APPENDIX D

ENDANGERED AND THREATENED SPECIES CONSULTATION AND FINAL BIOLOGICAL ASSESSMENT

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Alaska State Office
222 West Seventh Avenue, #13
Anchorage, Alaska 99513-7599
http://www.ak.blm.gov

TAKE PRIDE® IN AMERICA

6840(931)

Mr. James Balsinger
Regional Administrator, Alaska Region
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

Dear Mr. Balsigner:

The United States Department of the Interior (USDOI), Bureau of Land Management (BLM) has initiated the process to amend the 1998 Northeast National Petroleum Reserve-Alaska Integrated Activity Plan/Environmental Impact Statement (IAP/EIS). The BLM is amending this existing plan to consider opening a portion of BLM-administered lands (public lands) that are currently unavailable for oil and gas leasing in the Northeast portion of the National Petroleum Reserve-Alaska (Northeast Planning Area). In addition, the BLM proposes to develop performance-based lease stipulations and Required Operating Procedures (ROPs) in the Northeast Planning Area similar to those stipulations and ROPs included in the Northwest National Petroleum Reserve–Alaska IAP/EIS Record of Decision (Northwest IAP/EIS ROD; USDOI BLM and MMS 2004).

The management plan will fulfill BLM's responsibility for managing lands in the Northeast Planning Area. The plan also fulfills mandates of the President's energy policy to undertake "environmentally responsible oil and gas development in the National Petroleum Reserve-Alaska." In 2002, the President's National Energy Policy Development Group recommended that the President direct the Secretary of the Interior to "consider additional environmentally responsible oil and gas development, based on sound science and the best available technology, through further lease sales in the Petroleum Reserve" and that "such consideration should include areas not currently leased within the northeast corner of the Petroleum Reserve".

Congress first authorized an oil and gas leasing program in the Northeast Planning Area in 1981. The BLM completed an Environmental Assessment (EA) of the Northeast Planning Area in 1981, and an EIS in 1983 (USDOI BLM 1983) that deleted some areas from leasing and recommended stipulations, especially in areas with high surface values. A total of four lease sales were held during 1982 to1985, resulting in the drilling of a single well that was abandoned as a dry hole in 1985.

As a result of renewed interest in the Northeast Planning Area, and the need to update the environmental analysis of potential impacts from oil and gas development, the BLM began an assessment in 1997 of the potential impacts from oil and gas development in the Northeast portion of the Petroleum Reserve, including all lands in the Petroleum Reserve east of the Northwest National Petroleum Reserve-Alaska. The Northeast Plan culminated in a ROD in October 1998 that superseded the decisions of the 1983 EIS and included a decision to make approximately 4 million of the 4.6 million acres available for oil and gas leasing (USDOI BLM and MMS 1998).

Among other decisions, this document made approximately 87 percent of the Northeast Planning Area available for leasing, while approximately 600,000 acres in the Teshekpuk Lake area remained unavailable for leasing and an additional 240,000 acres were restricted to leasing with no permanent facilities and no exploratory wells. The area that is closed to leasing near Teshekpuk Lake is an area with especially high oil and gas potential. By excluding these areas from future oil and gas leasing, approximately 2 billion of the estimated 3.2 billion barrels of technically recoverable oil in the Northeast Planning Area was made unavailable. The 1998 Northeast IAP/EIS ROD also contained a set of prescriptive-based stipulations to protect natural and cultural resources.

In the five years since the completion of the 1998 Northeast ROD, the BLM has held oil and gas lease sales, leasing 133 tracts in 1999, and leasing an additional 60 tracts in 2002. Many lease tracts were sold around the perimeter of the Teshekpuk Lake area. Since the initial lease sale, industry has completed many miles of seismic lines and drilled 14 exploratory wells. ConocoPhillips Alaska, Incorporated has proposed development of five drilling pads that would be satellites to its Alpine field, near the village of Nuiqsut. Two of the pads would be on public lands within the Northeast Planning Area.

To assess opportunities for oil and gas production on federal lands in the Northwest portion of the National Petroleum Reserve–Alaska (Northwest Planning Area), the BLM began assessing the potential impacts from oil and gas development in the Northwest Planning Area in 2001. The Northwest IAP/EIS was completed in December 2003 (USDOI BLM and MMS 2003) and culminated in a ROD in January 2004 that superseded the decisions of the 1983 EIS and included a decision to make 8.8 million acres available for oil and gas leasing. The ROD also contained a set of performance-based stipulations to protect natural and cultural resources in the Northwest Planning Area. These stipulations differ from those developed for the 1998 Northeast IAP/EIS in that they:

1. Do not include actions that already exist in the form of regulation or law;
2. Are reformatted into logical groupings, or Required Operating Procedures; and
3. Provides the BLM and other land users, including industry, greater flexibility by emphasizing the intent or objective of the mitigation to protect the environment.

To carry out its management responsibilities and respond to the Presidential and Congressional directives to the Secretary of the Interior, the BLM is proposing to amend its 1998 Northeast IAP/EIS to:

1. Consider leasing portions of lands currently closed to oil and gas leasing in the Northeast National Petroleum Reserve-Alaska;
2. Develop performance-based measures to protect important surface resources from the impacts of oil and gas activities, similar to those developed for the Northwest National Petroleum Reserve–Alaska.

The BLM is committed to ensuring that ecosystems in all portions of the National Petroleum Reserve-Alaska remain healthy and productive. The amended plan includes various current and future land based surface-impacting activities that may affect some species within the Northeast Planning Area of the Petroleum Reserve, and could result in an increase in marine barge traffic in the offshore environment. However, the increase in marine traffic would be minimal during the exploration phase, and is expected to have no impact on marine listed species. If development should result from successful exploration, its impacts would be analyzed in future National Environmental Policy Act compliance and Section 7, Endangered Species Act requirements.

Your staff has reviewed the amendment and preferred alternative. The Bureau of Land Management requests a letter of concurrence to conclude this informal Section 7 consultation

If you have any questions, please contact John Payne (907) 271-3431.

Henri R. Bisson
State Director

2 Enclosures
1 - Notice of Intent (2 pp)
2 - General Lease Stipulations and Required Operating Procedures (21 pp)

cc:
Project Manager, Northeast Petroleum Reserve-Alaska Plan Amendment

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United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Alaska State Office
222 West Seventh Avenue, #13
Anchorage, Alaska 99513-7599
http://www.ak.blm.gov

6840(931)

Memorandum

To: Regional Director, Regional 7, U.S. Fish and Wildlife Service

From: State Director, Alaska

Subject: Initiation of Section 7 Consultation for the Northeast National Petroleum Reserve- Alaska Integrated Activity Plan/Environmental Impact Statement Plan Amendment

The United States Department of the Interior (USDOI), Bureau of Land Management (BLM) has initiated the process to amend the 1998 Northeast National Petroleum Reserve-Alaska Integrated Activity Plan/Environmental Impact Statement (IAP/EIS). The BLM is amending this existing plan to consider opening a portion of BLM-administered lands (public lands) that are currently unavailable for oil and gas leasing in the Northeast portion of the National Petroleum Reserve-Alaska (Northeast Planning Area). In addition, the BLM proposes to develop performance-based lease stipulations and Required Operating Procedures (ROPs) in the Northeast Planning Area similar to those stipulations and ROPs included in the Northwest National Petroleum Reserve–Alaska IAP/EIS Record of Decision (Northwest IAP/EIS ROD; USDOI BLM and MMS 2004).

The management plan will fulfill BLM's responsibility for managing lands in the Northeast Planning Area. The plan also fulfills mandates of the President's energy policy to undertake "environmentally responsible oil and gas development in the National Petroleum Reserve-Alaska." In 2002, the President's National Energy Policy Development Group recommended that the President direct the Secretary of the Interior to "consider additional environmentally responsible oil and gas development, based on sound science and the best available technology, through further lease sales in the Petroleum Reserve" and that "such consideration should include areas not currently leased within the northeast corner of the Petroleum Reserve".

Congress first authorized an oil and gas leasing program in the Northeast Planning Area in 1981. The BLM completed an Environmental Assessment (EA) of the Northeast Planning Area in 1981, and an EIS in 1983 (USDOI BLM 1983) that deleted some areas from leasing and recommended stipulations, especially in areas with high surface values. A total of four lease sales were held during 1982 to1985, resulting in the drilling of a single well that was abandoned as a dry hole in 1985.

As a result of renewed interest in the Northeast Planning Area, and the need to update the environmental analysis of potential impacts from oil and gas development, the BLM began an assessment in 1997 of the potential impacts from oil and gas development in the Northeast portion of the Petroleum Reserve, including all lands in the Petroleum Reserve east of the Northwest National Petroleum Reserve-Alaska. The Northeast Plan culminated in a ROD in October 1998 that superseded the decisions of the 1983 EIS and included a decision to make approximately 4 million of the 4.6 million acres available for oil and gas leasing (USDOI BLM and MMS 1998).

Among other decisions, this document made approximately 87 percent of the Northeast Planning Area available for leasing, while approximately 600,000 acres in the Teshekpuk Lake area remained unavailable for leasing and an approximate additional 240,000 acres were restricted to leasing with no permanent facilities and no exploratory wells. The area that is closed to leasing near Teshekpuk Lake is an area with especially high oil and gas potential. By excluding these areas from future oil and gas leasing, approximately 2 billion of the estimated 3.2 billion barrels of technically recoverable oil in the Northeast Planning Area was made unavailable. The 1998 Northeast IAP/EIS ROD also contained a set of prescriptive-based stipulations to protect natural and cultural resources.

In the five years since the completion of the 1998 Northeast ROD, the BLM has held oil and gas lease sales, leasing 133 tracts in 1999, and leasing an additional 60 tracts in 2002. Many lease tracts were sold around the perimeter of the Teshekpuk Lake area. Since the initial lease sale, industry has completed many miles of seismic lines and drilled 14 exploratory wells. ConocoPhillips Alaska, Incorporated has proposed development of five drilling pads that would be satellites to its Alpine field, near the village of Nuiqsut. Two of the pads would be on public lands within the Northeast Planning Area.

To assess opportunities for oil and gas production on federal lands in the Northwest portion of the National Petroleum Reserve–Alaska (Northwest Planning Area), the BLM began assessing the potential impacts from oil and gas development in the Northwest Planning Area in 2001. The Northwest IAP/EIS was completed in December 2003 (USDOI BLM MMS 2003) and culminated in a ROD in January 2004 that superseded the decisions of the 1983 EIS and included a decision to make 8.8 million acres available for oil and gas leasing. The ROD also contained a set of performance-based stipulations to protect natural and cultural resources in the Northwest Planning Area. These stipulations differ from those developed for the 1998 Northeast IAP/EIS in that they:

1. Do not include actions that already exist in the form of regulation or law;
2. Are reformatted into logical groupings, or Required Operating Procedures; and
3. Provides the BLM and other land users, including industry, greater flexibility by emphasizing the intent or objective of the mitigation to protect the environment.

To carry out its management responsibilities and respond to the Presidential and Congressional directives to the Secretary of the Interior, the BLM is proposing to amend its 1998 Northeast IAP/EIS to:

1. Consider leasing portions of lands currently closed to oil and gas leasing in the Northeast National Petroleum Reserve-Alaska;
2. Develop performance-based measures to protect important surface resources from the impacts of oil and gas activities, similar to those developed for the Northwest National Petroleum Reserve–Alaska.

The BLM is committed to ensuring that ecosystems in all portions National Petroleum Reserve-Alaska remain healthy and productive. The amended plan includes various current and future land based surface-impacting activities that may affect species listed under the Endangered Species Act of 1973, as amended (16 USC 1531 *et seq.*) within the Northeast Planning Area of the Petroleum Reserve. Your staff at the Northern Fish and Wildlife Service Field Office have been consulted informally in regards to Section 7, Endangered Species Act requirements for this plan amendment. This memorandum requests a species list for any listed species in the region. In addition, BLM would like to enter into formal Section 7 consultation for this plan amendment. A biological assessment is currently being prepared and will be submitted in the near future.

If you have any questions, please contact John Payne (907) 271-3431.

Henri R. Bisson
State Director

2 Enclosures
1 - Notice of Intent (2 pp)

2 - General Lease Stipulations and Required Operating Procedures (21 pp)

cc:
Manager, Northern Fish and Wildlife Service Field Office
Project Manager, Northeast Petroleum Reserve-Alaska Plan Amendment

TABLE OF CONTENTS

Page

List of Tables

Note to Reader: This document contains references to maps, figures, and tables that are part of the *Northeast National Petroleum Reserve – Alaska Final Amended Integrated Activity Plan/Environmental Impact Statement* (Final Amended IAP/EIS). They are referenced in this document, but contain the original numbering scheme used in the Final Amended IAP/EIS.

APPENDIX D

BIOLOGICAL ASSESSMENT

D.1 Introduction and Background

The United States Department of the Interior (USDOI), Bureau of Land Management (BLM) has initiated an amendment to the Northeast National Petroleum Reserve – Alaska Integrated Activity Plan/Environmental Impact Statement (Amended IAP/EIS; amendment). The BLM is amending its 1998 Northeast IAP/EIS to consider opening portions of the BLM-administered lands that are currently unavailable for oil and gas leasing in the Northeast National Petroleum Reserve – Alaska. In addition, the BLM proposes to develop performance-based lease stipulations and Required Operating Procedures (ROPs) for the Northeast National Petroleum Reserve – Alaska (Planning Area), similar to those stipulations and ROPs that were included in the Northwest National Petroleum Reserve – Alaska IAP/EIS Record of Decision (Northwest IAP/EIS ROD; USDOI BLM and MMS 2004).

The Amended IAP/EIS will fulfill the BLM's responsibility for managing lands in the Planning Area. The amendment will also fulfill mandates of the President's energy policy to undertake "environmentally responsible oil and gas development in the National Petroleum Reserve – Alaska." In 2002, the President's National Energy Policy Development Group recommended that the President direct the Secretary of the Interior to "consider additional environmentally responsible oil and gas development, based on sound science and the best available technology, through further lease sales in the National Petroleum Reserve – Alaska" and that "such consideration should include areas not currently leased within the northeast corner of the National Petroleum Reserve – Alaska."

Congress first authorized an oil and gas leasing program in the National Petroleum Reserve – Alaska in 1981. The BLM completed an Environmental Assessment (EA) of the National Petroleum Reserve – Alaska in 1981, and an EIS in 1983 (USDOI BLM 1983) that removed some areas from leasing and recommended stipulations, especially in areas with high surface values. A total of four lease sales were held during 1982 to 1985, resulting in the drilling of a single well that was abandoned as a dry hole in 1985.

As a result of renewed interest in the National Petroleum Reserve – Alaska, and the need to update the environmental analysis of potential impacts from oil and gas development in the National Petroleum Reserve – Alaska, the BLM began an assessment in 1997 of the potential impacts from oil and gas development in the Planning Area, including all lands east of the Northwest National Petroleum Reserve – Alaska. The 1998 Northeast IAP/EIS culminated in a ROD in October 1998 that superseded the decisions of the 1983 EIS and included a decision to make approximately 4 million of the 4.6 million acres available for oil and gas leasing (USDOI BLM and MMS 1998). The 1998 Northeast IAP/EIS ROD also contained a set of prescriptive-based stipulations to protect natural and cultural resources in the Northeast National Petroleum Reserve – Alaska.

Among other decisions, the ROD made approximately 87 percent of the Planning Area available for leasing, while approximately 600,000 acres in the Teshekpuk Lake area remained unavailable for leasing and approximately 240,000 acres were restricted to leasing with no permanent facilities and no exploratory wells. The area near Teshekpuk Lake that is closed to leasing is an area with especially high oil and gas potential. By excluding these areas from future oil and gas leasing, approximately 2 billion of the estimated 3.2 billion barrels of technically recoverable oil in the Planning Area was made unavailable.

In the 6 years since the completion of the 1998 Northeast IAP/EIS ROD, the BLM has held oil and gas lease sales, leasing 133 tracts in 1999, and an additional 60 tracts in 2002. Many lease tracts were sold around the perimeter of the Teshekpuk Lake area. Since the initial lease sale, industry has completed many miles of seismic lines and drilled 14 exploratory wells. ConocoPhillips Alaska, Inc., has proposed development of five drilling pads that would be satellites to its Alpine field, near the village of Nuiqsut. Two of the pads would be within the Planning Area.

To assess opportunities for oil and gas production on federal lands in the Northwest National Petroleum Reserve – Alaska, the BLM began assessing the potential impacts from oil and gas development in this area in 2001. The Northwest IAP/EIS was completed in December 2003 (USDOI BLM and MMS 2003) and culminated in a ROD in January 2004 that superseded the decisions of the 1983 EIS and included a decision to make 8.8 million acres available for oil and gas leasing. The Northwest ROD also contained a set of performance-based mitigations to protect natural and cultural resources in the Northwest National Petroleum Reserve – Alaska. These mitigations differ from those developed for the 1998 Northeast IAP/EIS in that they:

- Do not include actions that already exist in the form of regulation or law;
- Are modified to reflect an adaptive management concept through the principles of performance-based mitigation measures.

These mitigation measures will provide the BLM and other land users, including industry, greater flexibility by emphasizing the intent or objective of the mitigation to protect the environment.

To carry out its management responsibilities and respond to the Presidential and congressional directives to the Secretary of the Interior, the BLM is proposing to amend its 1998 Northeast IAP/EIS Record of Decision to:

- Consider leasing portions of lands currently closed to oil and gas leasing in the Northeast National Petroleum Reserve – Alaska; and
- Develop performance-based mitigation measures to protect important surface resources from the impacts of oil and gas activities, similar to those developed for the Northwest National Petroleum Reserve – Alaska.

The BLM is committed to ensuring that ecosystems in the National Petroleum Reserve – Alaska remain healthy and productive. The management plan includes various current and future surface-impacting activities that could affect spectacled eiders (*Somateria fischeri*) and Steller's (*Polysticta stelleri*) eiders, species that are federally listed as threatened under the Endangered Species Act (ESA), such as aircraft use, hazardous and solid material removal and remediation, overland moves, seismic activities, and oil and gas leasing, exploration, development, and production activities. Such activities, particularly oil and gas activities, temporary camps, and aircraft traffic associated with wildlife studies and other surveys, could result in disturbance, altered habitat, and spills of oil or other contaminants. These occurrences could adversely affect the behavior, distribution, and abundance of individual eiders or the population occurring in or adjacent to the Planning Area.

This Biological Assessment (BA) is prepared in accordance with Section 7 of the ESA of 1973, as amended (16 USC 1531 et seq.) This document describes 1) the various activities that may occur under the management plan, and proposed oil and gas lease sales, to the standard of a reasonably foreseeable development scenario; 2) the distribution, abundance, and habitat use of listed eiders; 3) the potential impacts of proposed oil and gas leasing as well as exploration, development, and production activities that might occur in the future; 4) the potential impacts of other prescribed activities; and 5) the proposed mitigating measures that could reduce potential adverse effects on listed eiders. The BA covers all anticipated effects of the Amended IAP/EIS on listed eiders. This assessment provides sufficient information on listed eiders and the potential impacts of a reasonably foreseeable development scenario and activities that might occur in the future to support issuance of a Biological Opinion (BO) regarding the reasonable likelihood of the entire action violating Section 7(a)(2) of the ESA, as amended. The U.S. Fish and Wildlife Service (USFWS) previously issued a BO for the Northeast National Petroleum Reserve – Alaska during the 1998 Northeast IAP/EIS. Any BO resulting from the current BA would replace the existing 1998 Northeast IAP/EIS BO.

The analysis incorporates estimates of reasonably foreseeable development scenario for oil and gas development and production impacts on federally-listed eiders thought to be the maximum that could occur (i.e., it attempts to estimate maximum potential impact to eiders given the entire range of potential impacts). Should commercially producible quantities of oil be discovered and development and production be proposed, additional and subsequent consultation would be conducted to consider the effects these activities The BLM also would consider the need for further consultation if 1) additional species were added to the list of species designated as threatened or endangered under the ESA, 2) the proposed actions were substantially modified, or 3) significant new effects-related information was developed.

A detailed description of the endangered and threatened species within the Planning Area and effects analyses of similar proposed actions were included in the following previously issued EISs and BOs:

USDOI BLM. 2004a. Alpine Satellite Development Plan Final Environmental Impact Statement, U.S. Department of the Interior, Bureau of Land Management, Anchorage Alaska.

USDOI BLM. 2004b. Alpine Satellite Development Plan Final Biological Assessment, U.S. Department of the Interior, Bureau of Land Management, Anchorage Alaska.

USDOI BLM and MMS. 1998. Northeast National Petroleum Reserve – Alaska Final Integrated Activity Plan/Environmental Impact Statement. BLM/AK/PL-98/016+3130+930. Anchorage, Alaska.

USDOI BLM and MMS. 2003. Northwest National Petroleum Reserve – Alaska Final Integrated Activity Plan/Environmental Impact Statement. BLM/AK/PL-04/02+3130+930. Anchorage, Alaska.

USDOI MMS, Alaska OCS Region. 2003. Beaufort Sea Planning Area Oil and Gas Lease Sales 186, 195, and 202, Final Environmental Impact Statement. OCS EIS/EA MMS 2003-001. Anchorage, Alaska.

USDOI USFWS. 2003. Biological Opinion for the Northwest National Petroleum Reserve – Alaska Integrated Activity Plan/Environmental Impact Statement, May 2003.

USDOI USFWS. 1998. Biological Opinion for the Northeast National Petroleum Reserve – Alaska Integrated Activity Plan/Environmental Impact Statement, March 17, 1998.

This BA references maps (2-4, 3-4, 3-33, and 3-34) and tables (4-4 and 4-5) that are included in the Final Amended IAP/EIS. Section 2.6 (Stipulations and Required Operating Procedures) of the Amended IAP/EIS contains the text for the lease-sale stipulations and ROPs discussed in the BA.

D.2 Description of Proposed Activities Using the Agency Final Preferred Alternative and Key Assumptions in the Analysis

D.2.1 Reasonable and Foreseeable Oil Development Scenario and Key Assumptions

The 1998 Northeast IAP/EIS considered two sets of scenarios: the first lease sale scenario and the multiple lease scenarios. Because two lease sales have occurred since the 1998 Northeast IAP/EIS ROD, the scenarios presented in the Amended IAP/EIS and in this BA assume multiple lease sales and full development of the estimated resources within the constraints of the evaluated alternatives.

Under the final Preferred Alternative, all of the Planning Area is available for leasing, except for Teshekpuk Lake (approximately 211,000 acres), which is deferred from leasing. This deferral would also preclude exploratory drilling. An additional 374,000 acres north and east of Teshekpuk Lake would have No Surface Occupancy restrictions. Current leases would not be restricted by the No Surface Occupancy restrictions.

The reasonably foreseeable development scenario is based on a comprehensive geological analysis and computer simulation modeling completed in 2002 by the Minerals Management Service (MMS) and the BLM. In this analysis, the results of petroleum resource characteristics of commercial fields, and of areas where these fields are likely to be discovered and developed were modeled using an average oil price of $30 per barrel. The exact locations for future commercial projects are impossible to define prior to exploration drilling. It is uncertain whether any commercial fields would be discovered, particularly if oil prices were to fall below $20 per barrel for an extended period of time.

D.2.1.1 Hydrocarbon Potential and Economics

Under the regulatory conditions of the final Preferred Alternative, it is estimated that up to 12 new fields would be developed as a result of multiple lease sales conducted in the Planning Area. Oil and gas fields on Alaska's North Slope typically are composed of one or more subsurface pools. These pools may, or may not, be grouped so that they can be produced from a common infrastructure. The first fields developed would be oil fields. Currently, no infrastructure exists to transport natural gas from the North Slope to a market. While natural gas is a byproduct of oil development, the BLM does not consider natural gas production to be reasonably foreseeable.

Assuming $30-per-barrel oil, 1,727 million barrels of oil could be developed in the Planning Area. Analyses of the geologic plays indicate commercial fields are most likely to be discovered in the portion of the Planning Area designated the "High Potential" area (i.e., the area having the highest economic potential for oil development, based on $30-per-barrel oil; Map 3-4). This High Potential area includes the area surrounding Teshekpuk Lake and the coastal areas to the north of the lake.

In previous oil leases, larger fields typically have been found earlier in the exploration cycle, and are more likely to be economically viable. This reasonable and foreseeable scenario assumes that the first fields developed in the Planning Area would be approximately the size of the Alpine field in extent of gravel cover, petroleum resources, associated activity, and current technology. The following hypothetical discovery and related reasonably foreseeable development and production schedule is the BLM's estimate of the types and timing of activities that could occur as a result of multiple lease sales under the final Preferred Alternative.

This analysis is based on two distinct, but related, phases in the discovery and development of an oil field on the North Slope of Alaska. In the first phase a lease sale is held, followed by the successful lessee entering into an exploration program. The second phase is success in discovery, followed by the construction of production facilities, operation and, in approximately 30 years, abandonment of the sites.

D.2.1.2 Key Assumptions for Analysis

Key assumptions for this BA ensure that the analysis is conservative with respect to the listed eider species. The following reasonably foreseeable scenario assumes that all of the projected development under the final Preferred Alternative would occur in the area of high potential for oil and gas development (Map 3-4).

Beginning in 1986, extensive aerial waterfowl breeding population surveys (referred to as breeding pair surveys) have been conducted by the USFWS on the Arctic Coastal Plain (ACP) of Alaska. These surveys have provided population estimates for many species of breeding waterfowl throughout the ACP (Mallek et al. 2003). The timing of this breeding pair survey, however, is too late to accurately assess eider populations, as male eiders begin leaving the ACP in mid- to late June (before the start of the aerial breeding pair survey; Larned et al. 2003). In 1992, a second survey (referred to as the eider population survey) was begun in order to collect information at a more phenologically appropriate time for the detection of male eiders. This eider population survey has been conducted annually since 1992, and has provided data to develop a population index and distributional information for several species, including spectacled eiders. Given that Steller's eiders are present on the ACP in very low densities, the eider population survey's sampling intensity is inadequate for obtaining data to develop a population index for this species. Quakenbush et al. (2002) has suggested that the range of the Steller's eider in Alaska has been greatly reduced, mostly in the vicinity of Barrow. In 1999, a survey specifically designed to obtain information on Steller's eiders in the Barrow area was initiated (Ritchie and King 2002, 2003). The survey area, which is referred to as the "Barrow Triangle," encompasses a 1,064-mi^2 (2,757-km^2) area south of Barrow and west of Admiralty Bay (see Ritchie and King [2004] for a complete description of the study area and slight differences among years). This survey has provided densities and population estimates of Steller's eiders in the Barrow area for the past 5 years.

The spectacled eider density used for this analysis was derived from population survey data collected between 1992 and 2002 (Larned et al. 2003). As some high density areas have been found in the Planning Area, the BLM chose the high end of the range of spectacled eider densities found on the eider population survey, or 2.85 observed birds per mi^2 (1.10 observed birds per km^2; Bob Platte, USFWS, pers. Comm.), as the basis for this analysis. A visibility correction factor has not been applied to this density estimate.

In order to be as conservative with respect to Steller's eiders, the BLM chose to use densities generated by the "Barrow Triangle" survey, as they are likely to be the greatest densities of Steller's eiders present on the ACP. For this analysis, the BLM used a mid-level Steller's eider density of 0.16 observed birds per mi^2 (0.06 observed birds per km^2; Ritchie and King 2002, 2003), since high densities of Steller's eiders have not been found anywhere in the Planning Area. A visibility correction factor has not been applied to this density estimate.

The selected densities are intended to represent the high end of a reasonable range, in recognition of the uncertainties about the future location of facilities, as well as imprecise information on eider distribution. Use of these density figures would likely result in the overestimation of potential impacts to listed eiders, thus ensuring that if development were to occur elsewhere in the Planning Area, the effects generally would be equal to or less than those noted in this BA. However, the assumed densities do not compensate for the bias inherent in estimating bird densities from aerial surveys. An established/accepted visibility correction factor is not currently available to apply to eiders detected on the aerial surveys. A visibility correction factor would allow the numbers of individuals observed from the air to be converted to a more accurate representation of the actual number of birds present by compensating for those birds not detected from the aircraft. In the absence of such a correction factor, the BLM assumes that the aerial survey data used for this BA may underestimate both populations and densities of listed eiders within the Planning Area.

To address disturbance effects to eiders, in addition to the immediate habitat loss from gravel pad and road development, the BLM is assuming both a 656-foot (200-meter) and a 1,640-foot (500-meter) zone of influence occur around all gravel production and development pads and roads. The 656-foot (200-meter) zone of influence has been used in previous analysis by USFWS, but is based on best professional judgment and little empirical data supports its use. The additional 1,640-foot (500-meter) zone of influence will allow for a determination of the maximum number of eiders that potentially could be affected by production facilities.

Development assumes 48 exploration wells and 35 delineation wells would be drilled using four exploration drill rigs. Exploration and delineation drilling would occur during winter months. Previous experience, in an unproven, high-cost, frontier area, has shown that this many exploration wells typically are required to discover an estimated 12 economically developable fields. Delineation and appraisal exploration would require three winter seasons to determine the extent of each field. While exploration activities primarily would be a winter exercise, "cold stacking," or the storage of exploration equipment, would occur at designated sites that would be accessible by helicopter or fixed-wing aircraft during the summer season to allow for occasional routine inspections.

For analysis, it is assumed development would include two larger fields that would serve as Central Production Facilities (CPFs) that are Alpine field-like in design, each with five satellite fields connected to each CPF, for a total of 12 fields. The CPFs are stand-alone facilities, with processing equipment for separating oil and gas, handling waste, and transporting oil through pipelines to large-scale distribution systems. Satellite developments involve fields too small to support full-scale operations and must rely on CPF facilities to separate the oil and gas, waste handling, and the transport of oil to large-scale distribution systems. Each Alpine field-like CPF would consist of both a production and a processing facility, with a second production-only pad in the near vicinity (≤3 miles), an airstrip, and a connecting road when a second production pad is part of the CPF. Current technology and economic considerations limit satellite fields to a maximum of 20 miles from a CPF. Current technology allows for "roadless" facilities, which means that roads could exist within and between the satellite and CPFs, but no roads would connect the CPFs to each other, and no "feeder" roads would connect to existing infrastructure in the Alpine field or to either of the CPFs. Geologic information, economics of extraction, and proximity to existing infrastructure in the Colville River Delta suggest this reasonably foreseeable development would take place within the area of high economic oil and gas potential. Within the Planning Area, the highest potential for success is in the northern portion of the Planning Area (Map 3-4). None of these facilities would require the establishment of new landfill locations. The approved landfill currently in operation at Deadhorse most likely would be used for materials not requiring additional treatment. Organic wastes would be disposed of in accordance with the Clean Water and Clean Air acts, and the disposal of any liquid or solid waste would not be permitted on site (ROP A-2).

D.2.2 Phase I: Leasing and Exploration

Exploration is on-going in the Planning Area. This document assumes that there would be multiple lease sales in the future, with the first lease sale under the amended IAP/EIS occurring in mid-2005 and leases issued later that year. Exploration actions would begin the following winter season. Other lease sales would be conducted at 2- to 3-year intervals thereafter.

D.2.2.1 Seismic Activities for Exploration

Most seismic surveying occurs during the winter months. Typically, three to four seismic crews are active on the North Slope each winter. It is expected that, on average, one to three 2-D seismic surveys would occur during the next 25 years. Additional 3-D seismic surveys would take place about two to three times during that period. Seismic crews are housed in mobile camps consisting of a "cat train" of trailer sleds pulled by tractors. Winter seismic operations are conducted by all-terrain ground vehicles and supported by light aircraft. Current seismic technology uses vibrator equipment (Vibroseis and airguns) to generate energy into the subsurface. A limited amount of support by aircraft (fixed-wing and helicopter) would be needed to survey potential sites during summer months to prepare for winter survey activities.

The only activities associated with these winter seismic surveys that would occur during the summer would be annual maintenance. Following the end of each winter seismic season, each crew stores its equipment at a staging area, which is usually an existing gravel pad built previously for some other purpose (e.g., during previous exploration in the Northeast National Petroleum Reserve – Alaska, seismic equipment was stored in the summer of 2003 at Lonely and Inigok, both previous development areas). Sometime during the summer, a repair crew would spend 2 to 4 weeks performing annual maintenance and installing upgrades to the seismic equipment. These activities would require aircraft support, with one to two fixed-wing and two to three helicopter flights per week. On completion of the maintenance work, the crew would leave the equipment cold stacked, and there would be no activity until the following winter. For analysis purposes, it is assumed that maintenance operations would be self contained and use accommodations that are part of the seismic camp. On completion of the work, all wastes would be removed and disposed of at approved disposal sites on the North Slope. None of these activities would require the establishment of new landfill locations. The approved landfill currently in operation at Deadhorse most likely would be used for materials not requiring additional treatment. Organic wastes would be disposed of in accordance with the Clean Water and Clean Air acts, and disposal of liquid or solid waste would not be permitted on site (ROP A-2).

Teshekpuk Lake is in the high potential area for oil and could be the subject of future exploration including the conduct of seismic surveys. Previous seismic surveys have been conducted in the lake and are not specifically prohibited under the final Preferred Alternative. The lake has large areas that are too deep to freeze from the lake surface to the lake bottom. Vibroseis surveys do not provide good data when conducted on ice that is not bottom-founded. It is therefore likely that any seismic surveys conducted in the lake (at least in the deep portions) in the future would be carried out during the ice-free period using an array of airguns as the sound source that would be towed behind a vessel. This type of surveying could potentially be conducted in other large lakes or in coastal waters such as the Kogru Inlet. In coastal areas, larger boats may be utilized and the crew could be housed on the vessel. In inland areas, such as Teshekpuk Lake, the seismic crew would likely be housed in temporary field camps or shuttled each day by aircraft to and from existing facilities.

D.2.2.2 Exploration Drilling

There would be a maximum of four exploration drill rigs operating in the Planning Area during any one year. Drilling depths for exploration and delineation wells average 10,000 feet, but would likely range from 6,000 to 12,000 feet. Onshore drilling would be conducted entirely during the winter months (early December to mid-April). A typical exploratory well (10,000 feet) could use about 630 short tons of drilling mud and produce about 820 short tons of dry-rock cuttings. Upon completion of drilling operations, all equipment and materials would be removed (during winter operations) over ice roads to staging areas and then to other locations on the North Slope, or to recycling centers out of the country. Due to the expense of constructing new staging areas, it is thought that previously-occupied sites such as Camp Lonely, Inigok, and Umiat would likely be the sites for such staging for exploration and production. Drilling material (mud and cuttings) could be re-injected into the dry drill hole if the exploration well was unsuccessful. If drilling was successful, the well would be temporarily capped, and the operator would remove drilling materials (mud and cuttings) and other camp wastes to an approved disposal area off site in accordance with the Clean Water and Clean Air acts. No liquid or solid waste would be disposed of on site, but would be removed from the staging area and disposed of at an approved site.

The final Preferred Alternative provides an opportunity to lease in the immediate offshore area of the Planning Area, which includes Kogru Inlet. Exploration drilling could potentially occur in these areas during the ice-free period from temporary platforms or vessels, such as barges or mobile drilling rigs. Drilling equipment could be transported by vessel to coastal area or by helicopter or ice road (from staging areas) to inland areas.

D.2.2.3 Winter Transportation and Support Infrastructure for Exploration

Ice roads would provide seasonal routes supporting winter activities. These temporary roads are constructed by spreading water from local sources (rivers and lakes) to build up a rigid base (Stipulation B-1). New construction methods, such as the use of aggregate chips produced from frozen lakes, significantly decrease both water demands and construction time for ice roads. Low-pressure vehicles are used to establish ice roads, which can then be used by conventional vehicles. Ice roads are designed to be a minimum of 6 inches thick, 30 to 35 feet wide, and up to 50 miles long. Ice roads would connect each exploration drill site to the staging area during winter activities.

Ice pads are used commonly as platforms for winter exploration activities (e.g., Northeast National Petroleum Reserve – Alaska exploration, 1999-2003). The method used to construct ice pads is similar to that described for ice roads. The tundra surface is flooded with water to build up progressive layers of ice, although the use of aggregate chips speeds up the process while decreasing water use. A typical ice pad is designed to be a minimum of 1-foot thick, covers 6 acres, and requires approximately 500,000 gallons of water to construct. Depending on the location of exploratory wells, ice pads range in size from 3 to 10 acres. Current ice-pad design technology could allow some pads to remain intact over the summer season. During the summer season, these ice pads would house one exploration drill rig. Each of these rigs would be stored with towers or derricks folded, and would present a silhouette of approximately 20 feet in height.

As many as half of the ice pads could be multi-year pads used for summer activities, such as storage of equipment. Tundra habitat under the footprint of multi-years pads would be lost as spectacled and Steller’s eider habitat during the lifetime of the pad. Vegetation under the footprint of multi-year pads would be relatively unaffected after the pad melted (McKendrick 2000). Some vegetation within a 3- to 6-foot (1- to 2-meter) wide band around the perimeter of multi-year ice pads could be damaged and require several years to recover. Under the maximum development scenario, 50 multi-year ice pads and 50 single-season ice pads covering 6 acres each could be constructed, resulting in a total footprint of 600 acres during the life of the project.

Materials and equipment necessary to support winter exploration activities could be moved to staging areas within the Planning Area by marine transport in the summer months (late July/August), and then overland on ice roads or hardened snow trails during winter exploration activities. The sealifts for exploration would use two to seven barges per year. The majority of large equipment movement would be by sealift to staging areas at locations such as Camp Lonely during summer months, then to the exploration pads over ice roads during winter months. These exploration staging areas would be small (500 feet by 500 feet gravel or sand-gravel pads), with summer activity limited to offloading and storage. When possible, existing pads would be used, although new pads could be constructed to support winter exploration activities.

Exploration activities, such as seismic surveys and drilling, could also occur during the ice-free period in coastal areas, such as Kogru Inlet and on large lakes such as Teshekpuk Lake. Equipment to be used for these activities could be transported directly to the site by vessel in the coastal areas, flown in via helicopter, or transported to coastal staging areas and then transported to the site during winter via ice roads.

While this scenario assumes that Barrow could be used as a staging area for the western portion of the Planning Area, the BLM does not anticipate development projects in direct support of exploration activities to be located at or near that community. Barrow already is a regional hub for commerce on the western North Slope, with an established airport and other support facilities that can accommodate most large planes currently used to support the oil and gas industry in Alaska. Infrastructure currently exists in Barrow to handle sealifts during the summer months and air freight during winter months that routinely supply the community.

There would be some additional employment and investment in the community during the exploration and construction phases, but the level of additional employment would be small and short term. The majority of support for exploration is expected to be deployed from Deadhorse because of its proximity to the Dalton Highway (Haul Road) and its existing oil field contractor-support facilities and infrastructure.

D.2.3 Phase II: Development, Production, and Abandonment

If exploration activities were successful and an economically viable field was discovered, companies likely would move forward to development and production. The first steps in these processes are to gather information and data, and to design and permit the project. All development projects would go through a National Environmental Policy Act evaluation and would require consultation with the USFWS pertaining to any species listed under the ESA. If ice roads or pads were needed during the production and abandonment phase, these activities would be essentially the same as those described in D.2.2.3 (Winter Transportation and Support Infrastructure for Exploration).

D.2.3.1 Field Development

Analysis of hydrocarbon potential and economics (Section 4.2.1.2, Table 4-4 of the Final Amended IAP/EIS) indicates that up to 12 fields would be developed in the high price ($30 per barrel) scenario. These fields would be a mixture of large fields (CPFs similar to the Alpine field) and smaller satellite fields. It is assumed that two Alpine-size fields, or CPFs, would be discovered and developed in the Planning Area, with five additional satellite fields tied into the infrastructure of each of the CPFs. A reasonable and foreseeable scenario suggests that each satellite field would be connected to a CPF by a gravel road. Current pipeline engineering constraints dictate that satellite fields are located within 20 miles of a CPF. Discovered fields that do not have enough oil to be economically developed, or are too far away from a CPF using today's technology, would not be developed and would have no pads. For this impact analysis, we have assumed an average distance of 10 miles from each satellite facility to its associated CPF. None of these facilities would require a new landfill location. Organic wastes would be disposed of in accordance with the Clean Water and Clean Air acts. No liquid or solid waste would be disposed of on site.

Under the final Preferred Alternative, it is assumed that one of the CPFs would consist of two gravel pads covering a total of 66 acres, a 5,000-foot airstrip covering 11 acres, and a 3-mile connecting road (connecting the two pads), which, at approximately 7.5 acres per mile, would cover 23 acres for a total of approximately 100 acres. The other CPF would consist of one large production and processing pad (approximately 50 acres) and a 5,000 foot airstrip covering approximately 11 acres. Runways would be oriented in a west-southwest/east-northeast direction, similar to the Barrow Airport.

A typical satellite field would be developed from a single gravel pad with a footprint of approximately 10 acres. Each pad would hold approximately 20 to 30 wells and would be accessed from the anchor development on a permanent gravel road approximately 62 feet wide at the base and up to 20 miles (average 10 miles) in length. Five satellite fields would be developed for each CPF. However, satellite field development would not be expected to occur until several years after the CPF was developed (this is true of the Alpine field development), and would have a production life of approximately 10 years. One 11-acre airstrip is assumed per group of five satellites.

Total areas of the gravel footprints for all of the above potential developments, as well as for two scenarios for summertime "zones of influence" (i.e., zones of potential disturbance to eiders) around the gravel pads are presented below in Table D-1.

There would be a maximum of eight development rigs operating in any given year. The time required to drill and complete a production well depends largely on the measured depth of the well. Currently on the North Slope, it takes approximately 20 to 30 days to drill and complete a 10,000-foot well. This equates to approximately 12 to 18 wells per rig over a 12-month period. Safety considerations normally restrict operations to one rig drilling on each pad at a time. Using the above example, in which up to 30 wells from each pad would be needed for initial reservoir development, drilling operations would take 3 to 4 years to complete. The overall development phase from construction of a staging area and remote base camp to production startup could take up to 3 to 4 years, depending on the size and location of the new field.

Table D-1. Gravel Footprint and Zones of Influence for Production and Related Facilities.

Activity	Gravel Footprint in Acres (km^2)[1]	200-Meter Zone of Influence in Acres (km^2)[2]	500-Meter Zone of Influence in Acres (km^2)[3]
CPF developments (2)	161 (0.7)	1,252 (5.1)	4,019 (16.3)
Satellite developments (10)	872 (3.5)	17,436 (70.6)	46,803 (189.4)
Gravel extraction sites (6 at 20-50 acres each)	225 (0.9)	Not Applicable	Not Applicable
Staging areas (2)	100 (0.4)	257 (1.0)	939 (3.8)
Total area	1,356 (5.5)	18,945 (76.7)	51,761 (209.5)

[1] Includes only the area under the gravel.
[2] Includes only the area outside the gravel but within 200 m of the gravel.
[3] Includes only the area outside the gravel but within 500 m of the gravel.

The description of exploration activities in Section D.2.2.3 (Winter Transportation and Support Infrastructure for Exploration) for staging areas and sealifts is also applicable during the development phase, with respect to the timing and types of activities. During development, the staging area(s) could be larger, up to 50 acres. Development of the staging area would occur in winter prior to the start of development activities. Where practical, staging areas used for exploration would be used for development. The number of barges required in each sealift to support development activities would be greater than the number required for exploration activities. However, the modules and equipment still would be offloaded from barges in 3 to 5 days and stored on the staging area pad until winter, when they would be transported by ice road to the CPF development site. The individual modules could be 20 to 30 feet in height. After transportation to the CPF development sites, these modules would become the site's operation and housing facilities complex. There likely would be two large sealifts (1 year apart) for each CPF.

Drill-Pad and Road Construction

Construction of gravel pads, roads, airstrips, and staging areas would be some of the first development activities to take place. Current technology uses gravel pads to support both CPFs and satellite production facilities. Gravel requirements for current "all-gravel" pads raised 5 feet or more above a wet tundra surface are approximately 8,000 to 12,000 cubic yards per acre of surface footprint. Gravel roads (approximately 62 feet at the base) cover approximately 7.5 acres per mile, and require 40,000 to 60,000 cubic yards of gravel per mile. Airstrips (100 feet wide and 5,000 feet long), cover 10 acres and require 110,000 cubic yards of gravel. The total gravel estimate for 12 fields, consisting of two CPFs and 10 satellite pads, is approximately 6,823,000 cubic yards. Any staging area or pump station sites would have gravel requirements. A staging area (50 acres) would require an additional 900,000 cubic yards of gravel.

Gravel mining and transportation would occur during the winter months, when gravel can be moved by heavy equipment over ice roads. Where gravel extraction has occurred on the North Slope, sites are 20 to 50 acres in size. Two CPF development sites and 10 satellite pads with roads would require approximately six extraction sites averaging 35 acres in size to be developed. The location of these potential mine sites are unknown at this time. If larger gravel extraction sites were discovered, the extraction footprint per site could exceed 50 acres in size, but the number of sites would be reduced, and the total disturbance footprint also would be less. Gravel extraction sites necessarily would be located within the area of highest geological potential because of the high cost of material transport.

Development of Production Pad and Facility

The first production pad (anchor pad) would be constructed approximately 8 years after the lease sale. Up to 489 production and injection wells would be drilled in total for the 12 fields. Each field would likely take 3 to 4 years for the drilling of associated production and service wells. The wells would be drilled year-round from the gravel pads. A maximum of eight drill rigs would be used to drill wells in all fields during a given year.

Central Production Facility

The CPF serves as the operational center for long-term production activities in an oil field. In addition to oil-production equipment, the CPF typically includes living quarters, offices, maintenance shops, storage tanks for fuel and water, power generators, waste-treatment units, and a communications center. For most North Slope projects, many components of the CPF are constructed as transportable modules in offsite locations, normally outside Alaska, and then moved to staging areas in the summer by sealift. The following winter they are moved overland on ice roads to the field and assembled. All buildings are supported on pilings to accommodate ground settling or frost heaving. An airstrip usually is located near the CPF to allow transport of supplies and personnel to the field site.

Power, telephone, and other communication lines would be buried in the roads or installed on the pipeline vertical support members (VSMs), to the extent practicable. Each CPF would have one tall (up to 60 feet) communication tower. Required Operating Procedure E-14 (see Section 2.6; Stipulations and Required Operating Procedures) would require that the tower guy wires be marked, increasing visibility to reduce potential collision by listed eiders.

Oil production equipment would include three-phase separators (oil, gas, and water are produced in varying proportions from each well); gas conditioning (natural gas liquids are stripped from produced gas); complex pipeline gathering and pressure regulation systems; and well monitoring and control systems. Oil from production wells would be filtered (to remove sand) and processed (removing water and gas) before being piped through a sales meter and into the sales-oil pipeline system. Gas would be processed (to remove liquids), pressurized (compressed), and re-injected into the reservoir through service wells. Likewise, water would be processed (chemically treated) and then re-injected into the reservoir for pressure maintenance. Re-injection of produced gas and water would increase oil recovery; this practice is normally initiated from the onset of production.

Pipeline Infrastructure

The actual locations of new pipelines constructed in the Planning Area would depend on both the location and sequence of discoveries of commercial-sized oil fields. Fields developed early would establish the first pipeline corridors connecting the Planning Area production to existing infrastructure at the Alpine field. Fields discovered and developed later would attempt to use these existing pipelines, if the capacity was available. If large fields were discovered late in the exploration sequence, they could require their own oil pipelines. It is possible that commercial-sized fields discovered by different companies would be shut in (not produced) until an agreement was reached to share the costs of constructing a large main line from the Planning Area to common carrier pipelines that connect to the Trans-Alaska Pipeline System (TAPS). In this analysis, one connecting pipeline would be constructed to the existing Alpine field facility, which has infrastructure available to connect to TAPS.

The scenario developed for the final Preferred Alternative assumes that 205 miles of pipeline would be installed during the winter, coinciding with the construction of the development and production facilities. The pipeline would consist of approximately 97 miles of elevated field gathering lines for oil and 108 miles of elevated oil trunk lines. The gathering pipeline would consist of connecting multiphase pipelines (a 24-inch oil pipeline, a 14-inch water pipeline, and a 10-inch gas pipeline for gas reinjection) installed aboveground on VSMs, and would be placed a minimum of 7 feet above the tundra. The VSMs would be spaced 55 to 70 feet apart. Routine pipeline maintenance would occur during the winter months, with summer activities occurring on an emergency basis only.

Possible future pipeline corridors in the Planning Area are speculative, but routes would be based on several factors, including oil-resource potential, previous leasing, and previous discoveries. The actual location of undiscovered, commercial-size fields and the timing of discovery are impossible to predict. For analysis purposes, 225 miles of common carrier trunk line would be constructed in the Planning Area, with an additional 120 miles constructed on State of Alaska lands to the east to transport product to market.

None of the pipelines described above would be established as subsea infrastructure.

Aircraft Support During Development

The highest level of aircraft activity would occur during the period when both construction and development drilling are occurring. From June 1, 2001 to July 15, 2002, there were a total of 1,474 aircraft landings or take-offs (a daily average of 32.8 operations) at the Alpine field (ABR Inc. 2001; Johnson et al. 2003a). About half of the aircraft operations were helicopter flights. The next largest group was primarily passenger planes (CASA, Twin Otter, Navajo, and Beech), averaging seven flights per day. On average, there was one DC-6 round trip flight per day. We expect similar levels of aircraft activity during the summer development phases for each of the CPF developments.

Estimated Number of Flights

The total number of flights expected to occur on the Planning Area over the life of the project is estimated below in Table D-2. The *Alpine Satellite Development Plan EIS* (USDOI BLM 2004a) provided estimates of the aircraft flights that might be generated by construction, development, and operation of the Alpine field, and these estimates were used as a baseline in the development of estimates for vehicular traffic that might occur in the Planning Area under the proposed development scenario as the proposed development consists of two Alpine field-like developments. The estimates shown in Table D-2 allow for other unscheduled flights, and project-related research.

Aircraft flights that occur during winter months would have no effect on eiders as they are not on the North Slope at that time of year. Therefore predicted winter (October-May) aircraft flights were not included in the estimate. Exploration occurs during the winter; however, some flights are conducted during the summer in support of seismic equipment maintenance operations. Development and operation would require aircraft support. Construction of the facilities (gravel pads, pipelines, buildings, etc.) would result in the most traffic.

Table D-2. Predicted Number of One-way Aircraft Flights Annually in the Planning Area during June through September.

Activity	Number of Flights Each /Summer[1]	Number of Months[2]	Number of Years	Total Summer Flights
Exploration	40	1	10	400
Construction	8,160	4	2-4	32,640
Operation	3,882	4	30	116,460
Abandonment	19	4	5	96
Non-Operational	2,500	4	30	75,000
Total				224,596

[1]If all phases of all activities envisioned in the development scenario occurred concurrently.
[2]Summer exploration flights are for maintenance of exploration equipment.

Summer aircraft flights were estimated based on the following information and assumptions:

- Construction flight numbers for the CPFs are estimated from the average number of flights recorded/day from June through August during the major construction period at the Alpine field facility, CD-1 and CD-2 (1999-2001; flight numbers reported in Johnson et al. 2003).
- Construction and operational flight numbers for the satellite developments are estimated from information on estimated flights contained in the *Alpine Satellite Development Plan Final EIS* and Biological Assessment (USDOI BLM 2004a, 2004b).
- Operational flight numbers for the CPFs are estimated from flight information for the Alpine field air strip from May through August of 2004 (ConocoPhillips Alaska, Inc. pers. comm.).
- The development scenario for the final Preferred Alternative assumes 2 Alpine-like CPFs and 10 satellite pads, therefore estimates from the *Alpine Satellite Development Final EIS* were multiplied by 2.
- Aircraft flights that occur during the winter months would have no effect on eiders as they are not on the North Slope at that time of year. Therefore, predicted winter (October-May) aircraft flights were not included in the estimate. Exploration occurs during the winter; however, some flights are conducted during the summer in support of seismic equipment maintenance operations. Development and operation would require aircraft support. Construction of the facilities (gravel pads, pipelines, buildings, etc.) would result in the most traffic.
- A flight equals a take-off or landing in a 24-hour period (i.e., all flights are one way).
- The estimation presented here assumes a linear progression from exploration through abandonment occurring concurrently, with exploration lasting 10 years, construction of CPFs lasting 4 years, individual satellites lasting 2 years, development lasting 30 years, and abandonment lasting 5 years. Actual timelines would likely be different and influenced by what is discovered, when it's found, economics, technology, and development permit requirements. Overlaps between phases should be expected. Therefore, any estimation of flights/month or year is likely an under-or over-estimation.
- Non-operation flight numbers from the *Alpine Satellite Development Plan EIS* (2,500 one-way/year) are included in the estimate for the 30-year operation period. This is likely an overestimation, as the majority of these flights are believed to be related to surveys required for development of the Alpine satellite fields. These surveys would be required for any development, but would likely only last for 3 to 5 years for any particular action. Additional flights may be required, based on monitoring requirements that could last for the life of the project, but this number is likely to be less than required pre-construction.

- The estimated flight numbers are based on current information. Actual flight numbers would be dependent on the level and timing of exploration, development, and production; limitations imposed by natural resource and subsistence protective measures; and future technology.

Traffic

The construction and use of ice roads and gravel roads as proposed under the development scenario considered in this BA would generate a significant number of vehicle trips, with potential for eider disturbance or collision. The *Alpine Satellite Development Plan Final EIS* (USDOI BLM 2004a) provided estimates of the vehicular traffic that might be generated by construction, development, and operation of the Alpine field, and these estimates were used as a baseline in the development of estimates for vehicular traffic that might occur in the Planning Area under the proposed development scenario. The proposed development consists of two Alpine-like developments.

Vehicular traffic that takes place during winter months would have no effect on eiders, as they are not on the North Slope at that time of year. Therefore, predicted winter (October-May) traffic on gravel roads, and all predicted traffic on ice roads, were not included in the estimate. Exploration would result in no significant vehicular traffic. Development and operation would result in limited vehicular traffic. Construction of the facilities (gravel pads, pipelines, buildings, etc.) would result in the most traffic. Estimates of the annual and total number of vehicle trips are provided in Table D-3.

Table D-3. Predicted Number of Vehicle Trips and Miles That May be Driven Monthly in the Planning Area during June through September and Over the Life of the Project.

	Trips/Month[1]		Miles/Month[2]		Total Trips[3]		Total Miles[4]	
	Mean	**Maximum**	**Mean**	**Maximum**	**Mean**	**Maximum**	**Mean**	**Maximum**
Exploration	0	0	0	0	0	0	0	0
Construction	740 to 6,600	2,300 to 6,700	14,800 to 132,000	46,000 to 134,000	192,384	222,720	3,847,680	4,454.400
Drilling	420 to 840	450 to 900	8,400 to 16,800	9,000 to 18,000	28,224	30,240	564,480	604,800
Operations	90	120	1,800	2,400	21,600	28,800	432,000	576,000
Total					242,208	281,760	4,844,160	5,635,200

[1] Number of round trips per month in the Planning Area based on projected mean and maximum numbers of trips for Alternative F in the Alpine Satellite Development Plan Final EIS (USDOI BLM 2004a) Alternative F. Assumed that no more than five satellites would be developed at a time and therefore used the numbers provided in that document.
[2] Number of months traffic occurs during any year when eiders are present (June-September).
[3] Total number of miles driven per month, based on mean and maximum numbers of trips per month with an average of 20 miles per trip.
[4] Total number of round trips driven over the lifetime of the project month based on projected trips for Alpine Satellite Development Plan Final EIS (USDOI BLM 2004a). Alternative F times 2.4 as the final Proposed Action entails 12 fields while the Alpine Satellite Development Plan Final EIS entailed only 5 fields. Life of project consisted of construction, drilling, and 20 years of operations.
[5] Total number of miles driven over the life of the project based on the mean and maximum number of trips to be driven and an average of 20 miles per trip.

D.2.3.2 Offshore Development Related to the Planning Area

The final Preferred Alternative would provide an opportunity to lease in the immediate offshore area of the Planning Area, including Kogru Inlet. The shorelines are protected by a ¾-mile No-Surface Occupancy (Map 2-2) requirement, both offshore and onshore, to protect the nearshore habitats. Reasonably foreseeable projections do not anticipate production facilities offshore. If a commercially viable discovery were made in the offshore area it most likely would be reached using directional drilling techniques anchored onshore, and a new analysis would be prepared to address the specific issues related to offshore production. If development occurred offshore, it likely would be constructed using materials and techniques similar to those used at the island bearing the Northstar development (U.S. Army Corps of Engineers 1999).

D.2.4 Production

The field infrastructure would include processing facilities and a permanent airstrip, and would operate year-round for at least 20 years. The first production from new leases could start up in 2018, with estimated peak rates of 77 million barrels per year (211,000 barrels per day).

D.2.4.1 Production Activities

During production, the size of the gravel footprint would remain constant. There would be higher levels of human activity at the two CPF development sites than at the satellite, or secondary fields. The number of aircraft flights to support the facility is estimated at four propeller-driven passenger planes (CASA, Twin Otter, Navajo, Beech) and 5 to 10 to ten helicopter flights per week. There would be some truck traffic from the main facilities to satellite and secondary pads on a daily basis. There would be helicopter flights along the length of the pipeline to monitor its integrity on a monthly basis, at a minimum.

The pipelines would be pigged and electronically monitored to determine pipeline integrity. Pipeline maintenance would be planned, and would occur during the winter months when the pipeline could be readily accessed by ice road or hardened snow trail.

Wastes generated at the production facility would be incinerated at the facility or treated and transported to approved disposal sites on the North Slope.

D.2.4.2 Watercraft Support to Production Facilities

It is likely that facilities would be supplied by annual sealift. Most of these supplies would arrive in containers by barge in late July or August. Containers would be offloaded with cranes and stacked on the gravel pad at the staging area. The typical container would be less than 10 feet in height. Vessel traffic generally would be limited to routes in shallow, nearshore waters between staging areas connected to existing infrastructure (e.g., West Dock, or Oliktok Point) and staging areas along the coastline in the Planning Area at potential sites such as Camp Lonely.

Non-recreational airboat use is allowed on streams, lakes, and estuaries seasonally accessible by motorboats. Airboats would be prohibited in seasonally-flooded tundra and shallow waters with wetland vegetation adjacent to streams, lakes, and estuaries. For this analysis, it is assumed that no facilities would be constructed adjacent to waterways that could support non-recreational use of watercraft, because of the setbacks required by stipulations K-1, K-2, and K-3.

D.2.4.3 Public Access and Subsistence Activities

The developments would not be accessible to the general public for recreational or tourism activities. However, the areas would be available to rural subsistence users. Subsistence use of the Planning Area is variable based on the availability and location of subsistence species. It is possible that subsistence activities could be enhanced by the road infrastructure described in this reasonably foreseeable scenario.

D.2.4.4 Spill-Response Training and Research Activities

There likely would be annual summer oil-spill-response training, which could involve 20 to 40 individuals for 1 to 2 days each summer at each CPF. There would likely be an increase in aircraft landings and take-offs, and if the facility were near water, there likely would be an increase in watercraft activity.

Boats and other watercraft could be used by researchers during study efforts if facilities, or areas of concern, were located near large waterbodies such as the Beaufort Sea, rivers, or large, deepwater lakes. These activities would occur during the summer months, but the numbers, locations, and types of activities remain speculative.

D.2.5 Abandonment and Restoration of Production Sites

Abandonment and reclamation of satellite fields likely would coincide with abandonment and reclamation of corresponding CPFs. Abandonment operations would entail removing all equipment, cutting well casings a minimum of 3 feet below the surface, and plugging wells. Gravel or gravel/sand pads would not be removed, but allowed to bed naturally. Overall, abandonment operations would take many years, as revegetation and environmental monitoring studies would continue to document the long-term effects of operations at a particular site. A series of permitting and inspection activities would be associated with abandonment procedures (Lease Stipulation G-1). Abandonment activities would occur during winter months when ice roads could be constructed to allow the removal of equipment. Monitoring abandonment would require periodic revisits to gather information on environmental parameters related to natural bedding and to document the success of abandonment actions. Normally, one helicopter with a crew of three would visit the sites annually for the first 5 years, followed by visits with increasing time gaps over the next 10 years. Site visits would include a maximum of 1 day per visit, and 1 visit per year.

D.2.6 Lease Stipulations and Required Operating Procedures

The final Preferred Alternative includes mitigating measures that are designed to reduce the potential take of spectacled and Steller's eiders. These measures are either lease stipulations (conditions that would apply to the lease) or ROPs (requirements that would apply to permits for activities associated with oil and gas operations). The full text for all stipulations and ROPs is given in Section 2.6 (Stipulations and Required Operating Procedures) of the Amended IAP/EIS. The following summarized stipulations and ROPs are directly applicable to eiders:

- Surveys would be required in the vicinity of proposed developments to direct project siting in a manner that prevents or reduces the taking of spectacled and Steller's eiders, and provides baseline information on the species near developments for impact monitoring.
- All utility and communications lines would be required to be buried in access roads or installed on the pipeline VSMs.
- All facilities greater than 20 feet in height would be required to have special lighting protocols. All communication towers, antennas, and similar facilities requiring support wires would be required to have markings to make support wires more visible to low-flying birds.
- All facilities would be required to be designed to prevent the nesting, denning, etc. of predatory species including gulls, ravens, raptors, foxes, and bears.
- Lessees would be required to develop oil-spill-response plans prior to any exploration or development drilling.
- Drilling pads and facilities would be relocated if necessary, up to 2 miles from the optimum pad location (the current North Slope maximum extended reach is 4 miles and a 2.5 departure ratio), if surveys indicated that relocation was necessary to avoid take.
- There would be restrictions on the establishment of permanent or temporary facilities on all deepwater lakes (lakes with depths greater than 13 feet); permanent facilities within ¼ mile of such lakes would be prohibited. No permanent facilities would be permitted in the streambeds of rivers. A no surface occupancy setback of ½ mile would be imposed on all major rivers (measured from the highest high water mark of the river, as determined by current hydrology at the time of application) for permanent facilities. Along rivers or river segments where subsistence concerns have been raised, setbacks for no surface occupancy would be increased to ¾ to 3 miles.
- Overland travel and associated activities for permitted uses would be restricted.

- Recreational off-highway vehicle (OHV) use would be restricted to winter use for snowmachines and other low-ground-pressure vehicles. Within the National Petroleum Reserve – Alaska, no summer recreational use of OHVs would be permitted. To support traditional subsistence activities and access, the summer use of OHVs, including all-terrain vehicles (ATVs) and airboats, would be allowed. The use of airboats during the summer would be limited to streams, lakes, and estuaries that are otherwise seasonably accessible by propeller- or jet-powered motorboat. To prevent impacts to soils, water quality, vegetation, and wildlife (especially nesting waterfowl), airboat use in areas of seasonal flooding of tundra and temporary shallow waters adjacent to streams, lakes, and estuaries would be prohibited.
- All facilities would be removed and rehabilitated to the satisfaction of the AO.

D.2.7 Private Lands

The Arctic Slope Regional Corporation (ASRC) owns private lands in the Northeast National Petroleum Reserve – Alaska. The best available geologic information about these lands is from the two existing gas fields near Barrow. Currently, the area is thought to be gas prone, and without a transportation system to a larger market, it is unlikely that there would be extensive interest in leasing and developing those lands at this time. The development of ASRC lands is considered to be speculative at this time, but the potential construction of pipelines and support facilities associated with development of fields in the Planning Area would reduce the potential development costs of oil and gas fields on private lands.

D.2.8 Other Key Assumptions

The North Slope Borough would be able to tax and receive income from the development of any oil and gas resources developed from the proposed activities. These taxes would add to the income available to the Borough for capital expenditures or to fund Borough operations. However, these potential projects would begin at the same time that income from other taxable projects, such as Prudhoe Bay, was declining. It is likely the additional income from these projects would offset the loss of income from fields that are declining or have been abandoned. While this income would be positive and beneficial, and would likely help maintain the current level of government activity and capital expenditure, it is unlikely to create a significant change in the growth rate of the communities on the North Slope, which could then increase subsistence or other pressures on eider populations.

D.3 Description of Listed Eiders Occurring in the Northeast National Petroleum Reserve – Alaska

D.3.1 Spectacled Eider

D.3.1.1 Population Status

The spectacled eider is a medium-sized sea duck that breeds along coastal areas of western and northern Alaska and eastern Russia, and winters in the Bering Sea (Petersen et al. 2000). Three breeding populations have been described: one in the Yukon-Kuskokwim (Y-K) Delta in western Alaska, a second on the North Slope of Alaska (Cape Simpson to the Sagavanirktok River), and the third in the Chaun Gulf and the Kolyma, Indigirka, and Yana River deltas of Arctic Russia. During the 1970s, approximately 50,000 female spectacled eiders nested in western Alaska. Data collected by the USFWS from ground-based study plots in the Y-K Delta suggested that the number of female spectacled eiders nesting in the Y-K Delta declined by approximately 8 to 14 percent per year from the 1970s to 1992 (Stehn et al. 1993, Ely et al. 1994). By 1992, the Y-K Delta spectacled eider population was reduced to approximately 4 percent of the population existing there in the 1970s, and it was federally-listed as a threatened species in 1993 (58 FR 27474).

Little information is available describing the status of the North Slope spectacled eider population prior to 1992. Historically, the North Slope population has likely been much smaller than the Y-K Delta population. The USFWS began conducting aerial surveys for breeding eiders in 1992 that have continued annually since then (Larned et al. 2003). The 1992 survey was flown too late in the season to be included in analyses with subsequent years, but since 1993 the North Slope spectacled eider population has remained relatively stable with a non-significant decreasing trend of approximately –0.7 percent corresponding to a mean growth rate of 0.99 (Larned et al. 2003). During this time period, the indicated total bird population index for the North Slope survey area has ranged from approximately 5,000 to 9,000 birds. The timing of surveys can influence the results of eider surveys and be an important factor when considering results of spectacled eider surveys (Troy Ecological Research Associates [TERA] 1997).

The latest population survey for the 2003 breeding season placed the ACP spectacled eider population index at 7,149 birds (Larned et al. 2003). The largest breeding population of spectacled eiders is located in Arctic Russia and the population there has been estimated at over 140,000 individuals (Hodges and Eldridge 2001). Based on estimates of the wintering population in the Bering Sea, the total world population may number around 375,000 birds (Larned and Tiplady 1999).

D.3.1.2 Spring Migration

Spring migration routes of spectacled eiders are not well documented. Most of the data are from counts of eiders as they pass Point Barrow in late May and early June (Suydam et al. 1997, 2000). During spring migration, thousands of king and common eiders follow offshore leads, and small numbers of spectacled eiders have been recorded during spring counts. Richardson and Johnson (1981) also reported small numbers of spectacled eiders offshore during spring migration counts east of the Colville River at Simpson Lagoon, although some of these birds may have been local breeders rather than migrants. Few researchers have conducted inland counts of migrating birds on the North Slope, but Myers (1958) reported that the spectacled eider was the most abundant eider species migrating along river systems south of Barrow in the spring. Because only small numbers of spectacled eiders have been recorded migrating along the coast during spring, it may be that most birds migrate overland from the Chukchi Sea across the ACP following river drainages.

D.3.1.3 Nesting

Spectacled eiders arrive on the North Slope breeding grounds paired in late May or early June. They occur in low densities across the North Slope from Wainwright to the Prudhoe Bay area. The highest concentrations occur within approximately 45 miles (70 km) of the coast in the Northwest National Petroleum Reserve – Alaska between Barrow and Wainwright, and in the Northeast National Petroleum Reserve – Alaska north of Teshekpuk Lake (USDOI BLM and MMS 1998; USDOI BLM and Ducks Unlimited 2002; Larned et al. 2003). Overall densities during the eider breeding population aerial surveys on the ACP have ranged from approximately 0.067 to 0.12 birds per mi^2 (0.174 to 0.305 birds per km^2) between 1993 and 2003 (Larned et al. 2003). The density during the 2003 breeding population survey was 0.09 birds per mi^2 (0.232 birds per km^2). Burgess et al. (2003a) reported spectacled eider densities of 0.008 to 0.015 birds per mi^2 (0.02 to 0.04 birds per km^2) during 2 years of aerial surveys in the eastern portion of the Planning Area. These estimates are lower than densities reported during aerial surveys for the Colville River Delta (0.08 birds per mi^2 [0.20 birds per km^2]; Burgess et al. 2003b, Johnson et al. 2003a), and in the Kuparuk oil field (0.03 birds per mi^2 [0.08 birds per km^2]; Anderson et al. 2003). During aerial surveys in the central-eastern portion of the Planning Area, Noel et al. (2001) reported higher densities of spectacled eiders in the Fish Creek Delta than in other portions of their study area. In the Planning Area, spectacled eiders have been reported consistently, and nests have been located during ground searches, in the vicinity of the U.S. Air Force Short-Range Radar Site at Point Lonely (Day et al. 1995; Day and Rose 2000; Ritchie et al. 2003). Burgess et al. (2003a) reported four spectacled eider nests discovered during ground searches on study plots in the eastern portion of the Planning Area.

In general, on the ACP, spectacled eiders breed near large shallow productive thaw lakes, often with convoluted shorelines and/or small islands (Larned and Balogh 1997), and nest sites are often located within 3 feet of a lakeshore (Johnson et al. 1996). Spectacled eiders on the Colville River Delta have been reported to nest in salt-killed tundra, aquatic sedge with deep polygons, and patterned wet meadow, although only salt killed tundra was preferred based on an analysis of habitat selection (ABR 2002; Johnson et al. 2003a). In the Kuparuk oil field, Anderson et al. (1999) reported that spectacled eider nests were located in basin wetland complexes, a mosaic of water bodies with stands of emergents and complex shorelines with numerous islands and peninsulas. Spectacled eiders on the ACP nest mainly in areas near the coast rather than at inland locations (Derksen et al. 1981; Burgess et al. 2003b). Of 62 nests reported in the Colville River Delta, none were further than 8 miles (13 km) from the coast (Burgess et al. 2003b).

Based on a small sample size of band returns, there is some evidence that spectacled eider males, as well as females, may exhibit both breeding site and mate fidelity (TERA 1997). Females begin to lay eggs during the second week of June, and clutch sizes range from four to nine eggs, although five to six is more common (Dau 1974). The incubation period is approximately 26 to 28 days with eggs hatching around mid-July. Males depart the breeding grounds with the onset of incubation. Young leave the nest 1 to 2 days after hatching and begin feeding on their own immediately. Broods are quite mobile and may move as far as 0.6 to 1.9 miles (1 to 3 km) from the nest site within the first few days after hatching (TERA 1996). Some broods move to areas used for feeding by females prior to the onset of incubation. In the Y-K Delta, Grand et al. (1994 *in* TERA 1995) reported that one spectacled eider brood moved as far as 8.5 miles (14 km) from the nest site. In most cases, brood-rearing apparently does not occur in ponds adjacent to nest sites even if suitable habitat is present (TERA 1995), indicating that not only is nest site location important, but spectacled eiders may also require a much larger area in the general vicinity of the nest site for brood-rearing. After an initial post-hatch dispersal in the Prudhoe Bay area, there was a tendency for broods to settle into a particular area for a time, and then abruptly move to a new area. Successful females and young-of-the-year begin to depart the breeding grounds in late July, and movement continues until the end of August. Troy (2003) reported that Smith Bay was an area of concentration for female spectacled eiders located with satellite transmitters and that the area near the Stockton Islands may be a secondary area of concentration. Juvenile birds in the Y-K Delta departed the breeding grounds approximately 59 days after hatch (Flint et al. 2000a). Female and young spectacled eiders depart northern Alaska breeding grounds in August and September.

D.3.1.4 Post-nesting Period

Most males depart the breeding grounds in mid-June after the onset of incubation, moving to coastal bays and lagoons to molt and stage for fall migration. Important molting and staging areas include Harrison Bay and Simpson Lagoon, Smith Bay, Peard Bay, Kasegaluk Lagoon, Ledyard Bay, and eastern Norton Sound (LGL 1992; Larned et al. 1995; Springer and Pirtle 1997; Petersen et al. 1999; TERA 1999; Troy 2003). TERA (1999) and Troy (2003) reported that some males may travel overland to the Chukchi Sea, but that some birds remain about 6 miles (10 km) offshore in Harrison Bay for 7 to 10 days before continuing their fall migration to molting areas such as Ledyard Bay in the Chukchi Sea (Map 3-34). Males moving overland along the coast directly to the Chukchi Sea departed the breeding grounds earlier than those that lingered in the Beaufort Sea (Troy 2003). However, Petersen et al. (1999) reported that molting and fall migrations occurred in offshore waters, and found no evidence that spectacled eiders nesting on the North Slope migrate over the coastal plain. Fischer et al. (2002) reported that spectacled eiders were generally uncommon in offshore surveys from Harrison Bay to Brownlow Point, with small numbers occurring in July and August in Harrison Bay. During this time, Simpson Lagoon and Harrison Bay may be important staging areas for several weeks (Petersen et al. 1999, TERA 1999).

Early departing females may be non-breeders or have had failed nesting attempts. Troy (2003) reported that female spectacled eiders use Beaufort Sea waters from east of the Sagavanirktok River west to Barrow and beyond to the Chukchi Sea during fall migration. In the Planning Area, spectacled eiders have been reported during migration in the offshore waters of the Beaufort Sea near the mouth of the Colville River, Harrison Bay, and Smith Bay, and near the coast in the area northwest of Teshekpuk Lake (Map 3-34). Arrival onto molting areas, departure from molting areas to winter areas, and arrival onto wintering areas all follow a similar pattern: males are followed by unsuccessful females, who are followed by successfully breeding females (Petersen et al. 1999). It is likely that more female than male spectacled eiders migrate through the marine waters of the Beaufort Sea because more open water exists in offshore areas when females depart than earlier in the year when males migrate. This availability of open water allows for more extensive use of marine habitats by later migrating birds. TERA (1999) reported that the average distance offshore for migrating males was 6.2 miles (10.1 km) compared to 13.5 miles (21.8 km) for migrating females. Troy (2003) reported that the average residency for females in the Beaufort Sea was almost 2 weeks with the Smith Bay area receiving the greatest level of use.

D.3.1.5 Non-breeding Season

Spectacled eiders winter primarily in the Bering Sea south of St. Lawrence Island (Petersen et al. 1999; Petersen et al. 2000). Based on counts and photography from aerial surveys, this population may number around 360,000 to 375,000 (Larned and Tiplady 1999). The birds congregate here to forage for invertebrates at depths of 150 to 230 feet (45 to 70 meters) in areas of open leads. Petersen et al. (1998) reported that stomach samples from spectacled eiders collected near St. Lawrence Island included snails, clams, barnacles, amphipods, and crabs. The samples were collected during May and June of 1987 and 1992, and the primary species group consumed was the clam *Macoma* species. However, Lovvorn et al. (2003) reported that esophagi of spectacled eiders collected on the wintering grounds southwest of St. Lawrence Island in 2001 contained only clams, mostly *Nuculana*, with no trace of *Macoma*. The difference in diet in the two studies may reflect temporal differences in prey availability.

D.3.1.6 Factors Affecting Population Status

The reasons behind declines in spectacled eider breeding populations are unknown. On the North Slope, historical data are lacking and the extent of declines there, if any, are difficult to assess. A number of potential factors that may have contributed to the spectacled eider population decline on the Y-K Delta have been identified, but the relative importance of each has not been determined.

Extensive research has been conducted on the effects of ingestion of lead shot by foraging birds. Lead poisoning has been confirmed to be a cause of mortality for spectacled eiders on the Y-K Delta. The first reports of lead poisoning in spectacled eiders came from four birds found dead or moribund on the Yukon Delta National Wildlife Refuge from 1992 to 1994 (Franson et al. 1995). Ingested lead shot was found in the lower esophagus of one bird, and analyses revealed higher than normal lead concentrations in the livers. Subsequent studies examined lead-exposure rates of Y-K Delta spectacled eiders (Flint et al. 1997). Ingested lead shot was detected in the gizzards of 11.6 percent of the birds sampled. During the brood-rearing period, 13.0 percent of the adult females and 6.6 percent of the adult males sampled had elevated blood lead levels, and during the brood-rearing period, 35.8 percent of the adult females and 12.2 percent of the ducklings had been exposed to lead. Flint and Grand (1997) also reported mortality of female spectacled eiders due to lead poisoning resulting from ingestion of lead shot, and speculated that lower adult female survival during the breeding season may be contributing to the overall population decline. Franson et al. (1998) collected 342 blood samples from spectacled eiders in the Y-K Delta and reported detectable lead in 58 percent of the samples. Detectable concentrations of lead occurred more frequently in females than in males, and maximum lead concentrations in the blood of females was greater than that of males and ducklings. Grand et al. (1998) reported that female spectacled eiders on the Y-K Delta exposed to lead prior to hatching their eggs survived at a much lower rate than females not exposed to lead before hatching. During a study of spectacled eider brood survival in the Y-K Delta, Flint et al. (2000a) reported detectable concentrations of lead in 73.7 percent of the bones of depredated female spectacled eiders and 21.1 percent of the duckling bone samples. Flint (1998) established experimental plots to determine the settlement rates of lead shot in wetland types commonly used by foraging waterfowl. There was no change in the proportion of lead shot collected in the surface layer of the habitats sampled over a 3-year period, suggesting that spent lead shot persists in waterfowl foraging habitat for many years.

Tundra nesting birds are subjected predation pressure from Arctic and red foxes (*Alopex lagopus* and *Vulpes vulpes*), grizzly bears (*Ursus arctos*), gulls, jaegers, ravens, and snowy owls (*Bubo scandiacus*). Some predators, such as ravens, gulls, Arctic fox, and bears, may be attracted to areas of human activity where they find anthropogenic sources of food and denning or nesting sites (Eberhardt et al. 1982, Day 1998, Burgess 2000). The availability of anthropogenic food sources, particularly during the winter, may increase winter survival of Arctic foxes and contribute to increases in the Arctic fox population. Anthropogenic sources of food at dumpsters and refuse sites may also help to increase populations of gulls and ravens above natural levels. Major negative impacts have occurred at the Howe Island goose colony in the Sagavanirktok Delta from predation by Arctic fox and grizzly bears (Johnson 2000). Arctic foxes and glaucous gulls (*Larus hyperboreus*) are predators of common eider (*Somateria mollissima*) and brant (*Branta bernicla*) eggs and young on the barrier islands (Noel et al. 2002). Arctic fox predation can also impact tundra-nesting birds (Day 1998, Rodrigues 2002). Reduced levels of Arctic fox trapping on the North Slope may also have contributed to an increase in fox numbers (USDOI BLM 2003). Increased levels of predation due to elevated numbers of predators could impact nesting and brood-rearing spectacled eiders.

Subsistence harvest of eider eggs and adults occurs in coastal areas during the spring and fall. The annual subsistence harvest reported for the Y-K Delta and for the Bristol Bay area averaged 112 and 90 spectacled eiders, respectively, from 1995 to 2000 (Alaska Migratory Bird Co-Management Council 2003). Fewer data are available for other areas. In the Bering Strait mainland area, 23 spectacled eiders were reported harvested in 1995, and the subsistence harvest at St. Lawrence Island averaged five birds for 1993 and 1996. Few data are available from the North Slope villages documenting the numbers spectacled eiders harvested annually, and none were reported by AMBCC (2003). However, Stephen R. Braund and Associates and Institute for Social and Economic Research (SRBA and ISER 1993) reported 155 spectacled eiders taken at Wainwright during 1988 and 1989, and two taken at Barrow. Reported subsistence spectacled eider egg harvest in the Y-K Delta has averaged 11 eggs annually from 1995 to 2000. During the same period, the average annual spectacled eider egg harvest at the Togiak National Wildlife Refuge was 42 eggs. In both areas, the reported harvests actually occurred in 1 year but were averaged over the period from 1995 to 2000. Reporting on harvest of spectacled eiders and their eggs is probably not complete, and reported harvest numbers represent only minimum values. Actual harvest numbers are likely higher.

Exposure to contaminants, including petroleum-related compounds, organochlorine compounds, and elements, has also been proposed as a possible contributing factor in the decline of the spectacled eider population. Trust et al. (2000) sampled male spectacled eiders from St. Lawrence Island and reported that a few contained trace concentrations of chlorinated organic compounds. However, levels of copper, cadmium, and selenium were elevated when compared to literature values for other marine birds. Other elements that could potentially impact eiders include mercury, selenium, and zinc (Stout 1998; Stout et al. 2002). However, the birds sampled by Trust et al. (2000) appeared to be in good health, and if the presence of contaminants is a factor involved in the spectacled eider population decline, it may act by reducing fecundity or survival of young rather than via direct health impacts on adults.

There has been speculation that researchers conducting studies on avian nest density and success may inadvertently affect the results by attracting predators to nests and broods (Bart 1977, Götmark 1992). Birds that are flushed from their nests during surveys may be more susceptible to nest predation than undisturbed birds. Ongoing activities by researchers could cause some mortality to spectacled eider eggs and chicks. The collection of birds for dietary or contaminant studies obviously impacts small numbers of spectacled eiders. Implantation of satellite transmitters has provided the best information available on spectacled eider movements and locations of molting and winter areas, but the invasive nature of the surgery may impact the ultimate survival of a small number of birds.

In recent years, numerous studies have been conducted documenting global climate change and climate regime shifts that may affect various animal and plant populations (e.g., Mantua et al. 1997, Merrick 1997, Benson and Trites 2002). These studies document changes in variables such as ocean water temperatures at the surface and in the water column, atmospheric pressure, river outflows, polar ice recession, and others that influence the abundance and distribution of various species in marine ecosystems. The causes of these climatic regime shifts are unclear, but regime shifts that cause changes in primary productivity can affect other members of an ecosystem, including apex predators. Climatic regime shifts that alter the abundance and distribution of marine benthic invertebrates in the Bering Sea could have implications for spectacled and Steller's eiders wintering in this area (Lovvorn et al. 2003).

Naturally occurring factors, such as the effects of disease and parasites (Hollmén et al. 2000), predation (Martin 1997a, Day 1998), and weather may also affect spectacled and Steller's eider survival. In addition, eiders are potentially at risk from sources related to human activities including the accumulation of environmental pollutants (Stout 1998; Trust et al. 2000; Stout et al. 2002), and commercial fishing activities that may potentially affect winter feeding areas.

Recovery Plan

A Recovery Plan for spectacled eiders was published by the USFWS (USDOI USFWS 1996) to delineate reasonable actions which are believed to be required to provide for recovery and/or protection of this species. The plan summarizes facts known regarding the status of spectacled eiders, causes for the decline in the population, current management activities, and reasons for listing as a threatened species. The plan reviews strategies for promoting spectacled eider recovery including management actions and specific tasks directed to enumerate actions that address threats to spectacled eiders.

Critical Habitat

Critical habitat for the spectacled eider has been designated in molting areas in Norton Sound and Ledyard Bay, breeding areas in central and southern Y-K Delta, and wintering area in waters south of St. Lawrence Island. A total of 38,991 mi^2 (101,000 km^2) is designated as critical habitat for spectacled eiders. No critical habitat has been designated for spectacled eiders on lands administered by BLM in the National Petroleum Reserve – Alaska.

D.3.2 Steller's Eider

Three breeding populations of Steller's eiders are recognized by the USFWS Steller's Eider Recovery Plan, two in Arctic Russia (Russian Atlantic and Russian Pacific populations), and one in Alaska (Fredrichson 2001, USDOI USFWS 2002). The Alaska population nests primarily on the ACP; however, a very small subpopulation exists on the Y-K Delta. Steller's eiders were formerly common breeders in the Y-K Delta, but numbers there declined drastically, and Kertell (1991) reported the Steller's eider as apparently extinct as a breeding species on the Y-K Delta. However, Flint and Herzog (1999) reported single Steller's eider nests in the Y-K Delta in 1994, 1996, and 1997, and three nests in 1998. Steller's eider density on the ACP is low. The largest population, which is located in eastern Russia, may number over 128,000 birds (Hodges and Eldridge 2001). In Alaska, Steller's eiders spend most of the year in shallow marine habitats along the Alaska Peninsula and the eastern Aleutian Islands to lower Cook Inlet, with stragglers south to British Columbia. In Eurasia, they winter from Scandinavia and northern Siberia south to the Baltic Sea, southern Kamchatka, and the Commander and Kurile islands (Johnson and Herter 1989). In the spring, the majority of the world population migrates along the Bristol Bay coast of the Alaska Peninsula, crosses Bristol Bay toward Cape Pierce, and continues northward along the Bering Sea coast (Larned 2003). Steller's eider was federally-listed as a threatened species in 1997 (62 FR 31748-31757) because of a reduction in the number of birds nesting in Alaska and substantial reduction in the breeding range in Alaska.

The range of Steller's eider range on Alaska's ACP apparently once extended from Wainwright east into the Canada's Northwest Territories (Johnson and Herter 1989; Quakenbush et al. 2002, and references therein). They are currently reported east at least to Prudhoe Bay (TERA 1997), but no recent records have been reported east of the Sagavanirktok River (Quakenbush et al. 2002). Steller's eider has not been recorded nesting east of Cape Halkett, other than one recent record inland near the Colville River (Quakenbush et al. 2002). Aerial surveys conducted by the USFWS indicate that Steller's eiders are widely distributed across the ACP in low densities (0.0045 birds per mi^2 [0.003 birds per km^2] in 2003; Larned et al. 2003) from Point Lay to the Sagavanirktok River, with very few sightings east of the Colville River. The highest concentrations occur near Barrow (Quakenbush et al. 1995, 2002; Ritchie and King 2002, 2003), although breeding there does not occur every year and may be related to predator/prey cycles (Quakenbush and Suydam 1999). During the 1990s, Steller's eider breeding at Barrow coincided with highs in the lemming population.

Based on aerial breeding pair surveys, Mallek et al. (2003) reported that the ACP Steller's eider population averaged around 1,000 birds from 1986 to 2001. Eider breeding population surveys conducted earlier in the year indicated a lower population, averaging around 170 birds from 1992 to 2003 (Larned et al. 2003). Differences in the two averages are likely related to survey timing. Larned et al. (2003) reported a non-significant population growth rate of 1.007 from 1993 to 2003 but, because of the small numbers of birds and high inter-annual variability, statistical tests probably lacked the power to determine significant trends. However, based on comparisons of historical and recent data, Quakenbush et al. (2002) suggested that a reduction in both occurrence and breeding frequency of Steller's eiders had occurred on the ACP, except in the Barrow area. Larned (2003) also reported a declining trend during annual spring surveys for Steller's eiders in the Bristol Bay area, although some of the variation may have been due to inter-annual variability in the timing of the eider migration that may have precluded portions of the population from being counted during some years.

Steller's eiders arrive on the ACP in early June, and evidence from the Barrow area suggests that nesting effort may vary from year to year (Quakenbush and Suydam 1999). At Barrow, Steller's eiders apparently nest during high lemming years when predators such as snowy owl and pomarine jaeger (*Stercorarius pomarinus*) that feed on lemmings are also nesting. Steller's eiders, as well as snowy owls and pomarine jaegers, may not nest at all during low lemming years. This cycle has been consistent since the initiation of intensive studies of Steller's eider nesting biology in the Barrow area in 1991, and has continued through 2003 (Quakenbush et al. 1995; Obritschkewitsch et al. 2001; Obritschkewitsch and Martin 2002a, b; Rojek and Martin 2003). Theoretically, an ample supply of lemmings may divert potential predators away from eider eggs and chicks, thus making it more advantageous for eiders to nest during years of high lemming populations. Some evidence also suggests that Steller's eiders may benefit by nesting close to nests of avian predators such as jaegers and snowy owls. These aggressive birds defend their own nests against other predators, and eider nests located nearby may benefit when potential predators are driven from the area. Other variables, such as weather and snow conditions, did not explain the inter-annual variability of eider nesting. Although intensive studies of Steller's eider breeding biology have been conducted in the Barrow area, little information is available for other portions of the ACP, including the Planning Area, where most information consists of scattered sightings during aerial surveys.

Steller's eider nests are most often found on tundra habitats, and are often associated with polygonal ground both near the coast and at inland locations. Emergent *Carex* and *Arctophila* provide import areas for feeding and cover. Males may remain on the breeding grounds for 2 weeks after the onset of the 24-day incubation period (Fredrichsen 2001). Clutch size ranges from three to eight, but averages five to six eggs. Nest success is variable, and ranged from approximately 14 to 71 percent at Barrow in the 1990s (Quakenbush and Suydam 1999). Nest predators include jaegers, common ravens (*Corvus corax*), glaucous gulls, and Arctic foxes. Steller's eider broods apparently are less mobile than those of spectacled eiders and remain in ponds with emergent *Carex* and *Arctophila* within a thousand feet of the nest site.

Male departure from the breeding grounds begins in late June or early July, after females begin incubation. Most of the available information on migration comes from Barrow, where birds disperse across the area from Admiralty Inlet to Wainwright and enter marine waters during the first week of July. They make use of coastal areas along the Chukchi Sea coast from Barrow to Cape Lisburne, and also use bays and lagoons of Chukotka (USDOI BLM 2003). Females that fail in breeding attempts may remain in the Barrow area into late summer (USDOI BLM 2003). Male, and non or failed-breeding, Steller's eiders concentrate in several lagoons on the Alaska Peninsula in August and September to molt (Flint et al. 2000b). Females and fledged young depart the breeding grounds in early to mid-September.

Causes for the decline of the Steller's eider population in Alaska are unknown, but may include increased predation pressure on the North Slope and Y-K Delta breeding grounds, subsistence harvest, and ingestion of lead shot and contaminants (Henry et al. 1995). Bustnes and Systad (2001) also suggested that Steller's eiders might have specialized feeding behavior that limits the availability of winter foraging habitat.

D.3.2.1 Recovery Plan

A Recovery Plan was published by the USFWS (USDOI USFWS 2002) to provide strategies to promote recovery of the Alaska breeding population of Steller's eiders to the point that protection under the ESA is no longer required. The interim objectives of the plan are to prevent further declines in the Alaska breeding population, protect Steller's eider breeding habitat, identify and alleviate causes of decline and/or obstacles to recovery, and determine size, trends, and distribution of the northern and western Alaska breeding populations.

D.3.2.2 Critical Habitat

For the Steller's eider, critical habitat has been designated in breeding areas on the Y-K Delta, staging area in the Kuskokwim Shoals, and molting areas in waters associated with the Seal Islands, Nelson Lagoon, and Izembek Lagoon in southwestern Alaska. A total of 2,830 mi^2 (7,330 km^2) is designated as critical habitat for Steller's eiders. There is no designated critical habitat for Steller's eiders on lands administered by the BLM in the National Petroleum Reserve – Alaska.

D.4 Avenues of Take for Listed Eider species Resulting from Activities in the Northeast National Petroleum Reserve – Alaska

D.4.1 Summer Seismic Surveys

The use of airguns for seismic work in Teshekpuk Lake during the summer could temporarily displace spectacled or Steller's eiders from preferred feeding habitats while surveys were being conducted. Because setbacks around the perimeter of the lake presumably would eliminate the potential for disturbance to eiders nesting near the lakeshore, only eiders using habitats in the open water of the lake would potentially be disturbed. Eiders displaced by seismic activities would likely return to preferred habitats after the airgun arrays passed through the area. Disturbance to threatened eiders near the shoreline could result from support activities, such as use of helicopters to transport personnel and supplies. Disturbance related to support activities could result in permanent or temporary displacement from nesting, feeding, or brood-rearing habitats. Conducting surveys after the completion of the nesting period would eliminate the potential for nest abandonment, but could impact hens and their broods.

D.4.2 Habitat Loss in High Density Nesting Areas

D.4.2.1 Fill and Structures That Displace Use

The oil and gas development activities with the greatest potential for causing loss of spectacled and Steller's eider habitat are gravel mining and placement. North Slope oil field roads and pads are constructed using gravel, and tundra covered by gravel would no longer be available for eider nesting, brood-rearing, or foraging. This loss of habitat would continue for as long as the proposed development was in operation. As abandonment plans call for allowing gravel pads and roads to "bed" naturally, loss of habitat may be considered permanent, or at least considerably longer than the end of the operational life of the field. Habitat loss for eiders would be minimized by locating gravel roads, pads, airstrips, and mine sites in areas where eider use is infrequent. Under ROP E-11, aerial surveys would be conducted for at least 3 years prior to construction authorization for developments located within the USFWS North Slope eider survey area. If spectacled or Steller's eiders were present within the proposed development area, the applicant would be required to consult with the BLM and USFWS about the design and placement of roads and facilities.

Locating infrastructure in areas with low eider densities could reduce loss of occupied eider habitat. Although specific studies have not been conducted to investigate the population effects of eider displacement as a result of infrastructure construction, spectacled and Steller's eiders displaced from nesting or brood-rearing sites may move to adjacent habitats. Anderson et al. (2003) and TERA (1996) reported spectacled eider nests within several hundred feet of roads and pads in the Kuparuk and Prudhoe Bay oil fields. Since nest site fidelity has been demonstrated by spectacled eiders (TERA 1997), it is possible that spectacled or Steller's eiders displaced from traditional nesting sites by gravel placement would remain in or return to the same general area and utilize similar habitats. Troy and Carpenter (1990) reported that returning shorebirds displaced by winter gravel placement may nest in adjacent habitats in subsequent years, and Johnson et al. (2003b) reported that waterbirds nesting near the Alpine field in the Colville River Delta that were displaced from nesting sites by gravel placement for oil field infrastructure likely moved their nests to nearby adjacent habitats.

The reasonably foreseeable development scenario specifies two developments, including CPF pads and satellite fields with adjoining roads and airstrips, one roadless pump station, up to six gravel extraction sites, and two staging areas that would create a total gravel footprint of approximately 1,356 acres (5.6 km^2; Table D-4). Loss of eider habitat could be permanent in the area occupied by the development footprint, and any eiders nesting in this area would be displaced to other areas. If spectacled and Steller's eider densities are assumed to be 2.85 and 0.16 birds per mi^2 (1.10 and 0.06 birds per km^2), which are relatively high estimates based on aerial survey data (Larned et al. 2003; Ritchie and King 2003), it is expected that 6.0 and 0.3 spectacled and Steller's eiders, respectively, could be directly displaced by the gravel footprint of the development, including the gravel extraction sites.

D.4.2.2 Gravel and Other Hard Rock Mining

Gravel for construction of roads, pads, and airstrips would be mined from gravel extraction sites during the winter. Under the development scenario, six gravel extraction sites covering 20 to 50 acres each could be required. Under the maximum development scenario, 225 acres of potential eider habitat could be lost as a result of gravel extraction (Table D-4). If gravel extraction sites were located in areas of high eider concentration, where it is assumed that spectacled and Steller's eider densities are 2.85 and 0.16 birds per mi^2 (1.10 and 0.06 birds per km^2) respectively, approximately 1.8 and 0.1 spectacled and Steller's eiders would be displaced by the gravel extraction sites under the maximum development scenario.

Table D-4. Gravel Footprint and Zones of Influence for Production and Effects on Eiders.

Development	Gravel Footprint in Acres (km^2) [1]	200-Meter Zone of Influence in Acres (km^2) [2]	500-Meter Zone of Influence in Acres (km^2) [3]
CPF developments (2) [4]	161 (0.7)	1,252 (5.1)	4,019 (16.3)
Satellite developments (10) [4]	872 (3.5)	17,436 (70.6)	46,803 (189.4)
Gravel extraction sites (8 at 20-50 acres each)	225 (0.9)	Not Applicable	Not Applicable
Staging areas (2)	100 (0.4)	257 (1.0)	939 (3.8)
Total Area	1,356 (5.5)	18,945 (76.7)	51,761 (209.5)
Spectacled eiders affected (assuming density of 1.1 eiders per km^2)	6.0	84.3	230.4
Steller's eiders affected (assuming density of 0.06 eiders per km^2)	0.3	4.6	12.6

[1] Includes only the gravel footprint of the structure.
[2] Includes only the area outside the structure but within 200 meters of the edge of the structure.
[3] Includes only the area outside the structure but within 500 m of the edge of the structure.
[4] Includes footprint of pads, roads, and airstrips.

D.4.2.3 Damage to Tundra From Exploration and Other Winter Oil Field Activities

In addition to permanent habitat loss, temporary loss of habitat associated with gravel placement could occur on tundra adjacent to gravel structures, where accumulated snow from plowing activities or snow drifts could become compacted and cause delayed snowmelt. Delayed snowmelt persisting into the nesting season could preclude eiders from nesting in those areas. Delayed snowmelt and temporary habitat loss could also result from the construction and use of ice roads during winter activities.

Dust deposition could affect eider habitat by causing early green-up on tundra adjacent to roads and pads, which could attract spectacled and Steller's eiders and other waterfowl early in the season when other areas are not yet snow free. Birds attracted to these areas could be susceptible to injury or death if hit by traffic associated with roads and pads. Dust deposition could also increase thermokarst and soil pH, and reduce the photosynthetic capabilities of plants in areas adjacent to roads (Walker and Everett 1987; Auerbach et al. 1997). Traffic levels, air traffic (including helicopters), and wind could all influence the amount of dust that would be deposited adjacent to roads and pads. Assuming a 656-foot (200-meter) zone of influence around gravel infrastructure within which dust and snow deposition could impact eider habitats, approximately 84.3 spectacled and 4.6 Steller's eiders could be affected under the maximum development scenario (Table D-4).

Rolligons and track vehicles used during seismic exploration could leave tracks on tundra habitats that would affect vegetation, soil chemistry, soil invertebrates, and soil thaw characteristics, and cause small-scale hydrologic changes (Kevan et al. 1995). The most noticeably affected areas would include terrain with considerable microtopographic relief caused by mounds, tussocks, hummocks, and high-centered polygons. These areas are used by eiders for nesting and loafing. Wet areas would be less likely to be affected than drier sites (Walker 1996). Because snow would act as a buffer against these impacts, avoidance of areas with low snow cover, use of lightweight vehicles, dispersing traffic patterns, and minimizing sharp turns could help to minimize damage (Walker 1996). Required Operating Procedure C-2 would require measures to protect stream banks, minimize soil compaction, and minimize the breakage, abrasion, compaction, or displacement of vegetation while using heavy equipment during winter overland moves or seismic work.

Ice roads could also cause compaction of vegetation, which could affect the availability of cover for nesting eiders in the ice road footprint. Potential impacts to spectacled eiders from ice roads could be reduced by alternating ice road routes annually, by avoiding routes near known eider nesting locations, and by routing ice roads over habitats not preferred by eiders. Under the development scenario the annual construction of approximately 50 miles of ice road covering 212 acres are proposed. Assuming the same spectacled and Steller's eider densities used in the analysis of habitat loss and gravel mining (above), ice road construction could affect tundra habitat supporting 0.9 spectacled and 0.05 Steller's eiders.

Ice roads would connect to ice pads where winter drilling activities for exploratory and delineation wells would be conducted. As many as half of the ice pads could be multi-year pads used for summer activities such as storage of equipment. Tundra habitat under the footprint of multi-years pads would be lost as spectacled and Steller's eider habitat during the lifetime of the pad. Vegetation under the footprint of multi-year pads would be relatively unaffected after the pad melted (McKendrick 2000). Some vegetation within a 3- to 6-foot- (1- to 2-meter-) wide band around the perimeter of multi-year ice pads could be damaged and require several years to recover. Under the maximum development scenario, 50 multi-year ice pads and 50 single-season ice pads covering 6 acres each could be constructed, resulting in a total footprint of 600 acres during the life of the project. Assuming the same spectacled and Steller's eider densities used in the analysis of habitat loss and gravel mining (above), ice pad construction could affect tundra habitat supporting 2.7 spectacled and 0.2 Steller's eiders.

D.4.2.4 Withdrawal of Freshwater From Lakes and Ponds

Construction of ice roads and pads involves water withdrawal from deep lakes near road and pad locations. Bergman et al. (1977) reported that spectacled eiders at Point Storkerson used deep *Arctophila* lakes during pre-nesting, nesting, and post-nesting periods, and Derksen et al. (1981) reported that some spectacled eider brood-rearing occurred on deep open and deep *Arctophila* lakes in the National Petroleum Reserve – Alaska. Spectacled eider nests are often located within several feet of lake shorelines; therefore, water withdrawal from lakes during ice road construction that lowered the level of lakes could affect spectacled eider nesting habitat. Changes in the surface levels of lakes as a result of water withdrawal would be dependent on the amount of water withdrawn, the size of the lake, and the recharge rate. Lake studies would be conducted prior to water withdrawal for ice road construction, and the State of Alaska places restrictions on the amount of water that may be withdrawn from individual lakes. Most lakes would likely return to pre-withdrawal levels during spring flooding (Rovansek et al. 1996).

Required Operating Procedure B-2 would specify water withdrawal requirements based on lake size, depth, volume, and fish populations that could help minimize potential impacts to eider habitats. During winter water withdrawal operations, care should be taken to minimize or eliminate water withdrawal from deep, open and deep, *Arctophila* lakes that could be used by spectacled or Steller's eiders. Aerial and/or ground-based surveys of potential water withdrawal lakes conducted during the summer breeding and post-breeding season could identify lakes used by threatened eiders, and help to determine which lakes would be most suitable for water withdrawal activities to minimize potential impacts on threatened eiders.

D.4.2.5 Disruption/Alteration of Hydrology That May Possibly Destroy Habitat

Impoundments created by gravel structures could cause temporary or permanent flooding on adjacent tundra. Impoundments could be ephemeral and dry up early during the summer, or they could become permanent water bodies that would persist from year to year (Walker et al. 1987; Walker 1996). Tundra covered by impounded water could be lost as nesting habitat for some birds. However, impoundments could also create new feeding and brood-rearing habitat that would be beneficial to some bird species. Noel et al. (1996) reported that the areas occupied by impoundments in the Prudhoe Bay area generally supported higher waterfowl densities than the same areas did prior to development, and that spectacled eiders nested on some impoundments. Warnock and Troy (1992) and Anderson et al. (1992) also reported use of impoundments in the Prudhoe Bay and Kuparuk oil fields by spectacled eider. Kertell (1993, 1994) reported few differences in numbers of invertebrates and Pacific loons when comparing use of natural ponds and impoundments in the Prudhoe Bay area. He also reported that feeding and resting ducks were more abundant on impoundments than natural ponds, although this difference was not significant. The effects of impoundments could be minimized or eliminated by using engineering plans that provided culverts to allow for adequate cross-drainage at gravel structures. However, culverts blocked by snow or ice could prolong the spring flooding period (Walker 1996).

D.4.3 Oil Field Disturbance

Activities related to oil development and production in the Planning Area, such as vehicle, aircraft, pedestrian, and boat traffic; routine maintenance activities; heavy equipment use; and oil-spill clean-up activities, could cause disturbances that would adversely affect threatened eiders. These disturbances could result in nest abandonment or decreased nest attendance, and increased energy expenditures that could affect the physiological condition of birds and their rate of survival or reproduction.

D.4.3.1 Construction Period (Pads, Roads, Runways, and Pipelines)

Installation of pipelines and placement of gravel for oil field infrastructure (e.g., roads, airstrips, and pads associated with well, camps, staging areas, and processing facilities) would be conducted during the winter. Because eiders are not present in the Planning Area during winter, there would be no disturbance to threatened eiders associated with construction of infrastructure in the Planning Area. The potential effects of permanent and temporary habitat loss associated with these activities are discussed in the section on habitat loss.

D.4.3.2 Pad Activity

Various types of disturbances associated with oil and gas operations, such as vehicular traffic, machinery, facility noise, and pedestrian traffic, may occur on pads. Some of these disturbances, such as vehicular traffic, may also occur on roads and are therefore discussed below in Section D.4.3.5 (Roads).

Because spectacled and Steller's eider densities in the Planning Area are low, few studies have documented responses of threatened eiders to oil field disturbances, although Anderson et al. (1992) reported that during the nesting period, spectacled eiders near the GHX-1 facility in the Prudhoe Bay area appeared to adjust their use of the area to locations further from the facility in response to noise. Disturbance from facility noise could affect the activity and energy budgets of spectacled and Steller's eiders.

TERA (1996) reported no conspicuous avoidance of facilities in the Prudhoe Bay oil field by brood-rearing spectacled eiders. Brood movement was extensive during the first few days after hatching, and broods often spent a portion of their time within 656 feet (200 meters) of facilities, including high-noise areas such as gathering centers and the Deadhorse airport. Spectacled eiders may be able to acclimate to periodic, but regularly occurring, disturbances related to oil field activities on roads and pads. A potentially more serious situation could develop if spectacled or Steller's eiders nested near roads or pads where little or no activity occurred early during the nesting period, but activity did occur later in the summer. In such cases, nest failure or abandonment by eiders could occur, as nesting eiders might not be acclimated to oil field activities.

Evidence suggests that pedestrian traffic may have a greater negative impact than vehicular traffic on some birds. Pedestrian traffic is likely to occur on well pads during well maintenance activities, and more regular pedestrian traffic is likely to occur on larger pads that support camps and production facilities. During a study of the effects of disturbance related to the Lisburne Development in the Prudhoe Bay oil field, Murphy and Anderson (1993) reported that of the more common sources of disturbance, humans on foot elicited the strongest reactions from geese and swans. Ritchie (1987) reported that pedestrians caused greater disturbance to nesting raptors than other sources of disturbance. Restricting or reducing the level of foot traffic on gravel roads and pads, particularly in areas adjacent to potential spectacled and Steller's eider habitat, could help to reduce the potential for disturbance to nesting or brood-rearing eiders.

Two CPF developments and 10 satellite developments, entailing 13 pads covering approximately 216 acres in total, are proposed under the development scenario. A 656-foot (200-meter) buffer around the developments would result in a zone of influence covering 1,140 acres within which disturbance could affect threatened eiders. If spectacled and Steller's eider densities are assumed to be 2.85 and 0.16 birds per mi^2 (1.10 and 0.06 birds per km^2), 5.1 and 0.3 spectacled and Steller's eiders, respectively, would potentially be affected by disturbance related to activities at the developments. If the zone of influence is increased to a 1,640-foot (500-meter) buffer, 21.3 spectacled eiders and 1.2 Steller's eiders could be affected by disturbances related to the developments.

D.4.3.3 Staging Area Activity

It is likely that staging areas would be established on the coast to support development activities. Summer barge traffic would occur from mid-July to early October, with barges used to transport equipment to coastal staging areas for storage until they could be transported to exploration or development sites during winter. Summer activity at staging areas would require the use of heavy equipment for offloading and storage of equipment and supplies from barges. Disturbance to eiders could result from equipment noise and movement, and from pedestrian activity. The types of disturbances would be the same as those described for other oil field activities, although their potential to affect threatened eiders could be reduced, given the smaller size of staging areas compared to the proposed development scenario for the Planning Area. Under the maximum development scenario, two staging areas covering approximately 100 acres could be in operation. A 656-foot (200-meter) buffer around the staging area would produce a 257-acre zone of influence that could affect habitat supporting 1.1 spectacled and 0.1 Steller's eiders. A 1,640-foot (500-meter) buffer around the staging areas would produce a 939-acre zone of influence that could affect habitat supporting 4.2 spectacled and 0.2 Steller's eiders.

D.4.3.4 Aircraft

Both fixed-wing aircraft and helicopters could be used to transport personnel, supplies, and equipment to airstrips or staging areas during development and production activities in the Planning Area. The potential for disturbance to waterfowl from aircraft is well documented (e.g., Schweinsburg 1974; Ward and Stehn 1989; Derksen et al. 1992; McKechnie and Gladwin 1993), although few studies have reported specifically on spectacled or Steller's eiders. Johnson et al. (2003b) conducted the most thorough study of aircraft disturbance to waterfowl in the Arctic at the Alpine field on the Colville River Delta. Responses of birds to aircraft include alert postures, interruption of foraging behavior, and flight. Such disturbances may displace birds from feeding habitats and negatively impact energy budgets. Gollop et al. (1974) suggested that helicopters may be more disturbing to wildlife than low-flying fixed-wing aircraft, although Balogh (1997) indicated that fixed-wing aircraft flown at 150 feet often caused spectacled eiders to flush, while helicopters flown at similar altitudes in the vicinity of Prudhoe Bay did not.

Oil Field Support

The effects of routine aircraft flights into airstrips could range from avoidance of certain areas by eiders to abandonment of nesting attempts or lowered survival of young. The potential for noise associated with aircraft to have negative impacts on eiders would probably be greatest during the nesting period when the movements of incubating eiders are restricted. The highest levels of aircraft noise would occur during takeoffs as engines reached maximum power levels. During landings, levels of aircraft noise would be reduced as engine power decreased. In the Planning Area, aircraft activity would likely be greater during the construction period, when more personnel and equipment would be transported to areas being developed, than during the production period, when activity levels would be reduced.

The Alpine field avian monitoring program in the Colville River Delta was a multi-year project designed to identify the potential effects of aircraft noise and disturbance on birds nesting near the airstrip and on large waterbirds during brood-rearing (Johnson et al. 2003b). The average number take-offs and landings of all types of aircraft combined at the Alpine field airstrip during the summer breeding season was greater during construction period in 2000 (41.8 take-offs and landings per day; Johnson et al. 2001, 2003b) than in the number of summer operational flights in 2004 (15 take-offs and landings per day; ConocoPhillips Alaska, Inc. unpubl. data). Other sources of disturbance included vehicle and pedestrian traffic, and predators. Although spectacled eiders nested in the general area, none nested in the study area, so the effects of aircraft disturbance reported by Johnson et al. (2003b) do not pertain specifically to spectacled eiders. However, it is reasonable to assume that spectacled eiders (and Steller's eiders, which occur at much lower densities) would have a respond to aircraft disturbance similar to that of other waterfowl in the study area.

The number of waterfowl nests located within 0.6 miles (1,000 meters) of the airstrip at the Alpine field declined after construction began, as compared to pre-construction levels (Johnson et al. 2003b). However, the number of nests located between 0.6 miles (1,000 meters) and 0.9 miles (1,500 meters) of the airstrip increased. The decline near the airstrip could not be directly linked to disturbance, because other factors, such as lower than normal temperatures and severe flooding later into the breeding season during construction years, may also have influenced nest densities. During years of heavy construction, nests of white-fronted geese (*Anser albifrons*) were apparently displaced to habitats similar to those used prior to construction at locations further from the airstrip. Johnson et al. (2003b) suggested that preferred white-fronted goose nesting habitats in the Alpine field development area had not been saturated with nests prior to development. Generally, white-fronted geese exhibited statistically non-significant and weak distributional changes in relation to sources of disturbance at the Alpine field, including increased noise levels, aircraft, vehicles, and pedestrians, which suggests that the geese moved their nests away from the gravel footprint and the noisiest areas, but not enough to be detected at the larger scale of approximately 1.2 miles (2,000 meters) surrounding the airstrip. The difference in distributions of nests between pre-construction and heavy construction years appeared to occur within the first 2,300 feet (700 meters) surrounding the airstrip (Johnson et al. 2003b).

At the Alpine field, white-fronted geese at failed nests were more likely to take incubation recesses than geese at successful nests. A higher frequency and duration of recesses may allow for increased predation by jaegers, gulls, ravens, and foxes at unattended nests. The probability of taking a recess increased as noise level increased, when aircraft were present, when the number of vehicles decreased, and when pedestrians were present. Geese nesting less than 1.2 miles (2,000 meters) from the airstrip were more likely to take a recess than birds nesting greater than 1.2 miles (2,000 meters) from the airstrip. Of the various disturbance types, helicopters were the least predictable because they did not have a restricted flight pattern. Incubating white-fronted geese and tundra swans (*Cygnus columbianus*) reacted to fixed-wing aircraft more often than helicopters, although monitored nests were closer to the airstrip than to the helipad. Airplanes and pedestrians elicited the highest rates of response from incubating geese, and vehicles the lowest. Nonetheless, successful white-fronted goose nests were generally closer to the Alpine field airstrip, the flight path, and the nearest gravel than unsuccessful nests, although most comparisons were not significant (Johnson et al. 2003b).

Johnson et al. (2003b) also reported on tundra swans and yellow-billed loons (*Gavia adamsii*) nesting near the Alpine field airstrip. There was no difference among years in the mean distance of tundra swan nests relative to the airstrip, closest gravel, or aircraft flight path. In 1998, a tundra swan nested successfully 520 feet (160 meters) northeast of the airstrip, despite daily helicopter activity at the airstrip during late June and early July. Another pair of tundra swans nested successfully from at least 1997 through 2002 at a site approximately 1,500 feet (450 meters) southwest of the airstrip and 475 feet (145 meters) from the infield road. The nest site was moved slightly during 2001, perhaps in response to increased vehicle traffic, but the original site was again occupied in 2002. These nests hatched successfully despite their proximity to the airstrip and their locations under the takeoff and approach patterns of aircraft. Johnson (1984) reported that at least three common eider hens nested successfully within 1,000 feet (330 meters) of a helicopter landing pad on Thetis Island offshore from the Colville River Delta that averaged approximately 12 flights per day. Disturbance effects of the various components of the Alpine field apparently were not severe enough to cause major changes in the selection of nest sites by tundra swans (Johnson et al. 2003b). Similarly, no evidence was found for disturbance effects on the distribution and abundance of yellow-billed loon nests near the Alpine field airstrip, although the sample size was small.

There is a potential for numerous overflights, landings, and takeoffs to displace some nesting eiders near routinely used aircraft landing sites. However, although the reaction of eiders to aircraft is unknown, there is also a potential for habituation to routine air traffic by spectacled eiders. In the Prudhoe Bay area, nests have been reported in wetlands within approximately 0.45 mile (750 meters) of the Deadhorse Airport (TERA 1996), including one less than 0.15 mile (250 meters) from the runway (Martin 1997b), suggesting that some nesting individuals are tolerant of aircraft activity. Given that spectacled and Steller's eiders occur in low densities in the Planning Area, and given the potential for habituation to aircraft disturbance, the potential for disturbance related to aircraft activity to negatively impact threatened eiders is probably low. However, spectacled eiders are sometimes known to nest at traditional colonial sites (TERA 1996; Anderson et al. 2003), and airports and landing strips should be located away from colonial nesting areas if possible. The ROP F-1 and Stipulation K-4 should help to minimize the potential effects of aircraft on spectacled and Steller's eiders by limiting air traffic in and around the goose molting lakes north of Teshekpuk Lake from May 20 to August 20.

A 1,640-foot (500-meter) buffer established around an airstrip 0.6 miles (1,000 meters) in length would produce a zone of influence in habitat capable of supporting 3 spectacled and 0.2 Steller's eiders. A 0.6-mile (1,000-meter) buffer established around the airstrip would produce a zone of influence in habitat capable of supporting 7 spectacled and 0.4 Steller's eiders.

Increased Research

The potential effects of low-level aerial survey flights for monitoring bird or caribou populations on eiders are unknown. In general, however, disturbance of a particular area would be of short duration, and surveys would cover only a small percentage of the ACP each season. Such flights would likely cause negligible disturbance to eiders. In the northeastern portion of the Planning Area, wildlife survey activity would likely be more frequent during a 3-week period in June and July. During this time, the area of disturbance in the Planning Area would be increased, or certain areas would be disturbed more intensively than others.

Eiders could be disturbed by helicopters used for studies in which caribou and grizzly bears are captured for attachment of radio collars. It is expected that relatively few nest sites would be affected, because eider nest sites generally are scattered at relatively low densities over the ACP and in the Planning Area. Effects resulting from aircraft activity would be difficult to quantitatively separate from natural variation in population numbers. Activity levels and associated disturbance to threatened eiders at remote research camps would probably be reduced compared to the amount occurring at active development sites where aircraft traffic levels would be much higher.

Overflights of support aircraft or aircraft conducting waterfowl surveys could occur during the open-water period when spectacled and Steller's eiders may be staging in the nearshore waters of the Planning Area. Overflights would be brief, and disruption of eider foraging or resting behavior would be minimal. Support aircraft could be routed inland and/or at elevations sufficient to minimize or eliminate disturbance. Aerial survey aircraft could cause more disturbance than support aircraft because they could fly at low elevations during surveys. Required Operating Procedure F-1 would require measures to minimize the effects of low-flying aircraft on wildlife, traditional subsistence activities, and local communities.

Summer camps requiring fixed-wing aircraft or helicopter support could be established to study wildlife populations, archeological sites, or other resources in the Planning Area. During 2002 and 2003, summer camps were established southeast of Teshekpuk Lake to study king eiders (Powell et al. 2004). In some cases supplies could be cached at research campsites during the winter when eiders are not present. Research camps would likely be active for 6 to 12 weeks during the summer breeding season. In most cases, the effects of aircraft associated with re-supply activities for large research camps would likely be short-term because re-supply flights would be infrequent. Eiders displaced by aircraft activities near airstrips or landing zones would be able to return to preferred habitats shortly after completion of the re-supply mission. However, given the infrequency of re-supply flights at research camps, eiders might not be able to habituate to aircraft disturbance, and some eiders could be displaced from preferred habitats for the duration of the research activity. Locating research camps away from areas of high spectacled and Steller's eider concentrations could help to reduce the effects of aircraft activity. However, this precaution would not be possible if the purpose of the research camp was to study threatened eiders. It is important to note that any research not directly related to the action being considered here would require separate consultation.

Increased Recreation

Recreational use of the Northeast National Petroleum Reserve – Alaska is unlikely to increase from implementation of the final Preferred Alternative. Current levels of use by aircraft could disturb small amounts of habitat associated with off-airstrip landings, and recreational camps trample small areas of vegetation. Impacts to eiders would be limited to behavioral disturbance associated with the aircraft and presence of the camps, but a similar level of impact would be expected even if no development occurred in the area.

Increased Village Aircraft Activity

The final Preferred Alternative is unlikely to increase aircraft traffic into the villages, since development facilities in the National Petroleum Reserve – Alaska would have their own airstrips.

D.4.3.5 Roads

Oil Field Support

Spectacled and Steller's eiders could be subjected to disturbances related to vehicular and pedestrian traffic and noise from equipment on roads and at facilities. Vehicular traffic, including large trucks, hauling cranes, and other equipment, and road maintenance equipment on access roads and pads, could impact threatened eiders during summer activities in the Planning Area. In the North Slope oil fields, these types of disturbances have been documented for brant, and Canada (*Branta canadensis*) and white-fronted geese, and have been shown to have greater effects on geese feeding close to roads than on geese feeding further away (Murphy et al. 1988; Murphy and Anderson 1993). Disturbances occur most often during the pre-nesting period when these birds gather to feed in open areas near roads, and during brood-rearing and fall staging when some geese exhibit higher rates of disturbance (e.g., "heads up" behavior) in areas near roads than do birds in undisturbed areas. A small percentage of birds may walk, run, or fly to avoid vehicular disturbances (Murphy and Anderson 1993). Disturbance occurs most often within 164 feet (50 meters) of roads. However, some disturbance has been reported for birds as far as 490 to 690 feet (150 to 210 meters) from roads (Murphy and Anderson 1993).

The effects of disturbance to threatened eiders near roads and pads would likely differ depending on the reproductive stage. Anderson et al. (2003) reported that pre-nesting pairs of spectacled eiders in the Kuparuk oil field were located nearer to roads than nesting females. However, both Anderson et al. (2003) and TERA (1996) reported locations of spectacled eider nests that were within a few hundred meters of oil field facilities. Anderson et al. (2003) also reported that there was no significant difference in the distance of failed versus successful spectacled eider nests from oil field facilities.

Gravel placement for roads and well pads would be unlikely to cause physical obstructions to movements of threatened eiders. During the period when eiders can fly, they can easily move over or around these structures. Gravel roads and pads could present some temporary obstructions during brood-rearing and molting periods when birds are flightless, particularly if traffic levels are high (Murphy and Anderson 1993). However, TERA (1996) reported that spectacled eider broods moved extensively, averaging 0.33 miles (0.53 km) per day during the first week after hatch and that some of the longest movements occurred during the first day or two after hatch. Spectacled eider broods did not avoid facilities and broods were known to cross roads; one brood crossed roads repeatedly (TERA 1996).

An analysis of the numbers of eiders that could potentially be disturbed by the gravel footprint of the development and in 656-foot (200-meter) and 1,640-foot (500 meters) buffers (or zones of influence) around the gravel footprint of the development scenario is shown in Table D-4. Spectacled and Steller's eider densities are assumed to be 2.85 and 0.16 birds per mi^2 (1.10 and 0.06 eiders per km^2), respectively. The analysis concluded that the total gravel footprint would displace 6.0 and 0.3 spectacled and Steller's eiders, respectively. The CPFs and satellite developments include a total of 103 miles of gravel road among the 13 developments. The gravel foot print of these roads totals approximately 773 acres and could displace 3.4 and 0.2 spectacled and Steller's eiders respectively. In the 656-foot zone (16,840 acres) of influence surrounding these roads, 75.0 spectacled and 4.1 Steller's eiders could potentially be disturbed, and in the 1,640-foot zone (43,730 acres) of influence, 194.7 and 10.6 spectacled and Steller's eiders, respectively, could potentially be disturbed. These numbers are probably high estimates, and the analysis assumes that no mitigating measures would be in place. Stipulations and ROPs would specify mitigation measures for siting of facilities, would require the use of fences to shield eiders from human activity on pads, and would place restrictions on aircraft use that would likely reduce the potential for aircraft to disturb spectacled and Steller's eiders.

Village Access

Most of the National Petroleum Reserve – Alaska is currently accessible to villages in the area by off road vehicles (four wheelers and snowmachines). Under the proposed alternative, access would not be increased unless roads were built that connected the developments directly to the North Slope road system.

Recreation/Tourism

Roads associated with potential development in the National Petroleum Reserve – Alaska would be unlikely to increase recreational use and tourism in the Planning Area.

D.4.3.6 Watercraft-based Support

Barge traffic associated with the transportation of equipment and supplies could be present during the open-water period from mid-July to early October. The use of barges to transport heavy equipment could require the construction of two staging areas along the coast, that could cover up to 50 acres each, for storage of equipment before moving it to inland locations. There would likely be two large sealifts (1 year apart) for each CPF development, and up to 20 barges per year during the development period. Barge routes could pass through shallow, nearshore habitats of the Beaufort Sea adjacent to the Planning Area that are known to be used by spectacled eiders (Map 3-33; TERA 1999, Fischer et al. 2002, Troy 2003). Spectacled eider groups most likely to encounter vessel traffic would be failed nesting females and females with young. Most males would have departed the area by late June or early July before the onset of vessel traffic. Spectacled eiders are uncommon in the offshore waters of the Planning Area, but Fischer et al. (2002) reported that when spectacled eiders were sighted they occurred in relatively large flocks. The mean spectacled eider flock size during surveys in 1999 and 2000 was 21 eiders. Small numbers of Steller's eiders could also occur in this area. Vessel traffic could cause temporary disturbance to feeding eiders if barges were to pass through feeding habitat. The disturbance would be short-term, and eiders would be able to swim or fly to avoid oncoming vessel traffic. The low number of barges involved would also minimize disturbance to eiders. Given the low density of spectacled and Steller's eiders in the offshore waters of the Planning Area, few barges would be likely to cause disturbances to eiders. Based on the mean flock size, barges that did encounter spectacled eiders would likely cause disturbance to about 20 eiders. Eiders could also collide with barges during poor weather.

Activity sites, including exploration, drilling, and production sites, are required to have an oil-spill response plan with trained personnel and cleanup equipment at each site, in accordance with federal, state, and Borough regulations. Spill response requirements would be thoroughly addressed when and if parcels were leased, and three spill drills would be required every 3 years.

Spill response training activities using small boats on lakes would have the potential to disturb foraging, nesting, or brood-rearing eiders. During oil spill response training drills, 20 to 40 people would participate for 1 to 2 days annually at each CPF development. There is little information on the potential impacts of boat disturbance on spectacled and Steller's eiders, but boat activity can cause alert postures, disruption of feeding behavior, and flight in other waterfowl, shorebirds, and raptors (Burger 1986, Belanger and Bedard 1989, Steidl and Anthony 2000). To minimize the potential for boat disturbance, set-back distances for boat activity for various bird groups ranges from 330 feet (100 meters) for shorebirds to 600 feet (180 meters) for wading birds (Rodgers and Smith 1995, Rodgers and Schwikert 2001). Conducting these activities in areas not frequented by eiders should help to reduce the likelihood that boats would impact threatened eiders. During the incubation period, up to two or three incubating hens could be disturbed if training activities occurred at a location where several pairs were nesting in close proximity. During the brood-rearing period, oil spill response training activities could affect hens with broods. Pre- and post-development surveys would be able to identify lakes where eider activity would be unlikely, and use of these lakes for oil spill response training would minimize the potential for activities to affect spectacled and Steller's eiders.

D.4.3.7 Pipeline Maintenance

Most pipelines would not be associated with roads, and routine maintenance of pipelines would be conducted during the winter when eiders are not present in the Planning Area. Routine maintenance activities during the winter would not cause any disturbance to threatened eiders. Although emergency maintenance or repairs would be unlikely to occur during the summer, such activities would have the potential to affect eiders. The level of impact would depend on the location and type of maintenance or repair activities. Given the low densities of spectacled and Steller's eiders in the Planning Area, the probability that emergency maintenance or repair activities would occur in an area occupied by threatened eiders is low. If these activities did occur in an area occupied by eiders, their effects could range from short-term displacement to nest abandonment and loss of breeding opportunity for the season. Helicopter activity at remote locations could have a greater impact than vehicular activity at locations along roads where eiders may be more accustomed to human activity.

Helicopters would be used on a weekly basis for surveillance to examine oil pipelines for leaks or damage. Helicopter surveillance flights could cause disturbance that would temporarily displace eiders from preferred feeding, nesting, or brood-rearing habitats. Under the maximum development scenario, up to 205 miles of pipeline could be constructed across numerous tundra habitats. A 1,640-foot (500-meter) buffer established around 205 miles of pipeline would include habitat that could support 363 spectacled and 20 Steller's eiders, assuming eider densities of 2.85 and 0.16 birds per mi^2 (1.10 and 0.06 spectacled and Steller's eiders per km^2), respectively. Although 363 spectacled and 20 Steller's eiders may use habitats within this buffer, far fewer eiders would likely be disturbed by helicopter surveillance of the pipeline. Displaced eiders would likely return to preferred habitats after surveillance surveys were completed, and some eiders could habituate to helicopter activity.

D.4.3.8 Tower Maintenance

Local companies could construct up to two cellular telephone towers in the Planning Area. Maintenance of communication towers would likely cause no more disturbance to threatened eiders than other pad activities, though it could potentially disturb eiders several times during the breeding season, as these sites would probably be remote and accessed by helicopter. Helicopters and ground personnel near areas of eider activity could cause displacement of eiders from foraging areas, disruption of incubation, nest abandonment, or disturbance to broods. Locating cellular telephone towers in habitats not frequented by threatened eiders would minimize or eliminate these potential disturbances.

D.4.3.9 Gravel Mining/Transport

Gravel mining and transport during construction of infrastructure would occur during the winter when threatened eiders are not present in the Planning Area. Gravel mining and transport would not cause disturbances that affect spectacled and Steller's eiders. The potential effects of habitat loss associated with gravel mining and transport are discussed in the section on habitat loss.

D.4.3.10 Oil Spill Response Activity/Training

Although the likelihood of an oil spill in areas occupied by spectacled or Steller's eiders is low, oil spills and associated clean-up procedures must be considered. The effects of oil spills in terrestrial and marine environments are considered in Section 4.2.2 (Oil Spills) of the amendment; here we consider the effects of oil clean-up activities in terrestrial environments associated with gravel roads and pads.

Oil spill response and clean-up activities would be immediate, and could not be planned to avoid eider habitats. Clean-up activities would involve the use of vehicles, equipment, and ground personnel, and their effects would be similar to those described for other activities associated with gravel roads and pads. Depending on the location and activity of eiders in relation to the spill, eider response could include anything from alert responses to nest abandonment. Clean-up activities at an oil spill associated with a pipeline located some distance from the road system could require helicopter support in addition to ground personnel with equipment. In this scenario, clean-up activities would be more likely to affect eiders unaccustomed to human activities.

D.4.4 Collisions (Strikes)

Structures and equipment associated with oil development and production that could represent potential collision hazards to spectacled or Steller's eiders include drill rigs, production and support facilities, pipelines, vehicles (trucks, heavy equipment), barges and other vessels, power and communication lines and towers, and bridges. Good visibility associated with extended day length during the summer breeding season would minimize the potential for eider mortality due to collisions with any of these structures. The greatest potential for eider collisions would occur during periods of reduced visibility, such as rain or foggy conditions. Placement of lighting on potentially hazardous structures could help to minimize eider mortality due to collisions. Required Operating Procedures E-10 and E-11 would establish measures to prevent migrating waterfowl from striking oil and gas facilities during low light conditions, and to reduce the possibility of spectacled or Steller's eiders striking aboveground utility lines.

D.4.4.1 Drill Rigs

Drill rigs and production facilities, which would be located onshore on gravel pads, could present a hazard to local movements of eiders, particularly during periods of low light or fog. Quakenbush and Snyder-Conn (1993) reported that a Steller's eider was apparently killed by collision with a tower near Nanvak Bay. Day et al. (2002) concluded that the probability of collisions of migrating eiders with existing structures at Barrow was low, but this finding was influenced by the offshore route followed by most eiders during fall migration. The potential for such collisions would likely be low because of constant daylight and good visibility during the summer season. In addition, this equipment would usually have a low profile and be located in a small area. The greatest chance for eider collisions with exploration equipment would occur during periods of foggy weather or other conditions that reduced visibility. Required Operating Procedure E-10 would establish guidelines for illuminating drilling structures, production facilities, and other structures that exceed 20 feet in height.

A typical drill rig used on the North Slope consists of a base structure which at ground level is approximately 30 feet by 40 feet and rises above the ground approximately 35 feet to the rig floor. Drill rig derricks extend approximately 150 feet above the rig floor, and could present a potential collision hazard.

Virtually all exploration drilling activities would occur during the winter when eiders are not present. Some exploration drilling equipment, such as pipe racks, drill rigs, towers, and other machinery, may be stored on ice-pads or on existing gravel pads over summer and could present a collision hazard to eiders. However, such rigs are typically stored (stacked) with the derrick laying down parallel to the ground. Federal Aviation Administration permits are required for such structures and are often conditioned so that they require the derrick to be laid down. Thus, exploration drilling poses little or no opportunity for eider collisions.

Development and production drilling can, and is often, conducted year-round from gravel pads. Therefore these drilling activities present opportunities for eider collisions with drill rig derricks. The final Preferred Alternative is expected to result in up to 489 wells (Table 4-5; Final Amended IAP/EIS). North Slope wells typically require 20 to 30 days of drilling, per well (Mark Major, ConocoPhillips Alaska Inc., pers. comm.).

The following estimate is based on the development scenario provided in the Final Amended IAP/EIS for the final Preferred Alternative. This scenario is based on existing knowledge of geologic potential and current exploration and development practices. Under the final Preferred Alternative, the plan area is estimated to contain 12 fields that are economically viable and could be developed from 13 production drill pads.

The development scenario assumes that a maximum of four exploration and delineation drill rigs would be available and working at the same time. Exploration and delineation of leaseable areas would take approximately 10 years. All exploration and delineation would take place during winter months (mid-December through early April; about 33 percent of the year). During the remaining portion of the year, the rigs would be cold-stacked with derricks lowered. Because of the short-winter season and distance from existing infrastructure, rigs would stacked at existing gravel pads or staging facilities and possibly multi-year ice pads within the Planning Area. The Camp Lonely, Inigok, and Umiat sites have been identified as potential staging areas that may be used for rig storage. The actual location of exploration and delineation would influence which area or method is used.

Based on the above assumption, the number of drilling rig years for the first years of exploration and delineation would be 13. 3 (four drilling rigs x 10 years x 0.33). All exploration is expected to occur during winter months when no listed eiders are present.

Once fields are discovered and "proved-up," which could happen at any time during exploration, the leaseholder would apply for a development permit. This permit would require National Environmental Policy Act and ESA compliance. This process, including surveys required by the ROPs and stipulations in the final Preferred

Alternative, could take a minimum of 3 years and up to 6 years or more. Once permitting was completed, site development and production drilling could begin. A maximum of eight production drilling rigs would be used during development. Production drilling could occur year-round. For safety, and due to space limitations on the pad, only one rig is used per pad. At a maximum estimate of 489 production and service wells, an average of approximately 38 wells/pad, and 20 to 30 days per well, it would take approximately 3 years to complete drilling on each pad. If all production began at the same time, an unlikely scenario, eight pads could be completed in 3 years with eight drilling rigs, and the remaining five could be completed with five drilling rigs in another 3 years.

Based on the above assumption, the number of drilling rig years for production would be 39 years [(eight drilling rigs x 3) + (five rigs x 3 years)]. All exploration is expected to occur during winter months when no listed eiders are present. Production drilling could occur year-round.

Exploration, permitting, and production are not expected to occur concurrently for all fields/pads. The timeline presented here would be affected by initial exploration activity, actual discoverable volume of recoverable oil, economics and emerging technologies. However, estimated rig-years are reasonable based on the development scenario for the final Preferred Alternative. Some fields may be proved-up prior to the end of estimated 10 year exploration period and production drilling completed before the end of total 22 year drilling period described above (10 years exploration drilling + 6 years permitting + 6 years production). Infrastructure development, economics, and permitting may result in some production drilling occurring outside the 22-year period. Again, the estimated number of rig years remains the same.

The estimated number of drilling rig days (4,890) is the total expected over the life of the project (10 to 20 years) and reflects the number of days drilling rigs would be active while eiders are on the North Slope. It is expected that no more than eight production drilling rigs would be used in the Planning Area in a given year. A typical rig derrick is approximately 18 feet wide by 12 feet deep at the base, 5 feet wide by 3 feet deep at the crown, and 150 feet tall. Thus eight drilling rig derricks would represent a very small portion of the 4.6 million-acre Planning Area, and render the probability for collision quite low.

D.4.4.2 Production/Support Facilities

Onshore

Production and support facilities on gravel pads could also present a collision hazard to threatened eiders. Facilities are not expected to be located in inter-tidal or offshore areas, because surface occupancy would not be allowed within ¾ mile of shorelines (Lease Stipulation K-6), and thus would not affect migrating eiders in coastal areas. Human activity in the vicinity of facilities, such as vehicle and pedestrian traffic, could help to deter eiders from using habitats near these areas. Proper lighting, as required under ROP E-10, would be installed on buildings and towers, and could help to minimize eider collisions with facilities during periods of poor visibility.

Elevated pipelines could be located across numerous tundra habitats, and could pose a collision hazard to eiders, particularly during periods of low visibility or under foggy conditions. Under the development scenario, 225 miles of pipeline could be constructed. Because of their large size, pipelines would generally be visible to eiders; therefore, collisions with pipelines would be unlikely. If pipeline routes were sited to avoid spectacled and Steller's eider habitats, the potential for collisions with pipelines and support structures would be reduced.

Mortality of spectacled and Steller's eiders could result from road kills caused by collisions with vehicular traffic. Vehicular collision is the greatest source of bird mortality associated with TAPS, particularly along the Dalton Highway where dust shadows caused early green-up along the road that attracted birds (TAPSO 2001). The primary birds groups affected by vehicular collisions were grouse and passerines. Although the number of birds killed was not quantified, the level of mortality was probably low when compared to the size local populations. Levels of traffic (including vehicular traffic and machinery) in the Planning Area would be greatest during the winter construction period when eiders are not present. Activities during the summer and the production period would involve vehicular traffic for well monitoring and maintenance. During an oil production period with continuing construction at the Alpine field in 2001, an average of 13 vehicles per hour passed the security check station between 6 a.m. and 6 p.m. during the latter half of June. Reduced speed limits along roads, particularly early in the season when eiders could be attracted to areas of early green-up near roads and pads, during periods of poor visibility, and during brood-rearing periods when flightless birds could cross gravel roads, would help to reduce the potential for eider collisions with vehicles.

Intertidal/Offshore

There are few reports of collisions of eiders with marine vessel traffic. Lovvorn et al. (2003) salvaged three spectacled eiders that collided with a ship during predawn hours in the Bering Sea. Spectacled or Steller's eiders staging in the Beaufort Sea adjacent to the Planning Area could potentially collide with vessel traffic during mid-July to September. Inexperienced young-of-the-year, which may be at higher risk for collisions with vessels, may occupy these marine habitats during August and September. However, good visibility associated with the long hours of daylight during much of this period could reduce the potential for eider collisions with vessel traffic. In addition, the number of barges transiting these offshore waters would be low.

Power/Communication Lines

The only elevated communication and power lines in the Planning Area would be those associated with the support structures for pipelines, which would present no more of a hazard to eiders than the pipeline itself. Other communication and power lines would be buried in access roads or suspended on VSMs to the extent practicable, and would present no additional hazard to eiders.

Communication Towers

Each CPF would each have a communications tower of approximately 60 feet in height and supported by guy wires, which would present a collision risk for spectacled and Steller's eiders. Quakenbush and Snyder-Conn (1993) reported that a Steller's eider was apparently killed by collision with a tower near Nanvak Bay, and local residents on St. Lawrence Island have reported eider collisions with wires associated with the Federal Aviation Administration tower (Day et al. 2003). Anderson and Murphy (1988) reported locating the remains of 15 birds in 1986 and 16 birds in 1987 that had been killed as a result of collisions with the Lisburne development powerline in the Prudhoe Bay area. None of the birds was identified as a spectacled or Steller's eider, although one unidentified eider was reported, along with several other waterfowl species. Although elevated powerlines are not part of the development scenario for the Planning Area, the effects of bird collisions with powerlines would be similar to collisions with guy wires for communication towers. The potential for eider collisions with communication towers or associated guy wires would likely be less than the potential for collisions at the Lisburne powerline because of the reduced amount of exposed wire hazard at communication towers. It is likely that less than one spectacled or Steller's eider would collide annually with communication towers or associated guy wires. Required Operating Procedure E-11(c) would require support wires for communication towers to be clearly marked along their entire length to improve visibility for low flying birds.

Scattered instances of collisions of eiders with various types of vessels or structures have been reported. A low probability exists that spectacled or Steller's eiders would collide with drill rigs, towers, buildings, pipelines, or other structures. Most of these structures are large and visible, and eiders would likely be able to avoid collisions in most cases. Structures such as powerlines or guy wires that are less visible could present the greatest potential for eider mortality due to collision. No aboveground powerlines are proposed in the Planning Area under the development scenario; although guy wires could be used to support communication towers. Based on the low numbers of eider collisions with structures that have been reported, it is likely that less than one spectacled or Steller's eiders annually would collide with structures in the Planning Area. However, any collisions that did occur would likely result in eider mortality.

D.4.5 Increased Predation

There is evidence that some predators may be attracted to anthropogenic sources of food or denning/nesting sites associated with oil field development (Eberhardt et al. 1982, 1983a, b; Garrott et al. 1983; Martin 1997a; Day 1998; Burgess 2000). Increased predation could impact threatened eiders. Potential predators of adult eiders and their eggs and young that could be attracted to anthropogenic sources of food or denning/nesting sites in the Planning Area include Arctic fox, red fox, grizzly bear, glaucous gull, and common raven. Jaegers might also prey on eider eggs and young, but would probably not be attracted by human activities associated with development.

Major negative impacts have occurred at the Howe Island brant and snow goose (*Chen caerulescens*) colony in the Sagavanirktok River Delta as a result of predation by common ravens, Arctic foxes, and grizzly bears (Johnson 2000). Arctic foxes and glaucous gulls are also predators of common eider and brant eggs and young on the barrier islands (Noel et al. 2002). Increased levels of predation as a result of elevated numbers of predators could impact nesting and brood-rearing spectacled and Steller's eiders.

In recent years, oil field operators have installed predator-proof dumpsters at camps and implemented new refuse handling techniques to minimize the attraction of predators to the North Slope Borough landfill and areas of oil field development. In addition, oil field workers undergo training to make them aware of the problems associated with feeding wildlife and of stipulations and ROPs designed to mitigate the effects of increased levels of predation. The numbers of foxes and most avian predators at the existing Alpine field did not appear to increase during construction of the project, with the exception of common ravens, which nested on buildings at the Alpine field (Johnson et al. 2003b). Required Operating Procedures A-1, A-2, and E-9 specify measures that would be implemented to prevent attraction of predators to anthropogenic sources of food and to prevent man-made structures from being used as nesting, denning, or shelter sites for predators at future developments. These ROPs should minimize or eliminate increased predation pressure associated with oil development and production activities in the Planning Area on threatened eiders and other tundra nesting birds.

D.4.5.1 Increased Den/Nesting Sites

Foxes in the Prudhoe Bay area have used areas under buildings as den sites, and common ravens, which were infrequent visitors to the ACP prior to development, use buildings, towers, and other structures for nest sites (Johnson and Herter 1989). Common ravens began nesting on structures at the Alpine field shortly after its construction (Johnson et al. 2003b), and a raven nest was reported on a remote wellhead in the National Petroleum Reserve – Alaska. In addition, gyrfalcons have been reported nesting on pipelines (Ritchie 1991). Required Operating Procedure E-9 requires that the best available technology be used to prevent facilities from providing nesting, denning, or shelter sites for ravens, raptors, and foxes to mitigate the potential increases in predators attracted to developed areas. Mitigation measures at the Alpine field have been successful in preventing predator use of structures for denning sites; nonetheless, common ravens used structures at the Alpine field for nest sites (Johnson et al. 2003b).

D.4.5.2 Increased Food

The availability of anthropogenic food sources, particularly during the winter, could increase winter survival of Arctic and red foxes and contribute to increases in the fox population. Anthropogenic sources of food at dumpsters and refuse sites could cause populations of foxes, gulls, and ravens to increase above natural levels. Increased predation pressure resulting from increases in the number of predators near camps could decrease the breeding success of local nesting eiders. Required Operating Procedures A-2 and E-9 would require measures be put in place to ensure that human-caused increases in predator populations did not occur in the Planning Area.

Predators, such as glaucous gulls and Arctic foxes, could be attracted to anthropogenic food sources associated with summer maintenance of stored exploratory drilling and seismic equipment. Garbage associated with winter exploration activities could also attract foxes and ravens. Garbage should not be a problem in the Planning Area because all garbage would be removed from activity sites and taken to approved North Slope Borough landfills.

Required Operating Procedures A-1 and A-2 would require proper handling and disposal of solid waste and garbage.

Additional Landfills

No additional landfill sites would be opened in the National Petroleum Reserve – Alaska. All garbage would be removed from development sites and transported to landfill sites currently in operation outside of the Planning Area.

Increased Garbage on the Tundra Resulting From Increased Access

State law and ROPs address waste handling procedures at all developments in the Planning Area. If carefully followed, these procedures should greatly decrease or eliminate garbage entering the tundra ecosystem. However, it is likely that some additional garbage may result from development in the Planning Area.

D.4.5.3 Increased Anthropogenic Perch/Hunting Sites

Building, towers, pipelines, and other structures provide perching sites that may be used by avian predators such as raptors, jaegers, snowy owls, and glaucous gulls. These perches may have the potential to increase predator efficiency, which could impact spectacled or Steller's eiders. The potential for impacts from avian predators using man-made hunting perches to affect eiders would be greatest during the brood-rearing period when hens with broods are moving across tundra habitats.

D.4.6 Oil Spills

Oil spills or leaks onto tundra or marine habitats could negatively impact spectacled or Steller's eiders in numerous ways. Oil can come in contact with and adhere to feathers, causing the feathers to lose their insulating capabilities and resulting in hypothermia (Patten et al. 1991). In aquatic habitats, where birds come in contact with water and require feather integrity to maintain water repellency and buoyancy, the consequences would be most severe. Birds can suffer toxic effects from ingestion of oil by consuming food contaminated by an oil spill or by preening oiled feathers (Hansen 1981). Oil that comes in contact with bird eggs can cause toxic effects to embryos (Patten and Patten 1979, Stickel and Dieter 1979). Oil could come in contact with eggs directly as a result of a spill, or indirectly from the oiled feathers of incubating adults. Oil can also contaminate food sources.

D.4.6.1 Terrestrial

Oil spills or leaks from a pipeline located in terrestrial habitats would be confined by topographical features. Spilled oil could also enter a lake or pond and be contained by the banks of these water bodies. McDonald et al. (2002) developed terrestrial and aquatic risk assessments for spectacled eiders based on a spill scenario constructed to mimic a spill entering and spreading across an entire lake to cover 1,134 acres, and a second spill scenario constructed to mimic a spill spraying onto the surrounding tundra and covering an area of 146 acres. Based on the assumptions of these scenarios, a maximum of 2.5 spectacled eiders would be exposed to oil from the aquatic spill, and 0.3 spectacled eiders would be exposed to oil from the terrestrial spill in the Colville, Kuparuk, and Prudhoe Bay areas. Assuming densities of 2.85 spectacled eiders per mi^2 (1.10 birds per km^2), 5 and 0.6 spectacled eiders could be affected by these aquatic and terrestrial spills, respectively. Steller's eiders occur in much lower densities in the Planning Area than spectacled eiders; therefore an oil spill in the Planning Area would likely impact fewer Steller's eiders than spectacled eiders.

During spring flooding, an oil spill could spread to a much larger area, depending on the amount of oil spilled, the surface topography, and the extent and duration of flooding. Oil entering a river or stream could spread into delta or coastal areas, where impacts to birds would likely be more severe. The potential for an oil spill to enter major rivers or streams would be minimized by lease stipulation K-1, which would provide setbacks of ½ to 1 mile from specified rivers within which permanent oil and gas facilities, including gravel pads, roads, and airstrips would be prohibited. On a case-by case basis, and in consultation with federal, state, and NSB regulatory and resource agencies (as appropriate, based on agency legal authority and jurisdictional responsibility), essential pipeline and road crossings may be permitted through setback areas.

D.4.6.2 Riverine/Intertidal

A small spill entering a riverine or intertidal area would be diluted and would be unlikely to affect threatened eiders. Larger spills would have the potential to spread to intertidal or offshore areas where staging eiders could be affected. The greatest potential for impacts to eiders would occur during the fall staging period when eider flocks are molting. The average flock size reported during aerial surveys in the offshore waters of Harrison Bay was 21 (Fischer et al 2002). An oil spill would be unlikely to contact eiders, given the low density of spectacled eiders in offshore waters; however, a spill that did contact spectacled eiders could impact 20 or more birds.

D.4.6.3 Offshore

In marine habitats or on Teshekpuk Lake, wind and currents could potentially spread an oil spill over a larger area than would be likely under most terrestrial scenarios. Therefore, birds residing in marine habitats or on Teshekpuk Lake could be particularly at risk for negative impacts from an oil spill. Offshore development is not proposed for the Planning Area; however, a potential spill from an onshore source or from an offshore tanker or barge could result in oiling of marine waters. An oil spill occurring during the summer breeding and staging seasons would have a greater impact on threatened eiders than a spill occurring during the winter, when eiders are on wintering grounds. An oil spill that spread into offshore waters of Harrison Bay during the fall molting/staging period would have the potential to affect a greater number of spectacled eiders than a nearshore spill (Fischer et al. 2002). Stehn and Platte (2000) developed an oil spill scenario for the central Beaufort Sea based on a spill size of 5,912 bbl. When taking spectacled eider densities in the Beaufort Sea into consideration, the highest mean number of spectacled eiders exposed to oil was two birds. However, since there is some evidence that spectacled eiders may occur in flocks in offshore Beaufort Sea habitats (Fischer et al. 2002), an offshore spill could potentially impact more birds than the number proposed in the analysis of Stehn and Platte (2000). Lingering effects from a winter spill could impact birds returning during the following breeding season if clean-up activities did not adequately remove contaminants from bird habitats and food sources.

D.4.7 Increased Subsistence Hunting

D.4.7.1 Birds Hunted in Previously Inaccessible Areas

Subsistence hunting and egg collecting activities could affect spectacled and Steller's eiders. The numbers of eiders and other bird species reported in subsistence harvest surveys conducted by the USFWS in various areas of Alaska can be found on their website (http://alaskafws.gov/ambcc/index.htm). Data in the reports include both numbers of birds and eggs harvested. The numbers of spectacled and Steller's eiders in the harvest surveys are reported for the Y-K Delta, the Bristol Bay area, St. Lawrence Island, the Bering Strait area, and the northwest Arctic Region. Little current information on subsistence harvest of spectacled or Steller's eiders from most areas on the North Slope is available (Wentworth 2004); SRBA and ISER (1993) reported one spectacled eider and three Steller's eiders were harvested annually from the Barrow area from April 1987 through March 1990. The actual numbers are probably higher because the average annual harvest for eiders unidentified to species was 5,982, some of which may have been spectacled or Steller's eiders. In the Planning Area, some level of subsistence hunting of eiders probably occurs in the Nuiqsut area.

Nuiqsut and Umiat are the only communities located within the Planning Area, although hunters from Barrow and some other villages also use areas around Teshekpuk Lake for subsistence activities. Increased access of the Planning Area road system by subsistence hunters could result if the road system were accessible by ATV trails near Nuiqsut or Umiat, or if ATVs could be transported by boat to the road system at locations along river systems.

Motorized access to oil field infrastructure could open a much larger area to subsistence hunting than the area currently available. However, unless future roads or other means of access from villages to infrastructure in the Planning Area were developed, it is unlikely that the proposed development would increase access to subsistence hunters in the Planning Area. In addition, subsistence hunters often avoid developed areas for subsistence hunting. Therefore, increased subsistence hunting pressure on spectacled and Steller's eiders would be unlikely to result from the final Preferred Alternative.

D.4.7.2 Lead Shot Accumulation Over a Greater Area

Lead poisoning has been reported as a source of spectacled eider mortality in the Y-K Delta that may have implications on a population level (Franson et al. 1995; Flint et al. 1997; Flint and Grand 1997; Grand et al. 1998). Lead shot used for hunting accumulates in wetland sediments used as feeding habitat by eiders and other waterfowl. Lead poisoning occurs primarily via ingestion of spent lead shot, which may remain available for consumption by eiders and other waterfowl for many years because of its low settlement rate (Flint 1998). Fewer studies have been conducted on the ACP; however, blood samples from nesting female Steller's eiders at Barrow in 1999 and 2000 all had concentrations exceeding the clinical level for lead exposure (USDOI USFWS 2002). If the source of the lead is on the breeding grounds, levels of exposure would be expected to increase for adults and young during the course of the breeding season (Flint et al. 1997).

The use of lead shot is currently illegal for hunting waterfowl, but is legal for hunting upland game birds such as ptarmigan. Lead shot used legally to hunt upland game birds could enter eider foraging habitats located adjacent to upland areas. Additionally, lead shot could also enter eider foraging habitats if used illegally to hunt waterfowl. Increased access to subsistence hunting areas in the Planning Area could increase the potential for both legal and illegal accumulation of lead shot in spectacled and Steller's eider habitats. High priority recovery tasks proposed by the Steller's Eider Recovery Team include monitoring of lead exposure levels throughout the species' range, and banning the use of lead shot for upland game birds in wetland environments (Swem 2004).

D.4.8 Toxics

Organic pollutants and metals can be found in various types of environments throughout the world. The availability of these contaminants and their effects on waterfowl are becoming popular topics of study for researchers (e.g., Franson et al. 1995; Henny et al. 1995, 1998; Stout 1998; Trust et al. 2000; Stout et al. 2002; Grand et al. 2002). Contaminants that are sometimes spilled during oil and gas exploration and development activities include drilling mud, waste water, used crankcase oil, dust-control chemicals, reserve pit fluids, diesel fuel, glycol, crude oil, and salt water (Walker 1996). Current policies in North Slope oil fields require that any spills of toxic materials, including small quantities of material, be reported and cleaned up as soon as possible. In addition, current and future development practices have eliminated hazardous reserve pits that may have been a source of contaminants for threatened eiders.

D.4.9 Mitigating Measures

Implementation of stipulations and ROPs (selected and abbreviated from the list of final Preferred Alternative stipulations and ROPs presented in Table 2-2 of the Final Amended IAP/EIS) could conserve important eider habitats, decreasing the probability of disturbance or displacement of eiders. The two following mitigation measures are specifically directed toward avoiding listed eiders, as much as possible, during the placement of oil facilities:

- Aerial surveys for breeding pairs would occur in areas proposed for development, and consultation with USFWS and BLM concerning the design and location of structures would be required before approval of any construction, if listed eiders were present in such areas (ROP E-11); and

- An ecological land classification map would be developed for use in siting facilities, with the intent of moving the proposed location of facilities, to the extent possible, away from habitat types of greater importance for listed eiders to those of lesser importance (ROP E-12).

The following seven mitigation measures are directed toward protection of fisheries, lake-dwelling waterbirds, raptor nesting areas, and human subsistence activities. Nonetheless, they could benefit listed eiders if eider habitat were to occur within the prescribed setbacks and No Surface Occupancy areas:

- Approval for location of permanent oil and gas facilities within 500 feet (150 meters) of fish-bearing waterbodies or within 100 feet (30 meters) of non-fish-bearing water bodies would be restricted to those facilities that are likely to cause minimal impacts to wildlife (Lease Stipulation E-2);
- Permanent oil and gas facilities would be prohibited within setback zones of ½ to 1 mile of listed waterways (Lease Stipulation K-1);
- Permanent oil and gas facilities would be prohibited within ¼ mile of deepwater lakes with depths greater than 13 feet (4 meters; Lease Stipulation K-2);
- Within the Goose Molting Area no permanent oil and gas facilities, except for pipelines, would be allowed on the approximately 216,000 acres shown on Map 2-4. No exceptions would be considered (Lease Stipulation K-4);
- Within the Caribou Movement Corridor, no permanent oil and gas facilities, including pipelines, would be allowed on the approximately 16,000 acres shown on Map 2-4 (Lease Stipulation K-9);
- Within the Southern Caribou Calving Area, no permanent oil and gas facilities, excluding pipelines, would be allowed on the approximately 141,000 acres shown on Map 2-4 (Lease Stipulation K-10); and
- Surface disturbance would be limited to 300 acres within each of seven lease tracts shown on Map 2-4; this does not include surface disturbance activities from pipeline construction (No Exceptions; Lease Stipulation K-11).

These mitigation measures are intended to benefit wildlife and fisheries in general, and so would provide some benefit to listed eiders as well:

- The facility footprint would be minimized and air traffic would be reduced (ROP E-5);
- Facilities would be prevented from providing nesting, denning, or shelter sites for ravens, raptors, and foxes (ROP E-9);
- Lighting would be provided on structures exceeding 20 feet (6 meters) in height to prevent migrating waterfowl, including threatened eiders, from striking oil and gas related facilities during low light conditions (ROP E-10);
- All personnel would be provided with information about applicable ROPs and stipulations, and the importance of not disturbing biological resources, habitats, and bird colonies (ROP I-1); and
- Permanent oil and gas facilities would be prohibited within ¾ mile of the coast, to the extent practicable (Lease Stipulation K-6).

D.4.10 Effects of Abandonment

Abandonment and reclamation of satellite fields would likely coincide with abandonment and reclamation of corresponding CPFs. Abandonment operations would entail removing all equipment, cutting well casings a minimum of 3 feet below the surface, and plugging wells. Gravel, or gravel/sand pads would not be removed, but allowed to bed naturally. Overall, abandonment operations would take many years, as revegetation and environmental monitoring studies would continue to document the long-term effects of operations at a particular site. A series of permitting and inspection activities would be associated with abandonment procedures (Stipulation

G-1). Abandonment activities would occur during winter months, when ice roads could be constructed to allow the removal of equipment. Abandonment monitoring would require periodic revisits to gather information on environmental parameters related to natural bedding and to document the success of abandonment actions. Normally, one helicopter with a crew of three would visit the sites annually for the first 5 years, followed by visits with increasing time gaps over the next 10 years. Each site visit would last a maximum of 1 day per visit, and there would be a maximum of 1 visit per year. It is expected that effects from abandonment would be negligible, because the pads would have been in place for nearly 3 decades, and eiders would have relocated to more suitable habitat.

D.4.11 Protection Recommendations

Protection recommendations are addressed in Section 4.2.2.5 (Spill Prevention and Response).

D.5 Cumulative Effects on Spectacled and Steller's Eiders

Since 1965, approximately 9.7 million acres of North Slope/Beaufort Sea acreage have been leased through 32 state sales, including many combined sales. In the past 10 years, the State of Alaska has conducted 12 lease sales in this area, leasing approximately 4.5 million acres. The State of Alaska has conducted annual area-wide sales in the Beaufort Sea and on the North Slope since 1995. Each Beaufort Sea offering would extend from Barrow to the Canadian border, while onshore sales would offer all unleased state lands between the Arctic National Wildlife Refuge and the National Petroleum Reserve – Alaska. The most recent sales were held in October 2004.

There currently are 25 producing oil fields on the North Slope, with Prudhoe Bay, North Prudhoe Bay, Kuparuk River, Alpine field, Milne Point, and Endicott being the most productive. The Alpine field, which began producing on the Colville River Delta in 2000, is the closest that oil field infrastructure has come to the Planning Area. Plans to construct satellite developments associated with the Alpine field in the eastern portion of the Planning Area are being prepared, and construction would likely begin within the next 1 to 2 years.

Cumulative effects are defined in 50 CFR § 402.02 (Interagency Cooperation on the Endangered Species Act of 1973, as amended) as "…those effects of future state or private activities not involving federal activities that are reasonably certain to occur within the action area of the federal action subject to consultation." The cumulative effects described in this section relate to potential effects to spectacled and Steller's eiders that may result from state or private actions reasonably certain to occur within or near the Planning Area. These actions can include subsistence harvest activities, commercial fishing activities, and recreational activities. The potential for construction of a road from Nuiqsut to existing infrastructure in the Prudhoe Bay oil field could also affect spectacled or Steller's eiders on State lands.

D.5.1 Potential Effects to Subsistence Harvest

Subsistence harvesting of spectacled and Steller's eiders is estimated to remove hundreds of birds annually from the Alaskan breeding population (AMBCC 2003). Surveys conducted by the USFWS have reported numbers of birds and eggs harvested annually for western Alaska and the Bristol Bay area. No estimates of the numbers of spectacled and/or Steller's eiders harvested annually are available for most areas of the North Slope. Stephen R. Braund Associates and ISER (1993) reported that a few spectacled and Steller's eiders were harvested in the Barrow area from 1987 to 1990, but most harvested eiders were not identified to species. Likewise, no recent information is available on the numbers of spectacled or Steller's eiders that may be harvested by residents of Nuiqsut.

Under the development scenario for the final Preferred Alternative, no roads connecting development infrastructure to Nuiqsut or other North Slope villages would be constructed. Thus, the proposed development would be unlikely to increase access to subsistence hunters in the Planning Area. However, the potential construction of a road from Nuiqsut to existing infrastructure in the Prudhoe Bay oil field could increase access to spectacled and Steller's eider habitats for subsistence hunters at the eastern edge of the Planning Area and adjacent lands to the east. This increased access could result in a greater level of eider mortality, and could increase the potential for contamination of eider habitats with lead shot.

D.5.2 Potential Effects to Commercial Fishing

A small commercial fishery is located in the Colville River Delta, where fishing activities occur at numerous scattered locations. Commercial fishing activities are conducted under the ice during the winter when eiders are not present on the ACP. The commercial fishery would not be expected to have any additional increased negative impact to spectacled or Steller's eiders.

D.5.3 Recreational Activities

A small amount of recreational activity could occur within or adjacent to the Planning Area. Approximately eight summer float trips are expected to occur annually on the Colville River, typically with four persons per party. Recreational activity on the Colville River near the coast, where spectacled eider densities are greatest, is expected to be less than activity further up river. Float trip traffic would generally pass through most areas without causing significant disturbance to spectacled or Steller's eiders. Float trip groups that stop at campsites along the river for overnight camping could cause disturbance to eiders and result in temporary or permanent displacement from preferred feeding, nesting, or brood-rearing habitats. Based on the low densities of eiders in the Planning Area and adjacent lands, and on the relatively small number and size of float groups expected annually, the impacts of recreational activities would not be likely to affect more than a few spectacled or Steller's eiders.

D.5.4 Nuiqsut Road Construction

The State of Alaska, Department of Transportation is considering the possibility of a new road that would be constructed from Nuiqsut to existing roads in the Prudhoe Bay oil field. Road construction could cause permanent and temporary habitat loss or alteration on state lands along and adjacent to the footprint of the road, which could affect spectacled and Steller's eider habitats. The effects of habitat loss would be the same as those discussed for gravel roads and pits in the Planning Area. Disturbance from vehicular or pedestrian traffic along the road could also cause permanent or temporary displacement of eiders from preferred habitats near the road, which could in turn disrupt feeding behavior and affect energy budgets, cause permanent or temporary nest abandonment, or cause behavioral disturbance to brood-rearing groups. Vehicular traffic on the Nuiqsut road could increase the potential for eider mortality due to collisions with vehicles, particularly during the spring when eiders may be attracted to areas near the road where habitats are open early in the season. A road from Nuiqsut to roads in the Prudhoe Bay oil field could increase access by subsistence hunters, which could result in increased eider mortality due to subsistence hunting. In addition, increased contamination of eider feeding habitats could potentially result from the use of lead shot, which could also impact survival of individual eiders.

D.6 Agency Determination

In accordance with Section 7(a)(2), Endangered Species Act of 1973, as amended (16 USC 1531 et seq.), the BLM's action of amending the Northeast National Petroleum Reserve – Alaska IAP/EIS **may affect and is likely to adversely affect** the listed spectacled and Steller's eiders within the Planning Area. Using conservative (high) estimates of eider density, approximately 84 spectacled eiders and 5 Steller's eiders (assuming impacts occur to eiders within 200 meters of zone of influence) could be impacted over the life span of the reasonably foreseeable development activities analyzed by the Amended IAP/EIS. Required Operating Procedures and stipulations are expected to substantially reduce the number of eiders expected to be impacted. No designated Critical Habitat for either species occurs within the Planning Area, thus no adverse modification would occur.

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