BLM

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

Environmental Assessment

Alaska Stand Alone Gas Pipeline Geotechnical Sampling Program

PREPARING OFFICE

U.S. Department of the Interior
Bureau of Land Management
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Environmental Assessment
Alaska Stand Alone Gas Pipeline Geotechnical Sampling Program

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Chapter 1. Introduction

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As part of a broad scope geotechnical program, the Alaska Gasline Development Corporation is requesting a land use authorization to access and collect data within the vicinity of the proposed Alaska Stand Alone Pipeline (ASAP) project alignment. This program would consist of implementing a borehole drilling project at approximately 1500 sites and a mineral material source project that would include; the drilling of boreholes, collecting samples, installing thermistors, piezometers and data loggers at selected locations, and conducting future periodic site visits for data collection and equipment maintenance.

1.1. Identifying Information:

1.1.1. Title, EA number, and type of project:

Alaska Stand Alone Gas Pipeline Geotechnical Sampling Program

DOI-BLM-AK-F030-2015-0003-EA

1.1.2. Location of Proposed Action:

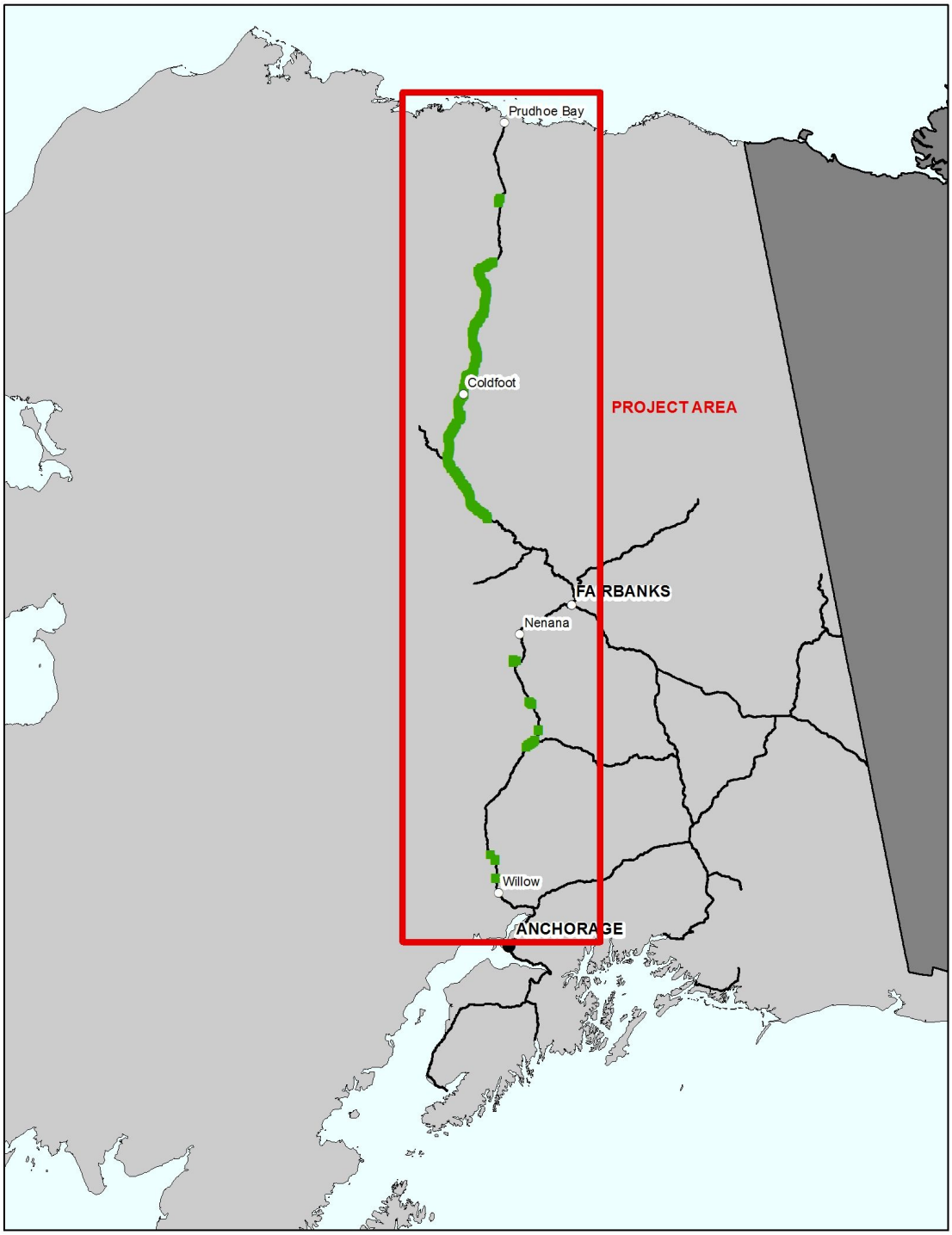

Figure 1.1. Proposed ASAP Pipeline Borehole Project Area

1.1.3. Name and Location of Preparing Office:

Lead Office - Central Yukon Field Office

(907) 474–2200

1150 University Avenue, Fairbanks, Alaska 99709

1.1.4. Identify the subject function code, lease, serial, or case file number:

288100

Case file number F–95641–A

1.1.5. Applicant Name:

Alaska Gasline Development Corporation

1.2. Purpose and Need for Action:

Background:

The Alaska Gasline Development Corporation on September 26, 2014, submitted an application proposing to access, conduct sampling and collect data within the vicinity of the proposed Alaska Stand Alone Pipeline (ASAP) project alignment from Prudhoe Bay to Cook Inlet, Alaska. This would consist of implementing a borehole drilling project at approximately 1,500 sites including: drilling of boreholes, collecting samples, installing thermistors, piezometers and data loggers at selected locations, and conducting future periodic site visits for data collection and equipment maintenance. Data collected from the borehole is needed to better understand the subsurface characteristics of the proposed pipeline route and to identify appropriate construction material sites. This work is intended to support the construction of a commercial natural gas pipeline, including mineral material sites, which would generate energy to be sold to public utilities, local municipalities, and possibly large commercial users for export.

BLM Purpose and Need:

The purpose of the proposed action is to provide the Alaska Gasline Development Corporation access to various sites on public lands to gather geotechnical data related to natural gas pipeline construction and the identification of suitable mineral material sites. This data would support the development of a natural gas pipeline from Prudhoe Bay to Cook Inlet, Alaska. The need for the proposed action is to the permit the applicant to gather data on the location of mineral material sites and assess geotechnical conditions on a proposed route to construct and operate a natural gas pipeline on public lands administered by the Bureau of Land Management (BLM).

1.3. Scoping, Public Involvement, and Issues:

Public notification of this EA was published to the Central Yukon Field Office electronic NEPA register website on October 31, 2014. Letters to interested third parties were mailed out on _____. No comments have been received as of _____.

Chapter 2. Proposed Action and Alternatives

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2.1. Description of the Proposed Action:

The Alaska Gasline Development Corporation (AGDC) proposes to explore soil characteristics by geotechnical borehole drilling, approximately 1,500 sites, along the proposed Alaska Stand Alone Pipeline (ASAP) alignment (from Prudhoe Bay to Cook Inlet, Alaska) and at proposed exploration areas as potential gravel sources. Proposed activities include access, installing thermistors, piezometers and data loggers, drilling and collection of geotechnical and geophysical data on public land. Information obtain would be used to support engineering design activities along the proposed gas pipeline corridor.

2.1.1. ASAP Alignment Geotechnical Program

Access and Clearing: Access to various sites on public lands would be necessary for equipment and crew to reach the study locations. Crew and equipment would travel overland or by helicopter. Access would be selected based on topography and the ability to negotiate the existing terrain with the necessary equipment. Overland travel would use existing roads and boat ramps, portions of existing trails, and new temporary access to reach locations. New temporary access would follow open areas requiring the least amount of vegetation clearing to the extent practicable. Final access routes would be determined as ground crews take advantage of natural clearings and areas where vegetation is less dense and may deviate up to 0.5 mile on either side of the proposed routes. GPS equipment would record tracklines of the access routes. Helicopter access would be selected based on existing terrain and safe operating conditions. Natural clearings and cleared landing zones would be used for helicopter access. For geotechnical borehole drilling, vegetation would be cleared around borehole locations in an approximate 25 to 60 foot radius with the wider clearing needed where borehole locations would serve as helicopter landing zones. To allow for helicopter landings, a clearing crew would travel by snow machine or four wheeler to clear around borehole locations. It may be necessary to land clearing crews via helicopter at nearby clearings and walk overland to the borehole location. Clearing limits would be adjusted as necessary for safe helicopter operations. To allow new temporary access routes for overland travel, it may be necessary to cut vegetation along an approximately 10 to 15 foot wide route with the wider clearing needed where equipment must negotiate tight radius turns. Equipment would operate in a manner that avoids or minimizes any disturbance to roots and soil. Woody vegetation would be cut just above ground level using chain saws or hand tools. Vegetation clearing to access excavation areas would be accomplished using a mower attachment on the excavator. Where practicable, equipment would drive over vegetation to minimize clearing and cutting. To avoid establishing trails that may be attractive to off-road vehicle users, straight, linear routes would be avoided to the extent practicable. The minimum amount of clearing would be performed to maintain a safe work environment.

Stream Crossings: Stream crossings would be made from bank to bank where possible. Existing roads and established boat ramps would be used where available to access and cross streams. For some streams, it may be necessary to use cut trees as corduroy logs on the stream banks to protect vegetation from damage. During stream crossings, equipment would be operated in a manner to preserve natural fish passage and movement. Stream crossings would occur year-round. During the winter months, equipment would not enter open water to cross streams. Crossings would occur in areas where the ice is naturally frozen to the stream bed or where ice thickness is sufficient to support the weight of equipment.

Geotechnical Borehole Drilling: At each location, a drill rig would advance an 8-inch borehole to a depth of up to 200 feet with continuous core or discrete soil samples collected at specified intervals. Borehole depths would vary depending on site conditions observed in the field. Depending on subsurface conditions, more than one attempt at advancing the boring may be necessary at the borehole locations to obtain the necessary depth and samples. After sample collection, boreholes would be backfilled with soil cuttings. Where necessary, pea gravel, bentonite, or sand may also be used as backfill to stabilize and seal the borehole. A 1-inch diameter PVC casing would be installed at some boreholes and would extend from the bottom of the borehole to about 36 inches above the ground surface. These casings are frangible and easily broken if impacted. The PVC casing would be used as either a piezometer for monitoring groundwater levels in the borehole, or as a conduit for a temperature acquisition cable to measure soil temperatures (Photos 1 and 2). The temperature acquisition cables are arctic-grade to remain flexible when cold. All posts would be marked with red and white reflective tape for visibility. Casing placement may vary depending on conditions encountered in the field. At most borehole sites, drilling is expected to be completed in one day. Field crews would return to the sites periodically to monitor and collect data. Upon completion of data collection all instrumentation would be removed.

Instream Geotechnical Borehole Drilling and Temporary Water Withdrawal: Some boreholes would be located in stream beds. Drilling in stream beds would occur either in winter months during stable ice conditions or on gravel bars. Equipment would operate from the surface of the ice or on gravel bars during open water months. Water would be withdrawn to support drilling. A hole would be drilled into the ice and a rig mounted pump with a 3-inch diameter hose and 3/32-inch screened intake would be used to withdraw water from just below the ice. Intermittent water withdrawal at a maximum rate of 20 gallons per minute is planned. Water use is estimated at up to 3,000 gallons per day for three to six days at each stream. Water may be circulated continuously to keep the hoses from freezing. Up to 10,000 gallons of water per day may be circulated; water would be returned to the same location as withdrawal. A water intake structure would be centered and enclosed in a screened box designed to prevent fish entrainment or entrapment. The screen would not exceed 0.25 inches, and the water velocity at the screen/water interface would not exceed 0.5 feet per second. Drilling operations on frozen streams are expected to take between one and six days at each location. During winter drilling, cuttings would likely collect under the ice on the stream bed. Any drill cuttings surfacing above the ice would be used to backfill the borehole. Boreholes drilled between high water marks would be sealed with bentonite chips or pellets. A bentonite plug would seal boreholes at a depth of at least 10 feet below the surface of the stream bed or mud line.

2.1.2. ASAP Material Site Location Program

The purpose of this Winter 2014 Material Sources Exploration Plan is to identify 15 material source exploration areas for investigation on public lands managed by the BLM in support of the ASAP project during the winter of 2014-2015. These prospective material sources are intended to provide Unclassified Type C, Surface Course and Select Type A materials in support of the gasline development effort.

The studies proposed in this document are to be conducted during winter field conditions. Winter exploration programs have several advantages over summer programs. During winter, the ground is frozen, allowing vehicles to access sites in areas of soft and wet surface soils without rutting and disturbing the ground surface. In addition, the snow cover provides a protective layer for

moss, lichens, and other near surface vegetation. Frozen rivers, streams, and ponds can be crossed with limited impact to the water body and aquatic plants and animals.

Table 2.1. Proposed Materials Source Areas for Exploration on BLM Lands- Winter 2014·2015

NAME	Acres	Lat	Long	Legal Description	# of Borings
MS 1D-B-A	171.6864384	68.6607016	-149.0873555	SEC 16, T9S, R13E, UM	24
MS 1D-C-B	23.41554777	68.6199609	-149.2884337	SEC 34, T9S, R12E, UM	12
MS 1D-I-A	29.56908252	68.2481845	-149.4146314	SEC 8, T14S, R12E, UM	12
MS 1D-L-A	52.16810963	68.1798934	-149.4127109	SEC 32, T14S, R12E, UM	14
MS 1F-B-B	88.73593183	68.0707975	-149.5901092	SEC 9, T16S, R11E, UM	10
MS 1F-D-A	66.11909189	68.0094508	-149.7458583	SEC 35, T16S, R10E, UM	8
MS 1F-E-A	56.38762217	67.9980337	-149.7642117	SEC 26, T37N, R10W, FM	8
MS 2A-K-A	55.1405136	67.885372	-149.8255206	SEC 4, T35N, R10W, FM	12
MS 2A-L-A	62.65684022	67.7416587	-149.7561561	SEC 26, T34N, R10W, FM	8
MS 2A-L-B	19.66010192	67.7353511	-149.7530033	SEC 35, T34N, R10W, FM	4
MS 2A-C-B	38.681465	67.6624252	-149.7137403	SEC 25, T33N, R10W, FM	10
MS 2A-C-A	33.49384174	67.6567283	-149.7146285	SEC 25, T33N, R10W, FM	10
MS 2A-G-B	121.0334526	67.4130883	-150.0861931	SEC 19, T30N, R11W, FM	12
MS 2B-D-B	78.77709803	67.0757884	-150.4041903	SEC 15, T26N, R13W, FM	30
MS 2B-H-B	27.43322818	66.8881422	-150.5009113	SEC 24, T24N, R14W, FM	12

ACCESS ROUTE AND TEST HOLE STAKING

Prior to clearing and drilling activities, a reconnaissance of proposed access routes and test boring locations would be conducted. A field geologist would travel to each of the proposed material sources and verify that the proposed access routes are feasible and determine the optimal locations for the test holes. Flagging would be placed along the approved access routes and lath would be installed at each of the proposed test hole locations.

MOBILIZATION

Drilling contractors would mobilize drilling rigs by highway from their home office. Drilling would proceed in a consolidated fashion, i.e. the field crews would focus on material sources located in a general area of operation. This approach is intended to minimize excessive movements between billeting locations and is intended to consolidate any shared mechanical or equipment requirements. Generally, the minimum support personnel and equipment proposed for the project is as follows:

- 1 Drill Crew (Driller, Helper) w/truck (Crew cab) w/auxiliary fuel tanks
- 1 R Field Coordinator w/ truck
- 1 R Field Geologist
- 1 Expediter w/truck, when necessary
- 1 Mechanic/Welder w/truck, when necessary
- 1 Traffic Control Supervisor w/truck, when necessary
- 1 Rig generator for powering electrical hand tools
- 1 Spill response kit
- 1 Clearing Crew (2 to 4 personnel) w/truck and hand tools

CLEARING AND ACCESS

Track-mounted drill rigs would travel to sites on existing roads and trails to the extent practical. Clearing of new access trails would be minimized and only to the extent allowed by land use permits. Incidental clearing of brush and a few small trees may be done by the driller and helper. For sites requiring more clearing than can be done in about 30 minutes, a clearing crew would perform the work in advance of the drill crew. The crew size would be 2 to 4 personnel, depending on the amount of clearing required. The crew would have a support truck and would work independently of the drill crew. At overland accessible material sources, the drill rig (drill and Nodwell carrier) would be transported between sites using a tilt-bed truck or low-boy trailer. Off-loading and loading operations would be accomplished on existing access roads, parking areas, and gravel pits, etc. Care would be taken during loading and off-loading operations to ensure environmental protection, worker safety and traffic safety. Mud track mats may be used to protect sensitive ground surfaces, as necessary. Fuel would primarily be purchased from bulk plant distributors at regional hubs. The fuel would be transported in bed-mounted auxiliary tanks on the crew support trucks and the drill mechanic's truck. Refueling of the Nodwells and drill rigs would be accomplished at or near the loading and off-loading points along the road and at exploration areas. Care would be taken during all fueling operations to prevent any spills. Absorbent pads along with other oil spill clean-up materials (spill response kits) would be stored on all drilling units and fuel carriers in the event these items are required. The plan for spill prevention and containment is presented in RM' s Project Specific Safety Plan provided under separate cover.

TRAFFIC CONTROL

Traffic Control during loading and unloading of the drill rig would be supervised by the certified Traffic Control Supervisor and other members of the field crew would act as flagmen during the operation. Prior to the beginning of the drilling program, the certified Traffic Control Supervisor would provide flagman training for the crew members.

BILLETING

All housing and subsistence arrangements would be through existing roadhouses and motels along the highway at Trapper Creek, Cantwell, Healy, Nenana, Fairbanks, Coldfoot, Happy Valley, and Deadhorse. Crews would travel to work sites using highway vehicles and/or helicopter transport. Typical travel times are designed to be less than two hours each way.

DRILLING AND SAMPLING METHODS

Field work would generally consist of investigating the material sites using geotechnical drilling rigs to obtain subsurface data. Depending on the location of the site, the drill may be truck, track, or platform-mounted. The platform-mounted rigs would likely be moved using a helicopter and

may be used to explore remote sites off the road system. In addition, helicopters may be utilized to move crews in and out of remote locations.

The number of borings required would be a function of the individual sites' areal extent and the availability, quantity and quality of the existing information. To be a viable source area, we are anticipating that the thickness of overburden should be less than 10 feet. The sample interval may be adjusted in the field to reflect site conditions. We anticipate the borings would be advanced 20 to 50 feet deep and expect to complete 3 to 4 borings each day per drilling crew. In general, field investigations would be conducted in accordance with the Alaska DOT&PF Geotechnical Procedures Manual. A sample of the soil and ground cover would be obtained from 0 to 18 inches at the location of each borehole or test pit. The recovered sample (or test pit side wall) would be photographed prior to additional disturbance and the sample placed in a sealable plastic bag. The sample would be submitted to the Baker wetland group for their analysis.

Hollow stem auger techniques would be utilized for most borings, which allows for drive sampling where caving soils are encountered. Where caving soils are encountered, standard 2.5-inch I.D. split spoons would be used to collect soil samples. These samplers would be driven with an automatic 340-pound drop hammer, as this is generally the most efficient method of collecting a large volume of soil. Samples are expected to generally be collected at 5-foot intervals unless conditions indicate otherwise. Blow counts (N-values) would be collected while driving split-spoons; however collection of N-values is considered secondary to maximizing sample volumes. Therefore, non-standard collection techniques may be employed and some N-values may not be applicable to the determination of relative densities.

In coarse cobbley and bouldery soils, and where non-caving soils are encountered, solid flight auger techniques or excavators may be utilized. Weathered bedrock sites would be tested with four-inch diameter solid flight augers. Grab samples at these sites would be obtained every five feet and large bulk samples (>20 pounds) of material from the upper 20 to 30 feet would be obtained where possible. In sites where riprap investigations may be conducted, the rock may be cored using standard rock coring techniques (American Society of Testing and Materials [ASTM] 02113). Cores would be placed in plastic core boxes. Weathering, hardness, and discontinuity (spacing and orientation) data would be recorded.

Methods may be modified to enhance sample recovery. Samples collected in gravelly or cobbley soil using split-spoon samplers generally do not provide adequate volume to meet minimum sample volumes as identified in ASTM procedures. In addition, the diameter of the split-spoon limits the maximum size of the particles collected. Where possible, at least one 50-pound bulk sample per four acres or a minimum of two per site would be collected in the field (to a maximum of I 0), which meets the minimum sample size of Sampling for Aggregates, Western Alliance for Quality Transportation Construction (W AQTC) field operating procedure (FOP) for American Association of State Highway and Transportation (AASHTO) T2 (ADOT&PF, 2012). Eight-inch diameter or larger solid flight auger may be used to collect bulk samples. The spinning action of the augers drives the soil up the test hole as the auger is advanced. Samples can be collected as the material comes out of the test hole. These samples would be tested for grain size distribution. Collection of the bulk samples may not be possible at sites where thick (>2 feet) seasonal frost is encountered or in areas of permafrost. The volume percentage of boulders, cobbles, and coarse gravel would be estimated based on drill action and observations at the site (where soils are exposed).

In addition, two (one-quart) samples from select material sources would also be collected for corrosion analysis. These samples would be collected from sources intended for use as bedding material and would be submitted to Coffman Engineers for analysis and reporting.

PVC INSTALLATION AND BACKFILL

Casings may be installed at some test hole locations to collect groundwater or ground temperature data. Upon completion of drilling operations at select boring locations, a 1 to 2-inch diameter PVC casing and borehole marker may be installed within the completed borehole. These casings and test hole markers would be left to stick up approximately 3 feet above ground surface and would not be completed with any protective casings. Test holes would be backfilled with cuttings, supplemented with dry silica sand as necessary and sealed with a minimum 2-foot bentonite plug. An approximately 6-inch high by 18-inch diameter mound of soil would be formed over the borehole. Any extra cuttings would be scattered 6 feet or more from the borehole.

2.2. Description of Alternatives Analyzed in Detail:

No Action Alternative

No other practicable alternatives were identified that would be less environmentally damaging. Under the no alternative action, AGDC would not receive a permit for borehole drilling and sampling for a natural gas pipeline.

2.3. Alternatives Considered but not Analyzed in Detail

No other alternatives were considered but not analyzed in detail.

2.4. Conformance

The EA is in conformance with the Utility Corridor Resource Management Plan and Final Environmental Impact Statement approved January 11, 1991. The proposed action is in conformance with plan because it is specifically provided for in the following planning decision (objectives, terms, and conditions):

Appendix N Lands Program Objectives (page N 7- 9)

Process applications for land use authorizations from the general public, federal and state agencies, and research organizations on a case by case basis.

Chapter 3. Affected Environment:

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Wildlife:

The proposed project will occur within the ranges of a multitude of native birds and mammals. The following terrestrial mammals will potentially be present in the proposed project area either seasonally (during breeding seasons or seasonal migration) or year round.

Common and Scientific Names	Habitat (MacDonald and Cook 2009)
Large Mammals	

Moose densities in Game Management Units (GMUs) 20F, 24 and 26 are low (0.1 – 0.7 moose/mi2) and primarily limited by predation (Craig and Stout 2014, Stout 2010). Sensitive periods for moose include calving season (May – June) and the fall rut (September – October).

The proposed project area lies within the winter range of the Central Arctic (CAH) and Hodzana Hills (HHH) caribou herds. Members of the CAH will primarily be present in the project area while on their winter range from September – May. HHH animals may be present in the area around Dalton Highway MP 100 year round. Sensitive periods for caribou include calving (May – June) and migration (September and April).

Agency surveys indicate that the Dall's sheep population in the Central Brooks Range, including the vicinity of the proposed action, is in decline. The proposed action is largely concentrated near the existing road corridor and no special sensitive habitat areas for Dall's sheep (including lambing areas and mineral licks) are within one mile of the proposed development. Therefore, impacts from the proposed development are likely to be negligible but avoidance of contact with Dall's sheep and other wildlife should be practiced to the greatest possible extent.

Black and brown bears are present and seasonally active in the northern interior and Central Brooks Range. Black and brown bears are thought to be present at low densities (33 bears/100 mi2) in spring, summer, and fall (Lenart 2011, Reynolds 1976). Bears, particularly sows with cubs, are most susceptible to negative impacts associated with human activity when they emerge from their dens in April and May.

Addressing special status species is a requirement of BLM environmental assessments to ensure that actions taken by BLM are consistent with the conservation needs of special status species and do not contribute to the need to list any special status species under the provisions of the Endangered Species Act of 1973, as amended. The proposed project will occur within the ranges of a variety of native birds, including the published ranges of five bird species that appear on the BLM AK Sensitive Species List. One of the BLM-listed Sensitive Species is the golden eagle (*Aquila chrysaetos*) which is afforded additional special protection under federal guidelines. The "taking of" golden eagle nests is restricted under the Bald and Golden Eagle Protection Act. "To take" includes "to disturb" meaning "agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause….a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or…. nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior". Additionally, federal guidelines recommend that "activities that have temporary impacts, such as the use of loud machinery….[are] carried out outside of the breeding season". Federal guidance specifically recommends that blasting and other loud, intermittent noises are avoided within one half mile of nesting birds.

Surveys for cliff nesting raptors were conducted prior to 1990 and in 2010 in the Utility Corridor resource management planning area. Although not all golden eagle and other raptor use sites within the proposed development area were likely detected and the species associated with all "use" areas was not identified, the survey did lead to the detection of three golden eagle sticknests and one perch within one half mile of the proposed development area. A number of other known nests and use-areas for the remaining species listed in the table were detected in the 2010 survey; all of these species are protected by the Migratory Bird Treaty Act and take of nests is prohibited.

	Distance from Proposed Development	
	.06 Miles (330 ft)	.5 Miles (2640 ft)
American Kestrel		2
Common Raven	1	1
Golden Eagle		4
Gyrfalcon		3
Jaeger	1	0
Northern Harrier		2
Rough-legged Hawk		1
Unknown Falcon		2
Unknown Raptor		8
Total	2	23

In addition to the golden eagle, the four bird species on the BLM Sensitive Species List which are likely to be impacted by the proposed development are the: blackpoll warbler, gray-cheeked thrush, olive-sided flycatcher and Townsend's warbler. No comprehensive inventories for these or other sensitive bird species have been conducted in the area of the proposed action. These bird species are migratory and occupy the proposed project area in the spring, summer, and early fall, and will be present during the period of the proposed action. All migratory birds are protected under the Migratory Bird Treaty Act.

Subsistence:

Residents of two rural communities, Coldfoot and Wiseman, are qualified subsistence users residing in the vicinity of the proposed action. The primary subsistence use area for Wiseman residents extends from Dalton Highway MP 160 – 240, but subsistence activities occur beyond this core area as well (Scott 1993). Important wildlife species used for subsistence include Dall's sheep, moose, caribou, black bears, furbearers, waterfowl, and small game. These animals are present in the area impacted by the proposed action either seasonally or year round. For further discussion of wildlife population characteristics refer to the *Wildlife* section of the *Affected Environment.* Local residents also use non-game subsistence resources such as wood, berries, and edible vegetation for food, fuel, and construction materials.

Subsistence hunting of moose and Dall's sheep occurs primarily in this area during the months of August, September, and October. Caribou are hunted opportunistically through fall migration and while the migratory CAH are on their winter range. Local residents trap furbearers throughout the winter, and many subsistence activities, such as firewood gathering and small game hunting, occur year round.

Invasive, Non-native species:

Surveys along the Dalton Highway for invasive plants (NIP) have occurred annually since 2004; 28 species have been documented. Invasive plants in Alaska are ranked on a scale of 0-100, with 100 being the most invasive. The most pervasive and invasive species recorded along the Dalton Highway: *Meliltous alba* and *Vicia cracca. Meliltous alba* (white sweetclover; ranking: 80), has

been rapidly expanding its range northward along the Dalton Highway and has been found as far north as the Hammond River (MP 190). *Vicia cracca* (Bird Vetch; ranking: 73), has been found in more than three places, and as far north as Coldfoot Camp.

Vegetation:

The proposed action spans two major ecosystem types, boreal forest and treeless tundra. An estimated total area of 3973 acres (6.2 square miles) of BLM CYFO managed land is proposed for exploration activities (although this total acreage is more than the actual exploratory borehole disturbance footprint will be). The forested areas which will be impacted by the proposed activity are predominantly white or black spruce stands (~1715 acres). For this analysis the areas considered to be tundra are low shrub and lichen dominated plant communities as well as sparsely (<20%) vegetated areas and areas dominated by herbaceous vegetation. The proposed action would impact up to ~1904 acres of tundra plant communities. Other plant communities include tall shrub communities (~248 acres) and deciduous forests (~46 acres). Approximately 125 acres of the proposed development area is covered by freshwater and 12 acres were classified as bare ground.

Vegetation Community	Summer	Winter	Total
Floodplain Sparse Vegetation	1	93	94
Floodplain Low Birch-Willow	0	37	37
Floodplain Open White Spruce	0	28	29
Peatland *Carex chordorrhiza/Carex aquatilis*	0	26	26
Floodplain Closed Alder-Tall Willow	0	18	19
Floodplain Open White Spruce/Balsam Poplar		9	9
Floodplain Open Balsam Poplar	0	5	5
Floodplain Non-acidic Dryas	0	4	5
Wet Graminoid	1	1	2
Floodplain Low Willow		2	2
Floodplain Wet Sedge		2	2
Wet Herbaceous-Moss	0	0	0
Total	3	226	229

A total of 229 acres of potential disturbance in on BLM-CYFO managed floodplain, wet and aquatic vegetation communities is proposed. The vast majority of the proposed development in these areas is in winter months. Approximately 38 acres of the proposed development will occur in forested floodplain areas with white spruce as a substantial component of the forest canopy.

Surveys for rare plant species have been conducted in the vicinity of the proposed development by the BLM and other entities. To date, no known plant species listed as sensitive, rare, imperiled or endanger either by the BLM or the Alaska Natural Heritage Program are known to occur within one half mile of the proposed development area.

Areas of Critical Environmental Concern:

The proposed action will, in part, occur in two areas designed for special their environmental characteristics under the current BLM Utility Corridor Resource Management Plan; Galbraith Lake Area of Environmental Concern (ACEC) and Toolik Lake ACEC. Galbraith Lake ACEC encompasses ~56,000 acres and was designated for cultural resources, rare/sensitive plants, scenic values, and lambing areas. Known lambing areas are a substantial distance from the proposed development area and no known BLM listed sensitive plant species are known to occur in this or any of the other proposed development areas. To some extent because of the treeless nature of the Galbraith Lake ACEC terrain, the proposed development area is highly visible from both the

Dalton Highway and the campground and airstrip access roads and could impact the scenic value of the ACEC, especially when considered in combination with the gravel pit activity near the campground. Toolik Lake ACEC encompasses ~82,800 acres and was designated for research activities and cultural resources. Since the Toolik Lake ACEC was established for research and there is a substantial amount of long-term research being conducted in this ACEC it is important that communication prior to development occurs between the research community, the BLM realty specialists and the permitee to ensure that research plots (which can be difficult to detect) are not disturbed by the proposed action.

Fire Management:

The proposed action would occur on lands managed under each of the 4 fire management options as defined in the 2005 BLM Alaska Wildland Fire Management Plan and the 2010 Alaska Interagency Wildland Fire Management Plan. The gaol of both the BLM and the Alaska interagency fire management program is to protect the public, firefighters, and identified sites from wildland fire while providing an opportunity wherever possible to allow natural fires in order to protect, maintain and enhance natural resources through the natural fire regime wherever possible. The pre-planned action is suppression for Critical and Full as well as Modified fires early in the fire season. For Limited fires and Modified Fires later in the fire season the pre-planned action is to monitor the fire. will The following table is a summary of the fire management option and miles of access trail proposed by season.

Fire Management Option	Field Season	Miles
Critical	Winter	0.8
Full	Summer	0.7
Full	Winter	0.3
Limited	Summer	7.5
Limited	Winter	42.6
Modified	Summer	1.2

The following table is a summary of the miles of trail used by the project that are in an existing disturbance and currently undisturbed. The table includes both Federal and Non-Federal land as well as the fire management option.

Disturbance	Federal	Fire Management Option	Miles
Existing Disturbance	N	Critical	14.1
Existing Disturbance	N	Full	103.9
Existing Disturbance	N	Limited	43.5
Existing Disturbance	N	Modified	9.4
Existing Disturbance	Y	Full	2.5
Existing Disturbance	Y	Limited	35.1
Existing Disturbance	Y	Modified	0.1
Undisturbed	N	Critical	4.5
Undisturbed	N	Full	15.0
Undisturbed	N	Limited	16.1
Undisturbed	N	Modified	9.7
Undisturbed	Y	Limited	18.6
Undisturbed	Y	Modified	3.0

The following table summarizes the miles of trail for proposed use by field season for each fire management option.

Protection	Field Season	Miles
Critical	Summer	11.0
Critical	Undetermined	17.3

Chapter 3 Affected Environment:

Critical	Winter	12.0
Full	Summer	19.0
Full	Undetermined	128.9
Full	Winter	138.2
Limited	Summer	30.0
Limited	Undetermined	135.9
Limited	Winter	3.1
Modified	Summer	16.2
Modified	Undetermined	20.8
Modified	Winter	0.2

Geology, Mining and Mineral Materials

The boreholes for some of the potential mineral material sites are within or adjacent to existing mineral material pits as well as conducting exploration or crossing mineral material sites that have revegetated and are proposed for closure. For the existing mineral material sites, AGDC will need to get Letters of Non-Objection from Alyeska and Alaska Department of Transportation and Public Facilities (ADOT&PF) prior to entry onto the permitted material sites.

Site Specific Information (if needed):

Milepost 297

Access to selected exploration areas uses a naturally reclaimed access road to a naturally revegetated mineral material site.

Milepost 291

Site of existing disturbance contains undetonated explosive material from previous mining work. ADOT&PF is waiting from their contractor to mobilize the equipment necessary to remove the explosive material from the ground and continue mining the site in 2015–2016.

Milepost 274

The south Galbraith Lake mineral material pit is located just north of a sizable fuel spill dating back to the TAPS construction days. This site is located between the Galbraith Lake campground and the South Galbraith mineral material pit. Great care is required to prevent entry and drilling into the fuel spill location.

Milepost 267

The Holden Creek exploration requested on the west side of the highway is located in an active ADOT&PF mineral material pit. The east side of the highway was reclaimed after the bridge rebuilding project completed in 2014. The material site was erroneously reported mined out at the end of the Holden Creek Bridge rebuilding. ADOT&PF states that there is more usable material in the pit to the north of the currently disturbed pit.

Milepost 239

The mineral material site located east of the Chandalar Shelf Airstrip has been applied for by ADOT&PF for the up-coming road rebuilding project starting in 2015.

Milepost 224

The mineral material site located west of the Dalton highway, across from the active mineral material pit has been applied for by ADOT&PF for the up-coming road rebuilding project starting in 2015.

Milepost 221

The area proposed for exploration by AGDC, east of the TAPS line, is a permitted material site by ADOT&PF. They have not mined this site yet, however the highway project slated for start in 2015 proposes using this site as a source of material for the project if they are not able to get the site west of MP 224.

Milepost 198.5

Proposed borehole locations are located on active federal claims that are located along Linda Creek. These need to be relocated, or written authorization from the claim owners needs to be obtained prior to any drilling.

Milepost 195

Boreholes proposed on the east side of the Dalton are in a previously mined and reclaimed ADOT&PF mineral material pit. It is also the access route for the locatable mineral mining that is conducted further up-stream.

Milepost 161

The requested exploration access route is along a permitted access to a mine camp.

Milepost 153

The site selected for the boreholes is a naturally reclaimed ADOT&PF mineral material pit that is recommended for closure.

Milepost 107

The Old Man Camp material site has been reported to contain asbestos mineralization. Care is needed to assure that the boreholes in this area are drilled with protection.

Riparian-Wetlands:

Within the vicinity of the proposed ASAP project alignment, riparian-wetland areas include land associated with streams and lakes as well as permafrost controlled wetlands that extend beyond the borders of streams and lakes. Although they account for only a small portion of the land base, riparian areas are a productive and critical component of the Dalton Highway Utility Corridor watersheds. Permafrost controlled wetlands make up a larger portion (versus riparian) of BLM managed lands in the CYFO. Due to the influence of permafrost, upland areas not normally meeting the criteria necessary to be considered riparian-wetlands are classified as such because of the presence of hydrophilic species and wet soil conditions.

Plant communities found in the planning area are discussed in more detail on pages 3-6 and 3-7 of the Utility Corridor Resource Management Plan and Final EIS (BLM 1989) and in the Vegetation section of this EA.

Water Resources:

In general, the headwaters of all the major watersheds in that encompass the proposed action are located in the Brooks Range or its foothills. Exceptions to this are those rivers in the southern portion of the Dalton Highway with headwaters located in the Kokrine-Hodzana Highlands. Drainages north of the continental divide flow north into the Beaufort Sea (Arctic Ocean). Those drainages south of the continental divide flow into the Yukon River and eventually the Bering Sea.

Many of northern Alaska's lakes and streams are frozen, or partially frozen, for five-six months of the year. In late April and May, "breakup" occurs when the snow melts and the lakes and streams thaw. A typical northern Alaska stream experiences low flow from December through March, peak flow during breakup in May-mid June, lower summer flows in late June and July, secondary peak flows produced by rainfall in August-September and freeze up with declining flows starting in October.

Watershed condition along the Dalton Highway is generally good. Most anthropogenic disturbance occurs near the Dalton Highway. Erosion is not a problem except in areas where the vegetation cover is disturbed or stream channel morphology is altered. When the vegetation cover is disturbed and the ground ice (where present) melts, many of the fine grained soil particles erode, resulting in silt pollution of nearby streams and lakes. Erosion is most prevalent along roads and trails (i.e. those proposed in this action), at construction sites, and at mining operations.

Surface water quantity and quality varies with the season. Generally, maximum discharge occurs during spring breakup which usually happens during the latter part of May south of the Brooks Range and during the middle of June north of the Brooks Range. Stream discharge rates peak during snow melt and summer rains. The presence of permafrost decreases infiltration, increasing runoff peaks but reducing base flow rates. In the fall and winter, much of the precipitation and runoff are in a frozen state, and stream flow declines. Seasonal snowpack is the most important annual water storage component in the hydrologic cycle. River icings also store considerable quantities of water. Water quality is generally good except during high water events and downstream from some construction projects and placer mining operations.

Soils:

In general, the Dalton Highway corridor is an area where frost processes dominate. Soil development is influenced by climate. The cold climate of this region inhibits soil development as organic material and living organisms are limited by a short growing season while low soil temperatures inhibit biological and chemical activity. Freeze-thaw processes physically disrupt the soil horizons (BLM 1989).

A brief description of the soils found along the Dalton Highway between the Yukon River and the northern extent of BLM managed lands at Dalton Highway Milepost 300 is presented in the following paragraph. Information is summarized from discussion in the Renewal of the Federal Grant for the Trans-Alaska Pipeline System Right-of-Way Environmental Impact Statement (BLM TAPS 2002) unless otherwise noted.

Windblown silt is a key component in soil formation on the uplands near the Yukon River. Formation of the soils on the uplands to the north of the Yukon River, in the physiographic region often referred to as the Kokrine-Hodzana Highlands (Wahrhaftig 1965), depend on the distance from the river. Windblown silt is less prevalent in areas further removed from (north of) the Yukon River. Soil formation on hilltops occurs mainly through weathering of bedrock. Weathered coarse-grained rock debris and a minor component of windblown silt from the hills are transported by mass wasting to the lower hillsides. Thicker organic horizons are present in

tussock meadows. Further north in the Koyukuk drainage, coarse-grained glacial and glaciofluvial sediments are distributed near the main channels of the Middle Fork Koyukuk and the South Fork Koyukuk Rivers. Soils outside the floodplain are made up of fine-grained silt and clay covering coarse-grained glacial till (Hamilton 1986). The Atigun Pass area is composed largely of exposed bedrock and coarse material. Unsorted coarse material is common in the soils near the toes of steep slopes in the Atigun River and Dietrich River valleys. Coarse-grained sand and gravel are believed to underlie these same valleys. Silt and sand deposits are present in the Atigun River floodplain (Kreig and Reger 1982). Soils of glacier-scoured basins (e.g., Galbraith Lake) are composed of boulders and larger cobble overlain with silt and clay.

Permafrost is prevalent in the area surrounding the Dalton Highway. Permafrost is commonly classified as continuous (covering from 90% to100% of an area), discontinuous (50 to 90% coverage), sporadic (10 to 50% coverage), or isolated patches (up to 10% coverage) (Brown et al. 1997). The area south of Wiseman in the Middle Fork Koyukuk River drainage is underlain by discontinuous permafrost. The upper Middle Fork Koyukuk River drainage north to Dalton Highway Milepost 300 is underlain by continuous permafrost (Kreig 1982). Permafrost may be absent or discontinuous beneath major active streams. There is an active layer of soil overlaying the permafrost that undergoes freezing and thawing each year. The depth of the active layer (1-15 feet) is influenced by local climate, vegetation and snow cover, slope, and soil moisture conditions. (TAPS Owners 2001a in BLM TAPS EIS 2002).Thawing of the permafrost and poor drainage can cause operating areas to be wet with unconsolidated soil, resulting in the ground being more susceptible to erosion. Drying of these areas can lead to extremely dusty surface conditions.

Soils of this area are described in further detail on pages 3-4 and 3-5 of the Utility Corridor Proposed Resource Management Plan and Final Environmental Impact Statement (BLM 1989). Detailed soil surveys are not available for the area encompassed by this action.

Fish:

The Utility Corridor Resource Management Plan (RMP) encompasses numerous streams and lakes. The RMP identifies 22 species of fish found in the planning area (USDI 1989). They include anadromous species such as chinook, chum and coho salmon. Grayling, whitefish species, burbot, Arctic grayling, pike, lake trout, Arctic char, and Dolly Varden are important resident species identified. These species are utilized in subsistence, commercial and sport fisheries. Streams and lakes located in the Dalton Highway corridor that are known to harbor regionally important fishery resources are listed below.

Fish Species Inhabiting Streams and Lakes of the Dalton Highway.

River/Creek/Lake name w/distance from the start of the Dalton Highway	**Fish species inhabiting streams and lakes near the Dalton Highway**
Yukon River MP 56	Chinook, coho and chum salmon have been documented as present in the Yukon River at the Dalton Highway bridge crossing (ADF&G 2011a). Arctic grayling, burbot, round whitefish, slimy sculpin, longnose sucker, sheefish, and northern pike, arctic lamprey, bering cisco, broad whitefish, least cisco, humpback whitefish, are all present in this river.
Ray River MP 70	The Ray River flows into the Yukon River about a mile downstream of the Yukon River bridge. The road parallels, but does not cross, the river near MP 69. Arctic grayling, burbot, round whitefish, slimy sculpin, longnose sucker, sheefish, and northern pike occur in the Ray River. No Name Creek (aka North Fork of Ray River) is a tributary to the Ray River. The Dalton Highway crosses this stream at MP 80.

River/Creek/Lake name w/distance from the start of the Dalton Highway	Fish species inhabiting streams and lakes near the Dalton Highway
Kanuti River MP 106	This is the first tributary of the Koyukuk River crossed by the highway. Arctic grayling, burbot, round whitefish, slimy sculpin, and northern pike occur here. The Kanuti River flows through the Kanuti National Wildlife Refuge and joins the Koyukuk River about 80 miles downstream.
Fish Creek MP 115	Arctic grayling, longnose sucker, slimy sculpin, and round whitefish are present. Fish Creek joins Bonanza Creek and flows about 30 miles before reaching the South Fork of the Koyukuk River. There is a small parking turnout on the northeast side of the bridge. The stream is small, generally clear in summer, and offers good fishing for Arctic grayling.
Bonanza Creek - South Fork MP 125 mi and North Fork MP 126	These creeks contain Arctic grayling, burbot, round whitefish, slimy sculpin, lake whitefish, longnose sucker, and northern pike. There is a good turnout on the southeast side of the bridge on the South Fork with room for a few campsites. The North Fork has a small turnout on the northeast side of the bridge. Both forks join within ¼ mile downstream of their crossing of the Dalton Highway.
Prospect Creek MP 135	Arctic grayling, northern pike, slimy sculpin, longnose sucker, and round whitefish are present. Chinook salmon spawn and rear in this creek (ADF&G 2011a). Prospect Creek flows into the Jim River within three miles downstream of its' Dalton Highway road crossing.
Jim River MP 140 (Bridge #1), MP 141 mi (Bridge #2), MP 144 (Bridge #3).	Arctic grayling, burbot, round whitefish, slimy sculpin, humpback whitefish, longnose sucker, and northern pike have been documented in the Jim River. Chinook salmon use this river for rearing and spawning habitat while chum salmon are known spawners in this system (ADF&G 2011a). This river is one of the most productive fisheries stream crossed by the Dalton Highway. The Jim River and Prospect Creek join and flow into the South Fork of the Koyukuk River. The road parallels the river for approximately 8 miles from Bridge Number 3 to the junction of the Bettles winter access road near Alyeska's Pump Station Number 5 (Prospect Camp).
Douglas Creek MP 142	Arctic grayling and slimy sculpin inhabit this creek. Juvenile Chinook salmon use this system for rearing habitat (ADF&G 2011a).
Grayling Lake MP 150	This 80-acre lake is relatively shallow, but constitutes an important spawning and rearing area for Arctic grayling. The outlet stream enters the Jim River.
South Fork Koyukuk River MP 156	Chinook salmon use this river for rearing and spawning habitat while chum salmon are known spawners in this system (ADF&G 2011a). Arctic grayling, longnose sucker, slimy sculpin, and round whitefish are present in the vicinity of the bridge. The South Fork joins the Koyukuk River between Bettles and Allakaket, approximately 75 miles downstream of the MP 156 bridge.
Unnamed stream MP 167	Chinook salmon rearing habitat is documented in this tributary to the Middle Fork Koyukuk River.
Rosie Creek MP 169	Chinook salmon use this creek downstream of the Dalton Highway as rearing habitat (ADF&G 2011a). Arctic grayling, Dolly Varden, slimy sculpin, and round whitefish are also present in this system.
Slate Creek MP 175	This stream enters the Middle Fork Koyukuk River at Coldfoot. Dolly Varden, Arctic grayling, slimy sculpin, and round whitefish are present. Chinook and chum salmon have been reported in this stream (ADF&G 2011a).
Marion Creek MP 180	Arctic grayling, small Dolly Varden, slimy sculpin, and round whitefish are present in the creek. Chinook salmon use this creek as rearing habitat while chum salmon are known spawners in this system (ADF&G 2011a).
Minnie Creek MP 187	Dolly Varden, Arctic grayling, long nose sucker, slimy sculpin, burbot, and round whitefish are present in this small stream. Chinook salmon use this creek as rearing habitat (ADF&G 2011a).
Middle Fork Koyukuk River--Three bridge crossings from MP 189 to MP 204	Chinook and chum salmon, and sheefish are catalogued as present in this system (ADF&G 2011a)., Dolly Varden, Arctic grayling, long nose sucker, slimy sculpin and round whitefish are present in the Middle Fork Koyukuk. The river flows south to join the North Fork of the Koyukuk River. Fish from many of the smaller tributary streams may use the Middle Fork for overwintering.

River/Creek/Lake name w/distance from the start of the Dalton Highway	Fish species inhabiting streams and lakes near the Dalton Highway
Hammond River MP 190	Dolly Varden, Arctic grayling, slimy sculpin, and round whitefish occur in this river. Chum salmon are catalogued as rearing and Chinook salmon are listed as present (ADF&G 2011a).
Bettles River MP 208	Chum salmon are catalogued as present (ADF&G 2011a). Grayling, round whitefish, and longnose sucker have been documented in this river (ADF&G 2011b).
Dietrich River	Dolly Varden, Arctic grayling, burbot, long nose sucker, slimy sculpin, and round whitefish occur in this river. The Dietrich River parallels the Dalton Highway from Chandalar Shelf near Dalton Highway MP 235 until it joins the Bettles River near Dalton Highway MP 208 to form the Middle Fork Koyukuk River. The river is braided and travels through a broad floodplain.
Atigun River - bridge crossings at MP 253 & 271	Arctic grayling, Dolly Varden, burbot, slimy sculpin, and round whitefish are present. Arctic grayling are distributed throughout the upper Atigun River and many of its tributaries. Several miles of stream are accessible from the Dalton Highway as far north as the bridge at 271 mile.
Tee Lake MP 270	This lake is located near the Dalton Highway adjacent to the access road to Pump Station Number 4. Present here are Arctic grayling, burbot, slimy sculpin, round whitefish, Dolly Varden and lake trout.
Galbraith Lake MP 275	Arctic grayling, Dolly Varden, lake trout, burbot, and whitefish are all present. Water is slightly turbid, and maximum depth has been measured at 23 feet in this 1,030 acre lake. Lake trout are occasionally present in the lower portion of the inlet stream in the fall.
Toolik Lake MP 284	Present are Arctic grayling, lake trout, burbot, slimy sculpin, and round whitefish (ARC LTER 2011). The lake drains north into the Kuparuk River. The University of Alaska operates an Arctic biology field research station at Toolik Lake, located at the termination of the access road. Maximum depth is about 77 feet and area is 358 acres. Inlet and outlet streams are present.
Kuparuk River MP 289	Arctic grayling and slimy sculpin are present (USDI 2010).
Oksrukuyik Creek MP 298	Arctic grayling, burbot, Dolly Varden, lake trout, broad whitefish and slimy sculpin are present (USDI 2010). This stream, which drains the Campsite Lakes 5 miles south of the road, also crosses the road at 310 mile just north of Pump Station Number 3.

Fish and Essential Fish Habitat

According to the Magnuson-Stevens Fish Conservation and Management Act (MSFCMA), Essential Fish Habitat (EFH) includes waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity. Under the MSFCMA, all five Pacific salmon stocks (pink, sockeye, chum, coho, and Chinook) found in Alaska are protected. EFH includes all stages of life in freshwater and marine environments. The MSFCMA mandated the identification of Essential Fish Habitat1 (EFH) for federally managed species and consideration of recommendations to conserve and enhance the habitat necessary for these species to carry out their life cycles. EFH is defined as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” “Waters” include aquatic areas and their associated physical, chemical, and biological properties. “Substrate” includes sediment underlying the waters. “Necessary” means the habitat required to support a sustainable fishery and the managed species’ contribution to a healthy ecosystem. “Spawning, breeding, feeding, or growth to maturity” covers habitat types utilized by a species throughout its life cycle (50 CFR 600.10).

For EFH identification, the State of Alaska Catalog of Waters Important for Spawning, Rearing, or Migration of Anadromous Fishes is the source of information used to identify fish streams with salmon in the vicinity of this project. Waterbodies and associated salmon species are listed in the table in this section of the EA.

Chapter 4. Environmental Effects:

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Wildlife:

Direct and Indirect Effects:

There are numerous proposed drilling sites distributed in varying concentrations within the proposed area. Human activity, vegetation clearing, and drilling will temporarily disturb and potentially displace resident birds, wildlife, and wildlife habitat present at borehole drilling sites in the proposed project area. Vegetation will be cleared to facilitate drilling. As such, there will be a temporary loss of wildlife habitat at each test site, and a net loss project-wide. Cleared areas will be small (< ¼ acre) and revegetation is expected to occur within 1-5 years if disturbed surface organic matter is left on site.

Direct impacts to wildlife will vary depending on the species. Burrows and nests of small mammals and birds may be disturbed or destroyed at drill sites. Large mammals will likely avoid the area when personnel and ongoing project activities are present. Moose and bears are likely to be relatively resilient to activities associated with the proposed action, while caribou and Dall's sheep may be affected more, particularly during sensitive periods such as calving and lambing.

Improper or insufficient storage of food, garbage, and waste products at personnel camps or active project sites will attract animals, specifically bears, to the site. This will potentially lead to human-animal conflicts and could result in Defense of Life and Property (DLP) incidents and impacts to local wildlife. Appropriate mitigations to minimize these conflicts and impacts to wildlife include 1) proper storage of food and garbage, 2) regularly removing garbage from project sites, and 3) prohibiting feeding and/or harassing wild animals.

For avian species, including special status bird species, vegetation clearing and development-related activity (particularly loud noises) may alter available habitat and nesting activity. However, if vegetation clearing is conducted within the recommended time frame for avoiding the "take" of active nests, then these impacts are likely to be negligible. Destruction of nests will be mitigated by ceasing vegetation clearing and reducing other development-related activities during nesting season or by ensuring that nesting birds are not present during vegetation clearing activities (see attached mitigation measures).

Cumulative Effects:

The proposed project area is within the Dalton Highway Utility Corridor. This project will disturb up to 6.2 sq. mi. of wildlife habitat, thereby contributing to cumulative effects to wildlife habitat in the corridor. There is a history of large scale construction and infrastructure development projects within the utility corridor. This project is broad in scope but the disturbance footprint is relatively small compared to other large-scale utility and infrastructure development projects. It will result in site-specific impacts to wildlife and wildlife habitats and a temporary net loss of wildlife habitat project-wide, but these disturbances will be minimal compared to impacts associated with past, ongoing, and future projects in the Utility Corridor.

Subsistence:

Direct and Indirect Effects:

Within this primary subsistence use area, borehole test sites are proposed within 26 potential material pit sites and along the proposed pipeline route. Drilling and human activity will potentially impact wildlife movements and associated subsistence hunting activities during the

months of August – October. Impacts to subsistence activities during this time may be mitigated by avoiding drilling at test sites within the Utility Corridor from Dalton Highway MP 160 – 240.

Based on the ANILCA Section 810 Evaluation and Finding, the proposed action is not anticipated to permanently impact subsistence resource abundance, distribution, or access. For further discussion of these findings refer to *Appendix C*.

Cumulative Effects:

Drilling at proposed sites will occur during specific, limited time periods. Disturbance to subsistence game animals is expected to be temporary. Relatively little wildlife habitat will be disturbed, and it is not anticipated to negatively impact subsistence wildlife populations. No cumulative effects to subsistence resources are predicted to result from authorizing the proposed action.

Invasive, Non-native species:

Direct and Indirect Effects:

Highways and trails are corridors for the spread of invasive plants. Seeds can 'hitchhike' on vehicles, equipment and footwear. In interior Alaska, disturbed areas (such as those created by any ground and vegetation disturbing activities) are the most common areas for infestations of invasive plants; the most prevalent species in this region are adapted to colonize and propagate most readily on disturbed soils. It follows that any activity in previously undisturbed areas near the currently infested Dalton Highway Corridor greatly increases the likelihood of invasive plant species spread along access routes and in newly disturbed and trafficked areas. Once the species becomes established in disturbed areas, the probability of establishment in adjacent undisturbed areas greatly increases. Spread along waterways is of particular concern, since disturbed soils vulnerable to infestation occur naturally in floodplain areas. Infestation of undisturbed naturally vegetated areas can have far-reaching and potentially hugely detrimental impacts on native plant communities and wildlife habitat.

Invasive plants can become established during all phases of development (e.g. exploration, access, ground disturbance) and the risk of infestation in disturbed areas remains long after activity has ceased. Issuance of this permit will increase the likelihood of

invasive plant infestation of both newly and previously disturbed areas associated with the proposed activity.

If invasive plant species become established as a result of this action, the probability of spread along rivers and within naturally disturbed areas could result in both environmental and economic costs, including loss of wildlife habitat and costs of control.

Cumulative Effects:

Past, current and reasonably foreseeable actions related to the proposed activity are not expected to result in cumulative impacts to native plant communities as a result of invasive plant infestation. However, monitoring is required to ensure that invasive plant spread does not result from the proposed action. If further future development occurs in relation to the proposed exploratory activity then cumulative effects in relation to invasive plant spread should be mitigated to prevent introduction and spread of invasive plants.

Vegetation:

Direct and Indirect Effects:

In Alaska, where vegetation recovery periods can be very slow, and suitable habitat for the small number of Federal subsistence game species is limited, it is important to take the impacts to vegetation communities into consideration when substantial vegetation disruption is proposed. Since it is not possible to determine the exact acreage of actual disturbance to any given vegetation type based on the nature of the proposed exploration activity, our estimates of effects on vegetation reference the maximum amount of area to be disturbed. Activity that occurs in areas of identified special value (including inherent environmental value, economic value and value to Federally-qualified subsistence users) require special consideration.

In general, it is strongly recommended that where at all feasible, the proposed activity occurs in previously disturbed areas to minimize the total impacts on vegetation, wildlife habitat, and visual resources. Specifically, white spruce stands in floodplain areas are of high value for subsistence logging (home building and firewood collection). Also, areas near water are commonly inhabited by plant species and assemblages of high environmental value for both animal habitat (including BLM-listed Special Status Species) and waterway stabilization and erosion control. Several best management practices could be employed to minimize the effect on wildlife habitat, federal subsistence vegetation resources and waterways. It is recommended that to the extent practical, the proposed action is conducted during the winter months when impacts to vegetation are most likely to be minimized relative to summer activity. It is particularly important that the proposed development in floodplain and other aquatic or wet areas occur in the winter months. Additionally, vegetation clearing should be conducted in such a way that few to no economically valuable white spruce trees in floodplain areas are removed as a product of the proposed activity.

The creation of new access routes increases the probability of repeated use by the public and ongoing damage to vegetation. Additionally, the invasive plants known to commonly occur in this region are known to become most readily established in areas of newly exposed soils, such as areas where vegetation has been cleared for exploration.

Cumulative Effects:

The total of 3973 acres (6.2 square miles) of proposed development area is equivalent to an area two tenths the size of the City of Fairbanks, Alaska. Even if the actual effects on vegetation are less than half the maximum estimated area, the proposed action is substantial and will have an impact on available habitat for wildlife, vegetation community structure, and visual resources for recreational users. The proposed action will substantially contribute to the cumulative effects on vegetation in the Utility Corridor. Cumulative effects will include site-specific impacts to vegetation and wildlife habitats and a temporary net loss of vegetation and wildlife habitat project-wide, but these disturbances will be minimal compared to impacts associated with past, ongoing, and future projects in the Utility Corridor.

Areas of Environmental Concern:

The Galbraith Lake and Toolik Lake ACEC's were established for important resources (cultural, research, wildlife) which could be potentially impacted by the proposed activity. The legal protections of these areas and the resources that they were established for should be reviewed thoroughly and carefully before implementation of the proposed action.

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Fire Management:

Direct and Indirect Effects:

There would be two general effects on Fire Management from the proposed action. First, any new access trails will be to some degree a break in continuity of fuels (vegetation) and thus obstruct the spread of wildfires. The duration of this effect will be variable depending on whether the trail is revegetated and how long it takes to revegetate. This obstruction of fire spread would generally benefit suppression activities and generally hinder the ability of fires to burn as they would

have naturally in areas where they are allowed to burn. The second effect will be one increased access due to trail construction. The duration of this effect would again be variable depending on whether the trail is revegetated and how ling it takes to revegetate. The increased access would generally facilitate fire suppression and reporting while increasing the chance of a human start. BLM policy is to suppress all human starts and bill suppression and resource damage as well as any other associated cost of the fire to the responsible party.

Cumulative Effects:

There are other roads, trails, and vegetative disturbances in the project area that have the same effect as the proposed activity. In the Dalton Highway Corridor the highway, the Oil Pipeline and associated trails, gravel pits, research areas, and other small developments exist already.

Geology, Mining and Mineral Materials

Exploration conducted over such a large scale has the advantage of being able to determine the usefulness of material over a large project area. It also has the disadvantage of being able to cross numerous other permitted locations, without the permit holders authorization. Caution is warranted when operating near any permitted site.

Riparian-Wetlands:

Direct and Indirect Effects:

Access is requested to allow drilling, soil sample collection, and to collect data from piezometers and soil thermistors installed in PVC casing at select sites. Upon completion of data collection, access would also be required to remove the instruments and casings. Some of the riparian and wetland vegetation growing along trails/roads and at sample sites will be crushed or cut during these activities. Recovery time is uncertain, though, with a root system intact, re-growth is likely. Depending on season of use, additional effects from use may include settling, soil compaction, and surface moisture changes all of which could impact vegetation growth and diversity.

The Utility Corridor Resource Management Plan (Implementing Actions) directs BLM to confine ORV operations to soils with low erosion potential or to when the ground is frozen (30 cm) with sufficient snow cover to protect vegetation. BLM has surveyed numerous trails along the Dalton Highway and has documented trails (notably in lowlands) showing signs of deterioration and damage when used in the summer by OHV's. Trails may be especially susceptible to damage during periods of heavy rain, freeze-up and breakup. Given concerns regarding the integrity of trails and to minimize impacts to soil, water and vegetative resources, use of temporary routes (undeveloped trails) for overland travel should be limited when collecting data from piezometers, data loggers and soil thermistors to access by non-motorized means, snow machines when ground is frozen (30 cm) with sufficient snow cover (average depth 6 inches), or helicopter. Annual trail monitoring should be undertaken to evaluate and confirm that riparian and wetland vegetation functionality is not impaired. Any riparian-wetland areas that become damaged due to the activities covered by this permit may be closed to motorized use and, in all cases, shall be restored to a condition satisfactory to the BLM CYFO.

The applicant also proposes (if necessary) to use cut trees as corduroy logs on the stream banks to protect vegetation from damage when crossing streams. The Utility Corridor Resource Management Plan (Implementing Actions) directs BLM to prohibit tree cutting within 50 feet of either side of a stream unless the trees are a danger to human safety or are adversely affecting

stream flow or within 200 feet of either side of the center line of a road. While trees may be available from clearing outside these zones, some crossings may be in areas with no trees available to corduroy. These situations may require use of a man made portable structure or to change crossing locations to minimize damage to stream banks.

To ensure continued vegetative integrity at stream crossings and to minimize the chance of water quality degradation due to soil erosion, activity at stream crossings should be monitored and any stream bank damage reported and repaired. Measures such as temporary stabilization and planting should be used, as necessary, to prevent bank erosion and water quality concerns.

Cumulative Effects:

In addition to the proposed action, there are active gravel quarrying sites, airstrips, the Trans-Alaska Pipeline, the Dalton Highway, private inholdings, and Alaska Department of Transportation highway maintenance facilities near the proposed action, all of which have altered habitat and condition. The additional disturbance from this permitted activity is anticipated to be short term in duration, and will not change the current functionality of wetlands and riparian vegetation on a watershed scale.

Water Resources:

Direct and Indirect Effects:

Access is requested to allow drilling, soil sample collection, and to collect data from piezometers and soil thermistors installed in PVC casing at select sites. A number of the access points (roads/trails) are adjacent to, or cross, waterbodies. Potential impacts to water quality include in stream sedimentation at stream crossing sites resulting from disturbance to stream bank cover or from vehicles disturbing the stream substrate during crossing. Depending on season of use, additional effects from use may include settling, soil compaction, and surface moisture changes all of which could increase erosion rates. Effects of the transport of a limited amount of sediment downstream will include intermittent periods of reduced water quality with the potential of not meeting State of Alaska water quality standards. To ensure continued vegetative integrity at stream crossings and to minimize the chance of water quality degradation due to soil erosion, activity at stream crossings should be monitored and any trail/road or stream bank damage reported and repaired. Measures such as temporary stabilization and planting should be used, as necessary, to prevent bank erosion and water quality concerns.

Given concerns regarding the integrity of trails (see vegetation section of this document) and to minimize impacts to water resources from soil erosion, use of temporary routes (undeveloped trails) for overland travel should be limited seasonally, as proposed by the applicant, with the minimum number of passes needed to complete the borehole sampling. Alternate routes that avoid stream and wetland crossings should also be employed to mitigate possible negative impacts to water quality. The proposed crossing of the Jim River between Dalton Highway Milepost 140-141 is an example of how rerouting to avoid a stream would lessen the damage to stream banks and wetland area and reduce the risk of erosion and water quality in an important salmon producing river.

The applicant's proposal also requests that some boreholes be located in stream beds. Drilling in stream beds would occur either in winter months during stable ice conditions or on gravel bars during open water months. During winter drilling, cuttings would likely collect under the ice on the stream bed. Any drill cuttings surfacing above the ice would be used to backfill the borehole.

Cuttings from drilling activity in winter that occur over flowing water would cause temporary elevation of sedimentation levels and concurrent periods of reduced water quality with the potential of not meeting State of Alaska water quality standards until drilling ceased. It is recommended that drilling over flowing water in winter be eliminated in order to minimize impacts of sedimentation on water quality and fish.

Cumulative Effects:

In addition to the proposed action, there are active gravel quarrying sites, airstrips, the Trans-Alaska Pipeline, the Dalton Highway, private inholdings, and Alaska Department of Transportation highway maintenance facilities near the proposed action, all of which have altered habitat and condition.

The timing and techniques to be employed for this project are designed to minimize impacts to water quality. However, during open water periods, waterways may experience slight decreases in water quality. Overall water quality impacts are expected to be temporary. Additional long-term direct or indirect water quality effects from this project on the water resources along the Dalton Highway are not anticipated.

Soils:

Direct and Indirect Effects:

Actions requested that may impact soils include access, drilling, soil sample collection, and data collection from piezometers and soil thermistors installed at select sites.

The Utility Corridor Resource Management Plan (Implementing Actions) directs BLM to confine ORV operations to soils with low erosion potential or to when the ground is frozen (30 cm) with sufficient snow cover to protect vegetation. BLM has surveyed numerous trails along the Dalton Highway and has documented trails (notably in lowlands) showing signs of deterioration and damage when used in the summer by OHV's. Trails may be especially susceptible to damage during periods of heavy rain, freeze-up and breakup. Given concerns regarding the integrity of trails and to minimize impacts to soil, water and vegetative resources, use of temporary routes (undeveloped trails) for overland travel should be limited when collecting data from piezometers, data loggers and soil thermistors to access by non-motorized means, snow machines when ground is frozen (30 cm) with sufficient snow cover (average depth 6 inches), or helicopter.

Vegetation growing along trails/roads, streams, and at sample sites will be crushed or cut during these activities with potential disturbance of the underlying soils. Depending on season of use, effects may include soil compaction and surface moisture changes which could lead to increased soil loss through erosion. Annual trail monitoring should be undertaken to evaluate and confirm that soil loss is not occurring and that soil functionality is not impaired. Any areas that become damaged due to the activities covered by this permit may be closed to motorized use and, in all cases, shall be restored to a condition satisfactory to the BLM Central Yukon Field Office.

Direct impacts from excavation and spreading of soil at borehole sites would include the reduction of the thickness of the soils and a short-term reduction in the ability of vegetation to obtain nutrients from the soil. Proposed saving and subsequent re-spreading of the organic layer and topsoil at borehole sites will influence recovery of the soils. The more rapidly vegetation is established on site, the sooner exposed soil is covered, erosion is arrested, and the soils begin the

process of regaining productivity. The progress of soil recovery and stabilization at these sites should be monitored over the life of this permit to in an effort to minimize loss of soil functionality.

Cumulative Effects:

In addition to the proposed action, there are active gravel quarrying sites, airstrips, the Trans-Alaska Pipeline, the Dalton Highway, private inholdings, and Alaska Department of Transportation highway maintenance facilities near the proposed action, all of which have altered habitat and condition. The additional disturbance to soil from this permitted activity is anticipated to be minimal. There will be little change in the current long term functionality of soils in the region given that reclamation efforts are expected to minimize soil loss.

Fish:

Direct and Indirect Effects:

The applicant's proposal requests that stream crossings be allowed year-round. During the winter months, equipment would not enter open water to cross streams. Some boreholes would be located in stream beds. Drilling in stream beds would occur either in winter months during stable ice conditions or on gravel bars during open water months. During winter drilling, cuttings would likely collect under the ice on the stream bed. Any drill cuttings surfacing above the ice would be used to backfill the borehole.

Potential impacts to aquatic habitat include in stream sedimentation at stream crossing sites resulting from disturbance to stream bank cover or from vehicles disturbing the stream substrate during crossing. Cuttings from drilling activity in winter would also cause elevated sedimentation levels with potential localized loss of overwintering fish habitat if conducted in areas with flowing water. Direct threats to fish from sediment include changes to physical habitat, subsequent decreased reproductive success and loss of rearing and over wintering habitat. Physical habitat changes from sediments are most often attributed to finer size particles. Developing eggs can be smothered and newly hatched fry can be killed by suspended sediment that prevents emergence from spawning gravels and interferes with respiration. Sedimentation of affected streams substrate also has the potential to decrease primary productivity and increase losses of benthic invertebrates. These impacts could occur both in the vicinity of the discharge or erosion as well as downstream.

Sub-lethal impacts to fish from sedimentation are a further concern in stream environs. Effects such as avoidance, reduced feeding, and lessened tolerance to disease can work in combination to reduce fitness and survival.

To minimize impacts of sedimentation to aquatic habitat, activity at stream crossings should be monitored and any stream bank damage reported and repaired. Measures such as temporary stabilization and planting will be used, as necessary, to prevent bank erosion and water quality concerns.

The applicant also proposes to drill in stream beds of waterbodies that harbor salmon, and as such, are considered to have EFH. During winter drilling at these sites, the applicant states that cuttings would likely collect under the ice on the stream bed. Any drill cuttings surfacing above the ice would be used to backfill the borehole. Boreholes drilled between high water marks would be sealed with bentonite chips or pellets.

If drilling is to occur over flowing water, an adverse impact to EFH is expected. An adverse effect is any impact that reduces the quality and/or quantity of EFH. Under this permit, cuttings from

drilling activity in winter would cause elevated sedimentation levels with potential localized disturbance to overwintering fish habitat if conducted in areas with flowing water. The MSFCMA requires federal agencies to consult with the National Marine Fisheries Service (NMFS) on all actions or proposed actions permitted by the agency that may adversely affect EFH. The MSFCMA requires NMFS to then make conservation recommendations to the agency (BLM) regarding actions that would adversely affect EFH. The necessity of BLM consulting with NMFS under an adverse impact to EFH determination would delay drilling at the affected sites until consultation is complete.

If drilling in stream beds were to occur in areas of no flowing water, or if drilling in the floodplain was precluded, there would be no expected impacts to EFH. Under these conditions, this action would not adversely affect EFH and no consultation with NMFS would be required.

Cumulative Effects:

In addition to the proposed action, there are active gravel quarrying sites, airstrips, the Trans-Alaska Pipeline, the Dalton Highway, private inholdings, and Alaska Department of Transportation highway maintenance facilities near the proposed action, all of which have altered habitat and condition. Given the mitigation included with this permit, the additional disturbance from this action is anticipated to be short term in duration, and will not change the current functionality of aquatic habitat or have more than a minimal impact on aquatic resources found along the Dalton Highway.

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Chapter 5. Tribes, Individuals, Organizations, or Agencies Consulted:

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Letters to all interested third parties were mailed on February 18, 2015, with a comment due date of March 6, 2015.

Table 5.1. List of Persons, Agencies and Organizations Consulted

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
State of Alaska, DNR	Water/Land permits	Permitted
State of Alaska, DOT	Interested Party	None
State of Alaska SHPO	Cultural	Permitted
Western Interior RAC	Caribou	
Residents of Wiseman	Interested Party	
Alyeska Pipeline Service Company	Access to sites	Permitted
64 applicants holding authorizations	Interested Parties	
State of Alaska, ADF&G	Permit for Fish	Permitted

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Chapter 6. List of Preparers

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Table 6.1. List of Preparers

Name	**Title**	**Responsible for the Following Section(s) of this Document**
Bob Karlen	Fisheries Biologist	
Karen Deatherage	Wilderness	
William Hedman	Archaeology	
Erin Julianus	Wildlife Biologist	
Jennifer McMillan	Ecologist	
Robin Walthour	Realty Specialist	
Tyler Cole	Natural Resource Spec	
Michael Schoder	Cadastral Survey	
Cory Black	GIS	
Thomas St. Clair	Fire Mgmt Officer	
Darrel VandeWeg	Geologist	
Cal Westcott	Outdoor Rec Planner	
Tim Hammond	AFM Resources/Minerals	
Shelly Jacobson	Field Manager	
Dian Rasumussen	Realty Specialist GFO	
Elizabeth Andringa	Hazmat Specialist	
Kelly Egger	Outdoor Rec Planner	
Darrel VandeWeg	Geologist	