U.S. Fish and Wildlife Service

Marine Mammals Management Office
Anchorage, Alaska

Draft Environmental Assessment

for a

Proposed Rule to Authorize the Incidental Take of Small Numbers of Polar Bear (*Ursus maritimus*) and Pacific Walrus (*Odobenus rosmarus divergens*) During Oil and Gas Activities in the Beaufort Sea and Adjacent Coastal Alaska

April 20, 2016

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Proposed Action:

Issuance of Regulations for take of small numbers of polar bears (*Ursus maritimus*) and Pacific walruses (*Odobenus rosmarus divergens*) incidental to oil and gas exploration, production, and development in the Beaufort Sea Region from August 3, 2016, through August 2, 2021.

Geographic Location:

Beaufort Sea and adjacent northern coast (North Slope) of Alaska

Type of Statement:

Draft Environmental Assessment

Date: April 2016

Responsible Official:

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Abstract:

This Draft Environmental Assessment analyzes the environmental impacts of a proposal by the U.S. Fish and Wildlife Service, Alaska Region, to issue Incidental Take Regulations, pursuant to section 101(a)(5)(A) of the Marine Mammal Protection Act, for the incidental take of small numbers of polar bears and Pacific walruses. Take may result from oil and gas industry activities within the Beaufort Sea region of Alaska.

Citation:

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Executive Summary

The Marine Mammal Protection Act (MMPA) establishes a moratorium on the taking of all marine mammals in U.S. waters; however, the MMPA allows certain exemptions and provides for the issuance of take authorizations under specified circumstances and conditions. Regulations are adopted which specify these conditions. The Alaska Oil and Gas Association and certain non-member companies (collectively, the Applicants) have petitioned the U.S. Fish and Wildlife Service to publish regulations for the non-lethal unintentional taking of small numbers of polar bears (*Ursus maritimus*) and Pacific walruses (*Odobenus rosmarus divergens*) incidental to oil and gas exploration, development, and production operations, and associated activities. The requested regulations would apply to activities in specified areas of the Beaufort Sea and the adjacent northern coast (North Slope) of Alaska for a period of 5 years beginning August 3, 2016, and extending through August 2, 2021.

If promulgated, the regulations petitioned for by the Applicants will not authorize or permit oil and gas exploration, development, and production activities themselves. Rather, the resulting Incidental Take Regulations would: (i) establish permissible methods of take, as well as associated monitoring, reporting, and mitigation requirements; and (ii) authorize issuance of Letters of Authorization for the nonlethal incidental unintentional take of small numbers of polar bears and Pacific walruses within the specified area resulting from oil and gas activities, provided that such take will have no more than a negligible impact on the affected species or stock, and will not have an unmitigable adverse impact on the availability of the species or stock for subsistence uses. This Draft Environmental Assessment (DEA) provides an evaluation of the reasonably foreseeable environmental impacts of the Proposed Action as required by the National Environmental Policy Act.

Issuance of the proposed regulations will result in impacts to small numbers of polar bears and Pacific walruses. However, these impacts will have a negligible impact on these species, and will not have an unmitigable adverse impact on the availability of these species for subsistence use by Alaska Natives. We base these findings on potential and documented Industry impacts on polar bears and Pacific walruses, scientific studies on these species, oil spill risk assessments, and current information regarding the life history and status of polar bears and Pacific walruses.

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Acronyms and Abbreviations

ANC	Alaska Nanuuq Commission
ANWR	Arctic National Wildlife Refuge
AOGA	Alaska Oil and Gas Association
BLM	Bureau of Land Management
BOE	Barrel of Oil Equivalent- the amount of hydrocarbon product containing energy equivalent to that of a barrel of oil
BOEM	Bureau of Ocean Energy Management
BOG	Bilateral Oversight Group
BPXA	BP Exploration Alaska Inc.
BRPC	Brooks Range Petroleum Corporation
CAP	Circumpolar Action Plan
CD5	Colville Delta drill site 5
CFR	Code of Federal Regulations
CI	Confidence Interval
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CPAI	ConocoPhillips Alaska, Inc.
CS	Chukchi/Bering Seas stock of polar bears
DEA	Draft Environmental Assessment
DPS	Distinct Population Segment
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESA	Endangered Species Act
EWC	Eskimo Walrus Commission
FONSI	Finding of No Significant Impact
FR	Federal Register
GMT	Greater Mooses Tooth
IHA	Incidental Harassment Authorization
IPCC	International Panel on Climate Change
ITR	Incidental Take Regulation, plural: ITRs
IUCN	International Union for Conservation of Nature
K	carrying capacity
LNG	Liquefied Natural Gas
LOA	Letter of Authorization, plural: LOAs
MMPA	Marine Mammal Protection Act
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Association
NPR-A	National Petroleum Reserve – Alaska
NSB	North Slope Borough
OCS	Outer Continental Shelf
PAH	Polycyclic Aromatic Hydrocarbon
POC	Plan of Cooperation
POP	Persistent Organic Pollutant

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PSO	Protected Species Observer
SAR	Stock Assessment Report
SBS	Southern Beaufort Sea polar bear stock
SEL	Sound exposure level
Service	U.S. Fish and Wildlife Service
TAPS	Trans-Alaska Pipeline System
U.S.C.	U.S. Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

Units of Measure

°C	Degrees Celsius
°F	Degrees Fahrenheit
bbl	Barrels (42 U.S. gallons [159 liters])
dB	Decibel (see Key Definitions)
$dB_{[RMS]}$	Root-mean-square decibel (see Key Definitions)
ft	Foot
ft^3	Cubic feet
gal	gallon
ha	Hectare
Hz	Hertz
kHz	Kilohertz
l	liter
m	Meter
MHz	Megahertz
mi	Mile
min	Minute
s	Second

Key Definitions

Applicants - The Alaska Oil and Gas Association and certain non-member companies who have petitioned the U.S. Fish and Wildlife Service to publish incidental take regulations.

Beaufort Sea ITR region - The area specified for inclusion in the proposed Incidental Take regulations and the focus of this document. It includes the North Slope and Beaufort Sea.

dB - Decibel level, a measure of sound pressure level; all dB levels herein are re: 1 μPa underwater and re: 20 μPa in air.

dB_{rms} - Root mean squared decibel level, the square root of the average of the squared sound pressure level over some duration (typically 1 second)

Harass - For non-military readiness activities, means any act of pursuit, torment, or annoyance that: has the potential to injure a marine mammal or marine mammal stock in the wild (**Level A harassment**); or has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not

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limited to, migration, breathing, nursing, breeding, feeding, or sheltering (**Level B harassment**).

Incidental take - Take events that are infrequent, unavoidable, or accidental. It does not mean that the taking must be unexpected.

Industry - Collectively, the entities, personnel, and companies involved in the following activities: oil and gas exploration, development, and production; oil and gas support services; and associated activities such as research.

Industry activities - The reasonably foreseeable actions of those involved in Industry, as defined, occurring during the period August 3, 2016 to August 2, 2021.

Negligible impact - An impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.

Proposed Action - The action proposed by the U.S. Fish and Wildlife Service is issuance of incidental take regulations, which would allow authorization of non-lethal unintentional taking of small numbers of polar bears and Pacific walrus incidental to Industry activities, as defined, in the Beaufort Sea and on the adjacent northern coast (North Slope) of Alaska for a period of 5 years beginning August 3, 2016, and ending August 2, 2021.

Small numbers - Our small numbers analysis evaluates whether the number of marine mammals anticipated to be taken is *small relative or proportional to the size of the overall population*. A more precise formulation of "small numbers" is not possible because the concept is not capable of being expressed in absolute numerical limits. The Court of Appeals for the Ninth Circuit has expressly approved this definition (*Center for Biological Diversity v. Salazar*, 695 F.3d at 905-907). The statutory definition is provided at 16 U.S.C. 1362; however, the Service no longer relies upon or applies this regulatory definition. The Court of Appeals for the Ninth Circuit (*Center for Biological Diversity v. Salazar*, 695 F.3d 893, 902-907 [9th Cir. 2012]) has determined that the regulatory definition conflates "small numbers" with "negligible impact," whereas the MMPA establishes these as separate standards.

Sound exposure level (SEL) - A measure of energy. Specifically, it is the dB level of the time integral of the squared-instantaneous sound pressure normalized to a 1-s period.

Take - To harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal.

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Chapter 1. PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 Introduction

The U.S. Fish and Wildlife Service (Service) has prepared this Draft Environmental Assessment (DEA) to analyze options, including a No Action alternative, for responding to a petition to issue incidental take regulations (ITRs) pursuant to section 101(a)(5)(A) of the Marine Mammal Protection Act (MMPA; 16 U.S.C. 1361, *et seq.*). The original petition was received May 5, 2014, from the Alaska Oil and Gas Association (AOGA) on behalf of its members[1] and other participating parties (collectively the Applicants)[2]. An amendment was received on July 1, 2015. The Proposed Action is to issue the ITRs, which would allow authorization of non-lethal unintentional taking of small numbers of polar bears (*Ursus maritimus*) and Pacific walrus (*Odobenus rosmarus divergens*) incidental to certain activities in the Beaufort Sea and on the adjacent northern coast (North Slope) of Alaska for a period of 5 years beginning August 3, 2016, and ending August 2, 2021. The geographic area encompassed within the requested ITRs (Figure 1) covers a total area of approximately 73.6 million acres (29.8 million ha), and remains generally the same as the previous ITRs at 50 CFR 18 subpart J, published on August 3, 2011 (76 CFR 47010).

The proposed ITRs apply to the currently foreseeable year-round activities of: (i) oil and gas exploration, development, and production; (ii) oil and gas support services; and (iii) associated activities such as research. The companies, personnel, and entities involved in these activities are hereafter referred to as "Industry," and the activities as "Industry activities." These activities comprise a class of actions with substantially similar impacts to marine mammals. Foreseeable Industry activities include geological and geophysical surveys, environmental studies, offshore and onshore exploration and production drilling, pad development, oil and gas distribution, decommissioning and remediation operations, and other activities as identified in the Applicants' petition (AES Alaska 2015) and described in Chapter 2 of this document. For this ITR, we assume that all proposed activities will occur, though it is possible that the actual level of activities will be less. Our assessment is limited to impacts from Industry activities on the North Slope and the Beaufort Sea (Figure 1), occurring between August 3, 2016, and August 2, 2021. Examples of potential effects include harassment, habitat loss, oil spills, exposure to contaminants, changes to prey species, and lethal take.

If promulgated, the proposed ITRs will not authorize actions related to oil and gas exploration, development, and production. Rather, the resulting ITRs would: (i) establish permissible methods of take, as well as associated monitoring, reporting, and mitigation requirements; and

[1] AOGA members represented in the petition include: Alyeska Pipeline Service Company, Apache Corporation, BP Exploration (Alaska) Inc. (BPXA), Chevron USA, Inc., Eni Petroleum, ExxonMobil Production Company, Flint Hills Resources, Inc., Hilcorp Alaska, LLC, Petro Star Inc., Caelus Energy Alaska, LLC, Repsol, Shell Exploration & Production Company (Shell), Statoil, Tesoro Alaska Company, and XTO Energy, Inc.

[2] ConocoPhillips Alaska, Inc. (CPAI), Brooks Range Petroleum Corporation (BRPC), and Arctic Slope Regional Corporation (ASRC) Energy Services.

(ii) authorize issuance of Letters of Authorization (LOAs) for the nonlethal incidental unintentional take of small numbers of polar bears and Pacific walruses within the specified area as a result of this class of activities, provided that such take will have no more than a negligible impact on the affected species or stock, and will not have an unmitigable adverse impact on the availability of the species or stock for subsistence uses.

This DEA analyzes the direct, indirect, and cumulative effects to polar bears and Pacific walruses caused by foreseeable oil and gas Industry activities to determine if the Proposed Action is a major Federal action that significantly affects the quality of the human environment. This DEA is prepared in accordance with the National Environmental Policy Act of 1969 (NEPA), as amended (42 U.S.C. 4321, *et seq.*), and the Council on Environmental Quality (CEQ) regulations in 40 CFR 1500-1508. This statute and the implementing regulations require that the Service, as a Federal agency:

- Assess the environmental impacts of the Proposed Action;
- Identify adverse effects that cannot be avoided, if the Proposed Action is implemented;
- Evaluate alternatives to the Proposed Action, including a No Action Alternative; and
- Describe the cumulative impacts of the Proposed Action together with other past, present, and reasonably foreseeable future actions.

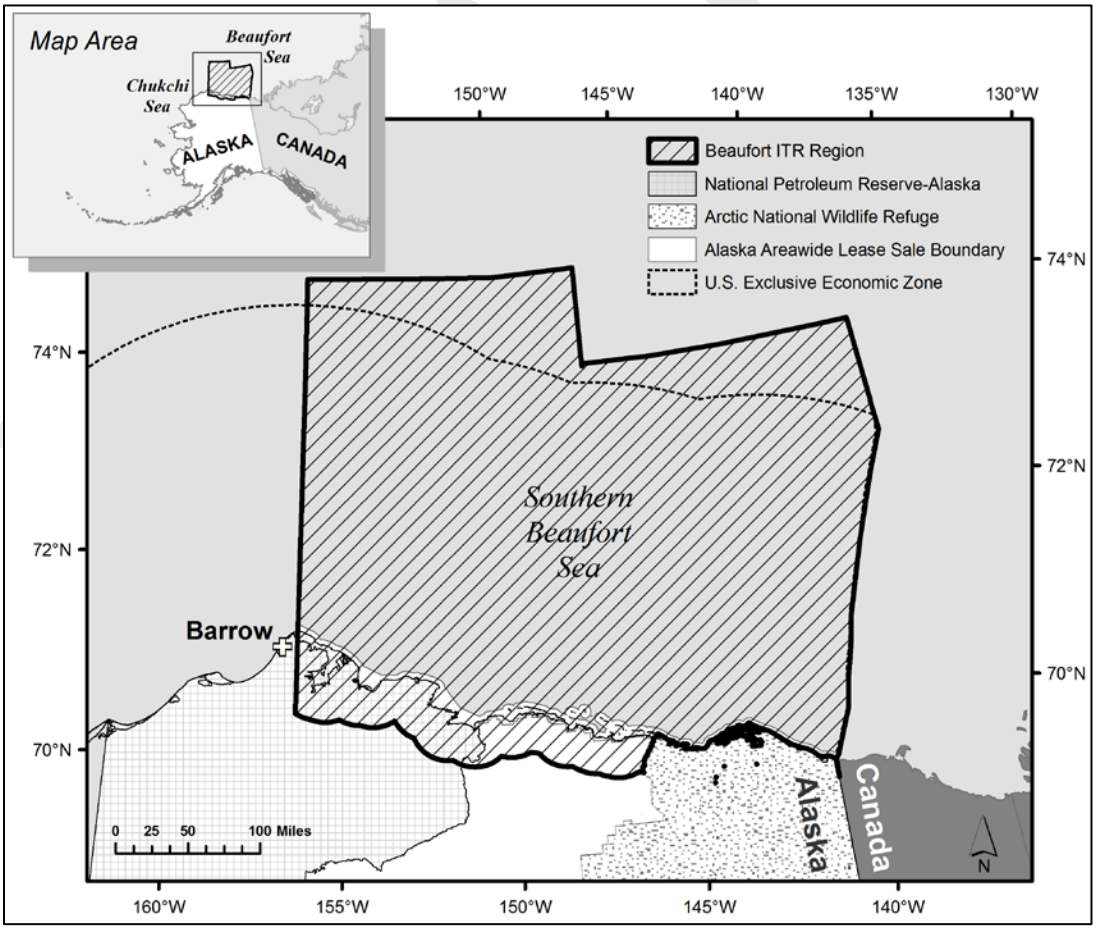

Figure 1. The geographic region covered by the Beaufort Sea Incidental Take Regulations. [Top]

1.2 Purpose and Need

The Applicants are engaged in year-round oil and gas exploration, development, and production activities within the Beaufort Sea region identified in Figure 1. This area encompasses offshore and onshore habitats for polar bears. Oil and gas activities within this area have in the past and are expected in the future to result in human encounters with polar bears, some of which may cause nonlethal incidental take (harassment) of small numbers of individual bears. In addition, while the Beaufort Sea region is extralimital (beyond the normal range) of the Pacific walrus, sightings do infrequently occur. Although human encounters with Pacific walrus during oil and gas operations are unlikely in the Beaufort Sea region, there is the potential for incidental take of small numbers of walrus as a consequence of oil and gas activities.

The Service is responsible for the conservation of polar bears and Pacific walruses in U.S. waters. The MMPA and the Endangered Species Act (ESA; 16 U.S.C. 1531, *et seq.*) provide direction for the management of these species. Both species are protected under the MMPA, which establishes a moratorium on the taking of all marine mammals in U.S. waters, except under specified circumstances and conditions, and for certain exemptions. The polar bear was listed as a threatened species in 2008 under the ESA. This listing prohibits take except pursuant to an incidental take authorization or statutory exemption. Although Pacific walrus are not listed under the ESA, they are a candidate species for potential future listing.

Purpose: The primary purpose of our Proposed Action—the issuance of ITRs for the Beaufort Sea—is to authorize the non-lethal incidental take by harassment of small numbers of polar bears and Pacific walruses. Takes may occur during the specified oil and gas Industry activities and would otherwise be prohibited by the MMPA. The ITRs, if promulgated, would allow the Service to issue LOAs for the non-lethal incidental take by harassment of small numbers of Pacific walruses and polar bears. The LOAs would identify the situations under which taking may occur and the measures required to minimize the impacts. To authorize take in accordance with section 101(a)(5)(A) of the MMPA, we must evaluate the best available information to determine whether take would have a negligible impact on marine mammals or stocks and would not have an unmitigable impact on the availability of marine mammal species for subsistence uses. We cannot issue ITRs if it would result in more than a negligible impact on marine mammals or if it would result in an unmitigable impact on subsistence uses of the species.

In addition, we must prescribe, where applicable, the permissible methods of taking and other means of effecting the least practicable impact on the species or stocks of marine mammals and their habitat (i.e., mitigation), paying particular attention to polar bear denning areas, walrus haulouts, and other areas of similar significance. If appropriate, we must prescribe means of effecting the least practicable impact on the availability of the species or stocks of marine mammals for subsistence uses. Authorizations must also include requirements or conditions pertaining to the monitoring and reporting of such taking in large part to better understand the effects of such taking on the species. Also, we must publish a notice of the proposed regulations in the Federal Register (FR) for public notice and comment.

The purpose of this DEA is therefore twofold:

1. To fulfill the requirements of the MMPA by:
    a. Evaluating the amount of take that would be authorized by the proposed ITRs;

   b. Determining whether such take would have a negligible impact on affected marine mammal species or stocks;
   c. Determining whether such take would have an unmitigable adverse impact on the availability of marine mammals for taking for subsistence uses; and
   d. Describing mitigation and monitoring measures to reduce the potential impacts.
2. To fulfill the requirements of NEPA by:
   a. Analyzing of the probable environmental impacts of a Proposed Action;
   b. Analyzing a reasonable range of alternatives that achieve the purpose and need for the Proposed Action, and analyzing a No Action alternative;
   c. Evaluating the effects of the Proposed Action (the issuance of the ITRs) on the human environment; and
   d. Determining if the Proposed Action is a major Federal action that significantly affects the quality of the human environment.

Need: In August of 2015, AOGA submitted a petition demonstrating both the need and potential eligibility for issuance of regulations. The Service has a corresponding duty to determine whether and how we can authorize take by Level B harassment incidental to the activities described in the petition. Our responsibilities under section 101(a)(5)(A) of the MMPA and its implementing regulations establish and frame the need for this DEA. Any alternatives considered under NEPA must meet the agency's statutory and regulatory requirements. Our described purpose and need guide us in evaluating reasonable alternatives for consideration, including alternative means of mitigating potential adverse effects.

1.3 Laws, Regulations, Agreements, and Policies

1.3.1 Marine Mammal Protection Act

The MMPA establishes a broad moratorium on the taking and importation of marine mammals and marine mammal products, except as explicitly allowed by the MMPA, or as authorized by permit. Section 101(a)(5)(A) of the MMPA directs the Service to allow, upon request, the incidental, but not intentional, take of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical area. The incidental taking of marine mammals may be allowed under this provision if the Service finds, based on the best scientific evidence available, that the total of such taking associated with the specified activity will have a negligible impact on the species or stock and will not have an unmitigable adverse impact on the availability of the species or stock for subsistence uses. If these findings are made, the Service must issue regulations that include monitoring and reporting requirements and permissible methods of taking and other means to ensure the least practicable adverse impact on the species and its habitat, and on the availability of the species for subsistence uses, paying particular attention to rookeries, mating grounds, and areas of similar significance. Regulations at 50 CFR 18.27(f) provide for the issuance of LOAs once specific ITRs are in place. An LOA may only be issued to citizens of the United States. Definitions of the terms used in the proposed ITR are listed under Key DefinitionsKey Definitions (page v).

Since 1993, the oil and gas industry operating on the North Slope of Alaska and in adjacent waters of the Beaufort Sea has requested and been issued a series of ITRs applicable to incidental take of polar bears and Pacific walrus occurring in the Beaufort Sea region as a consequence of specified oil and gas activities. Previous ITR regulations applicable to the Beaufort Sea region were promulgated on November 16, 1993 (58 FR 60402), August 17, 1995 (60 FR 42805), January 28, 1999 (64 FR 4328), February 3, 2000 (65 FR 168282), November 28, 2003 (68 FR 66744), August 2, 2006 (71 FR 43926), and August 3, 2011 (76 FR 47010). The current regulations for the Beaufort Sea ITR region expire on August 2, 2016.

The ITRs promulgated pursuant to section 101(a)(5)(A) of the MMPA do not permit, approve, or otherwise allow any individual or class of commercial, industrial, or development activity to occur. Instead, each ITR establishes a regulatory framework, linked to a specific area, a specific class of activities, a period not to exceed 5 years, and specific marine mammal species or stocks, under which U.S. citizens may apply for an LOA. The ITRs identify types of regulatory requirements for mitigation, monitoring, reporting, and cooperating with potentially affected communities. Each LOA issued by the Service imposes specific enforceable mitigation, monitoring, and reporting tailored to the activity's nature, location, timing, and duration to ensure that interactions with the identified marine mammal species or stocks occur in small numbers and with no more than a negligible impact.

Subsistence harvest by Native Alaskans is authorized under MMPA section 101(b) for marine mammals in general, and Title V for polar bears in the Chukchi Sea. The MMPA allows Alaska Natives who reside in Alaska and dwell on the coast of the North Pacific Ocean or the Arctic Ocean to harvest walruses and polar bears if such harvest is for subsistence purposes or for purposes of creating and selling authentic Native handicrafts and clothing, as long as the harvest is not done in a wasteful manner. The MMPA does not restrict the number, season, or age of walruses or polar bears that can be harvested in Alaska.

The status of each species protected by the MMPA is documented in periodic stock assessment reports (SARs) pursuant to MMPA section 117. Each SAR includes a description of the stock's geographic range, a minimum population estimate, current population trends, current and maximum net productivity rates, optimum sustainable population levels, allowable removal levels, and estimates of annual human-caused mortality and serious injury through interactions with commercial fisheries and subsistence hunters. The most recent revisions to polar bear SARs were published in 2010, and those for walrus in 2014 (USFWS 2010a, b, 2014c).

1.3.2 Endangered Species Act

The ESA (16 U.S.C. 1531 *et seq*.) establishes statutory requirements for conservation of fish, wildlife, and plants in danger of or likely to be in danger of extinction. Section 4 of the ESA (16 U.S.C. 1533) provides authority for the listing of species, subspecies, or distinct population segments as either threatened or endangered, and for the designation of critical habitat for listed species. After a species has been listed as threatened or endangered, the provisions of the ESA afford protection to such species and to designated critical habitat in the form of various procedural and substantive requirements and prohibitions. For example, under section 7 of the ESA (16 U.S.C. 1536), all Federal agencies must ensure through consultation with the Service (or, depending upon the affected species, the National Marine Fisheries Service [NMFS]) of the

National Oceanic and Atmospheric Administration [NOAA]) that actions authorized, funded, or carried out by such agencies are not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of designated critical habitat. In addition, under sections 4(d) (for threatened species) and 9 (for endangered species) of the ESA [16 U.S.C. 1533(d) and 1538], the taking of listed species is or may by regulation be prohibited, except pursuant to an incidental take authorization or statutory exemption. No incidental take authorization pursuant to the ESA may be issued for ESA-listed marine mammals, unless authorization for the incidental take has been obtained pursuant to section 101(a)(5)(A) of the MMPA.

The status of the Pacific walrus was evaluated in response to a 2008 petition to list this species under the ESA. The Service concluded that listing may be warranted but is precluded by higher priority actions (76 FR 7634). Accordingly, the Pacific walrus was designated as a candidate species. A thorough evaluation of the status of the species was completed and is available at 76 FR 7634. In addition, the Service released a separate status review in January, 2011 (Garlich-Miller et al. 2011). By September 2017, the Service must either propose adding Pacific walrus to the ESA list or determine that listing is no longer warranted.

The Service listed the polar bear as a threatened species throughout its range under the ESA on May 15, 2008, due to loss of sea ice habitat caused by climate change (73 FR 28212). The Service published a final special rule under section 4(d) of the ESA for the polar bear on February 20, 2013 (78 FR 11766). The "4(d)" rule provides for measures that are necessary and advisable for the conservation of polar bears. The 4(d) rule: (a) in most instances, adopts the conservation regulatory requirements of the MMPA and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) for the polar bear as the appropriate regulatory provisions for the polar bear; (b) provides that incidental, nonlethal take of polar bears resulting from activities outside the bear's current range is not prohibited under the ESA; (c) clarifies that the special rule does not alter the consultation requirements described by section 7 of the ESA; and (d) applies the standard ESA protections for threatened species when an activity is not covered by an MMPA or CITES authorization or exemption.

Critical habitat contains features that are essential for the conservation of a threatened or endangered species and may require special management or protection. In 2010, the Service designated critical habitat for polar bear populations in the United States effective January 6, 2011 (75 FR 76086). On January 13, 2013 the U.S. District Court for the District of Alaska issued an order (AOGA and American Petroleum Institute v. Salazar, Case No. 3:11–cv–0025–RRB) that vacated and remanded the polar bear critical habitat final rule to the Service. On February 29, 2016, the U.S. Court of Appeals for the 9th Circuit reversed that order and remanded it back to the U.S. District Court for the District of Alaska for entry of judgment in favor of the Service (Alaska Oil and Gas Association v. Jewell, Case No. 13-35619).

Designated critical habitat for the polar bear consists of barrier island habitat, sea-ice habitat (both described in geographic terms), and terrestrial denning habitat (a functional determination). Barrier island habitat includes coastal barrier islands and spits along Alaska's coast. Sea-ice habitat is located over the continental shelf and includes water 300 m (~984 ft) or less in depth. Terrestrial denning habitat includes lands within 32 km (~20 mi) of the northern coast of Alaska

between the Canadian border and the Kavik River and within 8 km (~5 mi) of the coast between the Kavik River and Barrow. The total area designated covers approximately 484,734 km^2 (~187,157 mi^2), and is entirely within the lands and waters of the United States. Polar bear critical habitat is described in detail in 75 FR 76086 (December 7, 2010).

The Service is directed to prepare recovery plans and status reviews for listed species. Section 4(f) of the ESA directs the Service to identify "objective, measurable" recovery criteria and site-specific recovery actions (16 USC 1533(f)(1)(B)). The *Draft Polar Bear Conservation Management Plan*, published in 2015, identifies these recovery criteria and highlights actions for the conservation of polar bears in the United States (USFWS 2015). The Service plans to publish a status review for polar bears in late 2016. Section 4(c)(2)(A) of the ESA directs the Service to conduct a status review every 5 years to ensure the listing of a species is accurate (e.g., Schliebe et al. 2006). This review considers the best scientific and commercial data available regarding species biology, habitat conditions, conservation measures, threats, and other new information.

Subsistence harvest of threatened and endangered species is allowed under section 10(e) of the ESA. For polar bears, the Service's special rule under section 4(d) of the ESA (78 FR 11766, February 20, 2013) adopted the harvest requirements of the MMPA. See the section 1.3.1

The Service has published deterrence guidelines (75 FR 61631, October 6, 2010) that may be used to deter a polar bear without seriously injuring or causing the death of the animal. These guidelines are voluntary and are intended to reduce occurrences of interactions between bears and humans in manners safe for both. They provide clear guidance for minimizing incidental encounters with polar bears, but do not change the legal status quo for any activities in Alaska.

1.3.3 CITES

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is a treaty designed to protect animal and plant species at risk from international trade. The CITES program regulates international wildlife trade by listing species in one of its three appendices. The level of monitoring and regulation depends on the appendix in which a species is listed. Polar bears are listed in Appendix II, which includes species that are threatened with extinction or may become so unless trade is closely controlled. Pacific walrus are listed under Appendix III, which includes species for which trade is regulated and cooperation of other countries is needed to prevent unsustainable or illegal exploitation. Export is authorized for only those listed species for which export will not be detrimental to the survival of the species, and then only those specimens that are verified to be legally owned and obtained.

1.3.4 National Environmental Policy Act

Section 102 of NEPA (42 U.S.C. 4332(C)) mandates a thoughtful and reasonably thorough analysis of the probable environmental impacts of a proposed major Federal action, including analysis of both a reasonable range of alternatives that achieve the purpose and need for the Proposed Action, and analysis of a No Action alternative. Such an analysis is referred to as an environmental impact statement (EIS). An EA is a concise document that provides sufficient information and analysis to determine whether preparation of an EIS is necessary. NEPA requires preparation of an EIS for major Federal actions that may significantly affect the quality

of the human environment. An EIS is not required if, after preparation of an EA, a Federal agency issues a Finding of No Significant Impact (FONSI). Accordingly, NEPA does not establish substantive statutory or regulatory standards or compel a particular decision to approve, modify, or disapprove a proposal. The requirements of NEPA are entirely procedural.

The procedural provisions outlining Federal agency responsibilities under NEPA are provided in the CEQ's implementing regulations (40 CFR 1500-1508). These regulations direct agencies to reduce excessive paperwork and eliminate repetitive discussion of issues by tiering to or incorporating by reference existing NEPA documents (40 CFR 1502.20-21). This DEA adheres to these recommendations by summarizing the issues discussed in broader or pre-existing NEPA documents and adopting these discussions by reference. In the present context, this approach is particularly relevant and useful with respect to discussion of aspects of climate change. This DEA incorporates by reference current information on climate change in the offshore and onshore areas of the Arctic from the following NEPA documents:

- *Alaska Outer Continental Shelf, Chukchi Sea Planning Area - Oil and Gas Lease Sale 193 in the Chukchi Sea, Alaska, Final Second Supplemental Environmental Impact Statement* (BOEM 2015a) at 3.1.9 (Climate Change); and
- *National Petroleum Reserve-Alaska Final Integrated Activity Plan/Environmental Impact Statement* (BLM 2012) at 3.2.1.1 (Climate Change on the North Slope).

1.3.5 Co-Management Agreements

The 1994 amendment to the MMPA included provisions for the development of cooperative agreements between the Service and Alaska Native organizations to conserve marine mammals and provide for the co-management of subsistence use by Alaska Natives. Section 119 of the MMPA amendments authorized the appropriation of funds to implement co-management activities in Alaska. Together with the Service, the Indigenous People's Council for Marine Mammals, U.S. Geological Survey (USGS), and NMFS developed a Memorandum of Agreement to provide the foundation and direction for the use of co-management funds. Cooperative agreements relevant to the Beaufort Sea ITR region have been adopted between the Service and the Alaska Nanuuq Commission (ANC) for management of polar bears, and the Eskimo Walrus Commission (EWC) for management of walruses. Fifteen villages are currently members of ANC, of these, Barrow, Wainwright, Nuiqsut, and Kaktovik are within the Beaufort Sea ITR geographic region. Of the 19 member communities in the EWC, Barrow and Wainright are within the ITR region. Alaska Native organizations participate in a variety of management issues including biological sampling programs, harvest monitoring, collection of Native knowledge, international coordination on management issues, and development of local conservation plans.

1.3.6 Agreement on the Conservation of Polar Bears (1973 Agreement)

Canada, Denmark (on behalf of Greenland), Norway, the Russian Federation, and the United States are parties to a 1973 Agreement requiring these "Range States" to take appropriate action to conserve polar bears and protect their habitat. A collaborative Circumpolar Action Plan (CAP) has been approved (Polar Bear Range States 2015). It emphasizes reduction of threats (especially climate change and human caused mortality), cooperation among member parties, monitoring,

and adaptive management. The 1973 Agreement also relies on the efforts of each party to implement a conservation plan for polar bears within their jurisdiction. The Service's Draft Polar Bear Conservation Plan (USFWS 2015a) serves as the United States' contribution to the CAP.

1.3.7 U.S./Russian Bilateral Agreement for Polar Bears

Polar bear researchers and managers from the United States and the Russian Federation have shared management responsibility and collective knowledge of polar bears in the Chukchi Sea since 2008. In 2007, the United States ratified the *Agreement between the Government of the United States of America and the Government of the Russian Federation on the Conservation and Management of the Alaska–Chukotka Polar Bear Population*. The purpose of the agreement is to assure long-term, science-based conservation of the polar bear population and allow for unifying management. It prioritizes conservation of ecosystems and important habitats, harvest allocations based on sustainability, collection of biological information, and consultation and cooperation with state, local, and private interests.

The agreement also calls for the active involvement of Native people and organizations in the management of shared polar bear populations. It established the U.S.-Russia Polar Bear Commission, which functions as the bilateral managing authority to make scientific determinations, establish taking limits, and carry out other responsibilities important to the conservation and management of the polar bear. In June 2010, the U.S.-Russia Commission adopted an annual harvest limit for polar bears from the Chukchi Sea population. The limit of 19 females and 39 males is to be split evenly between Native peoples of Alaska and Chukotka (DeBruyn et al. 2010). The Alaskan share of the harvest is 29 total polar bears per year. The Agreement applies to all Alaskan coastal villages south of, and including Barrow.

1.3.8 The Inuvialuit-Inupiat and U.S.-Canada Polar Bear Management Agreements

A Native-to-Native agreement between the Inupiat from Alaska and the Inuvialuit in Canada was created for the Southern Beaufort Sea (SBS) stock of polar bears in 1988. Polar bears harvested from the communities of Barrow, Nuiqsut, Kaktovik, Wainwright, and Atqasuk are currently considered part of the SBS stock and thus are subject to the terms of the Inuvialuit-Inupiat Polar Bear Management Agreement. The agreement establishes quotas and recommendations concerning protection of denning females, family groups, and methods of harvest. Quotas are based on estimates of population size and age-specific estimates of survival and recruitment. Currently, 70 bears are shared between the Inupiat and the Inuvialuit: 35 bears for each. This was based on a population estimate of 1,526 and was considered the maximum sustainable harvest level. The Native subsistence harvest of bears from the SBS has remained relatively consistent since 1980 and averages 36 bears per year.

In 2008, a Memorandum of Understanding (MOU) for the Conservation and Management of Shared Polar Bear Populations was signed by representatives of the United States and Canada (EU and USDOI 2008). The purpose of the MOU is to facilitate and enhance coordination and cooperation among Federal, State, Territorial, Native, and Aboriginal representatives regarding the conservation and management of polar bears. The MOU provides a framework for the development and implementation of mutually agreeable conservation actions. It is expected to

leverage, rather than duplicate existing polar bear coordination and management efforts, including the efforts of the Inuvialuit-Inupiat Agreement's partnership.

1.4 Scope of Analysis

In accordance with NEPA and CEQ implementing regulations, this document analyzes whether the Proposed Action (issuance and implementation of the proposed ITRs for the specified 5-year period) will result in impacts constituting a major Federal action that significantly affects the quality of the human environment. As stated previously, issuance of the proposed ITRs pursuant to the MMPA would not authorize oil and gas activities. This document's scope of analysis includes the direct, indirect, and cumulative effects of issuance of ITRs on elements of the human environment, particularly polar bears and Pacific walruses. Issuance of ITRs is contingent upon the Service's findings that the impact of the specified activities will have a negligible impact on the species or stock and will not have an unmitigable adverse impact on the availability of the species or stock for subsistence uses. Therefore, we also analyze the impacts of the oil and gas industry on polar bears and walruses. Analysis of effects of industry on the species demonstrates whether these findings can be made, and whether the ITRs can be issued. This DEA does not further evaluate effects on the elements listed in Table 1 because issuing ITRs for polar bears and Pacific walrus would not significantly affect those elements.

Table 1. Components of the human environment not affected by issuance of Incidental Take Regulations.

Biological	Physical	Socioeconomic / Cultural
Amphibians	Air Quality	Commercial Fishing
Marine Mammals Except Polar bears and Pacific Walruses	Essential Fish Habitat	Military Activities
	Geography	Recreational Fishing
	Land Use	Shipping and Boating
Invasive Species	Oceanography	National Historic Preservation Sites
Seabirds	State Marine Protected Areas	National Trails
Plants	Federal Marine Protected Areas	Low Income Populations
Fish	National Estuarine Research Reserves	Minority Populations
Aquatic organisms	National Marine Sanctuaries	Nationwide Inventory of Rivers
	Park Land	Public Health and Safety
	Prime Farmlands	Historic and Cultural Resources
	Wetlands	
	Wild and Scenic Rivers	
	Ecologically Critical Areas	

[Top]

1.5 Scientific Context and New Information

This DEA evaluates the potential impacts of oil and gas Industry activities on polar bears and walruses. This evaluation focuses on:

- The current and predicted status of polar bears, walruses, and their habitat;
- Factors affecting the status of the species;
- Distribution and abundance in areas where Industry activities are planned; and

- Behavioral and physiological responses of polar bears and walruses to ongoing and potential Industry activities.

We considered the following sources of information: peer-reviewed published scientific journals; documents published by Federal and state agencies; data available in the Service's unpublished files and reports; personal communications from subject matter experts; reports produced by Industry; and monitoring data collected by the Service in fulfillment of LOA mitigation requirements. A summary of the most relevant new information is in the following sections.

1.5.1 Monitoring Data

Since 1993, Industry activities have been closely monitored and reported pursuant to section 101(a)(5)(A) of the MMPA. Industry monitoring data collected between January 1, 2010, and December 31, 2014, was included in our assessment for the proposed ITRs. This information, together with previous monitoring data, indicates that the number of incidental takings is a small fraction of the annual observations. In most instances, takes consist of temporary, minor behavioral modifications that have no detectable effect on rates of recruitment or survival. The data establish that the presence of walruses in the Beaufort Sea region is uncommon. Disturbance due to Industry activity is uncommon. In sum, data collected over a period of decades regarding past oil and gas activities in the Beaufort Sea region indicate that the level of interaction between industry and polar bears and walruses has not caused adverse effects to these species.

1.5.2 Polar Bear

- The most recent population estimate for the SBS population was produced by the USGS in 2015 by Bromaghin et al. (2015). That study showed a 25 to 50 percent decline in abundance of SBS bears due to low survival from 2004 through 2006. Though survival of adults and cubs began to improve in 2007, and abundance was comparatively stable from 2008 to 2010, survival of subadult bears declined throughout the entire period. Bromaghin et al. (2015) estimated that in 2010 there were approximately 900 polar bears (90 percent confidence interval [CI] = 606–1212) in the SBS population.
- Since 2000, the health of the SBS polar bear population has undergone periods of change (Rode et al. 2014). There is evidence of declining abundance from 2004 to 2006 and increased survival rates from 2008 to 2010 (Bromaghin et al. 2015). Adult polar bears and cubs may be experiencing a decline in nutritional status (Rode et al. 2014). One possible explanation is that these declines were associated with low prey abundance or unfavorable ice conditions that limited access to prey (Bromaghin et al. 2015).
- While the SBS population has shown reduced condition and survival concurrent with reduced sea ice, the Chukchi/Bering Seas stock (CS) has maintained stable health and reproductive indices (Rode et al. 2014).
- Remains of bowhead whale (*Balaena mysticetus*) made available following the Alaska Native subsistence harvest continue to be an important food source for polar bears, comprising up to 70 percent of the fall diet of some individuals (Rogers et al. 2015).
- Increased consumption of terrestrial foods by polar bears is linked with declines in body condition and survival rates (Rode et al. 2015a).
- Recent past as well as the future distribution of polar bears may be linked to the loss of optimal sea ice habitat (Durner et al. 2007; Rode et al. 2014).

- Under both stabilized and unabated greenhouse gas emissions models, polar bears are expected to be have greatly decreased persistence throughout the region (Atwood et al. 2015). Population decline is expected to result from decreased female survival and reduced breeding. Primary stressors include reduced sea ice and a related decrease in prey and seal hunting habitat (Atwood et al. 2015).
- Anthropogenic activities (e.g. industrial, subsistence) are expected to exert a considerably smaller influence on polar bear populations than the effects of global climate change (Atwood et al. 2015; Regehr et al. 2015).
- The Service has recently issued a draft Polar Bear Conservation Management Plan (USFWS 2015). In it, the Service reaffirms its finding from the ESA listing decision in 2008 that the decline of sea ice habitat due to changing climate, driven primarily by increasing atmospheric concentrations of greenhouse gases, is the primary threat to polar bears. The draft plan also identifies minimizing sources of take through the existing MMPA ITR framework as an important conservation strategy.

1.5.3 Pacific Walrus

- The best available minimum population estimate, based on aerial surveys between the United States and Russia, is 129,000 walruses (95 percent CI = 55,000–507,000) (Speckman et al. 2011).
- Walruses rely on suitable sea ice as a substrate for resting between foraging dives. During years of low summer sea ice, walruses have hauled out in high numbers near Point Lay and travelled to Hannah Shoal during feeding bouts.
- There are currently no known haul-out sites from Point Barrow to Demarcation Point on the Beaufort Sea coast (Figure 5).
- Onshore haul-outs continue to occur along the Chukchi Sea. Disturbance events can cause walruses to stampede into the water and have been known to result in injuries and mortalities. The risk of stampede-related injuries increases with the number of animals hauled out. Calves and young animals at the perimeter of these herds are particularly vulnerable to trampling injuries (Udevitz et al. 2013).
- While walrus have been encountered and are occasionally present in the Beaufort Sea, the latest scientific studies confirm that the Beaufort Sea region is outside of the normal range (extralimital) for this species (LGL et al. 2013; Lomac-MacNair et al. 2014; Lomac-MacNair et al. 2015).
- From 2009 through 2014 there were no reports of walruses hauling out at Industrial facilities in the Beaufort Sea ITR region.

1.5.4 Climate Change

- The *Arctic Report Card: Update for 2014* (Jeffries et al. 2014) reported that climate change momentum has developed in the Arctic environmental system due to the effects of a persistent warming trend that began more than 30 years ago. A major source of this momentum is identified as the change in sea ice cover, snow cover, glaciers, and the Greenland ice sheet that have reduced the overall surface reflectivity of the Arctic region in the summer. Changes are predicted to continue in the Arctic in years to come; however, there are spatial and temporal variations in the anticipated magnitude and

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direction of change, and some mixed signals from the most recent available data. Nevertheless, the overall long-term trends provide evidence of continuing and significant changes in the Arctic related to global climate change.

- Researchers have projected that surface temperatures in the Arctic will increase faster than elsewhere in the world due to major regional and global feedback processes. This phenomenon has been termed "Arctic Amplification." According to the U.S. Geological Survey (USGS), the observed changes in sea-ice extent, the timing of spring snow melt, changes in permafrost, increases in area of forest fires, and increases in ocean temperatures are occurring faster than expected due to this phenomenon (Markon et al. 2012).
- Climate projections for the North Slope of Alaska vary, particularly when extended decades into the future. However, average summer and winter temperatures are generally expected to increase, shifts are expected to occur in patterns of precipitation, snowfall, and snowmelt. River levels may rise, flooding events increase, and the annual period of frozen ground is likely to decrease (Clement et al. 2013, Leonawicz et al. 2016)
- The International Panel on Climate Change (IPCC) released its Fifth Assessment Report providing extensive updates on the evolving science of climate change, including the Arctic (IPCC 2014a). Among other things, the IPCC estimates that global net warming will occur into the future as the mean surface temperature increases up to 3.7° F (1.48° C) by the year 2100 (IPCC 2013). [Top]

Chapter 2. PROPOSED ACTION AND ALTERNATIVES

2.1 No Action Alternative

Under the No Action alternative, no incidental take regulations would be issued. No authorizations for incidental take that may occur during Industry activities would be issued and the associated mitigation measures for reducing the effects of oil and gas activities on polar bears and walruses would not be required. The moratorium and prohibitions on the taking of marine mammals imposed by the MMPA would remain in effect. Under this alternative, takings that could occur incidental to oil and gas activities would be subject to the prohibitions of the MMPA, and oil and gas operators would be liable for penalties should a take occur. In addition, regulations at 50 CFR §402.14(i) specify that incidental take authorizations for marine mammals cannot be authorized under the ESA until regulations, authorizations, or permits under section 101(a)(5) of the MMPA are in effect. Because polar bears are listed as "threatened" under the ESA, a No Action alternative would also preclude issuance of ESA incidental take authorizations for polar bears.

The provisions in section 101(a)(5)(A) of the MMPA require the Service to allow the incidental, but not intentional, taking of small numbers of marine mammals, subject to the requisite findings that the specified activity will have a negligible impact on the identified species or stocks, and there will be no unmitigable adverse impact on the availability of the species or stocks for subsistence use by Alaska Natives. Accordingly, if these finding are made based upon the best available scientific information, the No Action alternative would not meet this requirement.

2.2 Preferred Alternative – Issuance of Incidental Take Regulations

The preferred alternative is to promulgate ITRs for a period of five years with monitoring, reporting, and mitigation measures, and additional requirements. This action would authorize incidental take of small numbers of polar bears and Pacific walruses associated with oil and gas activities in the Beaufort Sea and adjacent Alaskan coast for a 5-year period beginning August 3, 2016. The intent of the preferred alternative is to provide petitioners an overall set of guidelines under which LOAs could be issued and evaluated. The LOAs would include all of the general mitigation measures (as described in the Mitigation Measures section, page 67), as well as additional mitigation requirements, if necessary, that are tailored to the particular activity proposed. Conditioning LOAs would be done on a case-by-case basis to afford additional protection to sensitive areas, such as polar bears dens. These regulations would not allow activities that have the potential injure polar bears or walruses (Level A take), or that would cause intentional take of these animals. The following information describes the parties subject to, the specific location of, and the activities covered by the proposed 2016-2021 ITRs.

2.2.1 Covered Parties

The Applicants for the proposed ITRs are the AOGA, on behalf of its members, and certain non-AOGA members. The members of AOGA represented in the petition include: Alyeska Pipeline Service Company; Apache Corporation; BP Exploration Alaska, Inc. (BPXA); Chevron USA, Inc.; Eni Petroleum; ExxonMobil Production Company, Flint Hills Resources, Inc.; Hilcorp Alaska, LLC; Petro Star Inc.; Caelus Natural Resources Alaska, LLC; Repsol; Shell Exploration and Production Company (Shell); Statoil; Tesoro Alaska Company; and XTO Energy, Inc. Other parties include ConocoPhillips Alaska, Inc. (CPAI), Brooks Range Petroleum Corporation (BRPC), and Arctic Slope Regional Corporation Energy Services. If ITRs are issued, any individual or company, whether an AOGA member or not, may request an LOA.

2.2.2 Location

The geographic area covered by the requested incidental take regulations (hereafter referred to as the "Beaufort Sea ITR region") encompasses all Beaufort Sea waters east of a north-south line through Point Barrow (71°23'29" N, 156°28'30" W, BGN 1944) to approximately 200 miles north of Point Barrow, including all Alaska State waters and Outer Continental Shelf (OCS) waters, and east of that line to the Canada border (Figure 1). The onshore region is the same north/south line at Barrow, 25 miles inland and east to the Canning River. The Arctic National Wildlife Refuge is not included in these regulations. The geographical extent of these regulations is similar to that in previous regulations (76 FR 47011). For this rule, we propose that the offshore boundary match the boundary of the Beaufort Sea Planning area, approximately 200 miles offshore.

2.2.3 Description of Activities

This section reviews the type and scale of oil and gas activities projected to occur in the Beaufort Sea region over the specified period (2016 to 2021). Year-round onshore and offshore exploration and development activities are anticipated. Planned and potential activities considered in our analysis include activities described by the petitioners (AES Alaska 2015, pp.

10-25) and other foreseeable oil and gas Industry activities. Throughout the five years that the proposed regulations will be in place, activities are generally expected to be similar in type, timing, and effect to activities that have been evaluated under the prior regulations. Due to the large number of variables affecting Industry activities, prediction of exact dates and locations of operations is not possible. We assume that all proposed activities will occur, though it is possible that the actual level of activities will be less. For example, the actual number of offshore seismic projects during the previous ITR regulatory period was less than the amount analyzed. However, operators must provide specific dates and locations of proposed activities prior to receiving an LOA. If LOAs are requested for activities that exceed the scope of activities analyzed under these regulations, the LOAs will not be issued. Additional information on the proposed activities is available in AOGA's petition for ITRs (AES Alaska 2015, pp. 10-25).

Exploration Activities

In the Beaufort Sea ITR region, oil and gas exploration occurs onshore, in coastal areas, and in the offshore environment (Figure 2). Exploration activities may include geological and geophysical surveys consisting of: geotechnical site investigations; reflective seismic exploration; vibratory seismic data collection; airgun and water gun seismic data collection; explosive seismic data collection; vertical seismic profiling; and sub-sea sediment sampling. Exploratory drilling involves construction and use of drilling structures such as caisson-retained islands, ice islands, bottom-supported or bottom-founded structures such as the steel drilling caisson, or floating drill vessels. Exploratory drilling and associated support activities and features may include: transportation to site; setup and relocation of lodging camps and support facilities (such as lights, generators, snow removal, water plants, wastewater plants, dining halls, sleeping quarters, mechanical shops, fuel storage, landing strips, aircraft support, health and safety facilities, data recording facilities, and communication equipment); building gravel pads; building gravel islands with sandbag and concrete block protection; construction of ice islands, pads, and ice roads; gravel hauling; gravel mining; road building; road maintenance; operating heavy equipment; digging trenches; burying and covering pipelines; security operations; dredging; moving floating drill units; helicopter support; and conducting ice, water, and flood management. Support facilities include pipelines, electrical lines, water lines, buildings and facilities, sealifts, and large and small vessels. Exploration activities could also include the development of staging facilities, oil spill prevention, response, and cleanup activities, and site restoration and remediation. The level of exploration activities is expected to be similar to the level during the past regulatory periods, although exploration projects may shift to different locations, particularly to the National Petroleum Reserve-Alaska (NPR-A). During the regulatory period, exploration activities are anticipated to occur in the offshore environment and to continue in the existing oil field units.

Bureau of Ocean Energy Management Outer Continental Shelf Lease Sales

The Bureau of Ocean Energy Management (BOEM) manages oil and gas leases in the Alaska OCS region which encompasses 600 million acres (242 million ha). Of that acreage, approximately 65 million acres (26 million ha) are within the Beaufort Sea Planning Area, within the scope of the proposed ITRs. Ten lease sales have been held in this area since 1979, resulting in 147 active leases wherein thirty-two exploratory wells have been drilled. Production has occurred on one joint Federal/state unit, with Federal oil production accounting for more than

28.7 million barrels (bbl; 42 U.S. gal [159 l]) of oil since 2001 (BOEM 2015b). Details regarding availability of future leases, locations, and acreages are not yet available, but exploration of the OCS is expected to continue. Lease Sale 242 is planned in the Beaufort Sea during 2017 (BOEM 2012). Beaufort Sea Lease Sale 255 is proposed for the year 2020 (BOEM 2016).

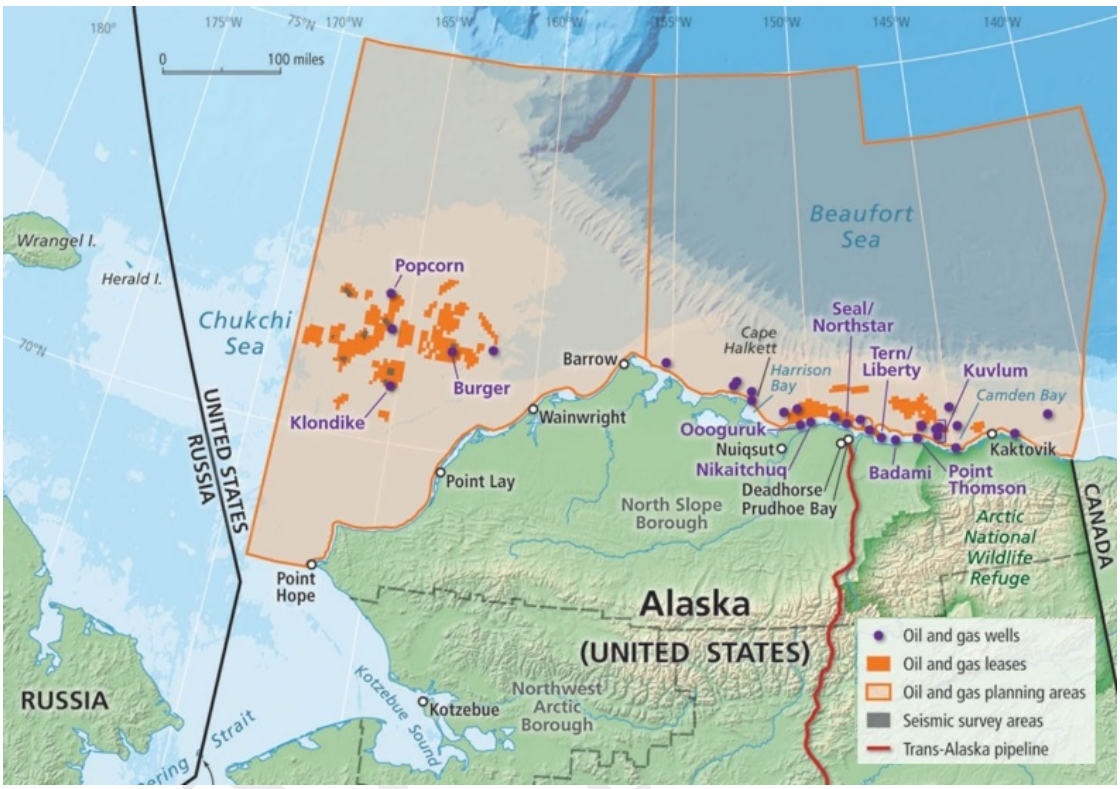

Figure 2. Oil and gas exploration and development areas in Northern Alaska (from Natural Research Council, in Fischman 2014). [Top]

National Petroleum Reserve – Alaska

The Bureau of Land Management (BLM) manages the 22.8-million acre (9.2 million ha) National Petroleum Reserve – Alaska (NPR-A) of which 3.2 million acres (1.3 million ha) occur within the Beaufort Sea ITR region. Within this area, the BLM has offered approximately 11.8 million acres (4.7 ha) for oil and gas leasing (BLM 2013a). Between 1999 and 2014, 5.1 million acres (2.1 million ha) were sold in 10 lease sales. As of January 2015, there were 205 leases amounting to over 1.7 million acres (680,000 ha) leased (BLM 2015). From 2000 to 2013, industry drilled 29 wells in federally managed portions of the NPR-A, and three in adjacent Native-owned lands (BLM 2013b). A majority of the leased acreage is held by CPAI. Exploratory efforts are expected to continue, especially seismic work and exploratory drilling within the Greater Mooses Tooth (GMT) and Bear Tooth Units of the NPR-A. Other operators, including Anadarko E&P Onshore LLC and NORDAQ Energy, Inc., also hold leases in the NPR-A. Caelus Energy Alaska, LLC (Caelus) has recently announced acquisition of leases and intentions to pursue exploratory drilling near Smith Bay in the Tulimaniq prospect. This project would include construction of ice pads, ice roads, temporary camps, and a temporary ice airstrip.

Areawide Lease Sales

The State of Alaska Department of Natural Resources, Oil and Gas Division, holds annual lease sales of state lands available for oil and gas development. Lease sales are organized by planning area. The approximately 2 million-acre (0.8 million-hectare) Beaufort Sea planning area occurs in coastal land and shallow waters along the shoreline of the North Slope between the NPR-A and the Arctic National Wildlife Refuge (ANWR) (State of Alaska 2015a). It is entirely within the boundary of the Beaufort Sea ITR region. The North Slope planning area includes tracts located to the south and inland from the Beaufort Sea planning area. Of the approximately 5.1 million acres (2.1 million ha), 2 million acres (0.8 million ha) occur within the Beaufort Sea ITR region. As of August 2015, there were 1,253 active leases on the North Slope, encompassing 2.8 million acres (1.1 million ha), and 261 active leases in the state waters of the Beaufort Sea, encompassing 703,452 acres (284,677 ha; State of Alaska 2015b). Number of acres leased has increased by 25 percent in the North Slope and 14 percent in the Beaufort Sea planning areas since 2013. Although most of the existing oil and gas development in the Southern Beaufort ITR region is concentrated in these state planning areas, the increase in leased acreage suggests that exploration on state lands and waters will continue during the 2016-2021 ITR regulation period.

Gas Hydrate Exploration and Research

Interest in methane gas hydrates is expected to increase in the upcoming five years. The USGS has estimated the volume of technically recoverable undiscovered methane gas hydrate on the North Slope is approximately 85 trillion cubic feet (ft^3; range: 25–158 trillion; USGS 2013). Recent test wells drilled on the North Slope have confirmed the presence of viable reservoirs and have buoyed interest in long-term testing. International and Gulf of Mexico test well simulations have generated production-level gas yields. Gas hydrate research on the North Slope is supported by Federal funding and state initiatives. In 2013, the State of Alaska temporarily set aside 11 tracts of unleased state lands on the North Slope for methane hydrate research. This support is expected to result in a continued interest in gas hydrates, but development of this nonconventional resource is yet unproven and uncertainties regarding economic feasibility, safety, and environmental impact remain unresolved. For these reasons, a relatively low, but increasing level of gas hydrate exploration and research is expected during the regulatory period.

Development Activities by North Slope Oil and Gas Unit

Industry operations during oil and gas development may include construction of roads, pipelines, waterlines, gravel pads, work camps (personnel, dining, lodging, and maintenance facilities), water production and wastewater treatment facilities, runways, and other support infrastructure. Activities associated with the development phase include transportation activities (automobile, airplane, and helicopter), installation of electronic equipment, well drilling, drill rig transport, personnel support, demobilization, restoration, and remediation work. Industry development activities are often planned or coordinated by unit. Alaska's North Slope oil and gas units include Prudhoe Bay, Kuparuk River, Greater Point McIntyre, Milne Point, Endicott, Badami, the Alpine oil fields of the Colville River Unit, GMT, Northstar, Oooguruk, Nikaitchuq, and Point Thomson. In addition, some of these fields are associated with satellite oilfields: Tarn, Palm, Tabasco, West Sak, Meltwater, West Beach, North Prudhoe Bay, Niakuk, Western Niakuk, Kuparuk, Schrader Bluff, Sag River, Eider, Sag Delta North, Qannik, and others.

Alpine Satellites and Greater Mooses Tooth

Continued expansion of the existing Alpine oil field within the Colville River Unit is planned for the 2016-2021 ITR period. Three new drill sites, Colville Delta drill site 5 (CD5, also known as Alpine West), GMT-1 (Lookout prospect, formerly CD6), and GMT-2 (Rendezvous prospect, formerly CD7) are located in the Northeast NPR-A. These facilities will connect to existing infrastructure at Alpine via a gravel road and four bridges over the Colville River (BLM 2014). Development of CD5 is currently underway; commercial oil production began at the end of 2015. The GMT-1 project has received permits. Road, pad, pipeline, and facilities construction is anticipated for 2017 through 2018, but due to permitting delays and low oil prices, CPAI has slowed construction plans that would have begun production by late 2017 (CPAI 2015). Permitting for GMT-2 has not yet been completed, but construction and first production is tentatively scheduled for 2019 and 2020. In addition to new drill site development in the NPR-A, expansion of existing drill sites in the Colville River Unit is also being considered, but is uncertain. Additional development infrastructure in the area is planned with construction of the Nuiqsut spur road. Although the road is not specifically designed for oil and gas industry purposes, it will provide access to Alpine workers living in Nuiqsut.

The Colville-Kuparuk Fairway

The region between the Alpine field and the Kuparak Unit has been called the Colville-Kuparuk Fairway (NSB 2014). Within this region, BRPC has proposed development of three drill sites by 2020 as part of the 13-well Mustang development. An independent processing center is proposed at the hub of the Mustang Development, but production pipelines will tie into the Kuparuk facilities. Approximately 20 mi (32.2 km) of gravel road and pipeline will need to be constructed to tie in the drill sites back to the Mustang development and provide year-round access. First production of oil is planned for mid-2016. Brooks Range Petroleum Corporation has also proposed development within the Tofkat Unit southeast of the Alpine oilfield for the years 2020 and 2021. If constructed, the Tofkat gravel pad will cover approximately 15 acres (6.07 ha) and will connect to Alpine infrastructure via an 8-km (5-mi) gravel road and pipeline. Caelus has begun development of the Nuna prospect within the fairway. This project is located at the northeast end, within the Oooguruk Unit. Estimated date of first production from the Nuna prospect is 2017. Development activities include seismic surveys, continued exploratory drilling, drilling production wells, and construction of drill pads, roads, and pipeline connections to Kaparuk infrastructure. Spanish oil company, Repsol, has submitted plans for development of five potential well locations beginning in winter 2015 with a three-well exploration program just northwest of the Alpine field. If deemed commercial, a road system expanded from these drill sites to existing Kuparuk facilities is easily envisaged, along with multiple new drill sites, a centralized processing facility, and a network of flow lines tied into the Alpine Pipeline System.

Kuparuk River

Ongoing infield and peripheral development at the existing Kuparuk River Unit has been conducted by CPAI over the past decade and is likely to continue into the foreseeable future. Efforts have focused on improving technologies, expanding current production, and developing new drill sites. Technological advancements have included hydraulic fracturing, enhanced oil recovery, coil-tube drilling, and 4-D seismic surveys. Two new drill rigs will be brought online

in 2016. As of 2015, a new drill site “2S” in the southwest “Shark Tooth” portion of the unit is under construction. It will require approximately 3.2 km (2 mi) of additional gravel road, pipelines, and power lines. Oil production from this well is planned for 2016. The proposed “Northeast West Sak” expansion of the existing “1H” drill site is also underway. The 9.3-acre (3.7-ha) project will accommodate additional wells and is planned to be completed in 2017. Oil from these facilities would be routed through the Kuparuk facilities to the Trans-Alaska pipeline. Other pad expansions and two additional drill sites in the eastern portion of the Kuparuk Unit may be developed later this decade to access additional oil resources.

Prudhoe Bay

New development within the Prudhoe Bay Unit is planned to help offset declining production from older wells. The possibility of development of as many as 200 new wells within the Greater Prudhoe Bay Unit area has been discussed by BPXA during the upcoming decade. Much of this expansion is planned to occur as part of the “West End Development Program.” Proposed activities in this program include drilling 16 new wells, improving capacity of existing facilities, adding twenty-five additional miles of pipeline, construction of the first new pad in more than a decade, adding two drill rigs to the fleet, and expanding two additional pads within the unit. This program of development has been underway since 2013 and is expected to be completed in 2017.

Beechey Point / East Shore

The Beechey Point Unit lies immediately north of the Prudhoe Bay Unit near the shore of Gwydyr Bay. The unit operator, BRPC, is planning to produce oil from several relatively small hydrocarbon accumulations in and near this unit as part of the East Shore Development Project. Existing Prudhoe Bay infrastructure will be incorporated with new development to access the estimated 26 million bbl of recoverable reserves in the Central North Slope region. The proposed East Shore pad will cover approximately 15 acres (6.07 ha). An 8.9-km (5.5-mi) gravel road will be constructed to provide year-round access to production facilities. Oil will be transported via a 1.6-km (1-mi) pipeline from the East Shore pad to existing pipelines. Gravel construction is expected to begin in 2018; first oil is planned for 2020.

Liberty

Hilcorp Alaska, LLC (Hilcorp) recently assumed operation of the Liberty Unit, located in nearshore Federal waters in Foggy Island Bay about 17 km (11 mi) west of the Prudhoe Bay Unit. Initial development of the Liberty Unit began in early 2009 but was suspended following changes in production strategy. The current project concept involves production from a gravel island over the reservoir with full on-island processing capacity. Support infrastructure would include a 12.9-km (8-mi) subsea pipeline connecting to the existing Badami pipeline. Pending permit approvals, first oil production is expected by 2020 or later. This project concept supersedes the cancelled Liberty ultraextended-reach drilling project.

Point Thomson

The Point Thomson Unit is located approximately 25 km (20 mi) east of the Liberty Unit and 97 km (60 mi) east of Prudhoe Bay. The reservoir straddles the coastline of the Beaufort Sea. It consists of a massive gas condensate reservoir containing up to 8 trillion ft^3 of gas and hundreds

of millions of barrels of gas liquids and oil. This is an estimated 25 percent of the North Slope's natural gas reserves and is critical to any major gas commercialization project. ExxonMobil is actively pursuing development of a processing facility capable of handling 10,000 bbl per day, a pipeline with a design capacity of 70,000 bbl per day, a camp, an airstrip, and other ancillary facilities. Production is estimated to begin in 2016. All proposed wells and supporting infrastructure will be located onshore. No permanent roads connecting with Prudhoe Bay are currently proposed, but gravel roads will connect the infield facilities. Ice roads and barges will be used seasonally to provide equipment and supplies. Potential full field development may include two satellite drill sites, additional liquids production, and sale of gas. The timing and nature of additional expansion will depend upon initial field performance and potential construction of a gas pipeline to export gas from the North Slope.

Natural Gas Pipeline

Two major proposals currently exist for construction of a natural gas pipeline from the Point Thomson and Prudhoe Bay production fields. The Alaska Liquefied Natural Gas (LNG) project is an industry-sponsored partnership whose members include BP Alaska LNG LLC; ConocoPhillips Alaska LNG Company; and ExxonMobil Alaska LNG LLC. The Alaska LNG project proposes to build a large diameter (45-106 cm [18-42 in]) natural gas pipeline from the North Slope to South-central Alaska. In 2014, the State of Alaska joined in the project as a 25 percent co-investor. Since then, the project has begun the engineering and design phase. The routing of the proposed Alaska LNG project pipeline is from Prudhoe Bay, generally paralleling the Dalton Highway corridor from the North Slope to Fairbanks. An approximately 56.3-km (35-mi) spur will take off from the main pipeline and end at Fairbanks. The main pipeline would continue south, terminating at a natural gas liquefaction plant near Nikiski. There the remaining hydrocarbons will be condensed for export to international markets. The second partnership, the Alaska Stand Alone Gas Pipeline project, was originally planned as a 24-in (0.6-m) diameter natural gas pipeline with a natural gas flow rate of 500 million ft^3 per day at peak capacity, and is currently considered by many as a backup plan for the larger Alaska LNG project.

Either project would include an underground pipeline with elevated bridge stream crossings, compressor stations, possible fault crossings, pigging facilities, and off-take valve locations. Both pipelines would be designed to transport a highly conditioned natural gas product, and would follow the same general route. As currently proposed, approximately 40 km (25 mi) of pipeline would occur within the Southern Beaufort ITR region. A gas conditioning facility would need to be constructed near Prudhoe Bay and will likely require one or more large equipment modules to be off-loaded at the West Dock loading facility. The West Dock facility is a gravel causeway stretching 4 km (21.5 mi) into Prudhoe Bay. Shipments to West Dock will likely require improvements to the dock facilities including installing breasting dolphins and raising the height of the existing dock head to accept the large shipments. Dredging will be needed to deepen the navigational channel to the dock head. Continued pre-construction project engineering and design work involving site evaluations and environmental surveys on the North Slope is likely to occur in the 2016-2021 period. Additional early-phase construction work could occur during this time but would likely be limited to expansion of West Dock beginning in 2020, gravel extraction and placement for pads and roads near Prudhoe Bay beginning in 2019, and ice-road construction in 2018-2021.

Production Activities

North Slope production facilities occur from the Barrow gas fields in the west to Badami and Point Thomson in the east. Production activities include building operations, oil and gas production, oil and gas transport, facilities maintenance and upgrades, restoration, and remediation. Production activities are permanent, year-round activities, whereas exploration and development activities are usually temporary and seasonal. Alpine and Badami are not connected to the road system and must be accessed by airstrips, barges, and seasonal ice roads. Transportation on the North Slope is by automobile, airplanes, helicopters, boats, rolligons, tracked vehicles, and snowmobiles. Aircraft, both fixed wing and helicopters, are used for movement of personnel, mail, rush cargo, and perishable items. Most equipment and materials are transported to the North Slope by truck or barge. Much of the barge traffic during the open water season unloads from West Dock. Maintenance dredging of up to 660,000 ft^3 per year of material is performed at West Dock to ensure continued operation.

Oil pipelines extend from each developed oil field to the Trans-Alaska Pipeline System (TAPS). The 122-cm (48-in) diameter TAPS pipeline extends 1,287 km (800 mi) from the Prudhoe Bay oil field to the Valdez Marine Terminal. Alyeska Pipeline Service Company conducts pipeline operations and maintenance. Access to the pipeline is primarily from established roads, such as the Spine Road and the Dalton Highway, or along the pipeline right-of-way.

Barrow Gas Fields

The North Slope Borough (NSB) operates the Barrow Gas Fields located south and east of the city of Barrow. The Barrow Gas Fields include the Walakpa, South, and East Gas Fields. The East Field and part of the South Field are included in the Beaufort Sea ITR region. Drilling and testing of the East Barrow Field began in 1974, and regular gas production from the pool began in December 1981. Production peaked at about 2.75 million ft^3 of gas per day in 1983, and then began to decline. In 2011 and 2012, NSB increased production by drilling five new wells, upgrading pipelines, and installing modern wellhead housings. In the winter of 2013, production was about 350 million ft^3 per day. Cumulatively, the field produced more than 8.8 billion ft^3 through July 2013, surpassing the original estimate of 6.2 billion ft^3 of gas in place.

Although activities within the Barrow Gas Fields were not specifically identified by the Applicants, the petition did include this area as part of the request for ITRs. Additionally, a portion of the Barrow Gas Fields are similarly described in ITRs for the Chukchi Sea (78 FR 35364**,** June 12, 2013), while the remainder is located in the Beaufort Sea geographic region. Therefore, as part of this analysis, we have included the Barrow Gas Fields in the event that LOAs for activities on the Beaufort Sea side of the field are requested. Gas production is expected to continue at its current rate during the next five years, and will be accompanied by maintenance and support activities, including possible access by air or over land, ice road construction, survey work, or on-pad construction.

Alpine Oil Field

The Alpine oil field within the Colville River Unit began production in 2000. The majority interest holder and primary operator is CPAI. Alpine is currently the westernmost production

oilfield on the North Slope, located 31 mi (50 km) west of the Kuparuk oilfield and 9 mi (14 km) northeast of the village of Nuiqsut. Facilities include a combined production pad/drill site, three additional drill sites, and 180 wells. Pads, gravel roads, an airstrip, and processing facilities cover a total surface area of 165 acres (67 ha). Crude oil from Alpine is transported 55 km (34 mi) through a 14-inch (0.35-m) pipeline to the Trans-Alaska Pipeline System. An ice road is constructed annually between Alpine and the Kuparuk oilfield to support major resupply activities. Small aircraft are used year-round to provide supplies and crew changeovers; camp facilities can support up to approximately 630 personnel.

Oooguruk Unit

The Oooguruk Unit, operated by Caelus, is located at the north end of the Colville-Kuparuk fairway, adjacent to the Kuparuk Unit. The Oooguruk drillsite is located on a 6-acre (2.4-ha) artificial island in the shallow waters of Harrison Bay. A system of subsea flowlines, power cables, and communications cables connects the island to onshore support facilities. Production began in 2008. Expansion of the drill site in 2015 and 2016 will increase the working surface area from 6 acres (2.4 ha) to 9.5 acres (3.8 ha). Drilling of additional production wells are planned and new injection well technology will be employed. Cumulative production was estimated to be 9.8 million bbl as of 2011 (AOGCC 2013)

Kuparuk River Unit

The Kuparuk oilfield, operated by CPAI, is Alaska's second-largest producing oilfield behind Prudhoe Bay. The gross volume of the oilfield has been estimated to be 6 billion bbl; more than 2.5 billion bbl have been produced as of 2014 (CPAI 2014). Nearly 900 wells have been drilled in the Greater Kuparuk Area, which includes the satellite oilfields of Tarn, Palm, Tabasco, West Sak, and Meltwater. The total development area in the Greater Kuparuk Area is approximately 1,508 acres (603 ha), including 104 mi (167 km) of gravel roads, 144 mi (231 km) of pipelines, six gravel mine sites, and over 50 gravel pads. The Kuparuk operations center and construction camp can accommodate up to 1,200 personnel.

Nikaitchuq / Milne Point

The Nikaitchuq Unit is located at Spy Island, north of the Kuparuk River Unit. In 2007, Eni became the operator in the area and subsequently constructed an offshore gravel pad and onshore production facilities at Spy Island and Oliktok Point. A subsea flowline was constructed to transfer produced fluids from shore. Production began in 2011 at Oliktok Point and in 2012 at Spy Island. Cumulative production at the end of 2011 was approximately 2 million bbl. As of 2016, a program to expand production is underway, including drilling of 20 or more new wells to recover oil from the nearby Schrader Bluff reservoirs.

The Milne Point Unit, operated by Hilcorp, is located approximately 56 km (35 mi) northwest of Prudhoe Bay and immediately east of the Nikaitchuq Unit. This field consists of more than 220 wells drilled from 12 gravel pads. Milne Point produces oil from three main fields: Kuparuk, Schrader Bluff, and Sag River. Cumulative oil production as of the end of 2012 was 308 barrels of oil equivalent per day (BOE; the amount of hydrocarbon product containing energy equivalent to that of a barrel of oil). The total gravel footprint of Milne Point and its satellites is 450 acres

(182 ha). The Milne Point Operations Center has accommodations for up to 180 people. An expansion program is underway for the Milne Point Unit. It is likely to improve technology of existing wells and may include building a new drill pad, roads, and associated wells.

Prudhoe Bay Unit

The Prudhoe Bay Unit, operated by BPXA, is one of the largest oilfields by production in North America and ranks among the 20 largest oilfields worldwide. Over 12 billion bbl have been produced from a field originally estimated to have 25 billion bbl of oil in place. The Prudhoe Bay oilfield also contains an estimated 26 trillion ft^3 of recoverable natural gas. More than 1,100 wells are currently in operation in the Prudhoe Bay oilfields, approximately 830 of which are producing oil (others are for gas or water injection). Average daily production in 2012 was around 255,500 bbl of oil equivalent (BOE).

The Prudhoe Bay Unit encompasses several oil fields, including the Point McIntyre, Lisburne, Niakuk, Western Niakuk, West Beach, North Prudhoe Bay, Borealis, Midnight Sun, Polaris, Aurora, and Orion reservoirs. Of these, the largest field by production is the Point McIntyre oil field, which lies about 11 km (7 mi) north of Prudhoe Bay. Cumulative oil production between 1993 and 2011 was 436 million bbl (AOGCC 2013). In 2014, production at Point McIntyre averaged about 18,700 bbl of oil per day. The Lisburne field is largest by area. It covers about 80,000 acres (32,375 ha) just northwest of the main Prudhoe Bay field. Production was reported as 7,070 bbl per day in 2011, and cumulative production was approximately 182 million BOE as of 2014. The Niakuk fields have also reached high cumulative yields among the Greater Prudhoe Bay area oil fields. Between 1994 and 2011, these fields produced about 157 million bbl. In 2014, the combined Niakuk fields yielded about 1,200 bbl per day. Orion, Aurora, Polaris, Borealis and Midnight Sun are considered satellite fields and were producing more than 22,500 bbl per day combined in 2014 (BPXA 2015). In total, Prudhoe Bay satellite fields have produced more than 184 million BOE.

The total development area in the Prudhoe Bay Unit is approximately 6,883 acres (2,785 ha) within an area of about 213,543 acres (86,418 ha). On the east side of the field the main construction camp can accommodate up to 625 people, the Prudhoe Bay operations center houses up to 449 people, and the Tarmac Camp houses 244 people. The base operations center on the western side of the Prudhoe Bay oilfield can accommodate 474 people. Additional personnel are housed at facilities in Deadhorse or in temporary camps placed on existing gravel pads. Activities in this unit are likely to emphasize greater production of natural gas if construction of a gas pipeline begins during the 2016-2021 ITR period.

Northstar and Endicott

The Northstar oilfield is located 6 km (4 mi) northwest of the Point McIntyre and 10 km (6 mi) north of the Prudhoe Bay Unit. It is operated by Hilcorp. The 38,400-acre (15,360-hectare) reservoir lies offshore in waters up to 40 feet (12 m) deep. A 5-acre (2-ha) artificial island supports 24 operating wells and all support facilities for this field. A subsea pipeline connects facilities to the Prudhoe Bay oilfield. Production began in 2001 and as of 2013 had surpassed 158.3 million bbl. The on-site base operations center houses 50 people.

The Endicott oilfield, operated by Hilcorp, is located approximately 16 km (10 mi) northeast of Prudhoe Bay. The Endicott oilfield was developed from two artificial islands connected to the mainland by a gravel causeway. The operations center and processing facilities are located on the 58-acre (24-hectare) main production island. As of August 2013, 501 million BOE have been produced from Endicott. Production is from the Endicott reservoir in the Kekiktuk formation and two satellite fields (Eider and Sag Delta North) in the Ivishak formation. All wells were drilled from Endicott's main production island. The total area of development is 522 acres (210 ha) of land (including the Liberty satellite island) with 24 km (15 mi) of roads, 43 km (24 mi) of pipelines, and one gravel mine site. Approximately 85 people can be housed at Endicott's Liberty camp.

East-End Production

The Badami and Point Thompson Units are located in the eastern portion of the North Slope and Beaufort Sea planning areas. Production from the Badami oilfield began in 1998 and from Point Thompson in 1983, but has not been continuous from either unit. The Badami field is located approximately 56 km (35 mi) east of Prudhoe Bay and is the most easterly oilfield currently in production on the North Slope. Point Thompson, located 4 km (2.5 mi) east of Badami, is expected to restart production in 2016. The Badami development area is approximately 85 acres (34 ha) of tundra including 7 km (4.5 mi) of gravel roads, 56 km (35 mi) of pipeline, one gravel mine site, and two gravel pads with a total of eight wells. As of 2011, cumulative production had reached 5.7 million bbl. There is no permanent road connection from Badami to Prudhoe Bay. A pipeline connecting the Badami field to the Endicott pipeline was built from an ice road.

Evaluation of the Nature and Level of Activities

Proposed production activities will increase the total area of the industrial footprint in the geographic region by the addition of new onshore facilities such as drill pads, pipelines, and support facilities. However, oil production volume is expected to continue to decrease during this 5-year regulatory period despite new development. This is due to declining production from currently producing fields. During the period covered by the regulations, we anticipate the annual level of activity at existing production facilities, as well as levels of new annual exploration and development activity, to be similar to that which occurred under the previous regulations, although exploration and development may shift to different locations.

2.3 Alternatives not Considered Feasible or Practicable

Alternatives that the Service considered, but determined were not feasible, include: (1) initiating an Incidental Harassment Authorization (IHA) program; (2) separating Industry operations by the type of activity, as well as the location or timing of the activity; and (3) promulgating separate regulations for each type of activity.

In contrast to the "umbrella" type of authorization provided by a 5-year ITR, an IHA is an individual authorization issued for specific activity for up to one year. For example, during the 2006 and 2007 open water season, the Service authorized IHAs for oil and gas exploration activities in the Chukchi Sea as a means to establish temporary incidental take authorization for a

limited number of projects occurring prior to the promulgation of ITRs for the area. The IHA process issues authorizations on a project-by-project basis, and consequently they generally do not provide the comprehensive coverage necessary to evaluate potential impacts from the various onshore and offshore oil and gas activities that may affect walruses and polar bears during the next 5 years. While an IHA program is possible, it is not practicable and the Service believes that a 5-year ITR is a more thorough process for evaluating anticipated projects and the potential impacts, as well as a more efficient use of staff time.

Similar reasoning was used to evaluate and eliminate alternatives that separate or segregate oil and gas operations by type, timing, or location of activity. In determining the impact of incidental taking, the Service must evaluate the "total taking" expected from the specified activity in a specific geographic area. The estimate of total taking involves the accumulation of impacts on polar bears and walruses from all anticipated activities to be covered by the specific regulations. Industry activities often co-occur, are associated, and have similar effects on polar bear and walrus. Therefore, they are not feasibly segregated. Our analysis indicates that separating oil and gas operations within the Beaufort Sea region is not a viable alternative, because we cannot separate, exclude, or exempt specific activities when determining whether the total amount would constitute a negligible impact finding. [Top]

Chapter 3. AFFECTED ENVIRONMENT

3.1 Physical Environment

3.1.1 Climate and Weather Conditions in the Beaufort Sea Region

The regional climate of Alaska's North Slope is typical of the Arctic zone, where weather extremes are common and climate influences the geographic features. Summers are short, with continuous daylight. Average July temperatures range between 4 ^{o}C to 12°C (39-53°F) (Western Region Climate Center 2015). During the summer, the ground thaws to a depth of 30 to 40 cm (12-16 in) and the landscape is dominated by wetlands. Winters are dark, cold, and last 8 to 9 months. Average winter temperatures range between -23 and -31°C ($^{-}$9 - $^{-}$25°F) in January. Annual precipitation is low and averages 11 cm (4.3 in), usually in the form of snow (Western Region Climate Center 2015). Surface winds are common throughout the year and result in wind chill factors well below the actual temperature.

This document incorporates by reference the climate and weather conditions information in section 3.1.2 (Climate and Weather Conditions on the North Slope) of the *Alaska Outer Continental Shelf, Chukchi Sea Planning Area - Oil and Gas Lease Sale 193 in the Chukchi Sea, Alaska, Final Second Supplemental Environmental Impact Statement* (BOEM 2015a).

3.1.2 Sea Ice

The Beaufort Sea can be characterized by seasonal variation:

- **Summer (open water).** The open water season usually begins in late June. The shore-fast ice melts and the pack ice recedes northward, resulting in an area of open water along

the coast. By mid-July, much of the lagoon and open-shelf areas are ice-free. The extent of open water along the coast varies from year to year depending upon climatic factors, but it reaches its fullest extent in August or September. There is considerable variation from year to year and the edge of the pack ice in September ranges from about 19 to 106 km (12-66 mi) offshore (Labelle et al. 1983). In recent years, however, the sea ice has exhibited record lows in sea ice extent, and it forms later in the fall and retreats earlier in the summer (Cavalieri et al. 1996)**.**

- **Broken ice**. The broken ice period is when the sea transitions from ice-covered to open water (break up) and from open water to ice-covered (freeze up). These periods usually occur in June and October, respectively.
- **Winter (ice-covered)**. Winter conditions in the Beaufort Sea begin with freeze up and an increase in the amount of sea ice. From November through May, ice covers nearly all of the Beaufort Sea. The ice reaches a maximum thickness of approximately 2 m (6 ft) by March or April. The winter sea ice can be divided into three distinct zones: landfast ice, shear, and pack ice.
    - **Landfast ice**. The landfast ice zone extends from the shore out to the zone of grounded ridges. These ridges first form in about 7 to 13 m (24-45 ft) of water but by late winter may extend to deeper water. Pressure from wind and water currents stress floating sheets of ice resulting in deformation and displacement. Ice deformations form ridges and rubble fields. As winter progresses, displacement and deformation decrease because the ice in the landfast zone thickens and strengthens and becomes more resistant to movement.
    - **Shear**. Seaward of the landfast ice zone is the shear zone. The shear zone is a region of dynamic interaction between stable landfast ice and moving ice. The violent interactions between ice zones create ice ridges. These ridges are usually about 1 to 2 m (3-6 ft) in height, but may reach heights of 6 m (20 ft). Channels of open water are created through the ice, providing habitat for marine mammals.
    - **Pack ice**. The pack ice zone lies seaward of the shear zone and includes first-year ice and multi-year ice. The first-year ice forms in the fractures, leads, and polynyas (large areas of open water). First-year ice varies in thickness from less than 2 cm to greater than a meter (1 in - 3.2 ft). Multi-year ice is ice that has persisted for more than a year.

3.1.3 Terrestrial Environment

Terrestrial areas adjacent to the Beaufort Sea are part of the Arctic Coastal Plain, an area characterized by low topographic relief, numerous lakes, meandering stream channels, and polygonal patterned ground. Patterned ground forms from ice wedges during freeze/thaw cycles, creating small rises and depressions throughout the area. Wetlands with flooded or saturated hydrological regimes are present over much of the region along with shallow permafrost soils. Vegetation grows seasonally, including very low shrubs such as *Salix*, and herbs such as *Eriophorum* and *Carex*. Soil profiles consist of shallow layers of seasonally thawed organics with continuous permafrost beneath. Water perches on top of the permafrost during spring snowmelt or precipitation events to create anoxic conditions during the growing season. Low gradient riverine systems are present, ranging from the Colville River near Nuiqsut to minor drainages throughout the Arctic Coastal Plain. In major rivers, water may flow throughout the year; but given the harsh conditions of the Arctic, most streams have only seasonal flow. Further

terrestrial information is incorporated by reference from the *NPR-A Final Integrated Activity Plan/Environmental Impact Statement* (BLM 2013b).

3.1.4 Climate Change

There is widespread consensus within the scientific community that atmospheric temperatures on earth are increasing that these increases will continue for at least the next several decades. Scientific analyses presented by the Intergovernmental Panel on Climate Change (IPCC) show that most of the observed increase in global average temperature since the mid-20th century cannot be explained by natural variability in climate, and is "extremely likely" (defined by the IPCC as 95% or higher probability) due to the observed increase in greenhouse gas concentrations in the atmosphere resulting from human activities, particularly carbon dioxide emissions from use of fossil fuels (IPCC 2014a).

High latitude regions, including Alaska and the surrounding oceans, are especially sensitive to the effects of climate change (Smol et al. 2005; Schindler and Smol 2006). The Arctic has warmed more rapidly than the average global rate resulting in substantial reductions in both the extent and thickness of sea-ice cover over the past 40 years (IPCC 2014a, Meier et al. 2014, Frey et al. 2015; Figure 3). The annual mean extent of Arctic sea ice decreased 3.5 to 4.1 percent per decade over the period 1979 to 2012; the annual minimum extent declined by over 12 percent per decade during that time frame (IPCC 2014a). The trend of continued decline of Arctic sea-ice is expected to continue for the foreseeable future (Amstrup et al. 2008, Overland and Wang 2013).

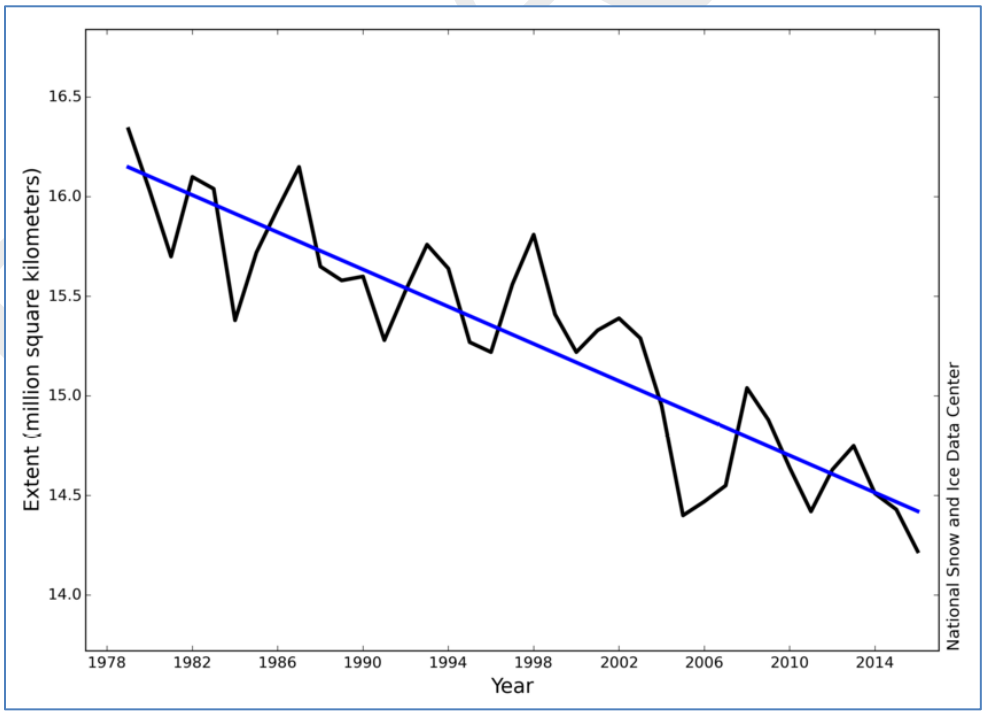

Figure 3. Average monthly Arctic sea ice extent February 1979 – 2016 (Data source: NSIDC 2016). [Top]

In the Beaufort Sea, sea ice is receding earlier in the summer season and farther north than in the past. Sea ice returns later in the season than observed in the past, with multi-year ice becoming thinner as well. This set of circumstances contributes to a longer open water season in the Beaufort Sea. Record minimum and near record minimum sea ice extent has been documented several times in recent years. Continued decline of sea ice in the Beaufort Sea is supported by the most recent climate models (Douglas 2010; IPCC 2014b).

The impacts of climate change are discussed under Biological Environment (section 3.2) for polar bears and Pacific walruses, respectively, as well as under Cumulative Impacts (section 4.2.4). For additional information regarding climate change in the Beaufort and Chukchi seas, see BOEM (2015a) section 3.1.9 (Climate Change), and Garlich-Miller et al. (2011) section 3.2.1 (Global Climate Change) and section 3.2.2 (Summary: Effects of Global Climate change on the Pacific Walrus Population), incorporated here by reference.

3.2 Biological Environment

3.2.1 Polar Bear (Ursus maritimus)

Stock Definition, Range, and Status

Polar bears are distributed throughout the circumpolar Arctic region. In Alaska, polar bears have historically been observed as far south in the Bering Sea as St. Matthew Island and the Pribilof Islands (Ray 1971). Two subpopulations, or stocks, occur in Alaska: the CS and the SBS stock (Figure 4). A detailed description of the CS and SBS stocks can be found in USFWS (2010a, b).

Potential interactions with Industry may involve bears from either the SBS population or the CS population. Because the petitioned area overlaps with only a small portion of the CS population's range, we expect that the vast majority of the interactions (if not all) that occur will involve SBS bears and that a very small proportion, if any, of the interactions will involve CS bears. Barrow, on the western edge of the proposed ITR region, is the only exception. Interactions in Barrow are equally likely to involve bears from either population.

Southern Beaufort Sea (SBS) Stock

The SBS polar bear population is shared between Canada and Alaska. Radio-telemetry data, combined with ear tag returns from harvested bears, suggest that the SBS population occupies a region with a western boundary near Icy Cape, Alaska, and an eastern boundary near Pearce Point, Northwest Territories, Canada (USFWS 2010b).

Early estimates from the mid-1980s suggested the size of the SBS population was approximately 1,800 polar bears. A population analysis of the SBS stock was completed in June 2006 through joint research coordinated between the United States and Canada. That analysis indicated the population of the region between Icy Cape and Pearce Point was approximately 1,500 polar bears (95 percent CI = 1,000–2,000). Although the CI of the 2006 population estimate overlapped the previous population estimate of 1,800, other statistical and ecological evidence

(e.g., high recapture rates encountered in the field) suggest that the current population is actually smaller than has been estimated for this area in the past.

The most recent estimate for the SBS population was produced by Bromaghin et al. (2015) using mark–recapture models of polar bears population dynamics in the SBS from 2001 to 2010. They estimated that in 2010 there were approximately 900 polar bears (90 percent CI = 606–1212) in the SBS population (Bromaghin et al. 2015). That study showed a 25 to 50 percent decline in abundance of SBS bears due to low survival from 2004 to 2006. Though survival of adults and cubs began to improve in 2007, and abundance was comparatively stable from 2008 to 2010, survival of subadult bears declined during the entire period.

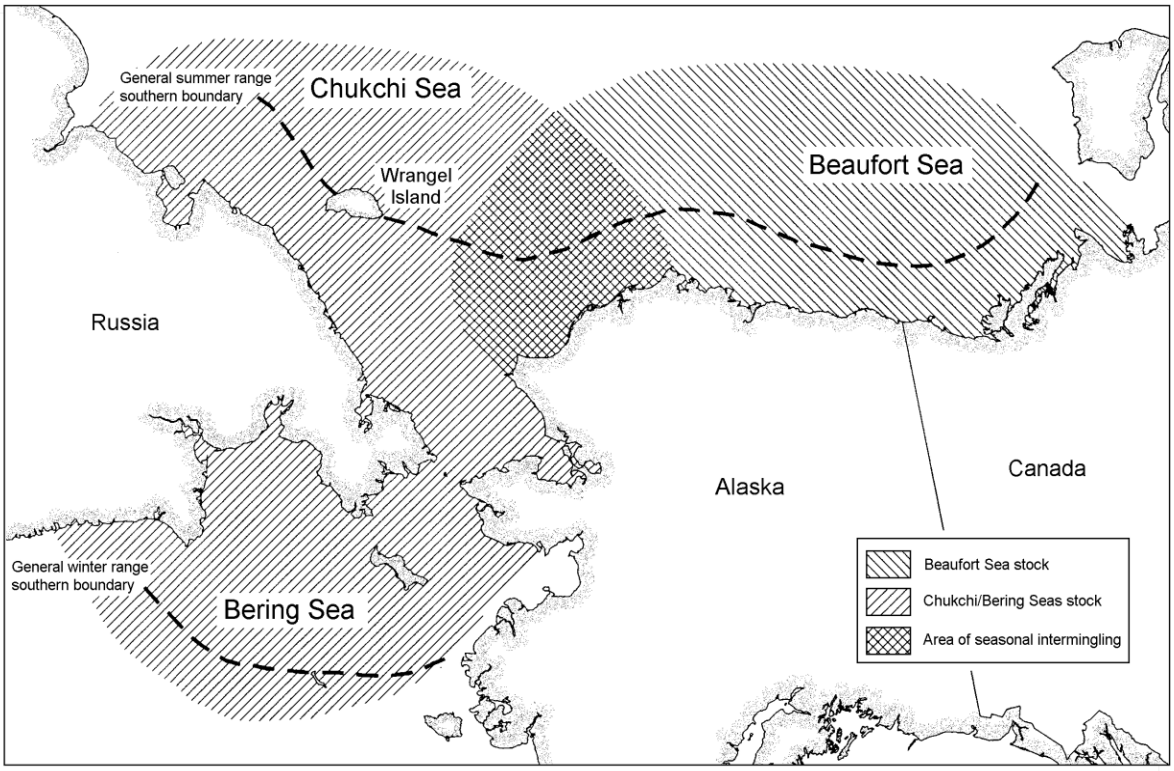

Figure 4. Polar bear distribution/range in Alaska. [Top]

Chukchi/Bering Seas (CS) Stock

The CS polar bear population is shared between the Russian Federation and Alaska. The CS stock is widely distributed on the pack ice in the Chukchi Sea and northern Bering Sea and adjacent coastal areas in Alaska and Chukotka, Russia. Radio-telemetry data indicate that the north-eastern boundary of the CS population is near the Colville Delta in the central Beaufort Sea and the western boundary is near the Kolyma River in north-eastern Siberia (Garner et al.1990; Amstrup 1995; Amstrup et al. 2005). The population's southern boundary is determined by the extent of annual sea ice in the Bering Sea. An extensive area of overlap between the Southern Beaufort Sea stock and the Chukchi/Bering seas stock occurs between Point Barrow

and Point Hope (Garner et al. 1990; Garner et al. 1994; Amstrup et al. 2000; Amstrup et al. 2004; Obbard et al. 2010; Wiig et al. 2015). Polar bears in this overlap area may be either from the CS population or from the SBS population (Amstrup et al. 2004).

It has been difficult to obtain a reliable population estimate for this stock due to the vast and inaccessible nature of the habitat, movement of bears across international boundaries, logistical constraints, and budget limitations (Amstrup and DeMaster 1988; Garner et al. 1992; Garner et al. 1998; Evans et al. 2003). Estimates of the stock have been derived from observations of dens and aerial surveys (Chelintsev 1977; Stishov 1991a; Stishov 1991b; Stishov et al. 1991); however, those estimates have wide confidence intervals and are out of date. The most recent estimate of the CS stock was approximately 2,000 animals, based on extrapolation of aerial den surveys (Lunn et al. 2002; USFWS 2010; Wiig et al. 2015). However, the current status and trend of the CS stock are considered unknown due to a lack of data. More information can be found at: *http://www.fws.gov/alaska/fisheries/mmm/polarbear/pbmain.htm.*

Life History

Polar bears occur throughout the Arctic. The world population estimate ranges between 22,000 and 31,000 animals with a current population estimate of approximately 26,000 (Wiig et al. 2015). Polar bears live up to 30 years, have no natural predators, and do not appear prone to death by diseases or parasites, though cannibalism is known to occur. Polar bears typically occur at low densities throughout their circumpolar range (DeMaster and Stirling 1981). They are generally limited to areas where the sea is ice-covered for much of the year; however, polar bears are not evenly distributed throughout their range. They are typically most abundant on sea ice, near the ice edges or openings in the ice, over relatively shallow continental shelf waters with high marine productivity (Durner et al. 2004).

Polar bears depend on sea ice for a number of purposes, including as a platform from which to hunt and feed upon seals; as habitat on which to seek mates and breed; and as a platform on which to travel to denning areas, and sometimes for maternity denning (Stirling and Derocher 1993). Their distribution in the coastal habitat is often influenced by the movement of the seasonal sea ice. Their primary prey is ringed (*Pusa hispida*) and bearded (*Erignathus barbatus*) seals, although diet varies regionally with prey availability (Thiemann et al. 2008, Cherry et al. 2011). Over most of their range, polar bears remain on the sea ice year-round or spend only short periods on land, where they will opportunistically scavenge on beached marine mammal carcasses (Kalxdorff and Fischbach 1998) or occupy maternal dens during the winter.

Females can initiate breeding at 5 to 6 years of age. Females without dependent cubs breed in the spring. Pregnant females enter maternity dens by late November, and the young are usually born in late December or early January. Only pregnant females den for an extended period during the winter; other polar bears may excavate temporary dens to escape harsh winter winds. An average of two cubs is born. Reproductive potential (intrinsic rate of increase) is low. The average reproductive interval for a polar bear is 3 to 4 years, and a female polar bear can produce about 8 to 10 cubs in her lifetime; in healthy populations, 50 to 60 percent of the cubs will survive.

Den sites can be located on land or on sea ice wherever accumulation of snow is sufficient for construction and maintenance of the den and insulation for the female and cubs. Adequate and

timely snowfall combined with winds that cause snow accumulation leeward of requisite topographic features create denning habitat (Harington 1968). In Alaska, denning habitat is frequently located on barrier islands and coastal bluffs along the Beaufort Sea, riverbank drainages such as those associated with the Colville and Canning rivers, and areas of the North Slope coastal plain. Maternal polar bear dens in Alaska appear to be less densely concentrated than those in Canada and Russia. Radio and satellite telemetry studies indicate that denning can occur in multi-year pack ice and on land, but the SBS population is the only one in which a significant proportion of females are known den on multiyear pack ice (Amstrup and Gardner 1994).

During the late summer/fall period (August through October), polar bears are most likely to be encountered along the coast and barrier islands. Barrier island habitat, in addition to providing den sites and access to maternal denning and feeding habitat in winter, also provides travel corridors and hunting areas along the coast that are relatively free from human disturbance. Based on Industry observations, encounter rates are higher during the fall period (August to October) than any other time. The duration the bears spend in these coastal habitats depends on a variety of factors including storms, ice conditions, and the availability of food. In recent years, polar bears have been observed in larger numbers than previously recorded during the fall period. The remains of subsistence-harvested bowhead whales at Cross and Barter islands provide a readily available food source for the bears in these areas and appear to play a role in these numbers (Schliebe et al. 2006). Based on Industry observations and coastal survey data acquired by the Service, up to 125 individuals of the SBS bear population have been observed during the fall period between Barrow and the Alaska-Canada border.

Historically, except for denning, polar bears in the United States spend almost the entire year on the sea ice and very little time on land. In the Chukchi Sea and Beaufort Sea areas, including the geographic region of the proposed ITRs, less than 10 percent of the polar bear locations obtained via radio telemetry were on land (Amstrup 2000; Amstrup, U.S. Geological Survey, unpublished data). However, in recent years the number of bears using the coastal areas, particularly during the summer and fall, has increased (Schliebe et al. 2008). Rode et al. (2015b) found that bears from the CS population that were captured off the coast of Alaska that spent more than 21 days on shore between August and October rose from 12.5 to 36.1 percent between the periods 1986 to 1995 and 2008 to 2013. This may reflect the increase of the open water period during the summer and early fall in addition to the retreat of the sea ice beyond the continental shelf (Zhang and Walsh 2006; Serreze et al. 2007; Stroeve et al. 2007).

The designated critical habitat for the polar bear consists of sea ice, barrier islands, and terrestrial denning habitat. In general terms, physical and biological features essential to the conservation of the polar bear include: (1) annual and perennial marine sea-ice habitats that serve as a platform for hunting, feeding, traveling, resting, and (to a limited extent) denning; and (2) terrestrial habitats used by polar bears for denning and reproduction, as well as for seasonal use in traveling or resting. Barrier island habitat includes the barrier islands off the coast of Alaska, their associated spits, and an area extending out 1.6 km (1 mi) from the islands where this zone contains habitat that is free from human disturbance.

Conservation Concerns

Management and conservation concerns include climate change, atmospheric and oceanic transport of contaminants into the Arctic, human activities (including oil and gas activities), and subsistence harvest. The impacts of oil and gas activities are discussed in depth in Chapter 4. Subsistence harvest affects the biology of the polar bear, but is also a vital element of the Socio–Economic Environment and is further discussed in section 3.3.

Climate change

Global climate change and its effects in the Arctic are likely to have serious consequences for the worldwide population of polar bears and their prey (Amstrup et al. 2007; Amstrup et al. 2008; Hunter et al. 2010). The associated reduction of summer Arctic sea ice is expected to be a primary threat to polar bear populations (Stirling and Derocher 2012). Projections indicate continued climate warming at least through the end of this century (IPCC 2013).

Climate change is expected to impact polar bears in a variety of ways. The timing of ice formation and breakup will impact seal distributions and abundance, and, consequently, how efficiently polar bears can hunt seals. Reductions in sea ice are expected to increase the polar bears' energetic costs of traveling, as moving through fragmented sea ice and swimming in open water requires more energy than walking across consolidated sea ice (Cherry et al. 2009, Pagano et al. 2012, Rode et al. 2014). Research has linked declines in summer sea ice to reduced physical condition, growth, and survival of polar bears (Bromaghin et al. 2015).

Climate change may impact the reproductive success of denning polar bears. In recent years, the ice edge has retreated further north in summer, multi-year ice cover has declined, and the length of the open water season has increased. Concurrently, fewer dens have been found on pack ice, suggesting that these changes may be making pack ice less suitable for maternal denning (Fischbach et al. 2007). Climate projections indicate continued loss of multiyear ice in summer and the possibility of total loss of summer sea ice (Holland et al. 2006). These conditions may further limit or eliminate maternity denning on pack ice (Stirling and Derocher 2012). Coastal dens may become more vulnerable to erosion from storm surges. Unseasonal warm weather or rain events can cause dens to collapse prematurely, resulting in mortality of some or all of their occupants (e.g., Stirling and Smith 2004). Polar bears denning on land are at greater risk of conflict with human activities.

Habitat loss due to declining Arctic sea ice throughout the polar bear's range has been identified as the primary cause of population decline and is expected to continue for the foreseeable future (73 FR 28212). Amstrup et al. (2007) projected a 42 percent loss of optimal summer polar bear habitat by 2050. They concluded that if current Arctic sea-ice declines continue, polar bears may eventually be excluded from onshore denning habitat in the Polar Basin Divergent Region. Amstrup et al. (2007) projected that the SBS and CS polar bear populations may be extirpated within the next 45–75 years, if sea-ice declines continue at current rates.

Due to the changing ice conditions, the Service anticipates that polar bear use of the Beaufort Sea coast will increase during the open-water season (June through October). Indeed, polar bear use of coastal areas during the fall open-water period has increased in recent years in the

Beaufort Sea (Schliebe et al. 2008). This change in distribution has been correlated with the distance of the pack ice from the coast at that time of year (the farther from shore the leading edge of the pack ice is, the more bears are observed onshore) (Schliebe et al. 2006). Reductions in sea ice will result in increased distances between the ice edge and land, which, in turn, will lead to increasing numbers of bears coming ashore during the open-water period, or possibly drowning in an attempt to reach land. Researchers have observed that in some cases bears swim long distances during the open water period seeking either ice or land and may become vulnerable to exhaustion (Durner et al. 2011; Pagano et al. 2012). In the fall of 2004, four drowned polar bears were observed in the Beaufort Sea during a BOEM coastal aerial survey program (Monnett and Gleason 2006). An increased number of bears on land may increase human–bear interactions or conflicts during this time.

Participants in an Inuvialuit Traditional Knowledge survey and associated workshop indicated that changing ice conditions and a warming Arctic are of great concern (Joint Secretariat 2015). Participants concluded that there have been visible changes and considerable annual variation in the Beaufort Sea environment, including in areas where until recently, many landscape features used for bear hunting were found with some certainty year after year. Participants indicated that bears are not as fat as they were prior to the mid-1980s and there are fewer really big bears, but the overall physical condition and number of polar bears in traditional hunting areas appears to have remained relatively stable within living memory. The workshop participants agreed that over the last several years, bears in certain areas appear to be visiting land more frequently and waiting on land for the ice to form in the fall (Joint Secretariat 2015).

Chemicals in the Arctic Environment

The presence of contaminants in polar bears and their habitat, and the biological implications of those contaminants, were outlined in the ESA Listing document (73 FR 28212). Even in areas where point sources of contaminants are absent, globally distributed contaminants such as persistent organic pollutants (POPs) and mercury are present in marine food chains. Methylmercury and POPs biomagnify in aquatic food chains. Polar bears are biological sinks for pollutants because they are the apex predator of the Arctic ecosystem and are also opportunistic scavengers of other marine mammals. The highest concentrations of persistent organic pollutants in Arctic marine mammals have been found in seal-eating walruses and polar bears near Svalbard (Norstrom et al. 1988; Muir et al. 1999). Contaminant concentrations are not presently thought to have population-level effects on most polar bear populations. However, increased exposure to contaminants has the potential to operate in concert with other factors, such as nutritional stress from loss or degradation of sea ice habitat, decreased prey availability and accessibility, or lower recruitment and survival rates. These combined stressors could ultimately have negative population level effects on polar bears.

3.2.2 Pacific walrus (Odobenus rosmarus divergens)

Stock Definition, Range, and Status

Pacific walruses constitute a single panmictic population inhabiting the shallow continental shelf waters of the Bering and Chukchi seas (Lingqvist et al. 2009, Berta and Churchill 2012). The distribution of walruses is largely influenced by the extent of the seasonal pack ice and prey

densities (Figure 5). During the winter breeding season walruses are found in three concentration areas of the Bering Sea where open leads, polynyas, or thin ice occur (Fay et al. 1984, Garlich-Miller et al. 2011). While the specific location of these groups varies annually and seasonally depending upon the extent of the sea-ice, generally one group occurs near the Gulf of Anadyr, another south of St. Lawrence Island, and a third in the southeastern Bering Sea south of Nunivak Island into northwestern Bristol Bay.

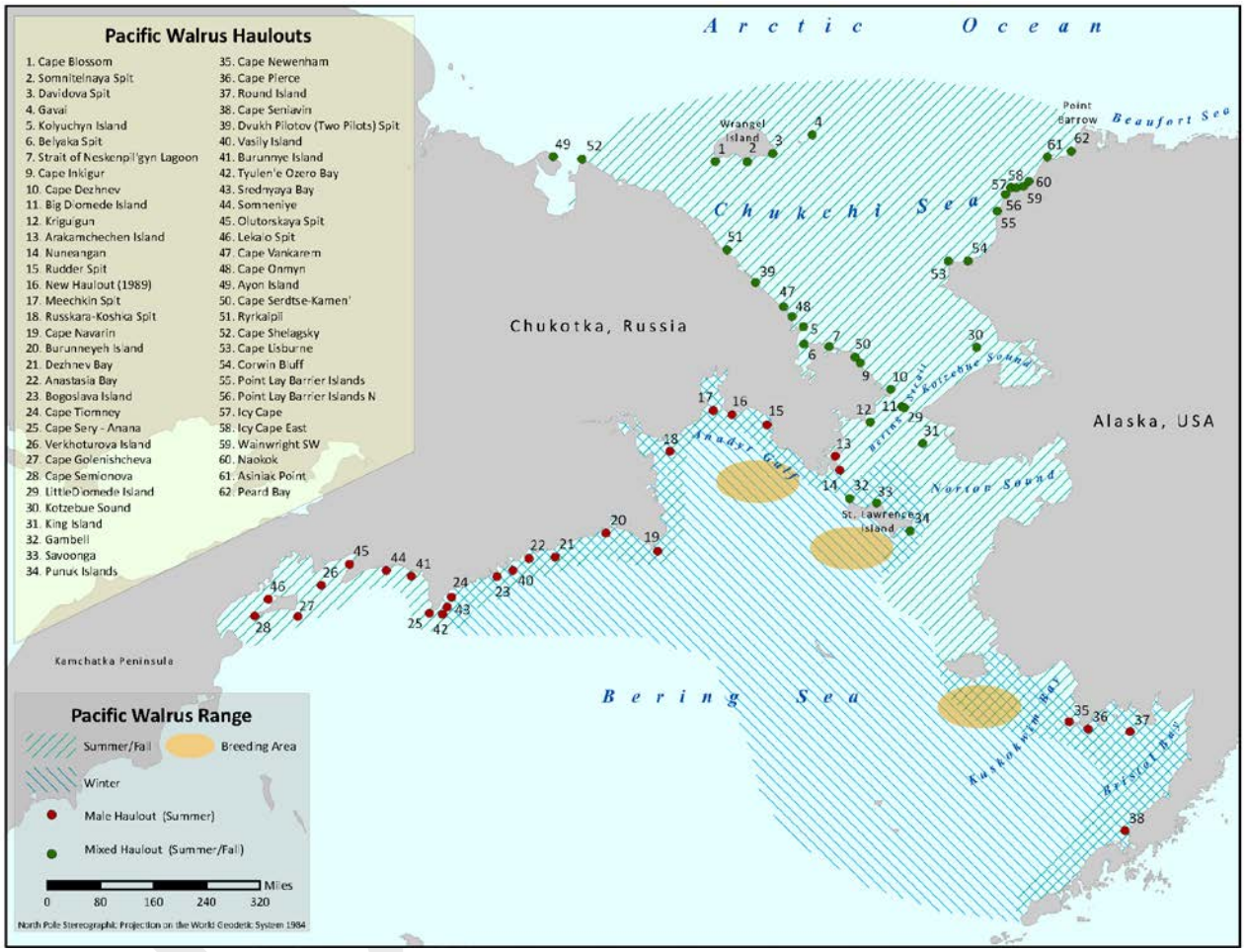

Figure 5. Distribution of the Pacific walrus in the Bering and Chukchi Seas in winter and summer. From Garlich-Miller et al. (2011), modified from Smith (2010). [Top]

During spring, most adult females, subadults, and juveniles migrate from the Bering Sea through the Bering Strait and into the Chukchi Sea. Walruses tend to migrate along lead systems (Fay 1982). Most adult males remain in the Bering Sea utilizing coastal haulouts during the ice-free season. Walruses that have migrated to the Chukchi Sea are closely associated with the edge of the seasonal pack ice during the open water season. By July, thousands of animals can be found along the edge of the pack ice from Russian waters to areas west of Point Barrow. The size of the hauled out groups can range from a few animals up to several thousand individuals. The largest aggregations occur at land haulouts. In recent years, the barrier islands north of Point Lay, Alaska have held large aggregations of walruses (20,000−40,000) in late summer and fall

(Monson et al. 2013). The pack ice usually advances rapidly southward in late fall and most walruses return to the Bering Sea by mid to late November.

Although most walruses remain in the Chukchi Sea throughout the summer months, small numbers of animals occasionally range into the Beaufort Sea in late summer. Industry monitoring reports have observed no more than 35 walruses in the area of these proposed ITRs between 1995 and 2012 (AES Alaska 2015; Kalxdorff and Bridges 2003; USFWS unpublished data). Beginning in 2008, the USGS, and since 2013, the Alaska Department of Fish and Game, have fitted about 30 to 60 walruses with satellite transmitters each year during spring and summer. In 2014, a tagged female spent about 3 weeks in Harrison Bay, 180 km (112 mi) east of Point Barrow (ADF&G 2014). The USGS tracking data indicates that at least one instrumented walrus ventured into the Beaufort Sea for brief periods in all years except 2011. Most of these movements extend northeast of Barrow to the continental shelf edge north of Smith Bay (USGS 2015). All available information indicates that few walruses enter the Beaufort Sea and those that do spend little time there.

The size of the walrus population has never been known with certainty but is thought to have fluctuated markedly in response to varying levels of commercial exploitation. Fay (1957) speculated that the population prior to large-scale commercial walrus hunting in 19th century was represented by a minimum of 200,000 animals. Annual harvests of tens of thousands between 1790 and 1880 caused the population to decline to an estimated 80,000 by 1880 (Fay 1957). Between 1910 and 1930, annual harvest levels from all sources were estimated at five to seven thousand walruses from a potential population of 60,000 (Fay 1957). During the mid-1950s, abundance was estimated to have dropped to 45,000 (Fay 1957). In 1960, harvest regulations were implemented that limited the take of females and resulted in a rapid population increase.

Between 1975 and 1990, aerial surveys conducted jointly by the United States and the Russian Federation at 5-year intervals produced population estimates ranging from about 200,000 to 255,000 individuals. Taylor and Udevitz (2015) used both the aerial survey population estimates described above and ship-based age and sex composition counts that occurred in 1981 to 1984, 1998, and 1999 (Citta et al. 2014) in a Bayesian integrated population model to estimate population trend and vital rates from 1975 to 2006. They recalculated the 1975 to 1990 aerial survey estimates for inclusion in their model. Their results generally agreed with the large-scale population trends identified by the previous efforts, but with slightly different population estimates in some years along with more precise confidence intervals. They were careful to note that all of the demographic rates in their model were estimated based on age structure data from 1981 to 1999, when the population was in decline, and that projections outside those years are extrapolations of demographic functions that may not accurately reflect dynamics for different population trends. Ultimately, they concluded that though their model provides improved clarity on past walrus population trends and vital rates, it cannot overcome the large uncertainties in the available population size data, and the uncertainties regarding the size of the Pacific walrus population will remain until accurate empirical estimation of the population size becomes feasible. Regardless of the exact size, the large population is thought to have reached or exceeded the food-based carrying capacity (K) of the region by 1980 (Fay et al. 1989, Fay et al. 1997, Garlich-Miller et al. 2006, MacCracken et al. 2014) and then gradually declined (steepest in the 1980s), levelling off after about 2003 (Taylor and Udevits 2015). Model derived vital rates

at 2006 (Taylor and Udevitz 2015), calf to cow ratios from 2006 to 2014 (MacCracken et al. 2014; USFWS unpublished data), fluctuating asymmetry of walrus tusks (MacCracken and Benter 2015), and field observations by biologists and hunters suggest that the population is currently below K.

In 2006, the United States and the Russian Federation conducted another joint aerial survey in the pack ice of the Bering Sea using thermal imaging systems to more accurately count walruses hauled out on sea-ice and satellite transmitters to account for walruses in the water. The number of walruses within the surveyed area was estimated at 129,000 (95 percent CI = 55,000-507,000). This is considered a minimum estimate, as weather conditions forced termination of the survey before large areas of the Bering Sea were surveyed (Speckman et al. 2011). As of 2016, this is the best population estimate available, but field studies are being conducted to estimate the current population size.

The Pacific walrus is currently a candidate for listing under the ESA and a Category III species under CITES (see sections 1.3.2 and 1.3.3). It is considered "Data deficient" by the International Union for Conservation of Nature (IUCN; Lowry 2015). NatureServe has classified the species as G4 (Apparently secure) on a Global scale, and S3 (Vulnerable) within the state of Alaska (NatureServe 2015).

Life History

Walruses preferentially use sea ice to meet important life history behaviors, such as resting between feeding bouts and giving birth (Fay 1982). Ice floes are optimum habitats for females with dependent young as they allow relatively small groups to spread out directly over feeding areas, provide security for young when mothers are feeding, provide protection from predators, and the continuous drift of sea allows walruses to feed over large areas (Ray et al. 2006).

Walruses are generally found in waters of 100 m (300 ft) or less although they are capable of diving to greater depths. They feed almost exclusively on benthic invertebrates. Native hunters have also reported incidences of walruses preying on seals; other items like fish and birds are occasionally taken (Sheffield and Grebmeier 2009; Seymour et al. 2014). Prey densities vary across the continental shelf according to sea ice dynamics, primary productivity, currents, and sediment grain size (Grebmeier et al. 2015). Sediments in preferred feeding areas are typically composed of mud and sand. Foraging trips may last for several days, with walruses diving to the bottom nearly continuously. Most foraging dives last between 5 and 10 minutes, with a 1 to 2-minute surface interval. The disturbance of the sea floor by foraging walruses releases nutrients from the sea floor into the water column, provides food for scavenger organisms, contributes to the diversity of the benthic community, and is thought to influence the ecology of the Bering and Chukchi seas (Ray et al. 2006).

Walruses are social and gregarious animals. They travel and haul out onto ice or land in groups. Walruses spend approximately 20 to 30 percent of their time out of the water. Hauled-out walruses tend to be in close physical contact. Young animals often lie on top of adults. The size of the hauled out groups can range from a few animals up to several thousand individuals. The largest aggregations occur at land haulouts. In recent years, the barrier island north of Point Lay,

Alaska has seen large aggregations of walruses (20,000−40,000) in late summer and fall (Monson et al. 2013). Refer to the previous 5-year Beaufort Sea incidental take regulations for more information on Pacific walrus habitat and life history (76 FR 47011).

Polar bears are known to prey on walrus calves. Killer whales (*Orcinus orca*) have been known to take all age classes of walruses (Frost et al. 1992; Melnikov and Zagrebin 2005). Predation rates are unknown but are thought to be highest near terrestrial haulout sites where large aggregations of walruses can be found; however, few observations exist for offshore environs.

Conservation Concerns

Exploitation of the Pacific walrus population by Europeans has occurred in varying degrees since the arrival of exploratory expeditions in the 18th century. Large-scale commercial harvests are believed to have reduced the population to 50,000 to 100,000 animals in the mid-1950s (Fay et al. 1989) but ceased in 1972 in the United States with the passage of the MMPA and in 1990 in Russia. Presently, walrus hunting in Alaska and Chukotka is restricted to the subsistence use by aboriginal peoples. Annual harvest mortality from 2000 to 2014 for both the United States and the Russian Federation averaged 3,207 walruses. This mortality estimate includes corrections for under-reported harvest in the United States and for struck and lost animals. Additional information on walrus harvest is provided under section 3.3: Socio–Economic Environment.

Intra-specific trauma at coastal haulouts is a known source of injury and mortality (USFWS 2015b). Disturbance events can cause walruses to stampede into the water and have been known to result in injuries and mortalities. The risk of stampede-related injuries increases with the number of animals hauled out. Calves and young animals at the perimeter of these herds are particularly vulnerable to trampling injuries and mortality. Management and protection programs in both the United States and Russia have been successful in reducing disturbances and large mortality events at coastal haulouts (USFWS 2015b). Udevitz et al. (2013) modeled the combined effects of female harvest and calf mortalities on population growth and defined levels of those combined mortality sources that would result in an increasing, stable, or decreasing female population, all else equal.

The reduction of summer Arctic sea ice is a concern for walrus conservation. Analyses of long-term environmental data sets indicate that substantial reductions in both the extent (Meier et al. 2014, Frey et al. 2015) and thickness (Meier et al. 2014) of the arctic sea-ice cover have occurred over the past 40 years. Record minimum sea ice extent was recorded in 2002, 2005, 2007, and 2012; sea ice cover in 2003 and 2004 was also substantially below the 20-year mean. The overall declining trend has continued (Frey et al. 2015). Recent trends in the Chukchi Sea have resulted in seasonal sea-ice retreat off the continental shelf and deep Arctic Ocean waters. Foreseeable impacts to walruses from diminishing sea ice cover include shifts in range and local abundance, increased frequency and duration at coastal haulouts, increased vulnerability to predation and disturbance, and localized declines in prey. It is unknown if walruses will utilize the Beaufort Sea more in the future due to climate change effects. Currently, and for the next 5-years, it appears that walruses will remain uncommon in the Beaufort Sea. Impacts to walruses from human activities, including oil and gas development are discussed in Chapter 4.

3.3 Socio–Economic Environment

The communities of the Beaufort Sea ITR region have two distinct economies: the oil industry with its support services; and the local communities and their mixed cash subsistence economies. Local tax revenues from the oil and gas Industry support about 1,900 local government jobs in the North Slope Borough (UAF & ACCAP 2014). Non-oil private sector employment is low. Retail is the largest private industry followed by education and health care. Native Corporations provide most of the private sector jobs.

3.3.1 Subsistence Harvest Levels and Trends

Subsistence harvest of polar bears and Pacific walruses by Alaska Natives plays an important role in the culture and economy of villages throughout coastal Alaska. Polar bears are hunted primarily for their fur, which is used to manufacture cold weather clothing. Polar bear meat is also sometimes consumed. Walrus meat is a subsistence food and ivory is used to manufacture traditional arts and crafts. The sale of handmade clothing and handicrafts made of walrus or polar bear parts is an important source of income in some remote Alaska Native communities. The limited cash that Alaska Native villagers can make from handmade clothing and handicrafts is vital to sustain their subsistence hunting and fishing way of life (Pungowiyi 2000). Although walrus and polar bear harvests are part of the subsistence traditions of most rural communities on the North Slope of Alaska, bowhead whales, seals, caribou (*Rangifer tarandus*), and fish are the dominant subsistence food sources.

The communities of Wainwright, Barrow, Atqasuk, Nuiqsut, and Kaktovik have the ability to harvest polar bears and walruses in the proposed Beaufort Sea ITR region. Barrow, Nuiqsut, and Kaktovik are within the ITR region while Atqasuk and Wainwright are adjacent to it. Information on subsistence harvests of walruses and polar bears in each community was obtained through the Service's Marking, Tagging, and Reporting Program and is presented below. Because the primary range of Pacific walrus is predominantly in the Chukchi Sea, west and south of the Beaufort Sea, most of the walruses reported by communities along the northern coast of Alaska were harvested outside of the geographic range of the proposed ITRs. Of the walrus harvest for Barrow, Nuiqsut, and Kaktovik from 2009 to 2014, less than 1.5 percent has occurred within the geographic range of these proposed ITRs.

Wainwright

Wainwright is located approximately 115 km (72 mi) southwest of Barrow on the northwest coast of Alaska. Polar bears are harvested throughout much of the year, with peak harvests reported in May and December. Polar bears are often harvested coincidentally with beluga and bowhead whale harvests. Most polar bear hunting typically occurs within 16 km (10 mi) of the community and some bears are harvested within the village itself. Wainwright hunters reported 140 polar bears harvested between 1987 and 2014. The total number of bears harvested during 2010 to 2014 was 32.

Wainwright hunters have consistently harvested more walruses than any other subsistence community on the North Slope of Alaska. In the past 15 years, Wainwright hunters have reported

874 harvested walruses. Most Wainwright walrus hunting occurs within 32 km (20 mi) of the community within the Chukchi Sea, outside of the geographic region of the proposed ITRs.

Barrow

Barrow is the northernmost community in the United States. Barrow hunters have reported 427 polar bears harvested in the past 27 years. During the period 2010 to 2014, 48 bears were harvested by residents of Barrow. The number of polar bears harvested in Barrow is most likely influenced by ice conditions and the number of people out on the ice. Hunting areas for polar bears often overlap with areas of bowhead whale subsistence hunting; particularly the area from Point Barrow South to Walakpa Lagoon where whale carcasses are known to attract polar bears seasonally. Many of the polar bears harvested by Barrow residents are reported in February and March and are often associated with other subsistence hunting activities (e.g., whales and seals) or community safety. It is common for a bear identified as a danger to the community to be taken as a subsistence harvest. Relatively few Alaska Natives in Barrow are known to hunt specifically for polar bears. When polar bears are specifically hunted, it is usually between October and March.

Walruses constitute a small portion of the total marine mammal harvest for this community. Most walrus hunting from Barrow occurs in June and July when the land-fast ice breaks up and hunters can access the migrating walruses on the retreating pack ice by boat. Walrus hunters from Barrow range up to 96 km (60 mi) from shore, however, most reported harvests were within 48 km (30 mi) of the community. Hunters from Barrow have reported 451 walruses harvested in the past 20 years with 78 of those since 2009.

Atqasuk

Atqasuk is located on the Meade River approximately 96 km (60 mi) south of Barrow. Atqasuk hunters have reported one polar bear harvested in the past 27 years. Atqasuk hunters do not normally hunt walrus due to the village's distance from the sea and the limited occurrence of walrus in their coastal hunting grounds. There have been five harvested walruses reported from Atqasuk hunters over the past 15 years.

Nuiqsut and Kaktovik

Nuiqsut is located along the Nechelik Channel of the Colville River Delta about 56 km (35 mi) from the Beaufort Sea coast. Kaktovik is located on Barter Island, between the Okpilak and Jago rivers, off the Beaufort Sea coast within the boundaries of the Arctic National Wildlife Refuge. Nuiqsut hunters have reported 36 polar bears harvested in the past 27 years. Kaktovik hunters have reported 61 polar bears harvested in the past 27 years. During the period 2010 to 2014, eight polar bears were harvested by hunters from Nuiqsut, and nine were harvested by hunters from Kaktovik. Hunters from Nuiqsut and Kaktovik do not normally hunt walrus due to the limited occurrence of walrus in their hunting grounds. They have reported taking four walruses since the inception of the ITRs in 1993.

Barrow and Kaktovik are expected to be affected to a lesser degree by Industry activities than Nuiqsut. Nuiqsut is located within 5 mi of the Alpine production field and the Alpine Satellite

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field. However, Nuiqsut hunters typically harvest polar bears from Cross Island during annual bowhead whaling in the autumn. Cross Island is approximately 16 km (10 mi) offshore from the coast of Prudhoe Bay.

3.3.2 Effects of Subsistence Harvest on the Species

Pacific Walruses

Pacific walruses have been an important subsistence resource for coastal Alaskan and Russian natives for thousands of years and will continue to be into the foreseeable future. The Pacific walrus population has experienced an estimated annual harvest of 3,200 to 16,100 animals from 1960 through 2000 (mean: 6,993; Angliss and Allen 2009). Since 2000, harvest estimates have continued to decline by about 3 percent per year. In 2013 and 2014, U.S. harvest levels were below 1,400 animals per year. The Russian harvest is now the largest hunt, with approximately 1,800 and 1,500 animals harvested in 2013 and 2014, respectively (Shadbolt et al. 2014).

Factors affecting harvest levels include the cessation of Russian commercial walrus harvests after 1991, changes in political, economic, and social conditions of subsistence hunters in Alaska and Chukotka, and the effects of variable weather and ice conditions (Angliss and Allen 2009). Recent low U.S. harvest levels are primarily due to unfavorable sea ice conditions during the harvest season and inclement weather that has kept hunters on shore. Resource managers in the Russian Federation have recently reduced harvest quotas based in part on the 2006 population size of 129,000 animals estimated by Speckman et al. (2011; Kochnev 2004, 2005; Kochnev 2010, pers. comm.; Litovka 2015, pers. comm.). Russian hunters have never reached the quota (Litovka 2015, pers. comm.). No statewide harvest quotas exist in Alaska at this time.

Harvest levels are currently less than 3 percent of the estimated population size. Although this level of harvest is currently thought to be sustainable, substantial uncertainty regarding the population status and trend makes it difficult to quantify appropriate removal levels (Garlich-Miller et al. 2011). If the carrying capacity of walrus habitat declines due to changes in sea ice, it is unknown if the current level of harvest will be sustainable. If the absolute number of animals harvested does not also decline in sync with population size and/or if the level of female and calf harvest is not reduced, subsistence harvest may exacerbate a population decline. Therefore, subsistence harvest could become a threat to the pacific walrus population. Jay et al. (2011) used Bayesian network modeling to determine that the additive effects of loss of sea ice and subsistence harvest will likely cause a “worsening condition” (i.e., change the walrus population state from robust or persistent to vulnerable, rare, or extirpated) for the Pacific walrus. However, if the declining trend in harvest removals continues, the subsistence harvest will likely remain sustainable.

Polar Bears

Population declines due to sport hunting (especially trophy hunting by non-Natives using aircraft) became an increasing international concern during the 1950s and 1960s. Between 1954 and 1972, 222 polar bears on average were harvested annually in Alaska, resulting in a population decline (Amstrup et al. 1986). Since hunting has been limited to subsistence harvest by coastal Natives, harvest levels have decreased dramatically. The Alaska Native subsistence

harvest from the SBS population has remained relatively consistent since 1980 and averages less than 40 bears per year. The total harvest of SBS bears reported by the Service's Marking, Tagging and Reporting Program from 2010 to 2014 was 98 bears, an average of 20 per year.

Active harvest management programs are in place in regions of Alaska where hunting takes place, including in the Beaufort Sea ITR region. Polar bear harvest is also actively managed in Canada. These actions, along with the ban on sport hunting in Alaska, are largely viewed as having succeeded in reversing overharvests that resulted in population depletion during the years prior to the multilateral 1973 Agreement (Prestrud and Stirling 1994). Although subsistence hunting has the potential to have significant population impacts, current harvest levels do not currently threaten the species throughout all or a significant portion of its range (USFWS 2008b).

Native subsistence harvest continues to be the greatest source of human-caused polar bear mortality, but a small number of polar bears have also been killed during research activities, have been euthanized due to illness or injury, or have been killed by non-Natives in defense of life. These levels of take have been determined to be insignificant and have no effect on the population. These sources of mortality are incorporated into consideration of harvest management regimes, by considering them as a component of the total human removals from each subpopulation (Schliebe et al. 2006). Other forms of mortality, such as poaching and increased mortality from human-bear encounters, may become a more significant threat in the future, particularly for subpopulations experiencing nutritional stress or declining numbers because of habitat change.

3.3.3 Oil and Gas Industry

The cash economies of the communities within the Beaufort Sea ITR region are highly dependent on the oil and gas Industry. The U.S. Census Bureau (2012) reported the oil and gas industry payroll in the state of Alaska to be $500 million. Two thirds of the oil field jobs are held by Alaska residents. Many Alaskan oil field workers commute to the North Slope, but many of the local residents also find employment with the oil and gas Industry. In an overview of the economy of the NSB, the University of Alaska published the following information (UAF & ACCAP 2014):

- In the first quarter of 2014, more than 15,300 jobs were located within the North Slope Borough, of which, 72 percent (11,100 jobs) were associated with the oil fields.
- In 2012, NSB received $322 million, and $43,959 per capita, from oil companies in the form of property taxes, equaling 99 percent of total property tax revenue.
- The NSB government is the largest employer of NSB residents in the region. Local tax revenue supports a little over 1,900 local government jobs.

Future development would continue to have economic benefits for the region. Northern Economics, Inc. (2011) estimated that development of the Beaufort Sea OCS could generate $97 billion over the next fifty years in Federal lease revenues and in Federal, state, and local government tax revenues. They also predicted the total payroll associated with the estimated 13,700 Alaska-based jobs to be $63 billion (Northern Economics, Inc. 2011). Although the accuracy of these economic analyses are sensitive to recent declines in oil prices, the economic benefits of continued or expanded oil and gas development on the North Slope will continue to be the major factor driving the fiscal economies of the local communities.

3.3.4 Other Socio-Economic Activities

Other socio-economic activity centered on these species, such as eco-tourism or wildlife viewing (predominantly for polar bears), has occurred in Barrow and Kaktovik. Polar bear viewing has been ongoing near Barrow for at least a decade and provides an economic benefit for the community. At Barter Island, near the village of Kaktovik, tourism is increasing because of the opportunity to observe polar bears during the fall. Viewing opportunities, however, can be seasonally unpredictable due to bears travelling along the coast and the availability of opportunistic food sources, such as whale carcasses. Oil and gas industry operators do not allow wildlife viewing, or any other tourist activity, within their areas of operation. Nevertheless, wildlife viewing, especially for polar bears, appears to be increasing. The Service works with communities to minimize impacts on polar bears from viewing activities by developing guidelines that limit potential interactions. [Top]

Chapter 4. ENVIRONMENTAL CONSEQUENCES

The impacts of Federal actions must be considered prior to implementation to determine whether the action will significantly affect the quality of the human environment. In this section, an analysis of the environmental consequences of issuing ITRs for oil and gas activities in the Beaufort Sea and alternatives to that Proposed Action are presented.

4.1 Alternative 1 – No Action Alternative

Under the No Action alternative there would be no ITRs issued under the MMPA for incidental unintentional non-lethal take of polar bears and Pacific walruses as a result of otherwise lawful oil and gas activities in the Beaufort Sea region during the period August 3, 2016, through August 2, 2021. There would be no associated monitoring, reporting, and mitigation requirements. Takings that result from oil and gas activities, unless otherwise authorized by sections 101(a)(4)(A), 109(h) or 112(c) of the MMPA, or qualifying for an exemption, would be subject to the prohibitions found in the MMPA and could result in enforcement actions for violation of the MMPA. In addition, because polar bears are listed as a threatened species under the ESA, a decision not to issue ITRs would complicate, delay, and possibly compromise ESA section 7 consultations by, among other things, precluding issuance of ESA incidental take authorizations for some oil and gas activities.

The No Action alternative would not prohibit Industry activities. Other Federal and state agencies, such as the U.S. Army Corps of Engineers, the BLM, BOEM, and the State of Alaska are responsible for permitting oil and gas activities on waters and lands within the Beaufort Sea region. If ITRs were not issued, oil and gas Industry activities may occur without the mitigation measures, monitoring, and reporting required by the ITRs.

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4.2 Alternative 2 (Preferred Alternative) – Issuance of 5–year Incidental Take Regulations with General Mitigation Measures and Additional Requirements

Under this alternative, the Service would promulgate incidental take regulations for a 5-year period that would address the proposed oil and gas activities outlined in the petition if such takes will have no more than a negligible impact on small numbers of animals. In addition, the analysis must find that any takes will not have an unmitigable adverse impact on the availability of the species for subsistence purposes. Section 101(a)(5)(A) of the MMPA states that the Secretary of the Interior may allow the incidental, but not intentional, taking of marine mammals provided that regulations set forth requirements pertaining to the monitoring and reporting of such taking.

Under this alternative, the measures described in the Mitigation Measures section (page 67) would be implemented to minimize potential adverse impacts from the proposed Industry activities, as well as provide data to improve our ability to evaluate the effects on walruses, polar bears, and the subsistence use of these resources. The specific LOAs will be conditioned, when necessary, on a case-by-case basis to afford additional protection to sensitive areas, such as areas frequented by feeding or resting animals and subsistence hunting areas.

4.2.1 Potential Impacts on Marine Mammals

Polar Bears

Polar bears will be present in the Beaufort Sea ITR region and could be impacted by offshore and onshore activities in various ways. Impacts from noise, vessel and aircraft, onshore drilling and human disturbance, physical obstruction, human encounters, prey, and oil or fuel spills are described below.

Noise Disturbance

Noise disturbance can originate from either stationary or mobile sources. Stationary sources include construction, maintenance, repair, and remediation activities, operations at production facilities, gas flaring, and drilling operations from either onshore or offshore facilities. Mobile sources include vessel and aircraft traffic, open-water seismic exploration, winter vibroseis programs, geotechnical surveys, ice road construction, vehicle traffic, tracked vehicles and snowmobiles, drilling, dredging, and ice-breaking vessels.

Sounds produced by Industry activities may elicit a wide range of responses in individual polar bears. A bear's response may be shaped by previous experiences and individual tolerance level. Noise may act as a deterrent or cause physiological stress. Novel sounds associated with a potential food source could attract bears to an area. Polar bears are most likely to respond to the majority of industry noises with short-term behavioral and physiological responses such as increased vigilance or heart rate. Any disturbance during resting may result in increased energy expenditure or adverse physiological responses (Watts et al. 1991), but short-term reactions like these will rarely affect the health or survival of the animal. Chronic disturbances, extreme reactions (fleeing or fighting), or disturbances affection key behaviors are more likely to affect fitness. High levels of sound could impact the ability of a polar bear to hear or to communicate

with other bears. Attracting bears to Industry facilities could result in human-bear encounters, with the potential for lethal take, or intentional hazing (under separate authorization).

Industry activities affecting polar bears at maternal den sites are of great concern. Potential impacts on the female and her cubs depend on the timing of Industry activity compared with the timing of the maternal denning period. Disturbance during the early stages of denning may cause a female to abandon the den site in search of another one. Premature den site abandonment after the birth of cubs may also occur. If den site abandonment occurs before the cubs are able to survive outside of the den, or if the female abandons the cubs, the cubs will die.

The monitoring and reporting program established by the ITRs has documented the following incidences of den abandonment:

- In the early stages of denning in January 1985, a female polar bear appeared to have abandoned her den in response to Rolligon traffic within 500 m (1,640 ft) of the den site.
- In spring 2002, noise associated with a polar bear research camp in close proximity to a bear den was thought to have caused a female bear and her cub(s) to abandon their den and move to the ice prematurely.
- In spring 2006, a female with two cubs emerged from a den 400 m (1,312 ft) from an active construction site river crossing. The den site was abandoned only three days after the female emerged and within hours of cub emergence.
- In spring 2009, a female with two cubs emerged from a den within 100 m (328 ft) of an active ice road with heavy traffic and quickly abandoned the site.
- In January 2015, a freshly dug polar den was discovered in an active gravel pit adjacent to an active landfill and busy road. The bear abandoned the den after 56 days. During the time the bear occupied the den, Industry activity in the area was restricted, and the den was constantly monitored. A subsequent investigation of the den found no evidence that the bear gave birth. It is unknown if or to what extent Industry activity contributed to the bear leaving the den.

Polar bears exposed to routine industrial noises may habituate to those noises and show less vigilance than bears not exposed to such stimuli. During the denning seasons of 2000 to 2002, two dens known to be active were located within approximately 0.4 km and 0.8 km (0.25 mi and 0.5 mi) of remediation activities on Flaxman Island in the Beaufort Sea with no observed impact to the polar bears. This observation came from a study that occurred in conjunction with industrial activities performed on Flaxman Island in 2002 and a study of undisturbed dens in 2002 and 2003 (Smith et al. 2007). Researchers assessed vigilant behavior by noting the frequency of occurrence and proportion of time spent by bears scanning their surroundings. The two bears exposed to the industrial activity spent less time scanning their surroundings than bears in undisturbed areas and engaged in vigilant behavior significantly less often.

The potential for disturbance increases once the female emerges from the den. She is more vigilant against perceived threats and easier to disturb. As noted earlier, in some cases, while the female is in the den, Industry activities have progressed near den site with no observed disturbance. In the 2006 den abandonment example, it was believed that Industry activity commenced in the area after the den had been established. Industry activities occurred within 50

m (164 ft) of the den site with no apparent disturbance while the female was in the den. Ongoing activity most likely had been occurring for approximately three months near the den.

Likewise, in 2009, two bear dens were located along an active ice road. The bear at one den site appeared to establish her site prior to ice road activity and was exposed to approximately three months of activity 100 m (328 ft) away and emerged at the appropriate time. The other den site was discovered after ice road construction commenced. This site was exposed to ice road activity, 100 m (328 ft) away, for approximately one month. Known instances of apparently undisturbed denning within 500 m (1,640 ft) of Industry activity occurred in 2006, 2009, 2010, and 2011. In these instances, polar bears established dens prior to the onset of Industry activity and remained in the den through the normal denning cycle, later leaving with her cubs.

Industry observation data suggests that, with proper mitigation measures in place, some activities can continue near dens until the emergence by the female bear. At that time, mitigation, such as activity shutdowns near the den and 24-hour monitoring of the den site can minimize impacts, allowing the female bear to abandon the den when she chooses. For example, in the spring of 2010, an active den site was observed approximately 60 m (197 ft) from a heavily used ice road. A (1.6 km) 1-mi exclusion zone was established around the den, closing a 2-mile section of the road. Monitors were assigned to observe bear activity and monitor human activity to minimize any other impacts to the bear group. These mitigation measures minimized disturbance to the bears and allowed them to abandon the den site naturally. Similar mitigation will be required for all known den sites near Industry activities; see Mitigation Measures section (page 67).

Seismic Exploration

Seismic exploration, high resolution surveys, and underwater drilling produce high levels of sound that may be capable of causing harm to polar bears from hearing damage, masking of communications (e.g., between a sow and cub), or extreme behavioral responses. Theoretically, polar bears may experience temporary or permanent hearing impairment (also known as temporary threshold shift [TTS] or permanent threshold shift [PTS]) if they are exposed to high-energy sound. Underwater exposure is a concern because sound travels farther underwater than in air and may affect marine mammals at distances beyond the immediate vicinity of the sound source. Data extrapolated from other marine mammal species (see e.g. Southall et al. 2007; NOAA 2013; NOAA 2015) suggest that hearing impairment could occur, for example, if polar bears are underwater during active seismic work involving large airgun arrays. Threshold noise levels capable of causing hearing impairment have not been determined for polar bears.

There is limited information on the hearing abilities of polar bears. Nachtigall et al. (2007) tested airborne auditory evoked potentials in response to stimuli from electrodes placed on the scalp of three captive polar bears. Testing was limited to frequencies ranging from 1 to 22.5 kHz; responses were detected at all frequencies greater than 1.4 kHz. Greatest sensitivity was detected between 11.2 and 22.5 kHz. Absolute thresholds were lower than 27 to 30 dB. These results indicate that polar bears have acute hearing abilities and can hear a wider range of frequencies than humans (which are limited to about 20 kHz).

Open-water seismic surveys generate loud noises but are normally conducted away from sea-ice. Polar bears are usually found on land or sea ice during summer and fall, making encounters with

open-water work unlikely. Polar bears on sea ice would be unaffected by underwater sound from seismic airguns. However, Industry monitoring reports indicate that small numbers of polar bears have been observed during open-water seismic survey programs. In 2012, during the open water season, Shell vessels encountered a few polar bears swimming in ice-free water more than 70 mi (112.6 km) offshore in the Chukchi Sea. In those instances, the bears were observed to either swim away from or approach the Shell vessels. Sometimes a polar bear would swim around a stationary vessel before leaving. In at least one instance a polar bear approached, touched, and investigated a stationary vessel from the water before swimming away.

If polar bears are encountered in water, the probability they would be exposed to harmful sound levels is lower than for other marine mammals. Polar bears generally do not dive far or for long below the surface and they normally swim with their heads above the surface where underwater noises are weak or undetectable. Sound levels attenuate more rapidly near the surface due to turbulence. Masking of sound is unlikely; polar bears are not known to communicate underwater. These factors reduce the likelihood of hearing impacts from high-level exposure to underwater sound. To further reduce the probability of harmful exposure, the Service will require operators to power down or shut down seismic or other loud activities or change a vessel's speed or course to prevent polar bears from exposure to underwater sound greater than 190 dB.

Offshore exploration activity, such as seismic surveys and drilling, does not occur on an annual basis in the Beaufort Sea ITR region. Few bears are likely to be seen in the exploration areas. From 2009 through 2014, there were few Industry observation reports of polar bears during seismic activities. Those observations were primarily of bears moving through an area during winter seismic surveys on near-shore ice. The disturbance to bears, if any, was minimal, short term, and temporary, and was limited to small-scale alterations to bear movements. Due to the limited scope of the planned offshore activities and the mitigation measures that will be applied, the Service concludes that offshore seismic exploration activities or other geophysical surveys during the open-water season are expected to result in no more than short-term and temporary behavioral disturbance to small numbers of polar bears and will have no more than negligible effects on the population.

Noise and vibrations produced by seismic activities during the ice-covered season could also result in impacts on denning polar bears. Female polar bears entering dens and females in dens with cubs are more sensitive to noises than other age and sex groups. As part of the LOA application, Industry provides the location of proposed activities near denning areas. To minimize the likelihood of disturbance to denning females, the Service evaluates the proposed work, along with information about known polar bear dens, historic denning sites, and identified denning habitat prior to issuing an LOA. Mitigation measures, including a 1.6-km (1-mi) operational exclusion zone around known dens and an 805-m (0.5-mi) exclusion zone around polar bears will be required to limit disturbance impacts to bears.

Offshore Drilling and Vessel Traffic

In the open-water season, marine Industry activities are generally limited to relatively ice-free open water. During this time in the Beaufort Sea, polar bears are typically found either on land or on the pack ice, which limits the chances of interaction with offshore Industry activities. Though polar bears have been observed in open water, miles from the ice edge or ice floes (as described in the 2012 Shell example), encounters are relatively rare. With the amount of Arctic sea ice cover changing rapidly due to climate change, vessel traffic from Industry activities is increasing in previously inaccessible Arctic areas. Industry activities may begin to encounter more bears in open water or low-density ice conditions (Hovelsrud et al. 2008).

Noise, sights, and smells produced by exploration activities may repel or attract bears, disrupting their natural behavior. For example, during a period of little ice in the late 1980s at the Belcher exploration-drilling site in the Beaufort Sea, a large ice floe threatened the drill rig. After the floe was moved by an icebreaker, workers noticed a female bear with a cub-of-the-year and a lone adult swimming nearby. It was assumed these bears had been disturbed from the ice floe by the icebreaker. In this type of encounter, disturbance could potentially affect the survival of the cub while disturbance of the adults was likely negligible. Most encounters between vessels and polar bears will likely result in no more than short-term and temporary behavioral disturbance.

Aircraft and Vehicles

Polar bears have been observed to respond from the sights and sounds of snowmachines, vehicles, vessels, and aircraft; especially helicopters (e.g. Watts and Ratson 1989; Dyck 2001; Dyck and Baydack 2004; Andersen and Aars 2005). The effects of fleeing from aircraft may be minimal if the event is short and the animal is otherwise unstressed. Likewise, fleeing from a working icebreaker may have minimal effects for a healthy animal on a cold day. However, on a warmer day, a short run may be enough to overheat a well-insulated polar bear. The effect of fleeing an aircraft or vessel on polar bear cubs, particularly cubs of the year, would likely be the use of energy that otherwise would be needed for survival during a critical time in a polar bear's life. If the exposure were brief and singular then the effect would most likely be minimal.

Routine Industry aircraft traffic should have little to no effect on polar bears, though frequent or low-level aircraft activity may cause disturbance. Observations of polar bears during fall coastal surveys, which flew at much lower altitudes than is required of Industry aircraft (see Mitigation Measures, page 67), indicate that the reactions of non-denning polar bears should be limited to short-term changes in behavior ranging from no reaction to running away. Such disturbance should have no more than short term, temporary, and minor impacts on individuals and no discernible impacts on the polar bear population, unless it was chronic and long-term.

Denning female bears may abandon their dens early in response to stress (Amstrup 1993; Ramsay and Stirling 1986). Amstrup (1993) reported most polar bears in dens continue to occupy the dens after close approaches by aircraft. Although the snow attenuates some aircraft noise (Blix and Lentfer 1992), repeated overflights may cause polar bears to abandon or depart their dens. Mitigation measures, such as minimum flight elevations over polar bears, and flight restrictions around known polar bear dens and habitat areas of concern will be required, as

appropriate, to reduce the likelihood that polar bears are disturbed by Industry aircraft. Therefore, the anticipated effects from aircraft are likely to have negligible impacts on few bears.

Physical Obstruction

Marine vessels, such as barges, ships, and icebreakers may act as physical obstructions, altering or intercepting bear movements, particularly if they transit through a confined lead or polynya system. Leads and polynyas are important habitat for marine mammals, which makes them important hunting areas for polar bears.

Industry facilities may also act as physical barriers to movements of polar bears. Most facilities are located onshore and inland where polar bears are less frequently found. The offshore and coastal facilities are more likely to be approached by polar bears. The majority of Industry bear observations occur within one mile of the coastline as bears use this area as a travel corridor. As bears encounter these facilities, the chances for human-bear interactions increase. The Endicott and West Dock causeways, as well as the facilities supporting them have the potential to act as barriers to movements of polar bears because they extend between the coastline and the offshore facility. However, polar bears have frequently been observed crossing existing roads and causeways and appear to traverse the human-developed areas as easily as the undeveloped areas. Offshore production facilities, such as Northstar, Spy Island, and Oooguruk have frequently been approached by polar bears, but appear to present only a small-scale, local obstruction to the bears' movement.

From 2010 through 2014, a total of 107 LOAs were issued to Industry. Polar bear observations were recorded for 36.4 percent (39) of those LOAs. There were 1,234 Industry polar bear observation reports of 1,911 bears. The majority of observations were of bears walking near Industry activities. In most cases, the bear showed no response or responded by walking away from the facilities or activities. Of greater concern is the potential for polar bear-human interaction at these facilities.

Human Encounters

Historically, polar bear observations are seasonally common, but close encounters with Industry personnel are uncommon. These encounters can be dangerous for both polar bears and humans. Polar bear sightings have generally increased since the inception of the ITRs, probably due in part to increased monitoring efforts, and possibly due to increased use of Industry areas by bears. Offshore units typically document higher numbers of polar bear sightings than onshore facilities. Endicott-Liberty, Northstar, and Prudhoe Bay units reported between four and 158 sightings of polar bears annually from 2008 to 2012 at each facility. Most sightings were of single adult and sub-adult bears. Fewer sightings were of sows with cubs. Most of these sightings are very likely repeated observations of the same animals. Human encounters are more likely to occur during fall and winter periods when greater numbers of bears are found in the coastal environment searching for food and denning habitat. Development of future offshore and nearshore production facilities could potentially increase polar bear-human encounters.

There is the potential for humans to encounter polar bear dens as well. Industry operators working in denning habitat during the denning season are required to coordinate with the Service

to conduct den detection surveys. Known polar bear dens are also discovered opportunistically or by tracking marked bears. Known dens are monitored by the Service and Industry activities are required to avoid known polar bear dens by 1.6 km (1 mi). However, known dens represent only a small percentage of the total dens for the SBS stock in a given year. There is the possibility that an unknown den may be encountered during Industry activities. When a previously unknown den is discovered in proximity to Industry activity the Service implements mitigation measures such as the 1.6-km (1-mi) activity exclusion zone around the den and 24-hour monitoring of the site.

Lethal take of polar bears by Industry activity is very rare. Since 1968, there have been three documented cases of lethal take of polar bears associated with oil and gas activities. In winter 1968/1969, an Industry employee shot and killed a polar bear in defense of human life. In 1990, a female polar bear was killed at a drill site on the west side of Camden Bay, also in defense of human life. Since the beginning of the incidental take program in 1993, which includes measures that minimize impacts to the species, one polar bear was been killed when an attempt to non-lethally deter the bear was not conducted properly. After this incident occurred in 2011, Service reviewed the circumstances that contributed to the death of the bear and implemented a series of corrective actions with Industry. The Service believes that the corrective actions significantly reduce the potential for a similar situation to arise in the future. Therefore, we do not anticipate any lethal take of polar bears during the 5-year period of these proposed ITRs.

Polar bear interaction plans, training, and monitoring required by the ITRs have proven effective at reducing polar bear-human encounters and the risks to bears and humans when encounters occur. Polar bear interaction plans detail the policies and procedures that Industry facilities and personnel will implement to avoid attracting and interacting with polar bears as well as minimizing impacts to the bears. Interaction plans also detail how to respond to the presence of polar bears, the chain of command and communication, and required training for personnel. Industry has also developed technology to aid in detecting polar bears, including bear monitors, closed-circuit television, video cameras, thermal cameras, radar devices, and motion detection systems. In addition, some companies use safety gates and fences to prevent access.

Prey

Ringed seals and bearded seals are the primary prey of polar bears, with ringed seals being the preferred prey. Industry impacts on seals arise from industrial noise disturbance and contamination from oil spills. Industry activity may displace seals from habitat areas such as pupping lairs, haulouts, and breathing holes. Effects to polar bears from exposure to contaminated seals are described in the Oil and Fuel Spills section. A recent detailed description of ice seal biology, effects of oil and gas activities, and mitigation measures typically required to reduce impacts to seals can found in the NMFS biological opinion, *Oil and Gas Leasing and Exploration Activities in the U.S. Beaufort and Chukchi Seas,* Alaska (NMFS 2013). The Service does not expect the availability of seals as a food source for polar bears to be significantly changed due to Industry activities, but some changes may occur. For instance, polar bears have been observed hunting seals in cracks in sea ice created in an ice floe as it passed a drilling caisson (Stirling 1990). Most disturbances appear to have minor, short-term, and temporary effects. Issuance of ITRs for take of polar bears and walruses during Industry activities will have no discernable impact on seal abundance or distribution.

Oil and Fuel Spills

The MMPA does not authorize the incidental take of marine mammals as the result of illegal actions, such as spills of oil, fuel, or other hazardous substances used by Industry. The proposed issuance of ITRs for polar bears would not alter the likelihood that illegal spills could occur. However, it is helpful to consider the full suite of potential impacts of Industry actions in order to understand the effects of the ITRs on polar bears given other potential stressors in the existing environment. The possibility exists that spills may result from Industry facilities, ships, and pipelines in both offshore and onshore polar bear habitat. However, any event that results in an injurious or lethal outcome to a marine mammal is not authorized under the proposed ITRs.

Sources of spills

Between 1971 and 2007, OCS operators produced almost 15 billion bbl of oil in the United States. During this period, there were 2,645 spills that totaled approximately 164,100 bbl spilled (~0.001 percent of bbl produced), or about 1 bbl spilled for every 91,400 bbl produced. Between 1993 and 2007, almost 7.5 billion bbl of oil were produced. During this period, there were 651 spills that totaled approximately 47,800 bbl spilled (~0.0006 percent of bbl produced), or approximately 1 bbl spilled for every 156,900 bbl produced.

Between July 1, 2009 and June 30, 2014, the North Slope industrial area reported an average of 59,043 gallons of spilled substances annually, with a total of 138 crude oil spills. Statewide during this period, approximately 5.6 percent of the total volume of spilled material consisted of crude oil (ADEC 2015). The volume of spilled crude on the North Slope was therefore estimated to be approximately 79 bbl (1,406 x 0.056=79). Recent large spills of crude oil have included a subsurface release of 166 bbl from a well at Milne Point, and a 100 bbl spill from a tank. Secondary containment retained the smaller of these spills.

Smaller spills (less than 500 bbl) have historically occurred from pipeline, vehicle, or gravel pad activities, and are typically caused by leaks or faulty equipment. From 1989–2006, 18 percent of spills were approximately 1 gallon, 54 percent were approximately 5 gallons, and 99 percent were less than 25 bbl (BLM 2005). The mean size is 2.8 bbl. The estimated rate for small crude spills on the North Slope is 178 spills per billion bbl produced (BLM 2005). Using this estimated spill rate, a mean spill volume of 3 bbl, and the maximum amount of resources (bbl), BLM estimated a total spill volume of 405 to 3,669 bbl over the production life of the northeast NPR-A (BLM 2005). In October 2013, BOEM released a report detailing small North Slope spill occurrences from 1971 to 2011 and used statistical modeling to estimate future potential spills based on several production variables (Robertson et al. 2013). Small spills are generally restricted to a small area of tundra and winter spills can be cleaned up before reaching the tundra (BLM 2005). Thus, a small spill event would likely be confined to a small area of impact and effects to polar bears and walruses mitigated through containment and recovery actions.

Two large onshore terrestrial oil spills have occurred because of pipeline failures. In the spring of 2006, approximately 6,200 bbl of crude oil spilled from a corroded pipeline operated by BP Exploration (Alaska). The spill affected approximately 2 acres (0.8 ha). In November 2009, a spill of approximately 1,150 bbl occurred from a “common line” carrying oil, water, and natural gas operated by BP occurred as well, impacting approximately 780 m^2 (~8,400 ft^2). None of

these spills were known to impact polar bears, in part due to the locations and timing. Both sites were within or near Industry facilities not frequented by polar bears and they are not typically observed in the affected areas during the time of the spills.

The BLM and BOEM modelled the likelihood of spills occurring during exploration and development in the National Petroleum Reserve-Alaska and in the Beaufort and Chukchi Sea planning area (BLM 2012 and BOEMRE 2011, respectively). Large (≥ 1,000 bbl) or very large spills (≥120,000 bbl) were considered extremely unlikely to occur during oil and gas exploration. The two sources of potential large crude oil spills are from pipelines and long duration blowout resulting from a well-control incident. The loss of the entire volume in an onshore pipeline between two valves would also result in a large spill of crude oil. The BLM estimated a 28 percent chance that one or more large crude oil spills would occur during 50 years. Based on information on past spills, spill volumes close to the lower end of the "large spill" range (1,000 bbl) are much more likely that spill volumes in the upper end of the range (119,999 bbl). BOEM (2014) considered spill sizes of 1,700 and 5,100 bbl to be the largest spill size likely to occur from a pipeline or facility, respectively.

The occurrence and frequency of large and very large spills from OCS exploratory and delineation wells was estimated to be 0.003 (mean spill frequency per 1,000 years) and 2.39 x 10^{-5} (mean spill frequency per well), respectively (BOEMRE 2011). The approximate occurrence rates worldwide for very large oil spills are about one for every 270 billion bbl produced (BLM 2012). At Northstar, the statistical frequency of a blowout well leading to a very large oil spill was estimated at 9.4 x 10^{-7} per well drilled for volumes > 130,000 bbl (BLM 2012). Thus, while small spills (<50 bbl) are reasonably likely to occur, very large oil spills are extremely unlikely to occur, and none have occurred on Alaska's North Slope or in the Beaufort Sea to date.

BOEM also released the Final Programmatic EIS for Oil and Gas Leasing Programs in June 2012, which contains a broad assessment of spill probabilities and response techniques for OCS oil and gas activities (BOEM 2012). Using historically high volumes of oil and long durations of release, BOEM provided catastrophic discharge scenarios for OCS program areas and determined that the type of drill rig, timing of drilling, and rig availability to drill a relief well were the primary factors affecting the duration of a very large spill in the Beaufort Sea (BOEM 2012). Based on historical large spills and hypothetical analyses, the probability of a very large spill occurring is very low. BOEM has recently implemented enhancements to its oil spill safety, inspection, and prevention program through research, regulations, and Notices to Lessees.

From 1982 to 2013, a total of 86 exploration wells have been drilled within the Chukchi and Beaufort seas of Alaska's OCS (BOEM 2013). Using the BOEM classification of a large spill, there have been only four large spill incidents (greater than or equal to 1,000 bbl) from U.S. exploration or production platforms from 1974 to 2009 (Anderson et al. 2012). No large spills have occurred on Alaska's OCS from exploration drilling. In 2010, the Deepwater Horizon oil rig exploded and sank causing a loss of well control and releasing an estimated 4.9 million bbl of oil (USCG 2011). This was the largest spill in U.S. history, far exceeding the 257 thousand bbl of North Slope crude spilled by the Tanker Vessel Exxon Valdez.

The large oil spill probabilities estimated by BLM (2012) and BOEMRE (2011; now BOEM) for the Beaufort Sea and Chukchi Sea Planning Areas are still considered valid despite the Deepwater Horizon oil spill. Geologic and other conditions in the Arctic OCS are substantially different from those in the Gulf of Mexico, including much shallower well depth and the resulting lower pressures, such that BOEM currently does not believe that the Deepwater horizon incident serves as a predictor for the magnitude of a very large oil spill event in the Beaufort Sea. Considering the low number of exploratory wells (84) that have occurred in the Beaufort Sea Alaska OCS (BOEMRE 2011), the low rate of exploratory drilling blowouts per well drilled, and the low rate of well control incidents, it is reasonable to conclude that the chance of a very large spill occurring during OCS exploration drilling in the Beaufort is small. In addition, Industry does not plan to conduct drilling operations at more than three exploration sites in the 5-year regulatory period.

Modes of exposure

If polar bears come in contact with spilled substances in the environment, exposure may result from absorption through the skin, ingestion during nursing, grooming, or from eating contaminated prey or snow, or drinking contaminated water. Volatile compounds in petroleum substances would be inhaled by polar bears swimming in or walking in or near an oil spill. Spilled oil can concentrate and accumulate in leads and openings that occur during spring break up and autumn freeze-up periods. Such a concentration of spilled oil would increase the chance that polar bears and their principal prey would be oiled.

Effects of exposure

The effects of exposure to spilled oil or other materials depends on the composition of the substances spilled, the amount and duration of exposure, and the animal's individual physiology. Oiling of the pelt causes significant thermoregulatory problems by reducing the insulation value. Irritation or damage to the skin by oil may further contribute to impaired thermoregulation. In 1980, Canadian scientists performed experiments that studied the effects to polar bears of exposure to oil (Øritsland et al. 1981). The thermal value of the fur decreased significantly after oiling, and oiled bears showed increased metabolic rates and elevated skin temperature. Oiled bears are also likely to ingest oil as they groom to restore the insulation value of the oiled fur. The experimentally oiled bears ingested much oil through grooming. Much of it was eliminated by vomiting and in the feces; some was absorbed and later found in body fluids and tissues.

Ingestion and inhalation of oil can have various physiological effects on polar bears, depending on whether the animal is able to excrete or detoxify the hydrocarbons. Petroleum hydrocarbons irritate or destroy epithelial cells lining the stomach and intestine, thereby affecting motility, digestion, and nutrient absorption. Vapor inhalation by polar bears could result in damage to various systems, such as the respiratory and the central nervous systems, depending on the amount of exposure. Inhalation of highly concentrated vapors, such as gasoline in excess of 10,000 parts per million, is typically fatal (Boesch and Rabalais 1987). At lower concentrations, up to 1,000 parts per million, humans and laboratory animals can develop inflammation, hemorrhaging, and congestion of the lungs (Boesch and Rabalais 1987).

Effects on experimentally oiled polar bears (where bears were forced to remain in oil for prolonged periods) included acute inflammation of the nasal passages, marked epidermal

responses, anemia, anorexia, and biochemical changes indicative of stress, renal impairment (Øritsland et al. 1981). Many effects did not become evident until several weeks after the experiment. Death could occur if a large amount of oil were ingested or if volatile components of oil were inhaled into the lungs. Indeed, two of three bears died in the Canadian experiment, and it was suspected that the ingestion of oil was a contributing factor to the deaths.

Oil may also affect food sources of polar bears. Seals that die during an oil spill could be scavenged by polar bears. This would increase exposure of the bears to hydrocarbons and could result in lethal impact or reduced survival of individual bears. A local reduction in ringed seal numbers from direct or indirect effects of oil could temporarily affect the local distribution of polar bears. A reduction in density of seals as a direct result of mortality from contact with spilled oil could result in polar bears abandoning a particular area for hunting. Possible impacts from the loss of a food source could reduce recruitment and/or survival.

The persistence of toxic subsurface oil and chronic exposures, even at sub-lethal levels, can have long-term effects on wildlife (Peterson et al. 2003). While small numbers of bears may be affected by an oil spill initially, the long-term impact could also be significant. Of particular concern is the toxic and persistent fraction of oil consisting of polycyclic aromatic hydrocarbons (PAHs), which cause a number of toxic effects including cancer. Sublethal effects from chronic exposure to PAHs may suppress the recovery of polar bear populations due to reduced fitness of surviving animals.

Acute exposure to small spills of oil or other compounds could potentially impact small numbers of bears. The effects of fouling fur or ingesting oil or wastes, depending on the amount of oil or wastes involved, could be short-term or result in death. For example, in April 1988, a dead polar bear was found on Leavitt Island, northeast of Oliktok Point. The cause of death was determined to be a mixture of ethylene glycol and Rhodamine B dye (Amstrup et al. 1989). Again, in 2012, two dead polar bears were found on Narwhal Island, northwest of Endicott that had been exposed to Rhodamine B. While those bears' deaths were clearly human-caused, investigations were unable to identify a source for the chemicals. Rhodamine B is commonly used on the North Slope of Alaska by many people for many uses, including Industry. Without identified sources of contamination those bear deaths cannot be attributed to Industry activity.

A large oil spill could affect the rates of recruitment and survival of the SBS polar bear population. If an oil spill killed a small number of bears, the SBS population may be able to survive and continue to sustain current level of subsistence harvest. However, if a large oil spill killed large numbers of polar bears, the SBS population may experience reduced rates of recruitment and survival and subsistence harvest could become unsustainable. Polar bear deaths from an oil spill could be caused by direct exposure to the oil. However, indirect effects, such as a reduction of prey or scavenging contaminated carcasses, could also cause health effects, death, or otherwise affect rates of recruitment and survival. Depending on the type and amount of oil or wastes involved and the timing and location of a spill, impacts could be acute, chronic, temporary, or lethal. In order for the rates of polar bear reproduction, recruitment, or survival to be impacted, a large-volume oil spill would have to take place. The following section analyzes the likelihood and potential effects of such a large-volume oil spill.

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Risk of exposure

Probability of exposure depends on many factors: the origin (location) of a large spill; the volume of a spill; characteristics of the spilled material; accessibility to spill site; spill trajectory; time of year; weather conditions (i.e., wind, temperature, precipitation); environmental conditions (i.e., presence and thickness of ice); importance of affected habitat; and mitigation measures enacted to prevent bears from encountering spilled oil. Polar bears have the greatest risk of exposure from large spills occurring in broken ice or water due to the ability of the oil to be dispersed by wind, currents, and waves, and the difficulty of cleanup.

Probability of exposure varies by demographic group. During the ice-covered season, mobile, non-denning bears would have a higher probability of encountering oil or other production wastes than non-mobile, denning females. In addition, subadult polar bears are more vulnerable to environmental effects than adults (Taylor et al. 1987). Subadult polar bears would be most prone to the lethal and sub-lethal effects of an oil spill due to their proclivity for scavenging (thus increasing their exposure to oiled marine mammals) and their inexperience in hunting. Because of the greater maternal investment a weaned subadult represents, reduced survival rates of subadult polar bears have a greater impact on population growth rate and sustainable harvest than reduced litter production rates (Taylor et al. 1987).

Polar bears are most likely to be exposed to spills during the open-water and broken-ice periods (summer and fall) due to their seasonal use of nearshore habitat. Nearshore and offshore polar bear densities are greatest in fall, and polar bear use of coastal areas during the fall open-water period has increased in recent years in the Beaufort Sea. This change in distribution has been correlated with the distance to the pack ice at that time of year (i.e., the farther from shore the leading edge of the pack ice is, the more bears are observed onshore).

An analysis of data collected from 2001 to 2005 during the fall open-water period concluded: (1) on average approximately 4 percent of the estimated polar bears in the Southern Beaufort population were observed onshore in the fall; (2) 80 percent of bears onshore occurred within 15 km (9.3 mi) of subsistence-harvested bowhead whale carcasses, where large congregations of polar bears have been observed feeding; and (3) sea-ice conditions affected the number of bears on land and the duration of time they spent there (Schliebe et al. 2006). Hence, bears concentrated in areas where beach-cast marine mammal carcasses occur during the fall would likely be more susceptible to oiling. In the Beaufort Sea, these aggregations often form near Point Barrow, Cross Island, and Kaktovik. In recent years, more than 60 polar bears have been observed feeding on whale carcasses just outside of Kaktovik, and in the autumn of 2002, NSB and Service biologists documented more than 100 polar bears in and around Barrow.

Coastal areas provide important denning habitat for polar bears, such as the Arctic National Wildlife Refuge (ANWR) and nearshore barrier islands (containing tundra habitat) (Amstrup 1993, Amstrup and Gardner 1994, Durner et al. 2006, USFWS unpublished data). Sixty-five percent of confirmed terrestrial dens found in Alaska from 1981–2005 were on coastal or island bluffs (Durner et al. 2006). Oiling of such habitats could have negative effects on polar bears, although the specific nature and ramifications of such effects are unknown.

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Minerals Management Service (now BOEM) conducted an analysis of oil spill risk in 2008. This risk assessment was performed by estimating that the likelihood that large spills originating from various North Slope facilities would contact important polar bear habitat areas. Probabilities varied by location, spill trajectory, and time of year and ranged between 0 and 13 percent. The statistical mean number of large spills from oil and gas development in the Beaufort Sea Planning Area was less than one for the period from 2008 to 2028 (MMS 2008).

The Service has conducted an independent risk assessment to estimate oil spill probability for Northstar and Liberty based on an oil spill trajectory model and a polar bear distribution model built from location of satellite-collared females during September and October (68 FR 66744, Nov. 28, 2003, and 71 FR 43926, Aug. 2, 2006). When calculating the probability that a 5,912 bbl spill would affect bears during the annual fall period, we found that oil spills and trajectories were likely to affect less than five bears. For Northstar, the chance that a 5,912 bbl oil spill would result in mortality was 1.0 to 3.4 percent for five or more bears, 0.7 to 2.3 percent for 10 or more bears, and 0.2 to 0.8 percent for 20 or more bears. For Liberty, the probability that a spill would affect five or more bears was 0.3 to 7.4 percent, 0.1 to 0.4 percent for 10 or more bears, and 0.1 to 0.2 percent for 20 or more bears.

As a result of the information considered here, the Service concludes that the likelihood of an offshore spill from a production facility in the next 5 years is low. Moreover, in the unlikely event of a large spill, the likelihood that spills would contaminate areas occupied by large numbers of bears is low. While individual bears could be negatively affected by a spill, the potential for a population level effect is low unless the spill were catastrophically large or contacted an area where large numbers of polar bears were gathered. Both scenarios are unlikely to occur. More likely, smaller spills could cause injury or mortality to small numbers of polar bears, resulting in negligible impacts to the SBS population.

Mitigating factors

The current management practices of Industry and the regulatory requirements of BOEM, BLM, the State of Alaska, the Environmental Protection Agency, and the U.S. Coast Guard include actions to minimize the potential for spills. Measures address the proper use, storage, transport, and disposal of petroleum compounds, wastes, and hazardous materials. The Alaska Department of Environmental Conservation (ADEC) Division of Spill Prevention and Response requires Industry to develop contingency plans that outline methods for preventing, responding to, and executing a cleanup. Details of each operator's prevention programs are located in the contingency plans approved by ADEC (*http://www.dec.state.ak.us/spar/about.htm*). Contingency plans typically include, but are not necessarily limited to, details on the following:

- Well control and emergency shutdown procedures
- Fluid transfer procedures
- Operating requirements for exploration and production facilities
- Storage tank requirements
- Description of secondary containment
- Facility piping corrosion program
- Leak detection system monitoring
- Discharge detection procedures

- Facility inspection and maintenance schedules
- Prevention training programs
- Security programs

Spill response techniques depend on the location, quantity, timing, and characteristics of a spill. Spill detection and monitoring is conducted to locate and track a spill and may use airplane and helicopter surveys, Forward Looking Infrared (FLIR) surveys, Ground Penetrating Radar, tracking buoys, and possibly unmanned aerial and underwater vehicles. Booms and skimmers are used to conduct mechanical containment and recovery wherever possible. Controlled *in situ* burning can quickly and efficiently reduce the volume of a spill. Residue is much less toxic than the original oil, but combustion products in the air must be carefully monitored.

Dispersants reduce the oil/water interfacial tension, thereby decreasing the energy needed for an oil slick to break into small particles and mix into the water column. Dispersed oil droplets are then colonized by bacteria and biodegrade naturally. The biodegradation process may not proceed as quickly in the Arctic, due to cold temperatures and other environmental factors. When used effectively, dispersants may rapidly decrease oil concentration and can help prevent an oil slick from reaching the shore. Dispersants may provide a valuable response option when strong wind and sea conditions make mechanical cleanup and controlled *in situ* burn techniques unsafe and/or ineffective. However, dispersants are unlikely to be effective in the presence of high-density sea-ice cover, due to insufficient mixing energy from waves.

A potential drawback of dispersant use is that toxic PAHs within dispersed oil droplets may be made more bioavailable for uptake by filter feeding plankton and benthic invertebrates and may have harmful effects (e.g., Epstein et al. 2000; Hansen et al. 2012). Pelagic and benthic invertebrates create the base of the Arctic marine food web, and impacts may be transmitted to higher trophic levels through loss of food resources or bioaccumulation of toxins. In the event of a spill, the use of dispersants in the Beaufort Sea may be authorized after careful consideration of these costs and benefits by the Federal or state On-Scene Coordinator with input from the Alaska Regional Response Team, Department of Interior (including the Service), and Department of Commerce.

Oil spill response activities may cause impacts to polar bears in addition to the impacts of the spill. Spill response measures are implemented on a case-by-case basis and are selected to minimize the impacts to human health and safety and the environmental contamination of spills. The Service participates in spill response efforts to minimize effects on polar bears and other protected species. The overall effect on polar bears of spill response activities given a spill are therefore expected to be lower than the level of impact of the spill alone (USFWS 2015c).

Measures identified in the *Alaska Federal/State Preparedness Plan for Response to Oil & Hazardous Substance Discharges/Releases* (ARRT 2010) and its *Wildlife Protection Guidelines for Alaska* (ARRT 2012), together with the Service's updated spill response plan for polar bears (USFWS 2015d) (*http://www.fws.gov/alaska/fisheries/contaminants/spill.htm*) include measures to reduce the chances that polar bear populations would be affected by Industry spills. These documents outline a three-tier strategy:

- **Primary response** for protecting polar bears from an oil spill is to prevent the oil from reaching sensitive areas such as denning sites, feeding sites, or areas where animals are concentrated. Known den sites should be avoided by all personnel at all times to minimize disturbance;
- **Secondary response** is to deter or haze polar bears from the area of the oil slick or contaminated habitat. This response is appropriate under all circumstances and may be incorporated with primary response activities. The degree of risk associated with the animal actually contacting oil before secondary response strategies are initiated should be considered. If the spill occurs when polar bears are believed to be present, an aerial survey should be conducted to locate potentially affected animals; and
- **Tertiary response** is the treatment of polar bears contaminated with oil. The components of tertiary response are the capture, handling, transport, treatment, holding, and release of polar bears. In collaboration with partners, the Service has developed the capacity to attempt the rehabilitation of a small number of oiled bears. The tertiary response involving capture of polar bears may only be undertaken by the Service or with their authorization.

Oil spill response techniques for containing, recovering, and cleaning up oil spills in poor weather and broken ice conditions of the Arctic's marine environments remain untested. Given the uncertainty, spill prevention measures adopted by, and required of Industry are critical for reducing the risk of marine mammal exposures to oil or other spills.

Conclusion

For these proposed ITRs, potential spills from Industry activities would most likely occur onshore associated with pipelines or offshore associated with the marine vessels. Most spills would be localized and relatively small, but offshore spills may be dispersed by wind and waves. Spills in the offshore or onshore environments classified as minor could occur during normal operations (e.g., transfer or transport of fuel or other substances, handling of lubricants and liquid products, and general maintenance of equipment). Small spills may have impacts affecting a small number of polar bears.

Potential large spills in the Beaufort Sea region would likely be associated with drilling platforms or drilling ships. Contingency requirements for drilling platforms and drilling ships require them to have their own containment capability in case of a spill or blowout. Nevertheless, there remains a possibility of catastrophic failure of spill prevention and containment systems. Such an event would have severe impacts to polar bears. Based upon the best information currently available, the Service concludes that the probability of a large catastrophic offshore oil spill in the Beaufort Sea during the period of the proposed ITRs is very small. However, should such an unlikely event occur, the number of polar bears potentially affected is unknown. Variables such as time of year, weather, and polar bear distribution would all influence the number of bears exposed to contamination. Given the wide range and generally low densities of polar bears, it is most likely that only a small number of bears relative to the population would be exposed or affected by such a spill.

The Service is tasked with analyzing and identifying incidental take of small numbers of polar bears and walruses from Industry activities. The proposed ITRs will not affect the polar bear's

risk of exposure to spills. The existing Federal and state requirements for oil spill prevention and clean-up contingency plans, the low probability of occurrence of a large spill, and the likelihood that spills will be small in size and located on terrestrial environments makes impacts to large numbers of polar bears unlikely. Therefore, the Service concludes that any impacts in the event of an operational spill are expected to be limited to a small number of animals. [Top]

Pacific Walrus

Walruses do not use the Beaufort Sea frequently and the likelihood of encountering walruses during Industry operations is low. Industry monitoring data have reported 35 walruses between 1995 and 2012, with only a few instances of disturbance to those walruses (AES Alaska 2015, USFWS unpublished data). Aerial and vessel surveys conducted from 2006 to 2010 found 22 walruses in 10 groups (Funk et al. 2011). From 2009 through 2014 there were no reported interactions between walrus and Industry in the Beaufort Sea ITR region, and no walruses were reported hauling out at Industrial facilities. There is no evidence that there were any physical effects or impacts to individual walruses due to Industry activity. Although interactions are expected to be infrequent, these activities could potentially result in some level of disturbance.

The response of walruses to disturbance stimuli is highly variable. Anecdotal observations by walrus hunters and researchers suggest that males tend to be more tolerant of disturbances than females, and individuals tend to be more tolerant than groups. Females with dependent calves are considered least tolerant of disturbances. Walruses are typically more sensitive to disturbance when hauled out on land or ice than when they are in the water. In the Chukchi Sea, disturbance events are known to cause walrus groups to abandon land or ice haulouts and occasionally result in trampling injuries or cow-calf separations, both of which are potentially fatal. Calves and young animals at terrestrial haulouts are particularly vulnerable to trampling injuries.

Walruses are closely associated with seasonal pack ice during the open water season. When sea-ice is not available, walruses come to shore to rest. Therefore, in evaluating potential impacts of oil and gas activities, broken pack ice and seasonal haul outs may serve as a reasonable predictor of walrus abundance. Activities occurring in or near these habitats are likely to have the greatest potential for impacting walruses. Impacts from noise disturbance, onshore/offshore drilling, vessel/aircraft, physical obstruction, human encounters, and oil/fuel spills are described below.

Noise Disturbance

Walruses hear sounds both in air and in water. Kastelein et al. (1996) tested the in-air hearing of a walrus from 125 hertz (Hz) to 8 kilohertz (kHz) and determined the walrus could hear all frequency ranges tested but the best sensitivity was between 250 Hz and 2 kHz. Kastelein et al. (2002) tested underwater hearing and determined that range of hearing was between 1 kHz and 12 kHz with greatest sensitivity at 12 kHz. The small sample size warrants caution; other pinnipeds can hear up to 40 kHz. Many of the noise sources generated by Industry activities, other than the very high frequency seismic profiling, are likely to be audible to walruses.

Pile driving, ice breaking, drilling, seismic operations, and various other Industry activities introduce substantial levels of noise into the marine environment. Greene et al. (2008) measured underwater and airborne noise from ice road construction, heavy equipment operations, augering,

and pile driving during construction of a gravel island at Northstar. Underwater sound levels from construction ranged from 103 decibels (dB) at 100 m (328 ft) for augering to 143 dB at 100 m (328 ft) for pile driving. Most of the energy of these sounds was below 100 Hz. Airborne sound levels from these activities ranged from 65 dB at 100 m (328 ft) for a bulldozer and 81 dB at 100 m (328 ft) for pile driving. Most of the energy for in-air levels was also below 100 Hz. Airborne sound levels and frequencies typically produced by Industry are unlikely to cause hearing damage unless walruses are very close to the sound source, but may cause disturbance.

In the nearshore waters of the Beaufort Sea, stationary facilities could produce high levels of noise. These include Endicott, BPXA's Saltwater Treatment Plant (located on the West Dock Causeway), Oooguruk, and Northstar facilities. The Liberty project will also have this potential when it commences operations. Previous observations have been reported of walruses hauled out on Northstar Island and swimming near the Saltwater Treatment Plant. In instances where walruses have been seen near these facilities, they have appeared to be attracted to them. In 2007, a female and subadult walrus were observed hauled-out on the Endicott Causeway. From 2009 through 2014 there were no reports of walruses hauling out at Industrial facilities.

Marine mammals in general have variable reactions to noise sources, particularly mobile sources such as marine vessels. Reactions depend on the individual's prior exposure to the disturbance source, their need, or desire to be in the particular habitat or area where they are exposed to the noise, and visual presence of the disturbance source. Potential reactions to noise include displacement from preferred foraging areas, increased stress, energy expenditure, interference with feeding, and masking of communications. The most likely response will be to move away from the source of the disturbance. Potential adverse effects of Industry noise on walruses can be reduced through the implementation of sufficient, practicable monitoring coupled with adaptive management responses. Any impact of Industry noise on walruses is likely to be limited to a few individuals due to their geographic range and seasonal distribution. Walruses typically inhabit the pack ice of the Bering and Chukchi seas and do not often move into the Beaufort Sea.

Seismic Exploration

In the open waters of the Beaufort Sea, seismic surveys and high-resolution site clearance surveys will be the primary source of high levels of underwater sound. Typical source levels associated with underwater marine 3D and 2D seismic surveys are 230-240 dB. Airgun arrays produce broadband frequencies from 10 Hz to 2 kHz with most of the energy concentrated below 200 Hz. Frequencies used for high-resolution oil and gas exploration surveys are typically 200 Hz to 900 kHz. Commercial sonar systems may also generate lower frequency side lobes audible to marine mammals (Deng et al. 2012). Some surveys use frequencies as low as 50 Hz or as high as 2 MHz. Broadband source levels for high resolution surveys can range from 210 to 226 dB at 1 m. Sound attenuates in air more rapidly than in water, and underwater sound levels can be loud enough to cause hearing loss in nearby animals and disturbance of animals at greater distances.

Acoustic injuries from high levels of sound such as those produced during seismic surveys manifest in the form of temporary or permanent changes in hearing sensitivity. The underwater hearing abilities of the Pacific walrus have not been studied sufficiently to develop species-specific criteria for preventing harmful exposure. Sound pressure level thresholds have been

developed for other members of the pinniped taxonomic group, above which exposure is likely to cause behavioral responses and injuries.

Historically, NOAA has used 190 dB_{rms} as a threshold for predicting injury to pinnipeds and 160 dB_{rms} as a threshold for behavioral impacts from exposure to impulse noise (NOAA 1998; HESS 1999). The behavioral response threshold was developed based primarily on observations of marine mammal responses to airgun operations (e.g., Malme et al. 1983; Richardson et al. 1986, 1995). Southall et al. (2007) assessed relevant studies, found considerable variability among pinnipeds, and determined that exposures between 90 and 140 dB generally do not appear to induce strong behavioral responses in pinnipeds in water, but an increasing probability of avoidance and other behavioral effects exists in the in the range from 120 to 160 dB.

The NOAA 190-dB_{rms} injury threshold is an estimate of the sound level likely to cause a permanent shift in hearing threshold (permanent threshold shift or PTS). This value was modelled from temporary threshold shifts (TTS) observed in pinnipeds (NOAA 1998, HESS 1999). More recently, Kastak et al. (2005) found exposures resulting in TTS in pinniped test subjects ranging from 152 to 174 dB (183 to 206 dB SEL). Southall et al. (2007) reviewed the literature and derived behavior and injury thresholds based on peak sound pressure levels of 212 dB (peak) and 218 dB (peak) respectively. Because onset of TTS can vary in response to duration of exposure, Southall et al. (2007) also derived thresholds based on sound exposure levels (SEL). Sound exposure level can be thought of as a composite metric that represents both the magnitude of a sound and its duration. The study proposed threshold SELs weighted at frequencies of greatest sensitives for pinnipeds of 171 dB SEL and 186 dB SEL for behavioral impacts and injury respectively (Southall et al. 2007). Reichmuth et al. (2008) demonstrated a persistent TTS, if not a PTS, after 60 seconds of 184 dB SEL. Kastelein (2012) found small but statistically significant TTS at approximately 170 dB SEL (136 dB, 60 min) and 178 dB SEL (148 dB, 15 min).

Based on these data, and applying a precautionary approach in the absence of empirical information, we assume it is possible that walruses exposed to 190 dB or greater sound levels from underwater activities (especially seismic surveys) could suffer injury from PTS. Walruses exposed to underwater sound pressure levels greater than 180 dB could suffer temporary shifts in hearing thresholds. Repeated or continuous exposure to sound levels between 160 and 180 dB may also result in TTS, and exposures above 160 dB are more likely to elicit behavioral responses than lower level exposures. Therefore, to protect walruses from potentially injurious sound exposures, the Service has adopted the measures described in the Mitigation Measures section (page 67).

The Service's underwater sound mitigation measures include employing protected species observers (PSOs) to establish and monitor 160-dB, 180-dB, and 190-dB isopleth mitigation zones centered on any underwater sound source greater than 160 db. The 180-dB zone shall be free of walruses, and 190-dB zone free of polar bears, before the sound-producing activity can begin. These zones must remain free of marine mammals during the activity. The proposed ITRs incorporate slight changes in the mitigation zones when compared to previous ITRs for the region. Previous ITRs have required separate actions for groups of greater than 12 walruses. Industry activities are unlikely to encounter large aggregations of walruses in the Beaufort Sea.

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This stipulation was originally developed for, and is more applicable to mitigation of impacts to walruses in the Chukchi Sea and is not likely to be applicable in the Beaufort Sea. The purpose of these mitigation zones is to protect walruses from Level A harassment (injury/harm) and to reduce the incidence and severity of Level B harassment (disturbance).

The acoustic thresholds for marine mammals under NOAA's jurisdiction are currently being revised and are available in draft form (NOAA 2015, NOAA 2016). New thresholds will estimate PTS onset levels for impulsive (e.g., airguns, impact pile drivers) and non-impulsive (e.g., sonar, vibratory pile drivers) sound sources. Thresholds will be specific to marine mammal functional hearing groups; separate thresholds for otariid and phocid pinnipeds will be adopted. Auditory weighting functions will be incorporated into calculation of PTS threshold levels. The updated acoustic thresholds will also account for accumulation of injury due to repeated or ongoing exposure by adopting dual metrics of sound (cumulative sound exposure level and peak sound pressure level). The updated criteria will not provide specification for modeling sound exposures from various activities. They will not update thresholds for preventing behavioral responses, nor will they provide any new information regarding the Pacific walrus.

Once NOAA's new criteria for preventing harm to marine mammals from sound exposure are finalized, the Service will evaluate the new thresholds for applicability to walruses. In most cases, the Service's existing thresholds for Pacific walrus will result in greater separation distances or shorter periods of exposure to Industry sound sources than would NOAA's new pinniped thresholds. Assuming walrus hearing sensitivities are similar to other pinnipeds, the Service's sound exposure thresholds are, in some situations, likely to be more conservative than necessary to prevent injury from PTS and TTS. However, animals may be exposed to multiple stressors beyond acoustics during an activity, with the possibility of additive or synergistic effects (e.g., Crain et al. 2008). The Service's mitigation measures have been developed to prevent acoustic injury as well as to minimize the probability that noise exposures will cause behavioral reactions with harmful effects.

To reduce the likelihood of Level B harassment, and prevent behavioral responses capable of causing Level A harassment, the Service has established an 805-m (0.5-mi) operational exclusion zone around groups of walruses feeding in water or any walrus observed on land or ice. As mentioned previously, walruses show variable reactions to noise sources. Low-level reactions, such as increased vigilance, are not likely to disrupt a biologically important behavioral pattern, and therefore do not reach the level of harassment, as defined by the MMPA. However, higher-level reactions have been demonstrated in response to noise. Monitoring efforts in the Chukchi Sea suggest that icebreaking activities can displace some walrus groups up to several kilometers away (Brueggeman et al. 1990). Approximately 25 percent of walrus groups on pack ice responded by diving into the water, and most reactions occurred within 1 km (0.6 mi) of the ship (Brueggeman et al. 1991). Reactions such as fleeing a haulout or departing a feeding area may disrupt behavioral patterns, including nursing, feeding, and resting, and may result in decreased fitness for the affected animal. These reactions meet the criteria for Level B harassment under the MMPA. Industrial activities producing high levels of noise or occurring in close proximity also have the potential to illicit extreme reactions (Level A harassment) including separation of mothers from young or instigation of stampedes. However, most groups of hauled out walruses showed little reaction to icebreaking activities beyond 800 m (0.5 mi; Brueggeman et al. 1990).

Because seismic operations are expected to move throughout nearshore regions of the Beaufort Sea, impacts are likely to be distributed in time and space and to have relatively localized, short term effects. Surveys are typically carried out away from the edge of the seasonal pack ice. This will minimize potential interactions with large concentrations of walruses, which typically favor sea ice habitats. The mitigation measures stipulated in the ITRs will require seismic survey vessels and associated support vessels to apply acoustic mitigation zones, maintain an 805-m (0.5-mi) distance from Pacific walrus groups, introduce noise gradually by implementing ramp-up procedures, and to maintain a 457-m (1,500-foot) minimum altitude above walruses. These measures are expected to reduce the intensity of disturbance events and to minimize the potential for injuries to animals. With the low occurrence of walruses in the Beaufort Sea and the adoption of the mitigation measures described in the Mitigation Measures section (page 67), the Service concludes that the only anticipated effects from Industry noise in the Beaufort Sea would be short-term behavioral alterations of small numbers of walruses.

Offshore Drilling and Vessel Traffic

The sight, sound, or smell of humans and machines could potentially displace walruses from any ice haulouts near drilling operations and vessel traffic. The reaction of walruses to vessel traffic is dependent upon vessel type, distance, speed, and previous exposure to disturbances. Richardson et al. (1995) reviewed various studies on walrus reactions to ships and boats and summarized that walrus responses depend strongly on distance from and speed of a ship and previous exposure to hunting; some studies reported no reaction, while other studies showed that high frequency noise from outboards may be more disturbing than low frequency noise from diesel engines. Fay et al. (1984) reported that walruses in water appear to be less readily disturbed by vessels than walruses hauled out on land or ice, and that walruses in the water showed little concern about an approaching vessel. Fay observed that when a ship was stationary, walruses often swam to within 20 m (66 ft) and frequently dove under the ship and surfaced on the other side. In 2009, during Industry activities in the Chukchi Sea, an adult walrus was found hauled out on the stern of a vessel. It eventually left once confronted.

Drilling operations are expected to involve drill ships attended by icebreaking vessels to manage incursions of sea ice. Ice management operations are expected to have the greatest potential for disturbances since walruses are more likely to be encountered in sea ice habitats. Ice management operations also typically require the vessel to accelerate, reverse direction, and turn rapidly thereby maximizing propeller cavitation and resulting noise levels. Previous monitoring efforts in the Chukchi Sea suggest that icebreaking activities can displace some walrus groups up to several kilometers away, however most groups of hauled out walruses showed little reaction beyond 800 m (0.5 mi) (Brueggeman et al. 1990). Monitoring programs associated with exploratory drilling operations in the Chukchi Sea since 1990 reported that approximately 25 percent of walrus groups encountered in the pack ice during icebreaking responded by diving into the water, with most reactions occurring within 1 km (0.6 mi) of the ship. In one such report, Brueggeman et al. (1991) noted that: (1) walrus and polar bear distributions were closely linked with pack ice; (2) pack ice was near active prospects for relatively short time periods; and (3) ice passing near active prospects contained relatively few animals.

Few walruses are found in the Beaufort Sea. Barges and vessels associated with Industry usually travel in open water, avoiding large ice floes or land where walruses are likely to be found.

Therefore, the only short-term behavioral impacts to small numbers of walruses in the vicinity of active operations are expected. Adoption of mitigation measures that include an 805-m (0.5-mi) exclusion zone for marine vessels around walruses observed on ice or in water are expected to reduce the intensity of disturbance events and minimize the potential for injuries to animals.

Aircraft Traffic

Aircraft overflights may disturb walruses. Reactions to aircraft vary with range, aircraft type, and flight pattern, as well as walrus age, sex, group size, and previous exposure to disturbances. Richardson et al. (1995) reviewed responses of walruses to aircraft and summarized that individual responses to aircraft can range from orientation (i.e., looking at the aircraft) to abandoning a haulout. Fixed-winged aircraft are less likely to elicit a response than helicopter overflights. Walruses are particularly sensitive to changes in engine noise and are more likely to stampede when planes turn or fly low overhead. Researchers conducting aerial surveys for walruses in sea-ice habitats have observed little reaction to fixed-winged aircraft above 457 m (1,500 ft) (USFWS unpublished data). There are no known haul-outs located in the area of activity and generally there is a low occurrence of walruses in the Beaufort Sea. Therefore, aircraft traffic will likely have no more than a negligible impact, if any, on individuals or the walrus population.

Physical Obstruction

Based on known walrus distribution and the very low numbers found in the Beaufort Sea, it is unlikely that walrus movements would be displaced by offshore stationary facilities, such as the Northstar Island or causeway-linked Endicott complex, or vessel traffic. There is no indication that the few walruses that used Northstar Island as a haulout in the past were displaced from their movements. Vessel traffic could temporarily interrupt the movement of walruses, or displace some animals when vessels pass through an area. This displacement would probably have minimal or no effect on animals and would last no more than a few hours.

Human Encounters

Human encounters with walruses could occur in the course of Industry activities, although such encounters would be rare due to the limited number of walruses in the Beaufort Sea. In 2004, a suspected orphaned calf hauled out on Northstar Island numerous times over a 48-hour period, causing Industry to cease some activities before it disappeared in stormy seas. Additionally, a walrus calf was observed for 15 minutes during an exploration program at Cape Simpson in 2006. From 2009 through 2014 there were no Industry reports of similar interactions with walruses. In the event that an individual or small group of walrus is encountered on a stationary facility, the oil and gas industry will record and report the interaction and implement the necessary precautions to minimize any effect. Vessels that encounter walruses typically divert around the animals wherever practical and make every effort to avoid disturbing the animals. Of 35 walruses encountered during Industry monitoring between 1995 and 2012, only a few instances of disturbance were observed. Given the small number of walruses in the Beaufort Sea, human encounters are expected to have no more than a negligible impact.

Prey

Walruses feed primarily on immobile benthic invertebrates. The effect of Industry activities on benthic invertebrates most likely would be from oil discharged into the environment. Oil has the potential to impact walrus prey species in a variety of ways including, but not limited to mortality due to smothering or toxicity, perturbations in the composition of the benthic community, and altered metabolic and growth rates. Dispersed oil or *in situ* burn residues may smother or contaminate benthic invertebrates, causing loss of food resources or reduction in food quality available to walruses.

Because walrus feed primarily on mollusks, they may vulnerable to exposure to toxins through the food chain. The oil constituents of toxic concern are PAHs. Bivalve mollusks are not effective at processing PAHs, resulting in highly concentrated accumulations and long-term retention of contamination within these organisms. Higher-level organisms like walruses readily metabolize these PAHs when contaminated food is digested, which could result in chronic exposure to carcinogenic metabolites. Furthermore, complete recovery of a bivalve mollusk population may take 10 years or more, forcing walruses to find other food resources or move to other areas.

The low likelihood of an oil spill large enough to affect prey populations (see the Oil/Fuel Spills section), combined with the fact that walruses are not present in the region during the ice-covered season and occur only infrequently during the open-water season, indicates that Industry activities will likely have limited indirect effects on walruses through effects on prey.

Oil/Fuel Spills

The MMPA does not authorize the incidental take of marine mammals resulting from illegal actions, such as spills of oil, fuel, or other hazardous substances used by Industry. The proposed issuance of ITRs for Pacific walruses would not alter the likelihood that illegal spills could occur. However, we considered the full suite of potential impacts of Industry actions in order to understand the effects of the ITRs on walruses given other potential stressors in the environment.

Sources of spills

Spills from Industry activities would most likely occur onshore associated with pipelines or offshore associated with the marine vessels. Onshore spills would have minimal impact to walruses. Spills in the offshore or nearshore environments could occur during normal operations (e.g., transfer or transport of fuel or other substances, handling of lubricants and liquid products, and general maintenance of equipment). Potential large spills in the Beaufort Sea region would likely be associated with drilling platforms or drilling ships. Larger spills associated with oil and gas activities on the North Slope have been primarily associated with production activities, as opposed to exploration or development, and have occurred at production facilities or pipelines connecting wells to the TAPS. See the Sources of spills discussion in section 4.2.1 for estimated probabilities of spills based on prior occurrences.

Modes and Effects of Exposure

In the event of a spill that occurs during the open-water season, oil in the water column could drift offshore and possibly be encountered by walruses. Oil spills from nearshore platforms could also contact walruses under certain conditions. Oil spilled on or under ice could become part of the ice substrate and be eventually released back into the environment during the following open-water season. Effects of exposure would depend on the particular conditions of a spill event and the physiology of the affected animal.

Little is known about the effects of oil specifically on walruses as no studies have been conducted. Hypothetically, walruses may react to oil much like other pinnipeds. Walruses have thick skin and blubber layers for insulation and very little hair. If ingested, oil can damage red blood cells, suppress immune systems, strain the liver, spleen, and kidneys, and interfere with the reproductive system of animals (Australian Maritime Safety Authority 2002). They exhibit no grooming behavior, which lessens their chance of ingesting oil. Heat loss is regulated by control of peripheral blood flow through the animal's skin and blubber. Direct exposure of walruses to oil is not believed to have any effect on the insulating capacity of their skin and blubber, although it is unknown if oil could affect their peripheral blood flow. Damage to the skin of pinnipeds can occur from contact with oil because some of the oil penetrates into the skin, causing inflammation and death of some tissue. The dead tissue is discarded, leaving behind an ulcer. While these skin lesions have only rarely been found on oiled seals, the effects on walruses may be greater because of a lack of hair to protect the skin. Like other pinnipeds, walruses are susceptible to oil contamination in their eyes. Direct exposure to oil can also result in conjunctivitis. Continuous exposure to oil will quickly cause permanent eye damage.

Inhalation of hydrocarbon fumes at the water’s surface could be fatal. In studies conducted on pinnipeds, pulmonary hemorrhage, inflammation, congestion, and nerve damage resulted after exposure to concentrated hydrocarbon fumes. If walruses were also under stress from molting, pregnancy, etc., the increased heart rate associated with the stress would circulate the hydrocarbons more quickly, lowering the tolerance threshold for ingestion or inhalation.

Walrus calves may be particularly vulnerable to effects of oil contamination. Female walruses with calves are very attentive, and the calf will stay close to its mother at all times, including when the female is foraging for food. It is possible that an oiled calf will be unrecognizable to its mother either by sight or by smell, and will be abandoned (Australian Maritime Safety Authority 2002). However, an even greater threat may come from an oiled calf that is unable to swim away from the contamination and a devoted mother that would not leave without the calf, resulting in the potential mortality of both animals.

Risk of exposure

The greatest risk of exposure is from large spills occurring in broken ice or open water during the late summer when walruses are most likely to be present in the Beaufort Sea. The tendency to congregate increases the potential for harmful effects from spills. Rarely would a single walrus be affected, but instead, all walruses in a spill zone would be exposed. Noise from activities during spill response may trigger walruses at a haulout to stampede, resulting in injury or death.

The relative importance of oil and gas development and the associated risk of spills to walrus survival were evaluated in relation to other potential threats in Bayesian belief network models developed by Garlich-Miller et al. (2011). These models incorporate three key elements; (1) important explanatory and response variables, (2) cause and effect relationships, and (3) probabilities representing the belief that a variable will be in a given state. These models are useful for formalizing and quantifying the opinions of experts (Marcot et al. 2006). Factors affecting walrus survival and recovery were ranked in order of importance. The most important factors influencing rankings were changes in harvest levels, followed by greenhouse gas emissions, predation, disease, shipping, oil and gas development, other removals, and commercial fishing. Oil and gas development was considered to be two times more important than commercial fishing or shipping. The resulting mean probability estimate for negative effects on the population (a measure of relative contribution of each stressor) from oil and gas development was 0.12 (0.1 - 0.2) compared with 19.3 (17 - 20.8) for harvest (Garlich-Miller et al. 2011). The small number of walruses in the Beaufort Sea and the low potential for large oil spills (see the Sources of spills in section 4.2.1) limits risk of exposure to spills. Walruses in the Beaufort Sea may be at greater risk in the future due to expanded Arctic shipping.

Mitigating Factors

Standard practices of Industry and oversight requirements of agencies address the proper use, storage, transport, and disposal of petroleum compounds, wastes, and hazardous materials for spill prevention. In the event of a spill, contingency plans are in place for minimizing impacts and executing cleanups (see discussion of Mitigating factors under section 4.2.1). Spill response measures are implemented on a case-by-case basis and are selected to minimize the impacts to human health and safety and the environmental contamination of spills (ARRT 2010; ARRT 2012). In the unlikely event there is an oil spill and walruses are in the affected area, mitigation measures such as those to deflect and deter animals from spilled areas may be implemented based on site-specific circumstances. A discussion of response for walruses is found at: *https://dec.alaska.gov/spar/ppr/plans/uc/Annex%20G%20(Oct%202012).pdf*.

Oil spill response activities may cause impacts to walruses in addition to the impacts of the spill. These include limitations on approach distances to haulouts for vessels and aircraft, guidance for use of deterrence techniques, and best management practices for avoiding use of dispersants near shore and near concentrations of wildlife. The overall effect on walruses of spill response activities given a spill are therefore expected to be lower than the level of impact of the spill alone (USFWS 2015c).

Conclusion

Although oil/fuel spills have the potential to cause adverse impacts to walruses and their prey, typical spills associated with the proposed Industry activities are not considered a major threat to walruses. Most operational spills would likely be of a relatively small volume, and occur in areas where walrus numbers are expected to be low. Adoption of mitigation measures that require both oil spill prevention and response plans reduce both the risk and scale of potential spills. Therefore, impacts associated with an operational spill are expected to be limited to a small number of animals relative to the size of the population. Given the small number of walruses present in the Beaufort Sea, the low probability of a large oil or production waste spill, and the measures that will be taken to mitigate the impact of any spill, it is not anticipated that oil and

production waste spills will have a significant impact on individual walruses or the Alaska walrus stock as a whole.

Mitigation Measures

Measures to mitigate potential effects of oil and gas activities on polar bear and walrus resources and subsistence use of those resources have been identified and developed through previous ITRs and implemented through stipulations in individual LOAs. Mitigation measures will vary depending upon the type of industry activity, the location, time of year, and other factors. Coverage under an LOA is contingent upon compliance with the conditions of the LOA. Mitigation measures would apply in addition to those required by other permitting agencies such as the State of Alaska, BLM, or BOEM. Any conflicting stipulations must be resolved by the applicant. The following measures are required, if applicable to a project.

(a) Mitigation measures for all LOAs: Holders of an LOA must utilize policies and procedures to conduct activities in a manner that minimizes to the greatest extent practicable adverse impacts on Pacific walruses and/or polar bears, their habitat, and on the availability of these marine mammals for subsistence uses. Adaptive management practices, such as temporal or spatial activity restrictions in response to the presence of marine mammals in a particular place or time or the occurrence of Pacific walruses and/or polar bears engaged in a biologically important activity (e.g., resting, feeding, denning, or nursing, among others) must be used to avoid interactions with and minimize impacts to these animals and their availability for subsistence uses.

(1) All holders of an LOA must:

(i) Cooperate with the Service's Marine Mammals Management Office and other designated Federal, state, and local agencies to monitor and mitigate the impacts of oil and gas industry activities on Pacific walruses and polar bears.

(ii) Designate trained and qualified personnel to monitor for the presence of Pacific walruses and/or polar bears, initiate mitigation measures, and monitor, record, and report the effects of oil and gas industry activities on Pacific walruses and/or polar bears.

(iii) Have an approved Pacific walrus and/or polar bear safety, awareness, and interaction plan on file with the Service's Marine Mammals Management Office and onsite, and polar bear awareness training will also be required of certain personnel. Interaction plans must include:

(A) The type of activity and, where and when the activity will occur (i.e., a summary of the plan of operation);

(B) A food, waste, and other "bear attractants" management plan;

(C) Personnel training procedures, procedures, and materials;

(D) Site specific walrus and/or polar bear interaction risk evaluation and mitigation measures;

(E) Walrus and polar bear avoidance and encounter procedures; and

(F) Walrus and polar bear observation and reporting procedures.

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(2) All applicants for an LOA must contact affected subsistence communities and hunter organizations to discuss potential conflicts caused by the proposed activities and provide the Service documentation of communications as described in 50 CFR 18.124.

(b) Mitigation measures for onshore activities. Efforts to minimize disturbance around known polar bear dens. Holders of an LOA must take efforts to limit disturbance around known polar bear dens.

(1) Efforts to locate polar bear dens. Holders of an LOA seeking to carry out onshore activities in known or suspected polar bear denning habitat during the denning season (November–April) must make efforts to locate occupied polar bear dens within and near proposed areas of operation, utilizing appropriate tools, such as FLIR surveys and/or polar bear scent-trained dogs. All observed or suspected polar bear dens must be reported to the Service prior to the initiation of activities.
(2) Exclusion zone around known polar bear dens. Operators must observe a 1.6 km (1-mi) operational exclusion zone around all known or suspected polar bear dens during the denning season (November–April, or until the female and cubs leave the areas). Should previously unknown occupied dens be discovered within 1.6 km (1 mi) of activities, work must cease and the Service contacted for guidance. The Service will evaluate these instances on a case-by-case basis to determine the appropriate action. Potential actions may range from cessation or modification of work to conducting additional monitoring, and the holder of the authorization must comply with any additional measures specified.
(3) The use of den habitat map developed by the USGS. A map of potential coastal polar bear denning habitat can be found at: *http://alaska.usgs.gov/science/biology/polar_bears/pubs.html*. This measure ensures that the location of potential polar bear dens is considered when conducting activities in the coastal areas of the Beaufort Sea.
(4) Restricting the timing of the activity to limit disturbance around dens.

(c) Mitigation measures for operational and support vessels.

(1) Operational and support vessels must be staffed with dedicated marine mammal observers to alert crew of the presence of walruses and polar bears and initiate adaptive mitigation responses.
(2) At all times, vessels must maintain the maximum distance possible from concentrations of walruses or polar bears. Under no circumstances, other than an emergency, should any vessel approach or operate within an 805-m (0.5-mi) radius of walruses or polar bears observed on land or ice.
(3) Vessel operators must take every precaution to avoid harassment of concentrations of feeding walruses when a vessel is operating near these animals. Vessels should reduce speed and maintain a minimum 805-m (0.5-mi) operational exclusion zone around feeding walrus groups. Vessels may not be operated in such a way as to separate members of a group of walruses from other members of the group. When

weather conditions require, such as when visibility drops, vessels should adjust speed accordingly to avoid the likelihood of injury to walruses.

(4) Incidental take during transit to or operation within the Beaufort Sea ITR region is not authorized prior to July 1. This operating condition is intended to allow walruses the opportunity to disperse from the confines of the spring lead system and minimize interactions with subsistence walrus hunters. Exemption waivers to this operating condition may be issued by the Service on a case–by–case basis, based upon a review of seasonal ice conditions and available information on walrus and polar bear distributions in the area of interest.

(5) All vessels shall avoid areas of active or anticipated walrus or polar bear subsistence hunting activity as determined through community consultations.

(6) The use of trained marine mammal monitors associated with marine activities. We may require a monitor on the site of the activity or on board drill ships, drill rigs, aircraft, icebreakers, or other support vessels or vehicles to monitor the impacts of Industry's activity on polar bear and Pacific walruses.

(d) Mitigation measures for aircraft.

(1) Operators of support aircraft should, at all times, conduct their activities at the maximum distance possible from concentrations of walruses or polar bears.

(2) Under no circumstances, other than an emergency, should aircraft operate at an altitude lower than 457 m (1,500 ft) within 805 m (0.5 mi) of walruses or polar bears observed on ice or land. Helicopters may not hover or circle above such areas or within 805 m (0.5 mi) of such areas. When weather conditions do not allow a 457 m (1,500 ft) flying altitude, such as during severe storms or when cloud cover is low, aircraft may be operated below the 457 m (1,500 ft) altitude stipulated above. However, when aircraft are operated at altitudes below 457 m (1,500 ft) because of weather conditions, the operator must avoid areas of known walrus and polar bear concentrations and should take precautions to avoid flying directly over or within 805 m (0.5 mi) of these areas.

(3) Plan all aircraft routes to minimize any potential conflict with active or anticipated walrus or polar bear hunting activity as determined through community consultations.

(e) Mitigation measures for sound producing offshore activities. Any offshore activity expected to produce constant or pulsed underwater sounds with received sound levels ≥160 dB re 1 μPa will be required to establish and monitor acoustically verified mitigation zones surrounding the sound source and implement adaptive mitigation measures as follows:

(1) Mitigation zones.

(i) A walrus mitigation zone where the pulsed or constant received sound level would be ≥ 160 dB re 1 μPa;

(ii) A walrus mitigation zone where the received pulsed sound level would be ≥ 180 dB re 1 μPa; and

(iii) A walrus or polar bear mitigation zone where the received pulsed sound level would be ≥ 190 dB re 1 μPa.

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(2) Adaptive mitigation measures.

(i) Ramp-up procedures. For all sound sources, including sound source testing, the following sound ramp-up procedures must be used to allow walruses and polar bears to depart the mitigation zones:

(A) Visually monitor the mitigation zones and adjacent waters for walruses and polar bears for at least 30 minutes before initiating ramp-up procedures. If no walruses or polar bears are detected, ramp-up procedures may begin. Do not initiate ramp-up procedures when mitigation zones are not observable (e.g., at night, in fog, during storms or high sea states, etc.).

(B) Initiate ramp-up procedures by activating a single, or least powerful, sound source, in terms of energy output and/or volume capacity.

(C) Continue ramp-up by gradually increasing sound output over a period of at least 20 minutes, but no longer than 40 minutes, until the desired operating level of the sound source is obtained.

(ii) Power down. Immediately power down a sound source when:

(A) One or more walruses is observed or detected within the area delineated by the constant sound ≥ 160 dB re 1 μPa walrus mitigation zone;

(B) One or more walruses is observed or detected within the area delineated by the pulsed sound ≥ 180 dB re 1 μPa walrus mitigation zone; and

(C) One or more walruses or polar bears are observed or detected within the area delineated by the pulsed sound ≥ 190 dB re 1 μPa walrus or polar bear mitigation zone.

(iii) Shut down.

(A) If the power down operation cannot reduce the received constant sound level to < 160 dB re 1 μPa (walrus) or received pulsed sound level to < 180 dB re 1 μPa (walrus) or < 190 dB re 1 μPa (walrus or polar bear), the operator must immediately shut down the sound source.

(B) If observations are made or credible reports are received that one or more walruses or polar bears within the area of the sound source activity are believed to be in an injured or mortal state, or are indicating acute distress due to received sound, the sound source must be immediately shut down and the Service contacted. The sound source will not be restarted until review and approval has been given by the Service. The ramp-up procedures must be followed when restarting.

(f) Mitigation measures for the subsistence use of walruses and polar bears. Holders of Letters of Authorization must conduct their activities in a manner that, to the greatest extent practicable, minimizes adverse impacts on the availability of Pacific walruses and polar bears for subsistence uses.

(1) Community Consultation. Prior to receipt of an LOA, applicants must consult with potentially affected communities and appropriate subsistence user organizations to discuss potential conflicts with subsistence walrus and polar bear hunting caused by the location, timing, and methods of proposed operations and support activities (see §18.124 for details). If community concerns suggest that the proposed activities may

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have an adverse impact on the subsistence uses of these species, the applicant must address conflict avoidance issues through a Plan of Cooperation as described below.

(2) Plan of Cooperation (POC). When appropriate, holders of LOAs will be required to develop and implement a Service-approved POC. The POC must include:
   (i) A description of the procedures by which the holder of the LOA will work and consult with potentially affected subsistence hunters; and
   (ii) A description of specific measures that have been or will be taken to avoid or minimize interference with subsistence hunting of walruses and polar bears and to ensure continued availability of the species for subsistence use.

(3) The Service will review the POC to ensure that any potential adverse effects on the availability of the animals are minimized. The Service will reject POCs if they do not provide adequate safeguards to ensure the least practicable adverse impact on the availability of walruses and polar bears for subsistence use.

(g) Monitoring requirements. Holders of an LOA will be required to:

(1) Develop and implement a site-specific, Service approved, marine mammal monitoring and mitigation plan to monitor and evaluate the effectiveness of mitigation measures and the effects of activities on walruses, polar bears, and the subsistence use of these species.

(2) Provide trained, qualified, and Service-approved on-site observers to carry out monitoring and mitigation activities identified in the marine mammal monitoring and mitigation plan.

(3) For offshore activities, provide trained, qualified, and Service-approved observers on board all operational and support vessels to carry out monitoring and mitigation activities identified in the marine mammal monitoring and mitigation plan. Offshore observers may be required to complete a marine mammal observer training course approved by the Service.

(4) Cooperate with the Service and other designated Federal, state, and local agencies to monitor the impacts of oil and gas activities on walruses and polar bears. Where insufficient information exists to evaluate the potential effects of proposed activities on walruses, polar bears, and the subsistence use of these species, holders of an LOA may be required to participate in joint monitoring and/or research efforts to address these information needs and insure the least practicable impact to these resources.

(h) Reporting requirements. Holders of LOA must report the results of monitoring and mitigation activities to the Service's Marine Mammals Management Office via email at: FW7_MMM_REPORTS@FWS.GOV.

(1) In-season monitoring reports.
   (i) Activity progress reports. Holders of an LOA must:
      (A) Notify the Service at least 48 hours prior to the onset of activities;
      (B) Provide the Service weekly progress reports of any changes in activities and/or locations; and
      (C) Notify the Service within 48 hours after ending of activities.

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(ii) Walrus observation reports. Holders of an LOA must report, on a weekly basis, all observations of walruses during any Industry activity. Upon request, monitoring report data must be provided in a common electronic format (to be specified by the Service). Information in the observation report must include, but is not limited to:
(A) Date, time, and location of each walrus sighting;
(B) Number of walruses;
(C) Sex and age (if known);
(D) Observer name and contact information;
(E) Weather, visibility, sea state, and sea-ice conditions at the time of observation;
(F) Estimated range at closest approach;
(G) Industry activity at time of sighting;
(H) Behavior of animals sighted;
(I) Description of the encounter;
(J) Duration of the encounter; and
(K) Mitigation actions taken.

(iii) Polar bear observation reports. Holders of an LOA must report, within 48 hours, all observations of polar bears and potential polar bear dens, during any Industry activity. Upon request, monitoring report data must be provided in a common electronic format (to be specified by the Service). Information in the observation report must include, but is not limited to:
(A) Date, time, and location of observation;
(B) Number of bears;
(C) Sex and age (if known);
(D) Observer name and contact information;
(E) Weather, visibility, sea state, and sea-ice conditions at the time of observation;
(F) Estimated closest distance of bears from personnel and facilities;
(G) Industry activity at time of sighting;
(H) Possible attractants present;
(I) Bear behavior;
(J) Description of the encounter;
(K) Duration of the encounter; and
(L) Mitigation actions taken.

(2) Notification of LOA incident report. Holders of an LOA must report, as soon as possible, but within 48 hours, all LOA incidents during any Industry activity. An LOA incident is any situation when specified activities exceed the authority of an LOA, when a mitigation measure was required but not enacted, or when injury or death of a walrus or polar bear occurs. Reports must include:
(i) All information specified for an observation report;
(ii) A complete detailed description of the incident; and
(iii) Any other actions taken.

(3) Final report. The results of monitoring and mitigation efforts identified in the marine mammal monitoring and mitigation plan must be submitted to the Service for review within 90 days of the expiration of an LOA, or for production LOAs, an annual report

by January 15th of each calendar year. Upon request, final report data must be provided in a common electronic format (to be specified by the Service). Information in the final (or annual) report must include, but is not limited to:

(i) Copies of all observation reports submitted under the LOA;
(ii) A summary of the observation reports;
(iii) A summary of monitoring and mitigation effort including areas, total hours, total distances, and distribution;
(iv) Analysis of factors affecting the visibility and detectability of walruses and polar bears during monitoring;
(v) Analysis of the effectiveness of mitigation measures;
(vi) Analysis of the distribution, abundance, and behavior of walruses and/or polar bears observed; and
(vii) Estimates of take in relation to the specified activities.

Monitoring and Reporting

The purpose of the requirements in parts (g) and (h) above, is to assess the effects of industrial activities on walruses and polar bears and to ensure that take is consistent with that anticipated in the negligible impact and subsistence use analyses, and to detect any unanticipated effects on the species. Monitoring plans document when and how bears and walruses are encountered, the number of bears and walruses, and their behavior during the encounter. This information allows the Service to measure encounter rates and trends of walruses and polar bears activity in the industrial areas (such as numbers and gender, activity, seasonal use) and to estimate numbers of animals potentially affected by Industry. Monitoring plans are site-specific, dependent on the proximity of the activity to important habitat areas, such as den sites, travel corridors, and food sources; however, all activities are required to report all sightings of walruses and polar bears. To the extent possible, monitors will record group size, age, sex, reaction, duration of interaction, and closest approach to Industry onshore. Activities within the geographic region may incorporate daily watch logs as well, which record 24-hour animal observations throughout the duration of the project. Polar bear monitors will be incorporated into the monitoring plan if bears are known to frequent the area or known polar bear dens are present in the area. At offshore Industry sites, systematic monitoring protocols will be implemented to statistically monitor observation trends of walruses or polar bears in the nearshore areas where they usually occur.

Take Estimates for Pacific Walruses and Polar Bears

Small Numbers Determination

The following analysis concludes that only small numbers of walruses and polar bears are likely to be subjected to Level B take by harassment incidental to the described Industry activities relative to their respective populations.

<u>1. The number of walruses and polar bears utilizing the Beaufort Sea ITR region during Industry operations is expected to be small relative to the number of animals in their overall populations.</u>

From 2010 through 2014 there were 1,234 Industry reports of polar bears comprising 1,911 bears total, or an average of 382 bears per year. The annual average of 382 bear observations comprises 42 percent of the current SBS polar bear population estimate of approximately 900 bears. We therefore assume 42 percent of the SBS population may have been observed by Industry personnel, though this is likely an overestimate due to the nature of the Industry observation data. When we evaluated the effects upon the 1,911 bears observed we found that 81 percent (1,549) resulted in instances of non-taking. There were 338 Level B takes of polar bears over those five years, approximately 18 percent of the observed bears, or 7.5 percent of the SBS population. We conclude that over the 5-year period of these ITRs, Industry activities will result in a similarly small number, approximately 340 Level B takes of polar bears.

2. Within the specified geographical region, the area of Industry activity is expected to be small relative to the range of walruses and polar bears.

Walruses and polar bears range beyond the boundaries of the proposed Beaufort Sea ITR region. The fact that walruses are extralimital in the Beaufort Sea and Polar bears move through the areas of Industry activity seasonally suggests that Industry activities in the geographic area of these proposed ITRs will have relatively few interactions with walruses and polar bears. As reported by AOGA, the total area of infrastructure on the North Slope as of 2012 was approximately 18,439 acres (7,462 ha), or 0.1 percent of the Arctic Coastal Plain between the Colville and Canning rivers. This is approximately 0.025 percent of the geographic region of these proposed ITRs. This area is smaller when compared to the range of walruses or the SBS polar bear population. Allowing for growth of Industry from 2012 through 2015, and anticipating growth over the 5-year period of these proposed ITRs, the Service concludes that the area of Industry activity will be relatively small compared to the range of walruses and polar bears.

3. Monitoring requirements and adaptive mitigation measures are expected to limit the number of incidental takes of animals.

Holders of an LOA will be required to adopt mitigation and monitoring measures designed to reduce potential impacts of their operations on walruses and polar bears. For Industry activities in terrestrial environments, where denning polar bears may be a factor, mitigation measures will require that den detection surveys be conducted and Industry will maintain at least a 1-mile distance from any known polar bear dens. A full description of the mitigation, monitoring, and reporting requirements associated with an LOA can be found in 50 CFR 18.128.

We expect that only a small proportion of the Pacific walrus population or the SBS polar bear population are likely to be affected by Industry activities because: (1) the majority of the walrus and polar bear populations will not come in contact with areas where Industry activities will occur; (2) only small numbers will be impacted because walruses are extralimital in the Beaufort Sea and polar bears are widely distributed throughout their expansive ranges, which encompasses area outside of the geographic region of the ITRs; and (3) the monitoring requirements and mitigation measures described below will further reduce potential impacts.

Negligible Effects Determination

Based upon our review of the nature, scope, timing of Industry activities, required mitigation measures, and in consideration of the best available scientific information, we have determined that the proposed activities will have a negligible impact on walruses and polar bears. Factors considered in our negligible effects determination include:

1. The behavior and distribution of walruses and polar bears in areas that overlap with Industry is expected to limit interactions of walruses and polar bears with Industry.

The distribution and habitat use patterns of walruses and polar bears indicate that relatively few animals will occur in the proposed areas of Industry activity at any particular time and those that do occur will spend little time there, thereby minimizing the number of animals that are likely to be adversely affected. As discussed previously, only small numbers of walruses are likely to be found in the Beaufort Sea where and when offshore Industry activities are proposed. Likewise, SBS polar bears are widely distributed, are most often closely associated with pack ice, are unlikely to interact with open-water industrial activities, and their range is greater than the geographic region of the proposed ITRs.

2. The predicted effects of Industry activities on walruses and polar bears will be nonlethal, temporary takes of animals.

The documented impacts of previous Industry activities on walruses and polar bears, taking into consideration cumulative effects, suggests that the types of activities analyzed for this rule will have minimal effects and will be short-term, temporary behavioral changes. The vast majority of reported polar bear observations have been of polar bears moving through the oil fields, undisturbed by the Industry activity.

3. The footprint of the proposed Industry activities is expected to be small relative to the range of the walrus and polar bear populations.

The relatively small area of Industry activity compared to the range of walruses and polar bears will reduce the potential of their exposure to and disturbance from Industry activities.

4. Mitigation measures will limit potential effects of Industry activities.

Holders of an LOA will be required to adopt monitoring requirements and mitigation measures designed to reduce the potential impacts of their operations on walruses and polar bears. Seasonal restrictions, early detection monitoring programs, den detection surveys for polar bears, and adaptive mitigation and management responses based on real-time monitoring information (described in these regulations) will be used to avoid or minimize interactions with walruses and polar bears and, therefore, limit potential Industry disturbance of these animals.

The Service concludes that any incidental take reasonably likely to occur in association with the proposed Industry activities addressed under these regulations will have no more than a negligible effect on walruses and polar bears within the Beaufort Sea region. We do not expect any resulting disturbance to negatively impact the rates of recruitment or survival for the walrus

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and polar bears populations. The proposed regulations do not authorize lethal take, and we do not anticipate that any lethal take will occur.

4.2.2 Potential Impacts on the Physical Environment

The preferred action is promulgation of regulations authorizing incidental take of polar bears and walruses. The authorization of incidental take, and any take by disturbance that will result, will have no impact on the physical environment. The associated Industry activities may have such impacts. A thorough discussion of impacts on the physical environment is found in the Beaufort and Chukchi Sea Planning Areas Draft EIS (*http://www.boem.gov/About-BOEM/BOEM-Regions/Alaska-Region/Environment/Environmental-Analysis/Draft-Environmental-Impact-Statement-OCS-EIS/EA-MMS-2008-0055.aspx*).

The proposed ITR area is limited to the Beaufort Sea region. The description of activities include: (1) the continued use and maintenance of the established oilfields in terrestrial and marine environments for production, where the majority of Industry activity will be in the terrestrial environment; (2) use of exploratory techniques to study the substrate for oil and gas reserves; (3) offshore drilling activities with stipulations in place that require plugging and capping of drill holes, and re-contouring the drill site as much as practicable; (4) onshore drilling, which could result in construction of ice pads, roads, and islands; and (5) vessels, ice breakers, and land transportation vehicles to help with facilitation of the above projects.

The geographic region contains a multitude of lands that are managed under various owners (e.g., Federal, state, and private landowners). The use of these lands will be dictated by those regulatory agencies with authority to permit the Industry activities. Once an Industry project has been permitted by the responsible agency, the Service will evaluate the project's effects on polar bears and walruses through a requested incidental take authorization, i.e., the LOA process provided by the proposed regulations.

With inclusion of all appropriate mitigation measures described in the Mitigation Measures section (page 67), plus any other measures incorporated into an LOA, the Service has determined that the Proposed Action would result in no measurable impacts of the physical environment.

4.2.3 Potential Impacts on the Socio-economic Environment

Three North Slope communities are within the Beaufort Sea ITR region: Barrow, Nuiqsut, and Kaktovik. Two additional communities, Atqasuk and Wainwright, harvest resources for subsistence uses from, and are adjacent to the Beaufort Sea region.

Effects of Oil and Gas Activities on Subsistence Harvest

The Alaska Native subsistence harvest of polar bears from the SBS population averages 36 bears annually. From 1978 to 2009, hunters from Barrow, Wainright, Kaktovick, Nuiqsut, and Atqasuk harvested a total of 583 bears, 75 percent of which were harvested by hunters from Barrow. Few walruses are harvested in the Beaufort Sea along the northern coast of Alaska since their primary range is in the Bering and Chukchi seas. All walruses taken by hunters from Wainright are harvested from the Chukchi Sea, as are approximately 98.5 percent of those from Barrow,

Nuiqsut, and Kaktovik. Hunters from Barrow harvested a total of 451 walruses in the past 20 years. In the past 15 years, Wainwright hunters have reported 874 walruses harvested. Walrus harvest from Nuiqsut and Kaktovik is rare and opportunistic.

Industry activities such as noise, vessel and aircraft disturbance, discharges, accidental spills, and presence of workers may hinder subsistence harvest if activities displace animals beyond the hunting range of subsistence communities, cause a change in an animal's normal behavior, or displace hunters away from productive areas. Disturbances associated with Industry activities could also heighten the sensitivity of animals to humans, with potential impacts to hunting success. Conversely, industry activities could also facilitate harvest if hunters gain information from Industry personnel regarding presence or location of a walrus or polar bear or if hunters use Industry access routes to ease travel to hunting grounds. Likewise, Industry activity could deflect polar bears into more accessible hunting areas.

Hunting success varies from year to year because of variable ice and weather conditions. The impacts of Industry on subsistence activities cannot readily be distinguished from other factors affecting walrus and polar bear distribution and abundance. Specific examples of impacts to subsistence hunting in the Arctic are rare, but have been reported; one Inuvialuit hunter reported that the location of the ice floe edge near Tuktoyaktuk had changed considerably as a result of artificial islands built for oil and gas exploration and the new floe edge and associated opportunity for polar bear hunting was farther from land (Joint Secretariat 2015). The potential impacts to harvest of marine mammals in the Chukchi Sea were described in detail, but not quantified, in BOEM EIS for Lease Sale 193 (BOEM 2015a). Many of the potential sources of impacts in the Chukchi Sea and the Beaufort Sea are the same, but there is little information available to quantify or predict the effects of Industry activities on the subsistence harvest of polar bears and walruses in either the Beaufort or Chukchi seas.

Effects of Issuance of ITRs on North Slope Communities

Prior to receipt of an LOA, Industry must provide evidence to us that community consultations have occurred or that an adequate POC has been presented to the subsistence communities. Industry will be required to contact subsistence communities that may be affected by its activities to discuss potential conflicts caused by location, timing, and methods of proposed operations. Industry must make reasonable efforts to ensure that activities do not interfere with subsistence hunting and adverse impacts on the availability of walruses and polar bear are minimized. However, should such a concern be voiced as Industry continues to reach out to the Native communities, measures to minimize any adverse effects must be developed. The POC must provide the procedures addressing how Industry will work with the affected Native communities and what actions will be taken to avoid interference with subsistence hunting of walruses and polar bears, as warranted. The POC will ensure that oil and gas activities will not have an unmitigable adverse impact on the availability of the species or stock for subsistence uses.

Changes in activity locations may trigger community concerns regarding the effect on subsistence uses. Industry will need to remain proactive to address potential impacts on the subsistence uses by affected communities through consultations, and where warranted, POCs. Open communication through venues, such as public meetings, which allow communities to express feedback prior to the initiation of operations, will be required as part of an LOA

application. If community subsistence use concerns arise from new or ongoing activities, available mitigation measures will be applied, such as a cessation of Industry activities at certain locations during specified times of the year, for example during the hunting seasons.

Multiple meetings for various projects from numerous operators have taken place under previous Beaufort Sea ITRs and no unmitigable concerns have been voiced by the Native communities with regard to Industry activities limiting availability of walruses or polar bears for subsistence uses. Based on Industry reports, aerial surveys, direct observations, community consultations, and personal communication with hunters, it appears that subsistence hunting opportunities for walruses and polar bears have not been affected by past Industry activities. We have received no evidence or reports that bears are altering their habitat use patterns, avoiding certain areas, or being affected in other ways by the existing level of oil and gas activity near communities or traditional hunting areas that would diminish their availability for subsistence use. Therefore we do not anticipate that the proposed activities for this ITR will have different effects. If there is new evidence during the 5-year period of the regulations that oil and gas activities are affecting the availability of walruses or polar bears for take for subsistence uses, we will reevaluate our findings regarding permissible limits of take and the measures required to ensure continued subsistence hunting opportunities.

Effects of Issuance of ITRs on Oil and Gas Industry

These mitigation measures may also have economic impacts on the oil and gas industry. Industry activities may need to be halted, postponed, or modified to prevent impacts to polar bears or walruses. For example, traffic on an Industry ice road may need to be diverted due to a polar bear den located nearby. The specific impacts and the associated costs are dependent on the activity and cannot be determined in advance. Typically, project modifications due to mitigation measures would constitute only a small portion of the cost of operations.

Issuance of ITRs may also have economic benefits for Industry. Take occurring without ITRs in place would be in violation of the MMPA and ESA. Industry parties could incur the penalties allowed by these laws, including financial damages. Issuance of ITRs and associated LOAs will authorize take and prevent ESA and MMPA violations and associated costs.

Transboundary Effects

On July 1, 1997, the CEQ issued a memorandum providing guidance on NEPA analyses for transboundary impacts, which states in part “that agencies must include analysis of reasonably foreseeable transboundary effects of proposed actions in their analysis of proposed actions in the United States.” Consistent with this memorandum, the Service considered management and conservation efforts in polar bear and Pacific walrus Range States as well and the reasonably foreseeable impacts the issuance of incidental take regulations might have on those efforts. The implementation of these regulations may have direct and foreseeable effects on polar bear and Pacific walrus populations inhabiting the Beaufort Sea. For this reason, our transboundary analysis focused on the CS and SBS polar bear stocks and the Pacific walrus population, both shared with the Russian Federation and Canada.

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In 1973, the Polar Bear Range States signed the *International Agreement on the Conservation of Polar Bears* (1973 Polar Bear Agreement). Consistent with Article III of the 1973 Polar Bear Agreement, the Range States, including the United States and the Russian Federation, recognize take by local people for subsistence purposes as an important exception to the otherwise prohibited taking of polar bears. International agreements covering the shared populations also recognize the importance of limiting human-bear interactions and encouraging appropriate deterrence techniques. We find that the issuance of incidental take regulations has the potential to benefit the transboundary management of polar bears in Canada and the Russian Federation because these regulations would authorize only potential harassment of polar bears, and would have mechanisms in place to reduce and mitigate such potential disturbances, thus minimizing any potential lethal take of polar bears.

While there are no formal international agreements specific to Pacific walruses, U.S. researchers work with colleagues in the Russian Federation to increase our understanding of Pacific walruses. The harvest of Pacific walruses in the Russian Federation is controlled through a quota system with an annual quota being issued through a decree by the Russian Federal Fisheries Agency. Quota recommendations are based on what is thought to be a sustainable removal level (approximately 4 percent of the population) based on total population and productivity estimates. Russian quota recommendations have generally been 2 percent or less of the estimated total population (Garlich-Miller and Pungowiyi 1999; Kochnev 2010, pers. comm.). Pacific walrus harvests for the Russian Federation have decreased from 3,000 per year in 2003 to 1,300 walruses in 2010 (Garlich-Miller and Pungowiyi 1999; Kochnev 2010, pers. comm.). These reductions are due in part to a concern over declining Pacific walrus populations. Even with these harvest reductions, incidental take regulations have the potential to decrease impacts of U.S.-based Industry activities on Pacific walruses so these activities do not impair the utilization of these species by the Russian Federation. We find that the issuance of incidental take regulations would have a potential benefit to the transboundary management of Pacific walrus in the Russian Federation because these regulations would authorize only potential harassment of Pacific walrus and have mechanism in place to reduce and mitigate such potential disturbances.

4.2.4 Cumulative Impacts

Cumulative impacts are defined as “the impacts on the environment which results from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future action regardless of what agency (Federal or non-Federal) or person undertakes such other actions” (40 CFR 1508.7). It is important to note, however, that the duration of the ITRs is for a 5-year period. At the end of 5 years or earlier if necessary, the Service can reassess the impacts of the Proposed Action. This is especially important in light of the rapid and unprecedented environmental changes occurring because of climate change. Our analyses are based upon the best scientific information available at this time. However, the global climate situation is changing in myriad unknown and unpredictable ways. With inclusion of the monitoring, reporting, and research components described in the Mitigation Measures section (page 67), the improved baseline data will provide insight from which mitigation measures can be adapted to accommodate new information, as well as help develop future measures. Subsistence harvest, vessel traffic, and past Industry activity have also contributed to current environmental conditions in the Beaufort Sea and could also cumulatively affect Pacific walrus and polar bear population status in the next 5 years.

Commercial and Subsistence Harvest

Walruses have an intrinsically low rate of reproduction and are thus limited in their capacity to respond to hunting. Recent recorded harvest levels for communities located in the geographic region of the requested action have indicated that 40 walrus were harvested from 2008 to 2012. However, all these animals were harvested from Barrow, and were likely taken to the west of Barrow, outside of the geographic region. Although recent overall harvest levels are lower than historic highs, lack of information on current population size or trend precludes an assessment of sustainable harvest rates. It is not anticipated that walrus harvest patterns will change significantly in the Beaufort Sea or the geographical region of the requested action.

Since 1972, only Alaska Natives from coastal Alaskan villages have been allowed to hunt polar bears for their subsistence uses or for handicraft and clothing items for sale. From 1987 to 2014, the total harvest for Alaska was 1,792 bears, averaging 66 bears per year. An average of 17 bears were harvested annually between 2010 and 2014 (n=82). Other sources of mortality related to human activities include bears killed during research activities, euthanasia of sick or injured bears, and defense of life kills by non-Natives. One of the Service's management concerns is the possible inadvertent overharvest of the CS or SBS stocks if the stocks become increasingly nutritionally stressed or decline due to some combination of the following threats: climate warming, which continues to increase both the expanse and duration of open water in summer and fall; human activities, including hydrocarbon exploration and development occurring within the near-shore environment; increased shipping and icebreaker activity and the risk of a large spill from one of these vessels; and/or changing atmospheric and oceanic transport of contaminants into the region. Population monitoring is critical for preventing overharvest.

Climate Change

The primary threat posed to the polar bear species, and the reason the species was listed under the ESA, is projection of future habitat loss (sea ice recession) linked to global climate change. Walruses also rely on suitable sea ice as a substrate for resting between foraging bouts, calving, molting, isolation from predators, and protection from storm events. The continued decline of sea ice is supported by the most recent climate models (IPCC 2014b; Douglas 2010).

For walruses, when sea ice recedes beyond shallow feeding areas on the continental shelf to the deep waters of the Polar Basin, they tend to relocate to coastal areas to rest on land. The number of walruses using land based haul-outs along the Chukchi Sea coast during the summer months, and the duration of haul-out use, has increased significantly over the past decade. In recent years scientists have documented tens of thousands of animals hauling out at some locations along the Russian and Alaskan coasts (Kavry et al. 2008). Disturbance can cause walruses to stampede into the water. Stampede-related injuries are especially dangerous for calves and young animals in herds, whose deaths have particularly high impacts on population (Udevitz et al. 2013).

Reasonably foreseeable impacts to walruses as a result of diminishing sea ice cover include: shifts in range; increased vulnerability to predation and disturbance; declines in available prey species; increased mortality rates resulting from storm events; and premature separation of females and dependent calves, all potentially negatively impacting abundance. Secondary effects on animal health and condition resulting from reductions in

suitable foraging habitat may also influence survivorship and productivity. Additionally, large concentrations of walrus on shore for longer periods of time could afford opportunity for additional harvest, and could potentially translate to somewhat higher harvest levels in the North Slope region.
Walruses are currently considered extralimital in the Beaufort Sea. While numbers could increase if walruses move east to forage for food, this is unlikely since the Beaufort Sea has significantly less shallow continental shelf area than the Chukchi Sea. Future studies investigating walrus distributions, population status and trends, and habitat use are critically important for responding to walrus conservation and management issues associated with changes in the sea ice environment.

For polar bears, habitat loss due to changes in arctic sea ice has been identified as the primary cause of decline in polar bear populations, and the decline of sea ice is expected to continue throughout the polar bear's range for the foreseeable future (73 FR 28212, May 15 2008). Under both stabilized and unabated greenhouse gas emissions models, polar bears are expected to have greatly decreased persistence throughout the region (Atwood et al. 2015). The Draft Polar Bear Conservation Management Plan states:

> *The threats to polar bears identified in the ESA listing determination were the loss of sea-ice habitat due to climate change and the inadequacy of existing mechanisms curtailing that threat (73 FR 28277). It cannot be overstated that the single most important action for the recovery of polar bears is to significantly reduce the present levels of global greenhouse gas emissions, which are the dominant source of increasing atmospheric levels that are the primary cause of warming in the Arctic. Recently, Atwood et al. (2015) corroborated the climate threat by determining through Bayesian network modeling that the most influential driver of adverse polar bear outcomes in the future will be declines in sea-ice conditions, and secondarily declines in marine prey base. Mortality from in situ anthropogenic factors like hunting and defense of life and property will exert considerably less influence on future polar bear population outcomes, while stressors such as trans-Arctic shipping, oil and gas exploration, and point-source pollution will have negligible effects (USFWS 2015).*

Climate change will affect polar bears in various ways. The timing of ice formation and breakup will determine how long and how efficiently polar bears can hunt seals, possibly reducing the polar bear prey availability. Reductions in sea ice will increase the polar bears' energetic costs of traveling, as moving through fragmented sea ice and open water is more energy intensive than walking across consolidated sea ice. Stressors are primarily reduced sea ice and decreased prey (Atwood et al. 2015). Human activities (e.g. industrial, subsistence) are expected to exert considerably smaller influence on populations (Atwood et al. 2015; Regehr et al. 2015).

Decreased sea ice extent may limit available denning habitat to bears, whether on the sea-ice by creating an unstable substrate, where a stable substrate is necessary for the duration of a successful den site; or on terrestrial habitats, where storm surge erosion events could limit selected denning areas. In the 1990s, approximately 50 percent of the maternal dens of the SBS polar bear population occurred annually on the pack ice in contrast to terrestrial sites (Amstrup and Garner 1994). The proportion of dens on pack ice declined from 62 percent in 1985 to 1994 to 37 percent in 1998 to 2004 (Fischbach et al. 2007). Polar bear terrestrial denning likely will become more important in the future as coastal erosion could alter terrestrial denning areas,

which could affect reproductive success. The Service views the issuance of ITRs with mitigation measures as necessary protections to ensure polar bear dens are protected and information on potential denning locations continues to be accumulated.

Due to the changing ice conditions, the Service anticipates that polar bear use of the Beaufort Sea coastal areas will increase during the open water season (June through October). Indeed, polar bear use of coastal areas during the fall open water period has increased in recent years in the Beaufort Sea. This change in distribution has been correlated with the distance to the pack ice at that time of year (the farther from shore the leading edge of the pack ice is, the more bears are observed onshore) (Schliebe et al. 2005). An increased number of bears on land may increase human-bear interactions or conflicts during this time period. Industry monitoring of polar bear use of coastal habitats, as well as human bear interactions through the ITRs are an important component of the conservation management plan.

It is recognized that the polar bear population is expected to decline as a result of continued Arctic warming and its associated sea ice habitat loss. The impact of oil and gas activities on species or stock health is negligible (Atwood et al. 2015; USFWS 2015). When compared to the effects of Arctic warming, the oil and gas activities will have an insignificant effect on the polar bear population of the Beaufort Sea.

Any incidental take of polar bears and Pacific walruses associated with oil and gas activities are expected to have no more than a negligible impact on the affected species or stock, and will not have an unmitigable adverse impact on the availability of the species or stock for subsistence uses.

Commercial Fishing and Marine Vessel Traffic

Polar bears spend the majority of their time on pack ice during the open water season, which limits their interaction with fishing vessels and barge traffic. The potential for interactions with bears and vessels can occur with either bears swimming or using ice floes in unconsolidated ice. If predictions for the decrease in the temporal and seasonal extent of the sea are realized, more vessels may transit the area and vessels may encounter polar bears more frequently. Researchers have observed that in some cases bears swim long distances during the open water period seeking either ice or land. With diminished ice, swimming bears may become vulnerable to exhaustion and storms because ice floes are dissipating and unavailable or unsuitable for use as haul-outs or resting platforms. Although rarely documented, vessel interactions with swimming bears could result in increased energetic expenditures.

Available data in the Beaufort Sea suggest that walruses rarely interact with commercial fishing and marine vessel traffic. Walruses are closely associated with sea ice, which limits their interactions with fishing vessels and barge traffic. However, as previously noted, the temporal and seasonal extent of the sea ice is projected to diminish in the future. Commercial shipping through the Northwest Passage and Siberian arctic waters may develop in coming decades. Commercial fishing opportunities may also expand should the sea ice continue to diminish. The result could be increased temporal and spatial overlap between fishing and shipping operations and walrus habitat use and increased interactions between walruses and marine vessels.

Past Offshore Oil and Gas Related Activities

Oil and gas related activities have been conducted in the Beaufort Sea since the late 1960s. Not all the animals exposed to an activity will necessarily have a behavioral response, or be disturbed by activities. Further, not all behavioral responses will be to a degree of causing a disruption of behavioral patterns that constitute a take as defined in the MMPA. According to the Service's guidelines, behavioral responses may include subtle to obvious changes in behavior, movement, or displacement (76 FR 77782, December 14, 2011). The Service's guidelines provide that, to constitute a take, a behavioral response must be biologically significant in that migration, breathing, nursing, breeding, feeding, or sheltering of an animal is disrupted (76 FR 54433, September 1, 2011). If a behavioral response includes a momentary change in behavior or moving a small distance, the impacts are not likely biologically significant (76 FR 77782, December 14, 2011).

As discussed earlier, the Beaufort Sea is considered extralimital for Pacific walrus. Hence, only very small numbers of walrus are present within the area of activity, and only during the open water season. Prior to 1995, no more than five walruses were encountered in the geographic region during oil and gas monitoring activities (LGL and Greeneridge 1996). From 2006 to 2012, no more than 30 walruses were sighted (Beland et al. 2011; LGL et al. 2013). Although more walruses have been seen in recent years, this might be attributed to increased activity levels and higher encounter rates. Although there have been occasional sightings of walruses hauled out on shore, there are no important foraging, haul-out, or rookery habitats for this population within the area. Few, if any, takes have been documented in the past, or are expected during the 5-year period of the proposed ITRs.

Documented impacts on polar bears by the oil and gas Industry during the past 40 years appear to be minimal. Historically, polar bears spend a limited amount of time on land, coming ashore to feed, den, or move to other areas. At times, fall storms deposit bears along the coastline where the bears remain until the ice returns. For this reason, polar bears have mainly been encountered at or near coastal and offshore production facilities, or along the roads and causeways that link these facilities to the mainland. According to AOGA figures, the offshore facilities of Endicott, Liberty, Northstar, and Oooguruk accounted for approximately 42 percent of the bear observations. With the changing of their distribution based on the changing ice environment, the Service anticipates that bears will remain on land longer. The likelihood of interactions between polar bears and Industry activities is thought to be increasing.

Sightings of polar bears are frequent, especially during the open water period. From Industry monitoring reports and observations from 2010 through 2014, there were 1,234 observation reports of 1,911 bears. A single polar bear may be sighted and reported multiple times during the year, or even multiple times in the same day by different operators or different observers. The high number of bear sightings is most likely due to increased number of bears using the terrestrial habitat as a result of changes in sea ice habitat, increased monitoring of industry projects, and repeat sightings of individual bears and family groups.

Intentional Take (Polar Bear Deterrence)

As during previous ITRs, the majority of actual impacts on polar bears have resulted from direct human-bear encounters. Intentional take of polar bears occurs in North Slope communities and during Industry activities through authorizations under sections 101(a)(4)(A), 109(h), and 112(c) of the MMPA, separate from the incidental take authorized by ITRs. The intentional take program allows the Service to authorize take of polar bears using non-lethal deterrence techniques. This program is conducted to maintain human and polar bear safety and welfare on the North Slope, and guidance and training are provided. We have found that the intentional take program, together with the planning and training requirements set forth in the ITRs and required through the LOA process have improved awareness of polar bears and have minimized the frequency and severity of encounters. We currently have no indication that these encounters, which alter the behavior and movement of individual bears, have an effect on survival and recruitment in the polar bear population.

Summary of Cumulative Impacts

Hunting pressure, climate change, and the expansion of commercial activities into their habitats all have potential to impact polar bears and Pacific walruses. Combined, these factors are expected to present challenges to future management and regulatory efforts. The success of future management will rely in part on continued investments in research investigating population status and trends and habitat use patterns. The effectiveness of various mitigation measures and management actions will also need to be continually evaluated through monitoring programs and adjusted as necessary. Climate change is of particular concern, and will need to be considered as more information on polar bear and Pacific walrus population status becomes available. The observed and projected losses of sea ice habitats in the Beaufort Sea will likely result in continued changes in seasonal distributions and habitat use patterns of polar bears and walruses.

It is difficult to forecast the rate and magnitude of future population changes because of the uncertainty inherent in future sea ice projections as well as uncertainty in the relationships between habitat changes and population demographics. The effects of climate change may continue to bring more polar bears to shore during ice-free periods and open offshore travel routes, allowing increased human access the Beaufort Sea. These effects, combined with eventual expansion of oil and gas development, both on and offshore, will lead to an overall increase in human-bear encounter rates. While most bear encounters end peaceably, the potential for conflict is directly related to frequency of encounters. Inuit and Inupiaq communities have agreed that bears shot for personal or public safety are to be subtracted from harvest quotas. Therefore, the resulting numbers of bears removed may not change, but the purposes for which they are taken may, resulting in fewer bears harvested during targeting hunting for polar bears.

Contribution to Cumulative Impacts

The descriptions of activities identified by the petitioners are likely to result in some incremental cumulative impacts to polar bears and walruses through exclusion or disturbance, potentially disrupting important associated biological behaviors. However, relatively few walruses and a limited number of polar bears are likely to interact with Industry activities. Required monitoring

and mitigation measures, designed to minimize interactions between authorized projects and walruses or polar bears are also expected to limit the severity of any behavioral responses. Therefore, we conclude that the proposed Industry activities, as mitigated through the regulatory process, would contribute only a negligible increase over and above the effects of baseline activities currently occurring as well as future activities that are reasonably likely to occur within the 5-year period covered by the regulations. [Top]

Chapter 5. CONCLUSIONS

5.1 Small Numbers

5.1.1 Pacific Walruses

We estimate that there will be no more than 10 Level B harassment takes of Pacific walruses by Industry activities during the 5-year period of these ITRs. Any takes will be Level B harassment, manifested as short-term, temporary behavioral changes. This take estimate is based on years of Industry observation reports. Walruses are extralimital in the Beaufort Sea and, hence, there is a low probability that the proposed Industry activities will adversely affect the walrus population. We also do not anticipate the potential for any lethal take from the proposed Industry activities. Therefore, we do not anticipate any detrimental effects on recruitment or survival of the walrus population.

5.1.2 Polar Bears

Industry observation reports from 2010 to 2014 indicate that an average of 383 polar bears was observed annually during Industry activities. Some of these observations are sightings of the same bears on different occasions. While the majority of observations were sightings with no interaction between polar bears and Industry activity (~81 percent of observed bears), takes by harassment do occur. According to Industry monitoring data, the number of Level B takes has averaged 68 per year from 2010 through 2014, including both incidental take by Industry and intentional take from deterrence activities. We included intentional takes to provide a transparent and complete analysis of Industry-related polar bear takes on the North Slope of Alaska. Based on this information, we estimate that there will be no more than 340 Level B harassment takes of polar bears during the 5-year period of these ITRs. All takes are anticipated to be nonlethal Level B harassment involving short-term and temporary changes in bear behavior. The required mitigation and monitoring measures described in the regulations are expected to prevent injurious Level A takes and therefore, the number of lethal takes is estimated to be zero.

5.2 Negligible Impact

Based on the best scientific information available, the results of Industry monitoring data from the previous ITRs, the review of the information generated by the listing of the polar bear as a threatened species and the designation of critical habitat, the ongoing analysis of the petition to

list the Pacific walrus as a threatened species under the ESA, the results of our modeling assessments, and the status of the population, we find that any incidental take reasonably likely to result from the effects of Industry activities in the Beaufort Sea and adjacent northern coast of Alaska during the period of the proposed ITRs will have no more than a negligible impact on walruses and polar bears. Though walruses are uncommon in the Beaufort Sea, the Service and USGS are conducting multiyear studies on the population to investigate movements and habitat use patterns. It is possible that as sea-ice diminishes in the Chukchi Sea beyond the 5-year period of this rule, walrus and polar bear distribution and habitat use may change. Importantly, we do not expect that the total of these disturbances will affect rates of recruitment or survival for walruses or polar bears. In making this finding, we considered the following:

(1) Distribution of the species;
(2) Biological characteristics of the species;
(3) Nature of oil and gas Industry activities;
(4) Potential effects of Industry activities and potential oil spills on the species;
(5) Probability of oil spills occurring;
(6) Impacts of Industry activities on the species given cumulative effects;
(7) Potential impacts of climate change;
(8) Mitigation measures to reduce Industry impacts through adaptive management; and
(9) Other data provided by Industry monitoring in the Beaufort and Chukchi seas.

We also considered Congressional direction for balancing the potential for a significant impact with the likelihood of that event occurring. The Congressional Record states:

> *If potential effects of a specified activity are conjectural or speculative, a finding of negligible impact may be appropriate. A finding of negligible impact may also be appropriate if the probability of occurrence is low but the potential effects may be significant. In this case, the probability of occurrence of impacts must be balanced with the potential severity of harm to the species or stock when determining negligible impact. In applying this balancing test, the Service will thoroughly evaluate the risks involved and the potential impacts on marine mammal populations. Such determination will be made based on the best available scientific information (53 FR 8474, March 15, 1988; 132 Cong. Rec. S 16305 (October. 15, 1986)).*

Our finding of "negligible impact" applies to incidental take associated with oil and gas exploration, development, production, and similar activities, as mitigated through the regulatory process. The regulations establish monitoring and reporting requirements to evaluate the potential impacts of authorized activities, as well as mitigation measures designed to minimize interactions with and impacts to walruses and polar bears. We will evaluate each request for an LOA based on the specific activity and the specific geographic location where the proposed activities are projected to occur to ensure that the level of activity and potential take is consistent with our finding of negligible impact. Depending on the results of the evaluation, we may grant the authorization, add further operating restrictions, or deny the authorization.

5.3 Effects on Subsistence Uses

Based on community consultations, locations of hunting areas, the potential overlap of hunting areas and Industry projects, the best scientific information available, and the results of

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monitoring data, we find that take caused by oil and gas exploration, development, and production activities in the Beaufort Sea and adjacent northern coast of Alaska will not have an unmitigable adverse impact on the availability of walruses and polar bears for taking for subsistence uses during the period of the rule. In making this finding, we considered the following: (1) records on subsistence harvest from the Service's Marking, Tagging, and Reporting Program; (2) community consultations conducted for LOAs and previous ITRs; (3) effectiveness of the POC process based on feedback received from Industry and affected Native communities (4) anticipated 5-year effects of Industry activities on subsistence hunting.

5.4 Conclusion Summary

To fulfill the requirement of NEPA, we analyzed the probable environmental impacts of issuance of regulations for incidental take of polar bears and walruses from oil and gas activities occurring between August 3, 2016, and August 2, 2021 in the Beaufort Sea and North Slope of Alaska. We also considered a No Action alternative. The Proposed Action (the issuance of the ITRs) primarily affects the biological and socio-economic components of the human environment. In particular, the ITRs affect the oil and gas industry's effects on polar bears and walrus. In order to determine whether the Proposed Action is a major Federal action that significantly affects the quality of the human environment, we reviewed the effects of the proposed oil and gas Industry activities occurring from 2016 to 2012 on walruses and polar bears, including impacts from noise, physical obstructions, human encounters, and oil spills. We evaluated these impacts in light of cumulative effects from subsistence harvest, climate change, vessel traffic, and past oil and gas activities.

Most of the impacts of Industry activities on polar bears and Pacific walruses will be short-term disturbances. Polar bears and walruses may change their location or alter their behavior in response to noise, vessels, aircraft, the presence of humans and Industry facilities. The majority of these disturbances will have no impacts on the survival or reproduction of the individual and no impacts to the population. The Industry impact most capable of causing significant environmental impacts is the risk of oil spills. We have analyzed the likelihood of an oil spill in the marine environment of the magnitude necessary to affect polar bear and walrus populations. We found there to be a low likelihood of spills capable of causing mortality, and a very low likelihood of population-level effects

The primary environmental threat to polar bears and to Pacific walruses is from the effects of climate change. Although the 5-year period of the proposed regulations is short, the progression of climate change in the Arctic is expected to continue, with ongoing adverse impacts or threatened impacts for polar bears and walruses. For polar bears in the Beaufort Sea region, sea ice declines may continue to affect their health (body condition), distribution, breeding success, and ultimately abundance. Because the Beaufort Sea region is extralimital for Pacific walrus, effects from climate change on Pacific walrus in this area are uncertain.

Notwithstanding the continuing negative effects of climate change, Industry effects on walruses and polar bears are expected to occur at a level similar to what has taken place under previous regulations. We anticipate that there will be an increased use of terrestrial habitat by polar bears in the fall. We also anticipate a slight increased use of terrestrial habitat by denning bears. These

changes may result in more frequent encounters with Industry. The mitigation measures may be implemented more frequently, but are expected to be effective in minimizing Industry effects arising due to shifts in distribution of polar bears during the 5-year timeframe of the ITRs.

After considering the effects of oil and gas development, production, and exploration activities and related activities, given the cumulative impacts from climate change and other sources, we find that the total expected takings from oil and gas Industry activities will affect no more than small numbers and will have no more than a negligible impact on the walrus and polar bear populations inhabiting the Beaufort Sea ITR region. Industry impacts are not anticipated to diminish the availability of polar bears or walruses for subsistence use. By requiring monitoring, reporting, and mitigation, the proposed ITRs will have the least practicable adverse impact on polar bears and Pacific walruses and their habitat, and on the availability of the species for subsistence uses. Therefore, the proposed regulations are not reasonably expected to have a significant impact on the human environment. [Top]

Chapter 6. CONSULTATION AND COORDINATION

The Service is the lead agency in the development of this DEA. Once the proposed ITRs and DEA are published, there will be a 30-day public comment period on both the proposed ITRs and the DEA. After considering the comments received, the Service will reach a final decision and will then publish a final rule. The Service may also publish a FONSI for the DEA. This FONSI would take into account any new information and public comment. If the Service concludes with a FONSI, then the deciding official will write a decision document selecting an alternative to implement, make additional agency findings, and identify any stipulations.

In addition to providing public notice, the Service will notify and seek comments from Tribal organizations. The Service is committed to fulfilling its Tribal consultation obligations and acknowledges our responsibilities to work directly with Alaska Natives in developing programs for healthy ecosystems, to seek their full and meaningful participation in evaluating and addressing conservation concerns for listed species, to remain sensitive to Alaska Native culture, and to make information available to Tribes.

Through the LOA process identified in the regulations, Industry applicants for an LOA will conduct meetings with the Native communities most likely to be affected by the proposed Industry activity, address community concerns, and develop a Plan of Cooperation (POC), if warranted, to avoid conflicts.

To facilitate co-management activities for polar bears and walruses on the North Slope and the Beaufort Sea, cooperative agreements have been completed by the Service, the ANC, and the (EWC). The cooperative agreements fund a wide variety of management initiatives, including: commission co-management operations; biological sampling programs; harvest monitoring; collection of Native knowledge in management; international coordination on management issues; and development of local conservation plans. Input on these proposed ITRs will be solicited from our co-management partners and incorporated into the final ITRs.

The Service also has ongoing cooperative relationships with the NSB and the Inupiat-Inuvialuit Joint Commission to manage the polar bear harvest in the SBS population. We work collaboratively to ensure that data collected from harvest and research activities, are used to: inform sustainable harvest management; provide information to co-management partners that allows them to evaluate harvest relative to management agreements and objectives; and allow evaluation of the status, trends, and health of polar bear population. We are open to discussing ways to continually to improve our coordination and information exchange, including through the LOA process, as may be requested by Tribes.

Although the Service recognizes that formal scoping may be ideal given the general interest in polar bear and walrus conservation, a formal scoping process is not proposed for the following reasons: (1) the short timeframe associated with promulgating the regulations; (2) through legal filings associated with previous ITRs and the public comment process, the Service has gained a good understanding of many of the opinions and concerns of key stakeholders; these were considered during the drafting of this DEA; and (3) formal scoping is not required for EAs.

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