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SECTION 4B
DIRECT AND INDIRECT IMPACTS – ALTERNATIVE B

4B.1 INTRODUCTION

This section provides an analysis of the environmental consequences that would result from implementation of Alternative B – CPAI Development Plan and Alternative B – FFD.

Except for those aspects specifically discussed below, the components of Alternative B are the same as those for Alternative A. Differences between the two alternatives provide for conformance to Northeast National Petroleum Reserve-Alaska IAP/EIS development stipulations, and include:

- Moving proposed permanent oil infrastructure to a distance at least 3 miles from Fish Creek (Stipulation 39[d]). This requires that CD-6 and associated roads and pipelines be moved from within the setback.

- Moving proposed permanent oil infrastructure to a distance of at least 500 feet from water bodies, excepting essential pipeline and road crossings (Stipulation 41). Roads and pipelines would be moved to conform to this provision to the maximum extent possible

- Eliminating roads to a road network outside BLM-managed lands within the Plan Area (Stipulation 48). Road connection between CD-6 and CD-7, on the one hand, and other facilities, on the other hand, are eliminated

In addition, access to roads would be restricted to industry personnel only.

Alternative B – FFD also would conform to Northeast National Petroleum Reserve-Alaska IAP/EIS development stipulations. The Teshekpuk Lake Special Area would preclude development in the northwestern part of the Plan Area near the Kogru River. This would eliminate HP-22. Several other facilities would have to be relocated outside the Fish Creek buffer.

4B.2 PHYSICAL CHARACTERISTICS

4B.2.1 Terrestrial Environment

4B.2.1.1 Physiography

ALTERNATIVE B – CPAI DEVELOPMENT PLAN IMPACTS ON PHYSIOGRAPHY

CONSTRUCTION PERIOD

Effects on physiography would result from changes to landforms by construction of roads, production pads, airstrips, and gravel mines. The impacts are therefore similar to those discussed in Section 4A.2.1.1 for Alternative A.

Areas where gravel mining operations would directly affect the physiography include 37 acres (Section 4B.2.1.4) of gravel mine. Placement of gravel on the tundra would directly affect physiography on 204 acres (Table 2.5-1).

OPERATION PERIOD

Effects during the operation period would be similar to those under Alternative A.

ABANDONMENT AND REHABILITATION

Impacts of abandonment under Alternative B would be similar in nature to those under Alternative A, but Alternative B would potentially leave fewer changes than Alternative A, because there would be 16 fewer miles of roads constructed.

ALTERNATIVE B – FULL-FIELD DEVELOPMENT SCENARIO IMPACTS ON PHYSIOGRAPHY

Areas that would experience direct physiographic effects from gravel mining operations under Alternative B – FFD encompass approximately 287 acres. Areas that would experience direct physiographic impacts from placement of gravel on tundra encompass 1,049 acres.

ALTERNATIVE B – SUMMARY OF IMPACTS (CPAI AND FFD) ON PHYSIOGRAPHY

Impacts to physiography would occur primarily during the construction phase and result from changes to landforms by construction of roads, production pads, airstrips, and mine sites. If not properly designed and constructed, these landforms can adversely affect thermal stability of the tundra and hydrology through thermokarsting and increased ponding.

ALTERNATIVE B – POTENTIAL MITIGATION MEASURES (CPAI AND FFD) FOR PHYSIOGRAPHY

No measures have been identified to mitigate impacts to physiography under Alternative B or Alternative B – FFD.

ALTERNATIVE B – EFFECTIVENESS OF PROTECTIVE MEASURES FOR PHYSIOGRAPHY

The effectiveness of the protective measures would be similar to that under Alternative A.

4B.2.1.2 Geology

Plan Area geology is comprised of marine limestones and marine and deltaic sands and shales of Mississippian to mid-Cretaceous age (Gyrc 1985), mantled largely by Quaternary-aged fluvial and glaciofluvial sediments (Rawlinson 1993). Oil production efforts in the Plan Area target a Jurassic sandstone reservoir located in the Beaufortian Sequence (BLM 2003b).

ALTERNATIVE B – CPAI DEVELOPMENT PLAN IMPACTS ON GEOLOGY

CONSTRUCTION PERIOD

Direct Effects

Drilling oil production wells at the five pad locations (CD-3 through CD-7) would directly impact the physical integrity of reservoir and overlying bedrock by pulverization and fracture. The only surface bedrock identified in the Plan Area outcrops at the bend in the lower Colville River, upstream of Ocean Point (Mayfield et al. 1988). Alternative B does not propose excavation activities in this area and would therefore not directly impact surface bedrock. The volume of rock impacted by drilling is insignificant compared to the total volume of bedrock comprising the Plan Area. Direct impacts to Plan Area bedrock during construction would produce no measurable effect and are considered negligible under this alternative.

Indirect Effects

No indirect effects are recognized for the construction period.

OPERATION PERIOD

Direct Effects

Annular disposal or injection of Class I and II wastes would directly impact the receiving bedrock via possible propagation of existing fractures, increase of pore space pressure, and alteration of pore space composition within an approximately 0.25-mile radius of the well (40 CFR 146.69 (b)). The volume of rock impacted by waste disposal is insignificant compared to the total volume of bedrock comprising the Plan Area. Direct impacts to Plan Area bedrock during operation would produce no measurable effect and are considered negligible under this alternative.

Production of petroleum hydrocarbons from subsurface reservoirs constitutes an irreversible and irretrievable commitment of resources. Direct impacts to petroleum hydrocarbon resources in the Plan Area would be major under this alternative.

Indirect Effects

No indirect effects are recognized for the operation period.

ABANDONMENT AND REHABILITATION

Geology will not be impacted by abandonment activities under Alternative B – CPAI Development Plan.

ALTERNATIVE B – FULL-FIELD DEVELOPMENT SCENARIO IMPACTS ON GEOLOGY

Direct and indirect impacts incurred during construction and operation of Alternative B – FFD would be similar to those presented in Section 4B.2.1.2.1, but would be experienced over greater spatial and temporal extents. Direct impacts to Plan Area bedrock would remain negligible under the Alternative B – FFD. Direct impacts to Plan Area petroleum hydrocarbon reserves would be major under this alternative.

ALTERNATIVE B – SUMMARY OF IMPACTS (CPAI AND FFD) ON GEOLOGY

Under either alternative, the irreversible and irretrievable commitment of petroleum hydrocarbon resources constitutes a major impact, however petroleum hydrocarbon production is the purpose of the applicant's proposed action. Impacts to bedrock under either alternative would be negligible.

ALTERNATIVE B – POTENTIAL MITIGATION MEASURES (CPAI AND FFD) FOR GEOLOGY

Mitigation of impacts to petroleum hydrocarbons would be in conflict with the purpose of the applicant's proposed action. Therefore no measures have been identified to mitigate the effect on geologic resources under Alternative B nor Alternative B – FFD.

ALTERNATIVE B – EFFECTIVENESS OF PROTECTIVE MEASURES FOR GEOLOGY

The effectiveness of the protective measures would be similar to that under Alternative A.

4B.2.1.3 Soils and Permafrost

ALTERNATIVE B – CPAI DEVELOPMENT PLAN IMPACTS ON SOILS AND PERMAFROST

Construction and operation of Alternative B would involve impacts similar in type but different in magnitude to those presented under Alternative A (Section 4A.2.1.3). Compared to Alternative A, Alternative B involves less road construction (due to elimination of a road network outside of BLM-

managed lands) and proposes power cable burial (as opposed to construction of an overhead powerline or inclusion of a power cable tray on pipeline VSMs). Except where noted, assumptions involved in the following calculations of soil and permafrost impacts do not differ from those presented in Section 4A.2.1.3. Impacts of abandonment under Alternative B would be similar in nature to those under Alternative A. However, if the rehabilitation preference is for removal of gravel pads, there would be less impact to the thermal regime between CD-2 and CD-6, because there would not be a road bridge over the Nigliq Channel, nor a road between CD-2 and CD-6 to be removed.

CONSTRUCTION PERIOD

Relative to Alternative A, Alternative B would eliminate the road connection between CD-2 and CD-6, thereby reducing the total road length from 26 to 10 miles. Reduction in road miles translates to a lesser need for fill, a minimization of impacts associated with excavation of fill, fewer culverts and bridges, and reduced length of ice roads. Under Alternative B, 1.6 million cy of fill would overlie approximately 204 acres of tundra. This footprint would be 37 acres less than that proposed under Alternative A. Extraction of the gravel required for construction of Alternative B would impact a total of 37 acres of tundra and would require a total of 38 acres of ice pad for stockpiling overburden at the ASRC Mine Site and at Clover. Temporary ice roads and adjacent ice pads would cover approximately 1,384 acres of tundra over six winter seasons—this area is 155 acres less than that estimated for Alternative A. Elimination of the road connection between CD-2 and CD-6 reduces the number of bridges required under Alternative B to two, and the area of ice pads associated with bridge construction to 59 acres. Installation of 110 culverts and 3,504 VSMs under Alternative B would disturb approximately 2,300 and 12,500 cy of soil, respectively. Impacts associated with water discharges to the tundra and tundra travel during the construction period are assumed to be of the same magnitude as those under Alternative A.

Under Alternative B, power cable would not be run over head or in a tray on pipeline VSMs. Alternative B proposes to bury power cable in roads, or in tundra between pads not connected by roads. Due to the thick depth of fill, power cable burial in gravel roads would not disturb the underlying soils and permafrost. However, power cable burial in the tundra would directly impact soils. Power cable burial involves cutting a trench through an ice road, placing the cable, and pushing the cuttings back into the trench. Relative to summer insertion, winter insertion of cables typically leaves a wider swath of barren soil on the tundra (Truett and Johnson 2000). Alternative B would require 20 miles of trenching in tundra between CD-3 and CD-1 and between CD-2 and CD-6. Assuming a trench depth of 5 feet and width of 1-foot, this alternative would disturb 19,519 cy of active layer soils. Power cable burial in tundra represents a significantly greater impact than the installation of VSMs or power poles. Power cable burial would disturb 978 cy of soil per mile, whereas VSM and power pole installation would disturb 343 and 38 cy of soil per mile, respectively.

OPERATION PERIOD

Reduction in road miles would minimize the indirect impacts associated with road travel and maintenance occurring during the operation period. Reduction of dust fallout and accumulations of plowed snow and sprayed gravel would minimize the thermal impacts to active layer soils and permafrost. The area of thermal impact calculated for Alternative B is 635 acres; 517 acres less than that under Alternative A. Quantification of thermal impact for Alternative B does not account for permafrost impacts due to trenching; an additional 2.4 acres would be disturbed by trenching. Trenching in tundra soils would alter soil properties and destroy the overlying vegetative mat. Truett and Johnson (2000) reported that thermokarst creates a persistent linear feature where power cable burial disturbs ice-rich sediments. Although power cable burial in tundra is likely to degrade permafrost, this activity represents a short-term and spatially constricted impact, whereas disturbance to roadside permafrost would be sustained for the duration of the operation period and could extend up to 164 feet from the road (Hettinger 1992, BLM and MMS 1998a and 2003b). Therefore, recovery from trenching would likely be faster than the rate of recovery experienced by roadside soil and permafrost. Operation period impacts associated with tundra travel, transmission of warm reservoir fluids, sub-permafrost injection of waste, and accidental oil spills are assumed to be of the same magnitude as those under Alternative A.

ALTERNATIVE B – FULL-FIELD DEVELOPMENT SCENARIO IMPACTS ON SOILS AND PERMAFROST

Construction and operation of Alternative B – FFD would involve impacts similar in type but different in magnitude to those presented for Alternative A – FFD (Section 4A.2.1.3). Compared to Alternative A – FFD, Alternative B – FFD eliminates construction of roads and production pads in areas not permitted for permanent oil and gas facilities, or not available for oil and gas leasing, respectively (BLM 1998). It also proposed power cable burial, as opposed to construction of an overhead powerline or a power cable tray supported by pipeline VSMs.

CONSTRUCTION PERIOD

Relative to Alternative A – FFD, Alternative B – FFD would eliminate HP-22 and its road connections to HP-11 and HP-15, and road connections between HP-18 and HP-26 and between HP-18 and HPF-1. This would reduce the total number of HPs to 21 and road length from 122 to 94miles. Such a reduction translates to a lesser need for fill, minimization of impacts associated with excavation of fill, and fewer culverts and bridges. Under Alternative B – FFD, 7.6 million of fill would overlie approximately 1,049 acres of tundra. This footprint would be 213 acres less than that proposed under Alternative A – FFD. Extraction of the gravel required for construction of Alternative B – FFD would impact a total of 287 acres of tundra and would require a total of 297 acres of ice pad for stockpiling overburden. Potential material source areas have not been identified..

Temporary ice roads and adjacent ice pads would cover approximately 2,739 acres of tundra over 20 winter seasons. Because Alternative B – FFD proposes a greater number of isolated HPs or HP clusters, ice road connections would need to be built each winter during the construction period. Therefore Alternative B – FFD would require construction of an additional 339 acres of ice roads relative to Alternative A – FFD. Elimination of road connections would reduce the number of bridges required for construction of Alternative B – FFD. Bridge locations have not been identified and therefore the area of ice pads associated with bridge construction cannot be quantified. However, it is assumed the number of bridges required under Alternative B – FFD would be less than the number required under Alternative A – FFD. Installation of 960 culverts and 13,044 VSMs under Alternative B – FFD would disturb approximately 19,900 and 46,500 cy of soil, respectively. Alternative B – FFD proposes to bury power cable in roads or in tundra between pads not connected by roads. Alternative B – FFD would require 48 miles of trenching in tundra to HP-11 and HP-15, and between HP-18 and HP-26 and HP-18 and HPF-1. Assuming a trench depth of 5 feet and width of 1-foot, this alternative would disturb 46,522 cy of active layer soils. Impacts associated with water discharges to the tundra and tundra travel during the construction period are assumed to be of the same magnitude as those under Alternative A – FFD.

OPERATION PERIOD

Reduction in road miles would minimize the indirect impacts associated with road travel and maintenance occurring during the operation period. Reduction of dust fallout and accumulations of plowed snow and sprayed gravel would minimize the thermal impacts to active layer soils and permafrost. The area of thermal impact calculated for Alternative B – FFD is 4,400 acres; 1,262 acres less than that for Alternative A – FFD. Quantification of thermal impact for Alternative B – FFD does not account for permafrost impacts due to trenching; an additional 5.8 acres would be disturbed by trenching. Operation period impacts associated with tundra travel, transmission of warm reservoir fluids, sub-permafrost injection of waste, and accidental oil spills occurring are assumed to be of the same magnitude as those under Alternative A – FFD.

ALTERNATIVE B – SUMMARY OF IMPACTS (CPAI AND FFD) ON SOILS AND PERMAFROST

Construction and operation of Alternative B and Alternative B – FFD would result in a lesser impact to soil and permafrost resources, compared to Alternative A and Alternative A – FFD. Under Alternative B, 1,556 acres and 1.6 million cy of soil would be directly impacted compared to 1,757 acres and 2 million cy of soil estimated

for Alternative A. The percent of the total Plan Area that would be impacted by construction under Alternative B is approximately 0.2 percent, which is an inconsequential impact.

Under Alternative B – FFD, approximately 4,085 acres and 7.6 million cy of soil would be directly impacted, compared to approximately 4,195 acres and 8.8 million cy of soil estimated for Alternative A – FFD. Alternative B – FFD would require a smaller surface disturbance than Alternative A – FFD due to the greater need for ice roads to support construction at isolated HPs. The percent of the total Plan Area that would be impacted by construction under Alternative B – FFD is 0.5 percent. Under Alternative B and Alternative B – FFD, the placement of fill on the tundra would represent the greatest direct impact to soil and permafrost; the thermal impacts associated with placement of fill on the tundra would represent the greatest indirect impact.

ALTERNATIVE B – POTENTIAL MITIGATION MEASURES (CPAI AND FFD) FOR SOILS AND PERMAFROST

Soil and permafrost systems could recover to their pre-impact state, but not without appropriate mitigation. Because impacts to soil and permafrost are generally unavoidable, mitigation aims to minimize the degree and magnitude of the applicant's proposed action. Mitigation measures proposed under Alternative B and Alternative B – FFD are the same as those identified for Alternative A (Section 4A.2.1.3). One specific recommendation under Alternative B is to run power cable in a tray supported by pipeline VSMs to avoid power cable burial and to reduce the degree and magnitude of impacts to soil and permafrost.

ALTERNATIVE B – EFFECTIVENESS OF PROTECTIVE MEASURES FOR SOILS AND PERMAFROST

The effectiveness of the protective measures would be similar to that under Alternative A.

4B.2.1.4 Sand and Gravel

Once used, sand and gravel resources for construction of roads, production pads, or airstrips may only be available for re-use upon abandonment.

ALTERNATIVE B – CPAI DEVELOPMENT PLAN IMPACTS ON SAND AND GRAVEL

CONSTRUCTION PERIOD

The estimated gravel volume required for Alternative B (Figure 2.4.2.1-1 and Table 2.4.2-3) is 1.6 million cy. Alternative B impacts to sand and gravel resources would be similar to, but less than, those identified for Alternative A.

OPERATION PERIOD

During the operation period, relatively small amounts of gravel are expected to be extracted from existing permitted mine sites for repair of road or pad embankments.

ABANDONMENT AND REHABILITATION

Sand and gravel impacts would be similar to those under Alternative A, although the use of approximately 20 percent less sand and gravel during construction would make this same amount unavailable for re-use.

ALTERNATIVE B – FULL-FIELD DEVELOPMENT SCENARIO IMPACTS ON SAND AND GRAVEL

The Alternative B – FFD would use and build off of the same road network that would be constructed under the Alternative B – CPAI Development Plan. Alternative B – FFD, depicted in Figure 2.4.2.2-1, is estimated to

need 7.6 million cy (Table 2.4.2-5 and Table 2.4.2-6). Other than Clover, potential sources for this gravel have not yet been determined.

ALTERNATIVE B – SUMMARY OF IMPACTS (CPAI AND FFD) ON SAND AND GRAVEL

Once used, sand and gravel resources for construction of roads, production pads, or airstrips may only be available for re-use upon abandonment. Removal of gravel fill is not currently a scheduled phase of abandonment.

ALTERNATIVE B – POTENTIAL MITIGATION MEASURES (CPAI AND FFD) FOR SAND AND GRAVEL

No measures have been identified to mitigate impacts to sand and gravel resources under Alternative B nor Alternative B – FFD.

ALTERNATIVE B – EFFECTIVENESS OF PROTECTIVE MEASURES FOR SAND AND GRAVEL

The effectiveness of the protective measures would be similar to that under Alternative A.

4B.2.1.5 Paleontological Resources

ALTERNATIVE B – CPAI DEVELOPMENT PLAN IMPACTS ON PALEONTOLOGICAL RESOURCES

Under Alternative B, the impacts to paleontological resources are generally the same as those under Alternative A, except that the intensity of the actions would decrease because of the elimination of road segments from CD-2 to CD-5 and CD-5 to CD-6. Excavation of sand and gravel material at the ASRC Mine Site and Clover could affect paleontological resources within approximately 37 acres of subsurface area. As for Alternative A, drilling, placement of gravel pads and VSMs, and bridge construction are very unlikely to impact paleontological resources.

Under Alternative B, powerlines would be buried in or under roads (in areas with roads) and in the tundra adjacent to the pipelines between pads in roadless areas. Because the occurrence of paleontological materials on the surface is isolated and rare, and route surveys would be completed before construction activities are started, the likelihood of impacts to paleontological resources during shallow trenching for powerlines is low.

Compared with Alternative A, Alternative B would require seven fewer vehicle bridges. The only bridge construction would be associated with a 40-foot vehicle bridge on the road segment between CD-6 and CD-7, and a 1,200-foot pipeline bridge across the Nigliq Channel. The only impact resulting from bridge construction would be associated with the placement of sheet piling at bridge abutments and with foundation piles at abutments and possibly in-stream locations. However, because route surveys are required for all construction activities, the location of important archaeological and paleontological resources would be known and would be avoided. Paleontological resources would not be impacted by abandonment activities.

ALTERNATIVE B – FULL-FIELD DEVELOPMENT SCENARIO IMPACTS ON PALEONTOLOGICAL RESOURCES

Under Alternative B – FFD, the mechanisms associated with impacts to paleontological resources would remain the same as those described under Alternative B, except that the intensity of the actions would increase as a result of the greater extent of the Plan Area. The primary potential cause of impacts would be excavation of gravel on approximately 287 acres. Approximately three gravel mine sites would be developed to provide the volume of construction material necessary for Alternative B – FFD. The location of gravel mine sites is yet unknown, but could be in areas that would affect paleontological resources. It is likely that the additional sand and gravel mine sites would be situated in the vicinity of the Fish–Judy Creeks and/or Kalikpik–Kogru Rivers

Facility Group. In addition, approximately 1,049 acres could be covered by gravel during the construction of production pads, roads, and airstrips.

ALTERNATIVE B – SUMMARY OF IMPACTS (CPAI AND FFD) ON PALEONTOLOGICAL RESOURCES

Surface activities such as the construction of pad, road, and airfield embankments is not likely to affect paleontological resources. Impacts could result from those activities involving subsurface disturbance, such as sand and gravel mining. Installation of VSMs and bridge piles would occur only after route surveys had been conducted, so important paleontological resources would be known and avoided. Excavation of sand and gravel under approximately 37 acres under Alternative B – CPAI Development Plan and 287 acres under Alternative B – FFD would constitute the greatest risk to paleontological resources. This "greatest risk" represents inconsequential impact potential to paleontological resources.

ALTERNATIVE B – POTENTIAL MITIGATION MEASURES (CPAI AND FFD) FOR PALEONTOLOGICAL RESOURCES

No measures have been identified to mitigate impacts to paleontological resources under Alternative B nor Alternative B – FFD.

ALTERNATIVE B – EFFECTIVENESS OF PROTECTIVE MEASURES FOR PALEONTOLOGICAL RESOURCES

The effectiveness of the protective measures would be similar to that under Alternative A.

4B.2.2 Aquatic Environment

4B.2.2.1 Water Resources

ALTERNATIVE B – CPAI DEVELOPMENT PLAN IMPACTS ON WATER RESOURCES

Alternative B conforms completely to Northeast National Petroleum Reserve-Alaska IAP/EIS development stipulations. Stipulation 39 specifically minimizes impacts to water resources owing to setback requirements of permanent oil and gas facilities from water bodies. Thus, under Alternative B there are more airstrips, but no major stream crossings and the length of roads is significantly reduced.

Because there is not a road bridge across the Nigliq Channel, the Ublutuoch River, or other streams between CD-2 and CD-6 nor roads between these pads, there is less potential for erosion, sedimentation, or upslope impoundment associated with abandonment and rehabilitation activities under this alternative, compared to Alternative A.

GENERAL IMPACTS

In general, Alternative B would affect the same water resources (i.e., subsurface waters, lakes, creeks, rivers, and the nearshore environment) but to a lesser extent than Alternative A. The potential difference in impacts between the alternatives is primarily related to the presence of additional airstrips at CD-5 and CD-6, and the lack of any major stream crossing that would require a bridge for vehicular traffic. Pipeline bridges will be required at the Nigliq and Ublutuoch Crossings, but these would not need to be as large as those under Alternative A. Other than that, differences in impacts between the two alternatives can also be attributed to the locations of the impacts. Quantitative hydrologic analyses of Alternative B have not been made, so analyses are qualitatively based on the Alternative A analysis. Tables 4B.2.2-1 and 4B.2.2-2 provide summaries of potential construction and operation impacts to water resources under Alternative B in the general vicinities surrounding CD-3, CD-4, CD-5, CD-6, and CD-7, including the roads and pipelines connecting the facilitie (Section 4A.2.2.1).

TABLE 4B.2.2-1 POTENTIAL CONSTRUCTION IMPACTS TO WATER RESOURCES

Alternative B – CPAI Development Plan

	GROUNDWATER		LAKES		MAJOR & MINOR STREAM CROSSINGS					ESTUARIES & NEARSHORE ENVIRONMENT	
	Shallow Groundwater	Deep Groundwater	Small Shallow Lakes and Ponds	Large Deep Lakes	Ulamnigiaq Channel	Tamayayak Channel	Sakoonang Channel	Colville River	Minor Streams	Colville River Delta Mouth	Harrison Bay
CD-3 and Vicinity											
Gravel Road Segment: CD-3 to Airstrip	8	NI	NI	NI	NI	NI	NI	NI	NI	7	6
Ice Roads	NI	NI	8,10	8,10	2,3	NI	NI	NI	2,3	2,3	NI
Airstrip	8	NI	NI	NI	2,3,4,5	NI	2,	2,3	2,3	6	6
Pipeline Segment: CD-1 to CD-3	NI	NI	NI	NI	2,7	2,7	2,7	NI	2,,7	6	NI
Production Pad	8	NI	NI	8	2,3	2,3	2,3	NI	1,2,3	6	6
Groundwater Wells	9	9	NI	NI	NI	NI	NI	NI	NI	NI	NI
Surface water extraction for potable and construction use	NI	NI	10	10	NI	NI	NI	NI	NI	NI	NI
CD-4 and Vicinity											
	Shallow Groundwater	Deep Groundwater	Small Shallow Lakes and Ponds	Large Deep Lakes	Nigliq Channel	Minor Streams				Harrison Bay	
Gravel Road Segment CD-1 to CD-4	8	NI	NI	NI	2,7	2,3,4,5,6				**NI**	
Pipeline Segment: CD-1 to CD-4	NI	NI	NI	NI	NI	2,7				**NI**	
Bridges	NI	NI	1,2,5	NI	2,3,4,5,6,7	2,3,4,5,6,7				**6**	
Production Pad	8	NI	8	NI	NI	1,2,3,4,5,6				**NI**	
Groundwater Wells	9	9	NI	NI	NI	NI				**NI**	
Surface water extraction for potable and construction use	NI	NI	10	10	NI	NI				NI	

TABLE 4B.2.2-1 POTENTIAL CONSTRUCTION IMPACTS TO WATER RESOURCES (CONT'D)

Alternative B – CPAI Development Plan								
	GROUNDWATER		LAKES		MAJOR & MINOR STREAM CROSSINGS			ESTUARIES & NEARSHORE ENVIRONMENT
	Shallow Groundwater	Deep Groundwater	Small Shallow Lakes and Ponds	Large Deep Lakes	Nigliq Channel	Minor Streams		Harrison Bay
CD-5 and Vicinity								
Gravel Segment: CD-5 to Airstrip	8	NI	NI	NI	NI	NI		NI
Ice Road and Bridge from CD-2 to CD-5	8	NI	8,10	8,10	2,3,4,5,6,7	2,3,4,5,6		NI
Airstrip	8	NI	NI	NI	NI	2,4,5,6		NI
Pipeline Segment: CD-2 to CD-5	NI	NI	NI	NI	NI	2,7		NI
Production Pad	8	NI	8	NI	NI	2		NI
Groundwater Wells	9	9	NI	NI	NI	NI		NI
Surface water extraction for potable and construction use	NI	NI	10	10	NI	NI		NI
CD-6 and Vicinity								
	Shallow Groundwater	Deep Groundwater	Small Shallow Lakes and Ponds	Large Deep Lakes	Fish-Judy Creek Basin	Ublutuoch River Basin	Minor Streams	Harrison Bay
Gravel Road Segment: CD-6 to Airstrip	8	NI	NI	NI	NI	NI	NI	NI
Ice Roads	8	NI	8,10	8,10	NI	2,3,4,5,6,7	2,3,4,5,6	NI
Airstrip	8	NI	NI	NI	NI	NI	2,4,5,6	NI
Pipeline Segment: CD-5 to CD-6	NI	NI	NI	NI	NI	2,7	2, 7	NI
Production Pad	8	NI	8	NI	NI	NI	2	NI
Groundwater Wells	9	9	NI	NI	NI	NI	NI	NI
Surface water extraction for potable and construction use	NI	NI	10	10	NI	NI	NI	NI

TABLE 4B.2.2-1 POTENTIAL CONSTRUCTION IMPACTS TO WATER RESOURCES (CONT'D)

Alternative B – CPAI Development Plan							
	GROUNDWATER		LAKES		MAJOR & MINOR STREAM CROSSINGS		ESTUARIES & NEARSHORE ENVIRONMENT
	Shallow Groundwater	Deep Groundwater	Small Shallow Lakes and Ponds	Large Deep Lakes	Fish-Judy Creek Basin	Minor Streams	Harrison Bay
CD-7 and Vicinity							
Gravel Road Segment: CD-6 to CD-7	8	**NI**	2,5	2	NI	2,3,4,5,6,7	NI
Pipeline Segment: CD-6 to CD-7	NI	**NI**	NI	NI	NI	2, 7	NI
Production Pad	8	**NI**	8	NI	NI	2	NI
Groundwater Wells	9	**9**	NI	NI	NI	NI	NI
Surface water extraction for potable and construction use	NI	**NI**	10	10	NI	NI	NI

Source:

Notes:

1 = Shoreline disturbance & thermokarsting

2 = Blockage of natural channel drainage

3 = Increased stages & velocities of floodwater

4 = Increased channel scour

5 = Increased bank erosion

6 = Increased sedimentation

7 = Increased potential for over banking (due to inundation or wind-generated wave run-up)

8 = Removal/compaction of surface soils/gravel and changes in recharge potential

9 = Underground disposal of non-hazardous wastes

10 = Water supply demand

NI = No Impact

TABLE 4B.2.2-2 POTENTIAL OPERATIONS IMPACTS TO WATER RESOURCES

Alternative B – CPAI Development Plan											
	GROUNDWATER		LAKES		MAJOR & MINOR STREAM CROSSINGS					ESTUARIES & NEARSHORE ENVIRONMENT	
Colville River Facility Group	Shallow Groundwater	Deep Ground ater	Small Shallow Lakes and Ponds	Large Deep Lakes	Ulamnigiaq Channel	Tamayayak Channel	Sakoonang Channel	Colville River	Minor Streams	Colville River Delta	Harrison Bay
CD-3 and Vicinity											
Gravel Road Segment: CD-3 to Airstrip	8	NI	NI	5	NI	NI	NI	NI	NI	7	6
Ice Roads	NI	NI	10	10	NI	NI	NI	NI	NI	6	NI
Airstrip	8	NI	NI	5,6	2,3,	2,3	2,3	2,3	2,3	6	6
Pipeline Segment: CD-1 - CD-3	NI	NI	NI	NI	2,7	2,7	2,7	NI	2,7	6	NI
Production Pad	8	NI	NI	8	2,3	2,3	2,3	NI	2,3	6	6
Groundwater Wells	9	9	NI	NI	NI	NI	NI	NI	NI	NI	NI
Surface water extraction for potable and construction use	NI	NI	10	10	NI	NI	NI	NI	NI	NI	NI
CD-4 Area and Vicinity											
	Shallow Groundwater	Deep Groundwater	Small Shallow Lakes and Ponds	Large Deep Lakes	Nigliq Channel	Minor Streams				Harrison Bay	
Gravel Road Segment CD-1 to CD-4	8	NI	NI	NI	NI	2,3,4,5,6,7				NI	
Pipeline Segment: CD-1 to CD-4	NI	NI	NI	NI	NI	2,7				NI	
Bridges	NI	NI	1,2,7	NI	NI	NI				NI	
Production Pad	8	NI	8	NI	NI	2,3,4,5,6				NI	
Groundwater Wells	9	9	NI	NI	NI	NI				NI	
Surface water extraction for potable and construction use	NI	NI	10	10	NI	NI				NI	

TABLE 4B.2.2-2 POTENTIAL OPERATIONS IMPACTS TO WATER RESOURCES (CONT'D)

Alternative B – CPAI Development Plan								
	GROUNDWATER		LAKES		MAJOR & MINOR STREAM CROSSINGS			ESTUARIES & NEARSHORE ENVIRONMENT
	Shallow Groundwater	Deep Groundwater	Small Shallow Lakes and Ponds	Large Deep Lakes	Nigliq Channel		Minor Streams	Harrison Bay
CD-5 and Vicinity								
Gravel Segment: CD-5 to Airstrip	8	NI	NI	NI	NI		NI	NI
Ice Road and Bridge from CD-2 to CD-5	8	NI	NI	NI	4,5,6		4,5,6	NI
Airstrip	8	NI	NI	NI	NI		2,4,5,6	NI
Pipeline Segment: CD-2 -CD-5	NI	NI	NI	NI	2,7		2,7	NI
Production Pad	8	NI	8	NI	NI		NI	NI
Groundwater Wells	9	9	NI	NI	NI		NI	NI
Surface water extraction for potable and construction use	NI	NI	10	10	NI		NI	NI
CD-6 and Vicinity								
	Shallow Groundwater	Deep Groundwater	Small Shallow Lakes and Ponds	Large Deep Lakes	Fish-Judy Creek Basin	Ublutuoch River Basin	Minor Streams	Harrison Bay
Gravel Road Segment: CD-6 to Airstrip	8	NI	NI	NI	NI	NI	NI	NI
Ice Roads	8	NI	NI	NI	NI	4,5,6	4,5,6	NI
Airstrip	8	NI	NI	NI	NI	NI	2,4,5,6	NI
Pipeline Segment: CD-5 to CD-6	NI	NI	NI	NI	NI	2, 7	2, 7	NI
Production Pad	8	NI	8	NI	NI	NI	NI	NI
Groundwater Wells	9	9	NI	NI	NI	NI	NI	NI
Surface water extraction for potable and construction use	NI	NI	10	10	NI	NI	NI	NI

TABLE 4B.2.2-2 POTENTIAL OPERATIONS IMPACTS TO WATER RESOURCES (CONT'D)

Alternative B – CPAI Development Plan							
	GROUNDWATER		LAKES		MAJOR & MINOR STREAM CROSSINGS		ESTUARIES & NEARSHORE ENVIRONMENT
	Shallow Groundwater	Deep Groundwater	Small Shallow Lakes and Ponds	Large Deep Lakes	Fish-Judy Creek Basin	Minor treams	Harrison Bay
CD-7 and Vicinity							
Gravel Road Segment: CD-6 to CD-7	8	NI	NI	NI	NI	2,3,4,5,6,7	NI
Pipeline Segment: CD-6 to CD-7	NI	NI	NI	NI	NI	2,7	NI
Production Pad	8	NI	1,7,8	NI	NI	NI	NI
Groundwater Wells	9	9	NI	NI	NI	NI	NI
Surface water extraction for potable and construction use	NI	NI	10	10	NI	NI	NI

Source:

Notes:

1 = Shoreline disturbance & thermokarsting

2 = Blockage of natural channel drainage

3 = Increased stages & velocities of floodwater

4 = Increased channel scour

5 = Increased bank erosion

6 = Increased sedimentation

7 = Increased potential for over banking (due to inundation or wind-generated wave run-up)

8 = Removal/compaction of surface soils/gravel and changes in recharge potential

9 = Underground disposal of non-hazardous wastes

10 = Water supply demand

NI = No Impact

CONSTRUCTION IMPACTS

During the construction phase, ice roads and an ice bridge across the Nigliq Channel would be built to provide access to CD-5, CD-6, and CD-7. Withdrawal of water from lakes to construct the roads and bridge would not have long-term effects on the lakes since they sufficiently recharge on an annual basis. Although construction of ice roads and a bridge would not directly disturb streamflow processes (because they would be built in the winter), the subsequent melting of the structures would alter the hydrology of the basins, both in timing and magnitude of elevated discharge. Quantitative hydrologic analyses of the effect of the ice bridge and roads have not been conducted. It is possible that an ice bridge could constrict flow in the Nigliq Channel as it melts. Based on the results from hydrologic analyses of the Nigliq Bridge under Alternative A, constricted streamflow would increase localized velocity in the channel. Higher velocities would be expected in the ice bridge scenario under Alternative B as well. Water surface elevations upstream of the ice bridge are expected to increase until flow is no longer constricted. As discussed for Alternative A, localized scour during high and moderate-sized floods is a function of water flow patterns around the bridge. Under Alternative B, streamflow patterns would be dynamic as water passed the melting ice bridge. Accordingly, it is expected that localized scour and Delta sedimentation would occur. Nevertheless, the overall effect of this is considered negligible when considering the erosion and sedimentation processes within the channel and Delta.

Because there would be no permanent roads connecting the eastern and western production pads, CD-5 and CD-6 would be larger to allow for the staging of equipment and supplies. The larger footprint would compact a larger area of soil and reduce the recharge to the tundra (i.e., supra-permafrost zone) of the area. The difference in recharge is expected to be negligible when considered on a broader scale. CD-6 would be relocated just outside the 3-mile setback for Fish and Judy Creeks. Hence, the indirect construction impacts (e.g. entrainment of eroded/excavated sediments during break-up) on Fish–Judy Creek basin surface waters would be less under Alternative B than under Alternative A.

The pipeline bridge across the Nigliq Channel would result in less impacts to hydrology and channel features than a vehicle bridge, and these impacts would be negligable. Pipeline segments and gravel road segments between CD-5 and CD-6, and CD-6 and CD-7 would be positioned differently than they would under Alternative A but would result in similar construction impacts to water resources in their specific geographic locations.

OPERATION IMPACTS

The ice roads and ice bridges would only be built during the construction phase. Thus, there would not be an annual water supply demand for ice road and ice bridge operation. Water would be drawn from lakes for facility maintenance (e.g. dust mitigation), potable water, and fire suppression, but the quantity required for these operations is far less than what is required to maintain ice roads and bridges. There would not be long-term impacts associated with water withdrawal. However, if the requirement to use ice roads becomes and annual demand then the impacts to lake water resources would be much greater.

The operational impacts of Alternative B on water resources would be less than those under Alternative A because there are few permanent gravel roads. Figures 4A.2.2-2 and 4A.2.2-3 illustrate water surface elevations of existing facility conditions on the Delta during the 50-year and 200-year flood, respectively. Figures 4A.2.2-8 and 4A.2.2-9 illustrate water surface elevations influenced by Alternative A structures during the 50-year and 200-year flood, respectively. There is a difference in water surface elevations on either side of the proposed road that connects the eastern production pads, but this difference does not occur under the existing conditions scenario when a road is not present. Based on the model results from the existing conditions scenario, it is expected that natural drainage patterns under Alternative B would not be altered as much as they are under Alternative A and that water surface elevations from CD-4 to CD-6 would not vary (like they do under Alternative A) during low frequency flood events. Because natural drainage patterns would be altered less under Alternative B, channel scour and erosion in the Delta channels and minor streams, and resultant sedimentation in the Delta and Harrison Bay would be expected to be less.

The localized effect of the airstrips on water resources would be less than the effect of the long, continuous road because flow patterns would be disturbed less. Further, because CD-6 would be relocated outside of the 3-mile setback for Fish and Judy Creeks, local impacts, such as scour during flood events and sedimentation of the Fish–Judy basin, would decrease. Operation period impacts related to pipeline and gravel road segments between CD-5 and CD-6, and CD-6 and CD-7 would be similar to those under Alternative A, but would occur at a location specific to Alternative B.

While total pad and airstrip surface area increases under Alternative A, road surface area decreases, so the overall difference in runoff potential is minor or negligible.

ALTERNATIVE B – FULL-FIELD DEVELOPMENT SCENARIO IMPACTS ON WATER RESOURCES

Alternative B – FFD is similar to Alternative A – FFD, except that HPF-1 would be eliminated from the Fish–Judy Creeks drainage basin and relocated to CD-9. Table 4B.2.2-3 provides a summary of potential construction and operation period impacts to water resources under Alternative B – FFD.

Stipulation 31 would set aside the Teshekpuk Lake Surface Protection Area—conformance would eliminate HP-22. This stipulation eliminates impacts to water resources to the Kogru River and other associated water bodies in the area of HP-22. In addition, under the Alternative B – FFD, several production pads would be relocated just outside the 3-mile setback on Fish and Judy Creeks (CD-6, HP-1, HP-16, and HP-17) in conformance with Stipulation 39. Stipulation 48 requires that no roads connect with road systems outside the Plan Area, which, among other things, results in a proposed vehicle bridge over the Nigliq Channel under this alternative.

Ice road construction under Alternative B – FFD would require up to 195 ac-ft per year of water to be withdrawn from lakes. The lengths of ice roads and the frequency of their construction would be higher under this alternative compared with Alternative A, in part because no gravel roads would be built across Fish Creek.

ALTERNATIVE B – SUMMARY OF IMPACTS (CPAI AND FFD) ON WATER RESOURCES

In general, impacts to water resources under Alternative B would be similar but to a lesser extent than those under Alternative A. A reduction in the linear miles of roads would reduce potential impacts between CD-2 and CD-5, such as blockage of natural channel drainage, increased stages and velocities of floodwater, and channel scour. The use of ice roads, both under Alternative B – CPAI Development Plan and Alternative B – FFD would increase the demand for surface water, relative to Alternative A

ALTERNATIVE B – POTENTIAL MITIGATION MEASURES (CPAI AND FFD) FOR WATER RESOURCES

Most of the data needs and mitigation measures recommended for Alternative A would also be applicable here. The exceptions would be the types, locations and amounts of data required related to stream crossings and bridge designs.

ALTERNATIVE B – EFFECTIVENESS OF PROTECTIVE MEASURES FOR WATER RESOURCES

The effectiveness of the protective measures would be similar to that under Alternative A.

TABLE 4B.2.2-3 POTENTIAL CONSTRUCTION AND OPERATIONAL IMPACTS TO WATER RESOURCES

ALTERNATIVE B – FULL FIELD DEVELOPMENT														
	GROUNDWATER		LAKES		MAJOR & MINOR STREAM CROSSINGS								ESTUARIES & NEARSHORE ENVIRONMENT	
Colville River Facility Group	Shallow Groundwater	Deep Groundwater	Small Shallow Lakes and Ponds	Large Deep Lakes	Nigliq Channel	Sakoonang Channel	Tamayayak Channel	Ulamnigiaq Channel	Elaktoveach Channel	Kupigruak Channel	Colville River	Minor Streams	Colville River Delta	Harrison Bay
CD-3 and CD-4 and HPs 44, 5, 7, 8, 12, 13, and 14														
Gravel Road Segments: CD-3 to airstrip; CD-1 to CD-4; CD-2 to CD-5; CD-4 to HP-4; CD-2 to HP-5; HP-7 road to airstrip; HP-12 road to airstrip; HP-13 road to airstrip; HP-14 road to airstrip	8	NI	NI	NI	1,2,3,4, 5,6,7	1,2,3,4, 5,6,7	1,2,3,4, 5,6,7	1,2,3,4, 5,6,7	1,2,3,4, 5,6,7	1,2,3,4, 5,6,7	1,2,3,4, 5,6,7	1,2,3,4, 5,6,7	1,2,3,4,5, 6,7	NI
Ice Roads: CD-3, HP-7, HP-12, HP-13, and HP-14	NI	NI	10	10	NI	NI	3	3	3	3	3	3	1,2,3,4,5, 6,7	NI
Pipeline Segment: CD-3 to CD-1; CD-4 to CD-1; CD-5 to CD-2; HP-4 to CD-4; HP-5 to CD-2; HP-7 to CD-3/1 pipeline; HP-12 to HP-7; HP-13 to HP-12; HP-14 to HP-12	NI	NI	NI	NI	2,7	2,7	2,7	2,7	2,7	2,7	2,7	2,7	2,7	NI
Production Pads: All CDs and HPs	8	NI	8	8	2,3	2,3	2,3	2,3	2,3	2,3	NI	2,3	2,3	NI
Airstrips: CD-3, HP-7, HP-12, HP-13, and Hp-14														NI
Groundwater Wells	9	9	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Surface water extraction for potable and construction use	NI	NI	10	10	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI

TABLE 4B.2.2-3 POTENTIAL CONSTRUCTION AND OPERATIONAL IMPACTS TO WATER RESOURCES (CONT'D)

ALTERNATIVE B – FULL FIELD DEVELOPMENT										
	GROUNDWATER		LAKES		MAJOR & MINOR STREAM CROSSINGS					ESTUARIES & NEARSHORE ENVIRONMENT
Fish–Judy Creeks Facility Group	Shallow Groundwater	Deep Groundwater	Small Shallow Lakes and Ponds	Large Deep Lakes	Fish Creek Basin	Inigok Creek Basin	Judy Creek Basin	Ublutuoch River Basin	Minor Streams	Harrison Bay
CDs 5, 6, and 7, HPF-1, and HPs 1, 2, 3, 6, 9, 10, 11, 15, 16, 17, and 19										
Gravel Road Segments: CD-5 to CD-6; CD-6 to CD-7; HP-1 to CD-6/5; CD-7 to HP-2; HP-3 to CD-6/5; HP-6 to CD-5/6; HP-6 to HP-9; HP-10 to CD-7/HP-2; HP-9 to HP-11; CD-6 to HP-15; HPF-1 to HP-16; HP-16 to HP-17; HP-17 to HP-19	8	NI	3,5,6,7	3,5,6,7	2,3,4,5,6,7	2,3,4,5,6,7	2,3,4,5,6,7	2,3,4,5,6,7	2,3,4,5,6,7	NI
Pipeline Segment: CD-6 to CD-5; CD-7 to CD-6; HP-1 to CD-6/5; CD-7 to HP-2; HP-3 to CD-6/5; HP-6 to CD-5/6; HP-6 to HP-9; HP-10 to CD-7/HP-2; HP-9 to HP-11; CD-6 to HP-15; HPF-1 to HP-16; HP-16 to HP-17; HP-17 to HP-19	NI	NI	2,7	2,7	2, 7	2,7	2,7	2,7	2,7	NI
Production Pads: All CDs, HPs and HPFs	8	NI	8	NI	2,3	2,3	2,3	2,3	2,3	NI
Processing Facility: HPF-1	8	NI	NI	NI	NI	NI	2,3,4,5,6	NI	NI	NI
Groundwater Wells	9	9	NI	NI	NI	NI	NI	NI	NI	NI
Surface water extraction for potable and construction use	NI	NI	10	10	NI	NI	NI	NI	NI	NI

TABLE 4B.2.2-3 POTENTIAL CONSTRUCTION AND OPERATIONAL IMPACTS TO WATER RESOURCES (CONT'D)

ALTERNATIVE B – FULL FIELD DEVELOPMENT								
	GROUNDWATER		LAKES		MAJOR & MINOR STREAM CROSSINGS			ESTUARIES & NEARSHORE ENVIRONMENT
Kogru–Kalikpik Rivers Facility Group	Shallow Groundwater	Deep Groundwater	Small Shallow Lakes & Ponds	Large Deep Lakes	Kalikpik River Drainage	Kogru River	Minor Streams	Harrison Bay
HPF-2 and HPs 18, 20, 21, and 22								
Gravel Road Segments: HP-18 to HPF-1; HP-19 to HPF-2/HP-18 road; HP-21 to HPF-2; HPF-2 to HP-18; HPF-2 road to airstrip	8	NI	3,5,6	3,5,6	2,3,4,5,6	NI	2,3,4,5,6	NI
Pipeline Segment: HP-18 to HPF-1; HP-20 to HPF-2/HP-18 road; HP-21 to HPF-2; HPF-2 to HP-18	NI	NI	NI	NI	2,7	NI	2,7	NI
Production Pads: All HPs and HPFs	8	NI	NI	NI	2,3,4,5,6	NI	2,3,4,5,6	NI
Airstrips: HPF-2	8	NI	NI	NI	3,4,5,6	NI	3,4,5,6,7	NI
Processing Facility: HPF-2	8	NI	NI	NI	3,4,5,6	NI	NI	NI
Groundwater Wells	9	9	NI	NI	NI	NI	NI	NI
Surface water extraction for potable and construction use	NI	NI	10	10	NI	NI	NI	NI

Notes:

1 = Shoreline disturbance & thermokarsting6 = Increased sedimentation

2 = Blockage of natural channel drainage7 = Increased potential for over banking (due to inundation or wind-generated wave run-up)

3 = Increased stages & velocities of floodwater8 = Removal/compaction of surface soils/gravel and changes in recharge potential

4 = Increased channel scour9 = Underground disposal of non-hazardous wastes

5 = Increased bank erosion10 = Water supply demand

NI = No Impact

4B.2.2.2 Surface Water Quality

ALTERNATIVE B – CPAI DEVELOPMENT PLAN IMPACTS ON SURFACE WATER QUALITY

CONSTRUCTION PERIOD

Total water withdrawal volumes required for ice road construction would be approximately the same under Alternative B as under the applicant's proposed action over the 5-year construction period. Ice roads would be built to the same locations, with very slight differences in length due to the movement of CD-6 outside of the Fish Creek buffer. However, the lengths of ice roads to be constructed in later years would be higher for this alternative compared with Alternative A, because no gravel road would be built to CD-5. The estimated miles of ice roads required each year during construction vary from a minimum of 39 to a maximum of 68 (Table 2.4.2-2).

The chance that ice roads would be routed across lakes, potentially causing increased incidences of reductions in dissolved oxygen concentrations (as described for Alternative A) would be increased. Such a scenario could in turn affect fish over-wintering habitats. However, the likelihood of this impact occurring is very low. Lakes less than 7 feet-deep typically freeze solid during the winter, so there would be no concern about oxygen concentrations. Additionally, owing to safety considerations, ice roads are not typically routed over deep lakes due to concerns about unfrozen water and the possibility of cracking the road during transportation of heavy equipment.

Alternative B would involve the elimination of the gravel road between CD-6 and CD-5 for the applicant's proposed project. The reduction in total gravel placed in the Plan Area would reduce the potential impacts to water quality from increased turbidity caused by erosion and sedimentation, compared to Alternative A. Under Alternative B approximately 204 acres would be covered with gravel. This represents an 18 percent decrease in the gravel coverage estimated for Alternative B, compared to Alternative A. The area of tundra potentially affected by thermokarst erosion would be equivalent to twice the area directly covered by gravel or approximately 408 acres.

An additional source of thermokarst erosion under Alternative B would be the trenching required for burial of powerlines. The powerlines would parallel the route of the pipelines and would cover a distance of approximately 34 miles. Assuming a maximum trench width of 18 inches, the width of possible thermokarst erosion resulting from trenching would be approximately 3 feet. This would represent a potential area of disturbance of 4 acres.

OPERATION PERIOD

Dust fallout from roads would be expected to be lower for under Alternative B, compared to Alternative A, for two reasons. First, Alternative B restricts access to roads to industry. This would reduce the total number of vehicles traveling on the roads, although probably not by a measurable percentage. Second, this alternative would include construction of 11 miles of gravel roads for the applicant's proposed action, which represents a reduction from Alternative A of 56 percent. This reduction would be the only factor controlling the potential for impacts from upslope impoundments, flooding, and erosion because roads would be constructed in the same general areas (in terms of surface water flow) and would be constructed with the same design specifications (in terms of number and type of culverts).

ABANDONMENT AND REHABILITATION

Under Alternative B, because there is not a road bridge across the Nigliq Channel, the Ublutuoch River, or other streams between CD-2 and CD-6 or on roads between these pads, there is less potential for erosion, sedimentation, or upslope impoundment associated with abandonment and rehabilitation, than under Alternative A.

ALTERNATIVE B – FULL-FIELD DEVELOPMENT SCENARIO IMPACTS ON SURFACE WATER QUALITY

Ice road construction under Alternative B – FFD would require up to a maximum of 195 ac-ft of water to be withdrawn from lakes each year, based on the estimated miles of ice roads shown in Table 2.4.2-8. This is the same maximum annual volume of water withdrawal estimated under Alternative A. The lengths of ice roads would, on average, be higher for this alternative compared with Alternative A – FFD, because no gravel road would be built across Fish Creek. Because the total estimated miles of ice roads under Alternative B – FFD would be approximately 14 percent higher than under Alternative A, the chance that ice roads would be routed across lakes would increase. Such an increase could also increase incidences of reductions in dissolved oxygen concentrations (as described for Alternative A), which in turn could affect fish over-wintering habitats. However, the likelihood of this impact occurring is very low. Lakes less than 7 feet-deep typically freeze solid during the winter, so there would be no concern about oxygen concentrations. Additionally, owing to safety considerations, ice roads are not typically routed over deep lakes due to concerns about unfrozen water and the possibility of cracking the road during transportation of heavy equipment.

Alternative B – FFD would involve the elimination of several production pads and roads. The reduction in total gravel placed in the Plan Area would reduce the potential impacts to water quality from increased turbidity caused by erosion and sedimentation. Approximately 1,049 acres would be covered with gravel under Alternative B – FFD. . This represents an 17 percent decrease from the gravel coverage estimated under Alternative A. The area of tundra potentially affected by thermokarst erosion would be equivalent to twice the area directly covered by gravel, or approximately 2,098 acres.

Burial of the powerline also could cause thermokarst erosion. Based upon the calculations cited above for powerline burial impacts under Alternative B, Alternative B – FFD could prompt thermokarst erosion of 18 acres in an area about 3 feet-wide, over a length of 150 miles.

Dust fallout from roads would be expected to be lower for this alternative compared to Alternative A due to limited road access and use, and the construction of only a few miles of road. Under Alternative B – FFD, 94 miles of gravel roads would be constructed, which represents a reduction from Alternative A of 23 percent. This reduction would be the only factor controlling the potential for impacts from upslope impoundments, because roads would be constructed in the same general areas (in terms of surface water flow) and would be constructed with the same design specifications (in terms of number and type of culverts).

ALTERNATIVE B – SUMMARY OF IMPACTS (CPAI AND FFD) ON SURFACE WATER QUALITY

Alternative B proposes conducting all activities and siting all facilities in complete accordance with Northeast National Petroleum Reserve-Alaska IAP/EIS development stipulations. In comparison with Alternative A, this alternative would have fewer sources of potential impacts to surface water quality. This is mainly due to the movement of several production facilities outside sensitive resource areas and the reduction in total miles of roads to be constructed. Impacts would include:

- Decreased area potentially affected by thermokarst erosion compared to Alternative A, leading to decreased impacts to water quality from decreased turbidity caused by erosion and sedimentation
- Further distance from water bodies compared to Alternative A, reducing the chance of accidental releases migrating into a nearby water body
- Reduced potential for dust fallout and upslope impoundments compared to Alternative A, resulting in fewer incidences of turbidity impacts

ALTERNATIVE B – POTENTIAL MITIGATION MEASURES (CPAI AND FFD) FOR SURFACE WATER QUALITY

No mitigation measures have been identified for Alternative B nor Alternative B – FFD.

ALTERNATIVE B – EFFECTIVENESS OF PROTECTIVE MEASURES FOR SURFACE WATER QUALITY

The effectiveness of the protective measures would be similar to that under Alternative A.

4B.2.3 Atmospheric Environment

4B.2.3.1 Climate and Meteorology

ALTERNATIVE B – CPAI DEVELOPMENT PLAN IMPACTS ON CLIMATE AND METEOROLOGY

CONSTRUCTION PERIOD

Construction period impacts to climate and meteorology under Alternative B would be similar to those described for Alternative A.

OPERATIONAL PERIOD

GHG impacts would be similar to those under Alternative A (Section 4A.2.3). Additional aircraft flights would occur due to operation of the additional airstrips, but would not change the overall impacts from GHG.

ABANDONMENT AND REHABILITATION

GHG impacts from would be similar to those under Alternative A (Section 4A.2.3).

ALTERNATIVE B – FULL-FIELD DEVELOPMENT SCENARIO IMPACTS ON CLIMATE AND METEOROLOGY

The impacts to climate and meteorology are similar to those under Alternative A – FFD. Additional airstrips would change the emission sources of GHG. The overall impact, however, would be minimal to the global GHG emissions budget.

ALTERNATIVE B – SUMMARY OF IMPACTS (CPAI AND FFD) ON CLIMATE AND METEOROLOGY

The impacts are the same as those under Alternative A.

ALTERNATIVE B – POTENTIAL MITIGATION MEASURES (CPAI AND FFD) FOR CLIMATE AND METEOROLOGY

No mitigation measures have been identified.

ALTERNATIVE B – EFFECTIVENESS OF PROTECTIVE MEASURES FOR CLIMATE AND METEOROLOGY

The effectiveness of the protective measures would be similar to that under Alternative A.

4B.2.3.2 Air Quality

ALTERNATIVE B – CPAI DEVELOPMENT PLAN IMPACTS ON AIR QUALITY

CONSTRUCTION PERIOD

Air quality impacts would be similar to those under Alternative A, with the exception of a potential decrease in of fugitive dust and particulates from construction of less acreage of gravel roads.

OPERATION PERIOD

Air emissions from the operational period of Alternative B would be the same as under Alternative A, except for minor short-term changes to air quality that may occur from differences in aircraft flights per month.

ABANDONMENT AND REHABILITATION

Impacts from abandonment and rehabilitation would be similar to those under Alternative A—short-term and transient.

ALTERNATIVE B – FULL-FIELD DEVELOPMENT SCENARIO IMPACTS ON AIR QUALITY

The impacts to the airshed would not likely be significantly different than those under Alternative A, except for a slight reduction in emissions as a result of elimination of drill site heaters and emergency generators from pads that may not be constructed under Alternative B – FFD. Impacts would be determined by air quality impacts analysis under the PSD preconstruction review process.

Operation of the airstrips would change the nature of mobile source emissions from daily aircraft takeoffs and landings, instead of vehicular ground travel. However, emissions from the use of aviation fuel are considerably less than diesel fuel-powered mobile sources and would not add to deterioration in the overall air quality of the region.

ALTERNATIVE B – SUMMARY OF IMPACTS (CPAI AND FFD) ON AIR QUALITY

Air quality impacts, including fugitive dust, from the project would be limited through the permitting process, which ensures that no significant new air pollution sources contribute to a deterioration of the ambient air quality. Mitigation measures for limiting fugitive dust would include road watering, vehicle washing, covering of stockpiled material, ceasing construction during wind events, and the use of chemical stabilizers. These measures may vary for the frozen season and non-frozen season. Dust may be reduced by utilizing sealing agents and chip-seal on pads, runways and heavily utilized portions o f the road system. Watering of dust-prone areas would also reduce dust associated with the project.

ALTERNATIVE B – POTENTIAL MITIGATION MEASURES (CPAI AND FFD) FOR AIR QUALITY

Air quality impacts from Alternative B would be limited through the permitting process, which ensures that no significant new air pollution sources contribute to deterioration of the ambient air quality. No additional measures have been identified.

ALTERNATIVE B – EFFECTIVENESS OF PROTECTIVE MEASURES FOR AIR QUALITY

The effectiveness of the protective measures would be similar to that under Alternative A.

4B.2.3.3 Noise

ALTERNATIVE B – CPAI DEVELOPMENT PLAN NOISE IMPACTS

CONSTRUCTION PERIOD

Noise impacts during the construction period of Alternative B would be similar to those under Alternative A. Although two additional airstrips would be constructed, fewer roads would be constructed, and similar noise impacts would be distributed over the span of the construction period.

OPERATION PERIOD

Operation period noise impacts would be similar to those under Alternative A except for the short-term impacts of additional aircraft flights at the two additional airstrips.

ABANDONMENT AND REHABILITATION

Noise impacts would be similar to those associated with construction (minus drilling noise) and to Alternative A. The level of impact would be less than construction impacts under Alternative B if gravel fill is not removed.

ALTERNATIVE B – FULL-FIELD DEVELOPMENT SCENARIO NOISE IMPACTS

The noise impacts would be similar to those described for Alternative A – FFD (Section 4A.2.3). There would be a reduction in drilling noise because there would be fewer production pads than under Alternative A.

ALTERNATIVE B – SUMMARY OF NOISE IMPACTS (CPAI AND FFD)

The impacts from Alternative B – CPAI Development Plan and Alternative B – FFD would be similar to the impacts described for Alternative A.

ALTERNATIVE B – POTENTIAL MITIGATION MEASURES (CPAI AND FFD) FOR NOISE

No potential mitigation measures have been identified for Alternative B nor Alternative B – FFD.

ALTERNATIVE B – EFFECTIVENESS OF PROTECTIVE MEASURES FOR NOISE

The effectiveness of the protective measures would be similar to that under Alternative A.

4B.3 BIOLOGICAL RESOURCES

4B.3.1 Terrestrial Vegetation and Wetlands

4B.3.1.1 Alternative B – CPAI Development Plan Impacts on Terrestrial Vegetation and Wetlands

The project design would minimize the facility footprints to reduce the loss of vegetation and habitat from gravel placement and associated indirect impacts. Biologists, geologists, facilities and reservoir engineers worked together combining information from waterbird distribution maps and wildlife habitat maps based on physical features (surface landforms, soil types, vegetation types) to locate facilities in drier habitats avoiding impacts to aquatic, Nonpatterned Wet Meadow, Patterned Wet Meadow, and Moist Sedge-Shrub Meadow habitats preferred by many waterbirds (CPAI 2004). Figure 4B.3.1-1 and Figure 4B.3.1-2 show vegetation and habitat potentially affected, and Table 4B.3.1-1 and Table 4B.3.1-2 summarize the area of vegetation classes and habitat types affected under the CPAI Development Plan, Alternative B. Terrestrial vegetation and wetlands impact calculation methods for CPAI's Alternatives A through F are described in Section 4A.3.1.1. All impacts under Alternative B would be to wetlands. Key wetland habitats correlated to those identified in the Northeast National Petroleum Reserve-Alaska Final IAP/EIS ROD (BLM and MMS 1998b) are described in Section 3.3.1 and identified in Table 4B.3.1-2. Oil spills, should they occur, would also directly or indirectly affect vegetation and wetlands in the Plan Area. The impacts of oil and chemical spills and the potential for spills in the Plan Area are described in Section 4.3.

Section 2.7 (Table 2.7-1) for a comparison of impacts to tundra habitats in the Plan Area among alternatives.

CONSTRUCTION PERIOD

The construction period includes gravel placement, grading of the gravel surface, placement of all facilities, and initial drilling.

GRAVEL PADS, ROADS, AND AIRSTRIPS

Gravel facilities would be designed and constructed as described in Section 2. Under Alternative B, a total of approximately 204 acres of tundra vegetation would be covered with gravel fill for the construction of pads (well pads and storage pads) (65.9 acres), approximately 10.7 miles of primary and spur roads (71.7 acres), and airstrip runways and aprons (64.1 acres). In addition to impacts from roads, pads, and airstrips, approximately 1.5 acres of tundra vegetation would be lost for the construction of a boat launch ramp at CD-4 and the associated access road, and a floating dock and access road at CD-3 as described in Section 2.3.8. Gravel facilities would be constructed and maintained to hold their designed dimensions; however, some gravel slumping from side-slopes could occur, which could potentially increase the impact area by approximately 16 percent (assuming a maximum increase from a 2H:1V to a 3H:1V sideslope). The type of impact from gravel slumping could range from direct loss of tundra vegetation to an alteration of vegetation communities depending on the thickness of gravel sloughed onto adjacent tundra. These potential impacts are included in the indirect impact area calculations from dust, gravel spray, snow accumulation, impoundments, and thermokarst discussed below. Vegetation classes and habitat types lost under Alternative B due to gravel placement are summarized in Tables 4B.3.1-1 and 4B.3.1-2, respectively.

Proposed gravel sources would be the same as those described under Alternative A. Gravel extraction for the construction of Alternative B would result in a permanent loss of approximately 37 acres of tundra habitat while the mine sites are active and an alteration from tundra to aquatic habitat when the gravel sites are reclaimed (Appendix O). The vegetation classes and habitat types affected by gravel extraction would be the same as those described under the CPAI Development Plan Alternative A.

The type of impacts from gravel facilities and mining and mitigation measures identified for these impacts would be the same as those described under CPAI's Development Plan Alternative A. Abandonment of roads, pads, and airstrips is discussed in Section 2.3.

DUST FALLOUT FROM ROADS

Under Alternative B, indirect impacts from dust fallout, gravel spray, snow accumulation, impoundments, and thermokarst would result in alteration of about 635 acres of tundra vegetation**,** assuming that these impacts occur within 164 feet (50 meters) of gravel facilities as described under CPAI's Development Plan Alternative A. Table 4B.3.1-1 and Table 4B.3.1-2 summarize the surface area by vegetation class and habitat types within this impact area. Compared to the other CPAI Development Plan alternatives proposed, Alternatives B and D would have the least amount of indirect impacts, including dust, because of their mostly roadless designs (i.e. Alternative B with slightly more impacts than Alternative D). The type of impacts from dust and associated mitigation measures would be the same as those described under the CPAI Development Plan Alternative A.

ICE ROADS, ICE PADS, AND SNOW STOCKPILES

Under Alternative B, a total of about 241 miles of temporary ice roads would be constructed over the life of the project for construction-related activities, resulting in a maximum of approximately 1,168 acres of vegetation disturbed. This is a maximum-case scenario that assumes the ice roads would be built in a different location each year as required by existing stipulations on BLM-administered land. The actual surface area disturbed would likely be much less, especially if ice roads are overlapped in subsequent years to minimize the areal extent of impacts. Ice roads placed for the construction of gravel roads and pipelines would follow adjacent to the road/pipeline routes and would tend to affect the same habitat and vegetation (Table 4B.3.1-1 and Table 4B.3.1-2). Winter ice roads would be designed and located to minimize the breakage, abrasion, compaction, or displacement of vegetation.

In addition to ice roads, ice pads would be used as staging areas during pipeline construction. Approximately 70 acres of vegetation would be disturbed by ice pad staging areas for the construction of the pipeline. Ice pads might also be used to stockpile overburden material associated with the ASRC Mine Site and Clover. Impacts from these ice pads would be the same as those described under Alternative A. Ice pads also would be constructed at each end of each proposed bridge to stage equipment. These ice pads used as staging areas would vary with the size of the bridge installation and equipment needs. Given the number of road bridges proposed under Alternative B, and assuming the maximum pad size would be 800 feet by 800 feet surrounding the abutment structure at each end of a bridge (Section 2.3), then a maximum of 59 acres of vegetation would be affected by ice pads for bridge construction Ice pads could also be built for storage of drill rigs and other equipment at remote production pads. The effects of ice pads on vegetation would be similar in type to those of ice roads.

Less snow would need to be plowed under Alternative B than Alternatives A and C because fewer miles of road would be built. This would result in decreased alteration of vegetation by snow stockpiles. However, Alternative B would require slightly more snow plowing than Alternative D.

The type of impacts from ice roads, ice pads, and snow stockpiles and mitigation measures identified to minimize these impacts would be the same as those described under CPAI's Development Plan Alternative A.

TABLE 4B.3.1-1 CPAI ALTERNATIVE B – SUMMARY OF SURFACE AREA (ACRES) OF VEGETATION CLASSES AFFECTED

Vegetation Classes	COLVILLE RIVER DELTA								THE NATIONAL PETROLEUM RESERVE-ALASKA (WESTERN BEAUFORT COASTAL PLAIN)								Totals for Alternative B
	DIRECT IMPACTS					INDIRECT IMPACTS		Totals for Delta	DIRECT IMPACTS					INDIRECT IMPACTS		Totals fe NPRor th -A	
	Primary Roads	Spur Roads	Well Pads	Airstrip Runway & Apron	Boat Launches, Dock, & Access Roads	Dust, Moisture Regime, & Thermal	Power Line Trenching		Primary Roads	Spur Roads	Well Pads	Storage Pad	Airstrip Runway & Apron	Dust, Moisture Regime, & Thermal	Power Line Trenching		
Water	1.1				<0.1	11.7	<0.1	12.8						3.5	0.1	3.6	16.4
Riverine Complex																	
Fresh Grass Marsh						1.6		1.6									1.6
Fresh Sedge Marsh									0.2					3.0	<0.1	3.2	3.2
Deep Polygon Complex				5.3		10.0	0.1	15.3									15.3
Young Basin Wetland Complex									2.1		2.5			14.5	<0.1	19.1	19.1
Old Basin Wetland Complex									1.7				2.0	26.1	0.3	30.2	30.2
Wet Sedge Meadow Tundra	9.6	1.6	21.9	11.0	0.1	116.4	0.7	161.4	3.4		6.3		5.6	36.9	0.3	52.5	213.9
Salt-killed Wet Meadow																	
Halophytic Sedge Wet Meadow						0.5		0.5									0.5
Halophytic Grass Wet Meadow																	
Moist Sedge-Scrub Tundra	9.0					60.8	<0.1	69.8	14.4	0.8	10.1	2.2	12.0	123.8	0.3	163.6	233.4
Tussock Tundra									21.2	0.7	14.6	7.8	28.2	194.8	0.4	267.7	267.7
Dryas Dwarf Shrub Tundra							<0.1										
Cassiope Dwarf Shrub Tundra															<0.1		
Halophytic Willow Dwarf Shrub Tundra																	
Open and Closed Low Willow Shrub	5.6				1.1	17.6	<0.1	24.4	0.4		0.7			4.2	<0.1	5.3	29.7

TABLE 4B.3.1-1 CPAI ALTERNATIVE B – SUMMARY OF SURFACE AREA (ACRES) OF VEGETATION CLASSES AFFECTED (CONT'D)

Vegetation Classes	COLVILLE RIVER DELTA								THE NPR-A (WESTERN BEAUFORT COASTAL PLAIN)								Totals for Alternative B
	DIRECT IMPACTS					INDIRECT IMPACTS			DIRECT IMPACTS					INDIRECT IMPACTS			
	Primary Roads	Spur Roads	Well Pads	Airstrip Runway & Apron	Boat Launches, Dock, & Access Roads	Dust, Moisture Regime, & Thermal	Power Line Trenching	**Totals for Delta**	Primary Roads	Spur Roads	Well Pads	Storage Pad	Airstrip Runway & Apron	Dust, Moisture Regime, & Thermal	Power Line Trenching	**Totals for the NPR-A**	
Open and Closed Tall Willow Shrub																	
Dune Complex																	
Partially Vegetated					0.2	9.2		9.4									9.4
Barrens						0.5	<0.1	0.5									0.5
Total Area	25.3	1.6	21.9	16.3	1.5	228.3	0.9	295.8	43.3	1.5	34.3	10.0	47.8	406.8	1.5	545.3	841.0

Notes:

Spur Roads are airstrip and/or well pad access roads that branch off of the primary road.

Calculation methods are described in text in Section 4A.3.1.1.

Columns may not sum to exact numbers in the total row because of rounding, particularly when vegetation classes have impacts of <0.1.

TABLE 4B.3.1-2 CPAI ALTERNATIVE B – SUMMARY OF SURFACE AREA (ACRES) OF HABITAT TYPES AFFECTED

Habitat Type	Colville River Delta								The NPR-A (Western Beaufort Coastal Plain)								Totals for Alternative B
	Direct Impacts					Indirect Impacts		Totals for Delta	Direct Impacts					Indirect Impacts		Totals for the NPR-A	
	Primary Roads	Spur Roads	Well Pads	Airstrip Runway & Apron	Boat Launches, Dock, & Access Roads	Dust, Moisture Regime, & Thermal	Power Line Trenching		Primary Roads	Spur Roads	Well Pads	Storage Pad	Airstrip Runway & Apron	Dust, Moisture Regime, & Thermal	Power Line Trenching		
Open Nearshore Water																	
Brackish Water																	
Tapped Lake with Low-water Connection																	
Tapped Lake with High-water Connection						1.0		1.0									1.0
Salt Marsh*						0.5		0.5									0.5
Tidal Flat*																	
Salt-killed Tundra*																	
Deep Open Water without Islands*						1.3	<0.1	1.3							<0.1		1.3
Deep Open Water with Islands or Polygonized Margins*	1.1					6.9	<0.1	8.0							<0.1		8.0
Shallow Open Water without Islands														1.8	<0.1	1.8	1.8
Shallow Open Water with Island or Polygonized Margins							<0.1							1.6	<0.1	1.6	1.6
River or Stream					<0.1	2.5		2.5									2.5
Aquatic Sedge Marsh									0.2					3.0	<0.1	3.2	3.2
Aquatic Sedge with Deep Polygons				5.3		10.0	0.1	15.3									15.3
Aquatic Grass Marsh*						1.6		1.6									1.6
Young Basin Wetland Complex*									2.1		2.5			14.5	<0.1	19.1	19.1

TABLE 4B.3.1-2 CPAI ALTERNATIVE B – SUMMARY OF SURFACE AREA (ACRES) OF HABITAT TYPES AFFECTED (CONT'D)

Habitat Type	Colville River Delta								The NPR-A (Western Beaufort Coastal Plain)								
	Direct Impacts					Indirect Impacts		Totals for Delta	Direct Impacts					Indirect Impacts		Totals for the NPR-A	Totals for Alternative B
	Primary Roads	Spur Roads	Well Pads	Airstrip Runway & Apron	Boat Launches, Dock, & Access Roads	Dust, Moisture Regime, & Thermal	Power Line Trenching		Primary Roads	Spur Roads	Well Pads	Storage Pad	Airstrip Runway & Apron	Dust, Moisture Regime, & Thermal	Power Line Trenching		
Old Basin Wetland Complex*									1.7				2.0	26.1	0.3	30.2	30.2
Riverine Complex*																	
Dune Complex																	
Nonpatterned Wet Meadow	0.8	0.8	7.6	1.8		24.7	0.2	36.0	2.0		5.9		0.2	20.9	<0.1	29.0	65.0
Patterned Wet Meadow	8.8	0.8	14.3	9.2	0.1	91.7	0.6	125.5	1.4		0.5		5.4	16.1	0.3	23.6	149.1
Moist Sedge-Shrub Meadow	9.0					60.8	<0.1	69.8	14.8	0.8	10.8	2.2	12.0	128.0	0.3	168.9	238.7
Moist Tussock Tundra									21.2	0.7	14.6	7.8	28.2	194.8	0.4	267.7	267.7
Riverine Low and Tall Shrub*															<0.1		
Upland Low and Tall Shrub																	
Upland and Riverine Dwarf Shrub*															<0.1		
Riverine or Upland Shrub*	5.6				1.1	17.6	<0.1	24.4									24.4
Barrens (riverine, eolian, or lacustrine)					0.2	9.7	<0.1	9.9									9.9
Artificial (water, fill, peat road)																	
Total Area	**25.3**	**1.6**	**21.9**	**16.3**	**1.5**	**228.3**	**0.9**	**295.8**	**43.3**	**1.5**	**34.3**	**10.0**	**47.8**	**406.8**	**1.5**	**545.3**	**841.0**

Notes:Spur Roads are airstrip and/or well pad access roads that branch off of the primary road.

Calculation methods are described in text in Section 4A.3.1.1

Columns may not sum to exact numbers in the total row because of rounding, particularly when habitat types have impacts of <0.1.

* Represents key wetland habitats that were correlated to Bergman et al. (1977) habitats and riparian shrub habitats identified as key wetlands in the Northeast National Petroleum Reserve-Alaska Final IAP/EIS ROD (BLM and MMS 1998b)

OFF-ROAD TUNDRA TRAVEL

Development and operation of oil facilities in the Plan Area may require access across tundra. Such access could be necessary to respond to spills or other emergencies, conduct pipeline maintenance and repair, facilitate ice road construction, or to transport supplies and equipment to roadless development sites. The types of impacts to vegetation from off-road travel and associated mitigation measures would be similar to those described under Alternative A; however, impacts from off-road travel would presumably be the highest for Alternatives B and D because of the mostly roadless designs. Off-road travel impacts would likely be the lowest for Alternative C because all pads and most of the pipeline would be accessible by road. Off-road travel impacts of Alternative A would be slightly less than those of Alternative C.

IMPOUNDMENTS AND THERMOKARST

Indirect impacts from dust fallout, gravel spray, snow accumulation, impoundments, and thermokarst associated with roads, pads, and airstrips are expected to occur within 164 feet (50 meters) of gravel facilities (Hettinger 1992); as described under CPAI's Development Plan Alternative A. Table 4B.3.1-1 and Table 4B.3.1-2 summarize the surface area of disturbance by vegetation classes and habitat types within this impact area. The types of impacts from impoundments and thermokarst and associated mitigation measures would be the same as those described under CPAI Development Plan Alternative A. Habitat alteration resulting from impoundments and thermokarst would be less extensive under Alternatives B and D because of the mostly roadless designs. The greatest amount of vegetation could potentially be affected by Alternative C because it proposes the highest number of road miles. The potential of Alternative A for impoundment and thermokarst impacts would be slightly less than for Alternative C.

CROSS-DRAINAGE AND WATER FLOW

The types of impacts from the disruption of cross-drainage and interception of sheet flow and associated mitigation measures are described under Alternative A. Habitat alteration resulting from interception of natural water flow by gravel roads and pads would be less extensive under Alternatives B and D because of the mostly roadless designs. The greatest amount of vegetation could potentially be affected by Alternative C because it proposes the highest number of road miles. The potential for cross-drainage and water flow impacts would be slightly less for Alternative A than for Alternative C.

AIR POLLUTION

Project construction would cause a localized and temporary impact on air quality. The sources of air pollution during the construction period are described under Alternative A. These sources are not expected to produce sufficient levels of pollutants to adversely affect vegetation. Air quality mitigation measures would be the same as those described under Alternative A.

PIPELINES

Beside the disturbance from ice roads and staging pads for the construction of pipelines (discussed above), the only other impact to vegetation from pipeline construction under Alternative B is from VSM borings. Given the maximum diameter of VSM borings and the projected number of VSMs to be constructed under Alternative B (presented in Section 2.), and adding a 0.5-foot disturbance buffer to account for potential spoils and thermal impacts around the borings, about 0.5 acre of vegetation would be lost to VSM installation. The vegetation and habitat types affected would depend on the exact location of the VSM. An elevated pipeline design reduces impacts to vegetation and habitat types compared to buried pipeline designs.

POWER LINES

Under Alternative B, approximately 20 miles of trenching would be required to bury power cable in roadless areas between CD-1 and CD-3 and CD-2 and CD-6, affecting approximately 2.4 acres of tundra vegetation.

This area was calculated by overlaying a 1-foot wide strip centered on the pipelines (in areas where the power line is proposed to be buried in tundra) on vegetation and habitat maps (Figure 3.3.1.2-1 and Figure 3.3.1.3-1) (Jorgenson et al. 1997, 2003c) and calculating the area of impact for vegetation classes and habitat types within this strip. Table 4B.3.1-1 and Table 4B.3.1-2 summarize the surface area of disturbance by vegetation classes and habitat types within this impact area. To bury power cable along roadless segments a trench would be cut through an ice road, the power cable placed, and the cuttings pushed back into the trench. This would result in a temporary narrow strip of barren soil, which would become covered by vegetative reproduction as shoots from plants on either side of the trench recolonize the area (McKendrick 2000b). Wet sites recover more quickly than dry sites, and in ice rich soils thermokarst creates persistent linear features (McKendrick 2000b). Alternative B would have the greatest impact on vegetation compared to the other CPAI Development Plan alternatives that proposed suspended or VSM-mounted power lines (i.e. Alternatives A, C and D). Alternative B would have the greatest impact on vegetation from power line trenching. The entirely suspended power line design in Alternative C-1 would result in greater impacts than the other alternatives that propose partially suspended or VSM-mounted power lines (i.e. Alternatives A and D).

OPERATION PERIOD

The operation period includes continued drilling and day-to-day operations and maintenance once production has begun.

GRAVEL PADS, ROADS, AND AIRSTRIPS

Additional vegetation losses following construction could occur during the operation period during maintenance of gravel roads (such as snow removal) or if flood events wash out portions of roads or pads and deposit gravel on tundra. The type of impacts to vegetation from these activities and events are described under the CPAI Development Plan Alternative A.

Impacts to vegetation resulting from maintenance of gravel roads and washouts would be less extensive under Alternatives B and D because of the mostly roadless designs. The greatest amount of vegetation could potentially be affected by Alternative C because it proposes the highest number of road miles. The impacts from maintenance of gravel roads and washouts in Alternative A would likely be slightly less than in Alternative C.

DUST FALLOUT FROM ROADS

During the operation period, effects of dust from roads, pads, and airstrips are expected to be realized within the 164-foot impact zone. The effects of dust on vegetation are described in the Construction Period section above. Table 4B.3.1-1 and Table 4B.3.1-2 summarize the surface area of disturbance by vegetation classes and habitat types within this impact area.

ICE ROADS, ICE PADS, AND SNOW STOCKPILES

In addition to ice roads required for construction-related activities, approximately 30 miles of ice roads would be needed for facility operations including well workovers and drilling activities at remote sites (CD-3, CD-5, and CD-6), resulting in approximately 145 acres of vegetation disturbed over the life of the facility. This is a maximum-case scenario that assumes the ice roads would be built in a different location each year. The actual surface area disturbed would likely be much less, especially if ice roads are overlapped in subsequent years to minimize the areal extent of impacts. Ice roads placed for the construction of gravel roads and pipeline would follow adjacent to the road/pipeline routes and would tend to affect the same habitat and vegetation types (Table 4B.3.1-1 and Table 4B.3.1-2). Ice pads would not likely be needed during operations.

As during the construction period, snowdrifts or plowed snow would accumulate on tundra adjacent to roads, well pads, and airstrips. See the Construction Period discussion above for potential impacts.

OFF-ROAD TUNDRA TRAVEL

Some off-road tundra travel would continue during the operation period to respond to spills or other emergencies, to conduct pipeline maintenance and repair, to facilitate ice road construction, or to transport supplies and equipment to roadless development sites. See the Construction Period discussion above for potential impacts.

IMPOUNDMENTS AND THERMOKARST

Although there is a potential for some habitat loss and alteration to occur from thermokarst and the creation of impoundments during the operation period of the project, these impacts are more likely to be initiated during construction. Therefore, the factors causing vegetation loss and alteration are discussed above in the Construction Period section.

CROSS-DRAINAGE AND WATER FLOW

Disruption of cross-drainage and interception of sheet flow may continue to cause impacts to vegetation during the operational phase of this project. These impacts are initiated during the construction period and are discussed above.

AIR POLLUTION

Air pollution levels would increase during operations with the ACX upgrade of the existing APF-1 and increased emissions from traffic, drilling equipment, and well servicing and production equipment; however, this increase is not expected to generate levels of pollutants that would adversely affect vegetation. Air quality impacts caused by emissions from well servicing and drilling equipment would be intermittent and localized. Air quality mitigation measures would be the same as those described under Alternative A.

PIPELINES

Pipeline operation would not cause vegetation losses or alteration. However, occasional large-scale pipe repairs that may be required during the thawed season could result in additional tundra damage from equipment needed to conduct the repair work. Tundra travel is discussed above. Additionally, indirect impacts (discussed above in the Construction Period section) associated with snow drifting and shading would continue to occur during the operation period. Effects of pipeline spills on tundra are described in Section 4.3.

POWER LINES

No additional impacts to vegetation would occur from power lines during the operation period.

ABANDONMENT AND REHABILITATION

Impacts of abandonment under Alternative B would be similar in nature to that for Alternative A. However, because fewer miles of gravel roads would be created, none between CD-2 and CD-6 except for a short road associated with CD-5's landing strip, the alteration in the vegetation and wetlands that could occur at abandonment would be correspondingly less.

4B.3.1.2 Alternative B – Full-Field Development Scenario Impacts on Terrestrial Vegetation and Wetlands

In addition to the impacts of CPAI Development Plan Alternative B, under the FFD scenario for Alternative B approximately 1,063 acres of tundra vegetation would be covered with gravel fill for the construction of pads (well pads, HPF pads, and storage pads), airstrips and associated aprons (474 acres), and 94 miles of roads (589 acres). Approximately 4,400 acres of vegetation would be indirectly affected by dust, gravel spray, snowdrifts,

impoundments, and thermokarst. The effects of FFD on terrestrial vegetation and wetlands would depend on the location and extent of development in specific locations within each facility group. Table 4B.3.1-3 and Table 4B.3.1-4 summarize the estimated areas of vegetation classes affected under FFD Alternative B. Impact calculation methods for FFD are described in Section 4A.3.1.2. The type of direct and indirect impacts to vegetation related to gravel fill; dust fallout from roads; ice roads and snow stockpiles; off-road tundra travel; impoundments and thermokarst; cross-drainage and water flow; air pollution; pipelines; and power lines in the three facility groups (Colville River Delta, Fish-Judy Creeks, and Kalikpik-Kogru Rivers facility groups) and proposed mitigation measures would be the same types as those described under CPAI Development Plan Alternative A.

COLVILLE RIVER DELTA FACILITY GROUP

GRAVEL PADS, ROADS, AND AIRSTRIPS

In addition to habitat loss described under CPAI Development Plan Alternative B, approximately 217 acres of vegetation would be lost in the Colville River Delta Facility Group under FFD Alternative B for the construction of pads (hypothetical production pads HP-4, HP-5, HP-7, HP-8, HP-12, HP-13, and HP-14 and storage pads) and airstrips (164 acres) and connecting roads (53 acres) (Table 4B.3.1-3 and Table 4B.3.1-4). The dominant vegetation class in the vicinity of the Colville River Delta is Wet Sedge Meadow Tundra. The types of disturbances and impacts to vegetation associated with gravel fill placement would be the same as those described previously for CPAI Development Plan Alternative A.

Gravel extraction for the hypothetical FFD would result in the destruction of approximately 287 acresof tundra vegetation. Specific gravel sources for the hypothetical FFD scenario have not been identified. The development process of any future gravel source would include planning, design, permitting, temporary staging areas, removal of overburden, blasting and excavation of gravel, and an approved rehabilitation plan. Analysis of impacts and appropriate mitigation measures would be examined before approval of future mine sites.

DUST FALLOUT FROM ROADS

Under FFD Alternative B, indirect impacts, including dust impacts, are expected to occur within 164 feet (50 meters) of gravel facilities as described in CPAI Development Plan Alternative A (Section 4A.3.1.1), resulting in alteration of about 656 acres of tundra vegetation in the Colville River Delta Facility Group (Table 4B.3.1-3 and Table 4B.3.1-4). The types of impacts to vegetation and mitigation measures associated with dust fallout would be the same as those described previously for CPAI Development Plan Alternative A.

ICE ROADS, ICE PADS, AND SNOW STOCKPILES

Under FFD Alternative B, ice roads would be necessary to access isolated pads and road segments every winter during construction and drilling, and periodically thereafter for well work over rig access and other maintenance and operations work. In the Colville River Delta Facility Group, approximately 165 miles of temporary ice roads would be constructed over the life of the project for FFD Alternative B, affecting approximately 800 acres of vegetation. The maximum area in the Colville River Delta Facility Group covered by ice roads in a single year would be 165 acres, with an average of 133 acres per year. As with CPAI Development Plan Alternative B, ice pads would be used as staging areas during pipeline construction, to stockpile overburden material associated with gravel mine sites, for equipment staging areas for bridge installation, and for storage of drill rigs and other equipment at remote production pads. The types of impacts to vegetation associated with ice roads and pads and associated mitigation measures would be the same as those described above for CPAI Development Plan Alternative A.

The types of impacts to vegetation associated with snow stockpiles would be the same as those described previously for Alternative A, although the construction of more roads, pads, and airstrips under the FFD scenario would result in potentially increased impacts to vegetation.

TABLE 4B.3.1-3 ALTERNATIVE B – FFD SUMMARY OF VEGETATION IMPACTS FROM PADS, AIRSTRIPS, APRONS, AND STORAGE PADS

Vegetation Classes	Colville River Delta		Direct Impacts	Indirect Impacts	Fish-Judy Creek		Direct Impacts	Indirect Impacts	Kalikpik-Kogru		Direct Impacts	Indirect Impacts
	Acres (%) in Colville Delta FFD Circles		Gravel (Acres)	Dust & Thermal (Acres)	Acres (%) in Fish-Judy Creek FFD Circles		Gravel (Acres)	Dust & Thermal (Acres)	Acres (%) in Kalikpik-Kogru FFD Circles		Gravel (Acres)	Dust & Thermal (Acres)
Riverine Complex	0	(0.0%)	0.0	0.0	35	(0.1%)	0.2	0.3	0	(0.0%)	0.0	0.0
Fresh Grass Marsh	56	(0.3%)	0.4	0.9	257	(0.6%)	1.3	2.2	49	(0.3%)	0.3	0.4
Fresh Sedge Marsh	3	(0.0%)	<0.1	<0.1	3,308	(7.9%)	17.2	28.4	1,296	(8.5%)	7.9	11.3
Deep Polygon Complex	550	(2.6%)	4.2	8.5	4,833	(11.6%)	25.2	41.5	1,417	(9.3%)	8.6	12.4
Young Basin Wetland Complex	0	(0.0%)	0.0	0.0	2,115	(5.1%)	11.0	18.2	650	(4.2%)	3.9	5.7
Old Basin Wetland Complex	0	(0.0%)	0.0	0.0	1,411	(3.4%)	7.4	12.1	0	(0.0%)	0.0	0.0
Wet Sedge Meadow Tundra	9,494	(44.1%)	72.2	147.2	8,951	(21.5%)	46.7	77.0	5,987	(39.1%)	36.4	52.4
Salt-killed Wet Meadow	1,633	(7.6%)	12.4	25.3	0	(0.0%)	0.0	0.0	0	(0.0%)	0.0	0.0
Halophytic Sedge Wet Meadow	1,210	(5.6%)	9.2	18.8	0	(0.0%)	0.0	0.0	0	(0.0%)	0.0	0.0
Halophytic Grass Wet Meadow	32	(0.1%)	0.2	0.5	0	(0.0%)	0.0	0.0	0	(0.0%)	0.0	0.0
Moist Sedge-Shrub Tundra	782	(3.6%)	5.9	12.1	3,308	(7.9%)	17.2	28.4	0	(0.0%)	0.0	0.0
Tussock Tundra	139	(0.6%)	1.1	2.2	14,864	(35.7%)	77.5	127.8	5,120	(33.4%)	31.1	44.8
Dryas Dwarf Shrub Tundra	29	(0.1%)	0.2	0.5	104	(0.3%)	0.5	0.9	0	(0.0%)	0.0	0.0
Cassiope Dwarf Shrub Tundra	0	(0.0%)	0.0	0.0	371	(0.9%)	1.9	3.2	238	(1.6%)	1.4	2.1
Halophytic Willow Dwarf Shrub Tundra	8	(0.0%)	0.1	0.1	0	(0.0%)	0.0	0.0	0	(0.0%)	0.0	0.0
Open and Closed Low Willow Shrub	1,929	(9.0%)	14.7	29.9	301	(0.7%)	1.6	2.6	1	(0.0%)	<0.1	<0.1
Open and Closed Tall Willow Shrub	0	(0.0%)	0.0	0.0	23	(0.1%)	0.1	0.2	0	(0.0%)	0.0	0.0
Dune Complex	0	(0.0%)	0.0	0.0	638	(1.5%)	3.3	5.5	113	(0.7%)	0.7	1.0
Partially Vegetated	1,183	(5.5%)	9.0	18.4	334	(0.8%)	1.7	2.9	130	(0.8%)	0.8	1.1
Barrens	4,487	(20.8%)	34.1	69.6	838	(2.0%)	4.4	7.2	311	(2.0%)	1.9	2.7
Totals	**21,536**	**(100.0%)**	**163.7**	**334.0**	**41,692**	**(100.0%)**	**217.3**	**358.4**	**15,312**	**(100.0%)**	**93.0**	**134.0**

Notes:Calculation methods are described in text in Section 4A.3.1.2.

Columns may not sum to exact numbers in the total row because of rounding, particularly when vegetation classes have impacts of <0.1.

TABLE 4B.3.1-4 ALTERNATIVE B – FFD SUMMARY OF VEGETATION IMPACTS FROM ROADS

Vegetation Classes	Colville River Delta		Direct Impacts	Indirect Impacts	Fish-Judy Creek		Direct Impacts	Indirect Impacts	Kalikpik-Kogru River		Direct Impacts	Indirect Impacts
	Acres (%) in Colville Delta Road Buffer		Gravel (Acres)	Dust & Thermal (Acres)	Acres (%) in Fish-Judy Creek Road Buffer		Gravel (Acres)	Dust & Thermal (Acres)	Acres (%) in Kalikpik-Kogru Road Buffer		Gravel (Acres)	Dust & Thermal (Acres)
Riverine Complex	15	(0.3%)	0.1	0.8	38	(0.1%)	0.4	2.7	0	(0.0%)	0.0	0.0
Fresh Grass Marsh	63	(1.1%)	0.6	3.6	2,105	(7.3%)	24.9	151.1	650	(6.5%)	12.5	76.1
Fresh Sedge Marsh	0	(0.0%)	0.0	0.0	229	(0.8%)	2.7	16.4	0	(0.0%)	0.0	0.0
Deep Polygon Complex	39	(0.7%)	0.4	2.3	76	(0.3%)	0.9	5.4	18	(0.2%)	0.3	2.1
Young Basin Wetland Complex	43	(0.8%)	0.4	2.5	3,164	(10.9%)	37.4	227.1	714	(7.2%)	13.8	83.6
Old Basin Wetland Complex	95	(1.7%)	0.9	5.5	1,123	(3.9%)	13.3	80.6	105	(1.1%)	2.0	12.3
Wet Sedge Meadow Tundra	2,958	(53.5%)	28.4	172.3	5,695	(19.6%)	67.3	408.8	1,254	(12.6%)	24.2	146.8
Salt-killed Wet Meadow	0	(0.0%)	0.0	0.0	0	(0.0%)	0.0	0.0	0	(0.0%)	0.0	0.0
Halophytic Sedge Wet Meadow	3	(0.1%)	<0.1	0.2	0	(0.0%)	0.0	0.0	0	(0.0%)	0.0	0.0
Halophytic Grass Wet Meadow	5	(0.1%)	<0.1	0.3	0	(0.0%)	0.0	0.0	0	(0.0%)	0.0	0.0
Moist Sedge-Scrub Tundra	702	(12.7%)	6.7	40.9	2,372	(8.2%)	28.0	170.3	206	(2.1%)	4.0	24.2
Tussock Tundra	442	(8.0%)	4.2	25.7	5,625	(19.4%)	66.5	403.8	3,367	(33.7%)	64.9	394.3
Dryas Dwarf Shrub Tundra	3	(0.0%)	<0.1	0.2	0	(0.0%)	0.0	0.0	0	(0.0%)	0.0	0.0
Cassiope Dwarf Shrub Tundra	231	(4.2%)	2.2	13.4	7,787	(26.8%)	92.0	558.9	3,238	(32.4%)	62.4	379.2
Halophytic Willow Dwarf Shrub Tundra	0	(0.0%)	0.0	0.0	0	(0.0%)	0.0	0.0	0	(0.0%)	0.0	0.0
Open and Closed Low Willow Shrub	517	(9.4%)	5.0	30.1	615	(2.1%)	7.3	44.1	283	(2.8%)	5.5	33.1
Open and Closed Tall Willow Shrub	0	(0.0%)	<0.1	<0.1	35	(0.1%)	0.4	2.5	1	(0.0%)	<0.1	0.1
Dune Complex	0	(0.0%)	0.0	0.0	0	(0.0%)	0.0	0.0	0	(0.0%)	0.0	0.0
Partially Vegetated	140	(2.5%)	1.3	8.2	103	(0.4%)	1.2	7.4	34	(0.3%)	0.7	4.0
Barrens	272	(4.9%)	2.6	15.9	60	(0.2%)	0.7	4.3	110	(1.1%)	2.1	12.9
Totals	**5,526**	**(100.0%)**	**53.0**	**321.8**	**29,027**	**(100.0%)**	**343.0**	**2,083.5**	**9,979**	**(100.0%)**	**192.4**	**1,168.6**

Notes:Calculation methods are described in text in Section 4A.3.1.2.

Columns may not sum to exact numbers in the total row because of rounding, particularly when vegetation classes have impacts of <0.1.

OFF-ROAD TUNDRA TRAVEL

The types of impacts from off-road tundra travel and associated mitigation measures would be similar to those described under CPAI Development Plan Alternative A. Under FFD Alternative B, the surface area affected would be expected to increase because of the increased length of pipeline and roads and the number of remote facilities that could require off-road tundra travel for emergencies, pipeline maintenance and repair, ice road construction, or supply transport.

IMPOUNDMENTS AND THERMOKARST

Indirect impacts from dust and changes to moisture or thermal regimes associated with roads, pads, and airstrips are expected to occur within 164 feet (50 meters) of gravel facilities (Hettinger 1992), as described under CPAI's Development Plan Alternative A. Table 4B.3.1-3 and Table 4BA.3.1-4 summarizes the surface area of disturbance by vegetation class within this impact area for each facility group. The types of impacts to vegetation associated with thermokarst and ponding and the proposed mitigation measures for these impacts would be the same as those described above for CPAI Development Plan Alternative A.

CROSS-DRAINAGE AND WATER FLOW

The types of impacts to vegetation associated with disruption of cross-drainage and interception of sheet flow would be the same as those described previously for CPAI Development Plan Alternative A. These impacts would be greatest in the vicinity of the Colville River Delta because of unstable flow regimes and ocean-induced storm surges. In addition, roads would likely cross many ephemeral streams in the Colville River Delta area, and culverts would need to be installed. Gravel placement could potentially disturb sheet flow in the spring and could affect local moisture regimes. Culverts allow surface water flow, but they tend to ice-up and increase flow in a small area relative to typical sheet flow. Alteration of sediment disposition patterns during flood events may occur due to obstructions from roads and redirection of floodwaters through culverts. These changes may result in alteration of vegetation succession and long-term alteration of habitat types.

AIR POLLUTION

No additional processing facilities would be built in the Colville River Delta Facility Group under FFD Alternative B; however, the increased amount of vehicles and equipment associated with the production pads and roads would potentially cause a greater increase in air pollution. This increase is not expected to generate levels of pollutants that would adversely affect vegetation.

PIPELINES

In addition to the impacts from CPAI Development Plan Alternative B, a total of approximately 1.8 acres of vegetation would be lost to VSM installation under the FFD scenario for Alternative B, of which about 0.4 acre would occur in the Colville River Delta Facility Group. The vegetation and habitat types affected would depend on the exact location of the VSM, which are generally spaced at 55 to 65 foot intervals. The types of impacts to vegetation associated with snow drifting or shading from the aboveground pipelines would be the same as those described previously for CPAI's Development Plan Alternative A.

POWER LINES

Under FFD Alternative B, power lines would be placed on cable trays on pipeline VSMs and would not cause any additional disturbance to vegetation.

FISH-JUDY CREEKS FACILITY GROUP

In addition to habitat loss described under CPAI Development Plan Alternative B, approximately 560 acres of vegetation would be lost in the Fish-Judy Creeks Facility Group under FFD Alternative B for the construction

of pads (a processing facility; well pads HP-1, HP-3, HP-6, HP-9, HP-10, HP-11, HP-15, HP-16, HP-17, and HP-19; and storage pads) and airstrips (217 acres) and connecting roads (343 acres) (Table 4A.3.1-3 and Table 4A.3.1-4). The types of disturbances and impacts to vegetation associated with gravel fill placement would be the same as those described previously for CPAI Development Plan Alternative A.

DUST FALLOUT FROM ROADS

Under FFD Alternative B, indirect impacts, including dust impacts, would result in alteration of about 2,442 acres of tundra vegetation in the Fish-Judy Creeks Facility Group (Table 4B.3.1-3 and Table 4B3.1-4). The types of impacts to vegetation and mitigation measures associated with dust fallout would be the same as those described previously for CPAI Development Plan Alternative A.

ICE ROADS, ICE PADS, AND SNOW STOCKPILES

Under Alternative B for FFD in the Fish-Judy Creeks Facility Group, approximately 276 miles of temporary ice roads would be constructed over the life of the project, affecting about 1,338 acres of vegetation. The maximum area covered by ice roads in the Fish-Judy Creeks Facility Group in a single year would be 213 acres, with an average of 134 acres per year. As with the CPAI Development Plan Alternative B, ice pads would be used as staging areas during pipeline construction, to stockpile overburden material associated with gravel mine sites, for equipment staging areas for bridge installation, and for storage of drill rigs and other equipment at remote production pads. The types of impacts to vegetation associated with ice roads and pads and associated mitigation measures would be the same as those described above under the CPAI Development Plan Alternative A.

The types of impacts to vegetation associated with snow stockpiles would be the same as those described above under CPAI's Development Plan Alternative A, although the construction of more roads, pads, and airstrips under the FFD scenario would result in potential increased impacts to vegetation.

OFF-ROAD TUNDRA TRAVEL

The types of impacts from off-road tundra travel and associated mitigation measures would be similar to those described for CPAI Development Plan Alternative A. Under FFD Alternative B, the surface area affected would be expected to increase because of the increased length of pipeline, roads, and number of remote facilities that could require off-road tundra travel for emergencies, pipeline maintenance and repair, ice road construction, or supply transport.

IMPOUNDMENTS AND THERMOKARST

The types of impacts to vegetation associated with thermokarst and ponding and the proposed mitigation measures for these impacts would be the same as those described previously for CPAI Development Plan Alternative A. The construction of more roads and pads under the FFD scenario could potentially result in increased impacts and alteration of vegetation communities from thermokarst and ponding. These impacts are expected to occur within the 164-foot impact zone as described in CPAI Development Plan Alternative A (Section 4A.3.1.1). Table 4B.3.1-3 and Table 4B.3.1-4 summarize the potential surface area of disturbance by vegetation class within this impact area for each facility group.

CROSS-DRAINAGE AND WATER FLOW

The types of impacts to vegetation associated with the disruption of cross-drainage and interception of sheet flow would be the same as those described previously for CPAI Development Plan Alternative A, although the construction of more roads and culverts under the FFD scenario could potentially cause increased impacts to vegetation communities from disturbance of local water flow.

AIR POLLUTION

The construction of an additional processing facility in the Fish-Judy Creeks Facility Group would result in a localized increase of air pollution levels. This increase is not expected to generate levels of pollutants that would adversely affect vegetation.

PIPELINES

Under the FFD scenario for Alternative B, approximately 1.1 acres of vegetation would be lost in the vicinity of the Fish-Judy Creeks Facility Group by VSM placement.

POWER LINES

Under FFD Alternative B, power lines would be placed on cable trays on pipeline VSMs and would not cause any additional disturbance to vegetation.

KALIKPIK-KOGRU RIVERS FACILITY GROUP

In addition to habitat loss described for CPAI Development Plan Alternative B, approximately 285 acres of vegetation would be lost in the Kalikpik-Kogru Rivers Facility Group under FFD Alternative B for the construction of pads (a hypothetical processing facility; production pads HP-18, HP-20, and HP-21; and storage pads) and airstrips (93 acres) and connecting roads (192 acres) (Table 4B.3.1-3 and Table 4B.3.1-4). The dominant vegetation classes in the Kalikpik-Kogru Rivers Facility Group are Tussock Tundra and Sedge Grass Meadow. The types of disturbances and impacts to vegetation associated with gravel fill placement would be the same as those described previously for CPAI Development Plan Alternative A.

DUST FALLOUT FROM ROADS

Under FFD Alternative B, indirect impacts, including dust impacts, would result in alteration of about 1,303 acres of tundra vegetation in the Kalikpik-Kogru Rivers Facility Group (Table 4B.3.1-3 and Table 4B3.1-4). The types of impacts to vegetation and mitigation measures associated with dust fallout would be the same as those described previously for CPAI Development Plan Alternative A.

ICE ROADS, ICE PADS, AND SNOW STOCKPILES

Under Alternative B for FFD in the Kalikpik-Kogru Rivers Facility Group, approximately 180 miles of ice roads would be constructed over the life of the project, affecting about 873 acres of vegetation. The maximum area covered by ice roads in the Kalikpik-Kogru Rivers Facility Group in a single year would be 305 acres, with an average of 218 acres per year. As with the CPAI Development Plan Alternative B, ice pads would be used as staging areas during pipeline construction, to stockpile overburden material associated with gravel mine sites, for equipment staging areas for bridge installation, and for storage of drill rigs and other equipment at remote production pads. The types of impacts to vegetation associated with ice roads and pads and associated mitigation measures would be the same as those described above under the CPAI Development Plan Alternative A.

The types of impacts to vegetation associated with snow stockpiles would be the same as those described above under CPAI's Development Plan Alternative A, although the construction of more roads, pads, and airstrips under the FFD scenario would result in potential increased impacts to vegetation.

TUNDRA TRAVEL

The types of impacts from off-road tundra travel and associated mitigation measures would be similar to those described for CPAI Development Plan Alternative A. Under FFD Alternative B, the surface area affected would be expected to increase because of the increased length of pipeline, roads, and number of remote facilities that

may require off-road tundra travel for emergencies, pipeline maintenance and repair, ice road construction, or supply transport.

IMPOUNDMENTS AND THERMOKARST

The types of impacts to vegetation associated with thermokarst and ponding and the proposed mitigation measures for these impacts would be the same as those described previously for CPAI Development Plan Alternative A. Under FFD Alternative B, the construction of more roads and pads would result in increased impacts and alteration of vegetation communities from thermokarst and ponding. These impacts are expected to occur within 164 feet (50 meters) of gravel facilities (Hettinger 1992). Table 4B.3.1-3 and Table 4B.3.1-4 summarize the potential surface area of disturbance by vegetation class within this impact area for each facility group.

CROSS-DRAINAGE AND WATER FLOW

The types of impacts to vegetation associated with the disruption of cross-drainage and interception of sheet flow would be the same as those described previously for CPAI Development Plan Alternative A, although the construction of more roads and culverts under FFD Alternative B would cause increased impacts to vegetation communities from disturbance of local water flow.

AIR POLLUTION

The construction of an additional processing facility in the Kalikpik-Kogru Rivers Facility Group would result in a localized increase in air pollution levels. This increase is not expected to generate levels of pollutants that would adversely affect vegetation.

PIPELINES

Under the FFD scenario for Alternative B, approximately 0.4 acre of vegetation would be lost in the Kalikpik-Kogru Rivers Facility Group from VSM placement. The types of impacts to vegetation associated with snow drifting or shading from pipeline placement would be the same as those described above under the CPAI Development Plan Alternative A.

POWER LINES

Under FFD Alternative B, power lines would be placed on cable trays on pipeline VSMs and would not cause any additional disturbance to vegetation.

4B.3.1.3 Alternative B – Summary of Impacts (CPAI and FFD) on Terrestrial Vegetation and Wetlands

Impacts from CPAI Development Alternative B to vegetation and habitat types are summarized in Tables 4B.3.1-1 and 4B.3.1-2, respectively. Impacts from FFD Alternative B are summarized in Table 4B.3.1-3 and Table 4B.3.1-4.

Vegetation maps cover the entire Plan Area, and detailed wildlife habitat maps are available for the entire area affected by CPAI's proposed Alternative B (Figure 4B.3.1-2). Vegetation classes and wildlife habitat types are cross-referenced in Table 3.3.1-3. Summary of impacts are presented as percentages of available vegetation type or habitat class within the Colville River Delta or the National Petroleum Reserve-Alaska portions of the Plan Area. Wildlife habitat mapping covers 100 percent of the Colville River Delta, 24 percent of the National Petroleum Reserve-Alaska portion of the Plan Area, and 37 percent of the total Plan Area.

Under CPAI Alternative B, approximately 241 acres of tundra vegetation would be lost by gravel fill and extraction associated with roads, pads, airstrips, and gravel mines; and 2,116 acres would be altered or disturbed

by ice roads and pads, dust, snow accumulation, power line trenching, and changes to thermal or moisture regimes; combined representing less than one percent of the Plan Area (Table 4B.3.1-1 and Table 4B.3.1-2).

In the Colville River Delta portion of the Plan Area, the highest surface area impacts are to Wet Sedge Meadow Tundra vegetation (161 acres lost or altered; 0.4 percent of available in the area) and Patterned Wet Meadow habitat (126 acres lost or altered; 0.4 percent of available in the area). In the National Petroleum Reserve-Alaska portion of the Plan Area, the highest surface area impacts are to Tussock Tundra vegetation (268 acres lost or altered; 0.1 percent of available in the area) and Moist Tussock Tundra habitat (268 acres lost or altered; 0.5 percent of available mapped habitat in the area) (Tables 4B.3.1-1 and 4B.3.1-2).

Under CPAI Alternative B, key wetland habitats that would be lost or altered in the 146,637 acre Colville River Delta are: riparian shrubland (24 of 7,575 acres); aquatic grass marsh (1.6 of 369 acres); deep open lakes (9.3 of 7,810 acres); basin-complex wetlands (0 of 2 acres); and coastal wetlands (0.5 of 29,022 acres). Key wetland habitats that would be lost or altered in the 175,153 acres mapped in the National Petroleum Reserve-Alaska are: riparian shrubland (<0.1 of 4,741 acres); aquatic grass marsh (0 of 501 acres); deep open lakes (<0.1 of 22,374 acres); basin-complex wetlands (49 of 16,297 acres); and coastal wetlands (0 of 36 acres). Thus, impacts to all key wetlands, including those that contain *Arctophila* and *Carex aquatilis*, will be minor.

Under FFD Alternative B, approximately 1,336 acres of tundra vegetation (less than one percent of the Plan Area) would be lost by gravel fill and extraction associated with roads, pads, airstrips, and gravel mines; and 9,031 acres (less than one percent of the Plan Area) would be altered or disturbed by ice roads, dust, and changes to thermal or moisture regimes (Table 4B.3.1-3 and Table 4B.3.1-4). Habitat types were not assessed for FFD because habitat mapping does not cover the entire Plan Area (Figure 3.3.1.3-1) (Jorgenson et al. 2003c).

4B.3.1.4 Alternative B – Potential Mitigation Measures (CPAI and FFD) for Terrestrial Vegetation and Wetlands

Potential mitigation measures would be the same as those identified for Alternative A (Section 4A.3.1.4).

4B.3.1.5 Alternative B – Effectiveness of Protective Measures for Terrestrial Vegetation and Wetlands

The effectiveness of the protective measures would be similar to Alternative A.

4B.3.2 Fish

As in Alternative A, the primary concern in the Plan Area is maintaining winter habitat for fish. Maintaining suitable feeding and spawning areas and access to these areas, which are often in different geographic locations; water withdrawal; alteration of flow patterns; release of contaminants during the life of the project; and the impacts of oil spills are likewise of concern.

Impacts of and measures to prevent, control, and mitigate spills are addressed in Section 4.3. Furthermore, that section includes an assessment of the effects of the project on marine fish and habitats. Normal construction and operation impacts for this alternative would not be expected to have measurable effects on Harrison Bay and nearshore Beaufort Sea environments and biota. Essential Fish Habitat is discussed in Section 4B.3.2.3.

4B.3.2.1 Alternative B – CPAI Development Plan Impacts on Fish

The CPAI Development Plan Alternative B (Figure 2.4.2.1-1) differs from Alternative A in that the project is designed to attain complete conformance with the Northeast National Petroleum Reserve-Alaska IAP/EIS stipulations as presented in the 1998 ROD (BLM and MMS 1998b). The primary differences include (1) moving the location of production pad CD-6 and the associated pipeline outside the 3-mile sensitive area surrounding Fish Creek (as designated by BLM and MMS 1998a); (2) eliminating the Nigliq Channel road

bridge; (3) eliminating the entire road between CD-2 and CD-6; and (4) constructing airstrips at production pads CD-5 and CD-6.

The impacts of Alternative B are largely the same as those of Alternative A discussed in Section 4A.3.2.1. Major differences from Alternative A are addressed in the following text.

CONSTRUCTION PERIOD

The construction of Alternative B would not result in any significant obstructions to fish movements. Fish would not be present in the affected areas during winter.

WATER WITHDRAWAL

The main potential impacts of Alternative B would be related to winter water withdrawal from fish-bearing lakes, as described in Section 4A.3.2. Impacts are not expected if withdrawals are conducted in compliance with permit requirements. The necessary water withdrawals would be monitored to ensure that the volume of water removed from any lake does not exceed permitted amounts. Potential water sources (i.e., for ice roads) would be the same lakes as described under Alternative A (see Figure 4A.3.2-1 and Figure 4B.3.2-1).

GRAVEL MINING

Impacts of gravel mining are as described in Section 4A.3.2, although they would be reduced compared to Alternative A because of a reduced need for gravel under this alternative.

PIPELINES

Impacts of pipeline installation would be generally the same as those for Alternative A (Section 4A.3.2). A pipeline crossing of or a pipeline bridge over the Nigliq Channel would be required. A pipeline-only bridge would carry a significantly smaller load, enabling a span of much greater distance as compared to a road bridge.

PADS AND AIRSTRIPS

The airstrip at CD-5 would be built on higher ground near the production pad and does not appear to impinge on any lakes or wetlands potentially used by fish (Figure 2.4.1.1-8 for detail near CD-5).

Likewise, the production pad and airstrip at CD-6 would be situated on high ground and would not impinge on any fish habitat. The location of this pad and airstrip outside of the sensitive area surrounding Fish Creek would minimize the possibility of impacts to that sensitive habitat.

In Alternative B, the road and pipeline corridors to CD-7 are somewhat shorter than the corresponding features of Alternative A and are outside the sensitive habitat around Fish Creek. No winter fish habitat would be affected, nor would any in-stream channel work be required.

BRIDGES AND ROADS

Impacts of road construction would be similar to those of Alternative A (Section 4A.3.2), but they would affect a much smaller area.

There would be a 40-foot bridge over the narrow neck of Lake 9323 (Figure 2.4.2.1-1 and Figure 4B.3.2-1) just north of CD-4. This would eliminate potential impacts of culvert installation described in Section 4A.3.2.

The Nigliq Channel road bridge would not be constructed. A favorable consequence relative to Alternative A is that the need for midstream support piers would be eliminated along with the potential construction impacts to the Nigliq Channel as described in Section 4A.3.2.

Similarly, no road bridge would be needed at the Ublutuoch River, and no impacts from pipeline construction would be expected at this site.

The roads and bridges from CD-2 to CD-5 and from CD-5 to CD-6 would not be constructed, and the associated impacts as described in Section 4A.3.2 would not occur. CPAI would still build ice roads for winter construction of the pipeline from CD-2 to CD-6.

A road bridge would still be required east of CD-7 (Figure 2.4.2.1-1), as in Alternative A (Section 4A.3.2).

CULVERTS

No culverts have been proposed for Alternative B. Impacts of culverts, if installed, would be as described in Section 4A.3.2.

BOAT RAMPS AND DOCKS

Construction of boat ramps and docks, should any be needed for spill response purposes, may have in-stream impacts similar to those of bridge construction.

POWER LINES

Wherever there are roads, power lines would be buried in or under roads or at the toe of the road slope. There should be no incremental impacts to fish beyond those described for roads (Section 4A.3.2).

Where there are no roads, power lines would be buried in the tundra adjacent to the pipeline. They would be hung off pipeline bridges at stream crossings and trenched across minor drainages. Because trenching would occur in winter when these waters would be frozen and no fish would be present, no impacts to fish would be expected

OPERATION PERIOD

ROADS AND PIPELINES

Operation of the pipeline in Alternative B would have effects similar to those described in Section 4A.3.2. Impacts from low-ground-pressure vehicles needing emergency access in roadless areas when the ground is not frozen could potentially occur between CD-1 and CD-3 and between CD-2 and CD-6.

The pipeline corridor would have minimal effects on fish habitat. No in-channel structures are contemplated. In particular, the VSMs on which the pipeline over the Nigliq Channel would be mounted would not result in alteration or loss of habitat nor obstruction of fish passage.

PADS, ROADS, AND AIRSTRIPS

Operation of airstrips, production pads, and the roads in Alternative B would have impacts similar to those of Alternative A (Section 4A.3.2); however, they would be on a smaller scale because of the shorter length of roads proposed for Alternative B. Because of the shorter length of roads proposed for Alternative B, the potential for flow alteration on a landscape scale would be smaller relative to Alternative A.

Production pad CD-6 is reasonably close to, but upstream of Lake M9925 (Figure 4B.3.2-1). This tundra lake is about 4 feet deep and has been documented to contain ninespine sticklebacks during summer. In Alternative B, CD-6 is located outside the sensitive area as designated by the BLM and MMS (1998a) in the Fish Creek drainage and farther away from Fish Creek—a very important fish habitat. This should reduce the potential for contaminants to reach this important habitat.

BRIDGES

Operation of the two proposed 40-foot bridges would not be expected to have any effects on fish. Because the Nigliq Channel road bridge would not be built, the potential for the disruptive effects of gravel road approaches to the bridge would be eliminated.

CULVERTS

Culverts, should they be installed, would be designed to maintain adequate water flow and fish passage. The nature of the potential impacts of installed culverts would be as described in Section 4A.3.2. Because of the shorter length of roads proposed for Alternative B, there potentially would be fewer culverts, and thus a lower impact potential than in Alternative A.

HUMAN ACCESS

Issues associated with and impacts of human access would be generally as described for Alternative A (Section 4A.3.2). The presence of ice roads during winter might encourage local fisherman to fish the Ublutuoch fish overwintering area, despite these roads being closed to local residents in Alternative B. This could result in a more than negligible increase of fishing pressure on overwintering fishes.

ABANDONMENT AND REHABILITATION

Impacts to fish from abandonment and rehabilitation activities would be similar, but less than those resulting from Alternative A primarily because there would be no road bridges over the Nigliq Channel or Ublutuoch River, or road with smaller bridges or culverts between CD-2 and CD-6 to be removed.

4B.3.2.2 Alternative B – Full-Field Development Impacts on Fish

Types of impacts of future development in the Plan Area generally will be similar to those described above for the five-pad CPAI Development Plan Alternative B (Section 4A.3.2). However, development on the scale postulated will, depending on precise siting, destroy or alter fish habitat substantially more than CPAI's proposed project. Overwintering, rearing, migration, and spawning habitats would be affected.

The road and pipeline network would create subtle alteration of flows of waterways on a landscape scale that could lead to unexpected shifts in drainage and loss of fish resources. Overall, the extent of roads has been substantially reduced from Alternative A; thus the extent of impacts would be proportionally reduced. Impacts to fish passage would be minimized by installation of culverts or bridges as determined during future permitting efforts. However, failure of any culverts that might be installed (Section 4A.3.2) could cause widespread habitat alteration and obstruction of fish movement.

The extent of road development under this scenario suggests that there should be increased potential for human access to fish resources throughout the ASDP Area, thus creating greater pressure on fish populations. However, road access would be allowed for industry only, and no gravel roads would cross the Fish and Judy creek drainages between HPF-1 and HP-18. Conversely, some traditional users of the area may choose other locations to avoid industrial activity altogether.

State-of-the-science construction and operation approaches would be used to minimize impacts, and human access to resources could be controlled as described in Section 4A.3.2. Withdrawal of fresh water necessary to support this scale of infrastructure development, plus well drilling, should not affect fish if withdrawals are done in compliance with permit restrictions. The cumulative effects of this FFD scenario are expected to be similar to effects from current developments. Future mitigation measures are expected to be successful, based on the impacts of previous projects to fish habitat and passage.

The following subsections summarize concerns specific to the three facility groups.

COLVILLE RIVER DELTA FACILITY GROUP

In the Colville River Delta, seven new production pads are hypothesized. Of particular note are production pads HP-12 and HP-14 on the eastern side of the outer Colville River Delta, which are in vicinity of the commercial (Helmericks) fishery as well as subsistence fisheries. Spills, addressed in Section 4.3, would be of major concern with these two hypothetical facilities.

No roads are hypothesized in this part of the Plan Area except short pad-airstrip roads and the road from CD-4 to HP-4. Pipelines would be constructed over several major watercourses including the Elaktoveach Channel, Kupigruak Channel, Tamayayak Channel, and the main stem of the Colville River. In-stream construction activities at these water bodies would have the potential to cause impacts as described in Section 4A.3.3.1.

FISH-JUDY CREEKS FACILITY GROUP

Ten new pads and one new processing facility in the Fish Creek watershed (including Judy Creek and the Ublutuoch River) are hypothesized.

HP-1 and HPF-1 have been moved out of the area around the Fish and Judy creek drainages designated for no permanent oil and gas facilities by the BLM and MMS (1998a). Thus, the potential impacts to these sensitive habitats would be reduced relative to Alternative A FFD. HP-11 would be in the sensitive area near the Colville River, as designated by the BLM and MMS (1998a), and would require consultation. HP-16, HP-17, and HPF-1 would be in the sensitive area around the Fish and Judy creek drainages, as designated by the BLM and MMS (1998a), and would require consultation.

The road network of this hypothetical development is less extensive than that of Alternative A. If roads are not routed along high ground to the extent possible, relatively large areas of fish habitat could be affected during road construction. Roads from CD-7 to HP-18 and from CD-6 to HP-15, which would be perpendicular to the primary drainage flow which could dam overland drainage, are not included in this alternative; therefore, the potential landscape-scale disruption of drainage patterns has been largely eliminated in this FFD Alternative. Furthermore, the pipeline crossing the Fish and Judy creek drainages crosses much less (compared with Alternative A) of these sensitive portions of these drainages.

KALIKPIK-KOGRU RIVERS FACILITY GROUP

Three new pads and one new processing facility in the Kalikpik-Kogru river drainages are hypothesized.

As with the Fish-Judy Creeks Facility Group, the road network of this hypothetical development is extensive. Therefore, relatively large areas of fish habitat might be affected during road construction if roads are not routed along high ground to the extent possible. The road from HP-18 to HPF-2 is perpendicular to the primary drainage flow and thus may function as a dam on a landscape scale, disrupting natural hydrology and obstructing fish movement over a wide area. Bridges or culverts installed in low-lying areas may mitigate this effect. HP-22, near Harrison Bay, has been eliminated; therefore, there would be no direct impacts northeast of HP-21.

4B.3.2.3 Alternative B – Summary of Impacts (CPAI and FFD) on Fish

Within the Plan Area, the primary concerns are generally the same as those arising from Alternative A, namely, impacts to winter habitat, feeding areas, and spawning areas as well as access to those sites.

Water withdrawal for winter construction could create overcrowding and reduce the available pool of dissolved oxygen in a water body, with fish mortality a possible result. Permit limits on amounts of water withdrawn are set to avoid such effects. Because the pipeline over the Nigliq Channel would be suspended from supports on either bank (i.e., no in-stream structures), suspension of oxygen-demanding materials during construction of the Nigliq Channel bridge is not a concern in Alternative B.

Construction of pads, roads, and pipelines is likely to have no measurable adverse effect on arctic fish populations. Construction of ice roads or airstrips on fish overwintering areas could cause freezing to the bottom and block fish movement if state requirements to maintain fish passage are not met. The new road system could facilitate increased human access to fishing areas, despite these roads being closed to local residents in Alternative B, potentially increasing subsistence fishing pressures. Because the road system of Alternative B would be shorter than that of Alternative A, impacts would be on a smaller scale.

Gravel mining would most likely have direct impacts if situated within the floodplains of rivers. Sedimentation from erosion could affect fish and other aquatic organisms by interfering with respiration and vision and by smothering benthic habitat.

The long network of roads in the FFD scenario could result in alteration of regional surface hydrology, including interruption of fish movements, in the Kalikpik- Kogru river drainages and in the lower Fish Creek drainage.

If culverts are installed, any failures may impound water, thus creating a new pond or lake upstream of the culvert and diminishing flow downstream; in turn, this would interrupt fish movement. Stream morphology changes could occur downstream of culverts as a result of altered flow.

Release of contaminants over the project duration and the impacts of oil spills are important concerns to fish resources; these issues are addressed in Section 4.3.

The potential impacts described above, should they occur, are likely to be localized and temporary and thus would have no significant effects on fish populations within and adjacent to the Plan Area. Given the total amount of construction proposed, the collective effects of development and production would have some effect on fish and fish habitats in the region. Whether those effects are measurable and distinguishable from naturally occurring population perturbations is unknown. Minor shifts in habitat or population integrity, especially if they are of a temporary nature, could reasonably be absorbed by the ecosystem. Furthermore, careful planning, appropriate engineering specification and design, and rigorous safety measures should minimize impacts and ensure the reproductive sustainability of stocks overall. Localized impacts could pose a more serious threat to localized (e.g., within a single drainage) stocks if they were to occur in or near prime spawning, nursery, or overwintering sites. Continued monitoring of fisheries resources is vital for evaluating long-term stability of the region. Monitoring and mitigation plans should be finalized and ready to address any signs that development may be having a truly detrimental effect on local fish populations.

ESSENTIAL FISH HABITAT

The impacts on EFH for Alternative B are the same as for Alternative A with one major exception: project facilities would be moved outside the 3-mile sensitive area around Fish Creek, thereby reducing the potential for impacts to this salmon stream. The potential impacts from Alternative B to fish in general are described in Section 4B.3.2. As is the case with Alternative A, because the Plan Area represents marginal habitat for salmon populations, the probability of affecting EFH from a species and commercial perspective is minimal.

4B.3.2.4 Alternative B – Potential Mitigation Measures (CPAI and FFD) for Fish

1. At project completion, gravel mines should be converted to fish habitat if practicable.

2. Ice roads and airstrips should avoid fish overwintering areas where possible, and in all cases maintain fish passage.

3. CPAI should continue fish monitoring studies in the Plan Area to ensure that the health of regional and locally important fish stocks is maintained. CPAI's mitigation plan should include remedial measures to be taken should monitoring detect adverse impacts due to the project.

4B.3.2.5 Alternative B – Effectiveness of Protective Measures for Fish

The effectiveness of the protective measures would be similar to Alternative A.

4B.3.3 Birds

See discussions of impacts by bird group presented in Section 4A.3.3 Birds for additional descriptions of impact mechanisms and for description of impact calculation assumptions and methods.

4B.3.3.1 Alternative B – CPAI Development Plan Impacts on Birds

Table 4B.3.3-1 presents the estimated number of nests displaced as a result of habitat loss, alteration and disturbance for the CPAI Development Plan Alternative B by bird species and species group. In CPAI Alternative B, facilities would be moved outside of the 3-mile sensitive area around Fish Creek, and power lines on poles would be replaced by power lines on cable trays on VSMs.

WATERFOWL AND LOONS

CONSTRUCTION PERIOD

Habitat Loss, Alteration, or Enhancement

Impacts to waterfowl and loons related to habitat loss and alteration would be the same as those described previously for Alternative A. The area covered by gravel or mined and lost as potential waterfowl and loon habitat would be reduced to 241 acres Alternative B from 306 acres in Alternative A. An estimated 8.2 waterfowl and 1.0 loon nests would be affected by habitat loss due to gravel placement and mining (Table 4B.3.3-1). Habitat loss and alteration would be similar to Alternative A in the Colville River Delta (Table 4B.3.3-2), and would be reduced by about 50 percent in the National Petroleum Reserve-Alaska area. Impacts to waterfowl and loon habitat from dust, snow drifting, and alterations in thermal and moisture regimes would be reduced affecting an estimated 17.6 fewer waterfowl nests and 2.5 fewer loon nests by the elimination of roadways in Alternative B (Table 4B.3.3-1 and Table 4A.3.3-2). However, impacts from ice roads would be increased slightly during the construction period (Table 4B.3.3-1).

Disturbance and Displacement

Fewer waterfowl and loons would be displaced by vehicle traffic by the reduction in the road system. However, the addition of two airstrips would cause additional disturbance to an estimated 32.8 additional waterfowl nests and 2.1 additional loon nests compared to Alternative A (Table 4B.3.3-1 and Table 4A.3.3-2).

OBSTRUCTIONS TO MOVEMENT

Potential obstruction of movement would be reduced in Alternative B compared to Alternative A by the removal of the road between CD-2 and CD-5 to CD-6. The general reduction in gravel fill would result in a reduction in potential obstruction of movements for brood-rearing waterfowl and loons (Table 4B.3.3-2).

MORTALITY

Mortality resulting from collisions with vehicles would be reduced in Alternative B from that in Alternative A with the reduction in the road system. The addition of two airstrips would increase mortality resulting from collisions with aircraft. Mortality resulting from collisions with power lines on poles would be reduced in Alternative B compared with Alternative A by placement of the power lines on pipeline VSMs between CD-6 and CD-7.

Any increase in predator populations attracted to the development areas would result in decreased reproductive success for waterfowl and loons. This is particularly true for increased glaucous gull, common raven, bear and arctic fox populations. The magnitude and extent of decreased productivity have not been quantified, but would be most detrimental to species with populations which may be declining such as long-tailed ducks (Mallek et al. 2003) and red-throated loons (Larned et al. 2003); and to colonial nesting species which concentrate in specific locations providing an abundant and predictable protein source. Ravens could be discouraged from nesting on oilfield structures. If problem birds persist, control may be necessary to reduce depredation on tundra nesting birds.

TABLE 4B.3.3-1 CPAI ALTERNATIVE B – ESTIMATED NUMBER OF BIRD NESTS POTENTIALLY DISPLACED BY HABITAT LOSS, HABITAT ALTERATION AND DISTURBANCE

Species	Colville River Delta					NPR-A Area					Grand Total[a]
	Habitat Loss	Habitat Alteration	Ice Road Habitat Loss	Air Traffic Disturbance	Total	Habitat Loss	Habitat Alteration	Ice Road Habitat Loss	Air Traffic Disturbance	Total	
Waterfowl											
Greater white-fronted goose	2.1	4.8	1.0	15.9	23.9	3.2	9.5	3.4	19.9	36.0	59.9
Snow goose	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1
Canada goose	0.0	0.1	0.0	0.1	0.2	0.8	2.4	0.8	6.0	10.0	10.2
Brant	0.2	0.4	0.1	2.0	2.7	0.4	1.1	0.4	3.0	4.9	7.6
Tundra swan	0.1	0.3	0.1	0.4	0.9	0.0	0.1	0.0	0.3	0.4	1.3
Mallard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Northern shoveler	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.3	0.4	0.5
Northern pintail	0.2	0.4	0.2	0.3	1.1	0.2	0.3	0.1	0.8	1.4	2.5
Green-winged teal	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.3	0.4	0.5
Greater scaup	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1
Lesser scaup	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
King eider	0.0	0.0	0.0	0.1	0.1	0.3	0.9	0.4	0.8	2.4	2.5
Long-tailed duck	0.2	0.6	0.1	2.0	2.9	0.3	0.7	0.2	1.4	2.6	5.5
Waterfowl Total[b]	**2.8**	**7.0**	**1.6**	**21.0**	**32.4**	**5.4**	**15.1**	**5.3**	**32.8**	**58.6**	**91.0**
Loons											
Red-throated loon	0.1	0.3	0.1	0.8	1.3	0.1	0.2	0.1	0.5	0.9	2.2
Pacific loon	0.2	0.5	0.2	1.3	2.2	0.5	1.3	0.5	1.5	3.7	5.9
Yellow-billed loon	0.1	0.1	0.0	0.4	0.6	0.1	0.1	0.1	0.1	0.4	1.0
Loon Total[b]	**0.3**	**0.9**	**0.3**	**2.5**	**4.0**	**0.7**	**1.6**	**0.7**	**2.1**	**5.1**	**9.1**
Ptarmigan											
Willow ptarmigan	0.3	0.6	0.2	0.4	1.5	0.3	0.9	0.2	2.4	3.8	5.3
Rock ptarmigan	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ptarmigan Total[b]	**0.3**	**0.6**	**0.2**	**0.4**	**1.5**	**0.3**	**0.9**	**0.2**	**2.4**	**3.8**	**5.3**
Seabirds											
Parasitic jaeger	0.0	0.1	0.0	0.1	0.2	0.1	0.2	0.1	0.2	0.6	0.8
Long-tailed jaeger	0.0	0.1	0.0	0.0	0.1	0.0	0.2	0.1	0.3	0.6	0.7
Glaucous gull	0.1	0.2	0.0	0.6	0.9	0.3	1.0	0.4	1.7	3.4	4.3
Sabine's gull	0.0	0.1	0.0	0.6	0.7	0.2	0.2	0.1	0.0	0.5	1.2
Arctic tern	0.2	0.5	0.1	1.1	1.9	0.3	0.9	0.4	0.8	2.4	4.3

TABLE 4B.3.3-1 CPAI ALTERNATIVE B – ESTIMATED NUMBER OF BIRD NESTS POTENTIALLY DISPLACED BY HABITAT LOSS, HABITAT ALTERATION AND DISTURBANCE (CONT'D)

Species	Colville River Delta					NPR-A Area					Grand Total[a]
	Habitat Loss	Habitat Alteration	Ice Road Habitat Loss	Air Traffic Disturbance	Total	Habitat Loss	Habitat Alteration	Ice Road Habitat Loss	Air Traffic Disturbance	Total	
Seabird Total[b]	**0.3**	**1.0**	**0.2**	**2.4**	**3.9**	**0.9**	**2.6**	**1.1**	**3.0**	**7.6**	**11.5**
Shorebirds											
Black-bellied plover	0.5	1.6	0.5	0.0	2.6	0.7	2.3	1.2	0.0	4.2	6.8
American golden-plover	0.6	1.9	0.6	0.0	3.1	0.6	1.9	0.8	0.0	3.3	6.4
Bar-tailed godwit	0.1	0.4	0.1	0.0	0.6	0.2	0.8	0.3	0.0	1.3	1.9
Semipalmated sandpiper	5.3	18.1	5.9	0.0	29.3	4.0	14.0	6.7	0.0	24.5	53.8
Baird's sandpiper	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.2	0.2
Pectoral sandpiper	10.0	34.3	11.2	0.0	55.5	8.0	15.8	6.3	0.0	30.0	61.8
Dunlin	0.4	1.2	0.4	0.0	2.0	0.6	2.3	0.9	0.0	3.7	5.7
Stilt sandpiper	0.5	1.6	0.5	0.0	2.6	0.7	2.6	1.1	0.0	4.4	7.0
Buff-breasted sandpiper	0.0	0.0	0.0	0.0	0.0	0.1	0.8	0.5	0.0	1.4	1.4
Long-billed dowitcher	0.8	2.7	0.9	0.0	4.4	2.5	7.1	3.0	0.0	12.5	16.9
Red-necked phalarope	2y5	8.5	2.8	0.0	13.8	5.0	7.8	3.2	0.0	15.9	29.7
Red phalarope	1.7	5.8	1.9	0.0	9.4	1.6	4.2	1.7	0.0	7.4	16.8
Shorebird Total[b]	**22.2**	**76.0**	**24.8**	**0.0**	**123.0**	**24.1**	**59.7**	**25.5**	**0.0**	**108.8**	**231.8**
Passerines											
Yellow wagtail	0.1	0.4	0.1	0.0	0.6	0.0	0.3	0.2	0.0	0.5	1.1
Savannah sparrow	0.6	1.9	0.6	0.0	3.1	1.2	2.4	1.1	0.0	4.6	7.7
Lapland longspur	10.1	34.6	11.3	0.0	56.0	13.6	34.9	14.7	0.0	63.0	119.0
Common redpoll	0.1	0.4	0.1	0.0	0.6	0.4	1.9	0.8	0.0	3.0	3.6
Passerine Total[b]	**10.9**	**37.3**	**12.2**	**0.0**	**60.4**	**15.2**	**39.5**	**16.8**	**0.0**	**71.2**	**131.6**

Notes:

[a] Section 4A.3.3 Birds for analysis method

[b] Totals rounded to include birds with <0.1 nests/km^2

TABLE 4B.3.3-2 CPAI ALTERNATIVE B – SUMMARY OF AFFECTED HABITAT TYPES USED BY WATERFOWL, LOONS AND SEABIRDS

Habitat Types	Colville Delta						NPR-A				
	Acres in Colville River Delta[b]	Loss or Alteration[c] (Acres and % of Available Habitat)		Species[a] (16)			Acres in the NPR-A	Loss or Alteration[c] (Acres and % of Available Habitat)		Species[a] (20)	
				Nesting (16)	Brood-rearing (13)	Staging (3)				Nesting (20)	Brood-rearing (15)
Open Nearshore Water	1,162					1	0				
Brackish Water	1,807			2		2	2				
Tapped Lake with Low-water Connection	5,397					1	412				
Tapped Lake with High-water Connection	5,146	1.0	<0.1%	5			7				
Salt Marsh*	4,473	0.5	<0.1%	2	1	1	36				
Tidal Flat*	18,187					1	0				
Salt-killed Tundra*	6,362			5	1	1	0				
Deep Open Water without Islands*	5,650	1.3	<0.1%	4	5		12,386	<0.1	<0.1%	1	3
Deep Open Water with Islands or Polygonized Margins*	2,160	8.0	0.4%	12	8	1	9,988	<0.1	<0.1%	3	6
Shallow Open Water without Islands	547						1,744	1.8	<0.1%	5	3
Shallow Open Water with Island or Polygonized Margins	155	<0.1	<0.1%	4	4		2,877	1.6	<0.1%	11	7
River or Stream	20,306	2.5	<0.1%			1	1,456				
Aquatic Sedge Marsh	32						3,037	3.2	0.1%	10	2
Aquatic Sedge with Deep Polygons	3,275	15.3	0.5%	12	3		66				
Aquatic Grass Marsh*	369	1.6	0.4%	2			501			2	
Young Basin Wetland Complex*	0						624	19.1	3.1%	9	3
Old Basin Wetland Complex*	2						15,673	30.2	0.2%	12	4
Riverine Complex*	0						698			3	1
Dune Complex	0						1,889				
Nonpatterned Wet Meadow	11,162	36.0	0.3%	7	2		5,697	29.0	0.5%	4	
Patterned Wet Meadow	27,969	125.5	0.4%	8	4		19,861	23.6	0.1%	7	1
Moist Sedge-Shrub Meadow	2,927	69.8	2.4%	2			42,071	168.9	0.4%	8	1
Moist Tussock Tundra	525						49,647	267.7	0.5%	3	1
Riverine Low and Tall Shrub*	1,270						1,803	<0.1	<0.1%		1
Upland Low and Tall Shrub	419						735				
Upland and Riverine Dwarf Shrub*	0						2,240	<0.1	<0.1%		
Riverine or Upland Shrub*	6,305	24.4	0.4%	2			0				

TABLE 4B.3.3-2 CPAI ALTERNATIVE B – SUMMARY OF AFFECTED HABITAT TYPES USED BY WATERFOWL, LOONS AND SEABIRDS

Habitat Types	Colville Delta						NPR-A				
				Species[a] (16)						Species[a] (20)	
	Acres in Colville River Delta[b]	Loss or Alteration[c] (Acres and % of Available Habitat)		Nesting (16)	Brood-rearing (13)	Staging (3)	Acres in the NPR-A	Loss or Alteration[c] (Acres and % of Available Habitat)		Nesting (20)	Brood-rearing 15)
Barrens (riverine, eolian, or lacustrine)	20,993	9.9	<0.1%	2			1,552				
Artificial (water, fill, peat road)	38						150				
Total Area	**146,638**	**295.8**	**0.2%**				**175,152**	**545.3**	**0.3%**		

Notes: (replaced with revised table 4/30/04 LEN)

* Key wetland

[a] Numbers of species using habitats by life history stage (Johnson et al. 2004). Species included are: greater white-fronted goose, snow goose, Canda goose, brant, tundra swan, northern pintail, green-winged teal, greater scaup, spectacled eider, king eider, long-tailed duck, red-breasted merganser, red-throated loon, Pacific loon, yellow-billed loon, parasitic jaeger, long-tailed jaeger, glaucous gull, Sabine's gull, Arctic tern,

[b] Habitat type mapped for the Colville River Delta (Jorgenson et al. 1997) within the Plan Area boundaries

[c] Total includes gravel for pads and airstrips and area indirectly affected by dust, snowdrifts, and alteration in thermal or moisture regimes (Table 4B.3.1-1)

[d] Habitat type mapped for the National Petroleum Reserve-Alaska area (Jorgenson et al. 2003c) within the Plan Area boundaries

OPERATION PERIOD

Habitat Loss, Alteration, or Enhancement

Some habitat loss or alteration from snowdrifts, gravel spray, dust fallout, thermokarst, and ponding would continue during project operation. These impacts would be reduced in Alternative B compared with Alternative A because of the reduced amount of gravel fill (Table 4B.3.3-2).

Disturbance and Displacement

Under Alternative B, loons and waterfowl would be subjected to the same types of disturbances discussed previously for Alternative A, including disturbances related to vehicular and air traffic. Disturbances to waterfowl and loons by vehicle traffic would be reduced in Alternative B from Alternative A by the reduction in the road system. This reduction is reflected in the estimated number of nests displaced due to habitat alteration within 165 feet of roads, pads and airstrips (Table 4B.3.3-1 and Table 4A.3.3-2). Disturbance related to air traffic would be increased for waterfowl and loons by the addition of airstrips at CD-5 and CD-6 (Table 4B.3.3-1).

Obstructions to Movement

Potential obstructions to waterfowl and loon movements related to the presence of gravel roads would be reduced in Alternative B compared to Alternative A by the reduction in the road system and the general reduction in gravel fill between alternatives (Table 4B.3.3-2).

Mortality

Potential mortality from collisions with vehicles would be reduced in Alternative B from Alternative A by the reduction in the road system. Potential mortality from collisions with aircraft would be increased in Alternative

B compared to Alternative A by the addition of airstrips at CD-5 and CD-6. Any increase in predator populations would result in decreased reproductive success for waterfowl and loons. This is particularly true for increased glaucous gull, common raven, bear and arctic fox populations. The magnitude and extent of decreased productivity have not been quantified, but would be most detrimental to species with populations which may be declining such as long-tailed ducks (Mallek et al. 2003) and red-throated loons (Larned et al. 2003); and to colonial nesting species which concentrate in specific locations providing an abundant and predictable protein source. Ravens could be discouraged from nesting on oilfield structures. If problem birds persist, control may be necessary to reduce depredation on tundra nesting birds.

PTARMIGAN

CONSTRUCTION PERIOD

Habitat Loss, Alteration, and Enhancement

The area covered by gravel and lost as potential ptarmigan habitat would be reduced in Alternative B from Alternative A (Table 4B.3.3-1). Impacts to ptarmigan habitat from dust, snow drifting and alterations in thermal or moisture regimes would be reduced by the elimination of roadways in Alternative B compared to Alternative A. However, impacts from ice roads would be increased slightly during the construction period (Table 4B.3.3-1). An estimated 0.9 fewer ptarmigan nests would be affected by habitat loss and alteration under Alternative B compared to Alternative A (Table 4B.3.3-1 and Table 4A.3.3-2).

Disturbance and Displacement

Some ptarmigan might remain on the Arctic Coastal Plain during winter, and a few birds could be disturbed or displaced during construction. In Alternative B, any potential for disturbance would be reduced compared to Alternative A because of the reduction in gravel placement for the road system. Disturbance from aircraft traffic would be increased in Alternative B compared to Alternative A by the addition of airstrips at CD-5 and CD-6. Potential displacement due to air traffic would affect an estimated 2.4 ptarmigan nests(Table 4B.3.3-1).

Obstructions to Movement

Movements of ptarmigan are unlikely to be affected by gravel placement for roads, well pads, and airstrips because ptarmigan can fly over or around such structures. Ptarmigan may use some structures, such as pipelines, for perches.

Mortality

Ptarmigan could suffer mortality from collisions with vehicular traffic, machinery, buildings, bridges, and pipelines during the construction phase of the development. Ptarmigan were among the species of birds most often struck by traffic in association with the TAPS project, although the number of birds lost was likely low compared to area populations (TAPS Owners 2001). Under Alternative B the potential for ptarmigan mortality from collisions with vehicular traffic would be reduced compared to Alternative A because of the reduction in the road system for this alternative. Ptarmigan may collide with aircraft, and mortality would be increased by the addition of airstrips at CD-5 and CD-6.

Any increase in predator populations would result in increased adult mortality and decreased reproductive success for ptarmigan. This is particularly true for increased glaucous gull, common raven, bear and arctic fox populations. Mortality caused by avian predators may be reduced in Alternative B compared to Alternative A by reduction in available perching habitat for avian predators with placement of power lines on VSMs between CD-6 and CD-7. The magnitude and extent of decreased productivity have not been quantified, but would be most detrimental to species with populations which may be declining, which aggregate in predictable locations year to year, and with low total population sizes.

OPERATION PERIOD

Habitat Loss, Alteration, and Enhancement

Some habitat loss and alteration would continue from dust deposition, snowdrifts, thermokarst, and ponding during project operations. Construction of annual ice roads during drilling would continue to alter ptarmigan winter and nesting habitat during project operation.

Disturbance and Displacement

Disturbance and displacement of ptarmigan in the CD-3 and CD-4 areas under Alternative B would be the same as that describe for Alternative A. At the National Petroleum Reserve-Alaska sites, overall disturbance due to vehicle traffic would be reduced under Alternative B compared to Alternative A because of a reduction in the road system. Disturbance would increase in the immediate area of the CD-5 and CD- 6 airstrips (Table 4B.3.3-1). Potential disturbance at the CD-7 site would be the same as that described under Alternative A.

Obstructions to Movement

Potential obstruction to movements of ptarmigan under Alternative B would be reduced compared to Alternative A because of the reduced road system under Alternative B. Obstruction to movements would be expected to be minimal because of the ability of ptarmigan to easily move over or around infrastructure.

Mortality

Under Alternative B the potential for collisions of ptarmigan with vehicular traffic would be reduced compared to Alternative A during the summer because of a reduction in the road system. As under Alternative A, increased levels of depredation from predators attracted to developed areas would increase adult, egg, and chick mortality of ptarmigan. Mortality caused by avian predators may be reduced in Alternative B compared to Alternative A by reduction in available perching habitat for avian predators with placement of power lines on VSMs between CD-6 and CD-7.

RAPTORS AND OWLS

Habitat loss and disturbance resulting from the proposed development under Alternative B are unlikely to affect raptors and owls because of the low numbers of those birds reported in the Plan Area. Raptors may use structures as perches. Perches would be reduced in Alternative B compared to Alternative A because power lines would be placed on VSMs instead of poles between CD-6 and CD-7. Gravel roads, buildings, pipelines, and bridges are unlikely to obstruct movements of raptors and owls. The small number of raptors and owls in the Plan Area could suffer mortality from collisions with vehicles, aircraft, buildings, bridges, or pipelines.

SHOREBIRDS

CONSTRUCTION PERIOD

Habitat Loss, Alteration, or Enhancement

Habitat loss and alteration resulting from gravel placement and mining would be reduced in Alternative B compared to Alternative A (Table 4B.3.3-2 and Table 4A.3.3-3). The proportion of available Moist Tussock Tundra and Patterned Wet Meadow habitats filled by gravel would be reduced in Alternative B compared to Alternative A, although both alternatives would affect a very small proportion of the available habitat (Table 4B.3.3-2 and Table 4A.3.3-3). Loss of tundra habitat due to gravel mining would be reduced under Alternative B compared to Alternative A because of the reduction in total gravel fill. Habitat alteration resulting from ice roads would be increased slightly in Alternative B compared to Alternative A (Table 4B.3.3-1). An estimated

231.8 shorebird nests would be affected by habitat loss and alteration under Alternative B, which is reduced from an estimated 346.9 nests affected by Alternative A.

Disturbance and Displacement

Impacts to shorebirds from human activities during summer construction activities at production pads would be similar for Alternative B to those described for Alternative A. Impacts at CD-3, CD-4, and CD-7 would be the same. Disturbance from vehicle traffic from CD-2 to CD-5, and CD-5 to CD-6 would be eliminated. Noise-related impacts associated with aircraft would be increased at CD-5 and CD-6, although no disturbance pattern was found for nesting shorebirds at APF-1 (Johnson et al. 2003a). Disturbance to staging shorebirds in the lower Colville River Delta due to air traffic at the CD-3 site would be the same as Alternative A, affecting an estimated 313 shorebirds within 500 meters of the airstrip.

Obstructions to Movements

Potential obstructions to movements of shorebird broods by roadways would be reduced in Alternative B compared to Alternative A because of the removal of the roads connecting CD-2 to CD-6.

Mortality

Potential mortality from collisions with vehicles would be decreased in Alternative B compared to Alternative A by the reduction in the road system. Any increase in predator populations attracted to development areas would result in decreased reproductive success for shorebirds. The magnitude and extent of this potential decreased productivity have not been quantified, but would be most detrimental to species with populations which may be declining such as buff-breasted sandpipers and dunlin. Mortality of adults, nests, and juveniles from depredation may be decreased in Alternative B compared to Alternative A because power lines would be placed on VSMs instead of on poles.

OPERATION PERIOD

Habitat Loss, Alteration, or Enhancement

Habitat loss and alteration would continue during project operations. Habitat alteration from dust, snowdrifts, and alteration of thermal and moisture regimes would be reduced in Alternative B compared to Alternative A because of the reduction in the road system, while habitat alteration resulting from ice road construction during drilling would be increased slightly in Alternative B compared to Alternative A (Table 4B3.3-1).

Disturbance and Displacement

Disturbance resulting from vehicle traffic would be reduced in Alternative B compared to Alternative A because of the reduction in the road system. Disturbance by aircraft would be increased by the addition of airstrips at CD-5 and CD-6, although disturbance was not found to affect nesting density of shorebirds at Alpine (Johnson et al. 2003a). Disturbance to staging shorebirds in the lower Colville River Delta would be the same as Alternative A.

Obstructions to Movements

Obstructions to movements of brood-rearing shorebirds would be reduced in Alternative B compared to Alternative A by the reduction in the road system.

Mortality

Potential mortality from collisions with vehicles would be reduced in Alternative B compared to Alternative A because of the reduction in the road system. Potential mortality from collisions with aircraft would not be

expected. Any increase in predator populations attracted to development areas would result in decreased reproductive success for shorebirds. The magnitude and extent of this potential decreased productivity have not been quantified, but would be most detrimental to species with populations which may be declining such as buff-breasted sandpipers and dunlin. Potential mortality from depredation by avian predators attracted to the development may be reduced in Alternative B compared to Alternative A by placement of power lines on VSMs instead of poles, eliminating power lines as potential perching habitat for avian predators.

SEABIRDS (GULLS, JAEGERS, AND TERNS)

CONSTRUCTION PERIOD

Habitat Loss, Alteration, and Enhancement

Habitat loss and alteration would be reduced in Alternative B in the National Petroleum Reserve-Alaska area due to the reduction in total gravel fill by the elimination of roadways between CD-2, CD-5 and CD-6. An estimated 4.3 fewer seabird nests would be affected by habitat loss and alteration in Alternative B compared to Alternative A (Table 4B.3.3-1 and Table 4A.3.3-2). Impacts to habitats used by seabirds would be similar in the Colville River Delta (Table 4B.3.3-2 and Table 4A.3.3-3). Impacts to Young and Old Basin Wetland Complexes are similar between Alternative A and Alternative B, although impact to other wetlands used by seabirds are reduced in Alternative B (Table 4B.3.3-2 and Table 4A.3.3-3). Habitat impacts from ice roads would be increased slightly during the construction period (Table 4B.3.3-1 and Table 4A.3.3-2).

Disturbance and Displacement

Disturbance due to vehicle traffic would be reduced by elimination of the road connecting CD-2 and CD-6 in Alternative B compared to Alternative A. Disturbance from air traffic would be increased in Alternative B by the addition of airstrips at CD-5 and CD-6 resulting in an estimated additional 3.0 seabird nests affected by disturbance (Table 4B.3.3-1 and Table 4A.3.3-2).

Obstructions to Movement

Potential obstruction of movements of seabird broods would be reduced by the elimination of the roads between CD-2, CD-5, and CD-6.

Mortality

Potential seabird mortality resulting from collisions with vehicles would be reduced in Alternative B compared to Alternative A by the reduction in the road system. Potential mortality from collisions with aircraft compared to Alternative A would increase with the addition of airstrips at CD-5 and CD-6 in Alternative B. Gulls in particular are vulnerable to mortality caused by collisions with both vehicles and aircraft. Mortality due to collisions with power lines would be reduced in Alternative B with the elimination of power lines on poles from CD-6 to CD-7 in Alternative B. Any increase in predator populations attracted to the development could result in decreased reproductive success for seabirds. The magnitude and extent of this decreased productivity have not been quantified, but would be most detrimental to species with populations which may be declining such as jaegers and arctic tern (Mallek et al. 2003).

OPERATION PERIOD

Habitat Loss, Alteration, and Enhancement

Habitat loss and alteration would continue during project operation as a result of gravel spray, dust fallout, and ice road construction in support of drilling operations. Habitat alteration caused by dust fallout would be reduced in Alternative B compared to Alternative A by the reduction in the road system.

Disturbance and Displacement

Disturbance caused by vehicle traffic along roadways would be reduced in Alternative B compared to Alternative A by the reduction in the road system. Disturbance from air traffic would be increased in Alternative B compared to Alternative A by the addition of airstrips at CD-5 and CD-6 (Table 4B.3.3-1 and Table 4A.3.3-2). In addition, potential hazing of seabirds from the area surrounding the additional airstrips would increase disturbance to seabirds.

Obstructions to Movement

Potential obstructions to movements of seabird broods would be reduced in Alternative B compared to Alternative A because of the reduction in the road system.

Mortality

Under Alternative B, the potential for seabird mortality resulting from collisions with vehicular traffic or bridges would be reduced compared to Alternative A because of the reduction in the road system. Potential seabird mortality caused by collisions with aircraft would be increased by the addition of airstrips at CD-5 and CD-6. Mortality due to collisions with power lines would be reduced in Alternative B with the elimination of power lines on poles from CD-6 to CD-7 in Alternative B. Any increase in predator populations attracted to the development could result in decreased reproductive success for seabirds. The magnitude and extent of this decreased productivity have not been quantified, but would be most detrimental to species with populations which may be declining such as jaegers and arctic tern (Mallek et al. 2003).

PASSERINES

CONSTRUCTION PERIOD

Habitat Loss, Alteration, or Enhancement

Gravel fill at CD-3 and CD-4 would be the same for Alternative B as for Alternative A. Habitat loss and alteration at these locations would be the same for passerines in both of these alternatives. Habitat loss and alteration would be reduced in the National Petroleum Reserve-Alaska portion of the Plan Area due to the elimination of the road system from CD-2, CD-5 and CD-6 in Alternative B compared to Alternative A (Table 4B.3.3-1 and Table 4A.3.3-2). Habitat loss from gravel mining would also be reduced in Alternative B compared to Alternative A by the reduction in the total amount of gravel used for construction. An estimated 74.4 fewer passerine nests would be affected by habitat loss and alteration for Alternative B compared to Alternative A. Elimination of the bridges across the Nigliq Channel and the Ublutuoch River would reduce the impacts to shrub habitats used by nesting passerines (Table 4B.3.3-2 and Table 4A.3.3-3), although ice bridges would alter these habitats. Habitat enhancement for ravens and snow buntings would be similar for Alternatives B and A because buildings would be the same for these alternatives. Perching habitat would be reduced for ravens in Alternative B compared to Alternative A by placement of power lines on VSMs instead of poles.

Disturbance and Displacement

Disturbance from vehicle traffic would be reduced in Alternative B compared to Alternative A by the reduction in the road system. Disturbance from air traffic would be increased by the airstrips at CD-5 and CD-6, although the Alpine Development Project airstrip was not found to cause disturbance-related reduction in nesting of passerines (Johnson et al. 2003a).

Obstructions to Movements

No obstruction to movements of passerines is expected from construction of the project.

Mortality

Potential mortality caused by collisions with vehicles is reduced in Alternative B compared to Alternative A by the reduction in the road system. No mortality from collisions with aircraft is expected for passerines. Construction of oil development facilities may result in an increase in predator species such as foxes, bears, glaucous gulls, and common ravens. Any increase in predator populations could result in increased adult mortality and decreased reproductive success for passerines. The magnitude and extent of this potential decreased productivity have not been quantified, but would be most detrimental to species with declining populations.

OPERATION PERIOD

Habitat Loss, Alteration, or Enhancement

Impacts to passerines from habitat loss and alteration would continue during project operation. Ice roads for annual access to CD-5 across riparian habitats and the Nigliq Channel might melt out later during spring and cause additional damage to willow communities used by nesting yellow wagtails, American tree sparrows, common redpolls, and hoary redpolls.

Disturbance and Displacement

Impacts from disturbance by vehicle traffic would be reduced in Alternative B compared to Alternative A because of the reduced road system. Potential disturbance impacts to passerines from air traffic would increase in Alternative B compared to Alternative A because of the airstrips at CD-5 and CD-6, although no difference in nesting densities of passerines was found near the Alpine Development Project airstrip (Johnson et al. 2003a).

Obstructions to Movements

Operational activities are not anticipated to obstruct movements of passerines.

Mortality

Potential mortality resulting from collisions with vehicles is lower in Alternative B compared to Alternative A because of the reduced road system. Mortality from collisions with aircraft is not expected for passerines and would not be increased by the addition of airstrips at CD-5 and CD-6. Potentially increased depredation by avian predators would be decreased in Alternative B compared to Alternative A by placement of power lines on VSMs instead of poles. Any increase in predator populations attracted to development areas could result in increased adult mortality and decreased reproductive success for passerines. The magnitude and extent of this potential decreased productivity have not been quantified, but would be most detrimental to species with declining populations.

4B.3.3.2 Alternative B – Full-Field Development Scenario Impacts on Birds

The mechanisms associated with habitat loss and alteration, disturbance and displacement, obstruction to movements, and mortality for birds in the Colville River Delta, Fish-Judy Creeks, and Kalikpik-Kogru Rivers facility groups would be the same as those described under Alternative A (Section 4A.3.3). Table 4B.3.3-3 summarizes impacts for Alternative B FFD based on assumptions and calculation methods presented in Section 4A.3.3 for estimated numbers of bird nests affected in the Colville River Delta and the National Petroleum Reserve-Alaska. In FFD Alternative B, all facilities would be moved outside of the 3-mile sensitive area around Fish Creek. Roads would link many of the production pads in the Fish-Judy Creeks and Kalikpik-Kogru Rivers facility groups, although airstrips would be situated at several sites. In the Colville River Delta Facility Group, the proposed facilities for FFD would be the same as those discussed for Alternative A FFD.

COLVILLE RIVER DELTA FACILITY GROUP

Table 4B3.3-3 presents a summary of the estimated numbers of bird nests affected by habitat loss, alteration and disturbance due to the hypothetical FFD in the Colville River Delta.

TABLE 4B.3.3-3 ALTERNATIVE B - FFD ESTIMATED NUMBER OF BIRD NESTS POTENTIALLY DISPLACED BY HABITAT LOSS, HABITAT ALTERATION AND DISTURBANCE

Bird Group	Habitat Loss	Habitat Alteration	Ice Road Habitat Loss	Air Traffic Disturbance	Total[a]
Colville River Delta Facility Group					
Waterfowl	5	14	3	32	54
Loons	1	2	0	5	8
Ptarmigan	1	2	0	4	7
Raptors and Owls	0	0	0	0	0
Seabirds	1	2	0	4	7
Shorebirds	72	219	44	0	335
Passerines	35	107	22	0	164
Total Nests	**115**	**346**	**69**	**45**	**575**
Fish-Judy Creeks Facility Group					
Waterfowl	31	89	5	45	170
Loons	4	11	0	6	21
Ptarmigan	1	4	0	2	7
Raptors and Owls	0	0	0	0	0
Seabirds	6	19	1	10	36
Shorebirds	149	431	24	0	604
Passerines	98	284	16	0	398
Total Nests	**289**	**838**	**46**	**63**	**1,236**
Kalikpik-Kogru Rivers Facility Group					
Waterfowl	10	48	8	15	81
Loons	1	6	1	2	10
Ptarmigan	1	2	0	1	4
Raptors and Owls	0	0	0	0	0
Seabirds	2	10	2	3	17
Shorebirds	50	230	39	0	319
Passerines	33	152	25	0	210
Total Nests	**97**	**448**	**75**	**21**	**641**

Notes:
[a] Section 4A.3.3 for assumptions and calculation methods

HABITAT LOSS, ALTERATION, OR ENHANCEMENT

Total habitat loss and alteration resulting from gravel placement would be similar in Alternative B FFD to that in Alternative A FFD, resulting in a similar number of estimated bird nests affected (Table 4B.3.3-3 and Table 4A.3.3-4). Ice roads and dust fallout would be increased slightly in Alternative B compared to Alternative A.

DISTURBANCE AND DISPLACEMENT

Potential disturbance and displacement by vehicle traffic at CD-4, HP-4, and HP-5 would be reduced in Alternative B FFD compared to Alternative A FFD by elimination of the road between CD-2 and CD-5 allowing access to the Delta from Nuiqsut. This would reduce potential traffic from the local community to these facilities. Disturbance due to air traffic would be similar for Alternative B and Alternative A FFD (Table 4B.3.3-3 and Table 4A.3.3-4).

OBSTRUCTIONS TO MOVEMENTS

Obstructions to movements of birds would be decreased in Alternative B FFD compared to Alternative A FFD by the elimination of the road connecting CD-2 to CD-5. All other FFD components of these two alternatives in the Colville River Delta are similar.

MORTALITY

The reduced road system in Alternative B FFD compared with Alternative A would reduce mortality from collisions with vehicles and potential collisions with a bridge over the Nigliq Channel. Mortality resulting from collisions with aircraft would be the same in Alternative B and Alternative A. Potential mortality from hunting would be lower in Alternative B FFD than in Alternative A FFD if increased access to Nuiqsut by the road between CD-2 and CD-5 contributes to increased harvest.

Any increase in predator populations attracted to development areas could result in increased adult mortality and decreased reproductive success for birds. The magnitude and extent of this potential decreased productivity have not been quantified, but would be most detrimental to species with declining populations, with low total population sizes, and which aggregate in predictable locations year to year. Within the Plan Area species which may be declining include long-tailed ducks (Mallek et al. 2003), red-throated loons (Larned et al. 2003); buff-breasted sandpipers (Lanctot and Laredo 1994), dunlin, jaegers and arctic tern (Mallek et al. 2003); with low total population sizes include red-throated loons, yellow-billed loons, buff-breasted sandpipers, and dunlin; and colonial nesting species include brant and snow geese.

FISH-JUDY CREEKS FACILITY GROUP

A summary of the estimated number of bird nests affected by the hypothetical FFD in the Fish-Judy Creek Facility Group area is presented in Table 4B.3.3-3.

HABITAT LOSS, ALTERATION, OR ENHANCEMENT

Under Alternative B for FFD in the Fish-Judy Creeks Facility Group, the overall amount of habitat loss would be reduced compared to Alternative A because of the reduced road system and the elimination of one production pad. An estimated 409 bird nests (primarily shorebirds and passerines) would be unaffected by habitat loss and alteration in Alternative B compared to Alternative A FFD (Table 4B.3.3-3 and Table 4A.3.3-4). Habitat impacts would be moved outside of the 3-mile Fish Creek buffer, reducing impacts to Open and Closed Low and Tall Willow Shrub habitats by 58 percent from Alternative A FFD (Tables 4B.3.1-3, 4B.3.1-4, 4A.3.1-3, and 4A.3.1-4).

OBSTRUCTIONS TO MOVEMENTS

The reduced road system in Alternative B FFD compared with Alternative A FFD would result in less obstruction to movements for brood-rearing birds.

DISTURBANCE AND DISPLACEMENT

The reduction in the road system and reduced access for local traffic would result in fewer disturbances by vehicle traffic in Alternative B FFD than in Alternative A FFD. Disturbance from air traffic would be increased by the addition of airstrips at CD-5, CD-6, and CD-24, increasing disturbance to an additional 43 waterfowl, loon, ptarmigan and seabird nests (Table 4B.3.3-3, Table 4A.3.3-4).

MORTALITY

The reduction in the road system and removal of access for local traffic would result in less mortality from collisions with vehicles in Alternative B FFD than in Alternative A FFD. Mortality from collisions with aircraft would be increased by the addition of airstrips at CD-5, CD-6, and HP-17. Local access to Nuiqsut would be eliminated for Alternative B FFD to pad locations adjacent to the Colville River and Harrison Bay. Subsistence harvest of waterfowl may be increased by road access to HP-8, HP-9, CD-5, HP-3 and HP-1 for Alternative B FFD due to increased road access. Alternatively, developments in these areas may reduce hunting if subsistence users avoid developed areas. The road route between HP-6, HP-3, and HP-1 would cover more areas often used by molting waterfowl and areas of high nesting density for king eiders compared to the road route for Alternative A FFD.

Any increase in predator populations attracted to development areas could result in increased adult mortality and decreased reproductive success for birds. The magnitude and extent of this potential decreased productivity have not been quantified, but would be most detrimental to species with declining populations, with low total population sizes, and which aggregate in predictable locations year to year. Within the Plan Area species which may be declining include long-tailed ducks (Mallek et al. 2003), red-throated loons (Larned et al. 2003); buff-breasted sandpipers (Lanctot and Laredo 1994), dunlin, jaegers and arctic tern (Mallek et al. 2003); with low total population sizes include red-throated loons, yellow-billed loons, buff-breasted sandpipers, and dunlin; and colonial nesting species include brant and snow geese.

KALIKPIK-KOGRU RIVERS FACILITY GROUP

A summary of the estimated number of bird nests affected by the hypothetical FFD in the Kalikpik-Kogru Rivers Facility Group is presented in Table 4B.3.3-3.

HABITAT LOSS AND ALTERATION

Habitat loss and alteration are reduced in Alternative B FFD compared to Alternative A FFD by the elimination of the production pad and airstrip at HP-22. The addition of an airstrip at the HPF-2 site would increase habitat loss in the immediate area of the facility. An estimated 56 fewer birds nests would be affected by habitat loss and alteration in Alternative B FFD compared to Alternative A (Table 4B.3.3-3 and Table 4A.3.3-4)

DISTURBANCE AND DISPLACEMENT

Disturbance resulting from vehicle traffic in Alternative B FFD would be the same as Alternative A FFD. Disturbance from air traffic would be reduced in Alternative B FFD compared to Alternative A FFD with the elimination of the HP-22 pad and airstrip. An estimated 20 fewer waterfowl, loon, ptarmigan and seabird nests would be disturbed by air traffic in Alternative B compared to Alternative A (Table 4B.3.3-3 and Table 4A.3.3-4)

OBSTRUCTION TO MOVEMENT

Under Alternative B FFD, any potential obstruction to brood movements would be reduced compared to Alternative A FFD by the elimination of the HP-22 pad and airstrip.

MORTALITY

Mortality resulting from collisions with vehicles would be similar in Alternative B FFD as in Alternative A FFD although reduction in access to local traffic in Alternative B may decrease traffic levels. Mortality from collisions with aircraft would be reduced in Alternative B FFD compared to Alternative A FFD with the elimination of the airstrip at HP-22. The potential for subsistence hunting to affect birds would be reduced compared to Alternative A FFD by the elimination of access roads to the Kalikpik-Kogru Rivers Facility Group if hunters used the road system for access.

Any increase in predator populations attracted to development areas could result in increased adult mortality and decreased reproductive success for birds. The magnitude and extent of this potential decreased productivity have not been quantified, but would be most detrimental to species with declining populations, with low total population sizes, and which aggregate in predictable locations year to year. Within the Plan Area species which may be declining include long-tailed ducks (Mallek et al. 2003), red-throated loons (Larned et al. 2003); buff-breasted sandpipers (Lanctot and Laredo 1994), dunlin, jaegers and arctic tern (Mallek et al. 2003); with low total population sizes include red-throated loons, yellow-billed loons, buff-breasted sandpipers, and dunlin; and colonial nesting species include brant and snow geese.

4B.3.3.3 Alternative B – Summary of Impacts for Alternative B (CPAI and FFD) on Birds

Impacts to birds associated with construction and operation of the proposed development include habitat loss, alteration, or enhancement; disturbance and displacement; obstructions to movement; and mortality. Additional impacts due to lost productivity are not quantified by this analysis, including impacts due to increased nest depredation caused by increased predator populations. We estimated the number of nests affected by habitat loss, alteration or disturbance for each alternative, based on site specific nesting densities for bird species and species groups to compare alternative development scenarios. Effects would be localized, and no measureable effects to North Slope populations would be expected. CPAI Alternative B would reduce nesting by 1 percent or less for Plan Area waterfowl, loon and seabird populations and less than 1 percent for Plan Area shorebird and passerine populations. FFD Alternative B would reduce nesting by 3 to 6 percent for Plan Area waterfowl, loon and seabird populations and 1 percent for Plan Area shorebird and passerine populations. Habitat loss does not involve the direct loss of active nests because winter gravel placement, ice road construction, snow dumping, and snow drifting occurs when nests are not active. Most impacts would be initiated during the construction period, including gravel placement, grading of the gravel surface, placement of all facilities, and initial drilling. The results of effects of these activities on estimated bird production due to loss, alteration or disturbance of nesting habitat for CPAI Development Plan and FFD Alternative B are presented in Table 4B.3.3-4.

TABLE 4B.3.3-4 CPAI AND FFD ALTERNATIVE B (CPAI AND FFD) – ESTIMATED NUMBER OF BIRD NESTS POTENTIALLY DISPLACED BY HABITAT LOSS, HABITAT ALTERATION AND DISTURBANCE

CPAI Alternative B Totals[a]					
Bird Group	**Habitat Loss**	**Habitat Alteration**	**Ice Road Habitat Loss**	**Air Traffic Disturbance**	**Total**
Waterfowl	8	22	7	54	91
Loons	1	2	1	5	9
Ptarmigan	1	2	0	2	5
Seabirds	1	4	1	5	11
Shorebirds	46	136	50	0	232
Passerines	26	77	29	0	132
Total Nests	**83**	**243**	**88**	**66**	**480**

TABLE 4B.3.3-4 CPAI AND FFD ALTERNATIVE B – ESTIMATED NUMBER OF BIRD NESTS POTENTIALLY DISPLACED BY HABITAT LOSS, HABITAT ALTERATION AND DISTURBANCE (CONT'D)

CPAI Alternative B Totals[a]					
Bird Group	**Habitat Loss**	**Habitat Alteration**	**Ice Road Habitat Loss**	**Air Traffic Disturbance**	**Total**
FFD Alternative B Totals[a]					
Waterfowl	46	151	16	92	305
Loons	6	19	1	13	39
Ptarmigan	3	8	0	7	18
Seabirds	9	31	3	17	60
Shorebirds	271	880	107	0	1,258
Passerines	166	543	63	0	772
Total Nests	**501**	**1,632**	**190**	**129**	**2,452**

Notes:
[a] Section 4A.3.3 Birds for assumptions and calculation methods. Totals from Tables 4B.3.3-1 and 4B.3.3-3.

4B.3.3.4 Alternative B – Potential Mitigation Measures (CPAI and FFD) for Birds

Potential mitigation measures would be the same as those identified for Alternative A (Section 4A.3.3).

4B.3.3.5 Alternative B – Effectiveness of Protective Measures for Birds

The effectiveness of the protective measures would be similar to Alternative A.

4B.3.4 Mammals

4B.3.4.1 Terrestrial Mammals

ALTERNATIVE B – CPAI DEVELOPMENT PLAN IMPACTS ON TERRESTRIAL MAMMALS

Alternative B would include 10 miles of road and 36 miles of pipeline (Figure 2.4.2.1-1). Alternative B would have 15.8 fewer miles of road than Alternative A (Figure 2.3.3.1-1. The primary pipeline route is similar to that in Alternative A and follows a southwest-northeast-oriented corridor from CD-2 in the Colville River Delta to the proposed CD-5, CD-6, and CD-7 production pads in the vicinity of Fish and Judy creeks. Alternative B differs from Alternative A in that the CD-6 site and the pipeline to it are moved to the southeast, out of the 3-mile setback around Fish Creek. Also, no road accompanies the pipeline from CD-2 to CD-6, and Alternative B has airstrips at CD-5 and CD-6. This configuration results in 16 fewer miles of road/pipeline combination in Alternative B than in Alternative A. As in Alternative A, no road accompanies the pipeline from CD-1 to CD-3. Important characteristics of Alternative B with regard to impacts on terrestrial mammals include the limited amount of road connecting most production pads, pipelines elevated to 5 feet, use of the roads by industry only, and airstrips at CD-3, CD-5, and CD-6.

CONSTRUCTION PERIOD

Direct Habitat Loss, Alteration, or Enhancement

During the winter construction period, habitat would be lost or altered by placement of gravel fill and ice roads. Alternative B would require a total of approximately 204 acres of gravel fill for roads, pads, and airstrips, and approximately 37 acres of vegetation cover lost due to gravel mining. This is 65 fewer acres of gravel fill than Alternative A. Sixteen miles of ice road (approximately 35 feet wide) would be necessary for the winter construction of the pipeline from CD-1 to CD-6. An ice road would be constructed to transport gravel from the Clover near the Ublutuoch River. Under Alternative B there would be slightly less direct loss of riparian habitat near the Nigliq Channel and the Ublutuoch River, which is generally important to terrestrial mammals on the North Slope. One existing arctic fox den in the Fish-Judy Creeks Facility Group could be affected by the construction of CD-5 and its associated airstrip (Burgess et al. 2002). Small mammals would lose less habitat to gravel fill than under Alternative A. See the Operation Period section under Alternative B, following, for quantification of habitat types lost or altered under gravel fill.

Obstruction of Movements

Winter movements of caribou could still be obstructed at construction sites as in Alternative A, but the effect might be less between CD-2 and CD-6 with construction of a pipeline but not a gravel road. Considering the tendency for caribou in winter to move less, to readily cross linear structures, and to occur at relatively low densities in the Plan Area, the obstruction to movements of caribou from winter construction of Alternative A and Alternative B would be similarly small in magnitude. Summer construction activity can also obstruct movements of caribou to some extent as described for Alternative A. The siting of CD-6 outside of the Fish Creek riparian zone under Alternative B could result in less obstruction of movements of moose or muskoxen there. Effects on other terrestrial mammals during construction would be similar to those for Alternative A.

Disturbance and Displacement

Disturbance of terrestrial mammals during the winter and summer construction activity would be mainly from noise and human activity associated with building the roads, pads, and airstrips. All of the production sites, except CD-6, in Alternative B are in the same locations as in Alternative A. In Alternative B, the CD-6 site and the pipeline to it would be outside of the Fish Creek riparian area. There would also be no gravel road between CD-2 and CD-6 in Alternative B. This would result in less disturbance in the Fish Creek riparian area and in the vicinity of the Ublutuoch River and Nigliq Channel during the construction phase of Alternative B. However, there would be additional construction activity and potential disturbance at the airstrips at CD-5 and CD-6 under Alternative B. The other components of Alternative B are the same as Alternative A, so the amount of disturbance during the construction phase would be comparable in these areas. As discussed under Alternative A, disturbance during construction could displace wintering caribou, muskoxen, and denning bears.

Mortality

Mortalities of terrestrial mammals associated with construction should be few and similar to those described in Alternative A.

OPERATION PERIOD

Direct Habitat Loss, Alteration, or Enhancement

Alternative B would result in the loss of a small amount of habitat under gravel compared to the amount available in the Plan Area. There would be less acreage lost to gravel placement in Alternative B than in Alternative A because there would be no road between CD-2 and CD-6. Muskoxen and moose generally winter south of the Plan Area, and riparian areas are important foraging habitats for them in the summer (TAPS Owners 2001). Under Alternative B there would be less direct loss of riparian habitat within the Plan Area than

under Alternative A. Riparian areas are also important to grizzly bears and wolverines (BLM and MMS 2003). Arctic foxes and red foxes adapt to development, so the differences in habitat loss for these species between Alternative A and Alternative B are probably negligible. Small mammals would experience less direct habitat loss with less gravel fill under Alternative B than Alternative A.

The two most important foraging habitat types for caribou in summer are Moist Sedge-Shrub Meadow and Moist Tussock Tundra (Lawhead et al. 2003, Russell et al. 1993, Jorgenson et al. 2003c). The Barrens habitat type primarily provides insect-relief to caribou in summer (Jorgenson et al. 2003c). The most important habitat types for muskoxen include Riverine, Upland Shrub, and Moist Sedge-Shrub Meadow (PAI 2002a; BLM and MMS 2003, and references therein). These habitat types, as well as Barrens, are the most important habitat types for grizzly bears (Shideler and Hechtel 2000; Jorgenson et al. 2003c; PAI 200a2, and references therein). The Riverine and Upland Shrub habitat types are also the most important habitat types for moose. These habitat types potentially lost from gravel fill (roads, pads, and airstrips) under Alternative B are quantified below.

A total of 2,927 acres of Moist Sedge-Shrub Meadow are available in the Colville River Delta (Table 4B.3.3-2). A habitat map is available for 175,861 acres in the National Petroleum Reserve-Alaska, but not for the entire area. The total area of Moist Sedge-Shrub Meadow in the habitat-typed area of the National Petroleum Reserve-Alaska is 42,071 acres (Jorgenson et al. 2003c). A total of 49.6 acres (9.0 acres in the Colville River Delta, 40.6 acres in the National Petroleum Reserve-Alaska) of Moist Sedge-Shrub Meadow would be lost as a result of gravel placement (roads, pads, and airstrips) under Alternative B (Table 4B.3.1-2). The potential loss of Moist Sedge-Shrub Meadow from gravel fill is less than 0.2 percent of that available on the Colville River Delta. The proportional loss of habitat in the National Petroleum Reserve-Alaska cannot be calculated because a habitat map is not available for the National Petroleum Reserve-Alaska area. However, the potential loss under gravel fill in the habitat-typed area in the National Petroleum Reserve-Alaska is 0.1 percent of the Moist Sedge-Shrub Meadow available in that area. In addition to effects of gravel fill, 189.2 acres (60.9 acres in the Colville River Delta, 128.3 acres in the National Petroleum Reserve-Alaska) of the Moist Sedge-Shrub Meadow habitat type would be altered by dust fallout (as calculated for vegetation impacts in Section 4A.3.1).

A total of 525 acres of Moist Tussock Tundra habitat type are available in the Colville River Delta (Table 4B.3.3-2). The total area of Moist Tussock Tundra in the habitat-typed area of the National Petroleum Reserve-Alaska is 49,647 acres (Table 4B.3.3-2). No Moist Tussock Tundra would be lost or altered in the Colville River Delta under Alternative B (Table 4B.3.1-2). A total of 72.5 acres of Moist Tussock Tundra would be lost as a result of gravel placement (roads, pads, and airstrips) in the National Petroleum Reserve-Alaska under Alternative B (Table 4B.3.1-2). The potential loss under gravel fill in the habitat-typed area in the National Petroleum Reserve-Alaska is less than 0.1 percent of that available in that area. In addition to the area affected by gravel fill, 195.2 acres of Moist Tussock Tundra habitat type would be altered by ground related imipacts in the National Petroleum Reserve-Alaska (Table 4B.3.1-2), while no habitat would be altered in the Colville River Delta.

The combined area of Riverine and Upland Shrub habitat types in the Colville River Delta is 7,994 acres (Table 4B.3.3-2). A habitat map is available for 175,152 acres in the National Petroleum Reserve-Alaska, but not for the entire area. The combined area of Riverine and Upland Shrub habitat types in the National Petroleum Reserve-Alaska is 4,778 acres (Table 4B.3.3-2). A total of 6.7 acres of Riverine and Upland Shrub habitat types would be lost as a result of gravel placement (roads, pads, and airstrips) under Alternative B in the Colville River Delta (Table 4B.3.1-2 No Riverine or Upland Shrub habitat types would be lost or altered in the National Petroleum Reserve-Alaska under Alternative B. The potential loss of Riverine habitat type and Upland Shrub habitat type is less than 0.1 percent of that available in the Colville River Delta. In addition to that area affected by gravel fill, 17.9 acres (17.7 acres in the Colville River Delta, 0.2 acres in the National Petroleum Reserve-Alaska) of Riverine and Upland Shrub habitat types would be altered by gravel related impacts (Table 4B.3.1-2).

The total area of Barrens habitat type in the Colville River Delta is 20,993 acres (Table 4B.3.3-2). The total area of Barrens in the habitat-typed area of the National Petroleum Reserve-Alaska is 1,552 (Table 4B.3.3-2). A total of 0.2 acres of Barrens would be lost as a result of gravel placement (roads, pads, and airstrips) in the Colville River Delta, and no Barrens habitat type would be lost or altered in the National Petroleum Reserve-Alaska,

under Alternative B (Table 4B.3.1-2). The potential loss of Barrens habitat is less than 0.1 percent of that available in the Colville River Delta. In addition to the area affected by gravel fill in the Colville River Delta, 9.8 acres of Barrens habitat type would be altered by gravel related impacts under Alternative B (Table 4B.3.1-2), while no acreage would be affected in the National Petroleum Reserve-Alaska.

Disturbance and Displacement

Disturbance associated with operations in Alternative B would be less than that described in Alternative A. There would be considerably less vehicle traffic in Alternative B because there would be no road between CD-2 and CD-6. Vehicle traffic is the main cause of disturbance associated with oilfield roads. Conversely, aircraft traffic at two airstrips, CD-5 and CD-6, would be higher in Alternative B than in Alternative A. This would result in more disturbance of caribou, muskoxen, grizzly bears, and moose. This impact could lessen with time, as caribou have habituated to the airstrip at Deadhorse. The placement of CD-6 and the pipeline to it outside the Fish Creek riparian area would result in fewer disturbances in this area. Moose, muskoxen, grizzly bears, and caribou could all use these riparian habitats. Access limited to oilfield workers by the lack of road connections to other oilfields or public roads would result in fewer disturbances than in the other alternatives.

Obstruction to Movements

The primary obstructions to movements of terrestrial mammals in oilfields are roads with traffic and pipelines. Alternative B would probably result in less obstruction to movements of terrestrial mammals than Alternative A. This is because there are only 10 miles of road/pipeline combination in Alternative B, compared to 26 miles of road/pipeline combination in Alternative A. This is 15.8 fewer miles of road/pipeline combination under Alternative B. Roads with pipelines are more of an impediment to caribou movement than either roads or pipelines alone (Cronin et al. 1994, Murphy and Lawhead 2000, TAPS Owners 2001). The pipelines in Alternative B would be elevated to 5 feet, as in Alternative A. This is generally adequate elevation to allow free passage of caribou, although some delay or deflection may occur. The area between CD-2 and CD-6 would have a pipeline without an accompanying road in Alternative B. This would result in less obstruction in summer of theTCH caribou moving east or of the CAH caribou moving west than in Alternative A. The riparian zones of the Nigliq Channel and Ublutuoch River would be crossed by only a pipeline under Alternative B, and movements of muskoxen and moose that frequently use riparian zones would be less affected than in Alternative A. The airstrips at CD-5 and CD-6 could cause some local obstruction of movements of mammals. These airstrips would be easy to circumnavigate compared to long stretches of road/pipeline combinations.

Mortality

With less road and traffic, fewer vehicle-wildlife collisions would be expected in Alternative B compared to Alternative A. As with the other alternatives, standard industry practice, BLM stipulations, and state regulation for Alternative B would include control of garbage and prohibition of intentional feeding of wildlife. This should ensure little or no impact on predator populations that could affect other terrestrial mammals and birds. In Alternative B, road access would be by industry only, so hunting mortality resulting from the road access would not occur.

ALTERNATIVE B – FULL-FIELD DEVELOPMENT IMPACTS ON TERRESTRIAL MAMMALS

The primary characteristic of the Alternative B FFD with regard to impacts on terrestrial mammals is the partial network of roads connecting the facilities. The pipeline routes in Alternative B are similar to those of Alternative A, although there is some different routing among the alternatives to several of the sites in the Fish-Judy Creeks Facility Group. The Alternative B pipelines would be elevated to 5 feet, as in Alternative A, and access to the production sites would be by industry only.

The total amount of gravel fill under Alternative B would be 1,149 acres, versus 1,262 acres for Alternative A, including 461 acres for pads/airstrips, and 588 acres for roads. Because neither detailed site locations nor habitat mapping are available, we cannot quantify specific terrestrial mammal habitat lost under Alternative B.

However, Alternative B has considerably less acreage covered with gravel than Alternatives A or C (for example, 247 acres less than Alternative A) and thus less direct loss of vegetated habitat. More than half (60 percent) of the Alternative B gravel would be roads, with associated impacts.

COLVILLE RIVER DELTA FACILITY GROUP

Characteristics of Alternative B FFD that differ from Alternative A FFD that would potentially affect terrestrial mammals in the Colville River Delta Facility Group are only those associated with differences between these alternatives for the ASDP. The additional FFD Scenario is the same for Alternatives A and B in the Colville River Delta.

Direct Habitat Loss, Alteration, or Enhancement

Under the Alternative B FFD, the amount of habitat directly lost to caribou, moose, and muskoxen for foraging in the Colville River Delta Facility Group would be the same as that associated with the Alternative A FFD.

Disturbance and Displacement

Disturbance and displacement of terrestrial mammals in Alternative B FFD would be comparable to those of Alternative A because the infrastructure would be the same. Alternative B would allow only industry access to roads in the Plan Area, and this would reduce the potential for disturbance and displacement compared to Alternative A.

Obstruction to Movements

Obstructions to movements of terrestrial mammals in Alternative B FFD would be comparable to those of Alternative A because the infrastructure would be the same. Alternative B would allow only industry access to roads in the Plan Area, and this would reduce traffic and the potential for obstruction of movements compared to Alternative A.

Mortality

Mortality associated with Alternative B FFD should be similar to that in Alternative A. Alternative B would allow only industry access to roads in the Plan Area, and this would reduce the potential for vehicle collisions and hunter harvest compared to Alternative A.

FISH-JUDY CREEKS FACILITY GROUP

There are considerable differences in the FFD for Alternatives A and B in the Fish-Judy Creeks Facility Group. Under Alternative B, the HP-3, HP-1, and HP-15 sites would be accessed by a road extending northwest from CD-5. Under Alternative A, HP-1 and HP-15 are accessed by roads from the road between CD-5 and CD-7. There are also different routes in these alternatives proposed to access HP-16, HP-17, HP-10, and HP-19. Most notably, in Alternative B, the hypothetical HPF-1 processing site is farther east of Judy Creek than in Alternative A, and there is no road accompanying the pipelines from HPF-1 to the HP-16 and HP-17 sites or westward to the Kalikpik-Kogru Rivers Group. Another important difference between Alternatives A and B is the industry-only access under Alternative B.

Direct Habitat Loss, Alteration, or Enhancement

There would be considerably less gravel fill covering habitat under Alternative B FFD because there is less roadway being constructed than in Alternative A FFD. The primary locations of roads in Alternative A that are not in Alternative B are between CD-5 and CD-6 (from the ASDP), HPF-1 and HP-16, and HP-16 and HP-18. However, there would be ice roads built annually connecting HPF-1 to HP-16 and HP-18 across Judy Creek and

Fish Creek, respectively. Given the large amount of habitat in the Plan Area and adjacent areas for terrestrial mammals, the impacts from the loss of forage habitat under Alternative B would be limited.

In Alternative B, with annual ice road construction between HPF-1 and HP-16 and between HP-16 and HP-18, direct loss of denning habitats for bears would be similar to Alternative A. Direct loss of summer foraging habitat for muskoxen, moose, and grizzly bears would be less under Alternative B in the Fish-Judy Creeks Facility Group. Grizzly bears have been sighted in the area of the Fish-Judy Creeks Facility Group. Muskoxen are expected to continue expanding their range westward, and moose are primarily associated with riparian habitats on the coastal plain (Shideler and Hechtel 2000, Burgess et al. 2002, BLM and MMS 2003). Effects on winter habitats of wolves, foxes, and small mammals are expected to be similar to those under Alternative A. Loss of riparian habitat near Judy Creek and Fish Creek would be less for Alternative B than for Alternative A. Small mammals would lose less habitat to gravel fill under Alternative B than Alternative A.

Disturbance and Displacement

Because of fewer roads and less traffic in Alternative B, disturbance and displacement of caribou and other terrestrial mammals would be less than in Alternative A. This may be particularly true along Fish Creek and Judy Creek because some of the facilities are farther from the creeks in Alternative B. There would still be some level of disturbance of caribou and other mammals during the summer and winter seasons, considering the road and aircraft traffic and human activity at the production pads and processing facilities. Past surveys have found that few caribou calved in this area, so disturbance during the calving period would be similar in Alternatives A and B. Airstrips at CD-6, HP-17, and APF-2 would cause temporary disturbances to caribou. Also, disturbances to grizzly bears and muskoxen from aircraft would be greater under Alternative B than under Alternative A. Because road access is restricted to industry only in Alternative B, habituation of caribou and other mammals to industry-related activities is likely within the Plan Area because there would be less traffic and hunting by local residents.

Obstruction to Movements

Movements of caribou would be less obstructed under Alternative B than Alternative A because there would be fewer roads under Alternative B. The corridors from HPF-1 to HP-16 and HP-16 to HP-18 would have only pipelines, and obstruction of movements is less likely than if there were roads with traffic. Also, in Alternative B, HP-16, HP-17, and HP-19 would not be accessed from the north along Judy Creek but instead from roads farther offset from the creek. This may mitigate potential obstruction of movements of terrestrial mammals (such as moose, muskoxen, and grizzly bears) using the riparian zone. However, data from May 2002 (Burgess et al. 2003) suggest that more wintering caribou could be exposed to an access road to HP-19 from HP-10, as proposed in Alternative B.

Caribou movements toward the coast could be obstructed by the road/pipeline from CD-5 to HP-15 in Alternative B. However, Alternative B would have less traffic (traffic would be restricted to industry only) and thus less potential obstruction of movements of caribou and other species than Alternative A. Grizzly bears, muskoxen, and moose use riparian corridors for foraging and travel, and Alternative B would reduce road development near Fish Creek and Judy Creek, potentially reducing negative impacts on movements.

Mortality

In Alternative B, with annual ice roads constructed from HPF-1 to HP-16 and on to HP-18, the probability of collisions with vehicles in winter would be similar to Alternative A. The limited new gravel roads in the area would reduce the probability of vehicle collisions in Alternative B. The restriction of road access to industry would further reduce the likelihood of vehicle-caused mortality and hunter harvest.

KALIKPIK-KOGRU RIVERS FACILITY GROUP

The primary difference between Alternatives A and B in this area is that HP-22 and its associated pipeline planned for Alternative A are not included in Alternative B. This removes potential impacts during construction, winter ice road use, and activity on the HP-17 site.

Direct Habitat Loss, Alteration, or Enhancement

Habitat loss would be the same as in Alternative A, except that habitat would not be lost at HP-22. There would be no ice road associated with construction of a pipeline to that pad. Habitat would be lost under the facilities at HP-18, HP-20, HP-21, and HPF-2, and the roads among them. This could entail loss of some calving, post-calving, and winter habitats for caribou.

Disturbance and Displacement

The construction and operational activity in this area could disturb caribou and other species. Caribou occur in this area during the calving period and disturbance from traffic on roads, aircraft, and other activity could result in displacement. Timing of activities and controlling traffic could mitigate impacts during the calving period. An airstrip at HPF-3 would cause temporary disturbances to caribou and other species.

Obstructions to Movement

The entire area has been occupied by caribou during calving, post-calving, and winter seasons in the past (Figures 3.3.4.1-1, 3.3.4.1-2, and 3.3.4.1-6). The area just south of the Kogru River has supported relatively high densities of wintering caribou (BLM and MMS 2003). It is possible that the road/pipeline complexes in the Alternative B FFD would obstruct or deflect caribou movements to some extent. The use of pipelines elevated to 5 feet and separation of roads and pipelines by more than 300 feet would mitigate this impact.

In Alternative B, large groups of TCH caribou in the area during calving and the summer season would not encounter a pipeline from HP-21 to HP-22 (as proposed in Alternative A) south of the Kogru River. Although elevated pipelines are not usually a barrier to movement, the lack of the pipeline and HP-22 facility in Alternative B reduces the potential for deflection and delay of movements.

Mortality

There could be some mortality of terrestrial mammals associated with road traffic under Alternative B. Limiting road access to industry would likely limit this impact. The smaller amount of road under Alternative B compared to Alternative A would also reduce this impact.

ABANDONMENT AND REHABILITATION

The impacts from abandonment and rehabilitation on terrestrial mammals under Alternative B would be similar to those for Alternative A. There would be a couple differences, though, primarily affecting terrestrial mammals and habitat west of the Nigliq Channel. Because there is no gravel road between CD-2 and CD-6, there would be less summer traffic and more winter traffic associated with dismantlement of above ground facilities located on pads, and consequently fewer impacts would be expected to muskoxen, moose, and grizzly bears. Air traffic impacts would be increased. Finally, the lack of a road between CD-2 and CD-6 would mean that abandonment would entail less disturbance compared with Alternative A along the corridor used by the road in the latter alternative.

ALTERNATIVE B – SUMMARY OF IMPACTS (CPAI AND FFD) ON TERRESTRIAL MAMMALS

The CPAI Development Plan Alternative B would cover 204 acres of undeveloped land with gravel fill. This is a small percentage of the land in the Plan Area, and 65 fewer acres than Alternative A. The amount of habitat types preferred by caribou, muskoxen, and moose that would be affected by this fill is a small proportion (less than 0.1 percent) of that available in the Plan Area. Alternative B would result in a small direct loss of terrestrial mammal habitat.

Disturbance, obstruction of movements, and mortality impacts of Alternative B would be similar to those of Alternative A. However, these impacts would be of less magnitude in Alternative B than in Alternative A because of the smaller amount of road/pipeline combinations and associated lower levels of vehicle traffic. Alternative B includes access restricted to industry, so the disturbance and hunting mortality from local resident access would not occur. The potential positive and negative aspects of hunting mortality described for Alternative A would not occur.

Alternative B FFD would cause the same impacts as those described for the CPAI Development Plan over a larger area. An exception is the potential for increased disturbance of calving caribou of the TCH in the northwestern part of the Plan Area.

ALTERNATIVE B – POTENTIAL MITIGATION MEASURES (CPAI AND FFD) FOR TERRESTRIAL MAMMALS

Appropriate mitigation measures for Alternative B will be essentially the same as those described for Alternative A. The lack of a road alongside the pipeline between CD-2 and CD-7 might make buried pipeline sections unnecessary.

ALTERNATIVE B – EFFECTIVENESS OF PROTECTIVE MEASURES FOR TERRESTRIAL MAMMALS

The effectiveness of the protective measures would be similar to Alternative A.

4B.3.4.2 Marine Mammals

ALTERNATIVE B – CPAI DEVELOPMENT PLAN IMPACTS ON MARINE MAMMALS

Two components of Alternative B differ from Alternative A and would affect marine mammals. First, in Alternative B, there is no road bridge over the Nigliq Channel between CD-2 and CD-5. A pipeline bridge would still be constructed. Second, Alternative B includes airstrips at CD-5 and CD-6 that are not included in Alternative A.

RINGED SEAL AND BEARDED SEAL

The impacts to ringed seals and bearded seals under Alternative B would be similar to those occurring under Alternative A during both construction and operation of the ASDP. The additional airstrips in Alternative B could result in greater air traffic over the nearshore Beaufort Sea that could disturb seals. Large oil spills could have effects that are far-reaching enough to affect seals. For a discussion of the impacts of oil spills and the likelihood of a large spill during fall migration, Section 4.3.

SPOTTED SEALS

The impacts to spotted seals expected under Alternative B would be less than those expected under Alternative A. The elimination of the road bridge over the Nigliq Channel would remove the potential disturbance of seals by construction and vehicle traffic. Hunter access would not be enhanced (as it would under

Alternative A) without the road/bridge at the Nigliq Channel. Construction impacts would be the same as under Alternative A because the pipeline bridge would still be built across Nigliq Channel. There is also the potential for increased disturbance from air traffic at CD-5 and CD-6 under Alternative B.

During construction and drilling, access to CD-5 would be by an ice road and ice bridge during the winter and by aircraft and low-ground-pressure vehicles during the summer. During the operation period, vehicular traffic between CD-2 and CD-5 would be eliminated during the summer under Alternative B. There would probably be an ice road over the Nigliq Channel each winter. Because spotted seals occur in the Beaufort Sea only in the open-water seasons of summer and early fall (PAI 2002a), disturbance from vehicle traffic would not occur. Access limited to industry would not allow increased access by hunters.

Aircraft traffic over the Nigliq Channel would increase as a result of the elimination of the road bridge. Several flights per week would be necessary to transport personnel and equipment to CD-5, CD-6, and CD-7. Flight elevations of less than 1,000 ft are anticipated to be over land areas within 3.6 miles northeast and southwest of the airstrip at CD-3. Thus, aircraft would cross the Nigliq Channel at a minimum of 1,000 feet altitude. At such elevation, the potential to affect spotted seals is substantially reduced. Therefore, no additional impacts to spotted seals are expected to result from the increased aircraft traffic under Alternative B. Large oil spills could have effects that are far-reaching enough to affect spotted seals. For a discussion of the impacts of oil spills and the likelihood of a large spill during fall migration, Section 4.3.

POLAR BEARS

The impacts to polar bears under Alternative B would be generally similar to those occurring under Alternative A during both construction and operation of the ASDP. However, the reduced road mileage in Alternative B would reduce the probability of vehicle-bear collisions and human-bear contact. Hunter access is not enhanced under Alternative B, so less mortality would result. Large oil spills could have effects that are far-reaching enough to affect polar bears. For a discussion of the impacts of oil spills and the likelihood of a large spill during fall migration, Section 4.3.

BELUGA WHALES

The impacts to beluga whales expected under Alternative B would differ from those of Alternative A because of the lack of road bridge over the Nigliq Channel and increased air traffic to CD-5 and CD-6. As with spotted seals, belugas may occur offshore of the Plan Area in the open water season. Therefore, there would be reduced potential for vehicle disturbance and hunter access under Alternative B. Increased air traffic could cause some disturbance, but altitude restrictions would minimize this. Potential disturbance impacts to belugas during the construction period could occur during the construction of the pipeline bridge across the Nigliq Channel. Large oil spills could have effects that are far-reaching enough to affect beluga whales. For a discussion of the impacts of oil spills and the likelihood of a large spill during fall migration, Section 4.3.

ABANDONMENT AND REHABILITATION

Impacts of abandonment and rehabilitation under Alternative B would be similar to that for Alternative A.

ALTERNATIVE B – FULL-FIELD DEVELOPMENT SCENARIO IMPACTS ON MARINE MAMMALS

Full-field development under Alternative B calls for the same production pads as Alternative A in the Colville River Delta Facility Group and the Fish-Judy Creeks Facility Group but eliminates HP-22 in the Kalikpik-Kogru Rivers Facility Group. There is an alternate road route from HP-3 to HP-15. The impacts to marine mammals expected under Alternative B would not be appreciably different from impacts expected under Alternative A FFD. Exceptions include the potential that impacts from HP-22 and local access (hunter access) under Alternative A would not occur under Alternative B.

ALTERNATIVE B – SUMMARY OF IMPACTS (CPAI AND FFD) ON MARINE MAMMALS

Impacts to marine mammals under Alternative B would include potential disturbance of seals and polar bears by noise during construction and operations. The limited roads, including no road over the Nigliq Channel, suggests there would be less disturbance from vehicles and more disturbance from aircraft traffic than in Alternative A. There would not be access by local residents, so increased hunting harvest would not occur.

Impacts from the Alternative B FFD would have the same impacts described for the CPAI Development Plan over a larger area.

ALTERNATIVE B – POTENTIAL MITIGATION MEASURES (CPAI AND FFD) FOR MARINE MAMMALS

Potential mitigation measures would be the same as those identified for Alternative A (Section 4A.3.4).

ALTERNATIVE B – EFFECTIVENESS OF PROTECTIVE MEASURES FOR MARINE MAMMALS

The effectiveness of the protective measures would be similar to Alternative A.

4B.3.5 Threatened and Endangered Species

4B.3.5.1 Bowhead Whale

ALTERNATIVE B – CPAI DEVELOPMENT PLAN IMPACTS ON BOWHEAD WHALE

Bowhead whales are generally not found in the Plan Area. During spring migration, bowheads are found far offshore in the lead system of the Beaufort Sea. During fall migration, most bowheads pass north of a line from Cape Halkett to Oliktok Point. Large oil spills could have effects that are far-reaching enough to affect bowhead whales. For a discussion of the impacts of oil spills and the likelihood of a large spill during fall migration, Section 4.3. Other activities that would occur in the Plan Area under all CPAI alternatives would not affect the bowhead whale population, habitat, migration, foraging, breeding, survival and mortality, or critical habitat.

ALTERNATIVE B – FULL-FIELD DEVELOPMENT SCENARIO IMPACTS ON BOWHEAD WHALE

Construction of a processing facility for FFD might require a sealift to transport processing facilities. This could result in impacts to bowhead whales from noise, pollution, disturbance, and vessel strikes. However, the use of docks was determined not to be a practical means of developing the facilities proposed by CPAI or during future development (Section 2.6.4), so the use of sealifts is uncertain. Aircraft noise could also disturb bowheads.

ALTERNATIVE B – SUMMARY OF IMPACTS (CPAI AND FFD) ON BOWHEAD WHALE

The potential impacts from Alternative B would be the same as those for Alternative A. This is also the case under FFD Alternative B, although the additional airstrips compared to Alternative A would lead to increased aircraft noise.

ALTERNATIVE B – POTENTIAL MITIGATION MEASURES (CPAI AND FFD) FOR BOWHEAD WHALE

Potential mitigation measures would be the same as those identified for Alternative A (Section 4A.3.5).

4B.3.5.2 Spectacled Eider

See discussions of impacts on spectacled eiders in Section 4A.3.5.2 for additional descriptions of impact mechanisms and for description of impact calculation assumptions and methods.

ALTERNATIVE B – CPAI DEVELOPMENT PLAN IMPACTS ON SPECTACLED EIDER

Table 4A.3.5-1 presents the estimated number of nests displaced as a result of habitat loss, alteration and disturbance for the CPAI Development Plan Alternative B. In CPAI Alternative B, facilities would be moved outside of the 3-mile sensitive area around Fish Creek, and power lines on poles would be replaced by power lines on cable trays on VSMs.

CONSTRUCTION PERIOD

Habitat Loss, Alteration, or Enhancement

The proposed infrastructure in the CD-3 and CD-4 areas under Alternative B is the same as that proposed for those sites under Alternative A. Potential impacts to spectacled eiders from habitat loss and alteration at the CD-3 and CD-4 sites would be the same as those discussed for Alternative A. At the CD-5, CD-6, and CD-7 sites, the overall amount of habitat lost because of gravel placement under Alternative B would be reduced compared to Alternative A by the elimination of the road connecting CD-6 with CD-5 and the Nigliq Channel road bridge.

Impacts to spectacled eiders related to habitat loss and alteration would be the same as those described for Alternative A. The area covered by gravel and lost as potential spectacled eider habitat would be reduced in Alternative B from Alternative A. Impacts to habitats important to spectacled eiders indicate that the total area of gravel cover for Patterned and Nonpatterned Wet Meadow habitats used by nesting spectacled eiders would be reduced in Alternative B compared to Alternatives A, C, and D in the Colville River Delta (Table 4A.3.5-2). Gravel cover impacts on open water habitat preferred by pre-nesting spectacled eiders and used by nesting spectacled eiders would be decreased in Alternative B compared to Alternatives A, C, and F in the National Petroleum Reserve-Alaska portion of the Plan Area (Table 4A.3.5-3). Gravel impacts on Old Basin Wetland Complex and Patterned Wet Meadow habitats used by spectacled eiders for nesting in the National Petroleum Reserve-Alaska would be reduced in Alternative B compared to Alternatives A, C, and F (Table 4A.3.5-3). Impacts to spectacled eider habitat from dust would be reduced by the elimination of roadways in Alternative B, although impacts from ice roads would be increased during the construction period. An estimated 0.6 spectacled eider nests affected by gravel fill related impacts and 0.1 spectacled eider nests would be affected by ice road impacts in Alternative B. In all cases, the proportion of available habitat used by spectacled eiders and affected by gravel fill-related impacts in the Colville River Delta and in the National Petroleum Reserve-Alaska portion of the Plan Area would be less than 1 percent (Table 4A.3.5-2 and Table 4A.3.5-3).

Disturbance and Displacement

Fewer spectacled eiders would be displaced by vehicle traffic in Alternative B compared to Alternative A as a result of the reduction in the road system. Addition of the airstrip at CD-5 and CD-6 would cause additional disturbance compared to Alternatives A and C, affecting an estimated additional 0.3 spectacled eider nests. This additional disturbance would occur in areas with low spectacled eider densities.

Obstructions to Movement

Potential obstruction of movement would be reduced in Alternative B compared to Alternative A by the removal of the road between CD-2 and CD-5 to CD-6. The general reduction in gravel fill would result in a reduction in potential obstruction of movements for brood-rearing spectacled eiders.

Mortality

Mortality resulting from collisions with vehicles would be reduced in Alternative B from Alternative A with the reduction in the road system. Mortality resulting from collisions with aircraft would be increased with the two additional airstrips. Mortality resulting from collisions with power lines on poles would be reduced in Alternative B from Alternative A by placement of the power lines on pipeline VSMs between CD-6 and CD-7.

Spectacled eider nesting success in the Plan Area was generally low (33 percent) (Johnson et al. 2004). Any increase in predator populations attracted to the development areas would result in decreased reproductive success for spectacled eiders. This is particularly true for increased glaucous gull, common raven, bear and arctic fox populations. The magnitude and extent of decreased productivity have not been quantified, but would be most detrimental to spectacled eiders because they are known to nest in specific locations year after year and have a low total population size.

OPERATION PERIOD

Habitat Loss and Alteration

Some habitat loss or alteration from snowdrifts, gravel spray, dust fallout, thermokarst, and ponding would continue during project operation. These impacts would be reduced in Alternative B compared to Alternative A because of the reduced amount of gravel fill (Table 4A.3.5-2 and Table 4A.3.5-3).

Disturbance and Displacement

The effects of disturbance on spectacled eiders under Alternative B in the CD-3 and CD-4 areas would be the same as those described previously for Alternative A. At the National Petroleum Reserve-Alaska sites, the overall disturbance to spectacled eiders from vehicular traffic and other disturbances associated with roads would be reduced compared to Alternative A by the elimination of the road connecting CD-6 with CD-5 and the Nigliq Channel road bridge. Disturbance related to aircraft could be increased at the CD-5 and CD-6 sites by the addition of airstrips; spectacled eiders have been recorded nesting near the proposed CD-5 site.

Obstructions to Movement

Under Alternative B, any potential obstruction to movements of spectacled eiders in the CD-3 and CD-4 areas would be the same as that discussed above for Alternative A. At the proposed National Petroleum Reserve-Alaska sites, any potential obstruction to spectacled eider movement resulting from road placement would be reduced compared to Alternative A by the elimination of the road connecting CD-6 with CD-5 and the Nigliq Channel road bridge to CD-2.

Mortality

Under Alternative B, the potential for spectacled eider mortality related to collisions with vehicular traffic at the CD-3 and CD-4 sites would be the same as under Alternative A. At the National Petroleum Reserve-Alaska sites, the potential for eider collisions with vehicular traffic would be reduced compared to Alternative A because of the elimination of the roads connecting the CD-6 site with CD-5 and the Nigliq Channel bridge and road to CD-2. Potential mortality from collisions with aircraft would increase in Alternative B compared to Alternative A with the addition of airstrips at CD-5 and CD-6. The potential for spectacled eider mortality from collisions with power lines on poles would be decreased in Alternative B compared to Alternative A as a result of the placement of all power lines on VSMs. The potential for increased depredation from raptors or ravens on spectacled eider nests would also be decreased in Alternative B compared to Alternative A by the elimination of poles that could improve foraging efficiency of raptors and ravens by providing additional vantage locations.

ALTERNATIVE B – FULL-FIELD DEVELOPMENT SCENARIO IMPACTS ON SPECTACLED EIDER

The mechanisms associated with habitat loss and alteration, disturbance and displacement, obstruction to movements, and mortality for birds in the Colville River Delta, Fish-Judy Creeks, and Kalikpik-Kogru Rivers facility groups would be the same as those described under Alternative A (Section 4A.3.5.2). Potential impacts are summarized for Alternative B FFD based assumptions and calculation methods presented in Section 4A.3.5.2 for estimated numbers of spectacled eider nests affected in the Colville River Delta and the National Petroleum Reserve-Alaska. Under Alternative B of the FFD, all facilities would be moved outside of the 3-mile buffer around Fish Creek. Roads would link many of the production pads in the Fish-Judy Creeks and Kalikpik-Kogru Rivers facility group areas, although airstrips would be situated at several sites. In the Colville River Delta Facility Group, the proposed facilities for FFD would be the same as those discussed for the FFD under Alternative A. The effects of FFD on spectacled eiders would depend on the location and extent of development in specific locations within each area. Habitat related impacts by vegetation class for FFD Alternative B are summarized in Table 4B.3.5-1 by facility group.

COLVILLE RIVER DELTA FACILITY GROUP

A summary of the estimated number of spectacled eider nests affected by the hypothetical FFD including the Colville River Delta Facility Group area is presented in Table 4A.3.5-4.

Habitat Loss, Alteration, or Enhancement

Total habitat loss and alteration resulting from gravel placement and mining would be similar in Alternative B FFD compared to Alternative A FFD. Habitat related impacts would affect an estimated 2.6 spectacled eider nests (Table 4A.3.5-4). Ice roads and dust fallout would also be similar in Alternative B and Alternative A, affecting an estimated 0.3 spectacled eider nests (Table 4A.3.5-4).

Disturbance and Displacement

Potential disturbance and displacement by vehicle traffic at CD-4, HP-4, and HP-5 would be reduced in Alternative B FFD compared to Alternative A FFD because of elimination of the road between CD-2 and CD-5 allowing access to the Delta from Nuiqsut. This would reduce potential traffic from the local community to these facilities. Disturbance related to air traffic in the Colville River Delta Facility Group would be the same as Alternative A, affecting an estimated 4.0 spectacled eider nests (Table 4A.3.5-4).

Obstructions to Movements

Obstructions to bird movements would be reduced in Alternative B FFD compared to Alternative A FFD by the elimination of the road connecting CD-2 to CD-5. All other FFD components are similar in these two alternatives.

Mortality

Mortality from collisions with vehicles would be reduced by the reduction in the road system between Alternative B FFD and Alternative A FFD. Mortality from collisions with aircraft would be the same for Alternative B and Alternative A. Potential mortality from hunting would be reduced in Alternative B FFD compared to Alternative A FFD if increased access to Nuiqsut by the road between CD-2 and CD-5 contributed to increased harvest. Any increase in predator populations would result in decreased reproductive success for spectacled eiders. This is particularly true for increased glaucous gull, common raven, bear and arctic fox populations. The magnitude and extent of decreased productivity have not been quantified.

FISH-JUDY CREEKS FACILITY GROUP

A summary of the estimated number of spectacled eider nests affected by the hypothetical FFD including the Fish-Judy Creeks Facility Group is presented in Table 4A.3.5-4.

Habitat Loss, Alteration, or Enhancement

Under Alternative B FFD in the Fish-Judy Creeks Facility Group, the overall amount of habitat loss would be reduced compared to Alternative A because of the decrease in the road system and the elimination of one well pad. The construction of airstrips would increase habitat loss in the immediate areas of CD-6 and HP-17. Habitat related impacts would affect an estimated 1.4 spectacled eider nests (Table 4A.3.5-4). Vegetation classes used by spectacled eiders that would receive decreased gravel fill related impacts compared to Alternative A are Fresh Sedge Marsh, Old Basin Wetland Complex and Wet Sedge Meadow Tundra (Table 4B.3.5-1 and Table 4A.3.5-5).

Obstructions to Movements

Obstructions to movements of brood-rearing birds would be reduced in Alternative B FFD compared to Alternative A FFD by the reduction in the road system.

Disturbance and Displacement

Disturbance from vehicle traffic would be reduced in Alternative B FFD compared to Alternative A FFD by the reduction in the road system and reduced access for local traffic. Disturbance from air traffic would be increased by the addition of airstrips at CD-5, CD-6, and CD-24. Disturbance of spectacled eiders by facility noise would be reduced by moving HPF-1 from an area of 0.01 to 0.11 birds/km^2 to an area of less than 0.01 birds/km^2. The greatest potential for vehicular traffic to affect spectacled eiders likely would occur in the vicinity of CD-6 and HP-1, along the access road from HP-1 to HP-15 where higher densities of spectacled eiders might occur (Figure 3.3.5.2-1).

At CD-6, the potential for aircraft disturbance to affect spectacled eiders would probably be increased compared to Alternative B of the ASDP because of the increased number of well pads and the HPF-1 facility that would receive support from the airstrip at that site. The addition of the airstrip at the HP-17 site might have little effect on spectacled eiders because of the lower number of eiders in that area compared to the CD-6 and CD-8 areas (Figure 3.3.5.2-1). Air traffic disturbance would affect an estimated 0.5 spectacled eider nests (Table 4A.3.5-4).

Mortality

Mortality from collisions with vehicles would be reduced in Alternative B FFD compared to Alternative A FFD by the reduction in the road system and removal of access for local traffic. Mortality from collisions with aircraft would be increased by the addition of airstrips at CD-5, CD-6, and HP-17. Local access to Nuiqsut would be eliminated for Alternative B FFD compared to Alternative A FFD to pad locations adjacent to the Colville River and Harrison Bay, potentially reducing subsistence waterfowl harvest if increased access to these areas would lead to increased harvest. Any increase in predator populations would result in decreased reproductive success for spectacled eiders. This is particularly true for increased glaucous gull, common raven, bear and arctic fox populations. The magnitude and extent of decreased productivity have not been quantified.

TABLE 4B.3.5-1 ALTERNATIVE B – SUMMARY OF AFFECTED VEGETATION CLASSES FOR FFD USED BY SPECTACLED EIDERS

Vegetation Classes	Colville River Delta Facilities Group[a]		Fish-Judy Creeks Facility Group[a]		Kalikpik-Kogru Rivers Facility Group[a]		Grand Total	Plan Area Totals[b]		Spectacled Eider Habitats
	Loss (acres)	Alteration (acres)	Loss (acres)	Alteration (acres)	Loss (acres)	Alteration (acres)		Acres	Percent Affected	
Riverine Complex	0.1	0.8	0.6	3.0	0.0	0.0	4.5	698.3	1%	
Fresh Grass Marsh	1.0	4.5	26.2	153.3	12.8	76.5	274.2	2583.7	11%	√
Fresh Sedge Marsh	<0.1	<0.1	19.9	44.8	7.9	11.3	93.2	40953.6	<1%	√
Deep Polygon Complex	4.6	10.8	26.1	46.9	8.9	14.5	109.7	55208.0	<1%	√
Young Basin Wetland Complex	0.4	2.5	48.4	245.3	17.7	89.3	402.8	22910.8	2%	
Old Basin Wetland Complex	0.9	5.5	20.7	92.7	2.0	12.3	132.9	15674.5	1%	√
Wet Sedge Meadow Tundra	100.6	319.5	114	485.8	60.6	199.2	1280.5	185820.8	1%	√
Salt-Killed Wet Meadow	12.4	25.3	0.0	0.0	0.0	0.0	37.7	6368.7	1%	√
Halophytic Sedge Wet Meadow	9.3	19.0	0.0	0.0	0.0	0.0	28.3	4453.2	1%	√
Halophytic Grass Wet Meadow	0.3	0.8	0.0	0.0	0.0	0.0	1.1	398.3	<1%	√
Moist Sedge-Shrub Tundra	12.6	53.0	45.2	198.7	4.0	24.2	335.0	44405.7	1%	
Tussock Tundra	5.3	27.9	144	531.6	96.0	439.1	1238.6	208178.9	1%	
Dryas Dwarf Shrub Tundra	0.3	0.7	0.5	0.9	0.0	0.0	2.4	1358.6	<1%	
Cassiope Dwarf Shrub Tundra	2.2	13.4	93.9	562.1	63.8	381.3	1116.8	7734.0	14%	
Halophytic Willow Dwarf Shrub Tundra	0.1	0.1	0.0	0.0	0.0	0.0	0.2	143.1	<1%	√
Open and Closed Low Willow Shrub	19.7	60.0	8.9	46.7	5.6	33.2	173.8	13557.3	1%	
Open and Closed Tall Willow Shrub	<0.1	<0.1	0.5	2.7	<0.1	0.1	3.6	687.2	1%	
Dune Complex	0.0	0.0	3.3	5.5	0.7	1.0	10.1	5913.9	<1%	
Partially Vegetated	10.3	26.6	2.9	10.3	1.5	5.1	56.7	10149.3	1%	
Barrens	36.7	85.5	5.1	11.5	4.0	15.6	158.1	44009.2	<1%	
Totals	**216.7**	**655.8**	**525.2**	**2441.9**	**285.4**	**1302.6**	**5449.1**	**671207.1**	**1%**	

Notes:

[a] Totals from Tables 4B.3.1-3 and 4B.3.1-4

[b] Totals from Table 3.3.1-1 (no data, shadows and water categories not included)

KALIKPIK-KOGRU RIVERS FACILITY GROUP

A summary of the estimated number of spectacled eider nests affected by the hypothetical FFD including the Kalikpik-Kogru Rivers Facility Group is presented in Table 4A.3.5-4.

Habitat Loss and Alteration

Under Alternative B FFD, the potential for habitat loss and alteration to affect spectacled eiders in the Kalikpik-Kogru Rivers Facility Group would be slightly reduced compared to Alternative A because of the elimination of the production pad and airstrip at HP-22. The addition of an airstrip at the HPF-2 site would increase habitat loss in the immediate area of that facility. Increased ice road construction resulting from the elimination of road access would increase temporary habitat alteration during construction and drilling compared to Alternative A FFD. Impacts related to habitat loss would affect an estimated 0.7 spectacled eider nests. Habitat impacts for vegetation classes used by spectacled eiders would be decreased for Fresh Sedge Marsh and Wet Sedge Meadow Tundra and increased for Old Basin Wetland Complex compared to Alternative A FFD (Table 4B.3.5-1 and Table 4A.3.5-5)

Disturbance and Displacement

Disturbance from vehicle traffic would be reduced in Alternative B FFD compared to Alternative A FFD because of the reduced road system. Disturbance from air traffic would be similar in Alternative B FFD and Alternative A FFD, although more spectacled eiders could be affected by the airstrip at HPF-2 compared to the airstrip at HP-22 in Alternative A FFD (Figure 3.3.5.2-1).

Obstruction to Movement

Under Alternative B FFD, any potential obstruction to movement of spectacled eiders might be slightly reduced compared to Alternative A FFD by the elimination of the HP-22 site and associated pipeline.

Mortality

Mortality from collisions with vehicles would be reduced as a result of the reduction in the road system in Alternative B FFD compared to Alternative A FFD, in addition to the reduction in access to local traffic for this alternative. Mortality from collisions with aircraft would be similar in Alternative B FFD and Alternative A FFD, although fewer seabirds might be affected by placement of the airstrip at HPF-2 rather than HP-22. The potential for increased access for subsistence hunting to affect birds would be reduced compared to Alternative A FFD because of the elimination of access roads to the Kalikpik-Kogru Rivers Facility Group. Any increase in predator populations would result in decreased reproductive success for spectacled eiders. This is particularly true for increased glaucous gull, common raven, bear, and arctic fox populations. The magnitude and extent of decreased productivity have not been quantified.

ALTERNATIVE B – SUMMARY OF IMPACTS (CPAI AND FFD) ON SPECTACLED EIDER

Impacts to spectacled eiders associated with construction and operation of the proposed development include habitat loss, alteration, or enhancement; disturbance and displacement; obstructions to movement; and mortality. Spectacled eiders occur in greater numbers near proposed developments in the Colville River Delta than in the National Petroleum Reserve-Alaska portion of the Plan Area. Additional impacts due to lost productivity are not quantified by this analysis, including impacts due to increased nest depredation caused by increased predator populations. We estimated the number of nests affected by habitat loss, alteration and disturbance for each alternative, based on site specific nesting densities for spectacled eiders to compare alternative development scenarios. Effects would be localized, and no measureable effects to North Slope populations would be expected. CPAI Alternative B would reduce nesting by 4 percent for the Plan Area spectacled eiders. FFD Alternative B would reduce nesting by 21 percent for Plan Area spectacled eiders and less than 1 percent for the North Slope population. Habitat loss does not involve the direct loss of active nests

because winter gravel placement, ice road construction, snow dumping, and snow drifting occurs when nests are not active. Most impacts would be initiated during the construction period, including gravel placement, grading of the gravel surface, placement of all facilities, and initial drilling. The results of effects of these activities on estimated spectacled eider production due to loss, alteration or disturbance of nesting habitat for CPAI Development Plan Alternative B is presented in Table 4A.3.5-1 and for the FFD is presented in Table 4A.3.5-4. Impacts from CPAI Alternatives A through F on habitats used by spectacled eiders are summarized in Table 4A.3.5-2 and Table 4A.3.5-3. Summaries of vegetation classes affected directly and indirectly by gravel fill for FFD Alternative B are presented in Table 4B.3.5-1.

ALTERNATIVE B – POTENTIAL MITIGATION MEASURES (CPAI AND FFD) FOR SPECTACLED EIDER

Potential mitigation measures would the same as those identified for Alternative A (Section 4A.3.5.2).

4B.3.5.3 Steller's Eider

This section describes the potential impacts of the ASDP on threatened Steller's eiders. Impacts to other bird groups associated with the proposed development are described in Section 4A.3.3 and can be referred to for a more detailed description of the mechanisms of specific impacts. In general, impacts to Steller's eider potentially are the same as those described for spectacled eider under all of the alternatives. However, the likelihood of impacts occurring to Steller's eiders is very small, even under FFD scenarios, because Steller's eiders occur very rarely in the Plan Area. There would be a loss of potential Steller's eider habitat from the ASDP. Given the current distribution of Steller's eider in the Plan Area it is unlikely that any of the project alternatives would affect this species.

4B.3.5.4 Abandonment and Rehabilitation

The impacts of abandonment and rehabilitation on threatened and endangered species would be similar to those for Alternative A because there would be little or no change in activities in the area of highest use by these species.

4B.3.5.5 Alternative B – Effectiveness of Protective Measures for Threatened and Endangered Species

The effectiveness of the protective measures would be similar to Alternative A.

4B.4 SOCIAL SYSTEMS

4B.4.1 Socio-Cultural Characteristics

4B.4.1.1 Alternative B – CPAI Development Plan Impacts on Socio-Cultural Characteristics

Socio-cultural impacts under the Alternative B – CPAI Development Plan would generally be similar to those under the Alternative A – CPAI Development Plan. Under Alternative B, oil production is expected to be lower due to the relocation of CD-6. The reduction in oil production will cause a proportional decrease in some economic benefits to the local communities, especially Nuiqsut (see discussion of impacts in Section 4B.4.2).

Changes in infrastructure (reduced length of road construction but offsetting increase in airstrips and aircraft operations) are not expected to materially change the extent of impacts to subsistence harvest and any potential indirect impacts to community health and welfare.

ABANDONMENT AND REHABILITATION

Impacts will be similar to those under Alternative A, however, it is less likely that Nuiqsut residents would have become accustomed to using the oilfield roads to access subsistence resources.

4B.4.1.2 Alternative B – Full-Field Development Scenario Impacts on Socio-Cultural Characteristics

Socio-cultural impacts under the Alternative B – Full-Field Development Scenario are expected to be the same as those under Alternative A – Full-Field Development Scenario. Under Alternative B, oil production is expected to be lower due to the relocation of two pads, elimination of two proposed pads, and the potential that an APF would be uneconomic to develop with the stipulations imposed (see discussion in Section 4B.4.2). The reduction in oil production will cause a proportional decrease in some economic benefits to the local communities, especially Nuiqsut.

4B.4.1.3 Alternative B – Summary of Impacts (CPAI and FFD) on Socio-Cultural Characteristics

Impacts to socio-cultural characteristics under Alternative B – CPAI Development Plan and Alternative B – Full-Field Development are expected to be the same as those under Alternative A – CPAI Development Plan and Alternative A – Full-Field Development with the exception of a potential for reduced economic activity.

4B.4.1.4 Alternative B – Potential Mitigation Measures (CPAI and FFD) for Socio-Cultural Characteristics

Potential mitigation measures would be the same as those identified for Alternative A (Section 4A.4.1.4).

4B.4.1.5 Alternative B – Effectiveness of Protective Measures for Socio-Cultural Characteristics

The effectiveness of the protective measures would be similar to Alternative A.

4B.4.2 Regional Economy

4B.4.2.1 Alternative B – CPAI Development Plan Impacts on Regional Economy

Economic impacts for Alternative B – CPAI Development Plan would be similar to those determined for the Alternative A – CPAI Development Plan except that oil production may be lower in certain years and capital costs would increase by approximately $89 million (8.4percent). Alternative B reflects adherence to several setback stipulations related to production pad location that could reduce the amount of oil produced from the ASDP. Under Alternative B, the BLM projects a potential reduction of between 10 and 30 percent in production from CD-6 as a result of moving the production pad outside the 3-mile setback for Fish Creek. The effect of this variation in pad location was calculated by taking the production stream projected for CD-6 in Table 4A4.2-1 and reducing it by 20 percent, the midpoint of the 10 to 30 percent estimate. The result of this calculation, taken over the period of production for CD-6, results in an overall reduction of 4.15 percent of the total production from the ASDP units CD-3 through CD-7. The economic impacts of Alternative B – CPAI Development Plan would be reduced by that factor.

ABANDONMENT AND REHABILITATION

Employment created by removing facilities and rehabilitation of the land may be comparable to that during construction if gravel fill is removed. Once oil ceases to flow from the satellites and termination activities are complete, economic stimulus from the satellites—with the exception of relatively insignificant employment from monitoring and long-term rehabilitation—would cease.

4B.4.2.2 Alternative B – Full-Field Development Scenario Impacts on Regional Economy

Under the Alternative B – Full-Field Development Scenario, hypothetical HP-22 would be eliminated because of the requirement for setback from the Teshekpuk Lake surface protection area. Permanent facilities would also be precluded by setbacks at Fish Creek and Judy creeks. These relatively narrow setbacks normally would not deny oil companies access to oil. However, oil accumulations centered within a large setback area such as that for Fish Creek may not be able to be reached economically with currently available technology. In the hypothetical scenario for Alternative B, HPF-1, HP-10, and HP-19 would likely be uneconomical to develop. Therefore, the production scenario for the Alternative B – Full-Field Development Scenario must be adjusted to eliminate production from HPF-1, HP-10, HP-19, and HP-22.

Applying this change to full-field production estimates results in an overall production over the period from 2008 through 2055 that is 25 percent lower than the production estimate for Alternative A – Full-Field Development Scenario.

4B.4.2.3 Alternative B – Summary of Impacts (CPAI and FFD) on Regional Economy

Overall economic impacts of Alternative B would be similar to but less than those that result from Alternative A, as described below.

Because most economic impacts associated with project development are directly proportional to oil production, the revenue and employment effects of Alternative B would be lower than for Alternative A. For Alternative B – CPAI Development Plan, the economic impacts would be reduced by approximately 4.15 percent from those estimated for the Alternative A – CPAI Development Plan. For FFD, economic impacts would be reduced by approximately 25 percent.

4B.4.2.4 Alternative B – Potential Mitigation Measures (CPAI and FFD) for Regional Economy

Potential mitigation measures would be the same as identified for Alternative A (Section 4A.4.2.5).

4B.4.2.5 Alternative B – Effectiveness of Protective Measures for Regional Economy

The effectiveness of the protective measures would be similar to Alternative A.

4B.4.3 Subsistence

4B.4.3.1 Alternative B – CPAI Development Plan Impacts on Subsistence

Effects for similar components in Alternative A – CPAI Development Plan would be the same for Alternative B – CPAI Development Plan (gravel mines, pads, roads, and pipelines outside the Fish and Judy creeks sensitive area) and are not specifically discussed in this section. This section focuses on Alternative B components that are different from those in Alternative A.

CONSTRUCTION PERIOD

Eliminating the road bridge across the Nigliq Channel and roads between CD-2 and CD-6 will require use of an ice bridge across the channel and ice road or low-pressure vehicle travel west of the channel. Subsistence hunters believe that low-pressure vehicles divert game from the areas in which these vehicles operate at a time when the animals are already under stress. One hunter described the effect of Caterpillar and Rolligon trains on winter caribou:

> "At first, there were a lot of caribou. As we worked, using more and more vehicles, the caribou moved out of their prime feeding area. This year the caribou were skinny. Their prime feeding area was invaded, and the herd had to move to a place where there was more heavy snow and they had to dig for food." (SRB&A, 2003a, Field Interviews)

Construction of infrastructure at the Nigliq Channel during winter (pipeline bridge, ice bridge and road) would increase industry traffic in that area. In addition, the Nigliq Channel ice bridge and road would be constructed annually. The Nigliq Channel is an important current and historical subsistence-use area for multiple resources for residents of Nuiqsut and, occasionally, Barrow. This area is especially important to residents of Nuiqsut as a location for winter fish harvest. Subsistence users would likely avoid construction areas during construction, and resources at that location would be less available. In addition, construction would deflect subsistence resources, such as caribou and furbearers, from this important use area, reducing the availability of these resources for subsistence uses. Construction activities would decrease access by subsistence users to areas of active construction because of perceptions of regulatory barriers and safety concerns of not shooting near industrial development.

Moving the location of CD-6 outside the Northeast National Petroleum Reserve-Alaska-stipulated 3-mile sensitive area from Fish Creek and the elimination of the gravel road connecting CD-5 and CD-6 have the potential to decrease impact to subsistence uses in the Fish and Judy creeks area during the construction period in comparison to Alternative A. The construction activity would be farther from the creek and campsites, and there would be less road construction. As with Alternative A, effects from construction are expected to last 2 years in any given location and to be primarily local in extent. Alternative B differs from Alternative A principally by relocating (away from Fish Creek) or eliminating (Nigliq Channel road bridge and road from CD-2 to CD-6) some construction and infrastructure. Annual ice bridge construction and cross-tundra winter travel will be needed to reach CD-5 and CD-6. Construction would affect availability of key subsistence resources because of disturbance in the construction area and would occur in seasonal and general (i.e., areas used year round for multiple resources by the whole community) use areas for key subsistence resources that are used for more than one season each year, have been used for multiple generations, and are used for multiple resources each year. Effects from Alternative B construction would occur in key geographic areas relative to other areas of subsistence availability and would pertain to individual subsistence users, groups of users, and the overall pattern of Nuiqsut subsistence uses. Access to key subsistence-use areas would be affected because of hunter perception of regulatory barriers as well as safety concerns with shooting around development. Construction and subsequent operation of these facilities would contribute to a perception by Nuiqsut residents that they are surrounded by development. Competition for subsistence resources between communities may increase temporarily as hunters avoid usual subsistence-use areas.

OPERATION PERIOD

In contrast with Alternative A, the elimination of all-weather gravel roads between CD-2, CD-5, and CD-6 would have several effects. First, it would eliminate the road (and associated berm) as a subsistence user barrier for the approximately 15-mile distance, although a pipeline with a minimum height of 5 feet would still be located in this area. Second, with no road, air traffic in the Nigliq Channel area (CD-5) and the Fish and Judy creeks area (CD-6) would increase. At the local level, the increase in air traffic would deflect caribou, moose, and waterfowl from these important subsistence-use areas during operation of the airstrips. The annual Nigliq Channel ice bridge may delay melting of the river ice, which would temporarily reduce or alter fish habitat and delay subsistence user access to the Nigliq Channel and Harrison Bay areas in the spring. Alternative B would decrease effects to subsistence uses in the Fish Creek area because the industrial activity would be located farther from Fish Creek. However, the pipeline connecting CD-5 and CD-6 could still locally deflect caribou and moose in the Fish and Judy creeks area, reducing availability of these resources. This pipeline, like that described for Alternative A, would have a minimum elevation of 5 feet and would pose similar concerns for caribou and hunter crossing, especially with drifted snow.

In summary, Alternative B would have less of an overall effect on subsistence than Alternative A. Similar to Alternative A, industrial development in the Fish and Judy creeks and Colville River Delta areas would reduce

the availability of and access to more than half of the harvest of fish, caribou, wolves, wolverines, geese, and eiders at Nuiqsut. Subsistence harvests would not be reduced to the same extent, but subsistence access would be affected as subsistence users avoid industrial areas because of perceived regulatory barriers and safety concerns of not shooting around industrial development. As noted in NRC (2003:156), "Even where access is possible, hunters are often reluctant to enter oilfields for personal, aesthetic, or safety reasons. There is thus a net reduction in the available area, and this reduction continues as the oilfields spread." To avoid industrial areas, hunters would hunt elsewhere and would travel farther at greater costs and effort. Currently harvest locations are based on local knowledge of resources and their abundance at traditional harvest areas. Moving to another area to avoid development means harvesters would more heavily use areas with presumably fewer and less densely distributed subsistence resources. These changes to subsistence use patterns would require increased investments in time, money, fuel, and equipment. It is likely that Nuiqsut hunters would not have the same rate of harvest success if access to these traditionally used areas is altered. These effects would last for the life of the applicant's proposed action (30 years); in other words, for multiple hunter generations. The key resources in this area are harvested during more than one season each year, they have been used for multiple generations, and the affected areas are used for multiple resources each year. Effects of the applicant's proposed action would occur in key geographic areas relative to other areas of subsistence availability and would pertain to individual subsistence users, groups of users, and the overall pattern of Nuiqsut subsistence uses.

ABANDONMENT AND REHABILITATION

There would be less infrastructure to remove under Alternative B than under Alternative A and that infrastructure would be farther from Fish Creek. Consequently, there would be less disruption of subsistence resources or users during the dismantlement and removal phase. Impacts following the dismantlement and removal phase would be similar to those described for Alternative A.

4B.4.3.2 Alternative B – Full Field Development Plan Impacts on Subsistence

Effects caused by the FFD scenario are analyzed in a more general way than those of the CPAI Development Plan because of the hypothetical nature of the scenario. Alternative B includes 22 locations (2 processing facilities and 20 production pads). Similar to the Alternative A FFD scenario, the Plan Area is divided into three groups: the Colville River Delta Facility Group, the Fish-Judy Creeks Facility Group, and the Kalikpik-Kogru Rivers Facility Group. The Alternative B FFD scenario is discussed in Section 2.4.

COLVILLE RIVER DELTA FACILITY GROUP

Under Alternative B, the effects of the FFD Scenario in the Colville River Delta Facility Group would be the same as under Alternative A during both construction and operation periods.

FISH-JUDY CREEKS FACILITY GROUP

The effects of this alternative for the FFD Scenario in the Fish-Judy Creeks Facility Group would be the same as those for Alternative A, with the exception that air traffic and associated subsistence effects discussed above would increase at production pads and processing facilities not connected by roads. Pads, processing facilities, and associated roads and pipelines would be located outside sensitive areas identified for no permanent oil and gas facilities in the Northeast National Petroleum Reserve-Alaska IAP/EIS, thus moving subsistence effects farther from Fish and Judy Creeks. Pipelines would cross sensitive areas where necessary. The increased number of annual ice roads would require more water withdrawal from area freshwater sources and may reduce overwintering fish habitat. These effects would have the effect of reducing the availability of multiple key subsistence resources in a primary subsistence-use area for Nuiqsut**,** though to a lesser extent than Alternative A.

KALIKPIK-KOGRU RIVERS FACILITY GROUP

Effects of development in the Kalikpik-Kogru Rivers Facility Group for Alternative B would be similar to those listed for the Alternative A FFD Scenario with a few exceptions. Elimination of one pad in an area important for caribou calving could benefit subsistence. However, an increase in air traffic in this group may deflect caribou and furbearers in an area used occasionally in summer and winter by Barrow residents, as well as occasionally by Nuiqsut residents for waterfowl and seals.

4B.4.3.3 Alternative B – Summary of Impacts (CPAI and FFD) on Subsistence

Effects from construction and operation for the Alternative B – CPAI Development Plan and Alternative B – FFD Scenario would be similar to those for Alternative A, except for the differences noted above associated with fewer roads between pads, more aircraft flights, facilities moving outside the 3-mile setback for Fish Creek, and a pipeline-only bridge across the Niqliq Channel. The overall effect on subsistence from Alternative B would be less than Alternative A.

Effects from construction and operation for the Alternative B CPAI Development Plan and FFD Scenario are expected to continue for the lifetime of the development and are expected to be primarily local in extent for the CPAI Development Plan and regional in extent for the FFD Scenario. Construction and operation would affect availability of key subsistence resources because of deflection or displacement of these resources (either by air or road traffic) from customary harvest locations. Access to subsistence resources would be affected by pipelines, especially in winter because of snowdrifts, avoidance of pads and industrial areas, the perception of regulatory barriers, the reluctance to shoot rifles in the vicinity of industrial development, the difficulty of negotiating road berms while hunting in winter, and a preference for animals not habituated to industrial development. Indirect effects would include hunters going to another area that would result in harvesting in traditional places less often and increased effort, costs, and risk associated with traveling farther. Alternative B would occur in seasonal and general use areas for key subsistence resources that are used for multiple seasons each year, have been used for multiple generations, and are used for multiple resources each year. Effects from construction and operation would occur in key geographic areas relative to other areas of subsistence availability and would pertain to individual subsistence users, groups of users, and the overall pattern of Nuiqsut subsistence uses. The construction and operation of the project would contribute to Nuiqsut residents' perception of being surrounded by development. Competition for certain resources among Nuiqsut, Anaktuvuk Pass, Barrow, and Atqasuk would increase as Nuiqsut hunters avoid traditional subsistence-use areas closer to Nuiqsut and travel to farther outlying areas.

4B.4.3.4 Alternative B – Potential Mitigation Measures (CPAI and FFD) for Subsistence

Potential mitigation measures would be the same as those identified for Alternative A (Section 4A.4.3.4).

4B.4.3.5 Alternative B – Effectiveness of Protective Measures for Subsistence

The effectiveness of the protective measures would be similar to Alternative A. In addition to the protective measures in Alternative A, this alternative would adhere to Stipulation 39 of the Northeast National Petroleum Reserve-Alaska IAP/EIS and there would be no development in the Fish and Judy Creek buffer zones, an area of high subsistence use.

4B.4.4 Environmental Justice

4B.4.4.1 Introduction

The basis for identifying disproportionate impacts to minority and low-income populations is described in Section 4A.4.4.

4B.4.4.2 Alternative B – Disproportionate Impacts (CPAI and FFD) on Environmental Justice

Disproportionate impacts under Alternative B – CPAI Development Plan and Alternative B – Full-Field Development are expected to be the same as those under Alternative A for both cases (Section 4A.4.4). Changes in the location of production pads incorporated in Alternative B are not expected to change the type or level of impacts identified.

4B.4.4.3 Abandonment and Rehabilitation

Impacts will be similar to Alternative A.

4B.4.4.4 Alternative B – Potential Mitigation Measures (CPAI and FFD) for Environmental Justice

Potential Mitigation Measures to reduce or avoid disproportionate impacts would be the same as those identified for Alternative A (Section 4A.4.4.3).

4B.4.4.5 Alternative B – Effectiveness of Protective Measures for Environmental Justice

The effectiveness of the protective measures would be similar to Alternative A.

4B.4.5 Cultural Resources

4B.4.5.1 Alternative B – CPAI Development Plan Impacts on Cultural Resources

Despite the relocation of some production pads, development under this alternative would have the same impacts as Alternative A. They would have negligible direct and indirect effect on known cultural resources during construction and operation, except possibly near CD-4.

No direct or indirect effect on known cultural resources would occur from the construction and operation of the existing ASRC Mine Site or Clover. However, the use of these gravel mines would involve significant ground-disturbing activities, though less than under Alternative A, which could affect unknown surface and subsurface cultural resources.

ABANDONMENT AND REHABILITATION

It is unlikely that cultural resources would be impacted by abandonment activities.

4B.4.5.2 Alternative B – Full-Field Development Scenario Impacts on Cultural Resources

Despite the relocation of some facilities, and the elimination of others, development under this alternative would have approximately the same impacts to known cultural resources as Alternative A. Because less gravel would be used in this alternative, the risk to unknown cultural resources from gravel extraction would be reduced.

4B.4.5.3 Alternative B – Summary of Impacts (CPAI and FFD) on Cultural Resources

Impacts resulting from implementation of Alternative B are similar to those of Alternative A. Known cultural resource sites that could be affected are the same as Alternative A. Because less gravel would be needed, the risk of impacts to unknown cultural resources from extraction would be reduced.

4B.4.5.4 Alternative B – Potential Mitigation Measures (CPAI and FFD) for Cultural Resources

Potential mitigation measures would be the same as those identified for Alternative A (Section 4A.4.5.4).

4B.4.5.5 Alternative B – Effectiveness of Protective Measures for Cultural Resources

The effectiveness of the protective measures would be similar to Alternative A.

4B.4.6 Land Uses and Coastal Management

4B.4.6.1 Alternative B – CPAI Development Plan Impacts on Land Uses and Coastal Management

LAND OWNERSHIP AND USES

Development of the Alternative B – CPAI Development Plan would affect the same landowners as described in Alternative A. Implementation of these developments would not change ownership status on lands within the ASDP Area, but would occur under negotiated leases. In addition, Kuukpik Corporation is still able to select lands, and those lands will likely be within the oil reserves. As previously stated, those lands selected are under BLM jurisdiction until patented.

The proposed development of oil production satellites and related facilities under Alternative B would result in less total area developed within the ASDP Area than under Alternative A. Development under Alternative B calls for development of approximately 204 acres, including production pads, roads, and airstrips. This would result in an increase of 2 times the total number of acres currently developed for oil production activities within the ASDP Area.

Alternative B would provide less access to the remote satellites west of Nigliq Channel than Alternative A. Access would be limited to oil industry personnel and government agencies. Effects to subsistence and recreation are discussed further in Sections 4B.4.3 and 4B.4.7. Other permitted uses within the ASDP Area, such as scientific studies, communications and navigation-related uses, and overland re-supply transport between villages, are not expected to be affected by the proposed development.

Alternative B conforms most closely to the stipulations established by the BLM for the National Petroleum Reserve-Alaska. Under Alternative B, CD-6 and all access roads and pipelines to CD-6 would be moved outside of the 3-mile buffer around Fish Creek. Other roads and bridges would be removed from water body setback areas, resulting in no direct impacts to the Fish Habitat LUEA. CD-7 would remain located within the CRSA, which was designated for maximum protection of its resources, consistent with the National Petroleum Reserve-Alaska's purpose of allowing for development of oil resources. No other Special Areas or LUEAs would be directly affected under Alternative B. In addition, there would be less total area constructed, which would minimize gravel extraction operations. There could, however, be slightly more flight activity during operations under Alternative B because of the reduced road access.

COASTAL MANAGEMENT

Development proposed under the Alternative B – CPAI Development Plan includes development both on federal lands and on state and Kuukpik lands within the coastal zone. Although federal lands are excluded from the coastal zone under the CZMA, development on federal lands is required to be consistent with state coastal programs to the extent possible. This section, therefore, evaluates the proposed development against the state and local district coastal zone standards, regardless of whether or not the development occurs on federal lands.

ALASKA COASTAL MANAGEMENT PROGRAM

The coastal standards are evaluated for Alternative B in the following sections.

Coastal Development (6 AAC 80.040)

As discussed under Alternative A, there is no feasible inland alternative to development of the existing oil resources situated within the ASDP Area. The proposed facilities have incorporated design measures to minimize potential effects to coastal resources, and development of bridges and access roads has been limited in the area closest to the coast (CD-3) and within water body setback areas. No road access across the Nigliq Channel is proposed. Stipulations on development within the National Petroleum Reserve-Alaska require that access continues to the coastal resources used for subsistence and traditional land uses; therefore, development of these facilities is not expected to displace other important coastal uses. BLM stipulations for the National Petroleum Reserve-Alaska areas also protect creek, river, and lake habitats through development setbacks. Under Alternative B, proposed facilities for the ASDP are sited outside of the Fish Creek buffer area and the other water-body setbacks. Development within the CRSA is expected to meet the requirement for maximum protection of resources through implementation of other the protective measures included in the BLM stipulations. Given its conformance with all BLM stipulations and alternative measures potentially required by the state, development under Alternative B is expected to comply with the coastal development standard.

Geophysical Hazard Areas (6 AAC 80.050)

Geophysical hazards are addressed under the ASDP in Alternative B just as in Alternative A, through design and siting of facilities to maintain the permafrost and natural drainage patterns and to protect the built structures from flood events, scour, ice jams, and storm surges. Incorporation of these design measures is expected to result in compliance with this standard.

Recreation (6 AAC 80.060)

Development proposed under Alternative B of the ASDP will be consistent with National Petroleum Reserve-Alaska stipulations requiring continued access to coastal resources for subsistence and other traditional land uses. The limited roads constructed within the ASDP Area would not, however, be open to recreation users, but would be limited to use by oil industry personnel. Development under Alternative B, in compliance with BLM stipulations and alternative measure potentially required by the state, is expected to comply with the recreation standard.

Energy Facilities (6 AAC 80.070)

The ASDP under Alternative B is consistent with the criteria in the energy facility standard for maximum consolidation of facilities and minimization of the potential for adverse effects to environmental resources, as discussed under Alternative A. The relocation of CD-6 out of the Fish Creek buffer area and the elimination of the Nigliq Channel crossing reduce the potential for adverse effects to below the level associated with Alternative A. Development within the CRSA would be designed to afford the maximum feasible protection to surface resources in this area. The development proposed under Alternative B, in compliance with BLM stipulations and alternative measures potentially required by the state, is expected to be in compliance with the energy facility standard.

Transportation and Utilities (6 AAC 80.080)

The development proposed under the ASDP Alternative B substantially reduces roadways compared to Alternative A. Alternative B includes a road from the existing Alpine Facility to CD-4 and a road from CD-6 to CD-7 within the Fish-Judy Creeks Facility Group. No new road access is provided to link satellite facilities west of the Nigliq Channel with the existing Alpine Facility to the east. Development under this alternative would comply with all BLM stipulations and alternative measures potentially required by the state to reduce impacts

on natural and cultural resources. Thus, development of Alternative B is expected to conform to the transportation and utilities standard.

Mining and Mineral Processing (6 AAC 80.110)

Development of the ASDP under Alternative B would require approximately 204 acres of gravel pad, road, and airstrip development. The reduction of road access under this alternative reduces gravel needs and minimizes potential environmental effects associated with gravel mining. Gravel sources for this alternative would be the same as those discussed under Alternative A. As with Alternative A, development under Alternative B is expected to comply with this coastal management standard.

Subsistence (6 AAC 80.120)

The proposed ASDP under Alternative B provides road access from CD-1 to CD-4 in the Colville River Delta and from CD-6 to CD-7 in the Fish-Judy Creeks Facility Group. Access to these roads is by air or low ground pressure vehicle only, and use of these roads is restricted to oil industry personnel. Operation of the remote facilities could result in a higher level of activity in these areas than the current level, which could affect subsistence resources. The potential for adverse effects on subsistence from the proposed development is discussed in more detail in Section 4B.4.3. Development would occur under BLM stipulations and alternative measures potentially required by the state to reduce the potential for impacts on subsistence resources near proposed facilities.

Alternative B would require development within the CRSA. Development in this area is expected to maximize protection of resources through implementation of design and construction measures described in Section 2, the BLM stipulations in Appendix D, and alternative measures potentially required by the state. Development of Alternative B, in compliance with the stipulations and state measures protecting subsistence and other resources, is expected to conform with the coastal subsistence standard.

Habitats (6 AAC 80.130)

As discussed under Alternative A, the extent of wetlands, lakes, rivers, and tidal areas throughout the ASDP Area makes development within these habitats unavoidable. Development of the ASDP under Alternative B, would be in compliance with all existing BLM stipulations. Development of CD-7 within the Colville River Special Area would require maximum protection of the surface resources in that area. Since Alternative B would comply with all of the BLM stipulations, with alternative measures potentially required by the state, and with other project specific procedures identified in Section 2, it is expected to meet the standard of maximum protection. Alternative B is expected to meet the coastal habitat standard's three-pronged test of public need, lack of feasible alternatives, and maximum conformance to coastal standards.

Air, Land, and Water Quality (6 AAC 80.140)

Development of the Alternative B – CPAI Development Plan would require the same permits and reviews discussed under Alternative A. Compliance with ADEC and USEPA regulations would result in conformance with this coastal management standard.

Historic, Prehistoric, and Archaeological Resources (6 AAC 80.150)

Development under Alternative B would require the same process for protection of cultural resources as discussed under Alternative A. The reduced access resulting from fewer roads and more restricted access is likely to reduce the potential for inadvertent impacts to previously undocumented cultural resources. As with Alternative A, compliance with the BLM stipulations, alternative measures potentially required by the state, and the project specific procedures described in Section 2, is expected to result in conformance with this cultural resource standard.

NORTH SLOPE BOROUGH COASTAL MANAGEMENT PROGRAM

The CPAI Development Plan under Alternative B is consistent with the current NSB *Standards for Development* (NSB CMP 2.4.3) through compliance with the BLM stipulations and the coastal management standards addressed above. Potential effects to subsistence and cultural resources would be expected to be lower than for Alternative A as a result of the decreased access to the remote satellite areas under Alternative B.

The proposed plan under Alternative B complies with the current NSB *Required Features for Applicable Development* (NSB CMP 2.4.4) through compliance with the BLM stipulations and alternative measures potentially required by the state. Alternative B would result in less vehicle traffic throughout the ASDP Area, but would result in increased aircraft activity by transport personnel to the remote satellites.

Development under Alternative B would address current NSB *Best Effort Policies* (NSB CMP 2.4.5). These policies call for protection of sensitive coastal resources, including subsistence and cultural resources. Protection of these resources has been addressed in Alternative B through compliance with the BLM stipulations included in Appendix D and alternative measures potentially required by the state. Development under Alternative B is expected to be consistent with the best effort policies.

The existing NSB CMP also contains standards for *Minimization of Negative Impacts* (NSB CMP 2.4.6). The proposed development under Alternative B includes design measures to protect permafrost and to address geophysical hazards as discussed above under the ACMP. Roadways and other facilities are removed from water-body setback areas and reduced through increased use of air transportation. Impacts to wildlife, vegetation and other subsistence resources are reduced through compliance with the BLM stipulations included in Appendix D and alternative measures potentially required by the state. Subsistence resources are further protected by the state of Alaska's Office of Habitat Management and Planning under Title 41 through its authority to require the proper protection of habitats important for the spawning, migration, and rearing of anadromous fish and its authority to require that durable and efficient fish passage is provided for all fish bearing water bodies. Proposed development under Alternative B is expected to be consistent with the NSB standards for minimizing negative impacts.

NORTH SLOPE BOROUGH LAND MANAGEMENT REGULATIONS

As discussed under Alternative A, most of the land within the NSB is zoned as Conservation, with the exception of some village sites and the existing oilfields at Prudhoe Bay and Alpine Field. The NSB's Resource Development zoning classification covers areas designated for oil development activities. Development east of the National Petroleum Reserve-Alaska in the Colville River Delta under Alternative B would require a rezoning of the development areas to the Resource Development classification permitting of activities through the approval of a master plan. Application of the NSB's land management regulations to oil and gas activities on federal lands is subject to legal constraints and therefore must be evaluated on a case-by-case basis as particular activities are proposed.

ABANDONMENT AND REHABILITATION

Land ownership would not be affected by abandonment and rehabilitation. Upon completion of abandonment and rehabilitation, land uses and management may return to something similar to the current situation. For discussion of subsistence and recreation use after abandonment and rehabilitation, see Section 4B.4.3.1 and Section 4B.4.7.1, respectively.

4B.4.6.2 Alternative B – Full-Field Development Scenario Impacts on Land Uses and Coastal Management

LAND OWNERSHIP AND USES

The Alternative B FFD scenario would affect the same landowners as described in Alternative A FFD. Implementation of these developments would not change ownership status on lands within the ASDP Area, but would occur under negotiated leases. In addition, Kuukpik Corporation is still able to select lands and those lands would likely be within the oil reserves. As previously stated, those lands selected are under BLM jurisdiction until patented.

The FFD scenario would result in development occurring throughout the ASDP Area, with an additional 20 production pads, 2 processing facilities, associated roads, and airstrips for a total impact area estimated at 1,056 acres and 136 miles of pipelines. The FFD scenario would result in a substantial increase in the area developed within the Colville River Delta, Fish-Judy Creeks, and Kalikpik-Kogru Rivers facility groups. Although roads would connect some of the remote satellite facilities to each other, there would be no continuous road access linking development east of the Nigliq Channel at the existing Alpine Facility to areas west of the channel. Access to areas west of the channel would require air transport, and access would remain limited to oil industry personnel. Although there would be increased activity levels in these areas resulting from operation of the facilities, the activity level would be lower than that under Alternative A. Effects on subsistence resources and recreation for FFD are discussed in Section 4B.4.3 and Section 4B.4.7.

Full-field development under Alternative B would more closely conform to the BLM stipulations for National Petroleum Reserve-Alaska in that production satellites would be placed outside of buffer areas and areas where surface activities are restricted. Some development would occur within the CRSA and would be required to provide maximum protection of surface resources. Flights could increase for this scenario, as compared to Alternative A, because of the increased number of satellite facilities accessible only by air.

COASTAL MANAGEMENT

Development proposed under the Alternative B – Full-Field Development Scenario includes development on mostly federal lands inside National Petroleum Reserve-Alaska and on state and Kuukpik lands within the coastal zone. Although federal lands are excluded from the coastal zone under the CZMA, development on federal lands is required to comply with state coastal management programs to the extent feasible. Therefore, this section evaluates the proposed development against the state and local coastal zone standards, regardless of whether or not the development occurs on federal lands.

ALASKA COASTAL MANAGEMENT PROGRAM

The coastal standards are evaluated for Alternative B in the following sections:

Coastal Development (6 AAC 80.040)

Full-field development under Alternative B differs from Alternative A in the elimination of a production satellite near the Kogru River, the elimination of a road bridge across the Nigliq Channel, and situating other production and processing facilities outside water body setback areas. Roads are proposed to connect some production satellites to regional oil processing facilities. Access to satellites in the Colville River Delta would occur only by air, ice road or low ground pressure vehicle. Development of these facilities would incorporate BLM stipulations and alternative measures potentially required by the state to minimize potential effects to coastal resources. Thus, the Alternative B – Full-Field Development Scenario is expected to conform to the coastal development standard.

Geophysical Hazard Areas (6 AAC 80.050)

Development of facilities under FFD would be required to meet the same design standards to protect permafrost and to reduce the potential for damage to structures or personnel from floods and other severe weather events. As with Alternative A, incorporation of these design measures is expected to result in conformance with this standard.

Recreation (6 AAC 80.060)

Development of facilities under FFD would be required to comply with the same stipulations on continued access for subsistence and traditional land uses within the National Petroleum Reserve-Alaska. Again, facilities constructed under this alternative would not provide any new access for recreation because they would be restricted to oil industry personnel. Development of the Alternative B – Full-Field Development Scenario, with the stipulations included in Appendix D and alternative measures potentially required by the state, is expected to conform to the recreation standard.

Energy Facilities (6 AAC 80.070)

The Alternative B – Full-Field Development Scenario would result in a lower potential for environmental impacts because of reduced road construction and moving facilities out of creek buffers and other water body setbacks. Thus, FFD under Alternative B would be expected to comply with the criteria of the energy facility standard.

Transportation and Utilities (6 AAC 80.080)

Full-field development calls for additional satellite development throughout the Plan Area. Roads are proposed to connect remote satellites with regional processing facilities in the Kalikpik-Kogru Rivers and Fish-Judy Creeks facility groups. No road access is provided between the remote facilities and the existing Alpine Facility. Development of Alternative B is expected to comply with the coastal standards for transportation and utilities.

Mining and Mineral Processing (6 AAC 80.110)

The Alternative B – Full-Field Development Scenario would require less gravel than FFD under Alternative A. Full-field development would still likely require resources beyond those currently identified. Any new gravel mining operation within the coastal zone would be required to receive a permit, which would maximize compliance with state coastal management standards and protection of coastal resources. As with Alternative A, FFD under Alternative B would be expected to comply with the coastal mining standard.

Subsistence (6 AAC 80.120)

Full-field development would result in more widespread development of satellite facilities. Roads are proposed to connect some remote satellites to each other and to regional processing facilities, but no direct road access is provided to link the remote satellites to the existing Alpine Development Project on the east side of Nigliq Channel. Access on industry roads would be restricted to industry personnel only. Operation of the remote satellites would result in some additional activity in remote areas, which could affect subsistence resources to some degree. Potential effects on subsistence from development under FFD are discussed further in Section 4B.4.3. Construction and operation of these facilities would be required to comply with the BLM stipulations outlined in Appendix D, and alternative measures potentially required by the state to minimize effects to subsistence to the greatest extent possible. Development under Alternative B, in compliance with the stipulations listed in Appendix D and alternative measures potentially required by the state, is expected to comply with the subsistence standard.

Habitats (6 AAC 80.130)

Full-field development would result in additional impacts to coastal habitats. Impacts would be lower than those discussed under Alternative A – Full-Field Development Scenario in that Alternative B removes production, processing, and roadway facilities from water body setbacks and restricted areas near the Kogru River. FFD under Alternative B also eliminates the road and bridge construction across the Nigliq Channel and limits access to remote sites to oil industry personnel. Development under Alternative B, in compliance with the stipulations listed in Appendix D, and alternative measures potentially required by the state, is expected to comply with the coastal management habitat standard.

Air, Land, and Water Quality (6 AAC 80.140)

Development of the FFD scenario under Alternative B would require the same permits and reviews discussed under Alternative A. Compliance with ADEC and USEPA regulations would result in conformance with this coastal management standard for the FFD scenario.

Historic, Prehistoric, and Archaeological Resources (6 AAC 80.150)

The Alternative B – Full-Field Development Scenario would require the same process for protection of cultural resources as discussed under Alternative A. The reduced access resulting from fewer roads and more restricted access is likely to reduce the potential for inadvertent impacts to previously undocumented cultural resources. The Alternative B – Full-Field Development Scenario, developed in compliance with the stipulations and alternative measures potentially required by the state, is expected to be in conformance with this standard.

NORTH SLOPE BOROUGH COASTAL MANAGEMENT PROGRAM

The Alternative B – Full-Field Development Scenario is consistent with the current NSB *Standards for Development* (NSB CMP 2.4.3) through compliance with the BLM stipulations and the coastal management standards addressed previously in this section. Potential effects to subsistence and cultural resources would be expected to be lower than FFD under Alternative s a result of the decreased access to the remote satellite areas.

Full-field development under Alternative B complies with the current NSB *Required Features for Applicable Development* (NSB CMP 2.4.4) through compliance with the BLM stipulations, alternative measures potentially required by the state, and project specific procedures described in Section 2. The Alternative B – Full-Field Development Scenario would result in less vehicle traffic throughout the Plan Area, but would result in increased aircraft activity to transport personnel to the remote satellites.

The Alternative B – Full-Field Development Scenario would address current NSB *Best Effort Policies* (NSB CMP 2.4.5). These policies call for protection of sensitive coastal resources including subsistence and cultural resources. These issues have been addressed above in the ACMP discussion. Again, Alternative B would be expected to reduce potential effects because of more restricted access to the remote satellites. Development of FFD under Alternative B, consistent with the project specific procedures in Section 2, the BLM stipulations, and alternative measures potentially required by the state, is expected to consistent with the NSB best effort policies.

The existing NSB CMP also contains standards for *Minimization of Negative Impacts* (NSB CMP 2.4.6). The proposed Alternative B FFD includes measures designed to protect permafrost and to address geophysical hazards as discussed above under the ACMP. Roadways and other facilities would be removed from water body setback areas and reduced through increased use of air transportation. Other adverse effects to wildlife, habitats, and subsistence are reduced through the project specific procedures in Section 2, the BLM stipulations in Appendix D, and alternative measures potentially required by the state. Therefore, the proposed FFD under Alternative B is expected to be consistent with the NSB standards on minimizing negative impacts.

NORTH SLOPE BOROUGH LAND MANAGEMENT REGULATIONS

Development to the east of National Petroleum Reserve-Alaska in the Colville River Delta under Alternative B FFD would require a re-zoning of the development areas to the "Resource Development" classification and permitting of activities through the approval of a master plan. Application of the NSB's land management regulations to oil and gas activities on federal lands is subject to legal constraints and therefore must be evaluated on a case-by-case basis as particular activities are proposed.

4B.4.6.3 Alternative B – Summary of Impacts (CPAI and FFD) on Land Uses and Coastal Management

Construction and operation of Alternative B – CPAI Development Plan is not anticipated to result in adverse effects to existing land uses and ownership. A direct impact, however, would be the increase in the acres of developed land. Implementation of the Alternative B – CPAI Development Plan would result in an increase of 2 times the total number of acres developed for oil production within the ASDP Area. Unlike Alternative A, all facilities and construction would occur outside the Fish Creek buffer area, thus eliminating the need for an exception to the stipulation restricting development activities within this area. Full-field development would place structures outside of buffer areas and areas where surface activities are restricted. Some development would occur in the CRSA, which is designated for maximum protection of surface resources consistent with the purpose of the area, which is to develop oil reserves. Conformance with the project specific procedures in Section 2, the BLM stipulations in Appendix D, and alternative measures potentially required by the state, is expected to meet the maximum protection criterion.

The proposed development under Alternative B, constructed and operated in compliance with the project specific procedures in Section 2, the BLM stipulations, and alternative measures potentially required by the state, is expected to be consistent with state and NSB coastal management policies. Implementation of the CPAI proposal and/or FFD would require NSB re-zoning of plan areas east of the National Petroleum Reserve-Alaska from "Conservation" to "Resource Development" and permitting of activities through the approval of a master plan. Application of the NSB's land management regulations to oil and gas activities on federal lands is subject to legal constraints and therefore must be evaluated on a case-by-case basis as particular activities are proposed.

4B.4.6.4 Alternative B – Potential Mitigation Measures (CPAI and FFD) for Land Uses and Coastal Management

No mitigation measures have been identified for the Alternative B CPAI or FFD Scenarios.

4B.4.6.5 Alternative B – Effectiveness of Protective Measures for Land Uses and Coastal Management

The effectiveness of the protective measures would be similar to Alternative A.

4B.4.7 Recreation Resources

4B.4.7.1 Alternative B – CPAI Development Plan Impacts on Recreation Resources

Under this alternative, effects on recreation users in the plan area would be similar for those described for Alternative A**.** The Alternative B – CPAI Development Plan to develop five pads could potentially affect the recreation experience, including those values mentioned for Alternative A (solitude, quietude, naturalness, and wilderness) over approximately 40,000 acres. However, the recreational use of the Plan Area is very low, and most recreation occurs directly along the Colville River corridor where activities associated with Nuiqsut already have decreased some of these recreational values. Therefore, actual effects to the recreational experience would be minor. Impacts may be lessened compared to those of Alternative A because of the reduced road activity (no roads) associated with development across the Nigliq Channel, though this may be offset by a resultant increase in aircraft traffic. As with Alternative A, recreational opportunities in the Plan

Area under this alternative would remain consistent with the BLM's SPM classification. As a result, no mitigation measures have been identified for this alternative.

ABANDONMENT AND REHABILITATION

Impacts from abandonment and rehabilitation would be somewhat less on recreational use under this alternative than Alternative A. Most recreational use near components of the Alternative B – CPAI Development Plan is along the Nigliq Channel. There would be fewer disturbances along the Nigliq Channel from abandonment and rehabilitation activities because less infrastructure would have been built there. Also because there is no road near the Nigliq Channel, there would be less opportunity for enhanced access after abandonment.

4B.4.7.2 Alternative B – Full-Field Development Scenario Impacts on Recreation Resources

Under the FFD alternative, the types of effects on hunting, fishing, and birding opportunities and the qualities of solitude, quietude, naturalness, and wilderness would be the same as those described for the Alternative B – CPAI Development Plan. However, the potential for such effects would increase under FFD as a result of the increased geographic scope of development. In addition to the potential effects on approximately 40,000 acres from the CPAI scenario, the recreational opportunities on as many as 176,000 acres could be affected if as many as the 22 proposed processing or production pads were developed. The level of impacts for FFD would be similar to that under FFD for Alternative A.

4B.4.7.3 Alternative B – Summary of Impacts (CPAI and FFD) on Recreation Resources

Construction and operation of the facilities proposed under Alternative B (CPAI and FFD) in the Plan Area are not expected to result in more than local adverse effects to the lightly used recreational resources of the Plan Area.

4B.4.7.4 Alternative B – Potential Mitigation Measures (CPAI and FFD) for Recreation Resources

No mitigation measures have been identified.

4B.4.7.5 Alternative B – Effectiveness of Protective Measures for Recreation Resources

The effectiveness of the protective measures would be similar to Alternative A.

4B.4.8 Visual Resources

4B.4.8.1 Alternative B – CPAI Development Plan Impacts on Visual Resources

CONSTRUCTION PERIOD

Construction impacts would be roughly the same as those described in Alternative A.

OPERATION PERIOD

Alternative B would introduce moderate contrast through operation of the five production pads. Some impacts would be lessened. Burial of the power line would eliminate the visual impacts of power poles, and fewer roads would reduce visual impacts of those structures and traffic. Moving CD-6 more than a mile farther from Fish Creek would slightly reduce its visibility and produce less contrast to viewers along the creek. Two additional airstrips (at CD-5 and CD-6) would introduce additional contrast with the natural landscape. If viewed from very close distances within the foreground and middle-ground zone, the color and texture of the airstrips would produce a moderate contrast with the natural landscape. However, since roads would be either non-existent or not accessible to local residents near the airstrips, this would be a negligible impact.

ABANDONMENT AND REHABILITATION

The impacts of abandonment and rehabilitation would be similar to those for Alternative A, though there would be less short-term visual impacts created by fugitive dust.

4B.4.8.2 Alternative B – Full-Field Development Scenario Impacts on Visual Resources

Full-field development construction and operation would introduce moderate contrast. These impacts may be slightly reduced from that described for FFD under Alternative A because there would be fewer and less use of roads and because some pads and their associated roads and pipelines would be moved farther from water travel routes, including Fish and Judy creeks.

4B.4.8.3 Alternative B – Summary of Impacts (CPAI and FFD) on Visual Resources

Alternative B would result in adverse impacts to visual resources, however this alternative would have slightly less of an impact than Alternative A because all power lines would be buried, and as a result, power poles would not be needed, and because some other facilities, including CD-6 in the applicant's proposed action, would be moved away from some water travel routes.

4B.4.8.4 Alternative B – Potential Mitigation Measures (CPAI and FFD) for Visual Resources

Potential mitigation measures would the same as those identified for Alternative A (Section 4A.4.8.5).

4B.4.8.5 Alternative B – Effectiveness of Protective Measures for Visual Resources

The effectiveness of the protective measures would be similar to Alternative A.

4B.4.9 Transportation

4B.4.9.1 Alternative B – CPAI Development Project on Transportation

ROADWAYS

Alternative B would result in the construction of 3 airstrips (at CD-3, CD-5, and CD-6), 10 miles of new gravel roads, and 36.5 miles of pipelines within the Plan Area. Use of the roadways and airstrip would be restricted to oil industry personnel and would not be open to residents of Nuiqsut.

This alternative significantly reduces the roadway network west of the Nigliq Channel and relies instead on air access, ice roads, and low ground pressure vehicles to most of the proposed production pads.

CONSTRUCTION PERIOD

Construction activities, phasing, and workforce under Alternative B would be the same as under Alternative A. No adverse effects on any public roadways are anticipated.

OPERATION PERIOD

Operation of the ASDP facilities would result in an increase of supply shipments to the North Slope on the Dalton Highway, as discussed under Alternative A. This increase is not expected to adversely affect traffic operations on the Dalton Highway or industry roads to the east of the Alpine Facility. Operation of the facilities under Alternative B would result in a lower level of traffic within the Plan Area than under Alternative A. Road access within the Plan Area would only be available from the Alpine Facility to CD-4 and from CD-6 to CD-7. Transport of bulk operating supplies and materials to the production pads would only be possible during the

winter, resulting in a need to construct larger storage facilities at the production pads. High-value, low-weight supplies, or other essential supplies that cannot wait to be sent until winter, may be shipped in by air.

Alternative B limits use of those gravel roads constructed within the Plan Area to industry-related personnel only. The only section of road west of the Nigliq Channel is between CD-6 and CD-7, and access to that section of road could only be by airstrip at CD-6, ice road, or low-ground-pressure vehicle. Therefore, Alternative B does not provide any new year-round road access to areas west of the Nigliq Channel in the Fish-Judy Creeks Facility Group. This design would result in much of the supply operations related to the site being concentrated in the winter, which would reduce total summer activity in the area. Potential effects to subsistence resources from this increased activity are addressed under Section 4B.4.3.

RAILROAD TRANSPORTATION

CONSTRUCTION PERIOD

As discussed under Alternative A, this alternative would not adversely affect rail transportation facilities during construction.

OPERATIONS PERIOD

As under Alternative A, this alternative would not adversely affect rail transportation facilities during operations.

MARINE FACILITIES

CONSTRUCTION PERIOD

As under Alternative A, Alaska ports and marine transport firms are expected to have sufficient capacity to meet any demands for marine transport associated with construction. This alternative is not expected to adversely affect marine transportation facilities.

OPERATIONS PERIOD

Transport of supplies during normal operations does not typically involve marine transport. Therefore, operation of the facilities proposed under Alternative B would not adversely affect marine transportation facilities.

RIVER TRANSPORTATION

CONSTRUCTION PERIOD

Most construction in the vicinity of rivers would occur during winter. Under Alternative B, there would be more use of ice roads and ice bridges throughout the construction period. Construction activities may interfere with some winter travel on frozen channels, but the interference is expected to be limited and it is expected that local residents' travel needs will be accommodated through construction areas. The increased use of ice bridges could potentially temporarily affect river access early in the summer if the ice bridge were to delay ice breakup in the river.

OPERATIONS PERIOD

Alternative B proposes construction of only pipelines over most waterways, including the Nigliq Channel and the Ublutuoch River. Pipeline bridges on navigable waterways would be designed to minimize effects on navigation. The lack of gravel roads would require more use of ice bridges throughout the operations period, increasing the potential for delayed access to river channels. The docks proposed under this alternative are the

same as those proposed under Alternative A. Therefore, operation of the facilities proposed under Alternative B is not expected to have any adverse effects on river transportation.

AVIATION FACILITIES

CONSTRUCTION PERIOD

As discussed under Alternative A, most construction personnel are expected to be transported by air to the North Slope by Shared Services Aviation. The construction workforce for Alternative B is similar to that discussed in Alternative A and effects would be similar. Because of the absence of gravel roads, however, air traffic levels are anticipated to be higher for Alternative B than for Alternative A. Transport of these additional workers and supplies would not be expected to have an adverse effect on aviation facilities and services to the North Slope.

Construction operations for the proposed facilities under Alternative B could result in slightly more aircraft flights (five per day) during construction, particularly during summer work on production pads. Because most construction would take place in the winter, however, the increase in flights could be minimal. It is expected that Shared Services Aviation would be able to provide the additional flights required and contract support could be used to supplement these flights.

OPERATIONS PERIOD

The demand for aviation support for operation of the production pads under Alternative B would require additional flights to the three west production pads because no road access from the housing facilities at the Alpine Facility would be available. It is estimated that operations personnel would fly from the existing Alpine Facility to these remote sites once every 3 days. It is expected that Shared Services Aviation would be able to accommodate these additional trips with its existing crews and air fleet. These services may be supplemented with contract air support as needed. The increased demand for air support is not expected to adversely affect air transportation resources within the region; however, it would have a direct impact on noise levels in the vicinity of the applicant's proposed action.

PIPELINES

CONSTRUCTION PERIOD

There would be no effects on existing pipeline facilities during the construction phase**.**

OPERATIONS PERIOD

During operations, production flows would be managed to remain within the capacity of the existing sales oil pipeline from the Alpine Facility to Kuparuk. As under Alternative A, the projected increase in throughput to TAPS under Alternative B is expected to remain well within the capacity of the pipeline.

ABANDONMENT AND REHABILITATION

Impacts would be similar to those associated with Alternative A.

4B.4.9.2 Alternative B – Full-Field Development Scenario on Transportation

ROADWAYS

Construction impacts to roadways outside the Plan Area would be similar to those identified for Alternative A. Construction materials and personnel from Kuparuk would be transported to the Plan Area primarily by ice road

in the winter. Some high-value, low-weight materials could be flown in to remote construction sites once the airstrips have been built.

Operations vehicular traffic associated with FFD would be lower under Alternative B than under Alternative A. Although no bridge over the Nigliq Channel to connect the western production pad areas to the existing Alpine Facility is proposed, the roadway network would connect the production pads in the eastern portion of the Fish-Judy Creeks Facility Group. This road network would not directly connect to Nuiqsut, but would be near the village. The more remote roadway networks connecting the production pads in the central and western portions of the Fish-Judy Creeks Facility Group and the roadways in the Kalikpik-Kogru Rivers Facility Group would not be connected across the Nigliq Channel to the existing Alpine Facility or other industry road networks to the east. No public access would be allowed on the proposed roads; use would be restricted to personnel related to the oil industry activities.

RAILROAD TRANSPORTATION

The demands on the railroad for construction and operation of the FFD Scenario would be the same for Alternative B as for Alternative A. It is expected that Alaska Railroad could meet the construction and operation needs without adversely affecting ongoing railroad operations.

MARINE FACILITIES

Phased construction of the FFD Scenario would likely occur over many years. Marine transport would likely be used to transport large, heavy construction equipment or production facilities for use in the Plan Area. Although the demand for marine transport has not been quantified, it is assumed that existing marine support services could accommodate the construction and operations demand associated with the FFD Scenario.

RIVER TRANSPORTATION

Construction and operations activities under Alternative B are likely to be similar to those described under Alternative A. Although Alternative B has more pipeline bridges and less road bridges, the impacts would be expected to be similar. There could be a need for more ongoing use of ice bridges across the Nigliq Channel, which could result in delaying access to the channel in the summer.

AVIATION FACILITIES

The Alternative B – Full-Field Development Scenario would require additional air support during construction and operations, especially for construction of the remote production pads. Transport of personnel from Anchorage or Fairbanks to Deadhorse, Kuparuk, or both would remain the same as for Alternative A. Air traffic, however, is anticipated to be somewhat higher than for Alternative A. There could be substantial increased demand (by as much as 40 percent) for flights from Kuparuk or the Alpine Facility to the proposed construction sites throughout the Plan Area, particularly during summer months, because of the lack of road access. Because development of the remote facilities under FFD is likely to be phased over a substantial period of time, it is believed that this level of flight operations could be accommodated by Shared Services Aviation and be supplemented with contract aviation support as needed. This additional demand is not expected to adversely affect air transportation resources in the region.

Operations under FFD would require that personnel fly to remote production pads approximately 3 times per weeks. Because of the number of production pads that have no road access, the demand for aviation support for these remote facilities would increase the number of flights needed. It is possible that there would be a need for Shared Services Aviation to increase its capacity or to be supplemented with contract aviation support. This additional demand is not expected to adversely affect air transportation resources in the region.

PIPELINES

As with Alternative A, the volume of oil to be produced from the phased implementation of FFD would be expected to remain within the capacity of the sales oil pipeline from the Alpine Field and TAPS.

4B.4.9.3 Alternative B – Summary of Impacts (CPAI and FFD) on Transportation

Most bridge construction activities will be conducted when the impacted waterways are frozen. If not, the applicant should work with local village and other vessel operators in order to facilitate marine navigation during construction. If bridge construction activities requires limiting vessel traffic, the applicant should issue sufficient notification of such closures to reduce conflict with marine navigation activities. A condition of the applicant's Coast Guard Bridge permit will require that construction of falsework, cofferdams or other obstructions, if required, shall be in accordance with plans submitted to approved by the Commandant prior to construction of the bridges. All work shall be so conducted that the free navigation of the waterway is not unreasonably interfered with and the present navigational depths are not impaired. Timely notice of any and all events that may affect navigation shall be given to the District Commander (Seventeenth District) during construction of the bridges.

4B.4.9.4 Alternative B – Potential Mitigation Measures (CPAI and FFD) for Transportation

The potential for impacts to river navigation during construction could be mitigated through development of a navigation plan for commonly navigated channels that would be crossed by pipelines or bridges. The navigation plan should be submitted to the USCG for review prior to the start of construction of pipelines or bridges over commonly navigated channels. This could help minimize impacts to river navaigation and help assure reasonable navigation means during construction.

4B.4.9.5 Alternative B – Effectiveness of Protective Measures for Transportation

The effectiveness of the protective measures would be similar to Alternative A.