alaska's southern coasts (Black 2004).

It was not until the 1830s that RAC traders traveled to the lower Yukon River, ascending the river to Nulato as early as 1836, establishing a small outpost there in 1838 (Dall 1870, Ogilvie 1913, Whymper 1868). Subsequent RAC expeditions further up the Yukon from their Nulato outpost came in 1843, when Zagoskin ascended the Yukon to the mouth of the Nowitna River.

At a similar time, the Hudson Bay Company was exploring the Yukon from the east, establishing Fort Yukon as a fur trading post in 1847. Following Zagoskin, RAC traders reached as far as Nuklukayet, at the confluence of the Tanana and Yukon Rivers, and established a trading post there sometime around 1861 (Brooks 1973). RAC traders are not known to have ventured much past the middle Yukon; however, Lukin may have ascended the Yukon River to Fort Yukon in 1863 (Ogilvie 1913, Raymond 1871, Whymper 1868).

While fur trading posts were being established on the Yukon, Tanana and Koyukon Athabascans were living in small bands, generally approximately 30 to 80 people, who moved between lakes, rivers, and mountains in a seasonal round to harvest fish, game, and plant resources (Allen 1887, Olson 1968). Zagoskin estimated that there were approximately 300 Koyukon Athabascans living between Nulato and the mouth of the Nowitna River in 1843. Among those he encountered were a solitary man living at present-day Ruby and a group of people at a summer fish camp seven miles north of present-day Ruby (Black 2004, Hart 1981, Zagoskin 1967). Living between fur trading stations at Fort Yukon and Nulato, it was not long before Koyukon and Tanana Athabascans incorporated fur trapping into their seasonal round (Raymond 1871).

American Exploration along the Yukon

Between 1865 and 1867, several Americans traveled the Yukon River while surveying for the Western Union Telegraph Company. Kennicott explored the Yukon River from his base in Nulato during the winter of 1865-1866; his untimely death saw Ketchum and LeBarge continue on to Fort Yukon that same year. In 1866, Dall and Whymper also traveled up the Yukon as part of the Western Union Telegraph Company survey. They overwintered in Nulato and continued to Fort Yukon in spring 1867 (Dall 1870, Whymper 1868).

With the US purchase of Alaska in 1867, RAC holdings, including fur trading stations, were eventually bought by what would become the Alaska Commercial Company. American traders moved into the Yukon region, and by the early 1880s, several traders had limited operations near the confluence of the Tanana and Yukon Rivers.

Following Alaska's purchase, a series of government expeditions were initiated to take stock of the new territory. In 1885, Lieutenant Allen explored both the Tanana and Koyukon Rivers. American prospectors and trappers also began exploring the new territory. A series of small gold rushes in the Rampart area in the mid-1890s brought thousands of hopeful gold seekers to the middle Yukon. With the Klondike Gold Rush of 1897–1898, steamboats began to ply the Yukon River regularly during summer months, bringing thousands of people with them.

A military telegraph line between Valdez and Fort Egbert, with a branch line to Fort Gibbon along the Yukon River, was completed in 1902. Maintenance stations were built every 40 to 50 miles. The communities of Old Minto and Tanana built up around these maintenance stations.

2.2.3 Ethnographic Context (Modern Communities in the Study Area)

The proposed Project is located within traditional Koyukon Athabascan and Iñupiaq territories. The criteria for selecting communities for this ethnographic analysis include communities within 50 miles of proposed Project alternatives that have a population comprised of 50 percent or more Alaska Native and/or a federally recognized tribe that is affiliated with the community (Table 1 and Figure 2).

The basis for these criteria is that these communities with higher percentages of Native populations and/or a federally recognized tribe are most likely to hold indigenous cultural values and traditional ties to areas that may be affected by industrial development. In total, this analysis identified 12 communities with traditional ties to the study area, including seven communities with Koyukon Athabascan cultural affiliations to the study area, one with Tanana Athabascan affiliations, and four with Iñupiaq affiliations. All communities have federally recognized tribes. Only Manley Hot Springs has a population of fewer than 50 percent Alaska Native as of the last census.

The 2014 NLURA data gap report provided a community summary for four modern villages within the original study area, including Bettles/Evansville, Kobuk, Shungnak, and Ambler. Using the above criteria, HDR identified eight additional communities for ethnographic analysis. These eight settlements are discussed briefly in the following section. Collectively, these 12 modern settlements are summarized in Table 1, and are organized by the primary indigenous group of the modern community, beginning with Athabascan communities and followed by Iñupiaq communities.

Athabascan Communities

At the time of contact, Athabascan people lived in small bands, moving between lakes, rivers, and mountains on a seasonal round of hunting, fishing, and harvesting berries and other plants (Olson 1968). Although Athabascan bands had traditional areas for these activities, they also are known to have travelled and traded widely. When Lieutenant Allen (1887) passed through the Tanana and Kobuk River region in 1885, he remarked on the extensive nature of Athabascan trade, noting items from as far away as the Yukon River and Chilkoot Inlet.

The late nineteenth and early twentieth centuries saw a series of government expeditions, gold rushes, development of new transportation routes, and implementation of a federal education system that impacted Athabascan bands throughout Alaska’s interior. In the early twentieth century, missionaries and the federal school system increased Native sedentism as families began to remain in a single location throughout the year. Many Tanana and Koyukon Athabascans began participating in a mixed economy of wage labor jobs such as cutting wood for steamboats or trapping and trading furs. Key sources of traditional food, including caribou and muskox, also suffered crashes during this time, increasing the need for families to shift from traditional subsistence ways of life to more sedentary wage-economy jobs. Sharing of knowledge and continuation of traditional cultural practices was also inhibited by the forced placement of school-age children in federal boarding schools, far from home.

Tanana

Tanana is located two miles west of the junction of the Tanana and Yukon Rivers, 130 air miles west of Fairbanks. The area at the confluence of the rivers was long a site for trading between Koyukon, Gwichin, and Tanana Athabascans. By the 1870s, there were several itinerant trading sites near the confluence of the Tanana and Yukon Rivers; however, the Tanana River had not yet been travelled by white traders or explorers. Dall (1870) noted that the Tanana River Athabascans had, up to that point, the least interaction with whites.

Table 1: Communities and Cultural Affiliation Located Nearest the Proposed Project

Community Number	Study Community	Cultural Affiliation	Community within 50 miles	Criteria for Inclusion in Ethnographic Analysis: 50 % or more Alaska Native Population	Criteria for Inclusion in Ethnographic Analysis: Federally Recognized Tribes
1	Allakaket	Koyukon	Yes	Yes	Yes
2	Evansville	Koyukon	Yes	Yes	Yes
3	Hughes	Koyukon	Yes	Yes	Yes
4	Huslia	Koyukon	Yes	Yes	Yes
5	Manley Hot Springs	Koyukon	Yes	No	Yes
6	Rampart	Koyukon	Yes	Yes	Yes
7	Tanana	Koyukon	Yes	Yes	Yes
8	Minto	Tanana	Yes	Yes	Yes
9	Alatna	Iñupiaq	Yes	Yes	Yes
10	Ambler	Iñupiaq	Yes	Yes	Yes
11	Kobuk	Iñupiaq	Yes	Yes	Yes
12	Shungnak	Iñupiaq	Yes	Yes	Yes

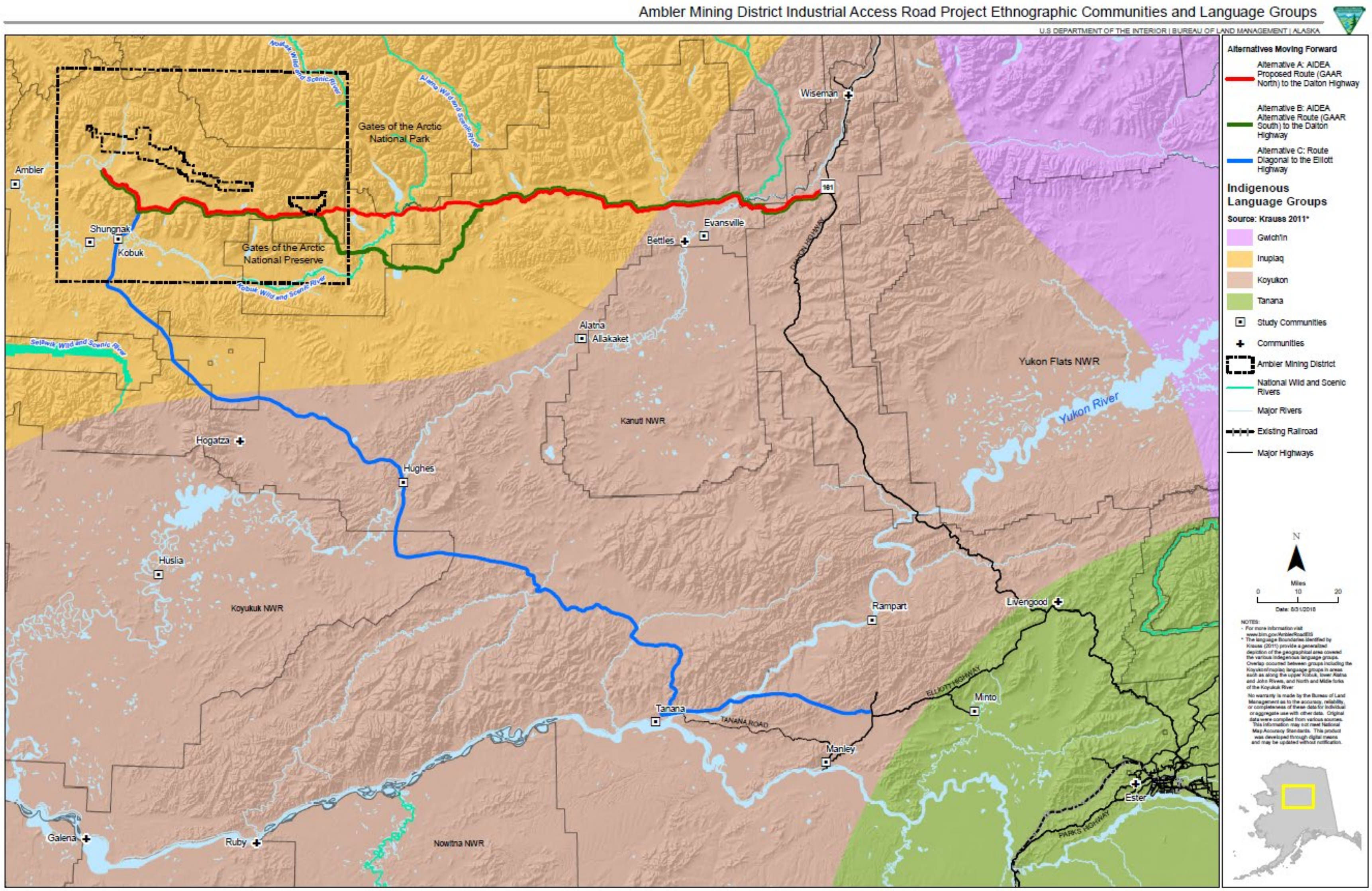

Figure 2: Ethnographic Communities and Language Groups (Krauss 2011).

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RAC traders reached the confluence of the Tanana and Yukon Rivers and established a trading post there sometime around 1861 (Brooks 1973). In 1880, a trader by the name of Bean opened a small trading post approximately 48 miles from the mouth of the Tanana River. He closed the post the following year when his wife was murdered (Olson 1968). Arthur Harper established a trading post with the Alaska Commercial Company downriver from the modern community of Tanana in 1880. When Allen passed through in 1887, he intended to stop at "Nuklukeyet," shown on his map as a village at the junction of the Tanana and Yukon Rivers. Allen (1887:86) discovered that the area near the junction was "merely the ground where the natives formerly assembled for trading purposes," and that "Nukilarai" was the name of the trading station a few miles downriver. However, he proceeded to refer to Nukilarai as Nuklukeyet, and it was at this location that Natives from Tanana, Fort Yukon, and Koyukuk amassed at the end of June for trading (Allen 1887).

In 1898, Fort Gibbon was founded by the US Army at modern Tanana to maintain the military telegraph line to Nome. That same year, a post office, the St. James Episcopal Church, a mission school, and hospital complex were also founded, providing services for white gold seekers and Natives (Community Database Online [CDO] 2018). Fort Gibbon closed in 1923, but the community that had grown up around it remained. Later, a White Alice Site, an early missile detection and communication site, was built on the hills behind Tanana during the Cold War era. The Episcopal mission closed in the 1950s.

Hughes

Hughes is located at the base of on a 500-foot bluff on the east bank of the Koyukuk River, 210 air miles northwest of Fairbanks. In 1884, Roy (Frederick) Hughes began prospecting the Hughes Bar, an area 2 miles upstream from the modern community of Hughes. At some time in the early 1900s, Alfred Isaac, a Koyukon man, discovered gold and the area became known as Indian Mountain and Indian River (Koyukuk River Tribal Tours [KRTT] 2018). The modern community was named after New York Governor Charles Hughes in 1910, when it was established as a riverboat landing to service mining endeavors in the Indian River diggings, approximately 20 miles away (KRTT 2018, Orth 1967). The community thrived as a mining camp until 1915, after which the mining industry declined. Placer mining continued in the area into the early 1960s (KRTT 2018). The first post office was established in 1914, rescinded in 1916 after the gold ran out, and then re-established in 1942.

Following the decline of gold mining, the community evolved into a Koyukon Athabascan village. The 1950s saw infrastructure improvements, including an airstrip. The US Air Force constructed the Indian Mountain Air Force Station and early warning defense radar station in 1951 (KRTT 2018). A school was built in 1956, and a health clinic was built in 1968. Hughes incorporated as a city in 1973. Most of the city was destroyed in a flood in 1994, and had to be rebuilt or rehabilitated by residents (KRTT 2018).

Huslia

Huslia is located on the north bank of the Koyukuk River, 290 air miles west of Fairbanks. It is the only community that lies within the Koyukuk National Wildlife Refuge. Koyukon Athabascans had seasonal settlements between the south fork of the Koyukuk River and the Kateel River. In 1887, Lieutenant Allen explored the Koyukuk River, recording “Hussliakanta” as a village of 14 Koyukon Athabascans and “Husaliakaket” as the name of a nearby stream (Allen 1887). Allen (1887) described a wide system of portages to the north, south, and west, used by the Koyukon Athabascans for trade with neighboring Athabascan and Eskimo bands, and at fur trading posts along the Yukon River.

Koyukon Athabascans were living at the village of Cutoff, located approximately four overland miles or 16 river miles from the modern community of Huslia. The name was derived from its location at the lower end of Treat Island, where miles of river can be “cut off” by following the east channel around the island (Rearden 2006). Jack Sackett, a prospector, trapper, and trader in the region, built a trading post at Cutoff. The store was supplied once per year by barge, and serviced the community of 150 Natives (Rearden 2006).

A post office was built at Cutoff in 1947. Cutoff was the site of frequent flooding, and the community relocated in 1949 to higher ground upriver and took the name of Huslia, after the local stream name (CDO 2018). The area around modern Huslia had been used as a burial site since 1886, although much of the burial grounds had already eroded by the time of the move (CDO 2018). The 1950s saw the construction of the first school, post office, and airport, and families beginning to live year-round at Huslia. The 1960s saw further community development with the construction of a health clinic and the installation of 29 individual hand-pumped water wells (CDO 2018). The city incorporated in 1969.

Manley Hot Springs

Manley Hot Springs is located approximately 5 miles north of the Tanana River on Hot Springs Slough, at the end of the Elliott Highway, 160 road miles west of Fairbanks.

In 1902, John Karshner, a mining prospector, located his agricultural homesteaded on 278 acres near the hot springs (CDO 2018). Around the same time, the US Army built a telegraph station there, and a trading post and small settlement, originally known Baker’s Creek after a nearby creek, developed nearby (CDO 2018, Cobb and Sasser 2000). Baker’s Creek soon became known as “Hot Springs,” and it became a service and supply point for miners in the Eureka and Tofty mining districts. In 1903, the first roadhouse was constructed at Hot Springs. In 1907, the area saw a small gold boom. That same year, miner Frank Manley built the Hot Springs Resort Hotel, boasting 45 guest rooms, steam heat, electric lights, hot baths, bar, restaurant, billiard room, bowling alley, barber shop, and an Olympic-size indoor swimming pool that used heated water from the hot springs (CDO 2018). In the early twentieth century, Manley could be reached by boat on the Tanana River during the summer. During the winter, the overland trip from Fairbanks took two days. The Alaska Commercial Company built a store at Manley and operated a postal service, employing dog teams to deliver mail to the community on a mail route between Nenana and Nome (Scott 1990). By the 1910s, the local population was reported as 101, although there may have been hundreds more people in the area (Orth 1967, CDO 2018). The decline of mining locally saw the community dwindle to 29 people by 1920 (Orth 1967). The late 1950s saw the name change to Manley Hot Springs in 1957 and the opening of a small school in 1958. In 1959, completion of the Elliott Highway linked Manley to Fairbanks during summer months. But it was not until 1982, that the State began maintaining the highway for year-round use (CDO 2018).

Rampart

Rampart is located on the south bank of the Yukon River, approximately 75 miles upstream from its junction with the Tanana River, 100 miles northwest of Fairbanks. Rampart's name refers to the "rampart-like mountain front" of low mountains through which the Yukon River passes (CDO 2018, Orth 1967).

In 1894, John Minook, of Athabascan and Russian heritage, discovered gold on Minook Creek. Soon after, a gold rush began in the Rampart mining district, with gold seekers staking claims on Minook Creek and its tributaries. By 1897, Rampart City was established as a river supply point for area gold placer mines. Rampart grew quickly, boasting for a time a newspaper, hotels, saloons, library, fire department, hospital, and a host of stores (CDO 2018). A system of government was installed and rapidly evolved from "miners" meetings, to a limited trusteeship, to a single military overseer, and finally to an elected mayor (L'Ecuyer 1995). Thousands of gold seekers rushed to the region. By late 1897, there were 1,500 people in and around Rampart (L'Ecuyer 1995).

Like many of the gold rush booms of the era, the boom in Rampart did not last long. By fall 1898, Rampart area miners were already striking out hundreds of miles away to places such as the Upper Koyukuk River, Anvil Creek, Nome, and Fairbanks (L'Ecuyer 1995, CDO 2018). By 1903, a small Native community remained at Rampart. However, the population was described as "little more than a score" in 1913 (Eakin 1913). By 1917, the population had grown to approximately 30 Natives and 30 non-Natives (CDO 2018). A University of Alaska agricultural experiment station, established across the river from Rampart in 1900, had more than 90 acres under cultivation by 1920, growing grains, legumes, vegetables, strawberries, and flowers. The agricultural station closed in 1925 (CDO 2018).

Community developments from the late 1930s saw the construction of an airstrip by the Alaska Road Commission (1939), a salmon cannery (1940s), and logging and sawmilling operation (1950s) (CDO 2018).

Minto

Minto is located on the west bank of the Tolovana River, 130 miles northwest of Anchorage. The community can be reached by an 11-mile spur road off the Elliott Highway. The Minto Flats area played prominently in the seasonal round for the Minto Band in the early twentieth century. Late summer and early fall seasonal settlements were primarily on salmon and whitefish bearing streams in the northern and eastern portions of Minto Flats (Andrews 1988). These areas were also used for fall moose and caribou hunting (Andrews 1988, Olson 1981). Natives from Steven's Village and Tanana also used the Minto Flats area for spring muskrat hunting (Andrews 1988, Olson 1968). During the early part of the twentieth century, the central flats area around Cache was a main settlement area for the Minto Band (Olson 1981).

In 1902, a military telegraph line was built between Valdez and Fort Egbert, with a branch line to Fort Gibbon at Tanana, which had small manned stations every 40 to 50 miles. One of those stations was the Minto Telegraph station on the Tanana River. In 1915, several Minto Band families built homes along the Tanana River, seven miles downriver from the telegraph station, calling their newly formed village by the same name (McKennan 1981, Olson 1981).

The village of Minto grew in the 1920s, when more Minto Band members from nearby Nenana and Cache moved to the new village. By 1937, a Bureau of Indian Affairs (BIA) school was built there (Andrews 1988, Loring and Gerlach 2010, Olson 1968). However, by the 1940s and 1950s, students began leaving the village for secondary education at Native schools in Sitka, Oregon, and Oklahoma (Olson 1981).

The mid-twentieth century saw increased use of the Minto Flats area by non-Natives for hunting and fishing, fueling Minto residents' frustration at what they considered an encroachment on their land (Olson 1981). After repeated flooding of the Tanana River and erosion problems at Minto, villagers decided to relocate the village. In 1968, the new village was established near the Neal Charlie family's hunting camp in Minto Flats. A year later, the Alaska Housing Authority built 30 homes at the new village site, and most of the residents from Old Minto moved to the new village within three to four years (Corbin et al. 2014).

<u>Allakaket</u>

Allakaket is on the south bank of the Koyukuk River, 190 air miles northwest of Fairbanks. The village of Alatna is located directly across the river. The two villages are at the confluence of the Koyukuk and Alatna Rivers. The area was a traditional trading center for Koyukon Athabascans and Kobuk, Selawik, and Nunamiut Eskimos from the north and northwest.

In 1906, Episcopal missionaries began St. John's of the Wilderness, the first mission on the Koyukuk River. The mission was positioned between the Koyukon and Kobuk settlements. Apart from the two women missionaries, Allakaket and Alatna were entirely Native communities, although a small trading post operated on the Koyukuk River approximately 10 miles away (Stuck 1910). Allakaket is the Koyukon Athabascan name for the "mouth of the Alatna [River]" and was the name Archdeacon Stuck used for the Episcopal mission's location (Orth 1967). In 1925, a post office was established as Alatna, but changed to Allakaket in 1938. Allakaket became the name for the settlement of Koyukon Athabascans, and Alatna was used for the Kobuk Eskimo settlement across the river.

The second half of the twentieth century saw further development of the community. A school was built in 1957. The community incorporated as a city in 1975. In 1987, a clinic and airport were built. The following year, in 1979, a new school was constructed. Most of the community was destroyed in a flood in 1994; however, it was rebuilt near the old city site (CDO 2018).

Iñupiaq Communities

Iñupiat are often subdivided into Nunamiut, or inland people, and Tagiugmiut, or coastal people, whose subsistence focus either on consumption of whale or caribou (Spencer 1984). Burch (1998) points out that the binary model described above may be overly simplistic, and that a cellular territorial model, emphasizing numerous circumscribed territorial boundaries is more accurate. Historically, the primary Iñupiaq social unit was a “local family,” which contained several generations of married children and their families within a lineage. The approximate population of a local family might vary from 12 to 50 or more members depending on subsistence circumstances. Iñupiat practiced a seasonal round, harvesting land and marine resources at a variety of locations throughout the year. Beginning in the late nineteenth century and continuing into the twentieth century, the combination of federal schools, reindeer herding, and missions resulted in an increase in sedentism and population rise in settlements throughout the northwestern Alaska (Burch 1984). Four Iñupiaq villages fall within the current study area: Kobuk, Shungnak, Ambler, and Alatna. As three of these have already been described in the 2014 NLUR data gap study, only Alatna is discussed below.

<u>Alatna</u>

Alatna is on the north bank of the Koyukuk River, southwest of its junction with the Alatna River, approximately 190 air miles northwest of Fairbanks. Alatna is across the river from Allakaket and shares a close history with that community (see Allakaket above). The Alatna population consists largely of descendants of Kobuk Eskimos (CDO 2018).

3. Cultural Resources in the Study Area

This section describes previously recorded cultural resources and an overview of the potential archaeological and ethnographic site types that could be identified in the Project study area. As previously stated in Section 1.3, HDR examined a 10-mile corridor around each of the three alternative routes for previously identified cultural resources and previous cultural resources investigations. HDR also identified cultural resources within a 1,000-foot corridor of the alternatives to determine those resources that are likely to be directly impacted by the proposed Project. This analysis focuses primarily on cultural resources that have been reported in the AHRS database.

The AHRS is the primary repository of archaeological site information for the State of Alaska. The AHRS contains locational and descriptive information for historic and prehistoric properties, as well as limited information regarding paleontological resources. It is a restricted access database that contains sensitive locational information; it is not a public use data set. The AHRS is continually updated with information from cultural resources inventories conducted in compliance with Sections 110 and 106 of the NHPA and the AHPA (AS 41.35.070), as well as information from other archaeological research and input.

The AHRS is not a "complete" inventory of archaeological and historic site location information for Alaska, as only a relatively small portion of the State has been subject to archaeological survey, and methods and standards for recording site locations have changed over time (e.g., through changes in Global Positioning System technology). In addition, modern sites continually "age-in" or reach the age at which they can be considered for NRHP eligibility. In some instances, new archaeological sites may be identified in previously surveyed areas due to changes in land cover and vegetation, or landscape changes that result in increased ground surface visibility. Federal land managers typically report archaeological site information to the AHRS, but some site types like modern subsistence use areas or traditional use areas may not be included in the AHRS database. Eligibility for inclusion in the NRHP is not a consideration for the designation of sites in the AHRS database; many AHRS are not eligible for inclusion in the NRHP, or have never had determinations of eligibility. For example, paleontological sites cannot be considered for NRHP eligibility but are recorded in the AHRS per AHPA regulation, and cultural resource sites designated with an AHRS number may be determined not eligible for the NRHP, but would regardless remain in the AHRS. It is generally reasonable to assume that NRHP-listed sites are reported in the AHRS.

In the following subsections, previously recorded AHRS sites are listed and categorized by typological attributes recorded in the AHRS. The resulting AHRS site typology is diverse, an expected outcome considering the broad geographical area encompassed by the combined Project alternatives. Previously recorded AHRS sites range temporally from the historic, prehistoric, and paleontological periods. Historic themes represented by sites in the AHRS include trapping, hunting, camping, homesteading, mining, reindeer herding, military, transportation infrastructure, telecommunications, aviation, religion, and education. Prehistoric sites also reflect a diverse range of activities and types, including caches or food storage, culturally modified trees, prehistoric camps, habitations, rock shelters, and villages. Numerous prehistoric artifact isolates and scatters demonstrate the use of distinct artifact and feature classes over an expansive time span. As reflected in the AHRS, evidence of prehistoric and historic funerary activities include human remains, burials, and cemeteries. Many of the site types described above are encompassed within previously designated historic districts, including the Batza Tena Archaeological District (MLZ-00002). Additional information is presented below.

3.1. Archaeological Resource Site Probability

In an effort to understand the types of archaeological resources that are likely to be identified in the Project study area and the potential to locate these sites in a large area, this section briefly discusses archaeological resource probability modeling. The ability of archaeologists to recognize and identify cultural resources in the field is influenced and/or limited by a variety of factors, including past human land use patterns, the signature of these patterns on the landscape, and subsequent human or environmental factors that may obscure or erase these signatures.

Due to the large physical area encompassed by the combined Project alternatives, an understanding of archaeological probability factors is necessary to predict the locations where previously unrecorded cultural resources are likely to occur. Information related to archaeological site probability may be utilized in the future implementation of an archaeological fieldwork program. Such methods have been used recently during the fieldwork stages of large cultural resources investigations, such as those conducted along extensive oil and gas corridors, as well as previous fieldwork conducted in support of this Project (Blanchard et al. 2014b, 2015).

Characteristics of the physical environment influence the intensity with which human populations utilized specific areas in the past. High probability zones for the identification of archaeological sites may include areas in proximity to natural resource (e.g., plants, fish/wildlife, water, lithic raw materials, wood) procurement areas; along travel routes, access corridors, or locations that otherwise afford passage over difficult terrain; or elevated areas or locations affording a substantial view shed, which are known to have been useful for defensive, spiritual, or hunting purposes in the past.

Conversely, various environmental zones are poorly suited to the identification of archaeological sites, regardless of the hypothetical utility of the area for prehistoric populations. Examples of low probability areas include saturated wetland areas, where it is impractical to conduct survey by pedestrian methods; steep slopes, where artifacts or features may wash downslope or otherwise prove dangerous for field investigation; areas of dense vegetation, where subsurface testing is required to gain knowledge of archaeological site distribution; areas of modern human disturbance, where previously existing archaeological materials may have been destroyed or otherwise removed from their context; or naturally disturbed areas (e.g., an active floodplain).

In addition, areas of moderate probability may be characterized based on a combination of factors identified above such as areas with good surface exposure located a greater distance from water or other natural resources. Examples of hypothetical probability zones are provided in Table 2.

Characteristics that were valued or used during the historic period should also be considered. It is generally assumed that historic sites can be identified through the written record, but that is not always the case. Furthermore, historic land use, including mining, exploration, and military use of the landscape, along with other historic activities, will introduce other factors that should be taken into consideration for archaeological site location probability modeling.

Table 2: Examples of Archaeological Site Probability Factors

Probability Zone	Probability Factors
High Probability	• Proximity to the confluences of existing and relict rivers and streams • Well-drained terraces adjacent to rivers and streams • High ground near an important resource • Proximity to travel ways (trails/streams) • High prominences above surrounding terrain usable as lookouts for game • Rock shelters and caves • Shorelines • Inlets and outlets of lakes • Perennial snow and ice patches • Proximity to previously recorded cultural resources
Moderate Probability	• Areas with some prospect of finding cultural resources but less than high potential • Along high riverbanks • Dry land with no topographic prominence relative to the surrounding terrain • High banks along the shores of lakes
Low Probability	• Wetland areas • Recent geological features such as active river floodplain or islands • Areas with steep inclines • Areas where previous ground surface and subsurface has been destroyed • Dry lakes or stream beds • Areas determined not suitable for occupation • Areas with low potential for site

3.2. Previously Recorded Cultural Resources in the Project Study Area

As previously discussed, this data gap considers known cultural resources within 10 miles around the proposed routes and alternatives. There are a total of 516 AHRS sites within the combined AIDEA Proposed, AIDEA Alternative, and Route Diagonal to the Elliott Highway 10-mile corridors (Table 3). However, there are likely dozens or even hundreds of additional sites along the routes that have not yet been recorded.

A portion of all recorded sites are common to two or more alternatives (97 total overlaps); however, significant overlap in sites occurs only between the AIDEA Proposed and AIDEA Alternative Route corridors (92 overlaps). Only five sites overlap with the Route Diagonal to the

Elliott Highway. Most AHRS sites located within the 10-mile corridors remain unevaluated for the NRHP, ranging from 74 percent (Route Diagonal to the Elliott Highway) to 96 percent (AIDEA Proposed Route). Site locations within the 10-mile corridors of the alternative routes are exhibited on Project study area maps in Appendix B. Detailed information on all 516 AHRS sites within the Project study area can be found in Appendix C.

Table 3: Total Number of Cultural Resources Sites within the 10-mile Project Route Corridors

Corridor	Mileage	Number of AHRS Sites	Determined Eligible	Determined Not Eligible	Unevaluated
AIDEA Proposed	211.18	289	1	10	278
AIDEA Alternative	228.37	134	1	10	123
Route Diagonal to the Elliott Highway	317.43	195	25	26	144

A total of 19 AHRS sites are located within a 500-foot buffer (1,000-foot corridor) for the combined AIDEA Proposed, AIDEA Alternative, and Route Diagonal to the Elliott Highway corridors (Table 4). As with sites located within the 10-mile Route corridors, several of these sites are common to two or more alternatives: six sites are common to the AIDEA Proposed and AIDEA Alternative Route corridors while one site is common to all three alternatives. As with sites located within the 10-mile Route corridors, the majority of AHRS sites within 500 feet of the combined centerlines remain unevaluated for the NRHP.

Table 4: Cultural Resources Sites within the 1,000-foot Project Route Corridors

Corridor	Mileage	Number of AHRS Sites	Determined Eligible	Determined Not Eligible	Unevaluated
AIDEA Proposed	211.18	9	None	None	9
AIDEA Alternative	228.37	8	None	None	8
Route Diagonal to the Elliott Highway	317.43	10	2	None	8

Provided below is a summary of the AHRS site types within the 10-mile corridor of each of the four proposed alternative routes (Sections 3.2.1–3.2.3).

3.2.1 AIDEA Proposed Route Corridor

There are 289 previously recorded AHRS sites located within the 10-mile AIDEA Proposed Route corridor: 29 historic, 254 prehistoric, 4 prehistoric/historic (multicomponent), and 2 paleontological (Table 5). The majority of AHRS sites are prehistoric lithic scatters (194) or lithic isolates (51). A variety of historic site types are also apparent, including sites related to trapping, transportation, mining, and camping. [redacted]

Table 5: AHRS Sites within the AIDEA Proposed Route 10-mile Corridor

Site Type	Historic Sites	Prehistoric Sites	Prehistoric/Historic Sites	Paleontological Sites	Total
Cache/Surface Depressions	0	2	0	None	2
Cabin	5	None	None	None	5
Cairn	None	1	None	None	1
Ditch	1	0	0	0	1
Historic Artifact Scatter	8	0	0	0	8
Lithic Isolate	0	51	0	0	51
Lithic Scatter	0	194	0	0	194
Mixed Prehistoric Artifacts	0	3	0	0	3
Mining	5	0	0	0	5
Paleontological	0	0	0	2	2
Prehistoric Habitation	0	2	0	0	2
Prehistoric/Historic Artifact Scatter	0	0	4	0	4
Transportation	5	0	0	0	5
Tent remains/camp	3	0	0	0	3
Trap	2	0	0	0	2
Undefined	0	1	0	0	1
Total	**29**	**254**	**4**	**2**	**289**

3.2.2 AIDEA Alternative Route Corridor

There are 134 previously recorded AHRS sites located within the AIDEA Alternative Route corridor: 17 historic, 111 prehistoric, 4 prehistoric/historic (multicomponent), and 2 paleontological (Table 6). The majority of AHRS sites are prehistoric lithic scatters (86) or lithic isolates (14). As with the AIDEA Proposed Route corridor, a variety of historic site types are also represented, including sites related to trapping, transportation, mining, and camping. Although concentrations of AHRS sites do occur along the AIDEA Alternative Route corridor, dense concentrations of sites, such as those described above in relation to the AIDEA Proposed Route corridor are not apparent, resulting in lower total numbers of sites.

Table 6: AHRS Sites within the AIDEA Alternative Route 10-mile Corridor

Site Type	Historic Sites	Prehistoric Sites	Prehistoric/Historic Sites	Paleontological Sites	Total
Cache/Surface Depressions	0	2	0	0	2
Cabin	4	0	0	0	4
Cairn	0	1	0	0	1
Ditch	1	0	0	0	1
Historic Artifact Scatter	1	0	0	0	1
Lithic Isolate	0	14	0	0	14
Lithic Scatter	0	86	1	0	87
Mixed Prehistoric Artifacts	0	3	0	0	3
Mining	5	0	0	0	5
Paleontological	0	0	0	2	2
Prehistoric Habitation	0	2	0	0	2

Site Type	Historic Sites	Prehistoric Sites	Prehistoric/Historic Sites	Paleontological Sites	Total
Prehistoric/Historic Artifact Scatter	0	0	3	0	3
Transportation	5	0	0	0	5
Trap	1	0	0	0	1
Undefined	0	3	0	0	3
Total	**17**	**111**	**4**	**2**	**134**

3.2.3 Route Diagonal to the Elliott Highway Corridor

There are 195 previously recorded AHRS sites located within the Route Diagonal to the Elliott Highway corridor: 77 historic sites, 108 prehistoric sites, 4 prehistoric/historic (multicomponent), 2 paleontological sites, 1 modern site, and 3 sites with no age attributed (Table 7). [redacted]

Table 7: AHRS Sites within the Route Diagonal to the Elliott Highway 10-mile Corridor

Site Type	Historic Sites	Prehistoric Sites	Prehistoric/ Historic Sites	Paleontological Sites	Modern Sites	Undefined Sites	Total
Archaeological District	0	1	0	0	0	0	1
Aviation	2	0	0	0	0	0	2
Bridge	1	0	0	0	0	0	1
Building	29	0	0	0	0	0	29
Burial/Cemetery	1	0	1	0	1	1	4
Cabin	8	0	0	0	0	0	8
Cache/Surface Depressions	0	3	0	0	0	0	3
Cairn	0	1	0	0	0	0	1
Camp	1	1	1	0	0	0	3
Culvert	1	0	0	0	0	0	1
Ditch	2	0	0	0	0	0	2
Habitation	1	2	0	0	0	0	3
Historic Artifact Scatter	3	0	0	0	0	0	3
Homestead	0	0	0	0	0	1	1
Hospital	2	0	0	0	0	0	2
Lithic Scatter	0	86	0	0	0	0	86
Material Source	0	8	0	0	0	0	8
Military	2	0	0	0	0	0	2
Mining	7	0	0	0	0	0	7
Mission	1	0	0	0	0	0	1

Site Type	Historic Sites	Prehistoric Sites	Prehistoric/ Historic Sites	Paleontological Sites	Modern Sites	Undefined Sites	Total
Mixed Prehistoric Artifacts	0	3	0	0	0	0	3
Paleontological	0	0	0	2	0	0	2
Prehistoric/Historic Artifact Scatter	0	0	1	0	0	0	1
Roadhouse	1	0	0	0	0	0	1
School	1	0	0	0	0	0	1
Telegraph/ Communications	3	0	0	0	0	0	3
Trail	1	0	0	0	0	0	1
Transportation (Roads, Highways)	8	0	0	0	0	0	8
Undefined	0	1	0	0	0	0	2
Village	2	2	0	0	0	0	5
Total	**77**	**108**	**4**	**2**	**1**	**3**	**195**

3.3. Ethnographic Resource Types in the Study Area

Ethnographic resources are cultural and/or natural features of a region to which traditionally associated cultures have formed significant connections and that are closely linked with the communities' sense of purpose, existence as a community, development as ethnically distinctive people, and survival of their lifeways. Ethnographic resources are held as traditionally meaningful, and may be sites, landscapes, structures, objects, or natural resources such as plants, fish/wildlife, minerals, or water bodies that have legendary, religious, subsistence, or other significance in the cultural system of the group traditionally associated with them.

The significance that traditionally associated cultures assign to ethnographic resources may encompass both tangible and intangible aspects of these special places. These types of sites provide the Project with knowledge regarding places important to identity, spirituality, and in the case of ethnographic landscapes, a broader more holistic way of viewing cultural resources within the natural resources that surround them. Types of ethnographic resources that are identified in cultural resource regulations and guidance documents include districts, TCPs, ethnographic landscapes, and Native American sacred sites. These resource types are discussed in more detail below.

3.3.1 Districts

Districts are a cultural resources category composed of a variety of resources. This category is often used to encapsulate ethnographic resources under a single entity for purposes of evaluation for or listing on the NRHP (NPS 1997). In regards to ethnographic resources, districts derive their significance from the continuity and interrelationship of the culturally important sites, buildings, objects, and/or structures.

3.3.2 Traditional Cultural Properties (TCPs)

A TCP is a cultural resources category defined as a property "that is eligible for inclusion in the NRHP because of its association with cultural practices or beliefs of a living community that are (a) rooted in that community's history and (b) are important in maintaining the continuing cultural identity of the community" (Parker and King 1998).

3.3.3 Ethnographic Landscapes

Ethnographic landscapes are a category of cultural landscape defined by the NPS as consisting of a geographic area that is associated with a contemporary group and used or valued in traditional ways (Birnbaum 1994). An ethnographic landscape may contain a variety of natural and cultural features that groups may consider as heritage resources and that are culturally imbued with connections to distinctive and long-established group identities. Examples of these features include plant communities, waterways, fish/wildlife, customary and traditional use areas, and ceremonial grounds. Documentation of oral histories and Native place names are two common data collection methods that support the identification of ethnographic landscapes and other ethnographic resources.

3.3.4 Native American Sacred Sites

Native American sacred sites are locations with religious or ceremonial significance to Native American tribes. As defined in Executive Order 13007, a 'sacred site' refers to "any specific, discrete, narrowly delineated location on Federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site" (Section 1[1][b][iii]). These sites are specific, discrete, narrowly delineated locations on federal land that are identified as sacred due to their established religious significance to, or ceremonial use by, indigenous religious practitioners.

3.4. Existing Ethnographic Resources Data

The 2014 NLURA data gap report indicated that no formally designated TCPs or cultural landscapes existed within the Project study area (Blanchard et al. 2014a). A review of the AHRS database resulted in the identification of a number of potential ethnographic resources, including several identified as cultural landscapes. Additional research, however, is necessary to determine whether these resources, or any of the other AHRS sites in the Project study area, include the characteristics of an ethnographic resource (e.g., ethnographic landscape, TCP, or sacred site).

In addition to a review of the AHRS, NPS staff were consulted. During this consultation, it was determined that NPS-documented cultural landscapes within lands managed by the NPS (e.g., GAAR) that are crossed by Project alternatives may not be recorded in the AHRS. Several AHRS sites that are within the 10-mile corridor of the proposed Project alternatives do not indicate that cultural landscape documentation exists. However, consultation with the NPS has indicated that these AHRS sites are, or are components of, documented NPS cultural landscapes. Further research and consultation with the NPS is needed to determine the extent/boundary of the existing cultural landscapes and whether they may qualify as ethnographic resources.

Place name research, which can inform the presence of ethnographic resources near the Project study area, has been conducted for the Koyukon and Iñupiaq languages. Relevant place name research associated with the Project study area include documentation of Koyukon place names in the communities of Huslia, Hughes, and Koyukuk (McCloskey et al. 2014); documentation of place names in the communities of Alatna, Allakaket, and Hughes (Yukon River Drainage Fisheries Association 2008); and documentation of place names in Koyukon communities (Jones 1986). GAAR, in association with anthropologist Eileen Devinney, developed the Iñupiaq Place Names Project in the 1990s which compiled Iñupiaq place names from several projects in the region into a single source. The Northwest Arctic Borough has been recently involved in the Iñuuniałiqput Iḷiḷugu Nunaŋŋuanun (Documenting Our Way of Life Through Maps) compilation of Iñupiaq place names in the region.

4. Previous Cultural Resources Studies

Archaeological and ethnographic research has been conducted since the nineteenth century in interior and northwestern Alaska as a result of early exploration, academic research, and compliance-based cultural resource management surveys carried out by public and private entities. In the initial Project data gap analysis, NLUR identified the following historical themes or motivations that have resulted in previous research to the present day (Blanchard et al. 2014a:44-51):

- Early ethnographic research (nineteenth and early twentieth century);
- Early archaeological research in interior and northwestern Alaska (1910s–1950s);
- Early cultural and historical research, processual archaeology, and cultural resources management in the vicinity of the Project study area (1950s–1960s);
- Archaeological surveys conducted in advance of the construction of the Trans-Alaska Pipeline System and subsequent utility corridor research;
- ANCSA related research, pre- and post-ANILCA related research; and
- Research conducted in towns near the Project study area corridors.

Although the geographic area encompassed by the current Project alternatives is larger, previous research carried out in this study area has occurred largely for the same reasons. Additional information regarding these themes can be found in the previous data gap analysis (Blanchard et al. 2014a). For these reasons, the following subsections provide information regarding previous archaeological and studies conducted in the direct alignment of the identified alternatives, as well as ethnographic information relevant to all of the alternative routes from a broader perspective.

4.1. Archaeological Studies

4.1.1 Corridor Specific Research

The most comprehensive archaeological surveys within the Project study area occurred during the 2013 and 2014 field seasons. NLURA, on behalf of AIDEA, conducted these surveys, which included both reconnaissance (Blanchard et al. 2014b) and intensive survey efforts (Blanchard et al. 2015). Both surveys utilized a methodology informed by a combination of Geographic Information System (GIS) based probability modeling, supplemented by helicopter assisted visual inspection of the ground surface in which 'low and slow' helicopter flight patterns serve primarily to identify landforms where preserved cultural remains are either likely or observable. When high probability landforms were identified through aerial reconnaissance, additional fieldwork was conducted via pedestrian survey strategies and subsurface testing. Additional information regarding the methods and results of these surveys is described below.

The 2013 study conducted by NLUR was carried out as a Class I reconnaissance level survey. As stated in the inventory report, the purpose of this initial survey was to "familiarize NLURA personnel with the landscape and vegetation within the corridor and ground truth assessments made during the helicopter survey," (Blanchard et al. 2014b:62). NLURA investigated a 2,000-foot corridor (1,000-foot buffer) surrounding the Project corridor centerlines, which corresponded to the AIDEA Proposed and AIDEA Alternative Routes in 2013.

This field investigation focused on lands managed by the BLM, State of Alaska, and NPS; ANCSA Native corporation land was also surveyed. Individual survey areas within the larger Project corridors were identified through a GIS analysis, in which "Locations of Interest" (LOIs), or high-probability areas, where identified. This GIS analysis involved examining a combination of high-precision Light Detection and Ranging (LIDAR) surface models and aerial imagery. A total of 772 LOIs were identified through the GIS analysis. Twenty-three of these LOIs were subjected to pedestrian survey; an additional three LOIs were identified during aerial over-flight of the entire length of the alignments. The total pedestrian survey conducted during the 2013 survey was 338.29 acres. Two newly recorded sites were identified as a result of this survey: AMR-00227, a lithic and milled wood scatter, and AMR-00228, a stone cairn.

In 2014, NLURA conducted additional survey within the Project corridor (Blanchard et al. 2015). This fieldwork consisted of an intensive cultural resources survey of NPS managed lands in GAAR. The study area was modified to consist of a 300-foot corridor (150-foot buffer) surrounding the alternative alignment centerlines. This survey was restricted to GAAR. The survey was conducted at a more intensive level than the 2013 survey, and was considered to be sufficient to conduct determinations of eligibility at sites identified along the alignment.

As with the larger reconnaissance survey conducted in 2013, the survey methods involved the delineation of high and low probability areas using a combination of GIS modeling and helicopter survey, followed by pedestrian survey and subsurface testing. The entire corridor within GAAR was subjected to helicopter survey to ground truth the GIS based probability model. All identified high probability areas were pedestrian surveyed. Due to dense vegetation encountered in much of the survey area, pedestrian survey functioned primarily to identify areas suitable for subsurface testing, which is required to identify subsurface prehistoric archaeological sites. In total, 33 areas were subjected to subsurface testing. Two previously recorded sites, and two newly recorded sites were identified. Site XSP-00058, a lithic scatter, was recommended as individually eligible for the NRHP, and three sites, XSP-00072, XSP000495, and XSP-000496, were recommended as individually not eligible for the NRHP. To date, these recommendations have not received SHPO concurrence.

4.1.2 Additional Research in Project Alternative Corridors

The following section describes additional previously conducted archaeological surveys that coincide directly with the combined Project alternative corridors. To date, use of AHRS online search modules to identify previously conducted archaeological surveys in a specific geographic area is restricted to geographic and non-geographic search terms. Examples of geographic search terms include search categories such as Meridian, Township, Range, and Section (MTRS) designations and USGS topographic map names. Examples of non-geographic search terms include categories such as publications dates and author names. Considering the large size of

USGS quadrangle maps, the most precise method for searching for previously conducted surveys in a location is via a corresponding map section. To this end, GIS applications were used to identify all individual map sections that directly intersect the Project alignment centerlines. Intersecting map sections were then cross referenced to the AHRS search module to identify any previous surveys that have occurred in the corresponding map sections (Table 8).

Table 8: Locations of Previous Surveys

Project Route Corridor	Total Intersecting Map Sections	Intersecting Map Sections Where Survey has Occurred
AIDEA Proposed	252	14
AIDEA Alternative	274	6
Route Diagonal to the Elliott Highway	383	12

The results of the query revealed that previous surveys outside of those discussed in Section 4.1.1 are relatively sparse. The query identified 274 map sections associated with the AIDEA Alternative Route and previous surveys in 6 map sections; 252 map sections associated with the AIDEA Proposed Route and previous surveys in 14 map sections; and 383 map sections associated with the Route Diagonal to the Elliott Highway and previous surveys in 12 map sections.

4.2. Ethnographic Studies

A summary of previous ethnographic research in the vicinity of the study area has been provided in NLURA's data gap analysis completed for the Project study area, which was smaller than the geographic extent of the current Project alternatives (Blanchard et al. 2014). Early examples of ethnographic research in the area includes Nelson (1899), Dall (1870), Stefansson (1914), Rainey (1939), Hrdlicka (1943), and De Laguna (1947). More recent research includes the works of Anderson et al. (1977); Uhl and Uhl (1979); Nelson, Mautner, and Bane (1982); and Nelson (1983). While earlier ethnographic studies are valuable in providing the context and background research in which specific ethnographic resources can be identified and documented, they do not provide specific enough information to inform the number and magnitude of ethnographic resources potentially impacted by the proposed Project.

Ethnographic studies to identify specific ethnographic resources within the study area are limited. Recent NPS work has focused on inventorying cultural landscapes within NPS-managed lands in the vicinity of the Project study area including a reindeer herding cultural landscape (Kelsey Mork, NPS, personal communication). The extent to which these cultural landscapes contain ethnographic resources is a data gap that would require consultation with the NPS and those who may hold traditional and contemporary ties with these resources. In general, other than the broader NPS efforts to document cultural landscapes, focused ethnographic research to identify resources such as ethnographic landscapes, TCPs, or sacred sites is lacking for the Project study area.

5. Data Gaps and Information Sources

Consistent with the general data gaps identified in NLURA's 2014 report (Blanchard et al. 2014a), this section identifies cultural resources data gaps within the Project area. Data gaps previously discussed by NLURA (Blanchard et al. 2014a) that are applicable to the current data gap analysis include: site location information, Ambler Mining District Mining Sites, Assessment of BIA Native Allotments and 14(h)(1) Cemetery and Historical Sites, and bear no further discussion. The following data gap analysis includes updated information for the current proposed Project alternatives as well as identifying information sources that should be considered in future planning for cultural resources investigations in support of the Project.

5.1. Lack of Cultural Resources Investigations in the Alternative Corridors

As previously mentioned, very few cultural resources investigations have occurred in the Project alternative corridors. The most recent cultural resources investigations include the two studies conducted by NLURA in 2013 and 2014 (Blanchard et al. 2014b, 2015). These prior cultural resources field studies for the Project focused on eastern portions of early corridors of the Project and do not necessarily overlap with the current project area. Also, the Project area has been expanded to include new routes in areas not previously surveyed by NLURA for the project. Prior NLURA studies for the Project did not include field investigations for ancillary areas such as material sites, stockpile areas, work camps, etc. (Blanchard et al. 2014). To date, no portion of the current proposed Project has had sufficient cultural resources investigations to allow for an assessment of the corridor, the road alignment, and ancillary construction areas.

Comprehensive cultural resources investigations involving aerial and pedestrian field survey, with sub-surface testing and site evaluation will need to be conducted throughout the proposed project area. A research design specific to the Project, with clear research questions and survey and testing strategy, should be developed to guide the field investigations.

5.2. Prehistoric and Historic Period Sites in the AHRS

The AHRS system is a central data repository for Alaska's cultural resources that began as a map-based system with unique AHRS designations for cultural resource sites. The site designation has developed over time, resulting in site numbers and distribution not necessarily reflective of site size and scale. For example, one AHRS number may be associated with a single artifact or with hundreds of prehistoric house depressions.

A review of AHRS sites within the Project area shows a predominance of prehistoric sites. Several factors contribute to this, including prehistoric sites in the region having received more attention by researchers than the historic sites, the relatively recent development of theories and methods for historical archaeology, and the limited settlement and development in the Project area in the nineteenth and twentieth centuries (Blanchard et al. 2014a). However, a lack of cultural resource investigations throughout most of the Project area is the main reason for a lack of known AHRS sites in the region.

5.3. National Register of Historic Places Evaluations

Authorized by the NHPA, the National Register of Historic Places, administered by the NPS, is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect America's historic and archeological resources. The three alternative routes considered under the current data gap analysis are associated with just one historic property currently listed on the NRHP, the Tanana Mission (TAN-00018). Built in 1899 as an Episcopal church, the Tanana Mission was determined eligible for the NRHP (#77000230) on August 3, 1977, for multiple contributing factors. The mission is located in the Yukon-Koyukon Census Area within five miles of the Route Diagonal to the Elliott Highway.

In addition to the site listed on the register, 25 other sites have been determined eligible for the NRHP, either individually (8 sites) or as contributing elements to a district (17 sites). Thirty-four AHRS sites have previously been determined not eligible for the NRHP. In total, 60 of the 516 previously recorded sites have been evaluated for the NRHP, while the majority (456 sites) remain unevaluated for the NRHP.

In the future, previously recorded but unevaluated AHRS resources that coincide with the Project's APE must be evaluated for NRHP eligibility. In addition, subsequent cultural resources surveys may result in the identification of new AHRS resources that will require evaluation for NRHP.

5.4. Mining Sites and Historic Mining Records

As NLURA's 2014 data gap analysis has previously indicated, mining endeavors in remote Alaska have been practiced since the nineteenth century. Gold rush activity often caused stampedes of miners to swarm quickly into remote areas, gather easily obtainable resources, and then move on to the next reported hot spot. Many levels of mining activity have been tried in search of material wealth from panning and prospecting placer deposits to heavy machinery dredging, lode mining, or hydraulic mining. All of these methods can leave behind significant physical alterations and markers on the cultural landscape. The AHRS database only shows a minor amount of previously inventoried resources given such a large area. This leads to the likely conclusion that there are large gaps in the data in this region on historic mining sites.

NLURA (Blanchard et al. 2014a) also stated that modern mining endeavor locations often occupy the same areas as historic mining activity. New technologies are often developed that allow the prospectors to revisit older sites to extract resources once viewed as inaccessible or not profitable enough to justify the costs of extraction. For example, new methods and technologies allow old discarded tailing piles to be re-worked for valuable deposits not previously collected. Evaluation and inventory of modern mining locations would likely lead to further knowledge of historic resources within the region.

Other archival resources useful for researching data gaps in mining activities for the current study area include: 1) historic USGS topographic quadrangles and other historic maps; 2) Master Title Plats and associated Land Status Records (these are generally available through the BLM); 3) Alaska Division of Lands files for mining claim documents and other mining-related documentation; and 4) Review of available records through the Division of Geological and Geophysical Surveys including mineral survey plats, reports by the US Bureau of Mines, Geological Survey Bulletins, etc.

5.5. Ethnographic Resources

As identified above, there are limited ethnographic resources (districts, ethnographic landscapes, TCPs, or sacred sites) that have been documented with the study area. Reasons for this include the general overall lack of research in the region and the relatively new addition and focus on resources such as TCPs, sacred sites, and ethnographic landscapes to the cultural resource regulatory review. Given the lack of focused cultural resource research in the area, it is not surprising that broad resources such as ethnographic landscapes have not yet been documented as these resources are typically identified when an area has been more thoroughly examined and the interconnections between the natural and cultural environments become more apparent.

Scoping comments received to date identified the importance of cultural resources research to include consultation with Native groups and evaluation of the area to be impacted as a cultural landscape. While information regarding these resources may be gleaned, in part, from further research into previous studies (including place name studies) and scoping testimony, focused interviews and research with Iñupiaq and Koyukon groups would address this data gap. Field surveys combined with interviews with traditional knowledge holders would be one step in ascertaining where these resources may exist within the cultural resource study area. TCPs and sacred sites are usually identified by the indigenous cultures that inhabit a particular area, and future cultural and subsistence studies with local residents could include questions regarding the existence of TCPs or sacred sites within the cultural resource study area.

5.6. Oral Histories and Informant Interviews

The University of Alaska, Fairbanks has numerous oral histories of Alaska available digitally through Project Jukebox. The Gates of the Arctic Research Portal on Project Jukebox has digital links to interviews with residents from within and surrounding Gates of the Arctic National Park and Preserve. Also available through this database are listings of books, photographs, oral history recordings, archival films, archival collections, language materials, museum objects, journal articles, maps, and government documents. Communities within 50 miles of the current Project study area that are included in the Gates of the Arctic Research Portal are Allakaket and Alatna; Ambler; Bettles and Evansville; Hughes and Huslia; Kobuk; and Shungnak.

Other oral histories available on Project Jukebox that may contain relevant information regarding area history and cultural resources include the Kiana Village History Project Jukebox, Rampart

Project Jukebox, Tanana Tribal Council Project Jukebox, Reindeer Herding Jukebox, and Pioneer Miners of Alaska Project Jukebox. For this report, only a small number of Project Jukebox interviews were reviewed. These records should be examined during the planning and analysis phases of future cultural resources research.

5.7. Revised Statute (RS) 2477 Roads and Trails

As indicated by NLURA (Blanchard et al. 2014a), RS 2477 trails exist within the Project study area for AIDEA's Proposed and Alternate routes. RS 2477 derives from Section 8 of the Mining Law of 1866 and provides for the ROW for the construction of highways over public lands. Crude pack trails, sled dog trails, and wagon roads are all examples of RS 2477 roads and trails. RS 2477 roads and trails include those that exist on federal lands, as well as those that exist on former federal land now owned by the State or even by private parties. The Alaska Legislature recognizes more than 600 ROWs, and the Alaska Department of Natural Resources (ADNR) maintains RS 2477 case files that can be accessed online through ADNR. Several roads and trails on the AHRS database were identified as having the RST designation. These were located along all routes, including the Route Diagonal to the Elliott Highway corridors. The RS 2477 files were not accessed for this data gap analysis, but the records should be reviewed as part of future cultural resources identification efforts for the Project.

5.8. Paleontological Resources

As NLURA (Blanchard et al. 2014a) previously stated, paleontological resources are afforded protection under State of Alaska Historic Preservation Statutes that are located on State lands. Paleontological resources are also afforded protection on public lands administered by the federal government (e.g., Paleontological Resources Protection Act, 43 CFR 49, 36 CFR Part 2).

Paleontological studies can assist with current understanding of Alaska's prehistory by illuminating resources available to ancient peoples, and changes in the environment over time. Unfortunately, little paleontological research and inventory has occurred in the Project area. K. Don Lindsey conducted a paleontological inventory and assessment on public lands administered by the BLM in the State of Alaska in 1986 (Lindsey 1986). The NPS is compiling a comprehensive report and database of the paleontology of Arctic parks, including GAAR, which will identify what paleontological resources the parks contain, the condition of these resources, and their potential vulnerability to disturbance (Lanik et al. 2017).

Although the AHRS database includes paleontological resources, few paleontological sites are recorded in the database. The University of Alaska Museum of the North also maintains a paleontological database for locales in Alaska, and should also be consulted.

5.9. Geoarchaeological Research

Geomorphic processes have shaped Alaska's landscapes. An immense amount of glacial silt and sand deposits has been redistributed via wind mobilizations across much of the Beringian landscape, with many higher landforms near glaciers having been stripped of silts and sands while landscapes farther away from glaciers have over time been buried by significant loess deposits. Along Alaska's northwestern coasts, wind, wave, and storm activity over thousands of years has resulted in the deposition of parallel ridges of gravels and sands.

Understanding the prehistoric environment is crucial to the identification of buried sites, as well as to answering important questions regarding chronology, settlement, and subsistence activity of past peoples. Additionally, understanding ancient landscapes is necessary for determining prehistoric site distributions, reconstruct how prehistoric populations adapted to a changing landscape, and model the decision-making processes that underlay settlement and subsistence choices. Knowledge of the prehistoric environment that can be gleaned through geoarchaeological studies can be used for predictive modeling of past landscapes and site location and distribution. Testing of predictive models then helps to refine the process for future endeavors.

5.10. Other Site Information and Sources

Other sources that may have information pertinent to cultural resources and investigations in the Project study area include Alaska's Digital Archives, which is a digital curation of historical photographs, albums, oral histories, moving images, maps, documentaries, and physical objects from several of Alaska's libraries, museums, and archives. Other digital archives with potential pertinent information regarding cultural resources within the current Project study area include those available through the National Archives, which houses Alaska's archival material in Seattle but is currently digitizing their Alaska Records. Archival material through Alaska's Digital Archives and the National Archives has not been reviewed for this document but should be considered during the planning and analysis phases of future cultural resources research. Examination of historic aerial photographs, topographic maps, and LIDAR imagery in an attempt to locate previously unidentified cultural resources should also be considered when planning future studies in the Project area.

6. Summary and Recommendations

6.1. Data Gap Analysis Summary

In support of the BLM's NEPA and Section 106 compliance requirements, HDR conducted a cultural resources data gap analysis to examine current information about cultural resources and cultural resources investigations along with the data gaps that exist within the Project study area, which includes four alternative routes under consideration for NEPA analysis. The primary data source used in the analysis was the AHRS online database and its associated research modules. Additional sources of information included the NRHP database; the RS 2477 trails database; and publicly available data sources such as previously published books, articles, reports, and various other records. Staff at NPS were also contacted regarding the location of previously recorded sites and investigations on NPS lands.

For the purposes of this data gap analysis, the Project study area was defined by different analysis zones around the Project alternative routes. To be consistent with NLURA's 2014 data gap analysis and to allow for a broader view of the larger ethnographic landscape and potential indirect effects, the current data gap study relied upon a 10-mile study corridor around each alternative as a basis for identifying previously recorded cultural resources and investigations, both archaeological and ethnographic. HDR also examined a 1,000-foot corridor (500-foot buffer off centerline) around each alternative route to identify cultural resources that would likely be directly affected by the Project.

The results of this data gap analysis were not unlike the findings by NLURA in 2014. Although hundreds of AHRS sites were identified as a result of the analysis, the archaeological survey coverage is low and the majority of previous inventories occurred 10 or more years ago. Furthermore, studies focusing on ethnographic resources are limited in the Project study area and though several AHRS sites were identified as potential ethnographic resources, further research is required. Most AHRS sites lack NRHP determinations of eligibility, which are required under Section 106 to assess Project effects on historic properties. In addition, the locations of ancillary features for all Project alternatives (material sites, landing zones, etc.) have yet to be identified. This information will be required to identify all cultural resources that may be affected by the proposed Project. As this analysis was primarily focused on information contained within the AHRS database, other sources of information regarding cultural resources should be considered in future project planning.

6.2. Recommendations and Next Steps

Much like the findings in NLURA's 2014 data gap report, HDR's analysis also indicated that little cultural resources work has been conducted in the current Project study area and that little is known about the extent of cultural resources that may be affected by the proposed Project. The amount of investigations completed to date in the Project alternative corridors is insufficient for understanding the nature and range of both ethnographic and archaeological resources in the Project study area or to assess the effects of the proposed Project to those resources. As the Project moves forward, a number of studies will need to be conducted to identify cultural resources and assess project impacts to comply with NEPA and Section 106 requirements. The BLM should determine the level of effort required to fill the data gaps necessary to comply with NEPA and Section 106 through consultation with tribes, state and federal agencies, Project proponents, and other interested parties involved with the Project.

The following recommendations are provided for addressing gaps for archaeological resources:

- Research the data and information sources in Section 5 and in NLURA's 2014 cultural data gap report including, but not limited to: RS 2477 Roads and Trails files; Assessment of BIA Native Allotments and 14(h)(1) Cemetery and Historical Sites; oral histories; Alaska mining records; and various repositories of archival information on documents, maps, photographs, and other pertinent records.
- Develop a predictive model and survey strategy for archaeological resource identification. This should begin early in the planning process.
- Conduct field surveys and geoarchaeological research in the Project alternative corridor in an effort to identify new archaeological resources.
- In conjunction with ethnographic interviews, informants from the communities should also be asked questions regarding archaeological sites that are known to exist in the Project area as they are likely familiar with archaeological resource locations.

The following recommendations are provided for addressing gaps for ethnographic resources:

- Compile previously documented place names for the cultural resource study area to help identify ethnographic resources. Following the compilation of place name information, include place name research for areas lacking previous documentation.
- Conduct interviews focused on the identification of TCPs, sacred sites, and ethnographic landscapes. Ethnographic interview questions could be included in subsistence or cultural resource interviews to increase the efficiency of field studies.
- Research the existence of ethnographic resources in the AHRS database and potential overlap with NPS-documented cultural landscapes.

In an effort to meet Section 106 compliance requirements for the Project, HDR recommends that the BLM develop a Section 106 Programmatic Agreement (PA) in consultation with Section 106 consulting parties, to establish a process for consultation, review, and compliance under Section 106 for the Project. The PA will be used to fulfill Section 106 requirements for the identification and evaluation of historic properties and to resolve any adverse effects to historic properties after the EIS Record of Decision is signed. The PA will be a legally binding agreement between the BLM, as the lead federal agency; the SHPO; the Advisory Council on Historic Preservation, if they choose to participate; NPS, and other invited signatories, and will specify how the requirements of the NHPA will be met.

HDR also recommends that a Cultural Resources Management Plan (CRMP) be developed in conjunction with the Section 106 PA that provides guidance for cultural resource management activities for the Project, regardless of land status, for the duration of the Project (pre-construction through reclamation). The CRMP will define how historic and cultural resources will be identified, documented, and evaluated, and how adverse impacts will be avoided, minimized, or resolved. Other topics will include the treatment of artifacts, contractor training, construction monitors, and methods to care for human remains if any are inadvertently discovered. These methods and standards will be determined through consultation, and will be documented in the CRMP. Other relevant information for the CRMP would include:

- Scope and role of the CRMP (in support of the PA to fulfill Section 106 obligations);
- Ethnographic and historic/prehistoric context;
- Previous identification efforts and known historic and cultural resources within the APE;
- Types of resources that may be encountered (define the resource types based on known regional data);
- The identification methods that will be used to inventory each resource type;
- How eligibility status will be determined for each resource type;
- How impacts will be assessed for each resource type;
- The methods for avoiding, minimizing, and mitigating impacts for each resource type;
- Documentation standards for each resource type (forms, formatting, data standards);
- How artifacts will be treated (what will be collected, repository where it will be housed, associated costs of housing artifacts);
- Requirements for cultural resource awareness training;
- Requirements for archaeological monitoring during the construction, maintenance, and reclamation phases; and
- Continued consultation and reporting requirements for the duration of the Project.

As previously stated, the BLM will need to consult with various stakeholders and Section 106 consulting parties throughout this entire process. HDR recommends that the BLM continue Section 106 and government-to-government meetings, as appropriate, to move the process forward and to address the data gaps as soon as possible.

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Appendix A:

2014 Northern Land Use and Research Alaska
Cultural Data Gap Analysis Report

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Appendix B:

AHRS Site Location Maps

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Appendix C:

Summary Table of Cultural Resources

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